

IMMINGHAM EASTERN RO-RO TERMINAL



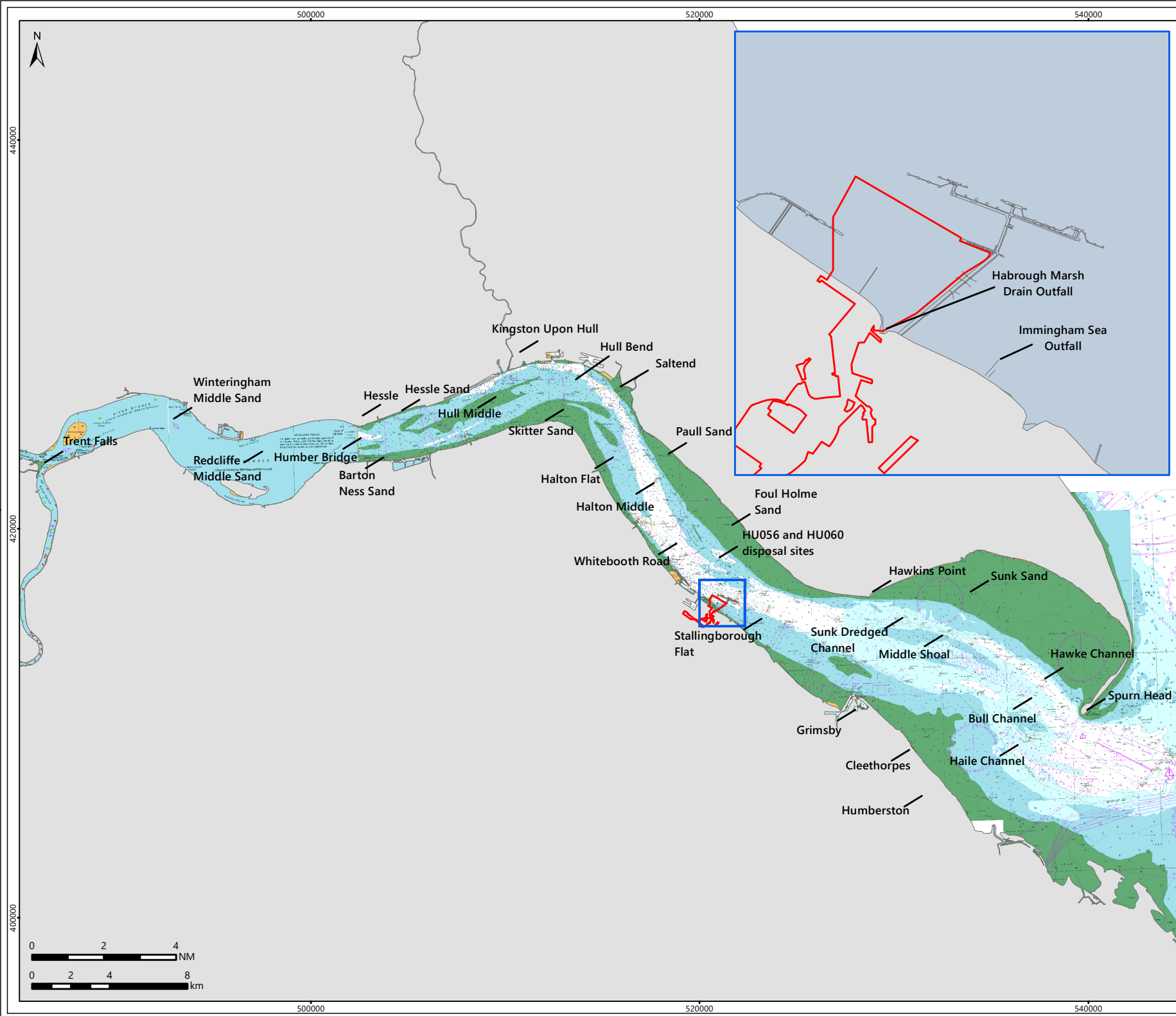
Environmental Statement: Volume 2
Figures: Chapter 7: Physical Processes
Document Reference: 8.3.7

APFP Regulations 2009 – Regulation 5(2)(a) and 5(2)(e)
PINS Reference – TR030007

February 2023

Figures	Coversheet
8.3.7(a)	Figure 7.1 Regional setting within Humber Estuary
8.3.7(b)	Figure 7.2 Current and wave roses at the proposed site
8.3.7(c)	Figure 7.3 Benthic sampling locations
8.3.7(d)	Figure 7.4 Particle size distribution of bed samples
8.3.7(e)	Figure 7.5 Maximum excess SSC from peak flood (top) and peak ebb (bottom) at HU060
8.3.7(f)	Figure 7.6 Maximum SSC and sedimentation from dredge and disposal across full modelled period
8.3.7(g)	Figure 7.7 Timeseries of excess SSC (top) and SED (bottom) at locations down (left) and up-estuary (right)
8.3.7(h)	Figure 7.8 Peak flood baseline flows (top) and impact of scheme (bottom)
8.3.7(i)	Figure 7.9 Peak ebb baseline flows (top) and impact of scheme (bottom)
8.3.7(j)	Figure 7.10 Timeseries of changes to flows and bed shear stress for sites DP1 (left) and DP2 (right)
8.3.7(k)	Figure 7.11 Timeseries of changes to flows and bed shear stress for sites DP3 (left) and DP4 (right)
8.3.7(l)	Figure 7.12 Timeseries of changes to flows and bed shear stress for sites P1 (left) and P2 (right)
8.3.7(m)	Figure 7.13 Timeseries of changes to flows and bed shear stress for sites P3 (left) and P4 (right)
8.3.7(n)	Figure 7.14 Timeseries of changes to flows and bed shear stress for sites P5 (left) and P6 (right)
8.3.7(o)	Figure 7.15 Timeseries of changes to flows and bed shear stress for sites P7 (left) and IOT (right)
8.3.7(p)	Figure 7.16 Timeseries of changes to flows and bed shear stress for sites HST (left) and Able (right)
8.3.7(q)	Figure 7.17 Baseline peak flood flow speed (top), change due to scheme (left) and due to vessels on berth (right)
8.3.7(r)	Figure 7.18 Baseline ebb flood flow speed (top), change due to scheme (left) and due to vessels on berth (right)

8.3.7(s)	Figure 7.19	Modelled bed level change over a mean spring neap cycle
8.3.7(t)	Figure 7.20	Predicted change to BSS on flood (top) and ebb (bottom)
8.3.7(u)	Figure 7.21	Predicted baseline sedimentation over mean spring neap cycle
8.3.7(v)	Figure 7.22	Baseline Hs (top) and effect of scheme (bottom) for 0.5-yr wave event from NE (left) and E (right)
8.3.7(w)	Figure 7.23	Baseline Hs (top) and effect of scheme (bottom) for 0.5-yr wave event from SE (left) and 50-yr wave from NE (right)
8.3.7(x)	Figure 7.24	Baseline Hs (top) and effect of scheme (bottom) for 50-yr wave event from E (left) and from SE (right)



Legend
 Proposed Application Site

© ABPmer, All rights reserved, 2023. © Crown copyright and database rights 2022. Ordnance Survey 0100031673.
 © Crown Copyright and/or database rights. Reproduced by permission of The Keeper of Public Records and the UK Hydrographic Office (www.gov.uk/ukho).
 Not to be used for navigation

Date	By	QA
08/02/2023	OJR	CRO
Projection	British National Grid	
Scale (A4)	1:250,000	
Project no.	5035	

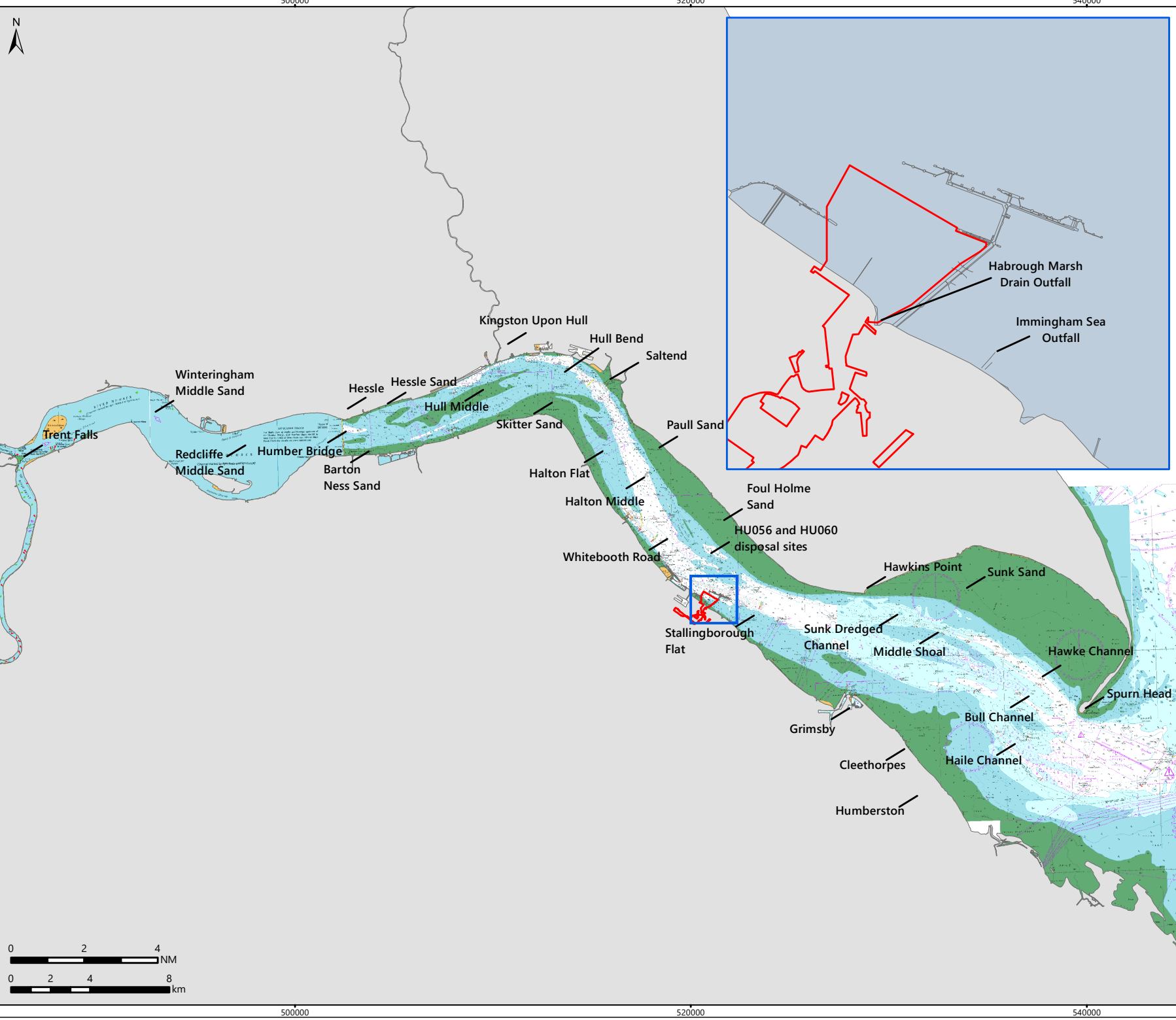
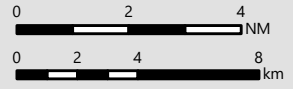


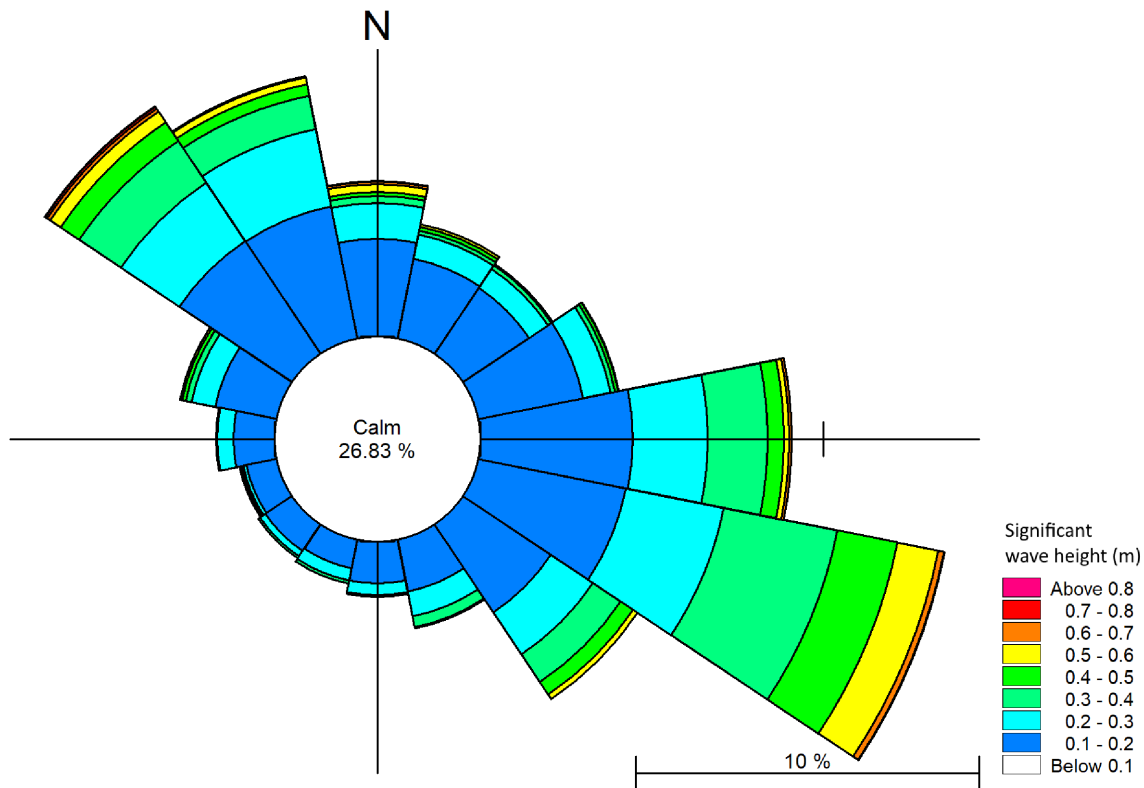
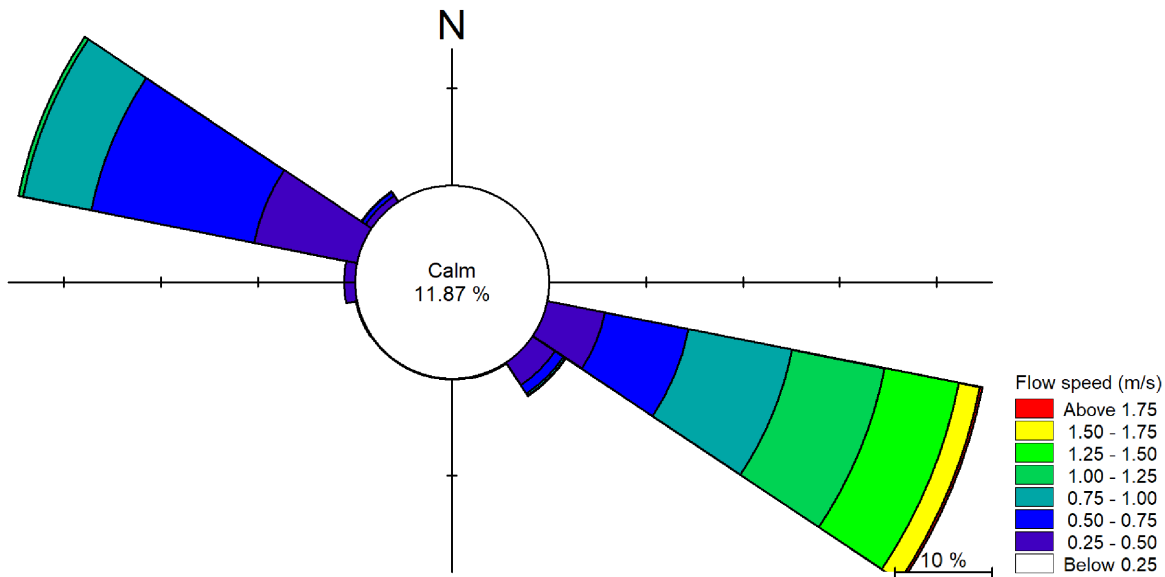
Fig7.1_ES_A4.mxd



**IMMINGHAM EASTERN
 RO-RO TERMINAL
 REGIONAL SETTING WITHIN
 THE HUMBER ESTUARY**

Figure 7.1





© ABPmer, All rights reserved, 2022.

Rose plots based on measured data collected between November 2019 and June 2020.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

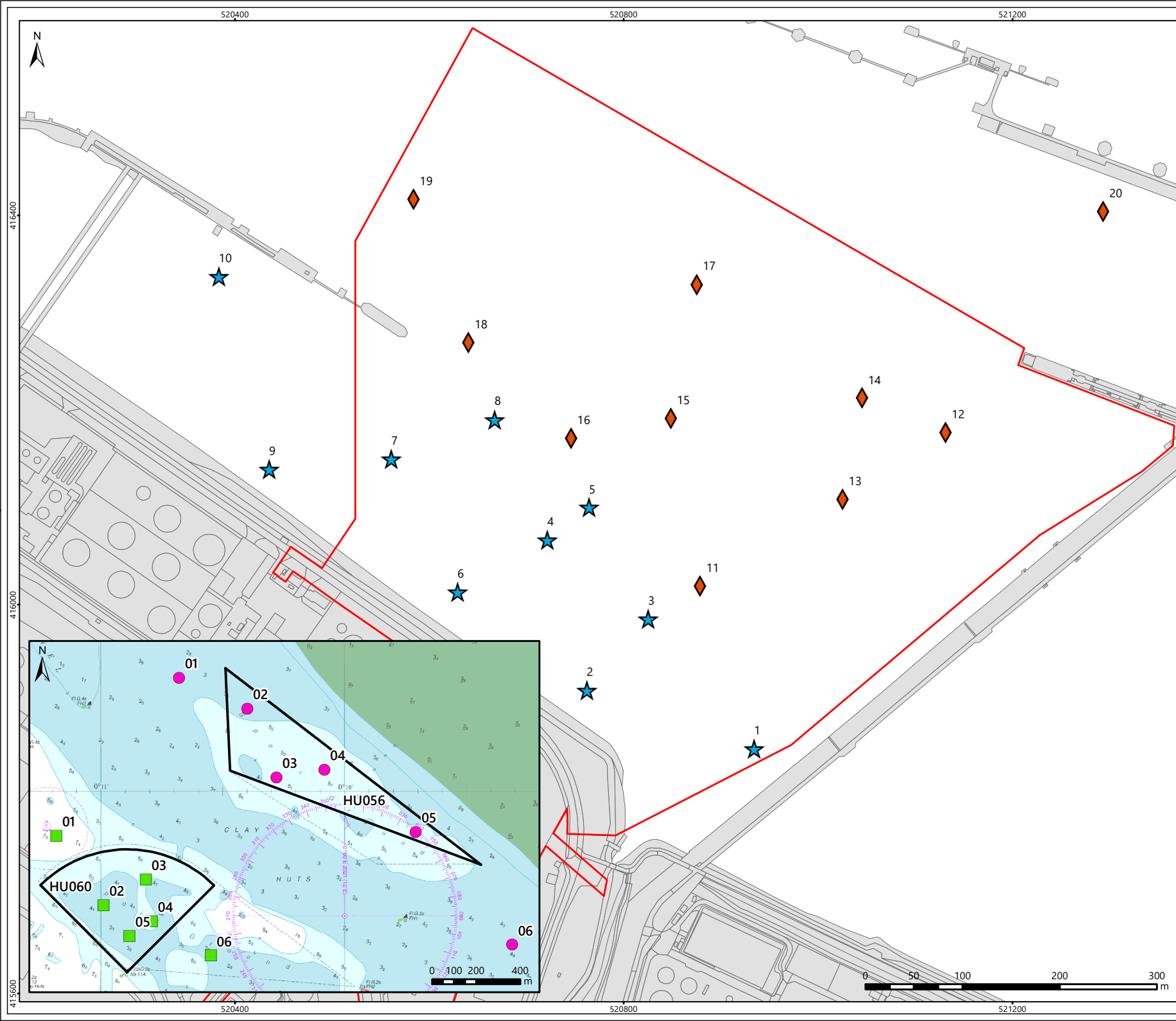


Fig7.2_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
CURRENT AND WAVE ROSES
AT THE PROPOSED SITE**

Figure 7.2



Legend

- Proposed Application Site
- Sediment sampling
 - Intertidal
 - Subtidal
- Disposal site sampling
 - HU056
 - HU060

© ABPmer, All rights reserved, 2022. © Crown copyright and database rights 2022. Ordnance Survey 0100031673. © Crown Copyright and/or database rights. Reproduced by permission of The Keeper of Public Records and the UK Hydrographic Office (www.gov.uk/ukho). Not to be used for navigation.

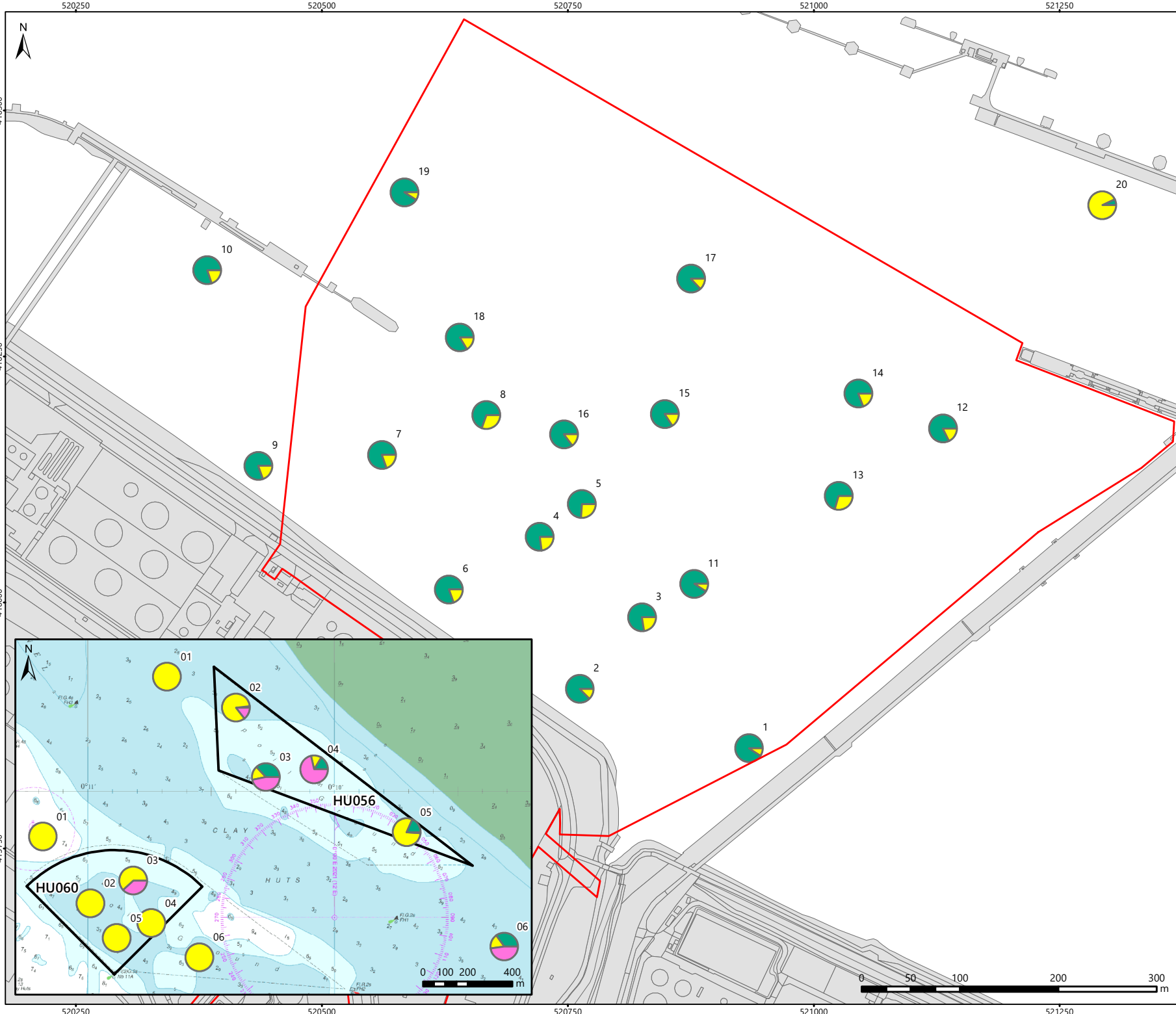
Date	By	QA
09/12/2022	AMF	OJR
Projection	British National Grid	
Scale (A4)	1:5,000 / 1:22,000	
Project no.	5035	



Fig7.3_ES_A4.mxd

**IMMINGHAM EASTERN
RO-RO TERMINAL
BENTHIC SAMPLING LOCATIONS**

Figure 7.3



Legend

Proposed Application Site

Sediment sampling

- mud
- sand
- gravel

© ABPmer, All rights reserved, 2022. © Crown copyright and database rights 2022. Ordnance Survey 0100031673. © Crown Copyright and/or database rights. Reproduced by permission of The Keeper of Public Records and the UK Hydrographic Office (www.gov.uk/ukho). Not to be used for navigation.

