APPENDIX 4.4B

ASSESSMENT OF WATER QUALITY IMPACT DUE TO POSSIBLE CHANGE IN COASTLINE CONFIGURATION FOR 2016

Appendix 4.4B
Assessment of Water Quality Impact due to Possible Change in Coastline Configuration for 2016

As the reclamation limits for some planned coastal developments such as the Revised South East Kowloon Development, Central Reclamation Phase III and Wan Chai Development Phase II are not yet confirmed and still subject to change at the time when this EIA was prepared, sensitivity test was conducted under this Study to investigate the effect of possible changes in coastline configuration in Victoria Harbour on the overall conclusion of the water quality impact assessment. Additional modelling was undertaken for Scenarios 3b (refer to **Table 4.8**) using an alternate coastline configuration (**Figure 4.6b**) as sensitivity test. This sensitivity run, namely Scenario 3c, has excluded the following reclamation projects.

- Revised South East Kowloon Development (SEKD);
- Yau Tong Bay Reclamation;
- Sham Tseng Further Reclamation;
- Central Reclamation Phase III (CRIII); and
- Wan Chai Development Phase II (WDII).

Same as Scenario 3b, Scenario 3c represents normal operation of TPSTW and STSTW in 2016 after Project commission where the effluent flow from TPSTW would reach its full capacity (13,000 m^3/day). Under this sensitivity test (Scenario 3c), the Project effluent was discharged into the Kai Tak Approach Channel (KTAC). This is different from Scenario 3b where the Project effluent was discharged at the coastline of Kowloon Bay after completion of the SEKD.

The water quality contour plots for Scenario 3c (using alternative 2016 coastline in **Figure 4.6b**) are shown in **Figures 3c1** to **3c10**. **Tables 3c1** and **3c2** summarised the modelling results at identified water sensitive receivers. The results for Scenario 3b (using original 2016 coastline in **Figure 4.6a**) are also included for comparison. All the results are presented as annual average.

The results for Scenario 3c indicated non-compliance of the marine WQO for depth-averaged (DA) DO (4 mg/L), bottom DO (2 mg/L), TIN (0.4 mg/L) and NH_3–N (0.021 mg/L) within KTAC and at existing Kwun Tong Typhoon Shelter (KTTS) both of which have very weak tidal circulation (**Figures 3c1 to 3c3, 3c5 to 3c6**). High levels of BOD_5 (> 3 mg/L) and SS (> 10 mg/L) were also predicted within KTAC and existing KTTS (**Figures 3c4 and 3c8**). High *E.coli* level (> 500 count/100mL) were predicted at the upper part of KTAC. As compared to other parameters, the *E.coli* plume caused by the Project was smaller and confined within the KTAC and did not reach the existing KTTS. As shown in **Figure 3c7** and **Table 3c1**, the *E.coli* level at the new KTTS location was much higher under Scenario 3b (with the SEKD reclamation) as compared to Scenario 3c (without the SEKD reclamation).

The coastline at Kowloon Bay would be streamlined with the SEKD reclamation. There would be less embayment areas under Scenario 3b. Although the Project effluent would be diverted to Kowloon Bay and a larger amount of pollution load would be discharged into the Kowloon Bay under Scenario 3b, the predicted water quality at Kowloon Bay under Scenario 3b (with SEKD reclamation) was still better than that

predicted under Scenario 3c (without SEKD reclamation) where the Project effluent was discharged away from Kowloon Bay. With the To Kwa Wan Typhoon Shelter in place, the tidal circulation at Kowloon Bay under Scenario 3c would be very weak and thus deteriorate the water quality at the Kowloon Bay.

Similar to the SEKD reclamation, WDII and CRIII would streamline some of the coastline along the seafront of Central, Wanchai and Causeway Bay, thus reducing the embayment areas. The model results indicated that the *E.coli* levels at the locations of the proposed Kellet Island Marina and Causeway Bay Typhoon Shelter were much higher under Scenario 3c (without WDII and CRIII) as compared to Scenario 3b (with WDII and CRIII).