Date	By	QA
09/12/2022	AMF	OJR
Projection	British National Grid	
Scale (A4)	1:5,000 / 1:22,000	
Project no.	5035	

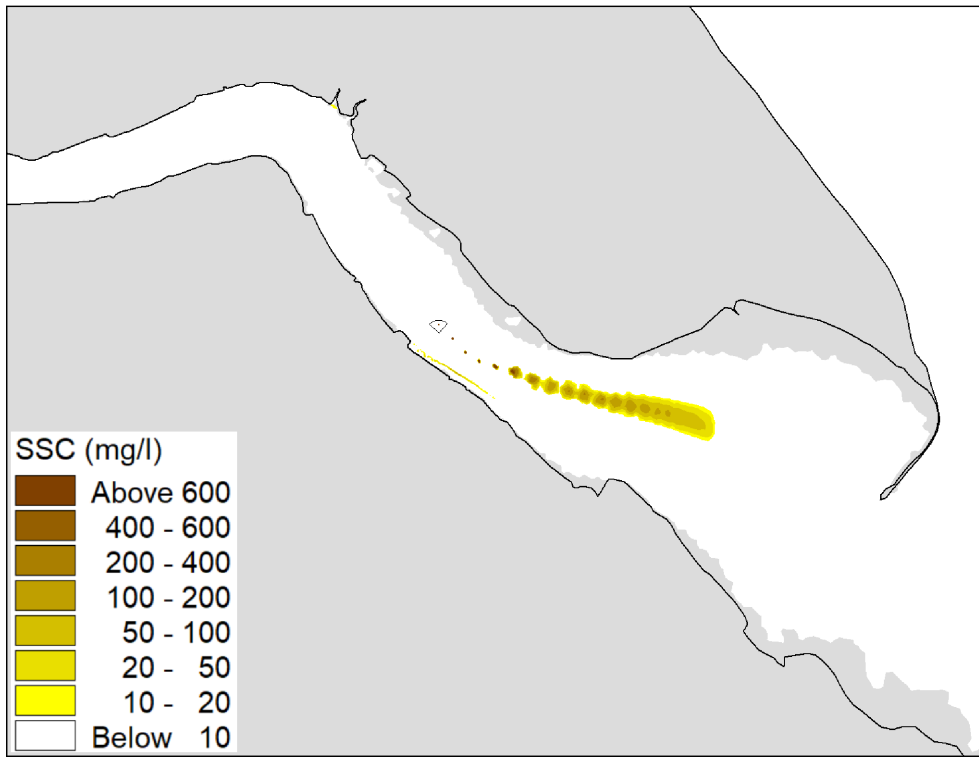
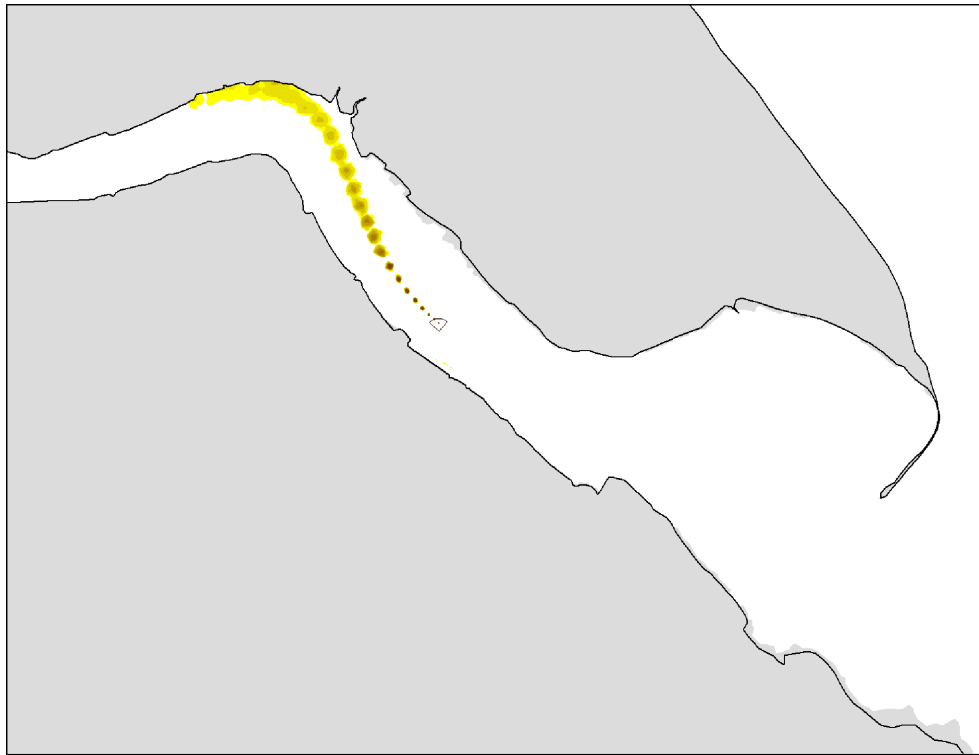


Fig7.4_ES_A4.mxd		
------------------	--	--



**IMMINGHAM EASTERN
RO-RO TERMINAL
PARTICLE SIZE DISTRIBUTION
OF BED SAMPLES**

Figure 7.4



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

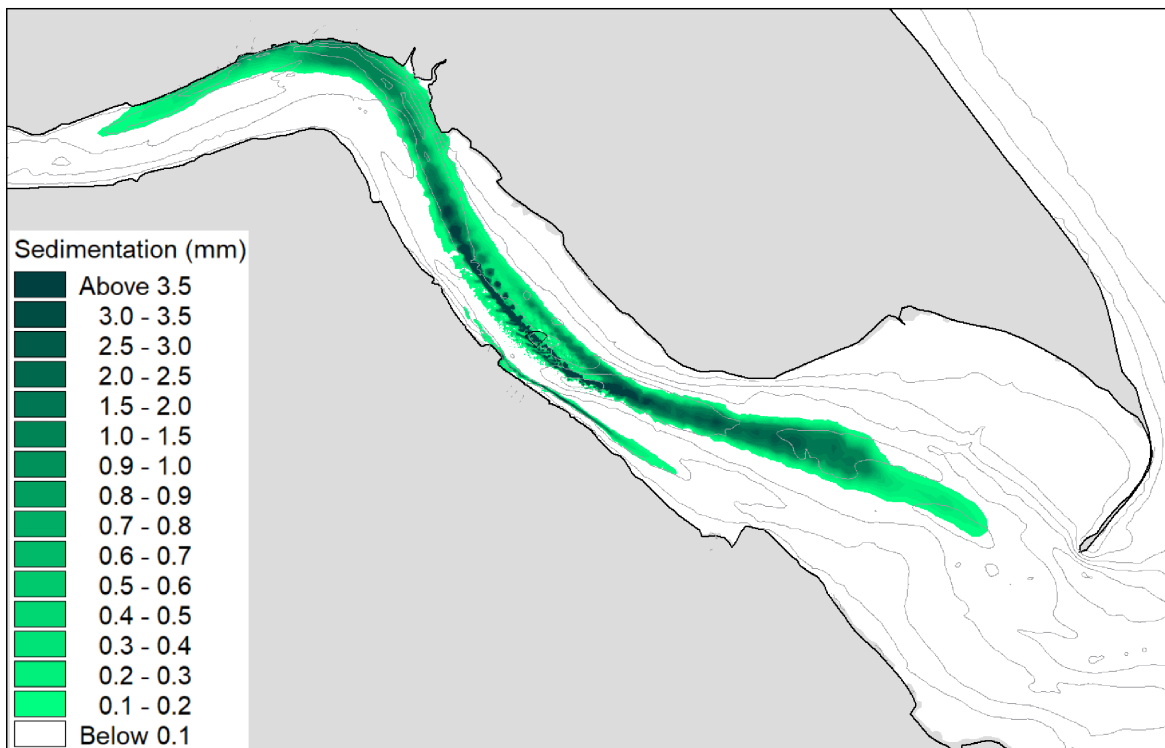
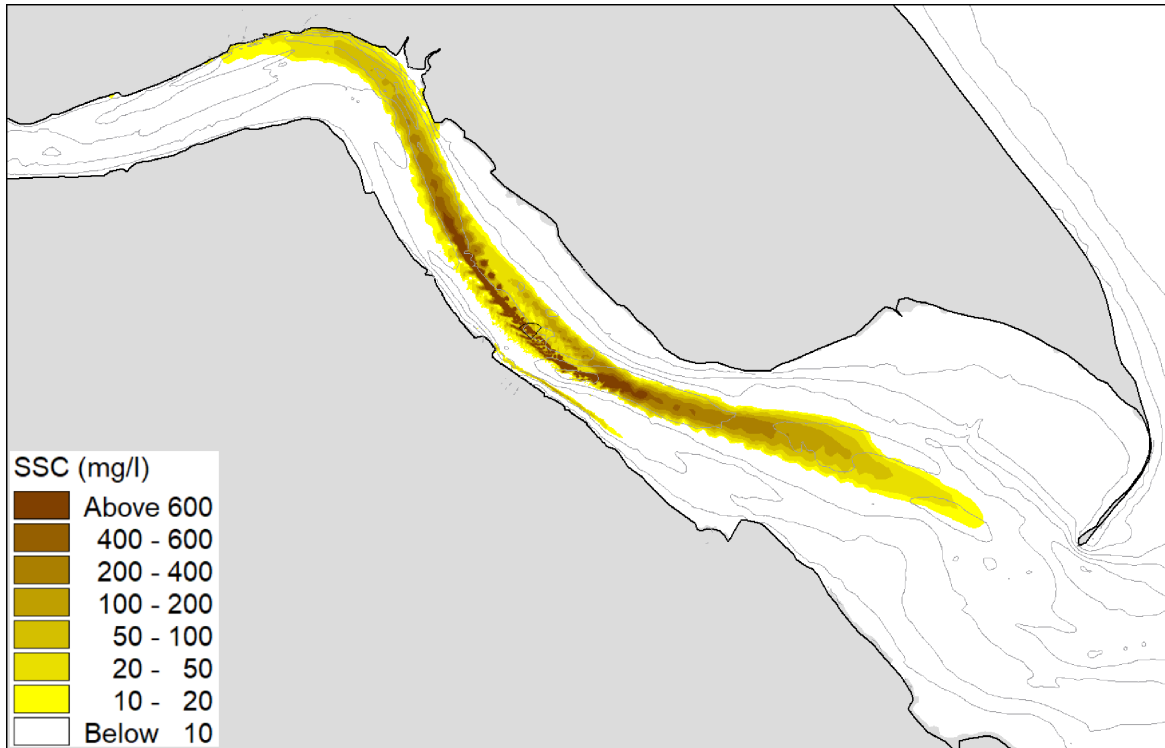


Fig7.5_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
MAXIMUM EXCESS SSC FROM
PEAK FLOOD (TOP) AND PEAK
EBB (BOTTOM) DISPOSAL AT HU60**

Figure 7.5



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

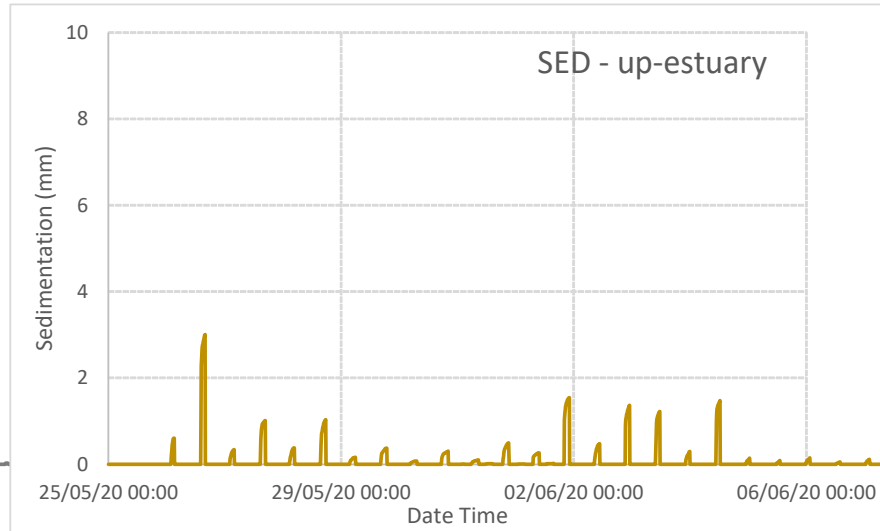
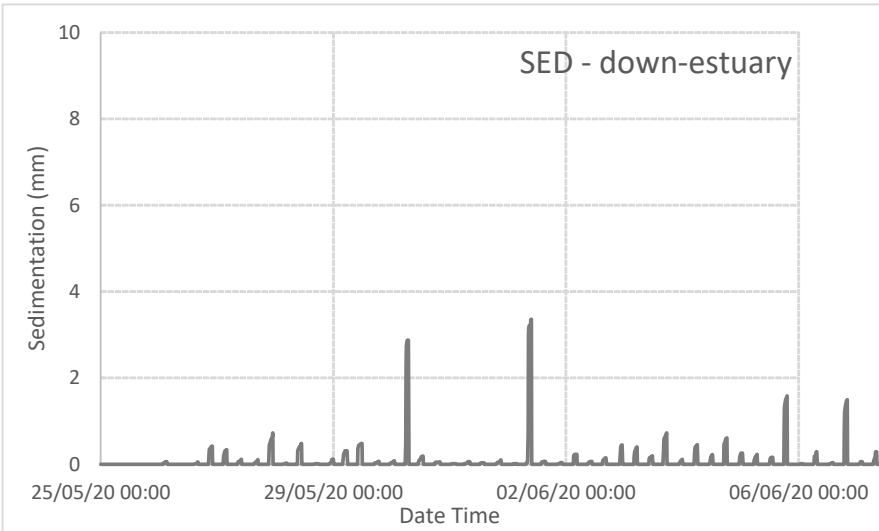
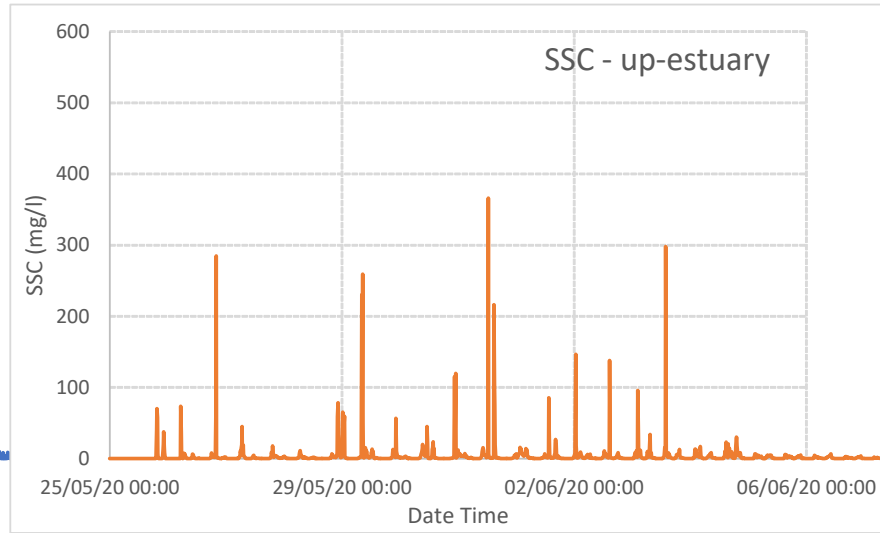
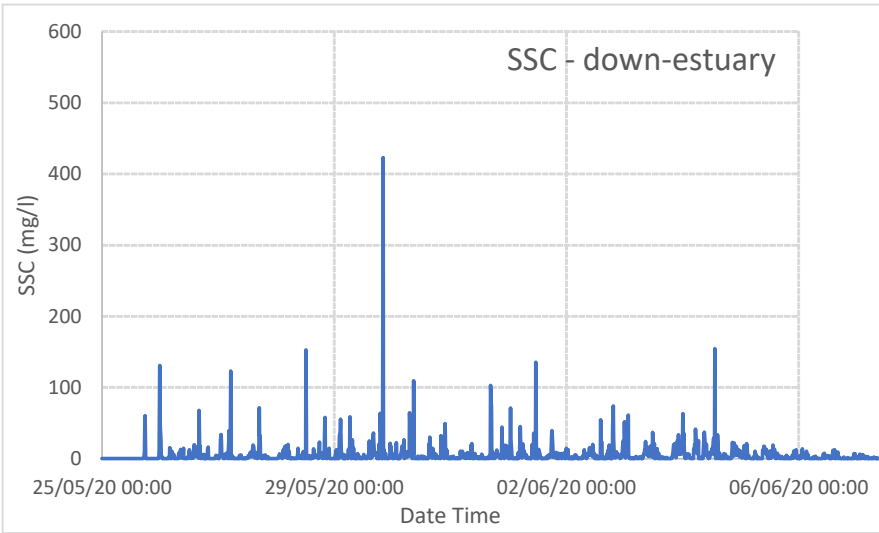


Fig7.6_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
MAXIMUM SSC AND SEDIMENTATION
FROM DREDGE AND DISPOSAL
ACROSS FULL MODELLED PERIOD**

Figure 7.6



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

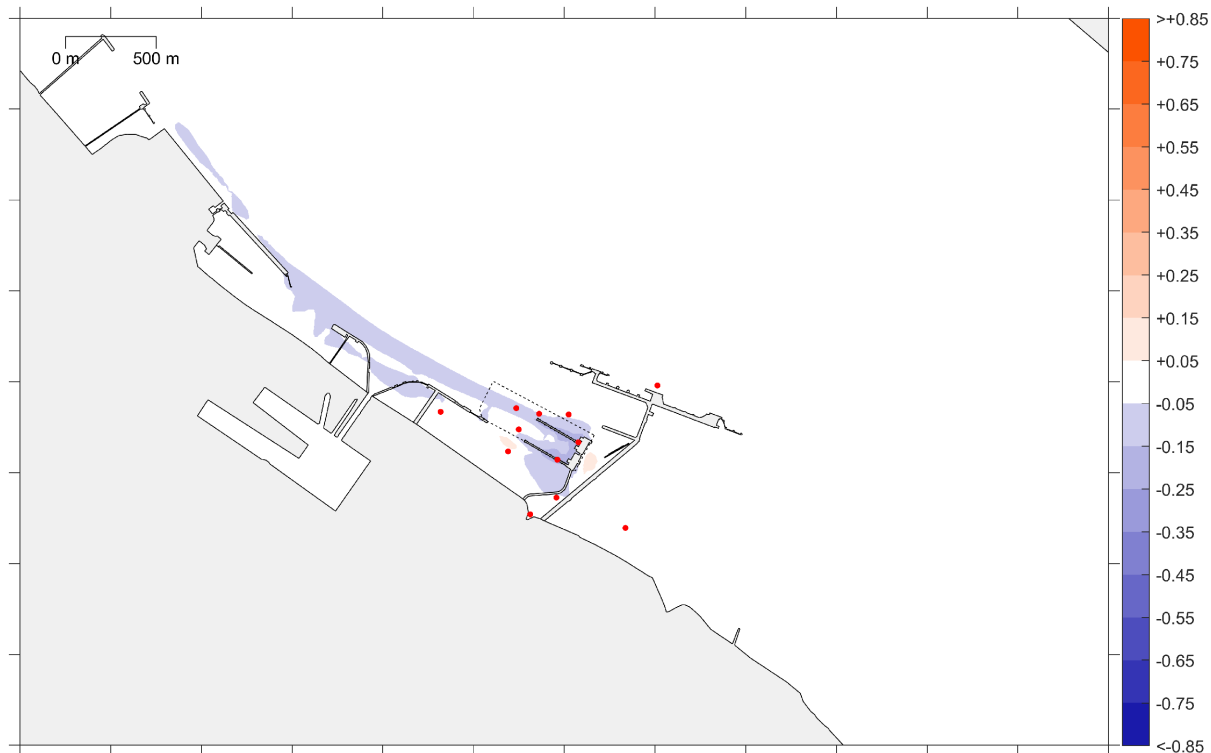
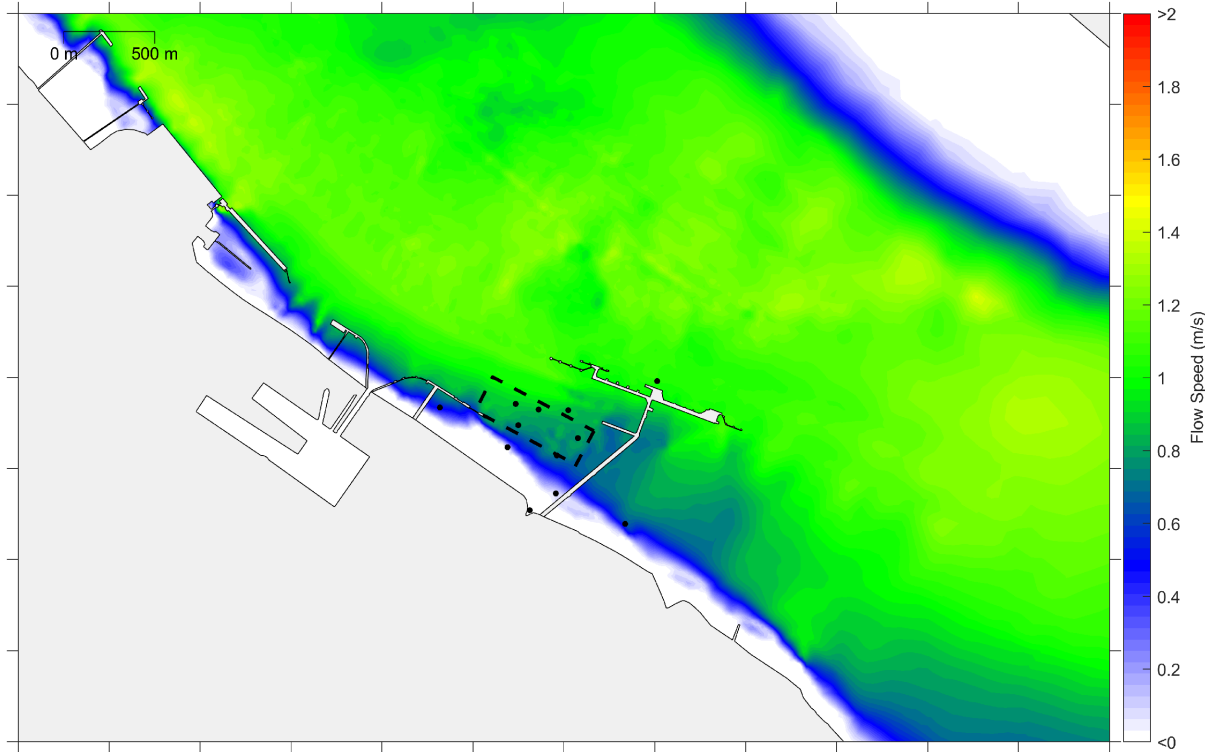


Fig7.7_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL**
**TIMESERIES OF EXCESS SSC (TOP) AND
SED (BOTTOM) AT LOCATIONS DOWN
(LEFT) AND UP-ESTUARY (RIGHT)**

Figure 7.7



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

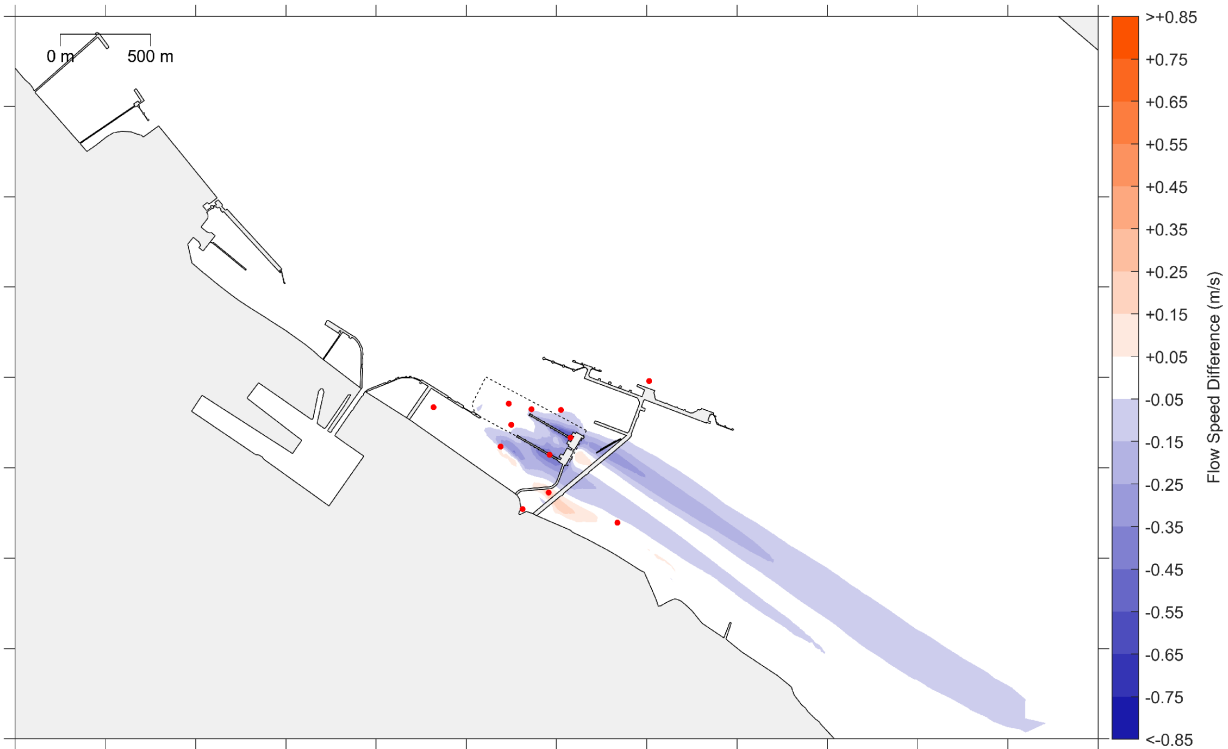
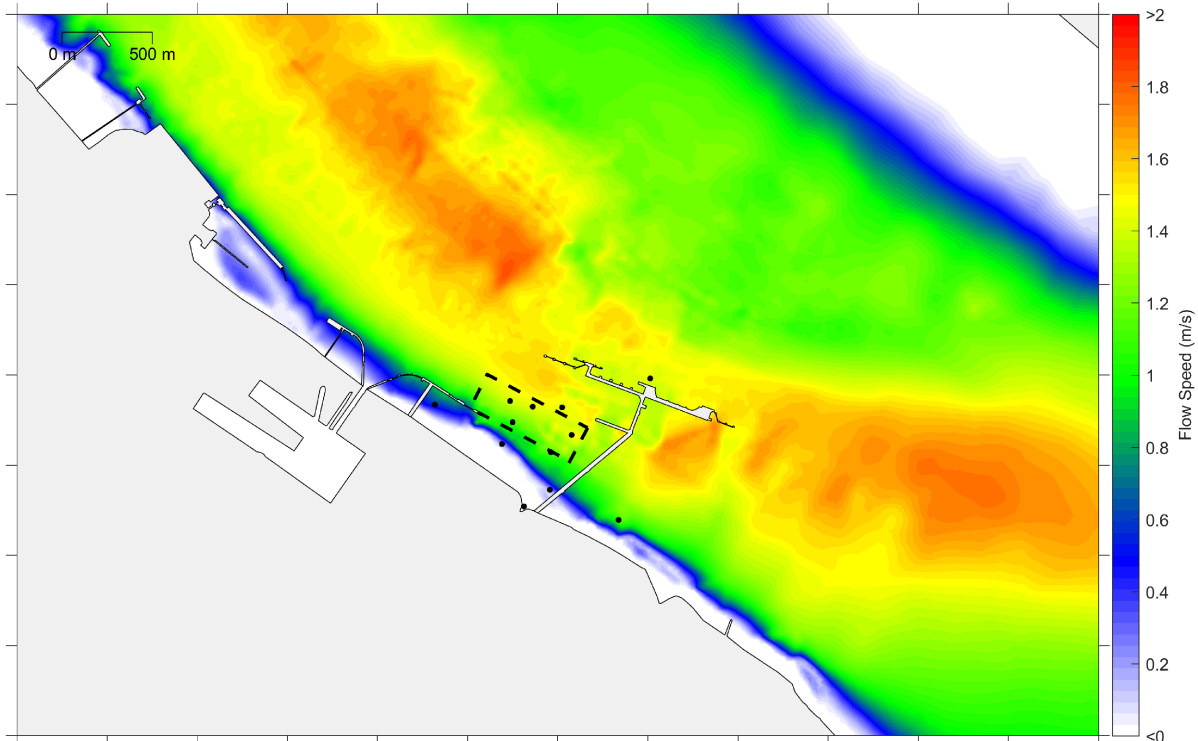


Fig7.8_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
PEAK FLOOD BASELINE FLOWS (TOP)
AND IMPACT OF SCHEME (BOTTOM)**

Figure 7.8



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	



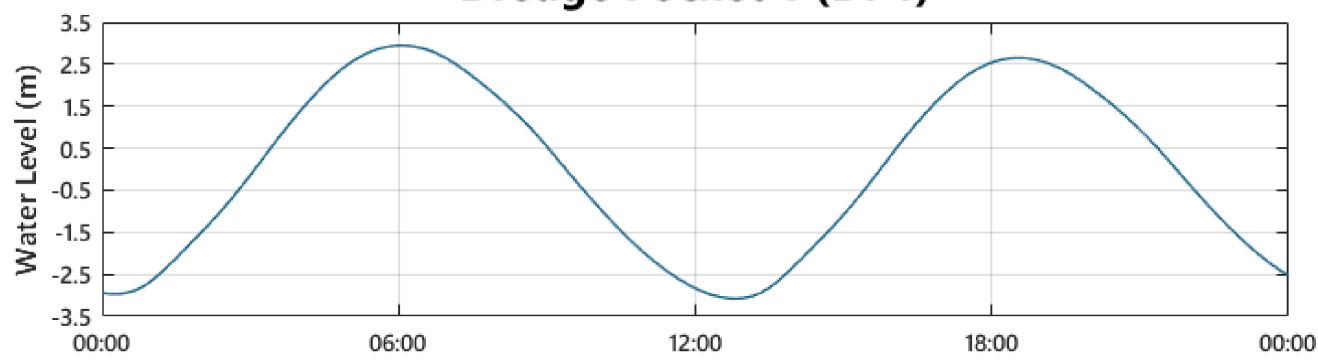
Fig7.9_ES_A4.mxd



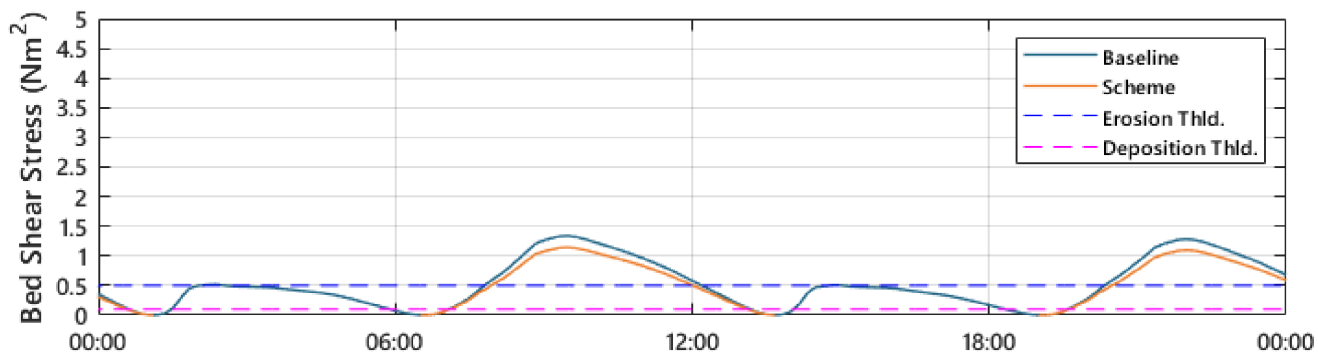
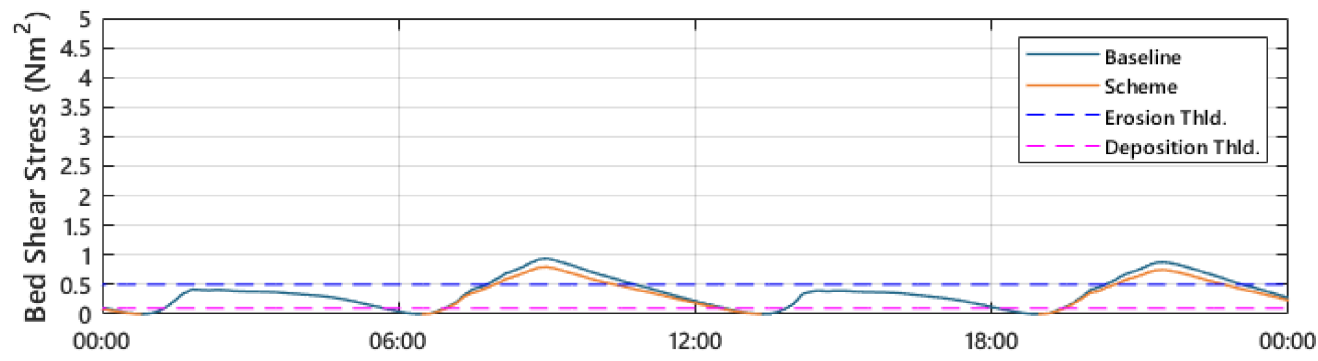
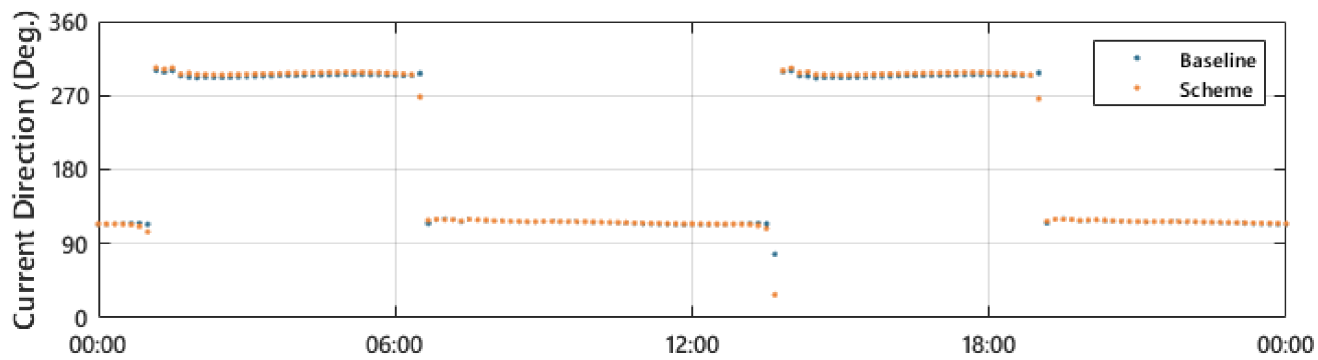
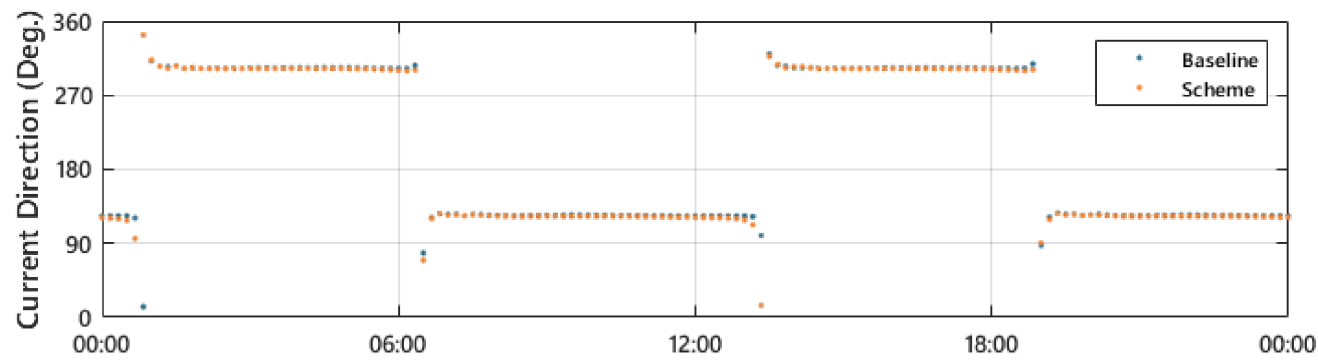
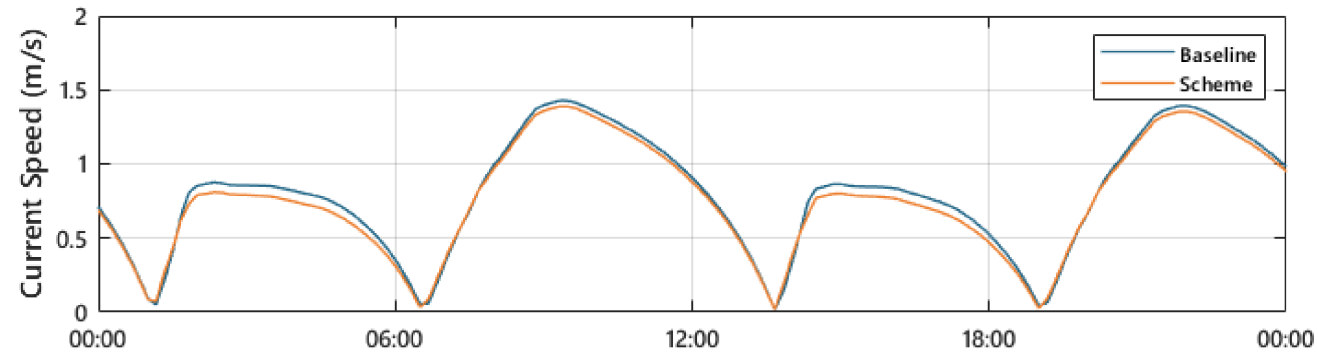
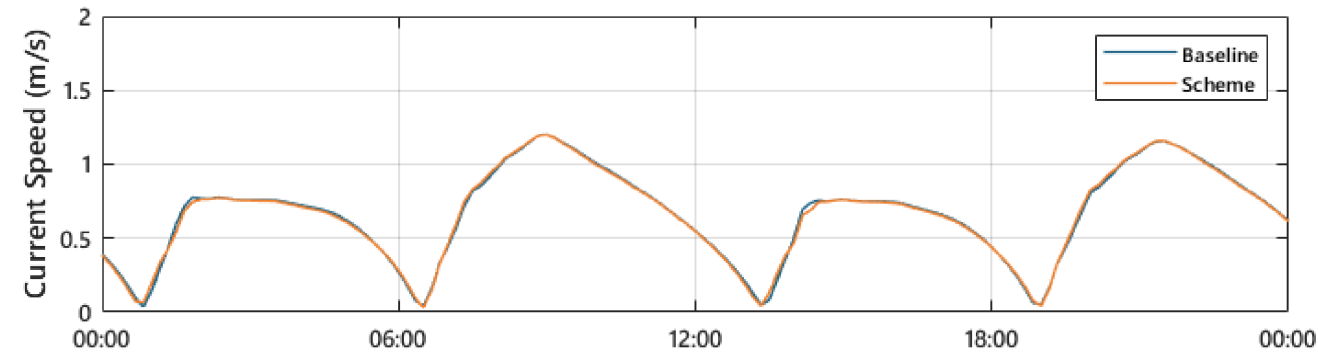
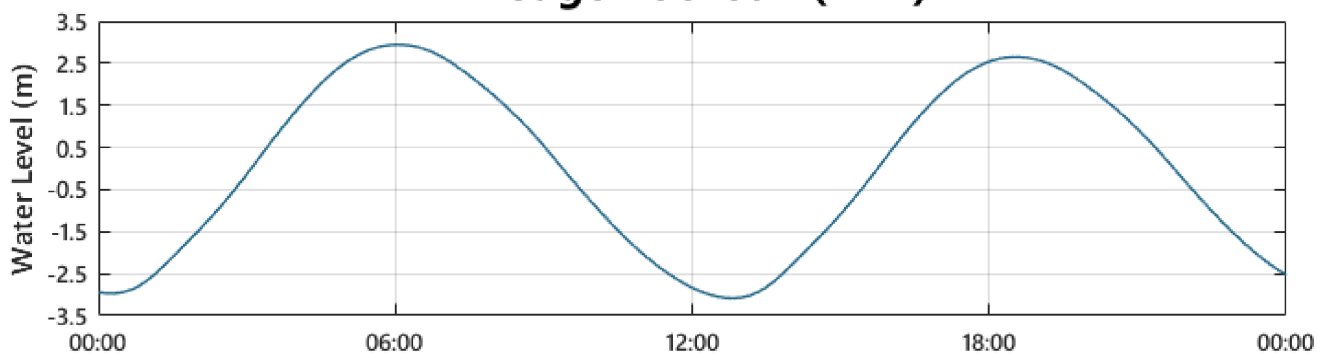
**IMMINGHAM EASTERN
RO-RO TERMINAL
PEAK EBB BASELINE FLOWS (TOP)
AND IMPACT OF SCHEME (BOTTOM)**

Figure 7.9

Dredge Pocket 1 (DP1)



Dredge Pocket 2 (DP2)



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A3)	NA	
Project no.	5035	

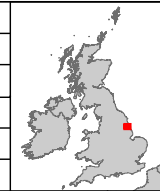


Fig7.10_ES_A3.mxd

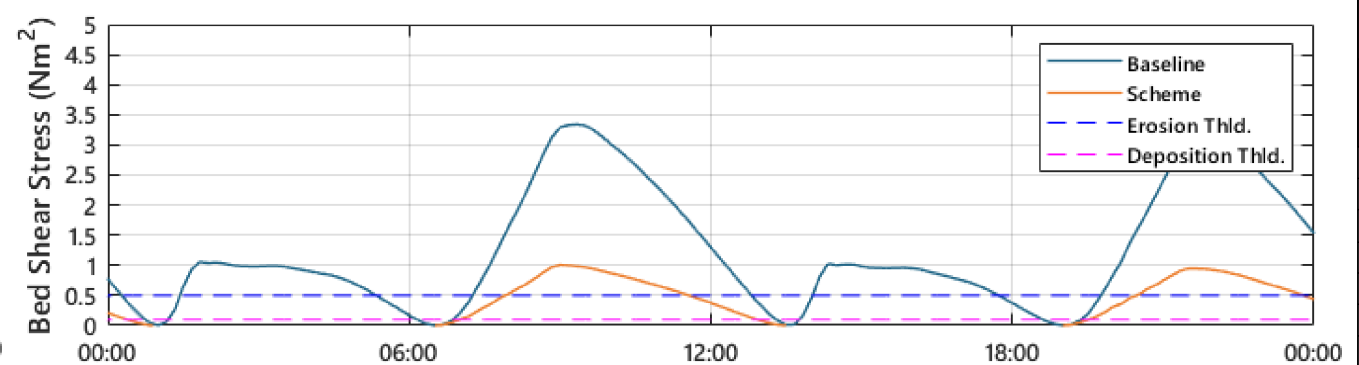
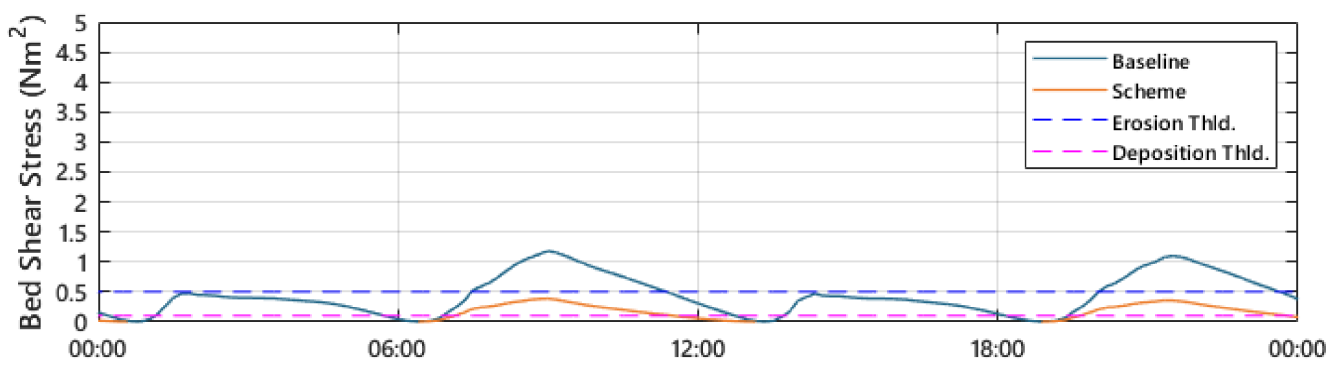
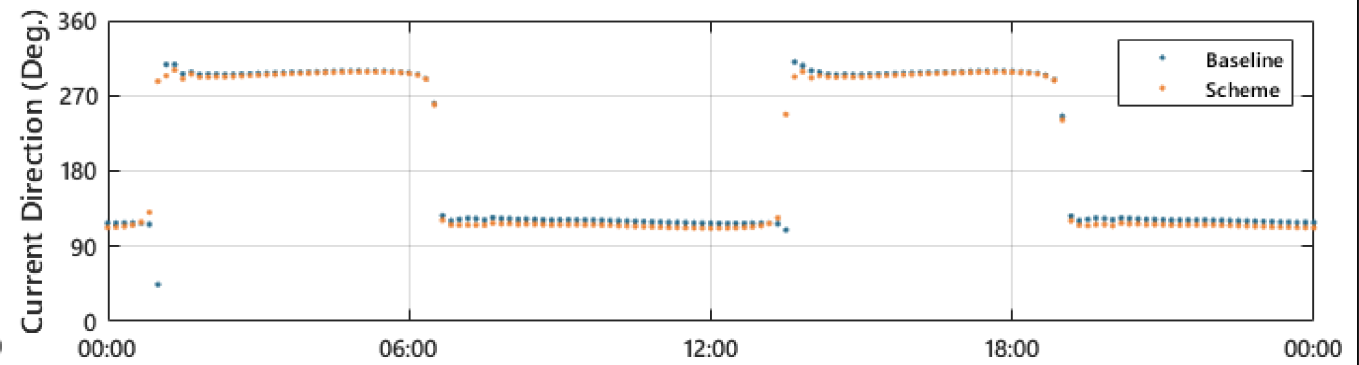
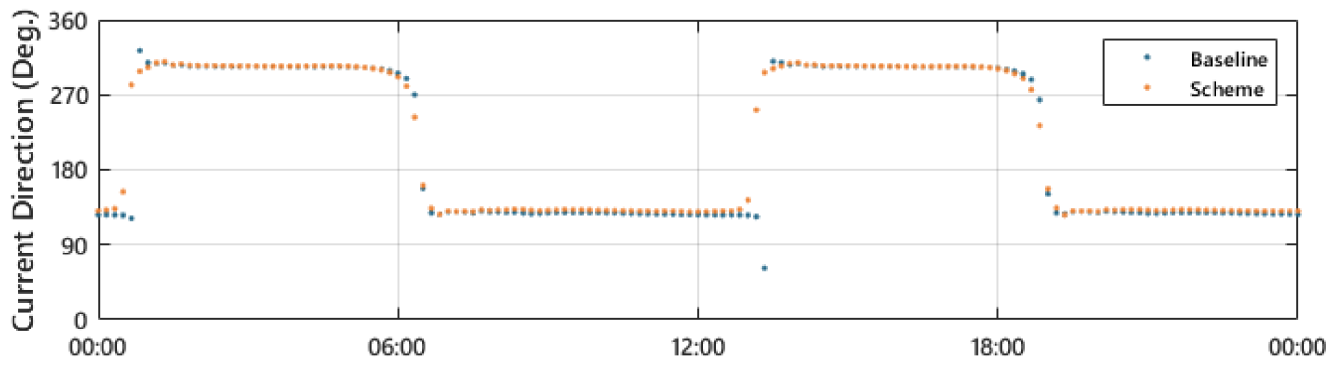
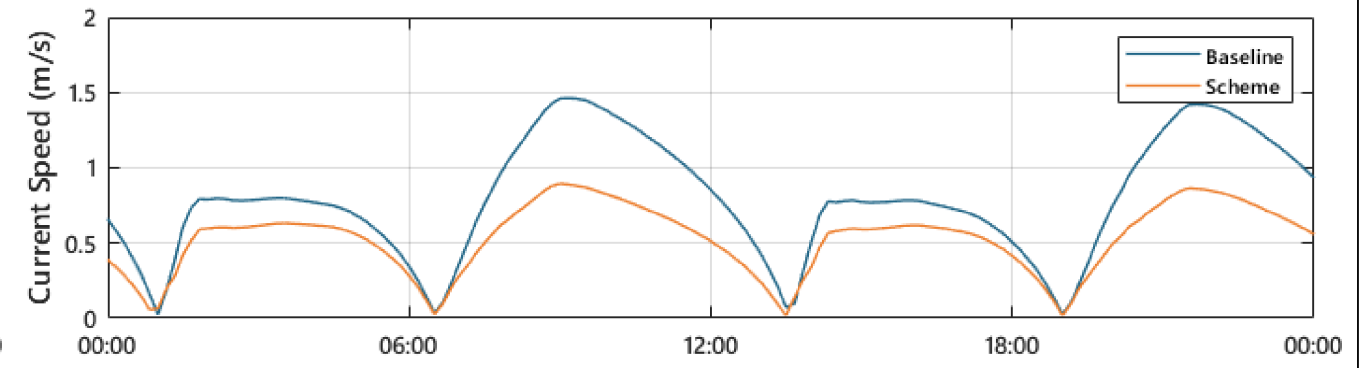
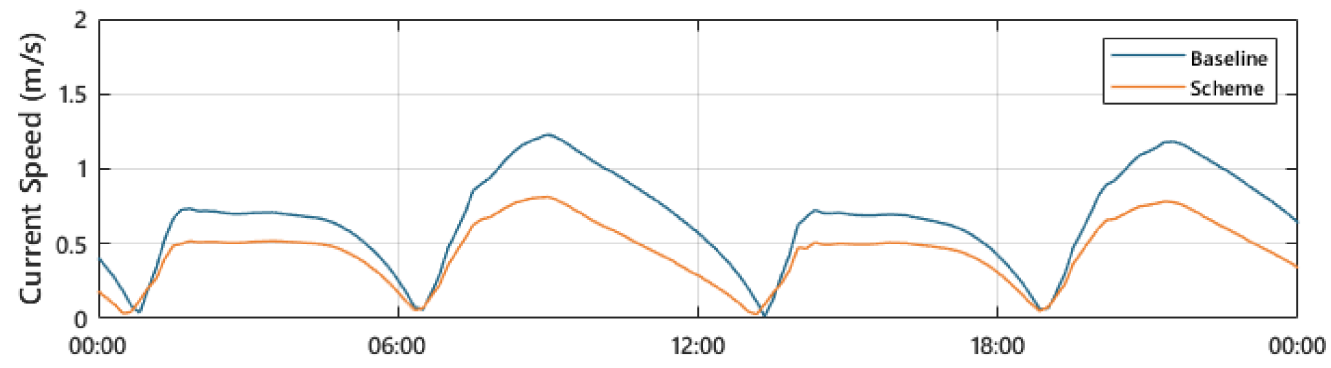
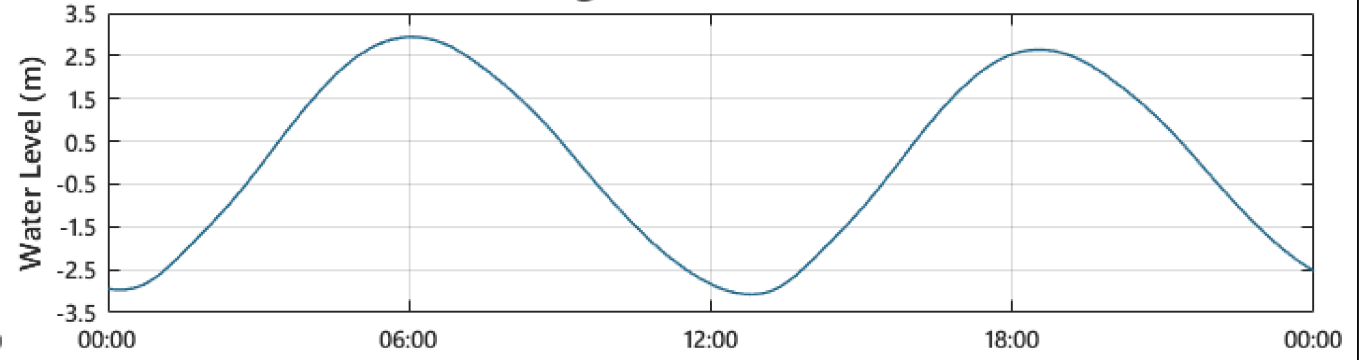
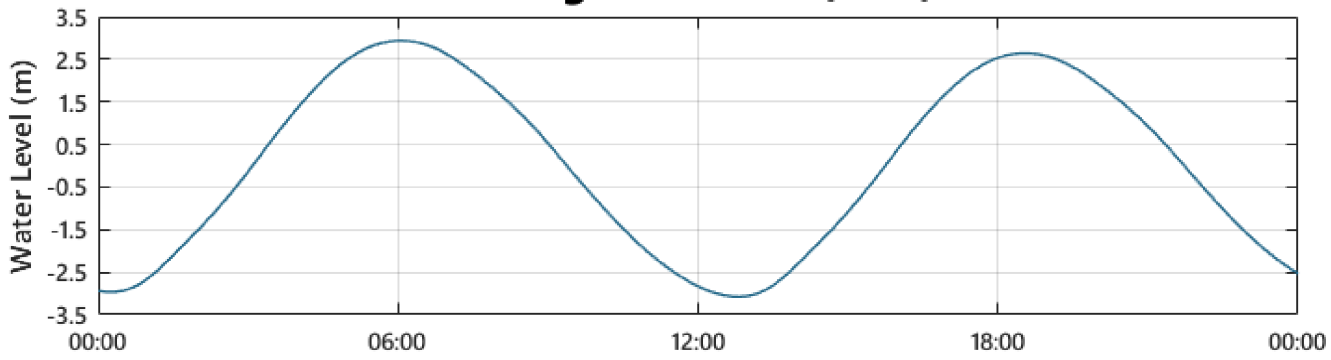


**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
DP1 (LEFT) AND DP2 (RIGHT)**

Figure 7.10

Dredge Pocket 3 (DP3)

Dredge Pocket 4 (DP4)