In conclusion, the impact from the Project effluent would be very localized. Without the SEKD reclamation under Scenario 3c, the predicted impact would be confined within the KTAC and the existing KTTS after full commissioning of the Project in 2016. It is not expected that the water quality at the nearby sensitive receivers would be adversely affected by the Project. The plumes of high pollution levels observed at the seafront of Kowloon Bay, Central, Wanchai and Causeway Bay under Scenario 3c were caused by other background pollution sources.

Table 3c1 Predicted Water Quality at Indicator Points for Scenario 3b and Scenario 3c in Year 2016 (annual average)

Indicator Point	Scenario	DA DO (mg/L)	DA DO 10%tile (mg/L)	Bottom DO (mg/L)	Bottom DO 10%tile (mg/L)	DA TIN (mg/L)	DA UIA (mg/L)	DA SS (mg/L)	DA *E. coli* (no/100mL)
Fish Culture Zone (Figure 4.10)									
Ma Wan	Scenario 3c	5.86	4.96	5.74	4.60	0.25	0.006	7.42	45
	Scenario 3b	5.86	4.97	5.74	4.60	0.25	0.006	7.39	44
Tung Lung	Scenario 3c	5.89	4.40	5.55	3.35	0.05	0.002	3.91	9
	Scenario 3b	5.88	4.37	5.54	3.32	0.05	0.002	3.89	9
Gazetted Beach (Figure 4.10)									
Tung Wan	Scenario 3c	6.02	5.07	5.75	4.54	0.24	0.005	6.68	12
	Scenario 3b	6.02	5.06	5.76	4.54	0.24	0.005	6.66	12
Ting Kau	Scenario 3c	5.87	4.90	5.76	4.61	0.25	0.006	6.85	101
	Scenario 3b	5.86	4.90	5.76	4.63	0.25	0.006	6.86	100
Typhoon Shelter (Figure 4.10)									
Rambler Channel	Scenario 3c	5.93	5.07	5.76	4.74	0.29	0.007	6.92	3710
	Scenario 3b	5.92	5.07	5.74	4.74	0.29	0.007	6.93	3680
Yau Ma Tei	Scenario 3c	6.69	5.84	5.98	4.52	0.29	0.007	6.69	3180
	Scenario 3b	6.67	5.81	5.93	4.40	0.29	0.007	6.69	3180
Kwun Tong	Scenario 3c	6.11	5.16	5.87	4.44	0.30	0.010	5.03	217
	Scenario 3b	6.13	5.27	5.83	4.49	0.29	0.008	5.22	927
Sam Ka Tsuen	Scenario 3c	6.24	5.38	5.92	4.56	0.19	0.005	4.94	841
	Scenario 3b	6.21	5.26	5.88	4.44	0.17	0.004	4.82	818
Causeway Bay	Scenario 3c	6.41	5.80	6.25	5.41	0.25	0.005	5.34	1590
	Scenario 3b	6.37	5.77	6.13	5.15	0.25	0.005	5.21	977
Sau Kei Wan	Scenario 3c	6.12	4.97	5.86	4.25	0.17	0.004	4.65	1270
	Scenario 3b	6.10	4.93	5.85	4.25	0.17	0.004	4.63	1330