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A3)	NA	
Project no.	5035	



Fig7.11_ES_A3.mxd

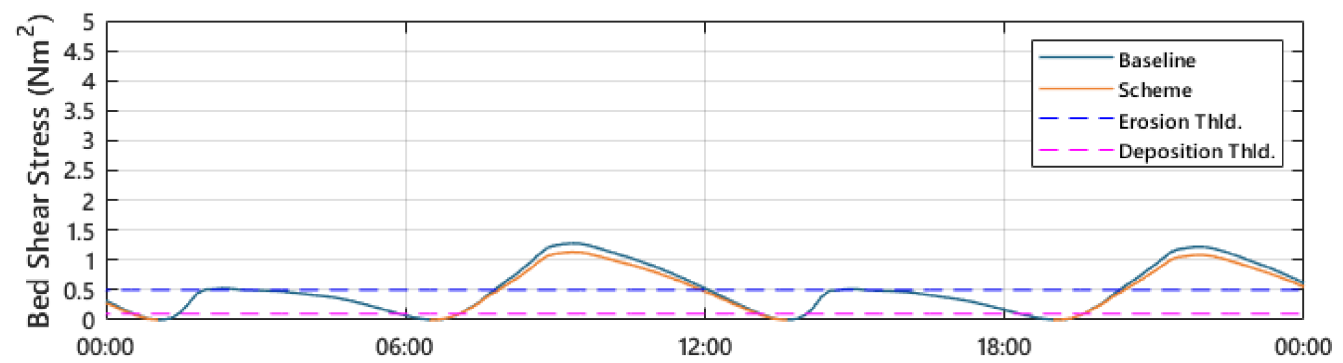
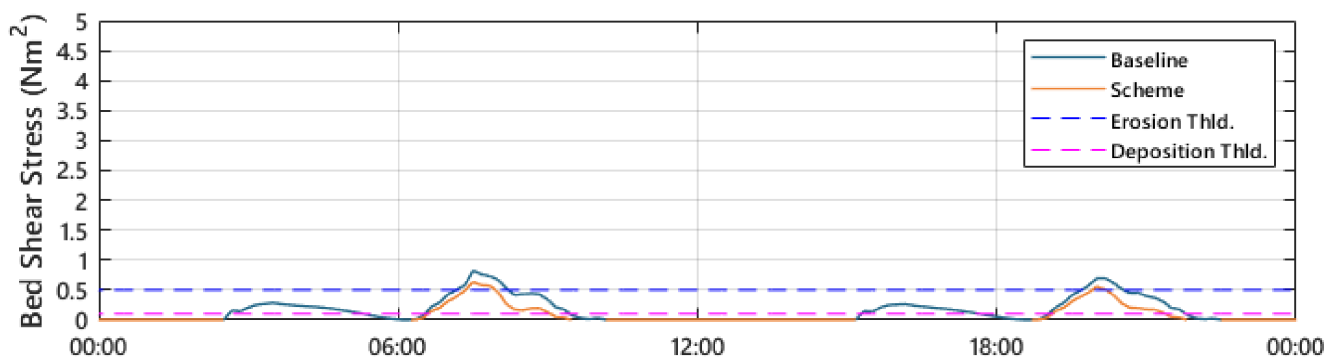
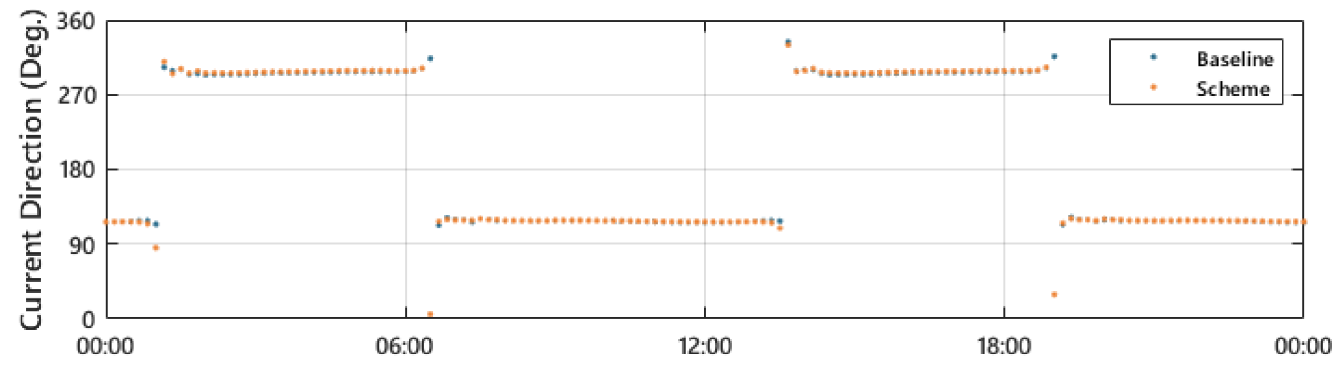
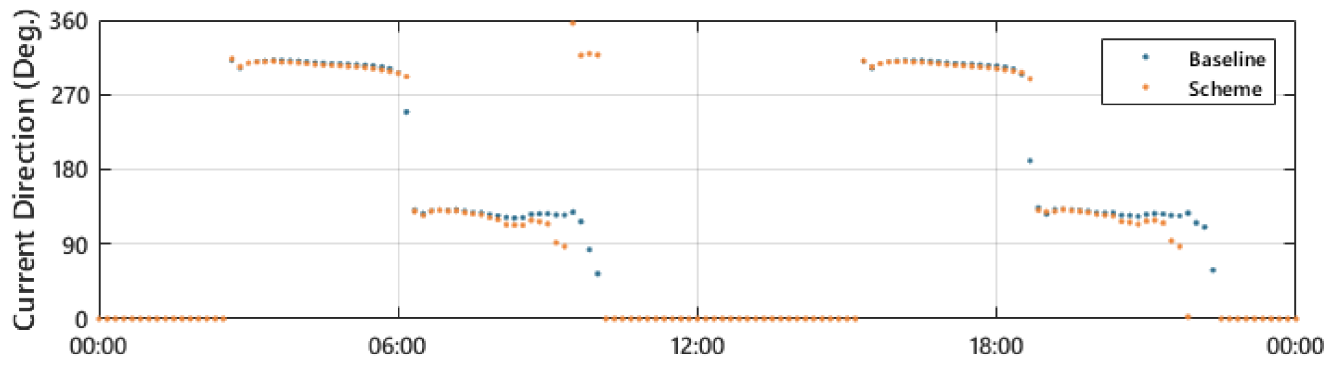
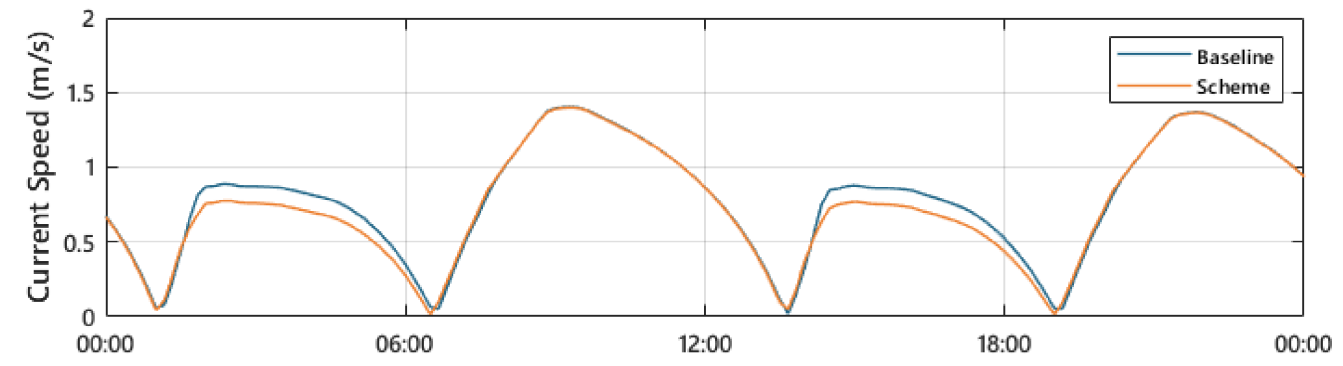
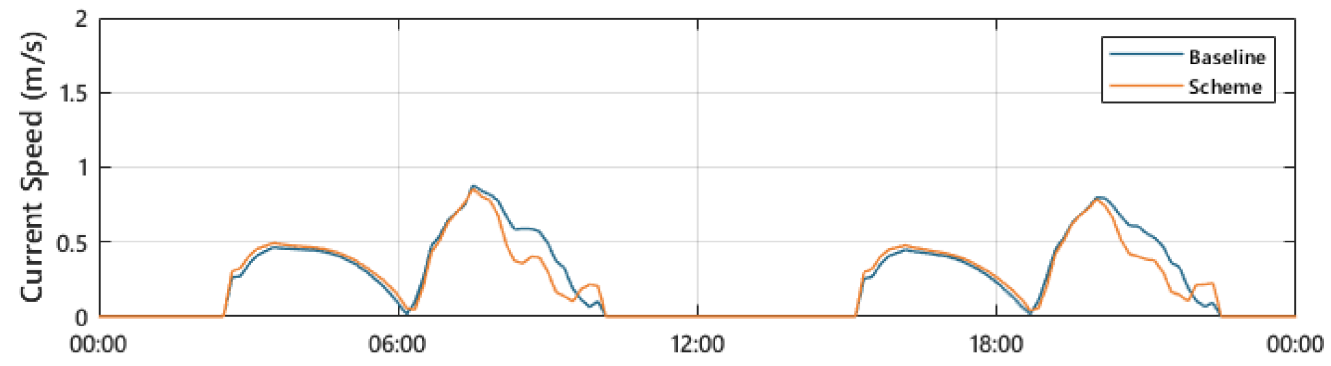
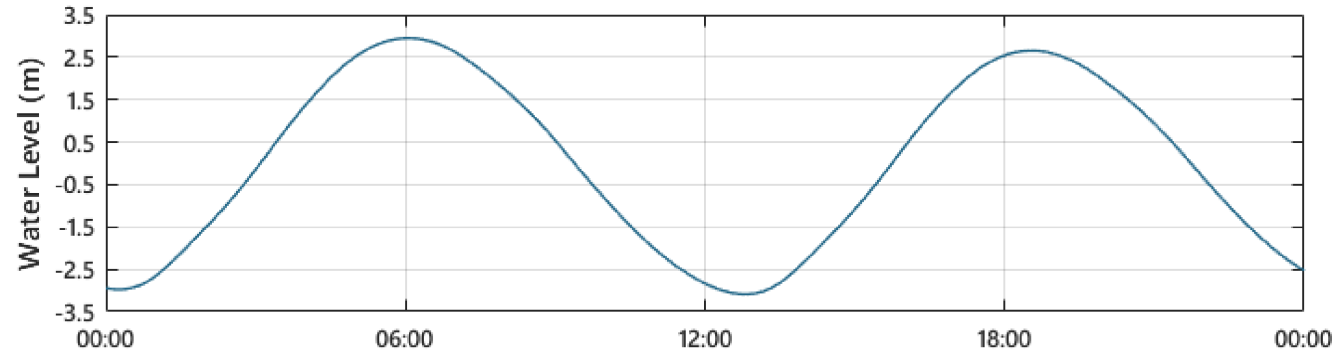
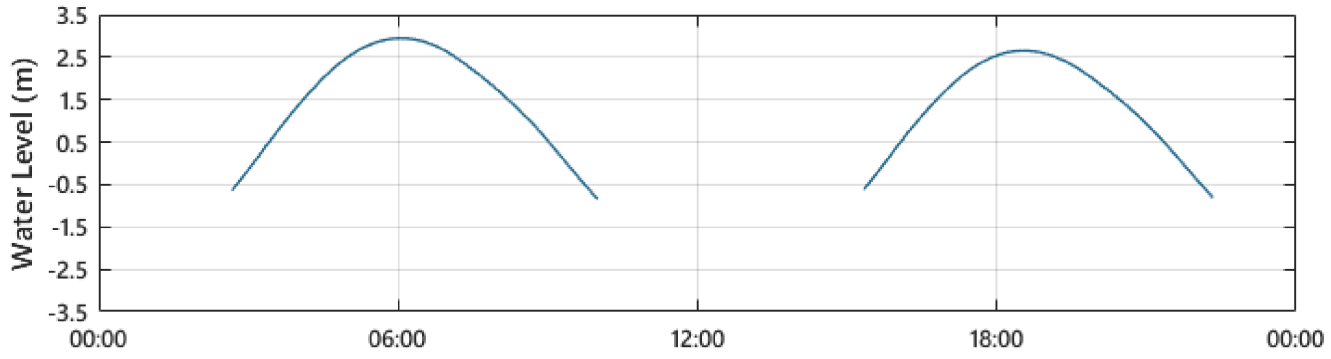


**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
DP3 (LEFT) AND DP4 (RIGHT)**

Figure 7.11

P1

P2



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

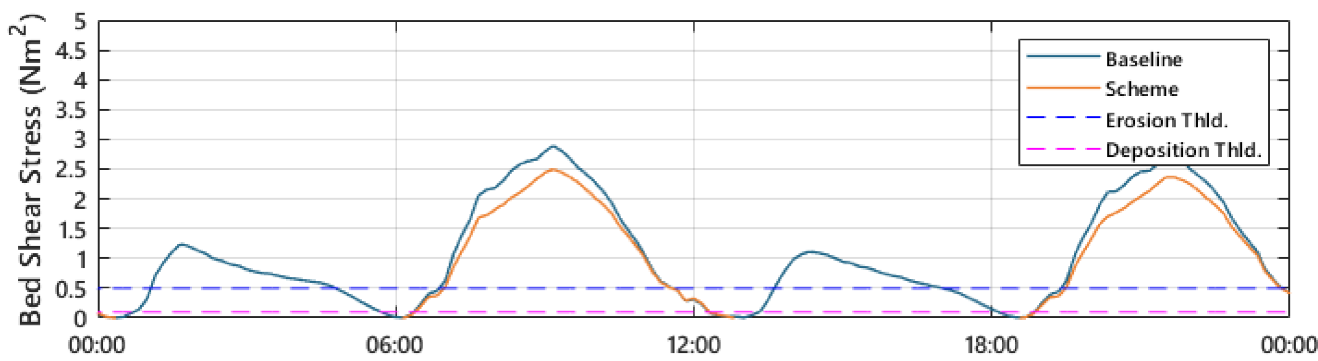
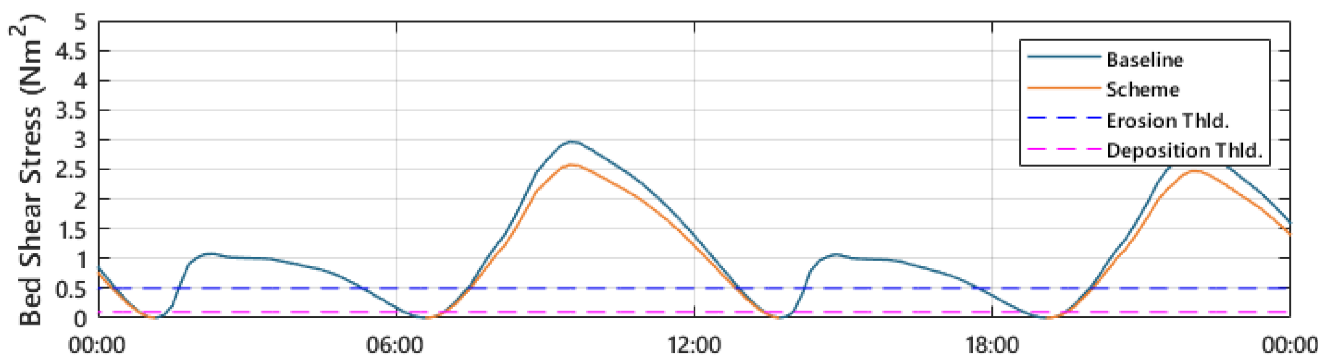
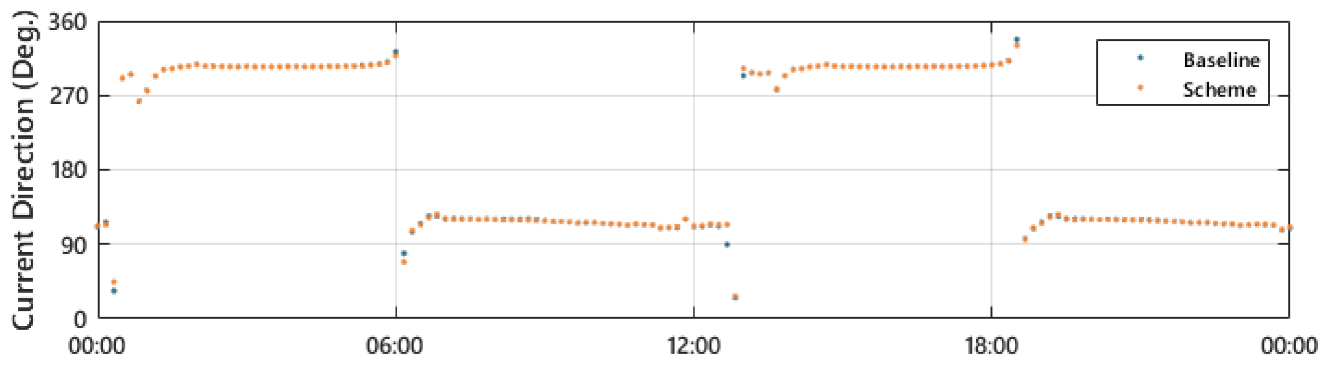
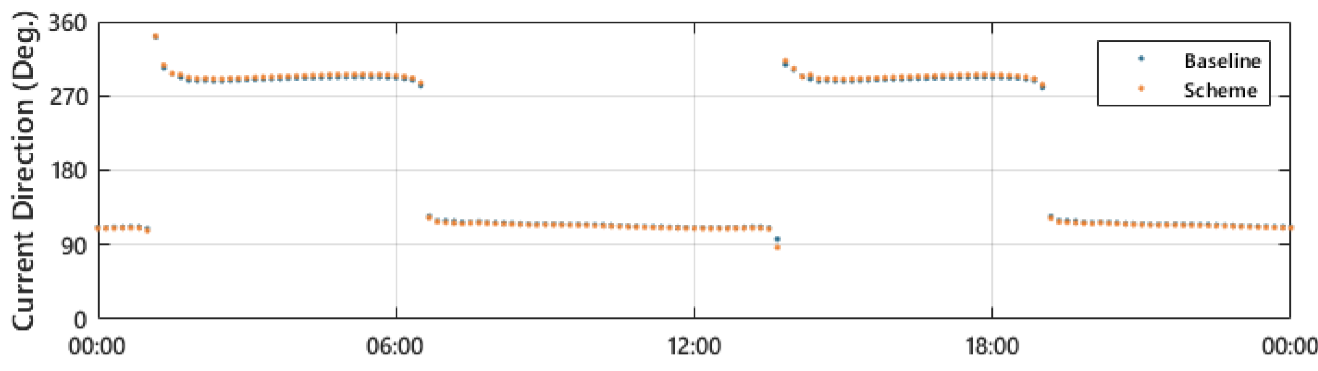
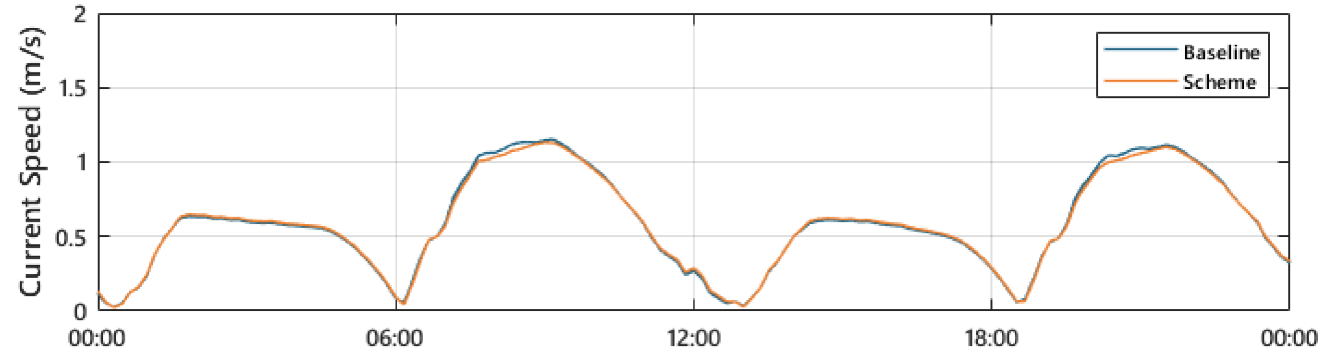
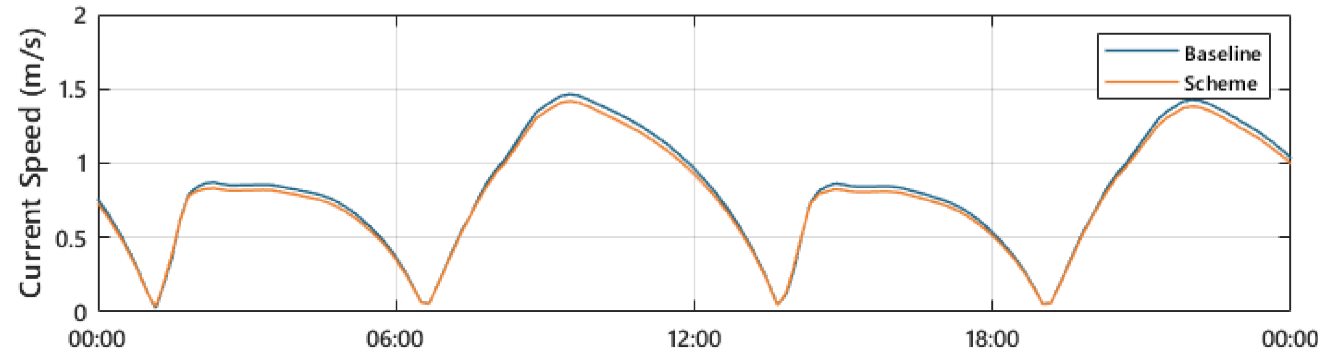
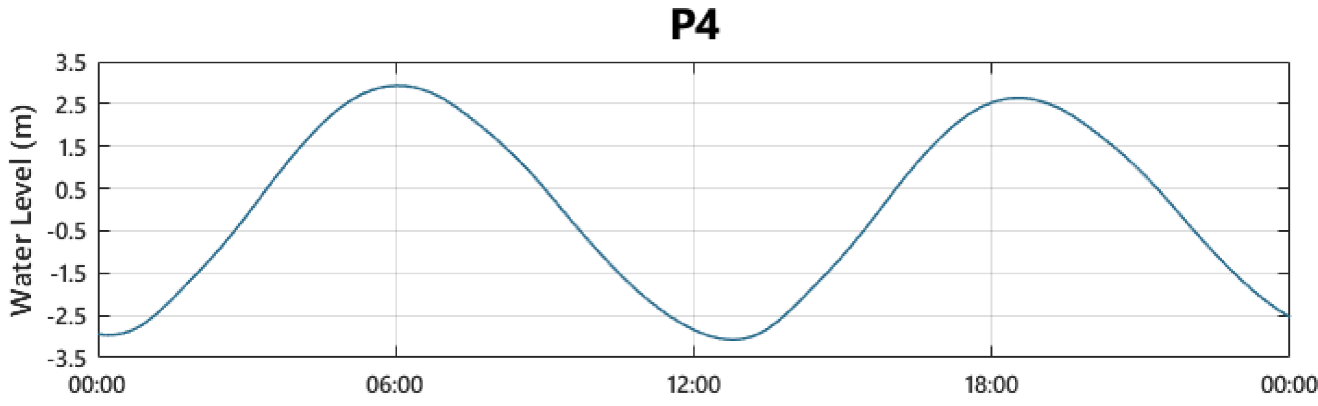
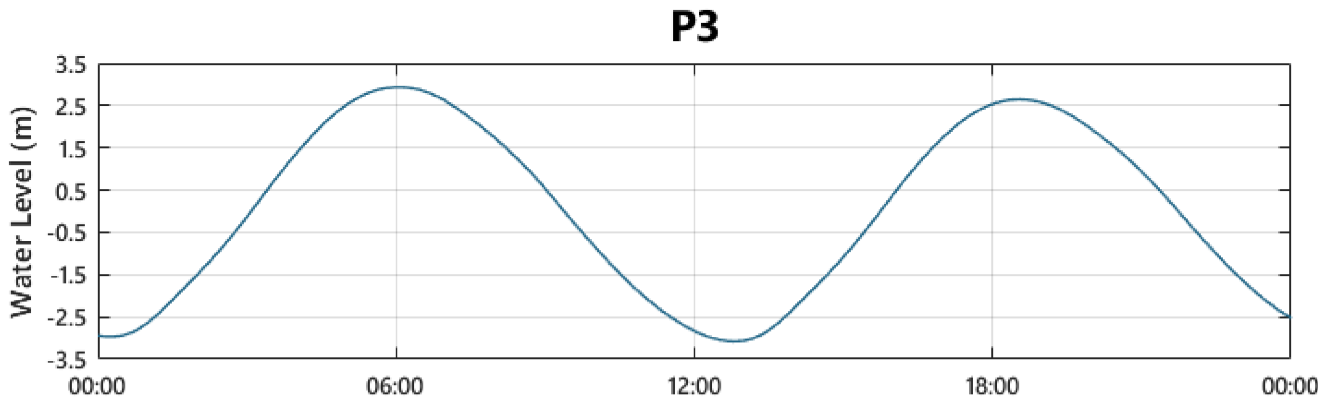


Fig7.12_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
P1 (LEFT) AND P2 (RIGHT)**

Figure 7.12



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

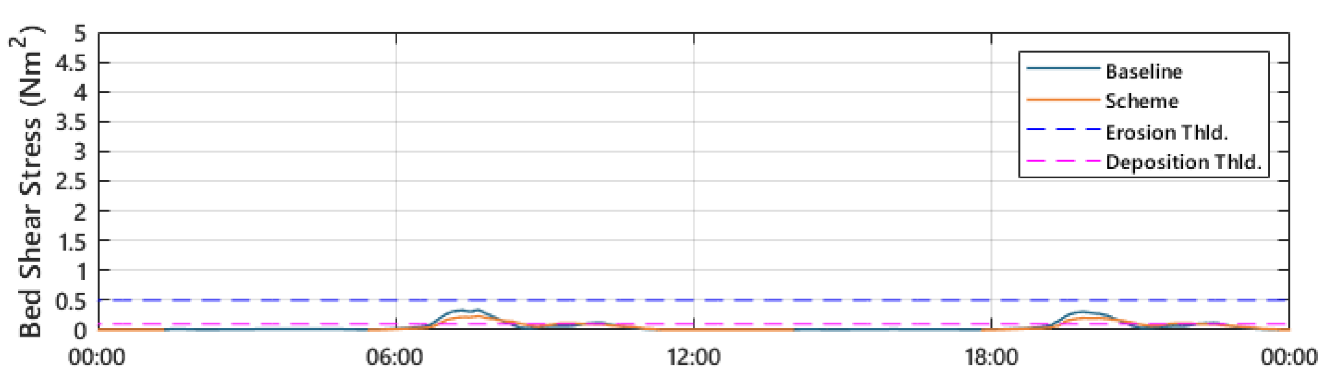
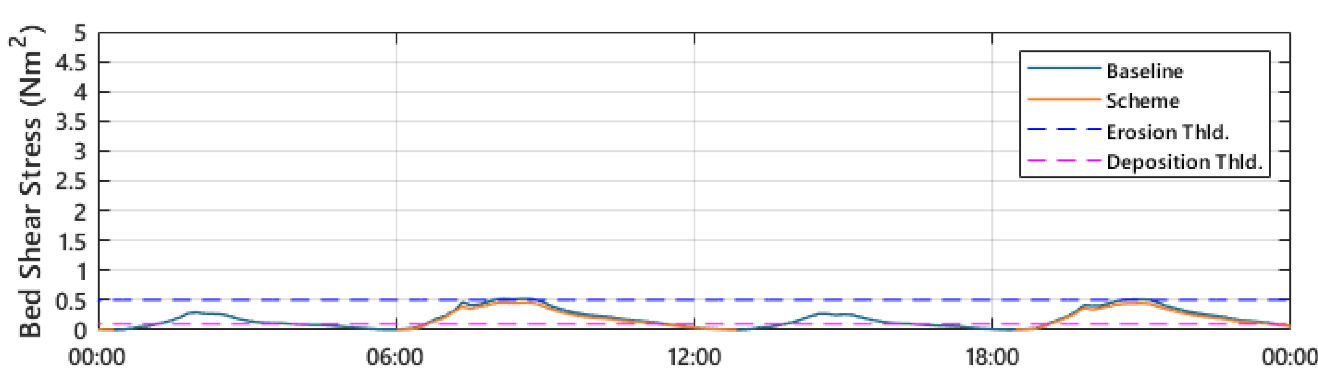
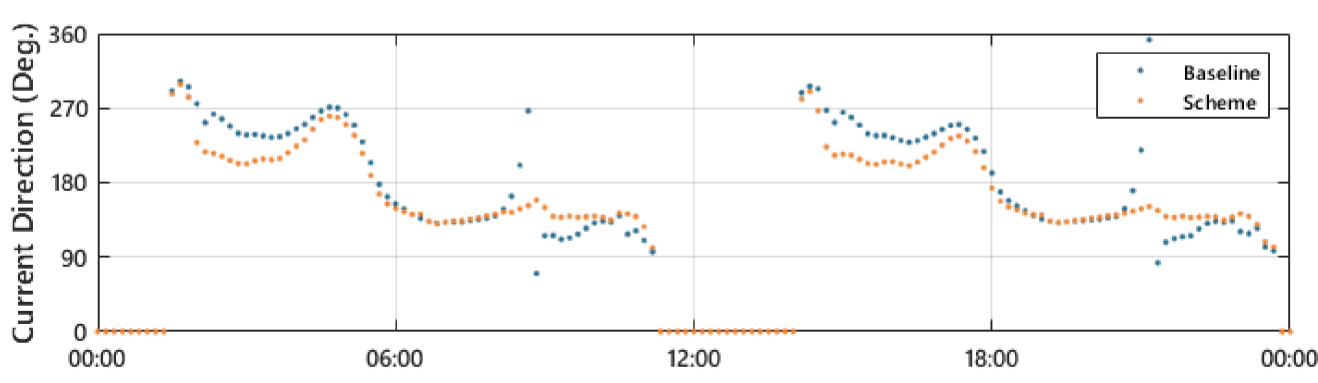
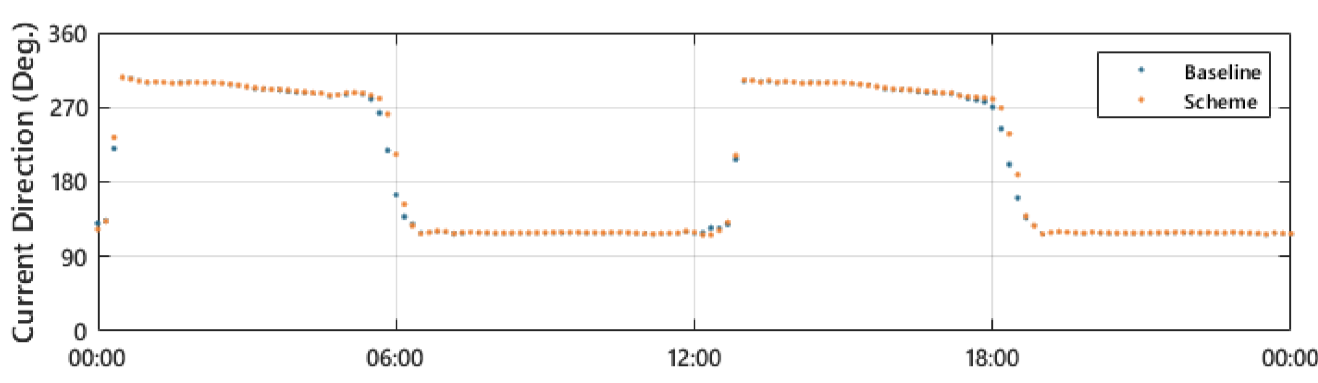
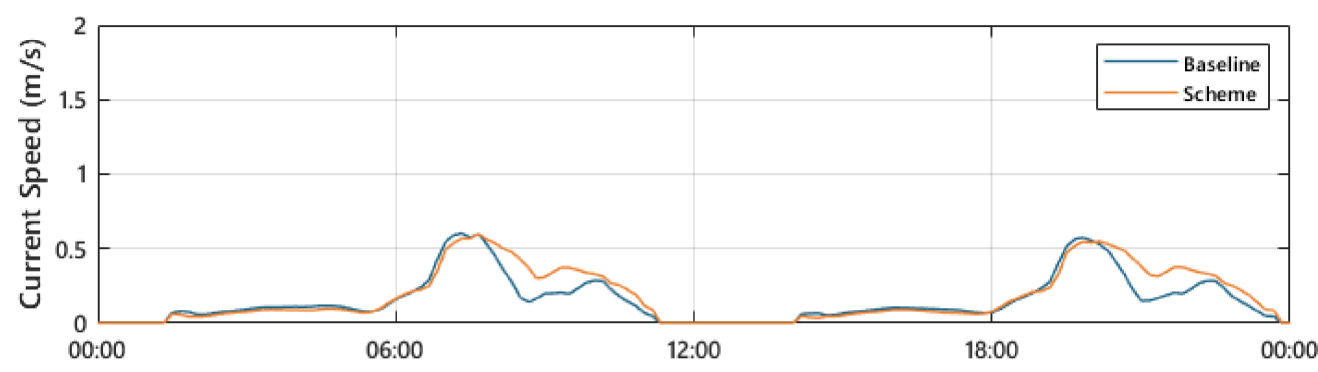
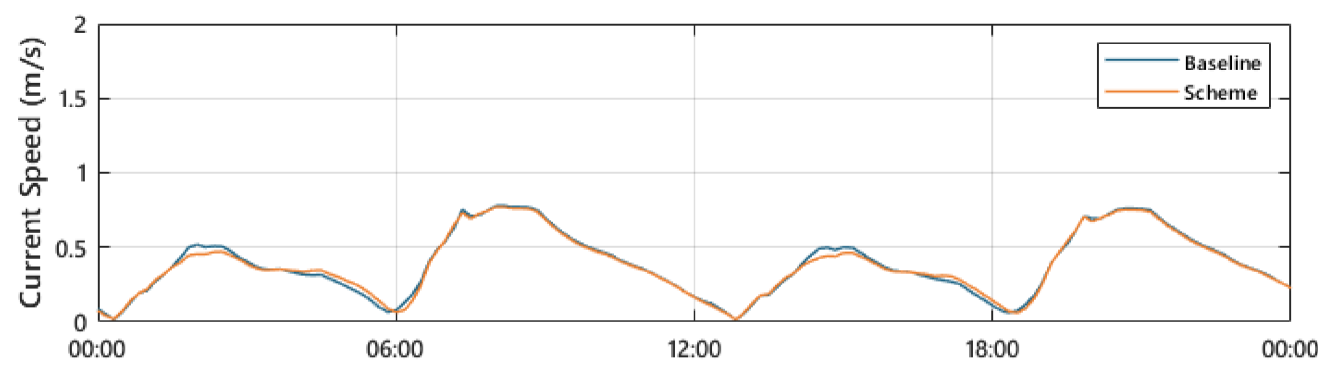
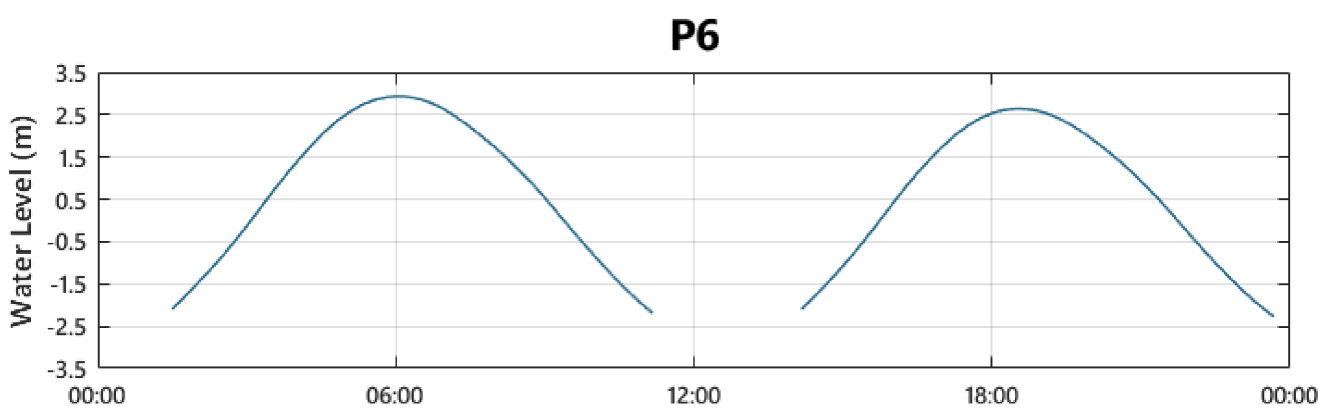
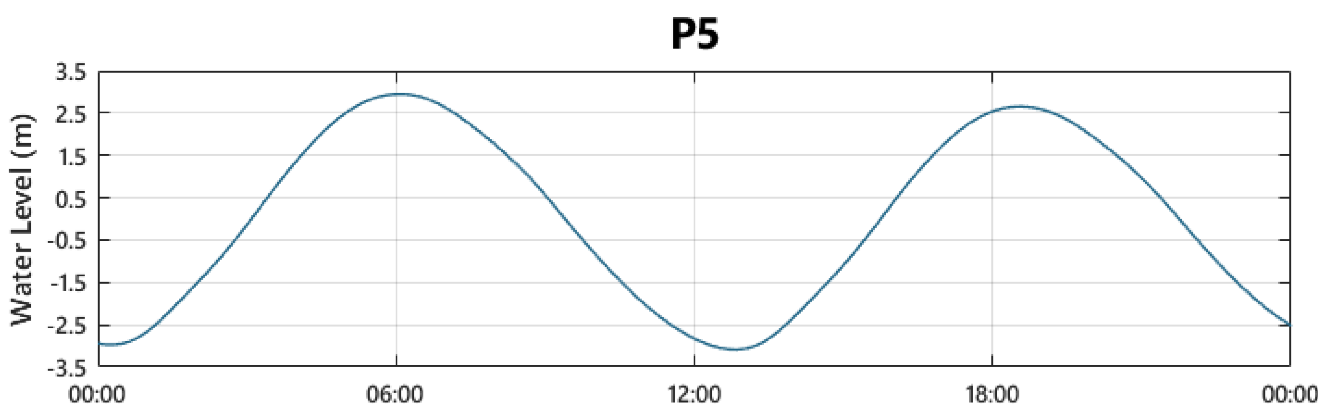


Fig7.13_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
P3 (LEFT) AND P4 (RIGHT)**

Figure 7.13



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A3)	NA	
Project no.	5035	

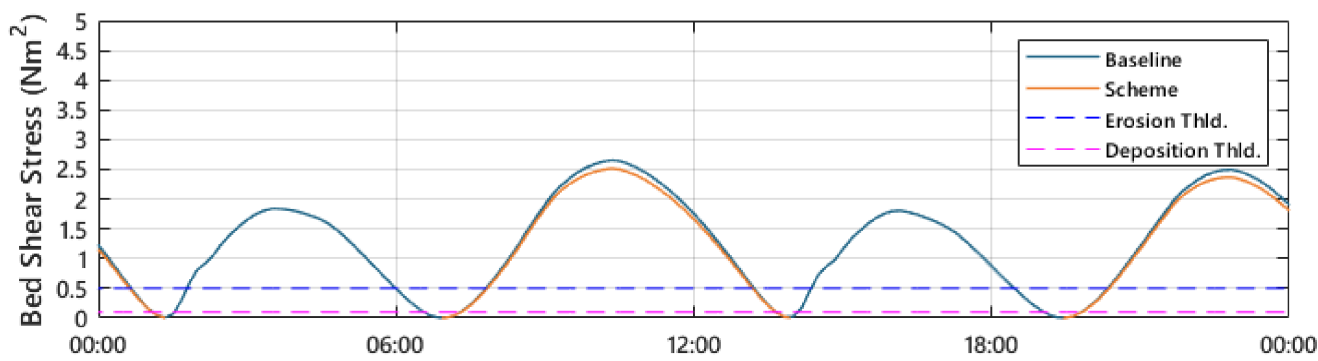
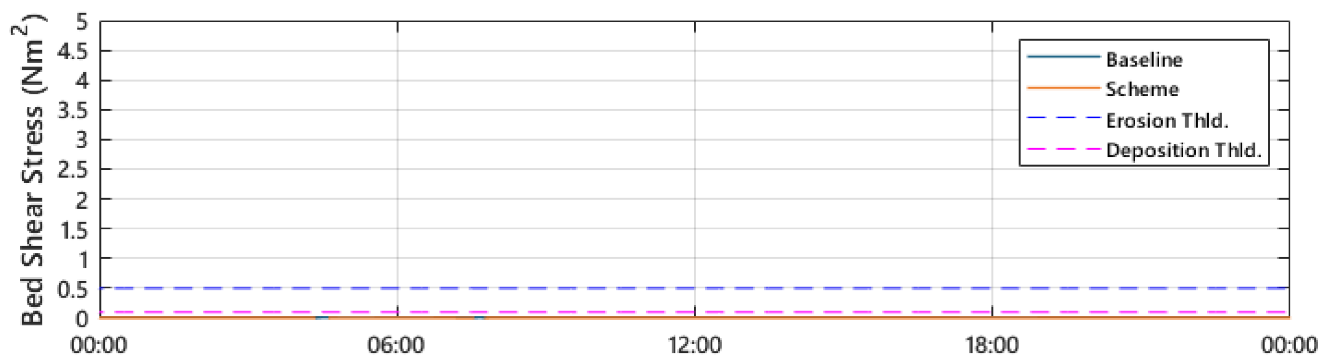
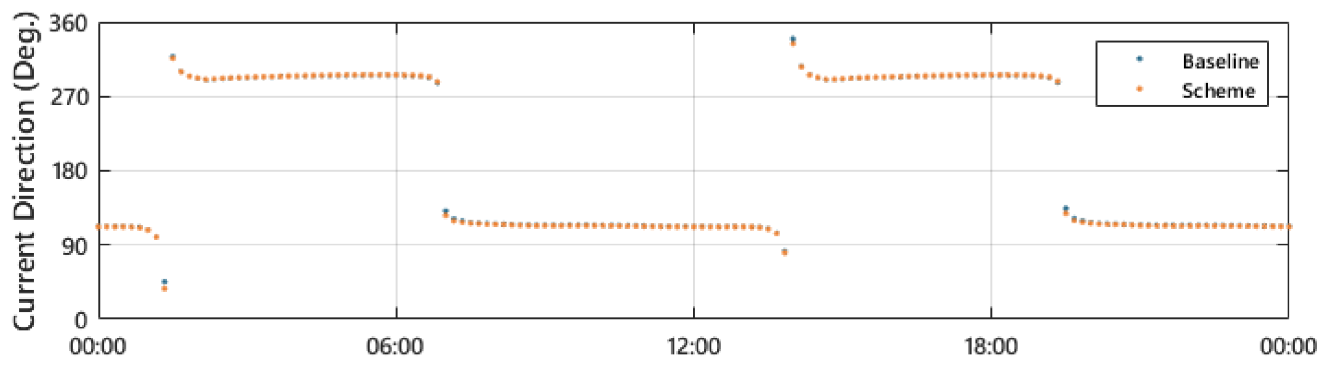
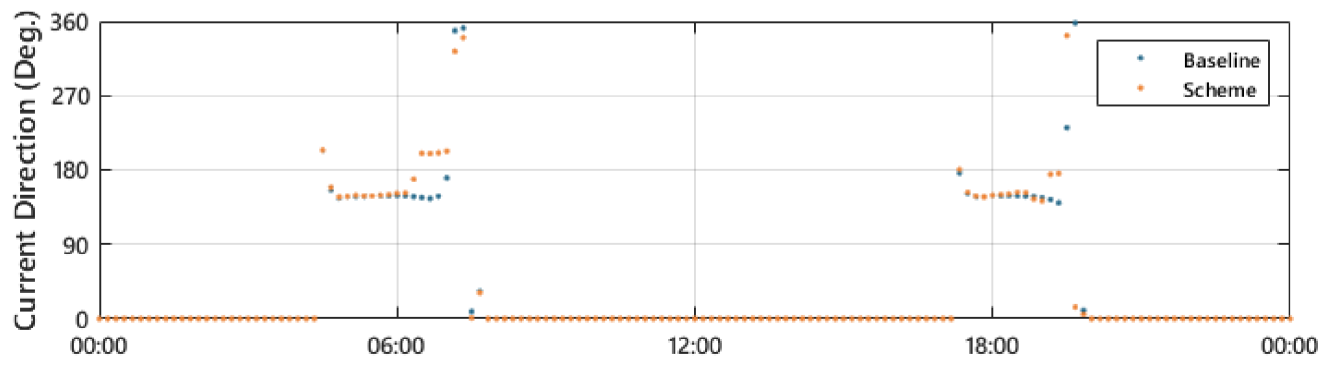
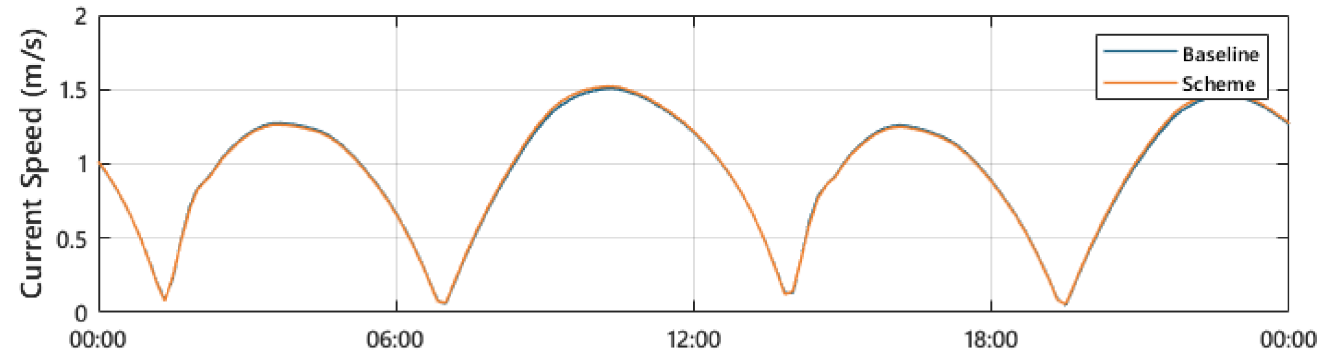
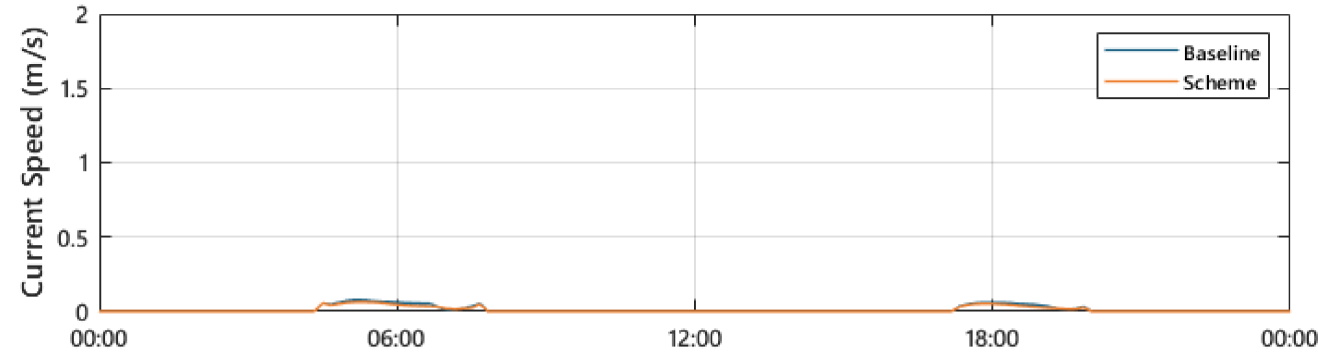
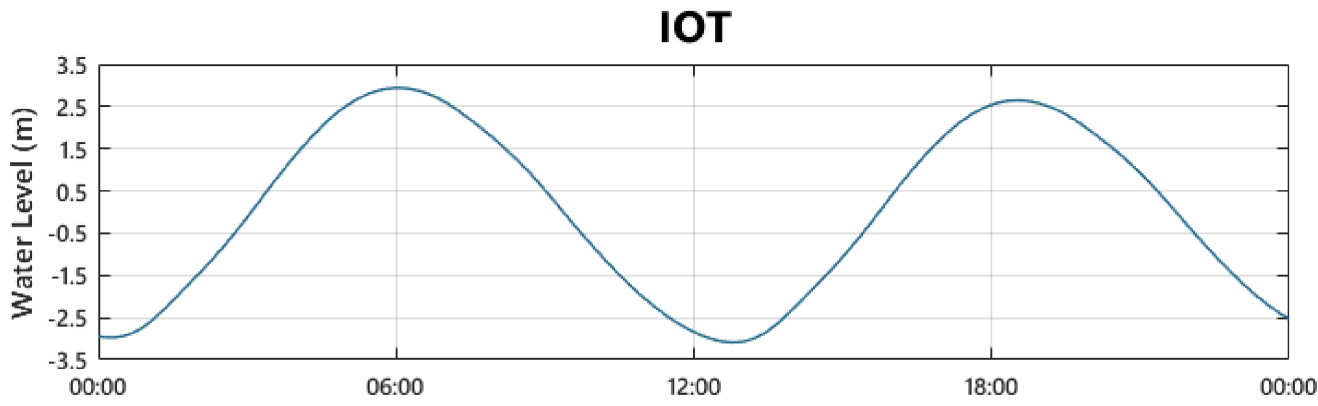
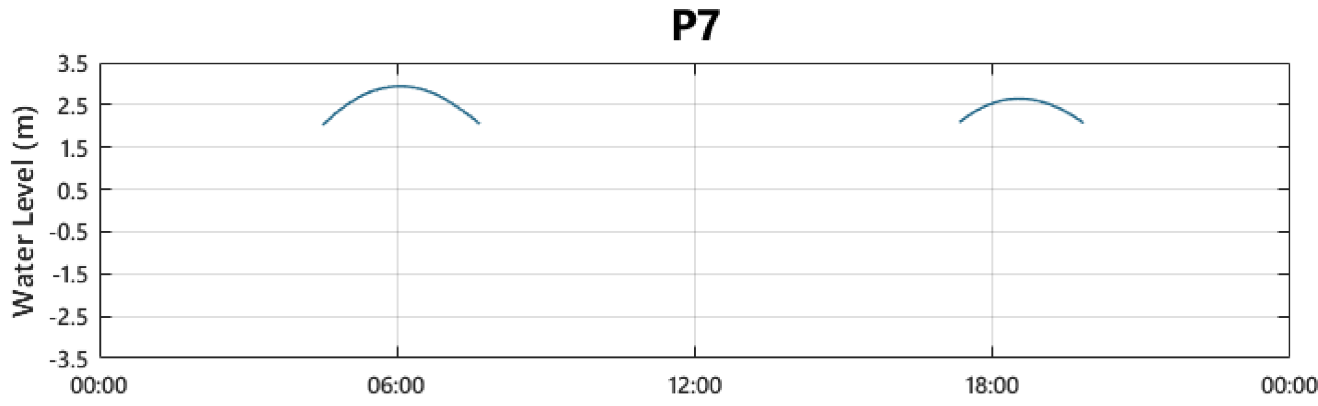


Fig7.14_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
P5 (LEFT) AND P6 (RIGHT)**

Figure 7.14



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035



Fig7.15_ES_A3.mxd

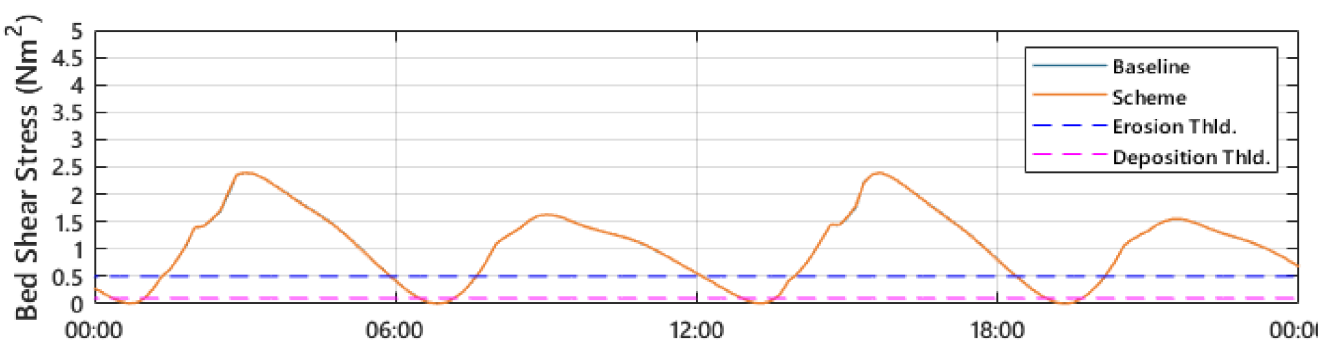
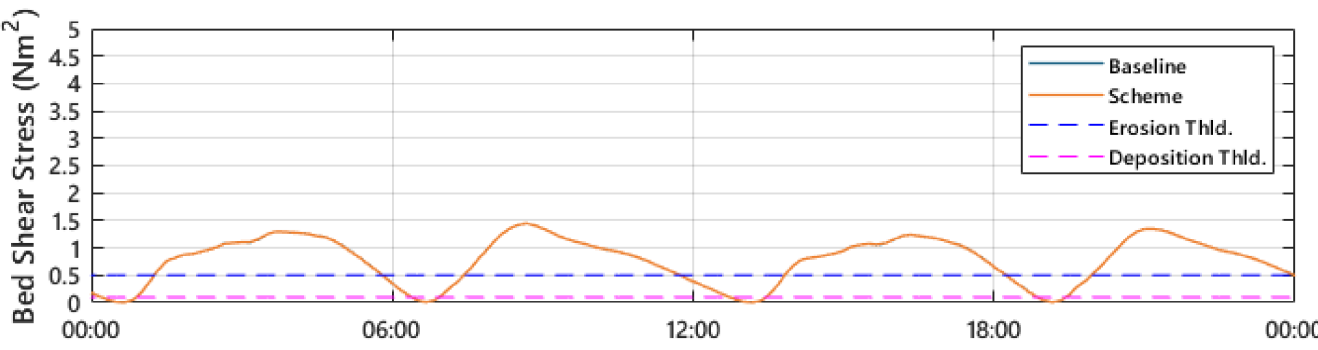
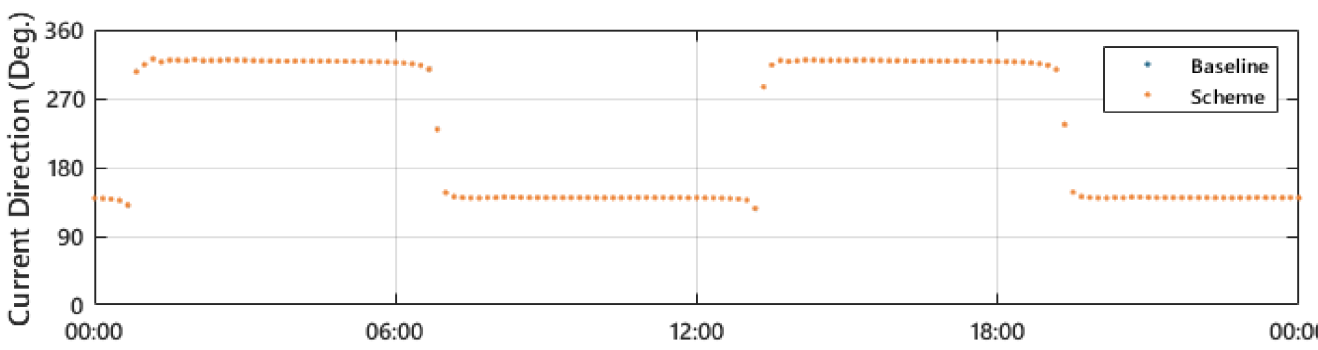
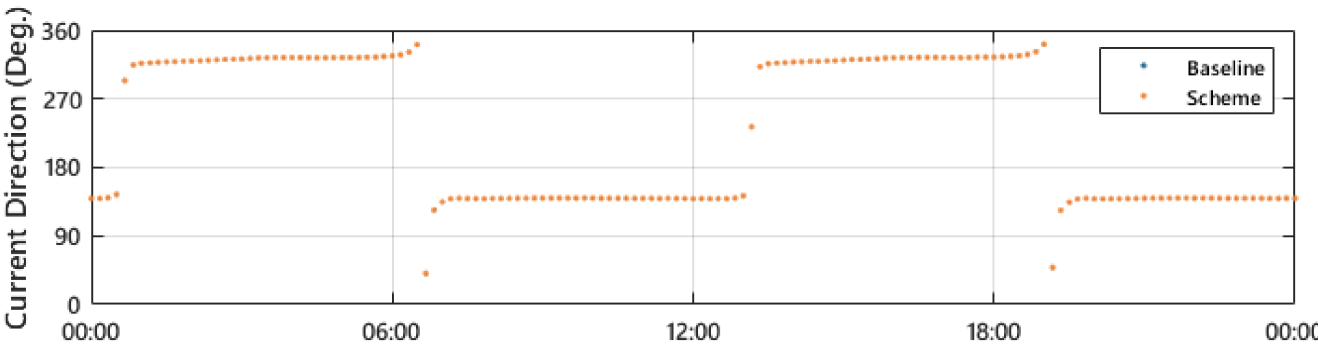
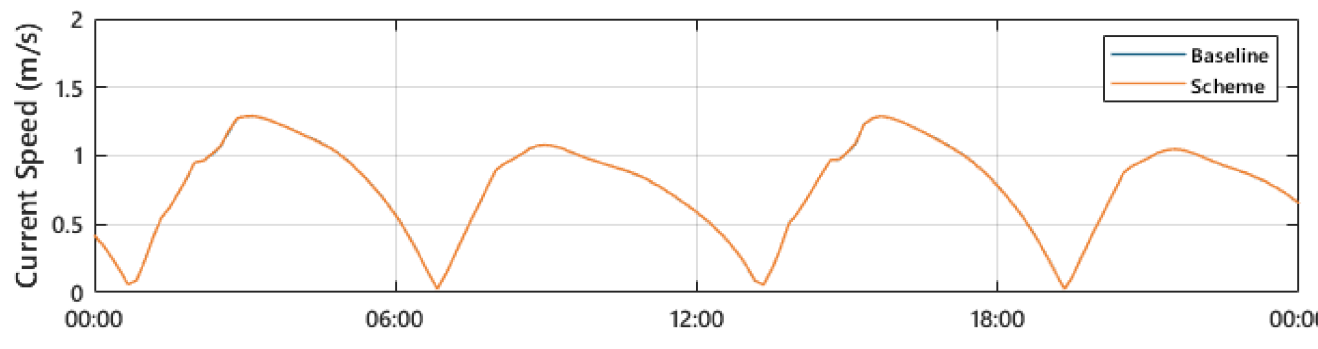
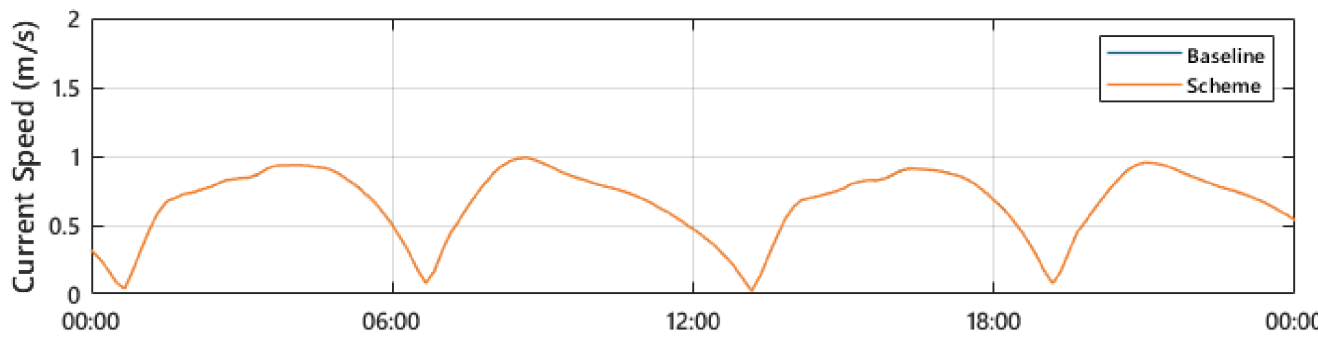
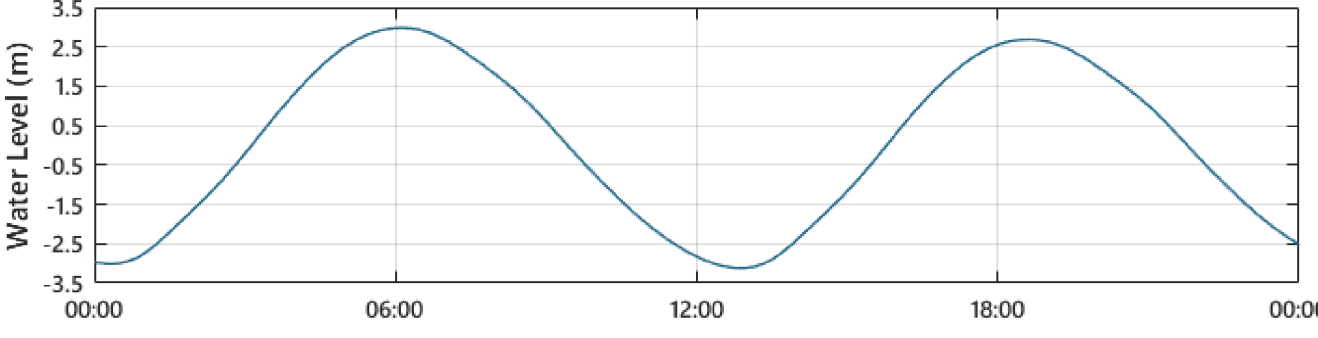
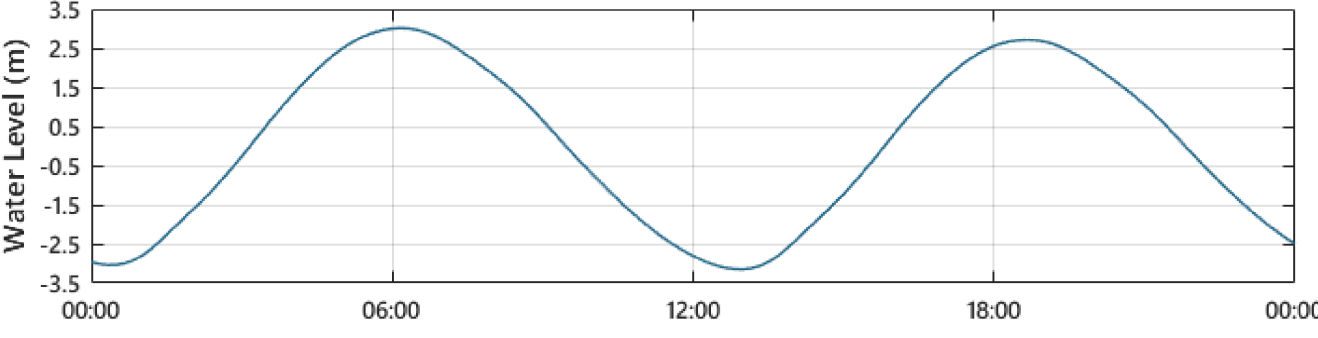


**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
P7 (LEFT) AND IOT (RIGHT)**

Figure 7.15

HST Green Port Hull (GPH)

ABLE



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A3)	NA	
Project no.	5035	

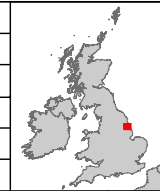
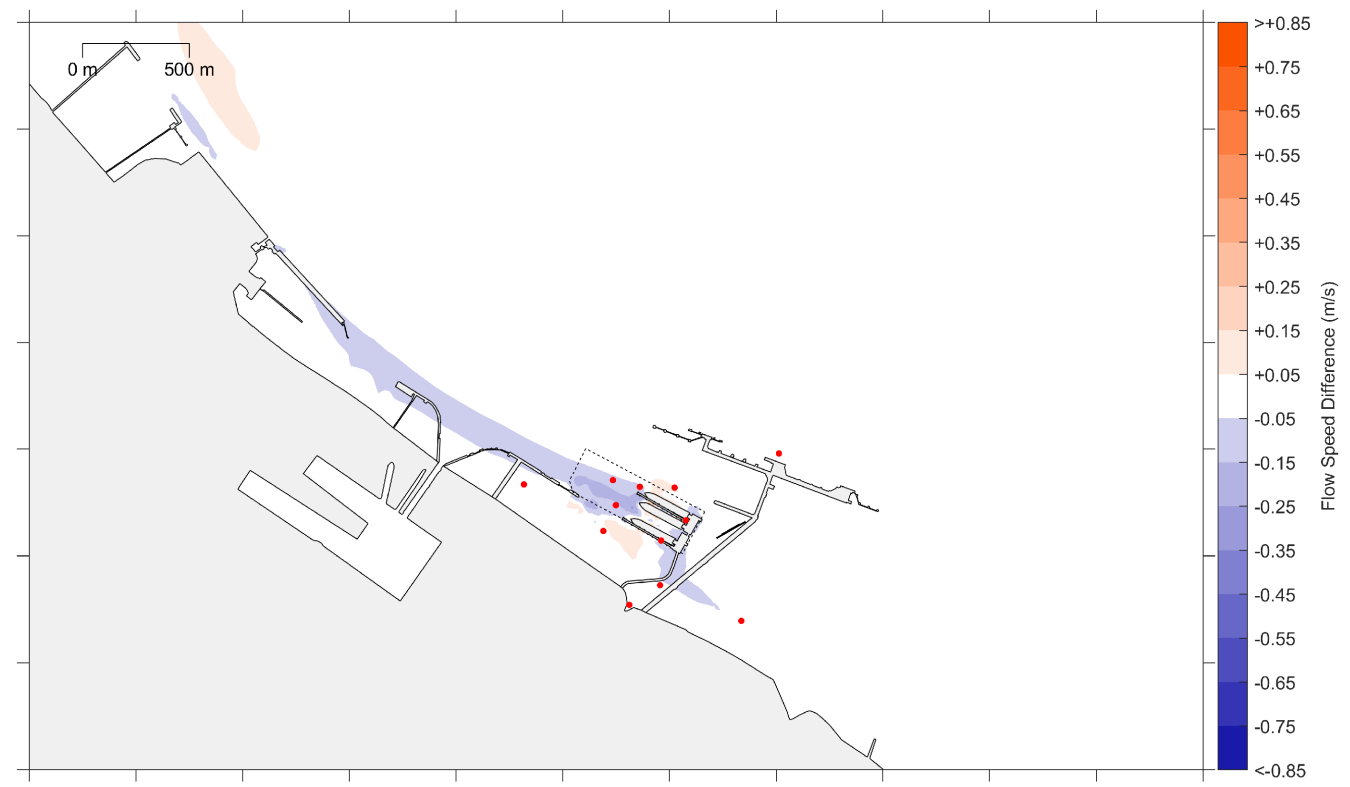
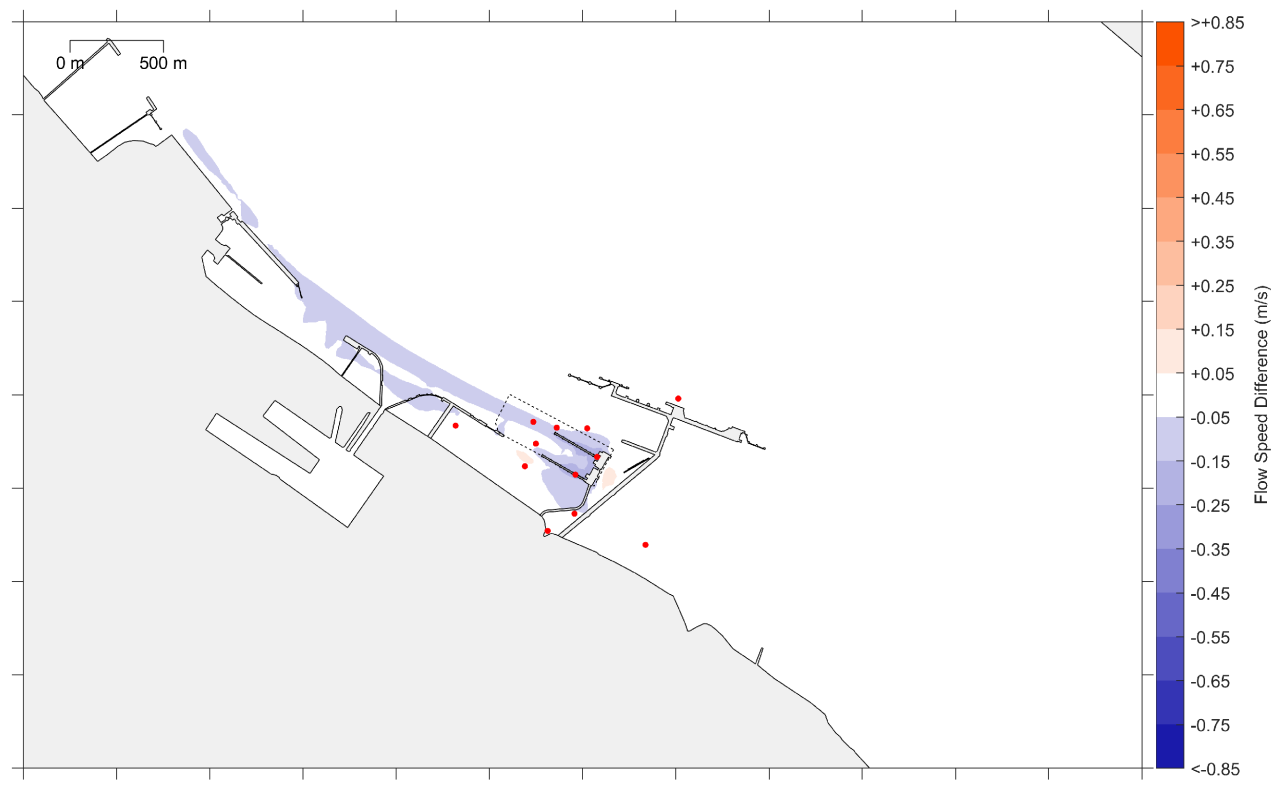
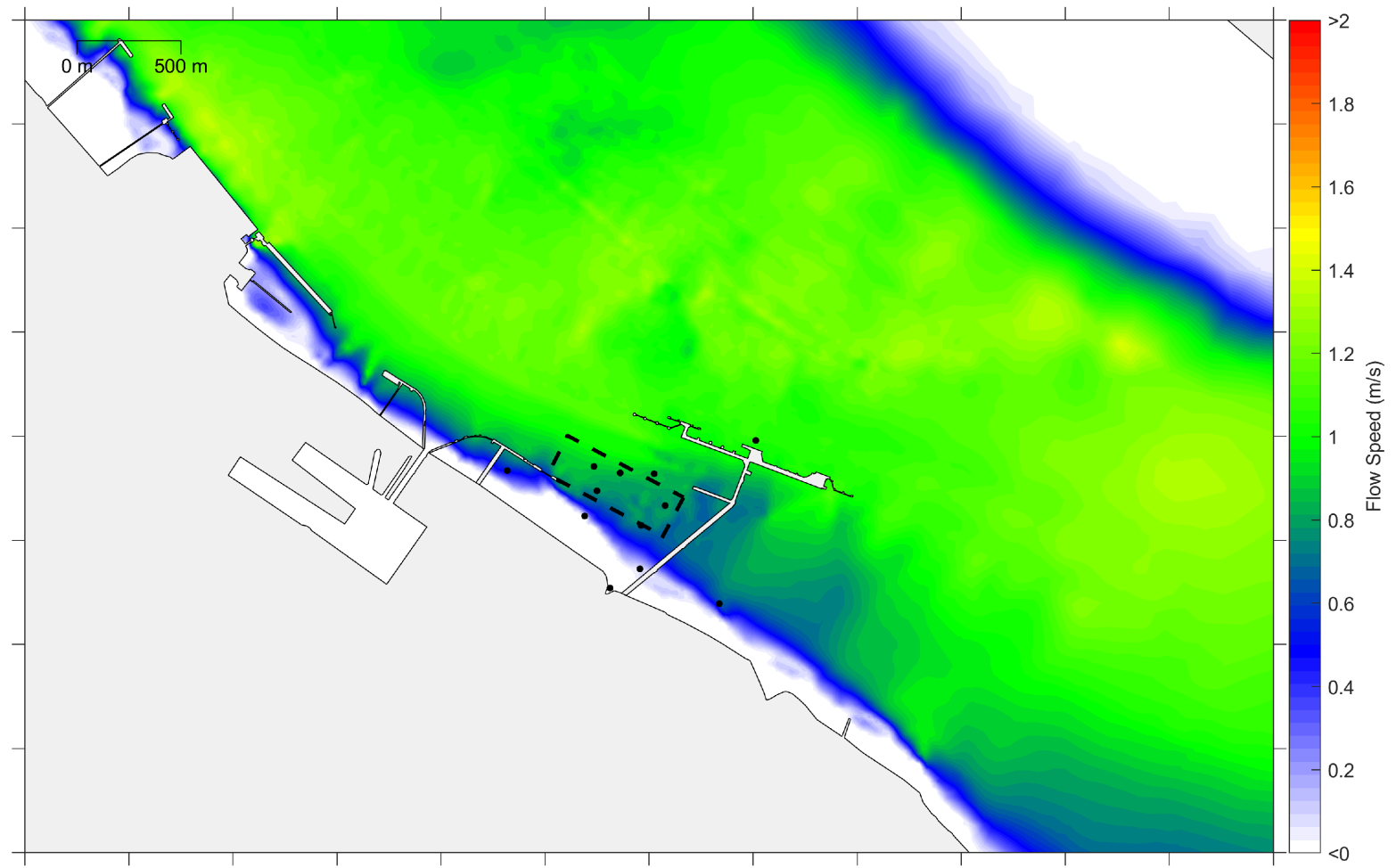


Fig7.16_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
TIMESERIES OF CHANGES TO FLOWS
AND BED SHEAR STRESS FOR SITES
HST (LEFT) AND ABLE (RIGHT)**

Figure 7.16



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

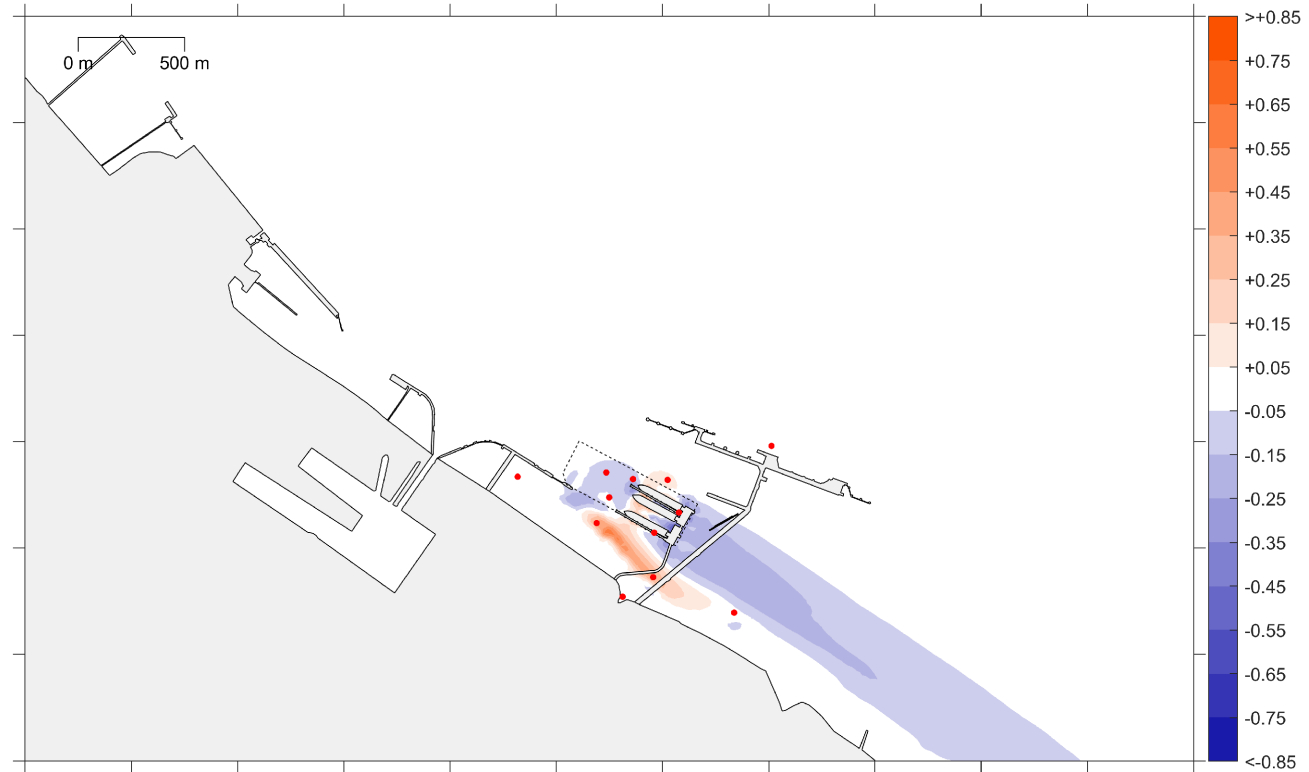
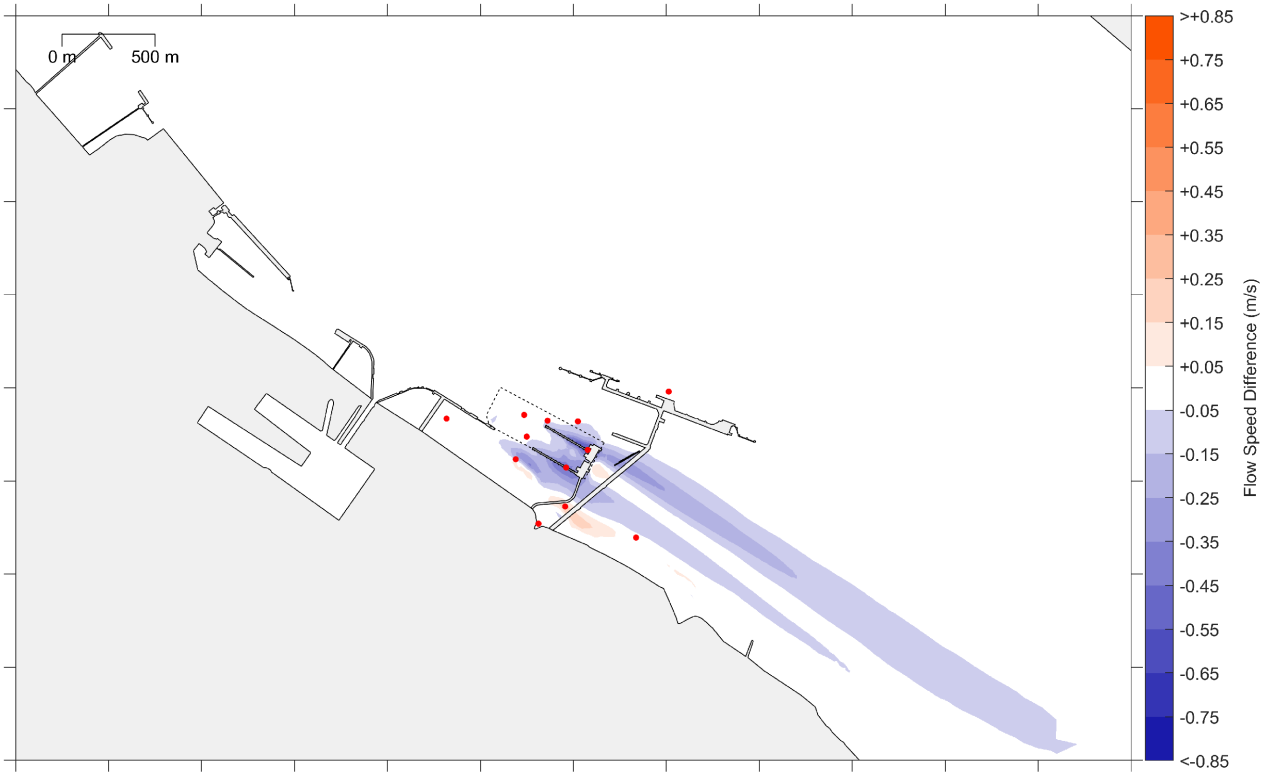
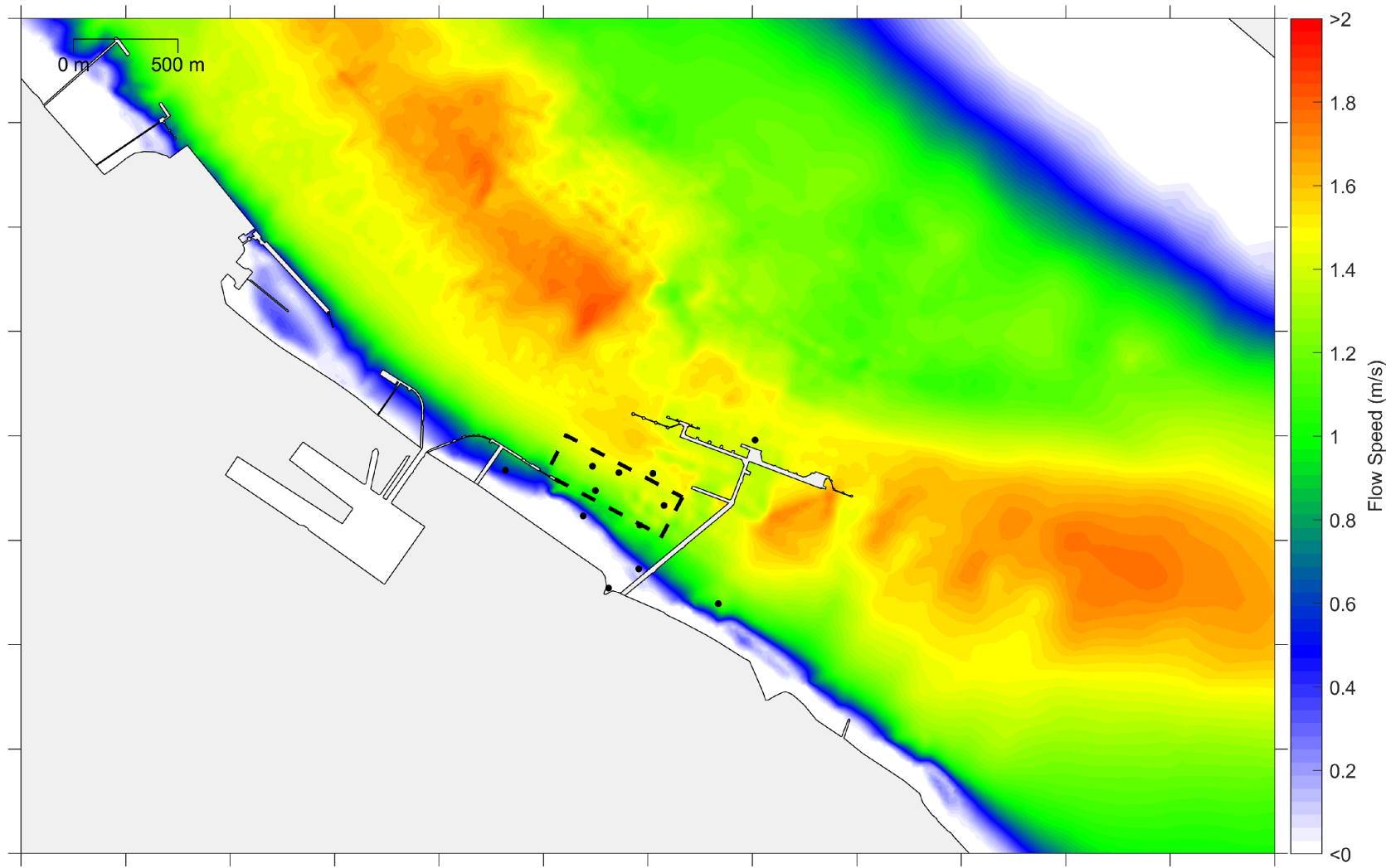


Fig7.17_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
BASELINE PEAK FLOOD FLOW SPEED (TOP),
CHANGE DUE TO SCHEME (LEFT) AND DUE
TO VESSELS ON-BERTH (RIGHT)**

Figure 7.17



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

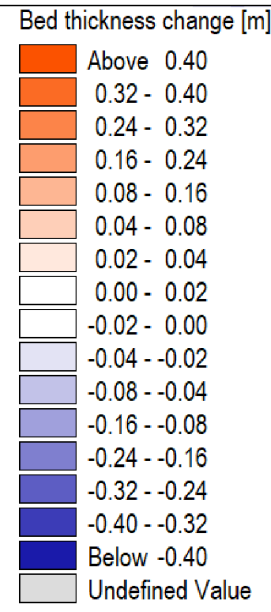
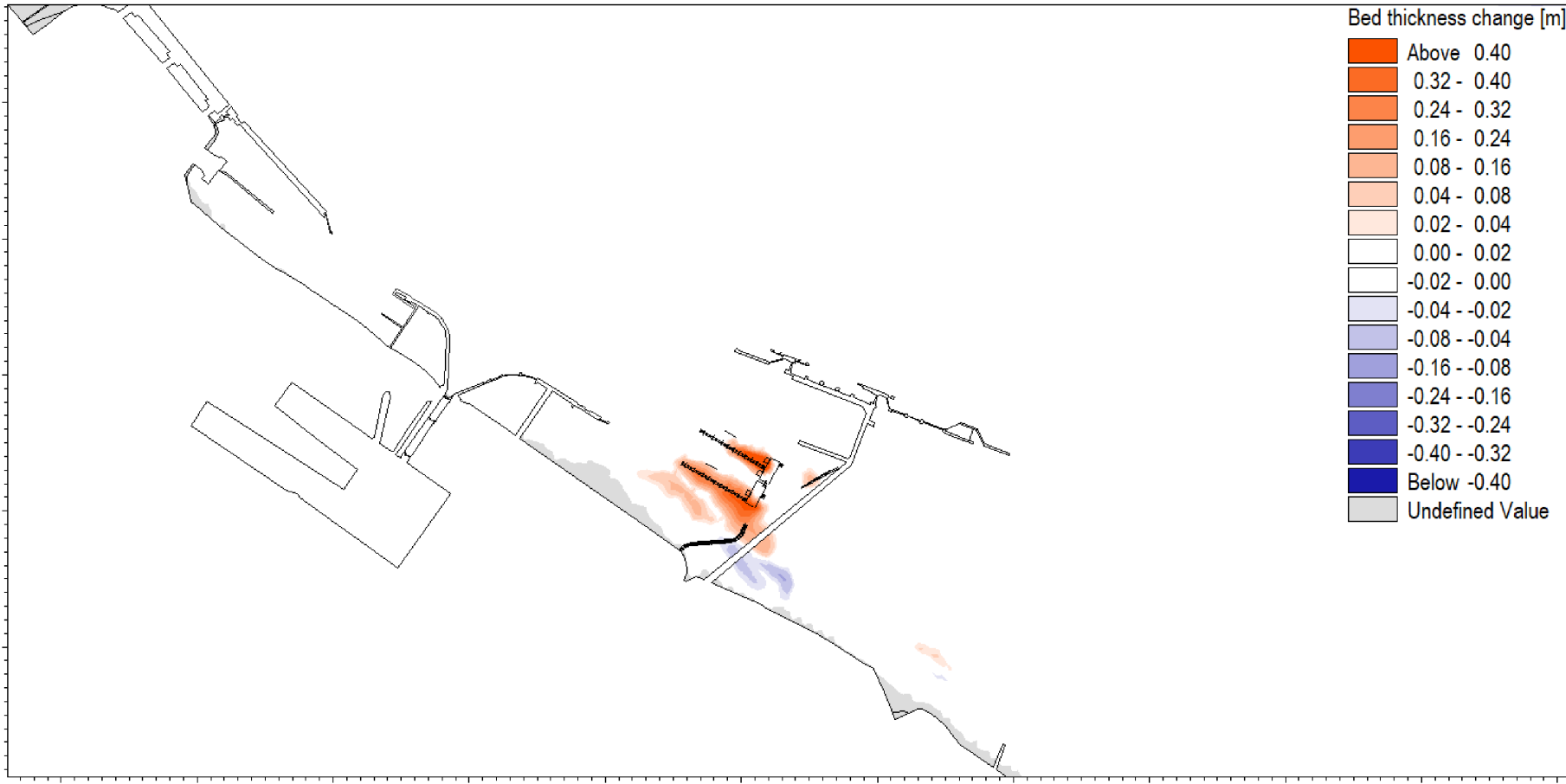


Fig7.18_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
BASELINE PEAK EBB FLOW SPEED (TOP),
CHANGE DUE TO SCHEME (LEFT) AND DUE
TO VESSELS ON-BERTH (RIGHT)**

Figure 7.18



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	



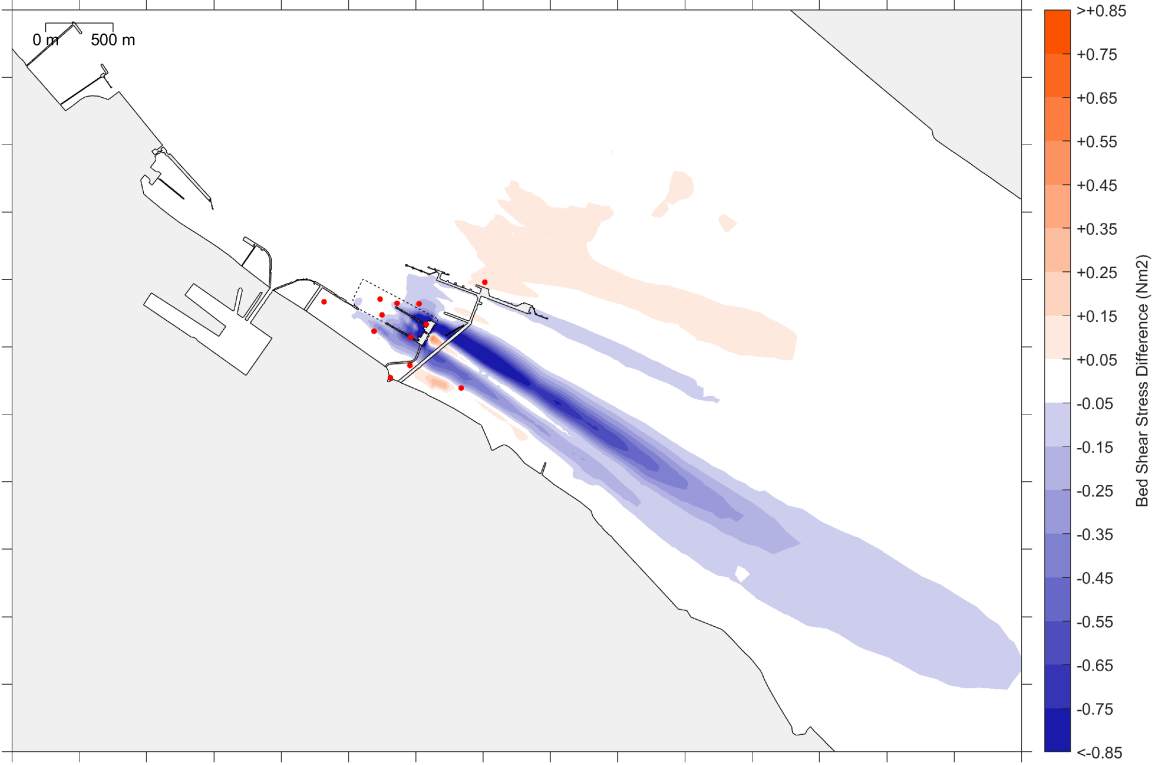
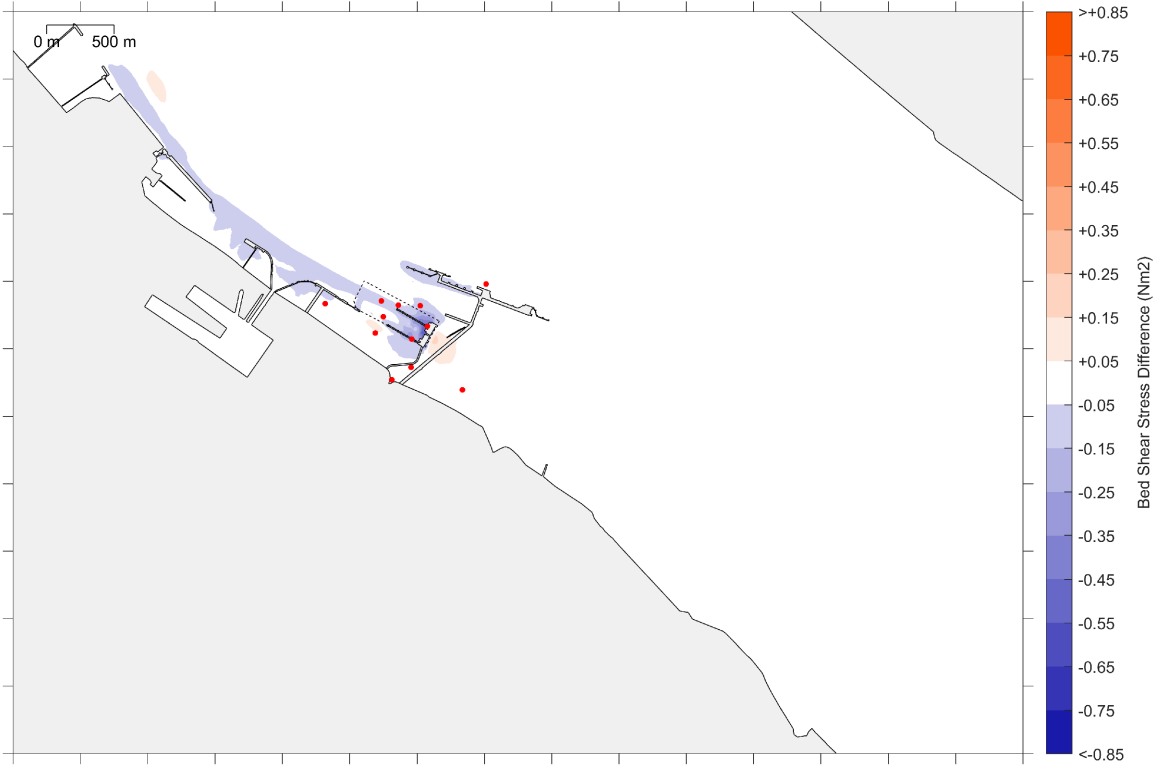
Fig7.19_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL**

**MODELLED BED LEVEL CHANGE
OVER A MEAN SPRING NEAP CYCLE**

Figure 7.19



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

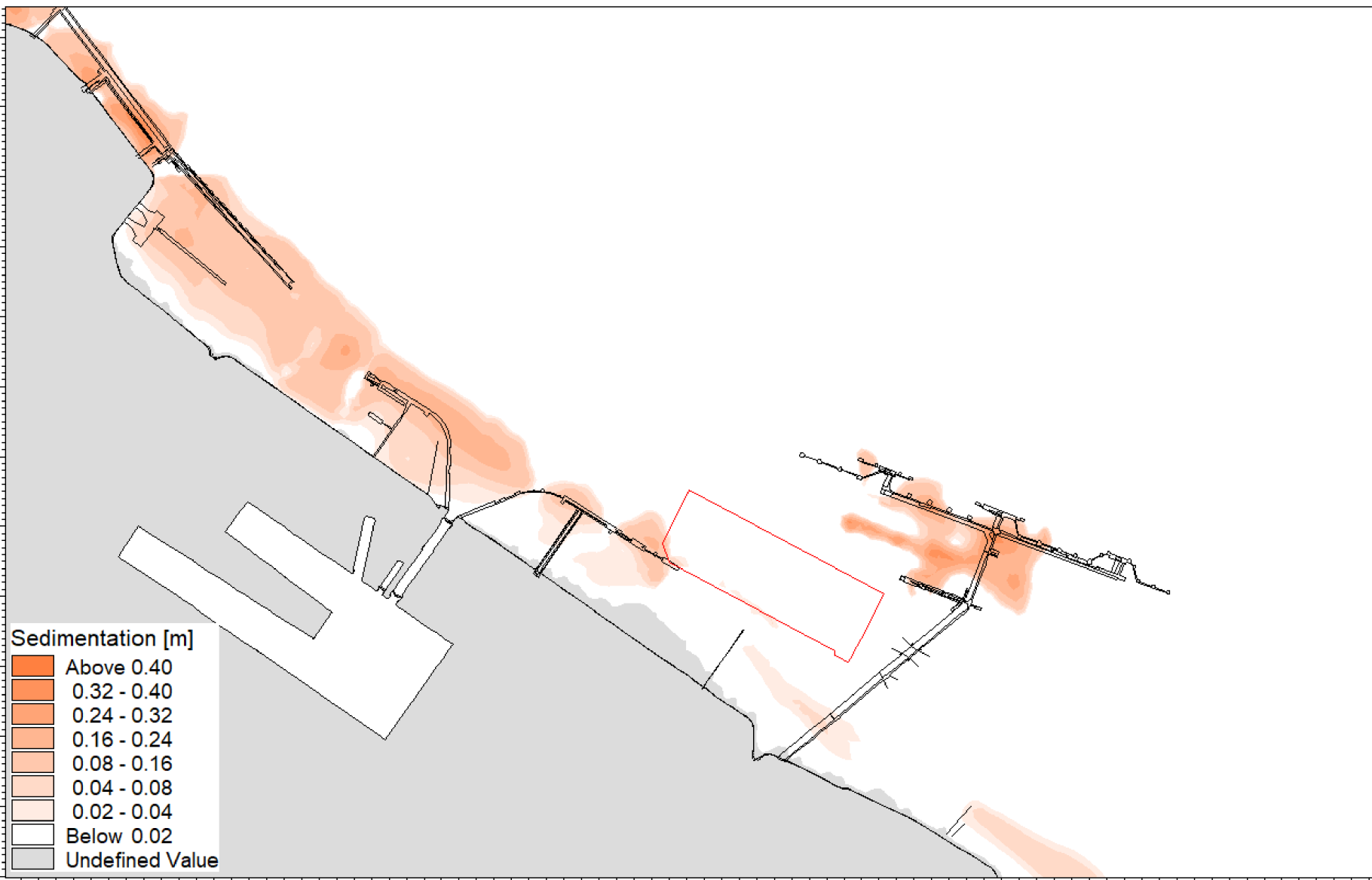


Fig7.20_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
PREDICTED CHANGE TO BSS ON
FLOOD (TOP) AND EBB (BOTTOM)**

Figure 7.20



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection	NA	
Scale (A4)	NA	
Project no.	5035	

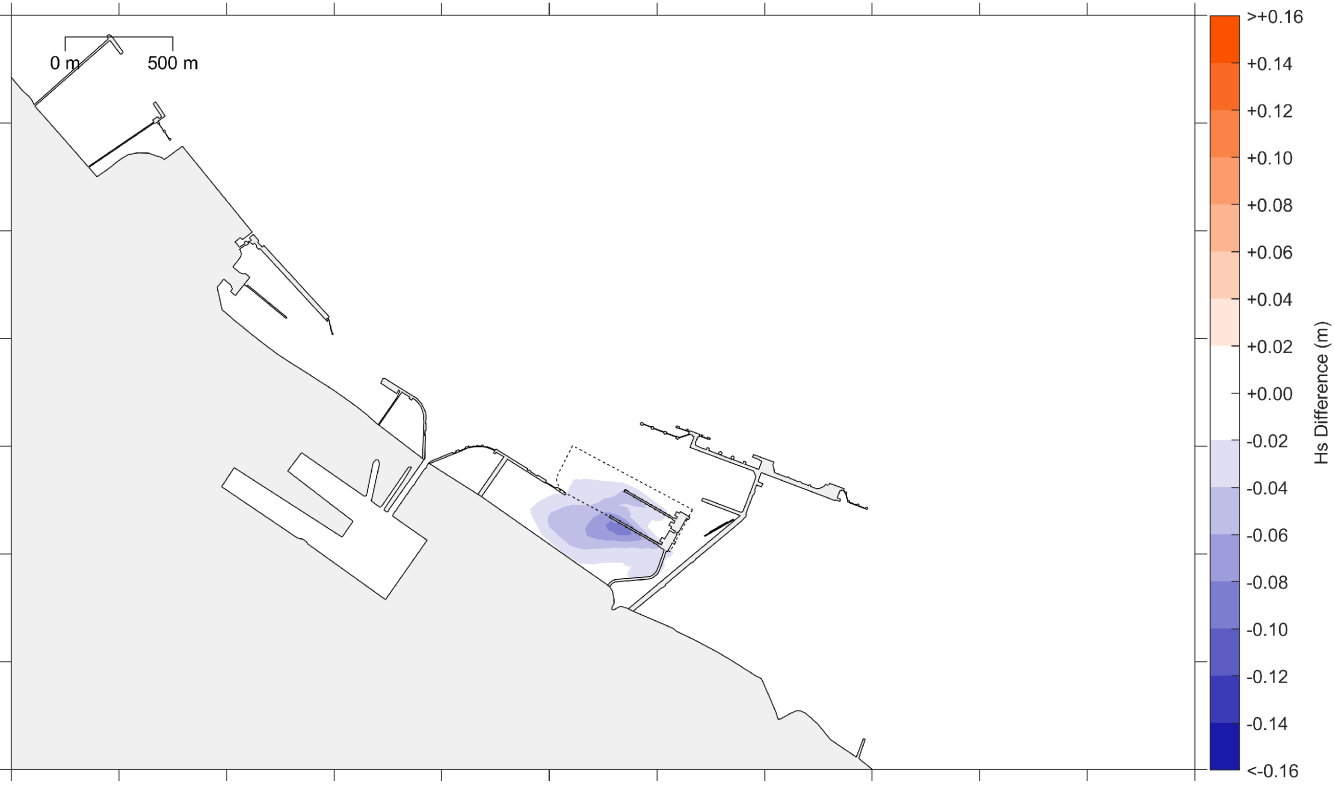
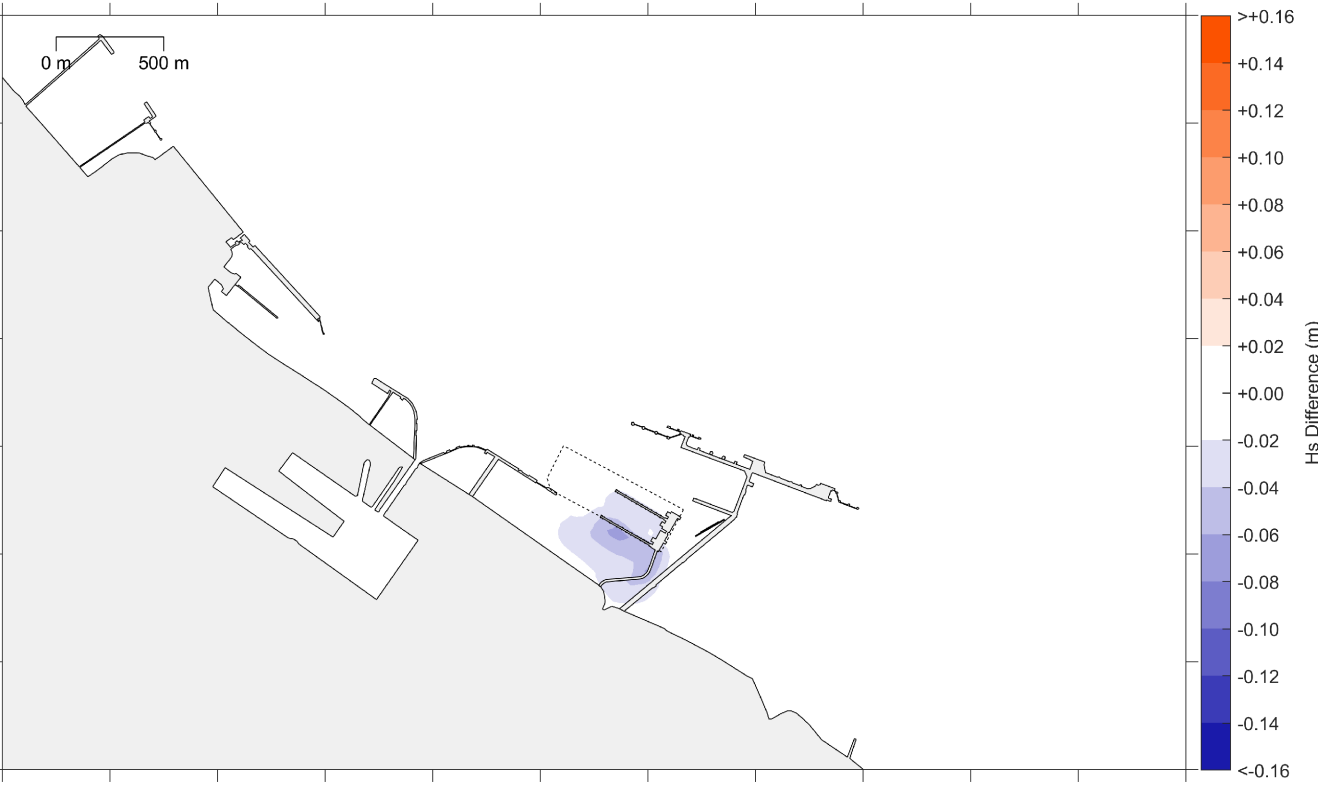
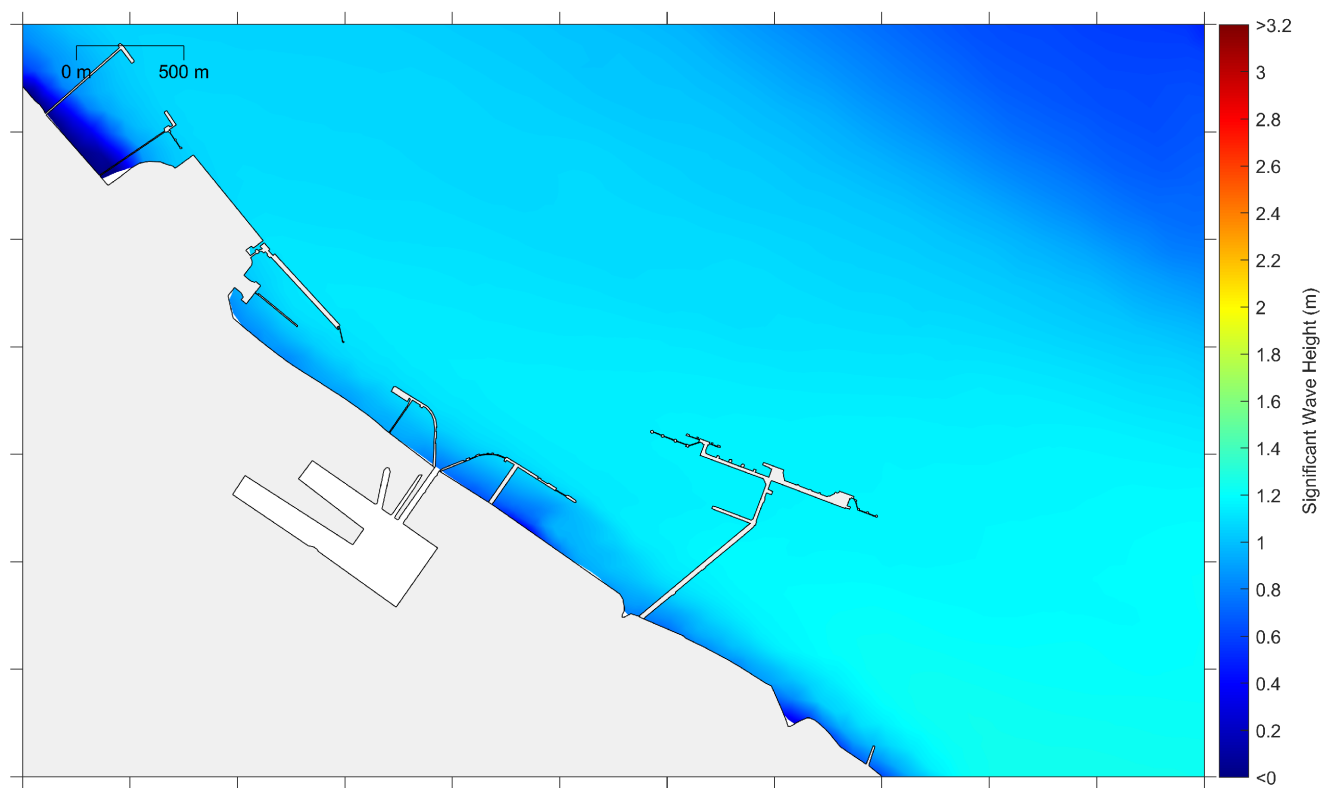
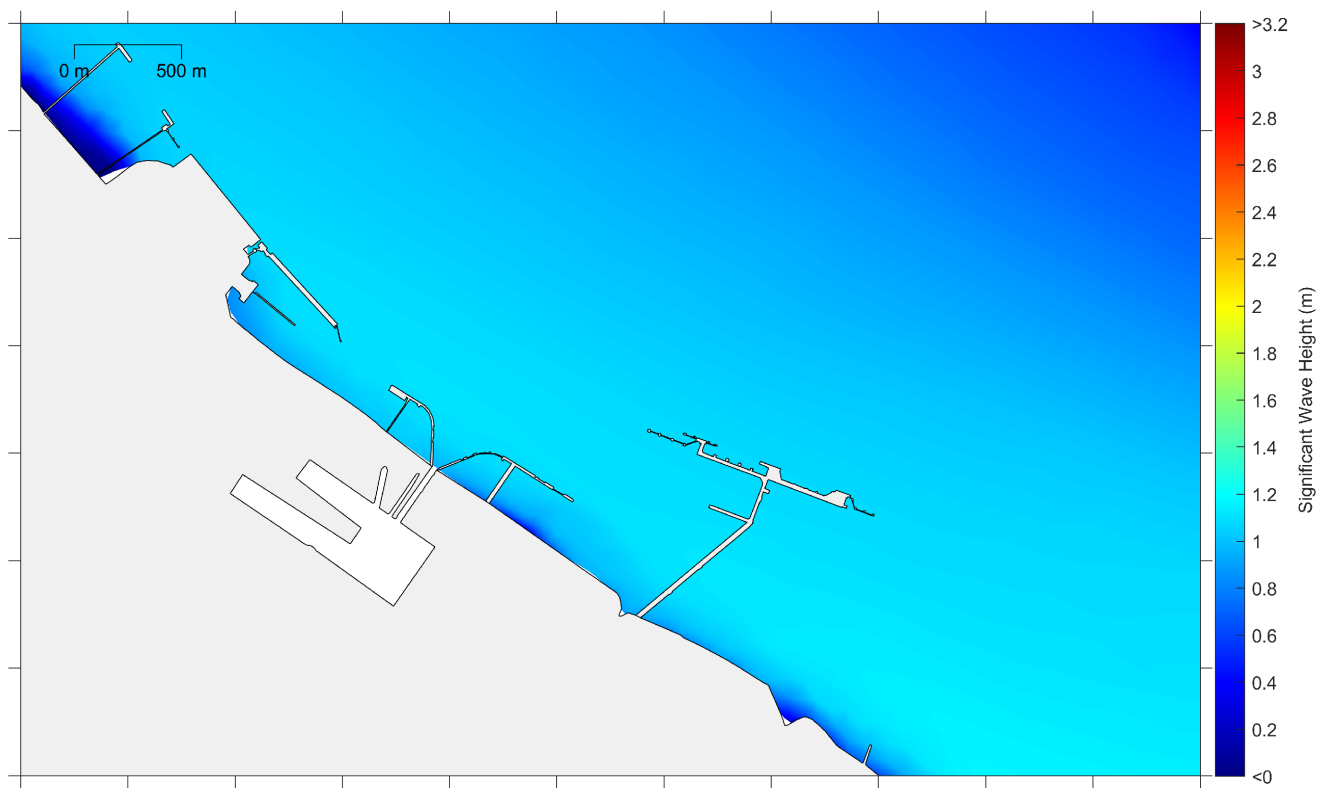


Fig7.21_ES_A4.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
PREDICTED BASELINE SEDIMENTATION
OVER MEAN SPRING NEAP CYCLE**

Figure 7.21



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

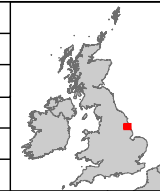
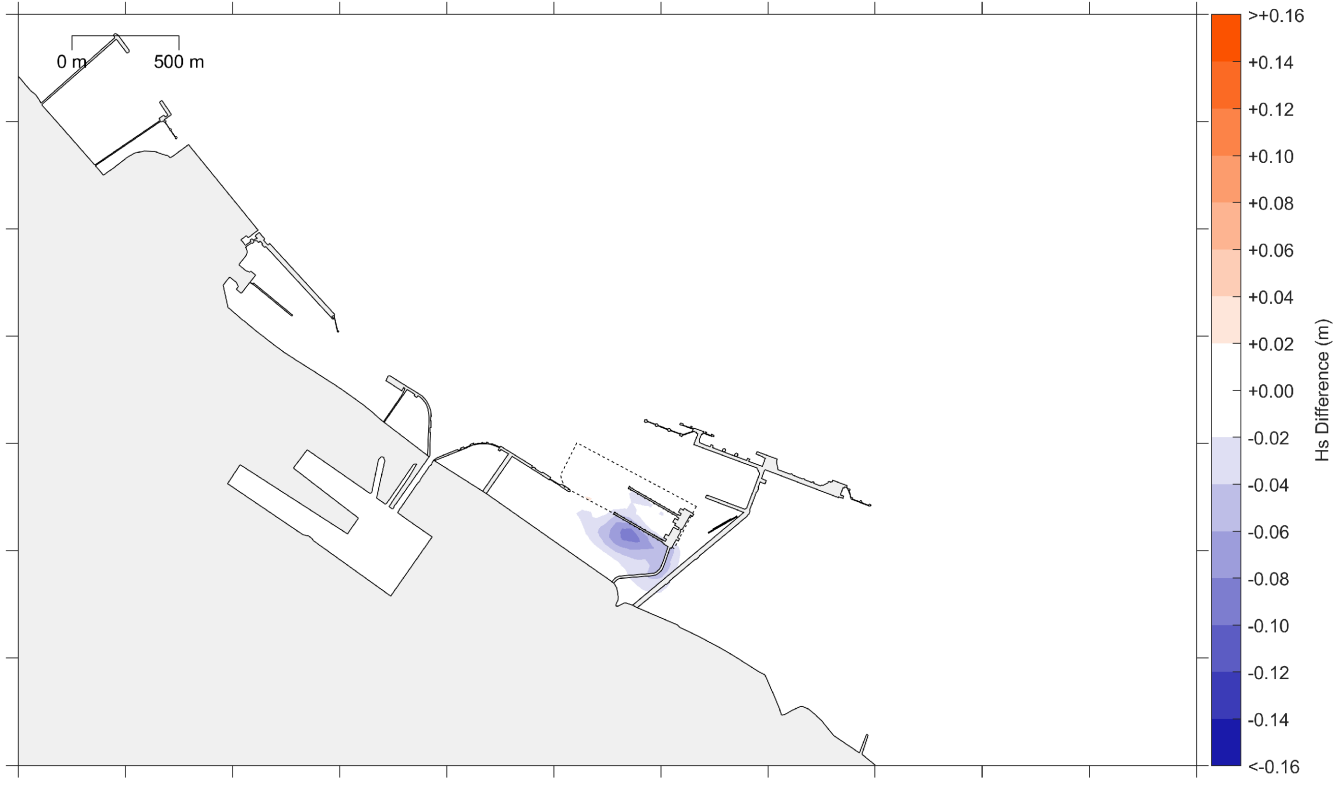
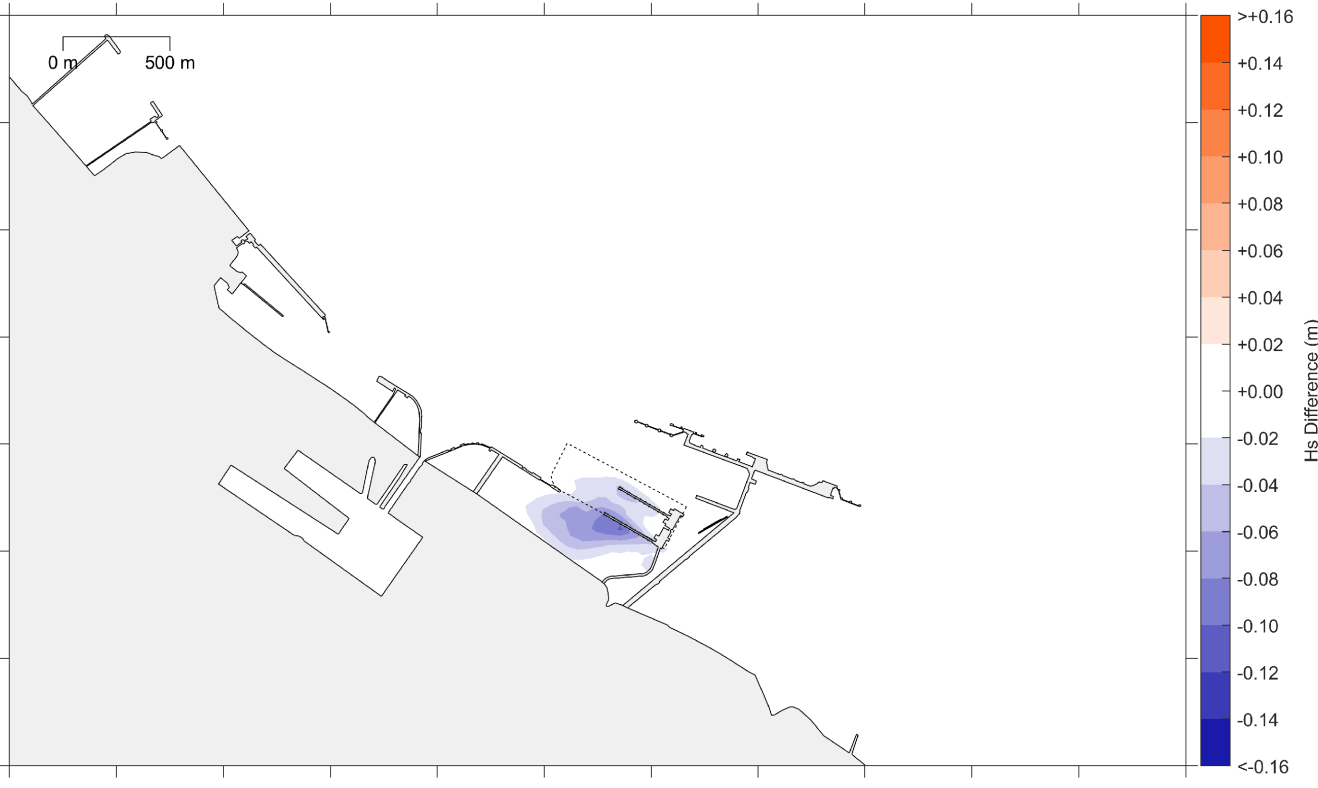
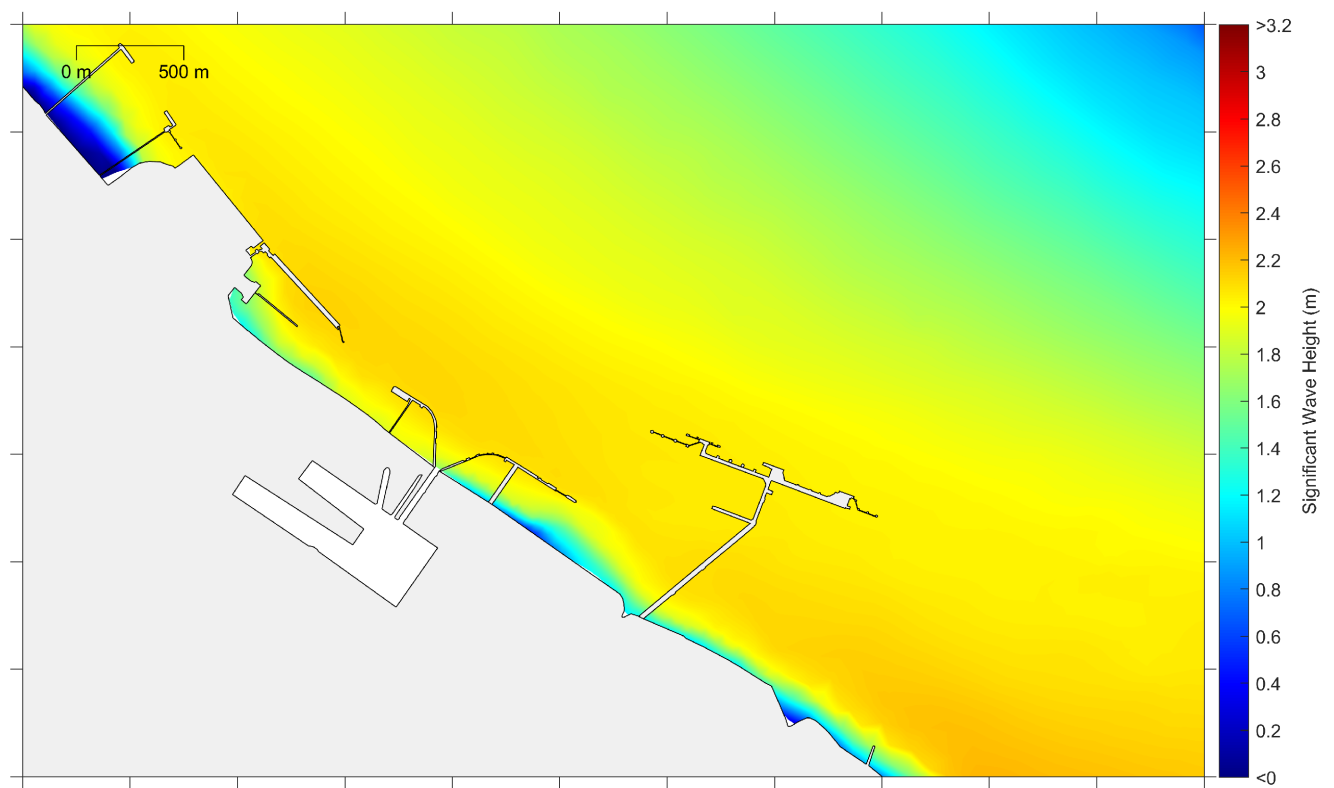
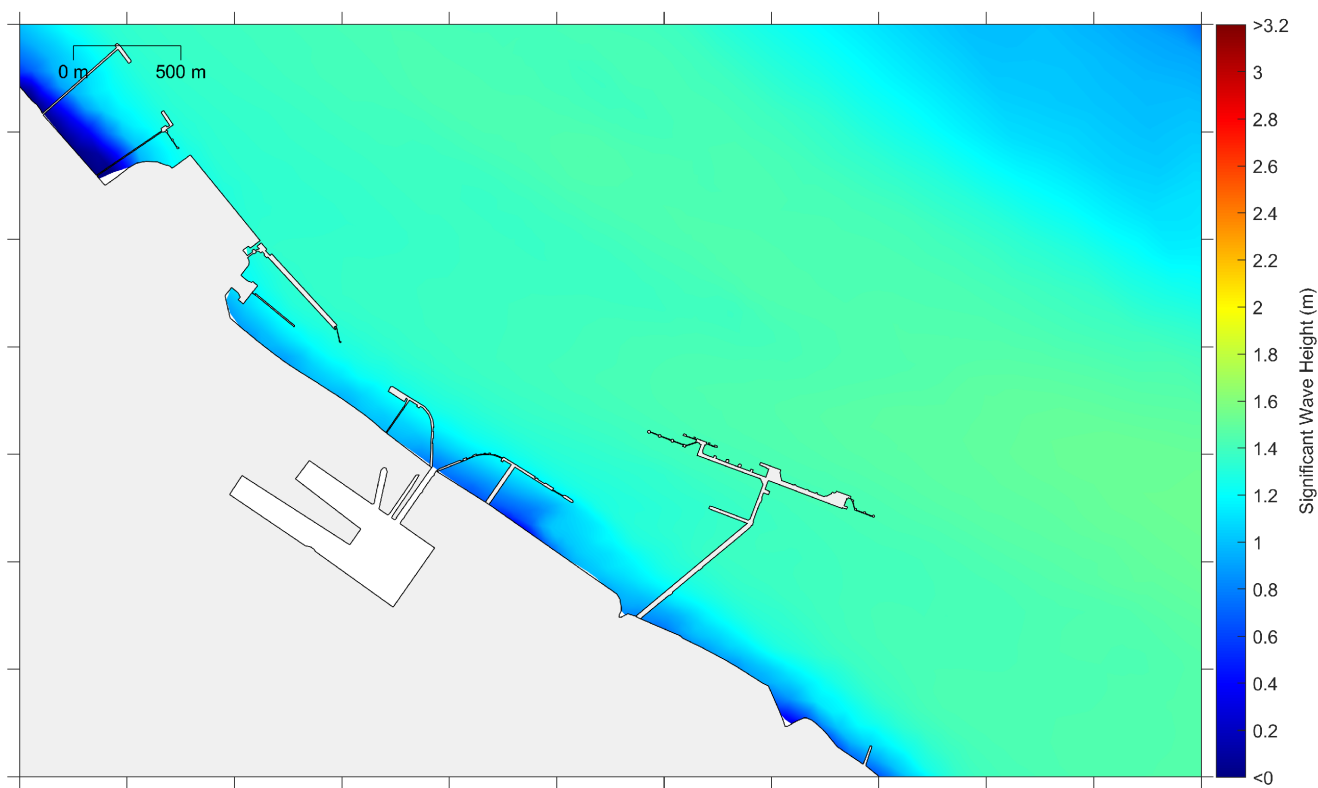


Fig7.22_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
BASELINE HS (TOP) AND EFFECT OF SCHEME
(BOTTOM) FOR 0.5-YR WAVE EVENT FROM
NE (LEFT) AND E (RIGHT)**

Figure 7.22



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035

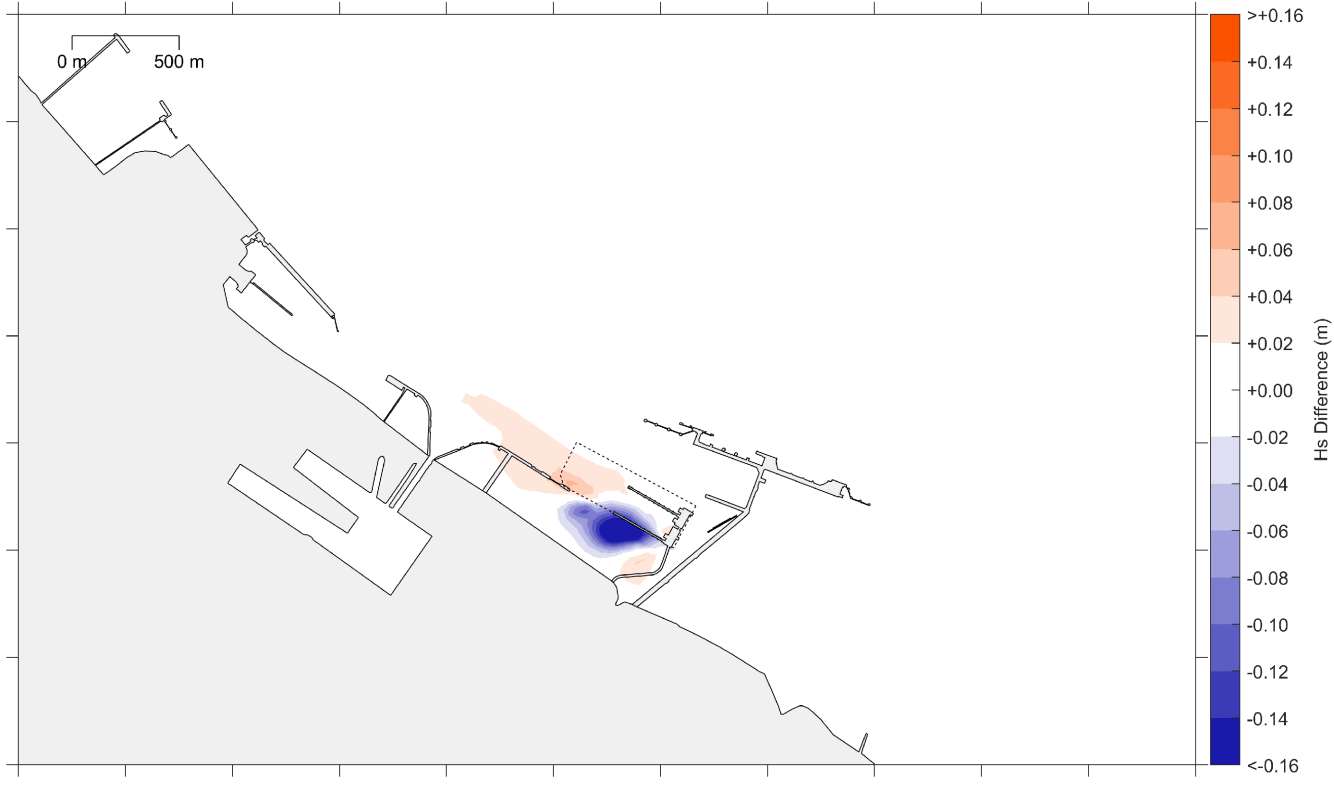
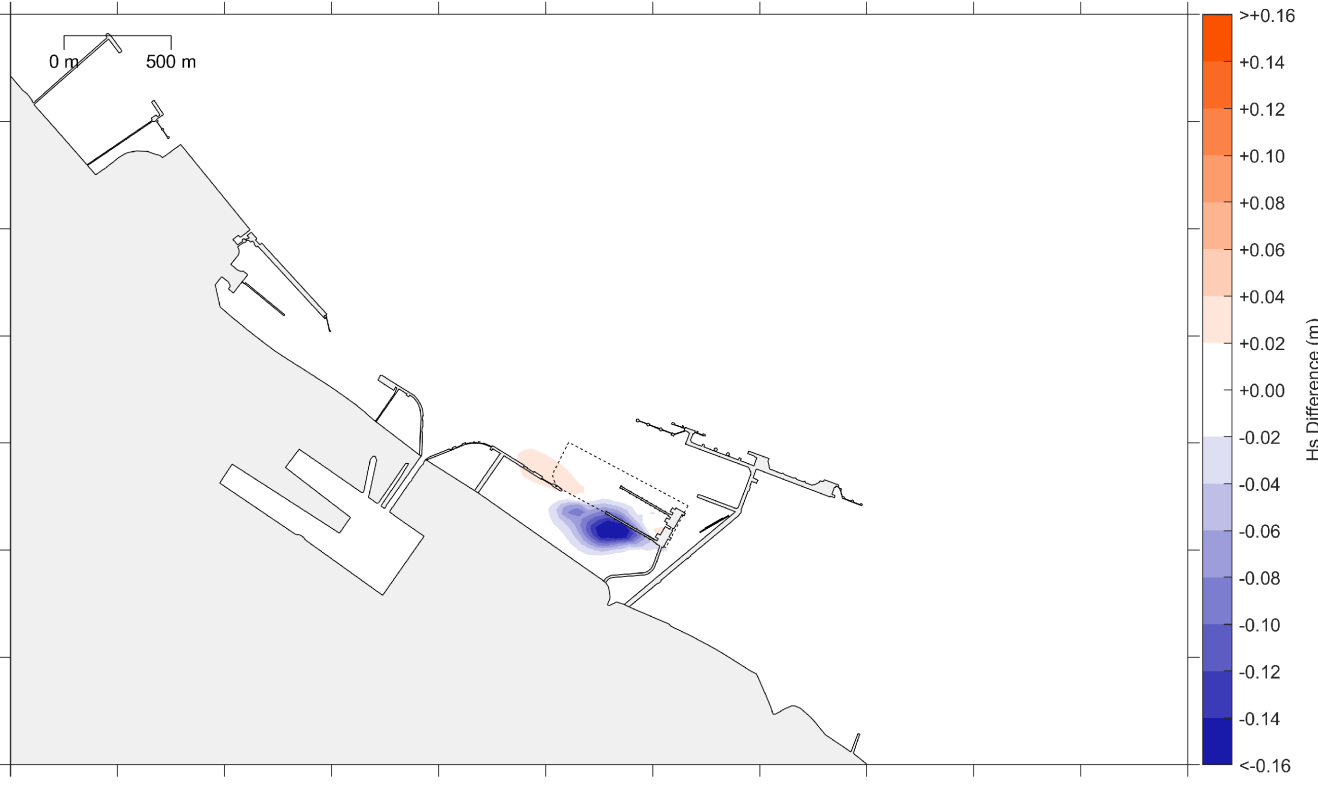
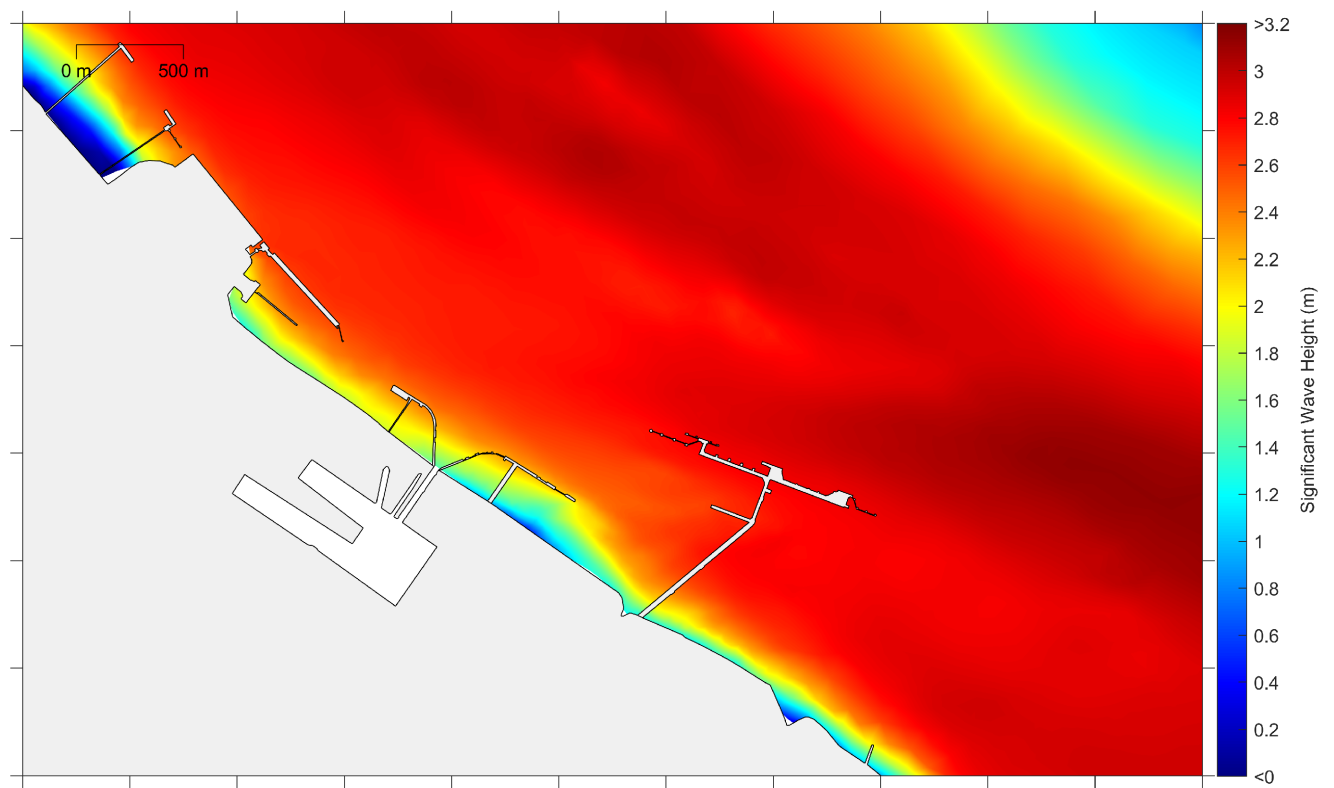
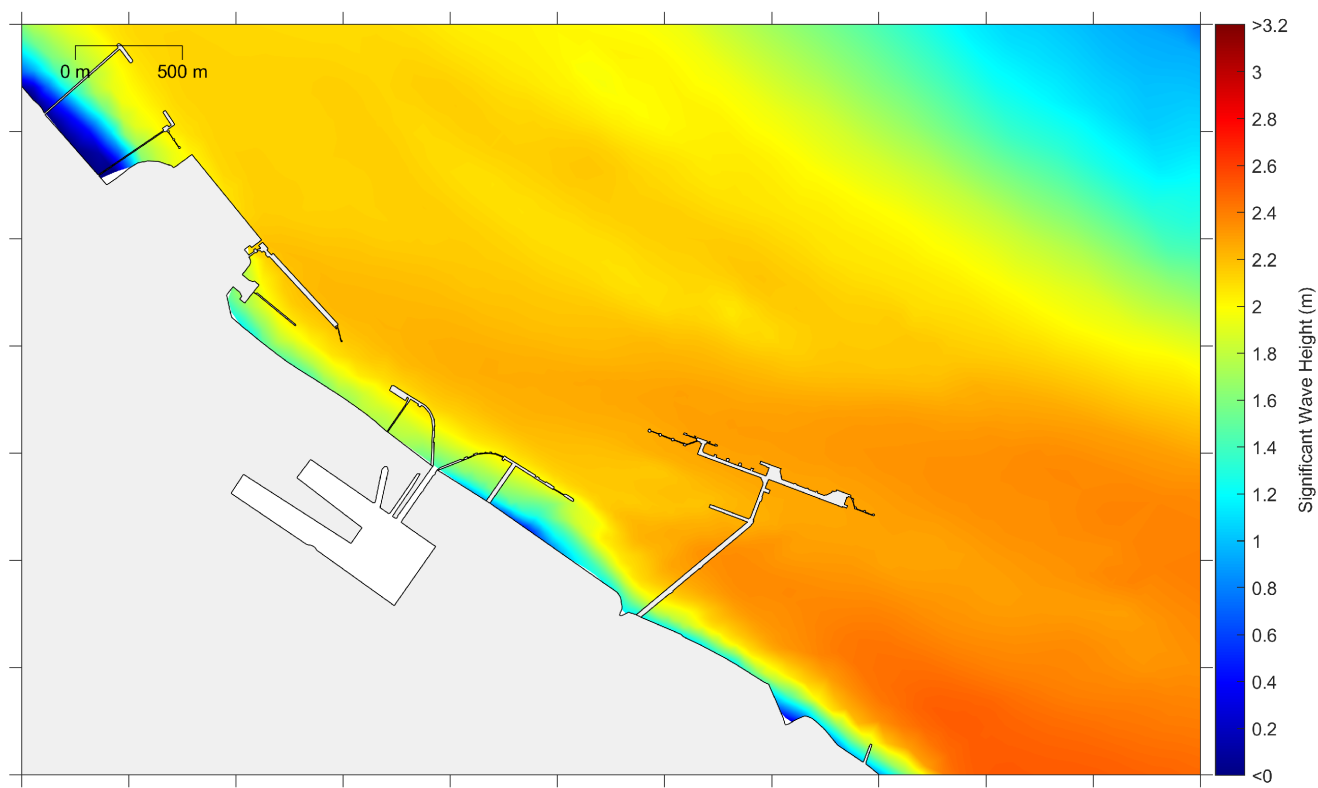


Fig7.23_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
BASELINE HS (TOP) AND EFFECT OF SCHEME
(BOTTOM) FOR 0.5-YR WAVE FROM SE
(LEFT) AND 50-YR WAVE FROM NE (RIGHT)**

Figure 7.23



© ABPmer, All rights reserved, 2022.

Date	By	QA
09/12/2022	AMF	OJR
Projection		NA
Scale (A3)		NA
Project no.		5035



Fig7.24_ES_A3.mxd



**IMMINGHAM EASTERN
RO-RO TERMINAL
BASELINE HS (TOP) AND EFFECT OF SCHEME
(BOTTOM) FOR 50-YR WAVE EVENT FROM
E (LEFT) AND FROM SE (RIGHT)**

Figure 7.24