Indicator Point	Scenario	DA DO (mg/L)	DA DO 10%tile (mg/L)	Bottom DO (mg/L)	Bottom DO 10%tile (mg/L)	DA TIN (mg/L)	DA UIA (mg/L)	DA SS (mg/L)	DA *E. coli* (no/100mL)
Marina (Figure 4.10)									
Kellett Island Marina	Scenario 3c	6.36	5.72	6.19	5.29	0.26	0.005	5.29	2700
	Scenario 3b	6.40	5.79	6.18	5.33	0.25	0.005	5.19	1110
Marina at SEKD	Scenario 3c	6.12	5.36	5.81	4.53	0.29	0.009	5.61	2260
	Scenario 3b	6.11	5.27	5.90	4.67	**0.43**	0.013	5.46	9280
EPD Monitoring Station (Figure 4.1)									
EM1	Scenario 3c	5.93	4.33	5.71	3.67	0.10	0.003	4.16	67
	Scenario 3b	5.91	4.30	5.69	3.63	0.10	0.002	4.14	71
EM2	Scenario 3c	5.85	4.21	5.61	3.52	0.07	0.002	3.99	11
	Scenario 3b	5.83	4.19	5.59	3.50	0.07	0.002	3.97	12
EM3	Scenario 3c	5.78	3.91	5.58	3.40	0.05	0.001	3.75	13
	Scenario 3b	5.78	3.91	5.57	3.39	0.05	0.001	3.74	13
VM1	Scenario 3c	6.05	4.79	5.86	4.18	0.17	0.004	4.56	285
	Scenario 3b	6.04	4.79	5.84	4.18	0.18	0.004	4.55	288
VM2	Scenario 3c	6.09	4.98	5.90	4.38	0.20	0.005	4.74	173
	Scenario 3b	6.09	5.06	5.89	4.43	0.22	0.005	4.80	314
VM4	Scenario 3c	6.12	5.11	5.92	4.47	0.24	0.005	4.92	307
	Scenario 3b	6.10	5.08	5.90	4.46	0.24	0.005	4.89	422
VM5	Scenario 3c	6.19	5.33	6.00	4.72	0.27	0.005	5.18	450
	Scenario 3b	6.16	5.33	5.96	4.68	0.27	0.005	5.13	562
VM6	Scenario 3c	6.20	5.39	5.98	4.70	0.28	0.006	5.31	436
	Scenario 3b	6.17	5.36	5.94	4.64	0.28	0.005	5.24	419
VM7	Scenario 3c	6.21	5.38	5.97	4.68	0.29	0.006	5.42	353
	Scenario 3b	6.18	5.37	5.93	4.64	0.30	0.005	5.36	397
VM8	Scenario 3c	6.04	4.97	5.85	4.55	0.27	0.005	5.70	34
	Scenario 3b	6.03	4.98	5.84	4.55	0.27	0.005	5.68	37
VM12	Scenario 3c	6.05	5.08	5.85	4.52	0.31	0.006	6.07	234
	Scenario 3b	6.02	5.05	5.81	4.50	0.31	0.006	6.05	249
VM15	Scenario 3c	6.26	5.50	5.98	4.73	0.29	0.006	5.53	148
	Scenario 3b	6.24	5.48	5.93	4.65	0.30	0.005	5.49	166
VM13	Scenario 3c	5.87	4.86	5.74	4.59	0.29	0.006	6.70	1160
	Scenario 3b	5.85	4.85	5.73	4.58	0.29	0.006	6.71	1160
VM14	Scenario 3c	5.90	5.02	5.82	4.81	0.28	0.006	6.82	1260
	Scenario 3b	5.89	5.02	5.81	4.80	0.28	0.006	6.84	1260
WM1	Scenario 3c	5.91	4.51	5.68	3.90	0.09	0.002	4.61	13
	Scenario 3b	5.91	4.51	5.68	3.90	0.09	0.002	4.60	13
WM2	Scenario 3c	5.98	4.81	5.76	4.27	0.17	0.004	5.59	8
	Scenario 3b	5.98	4.81	5.76	4.27	0.17	0.004	5.58	8
WM3	Scenario 3c	6.00	4.97	5.78	4.43	**0.43**	0.006	6.07	111
	Scenario 3b	5.99	4.97	5.76	4.42	**0.43**	0.006	6.05	116
WM4	Scenario 3c	5.84	4.71	5.73	4.45	0.24	0.005	6.54	29
	Scenario 3b	5.83	4.71	5.73	4.45	0.24	0.005	6.52	29

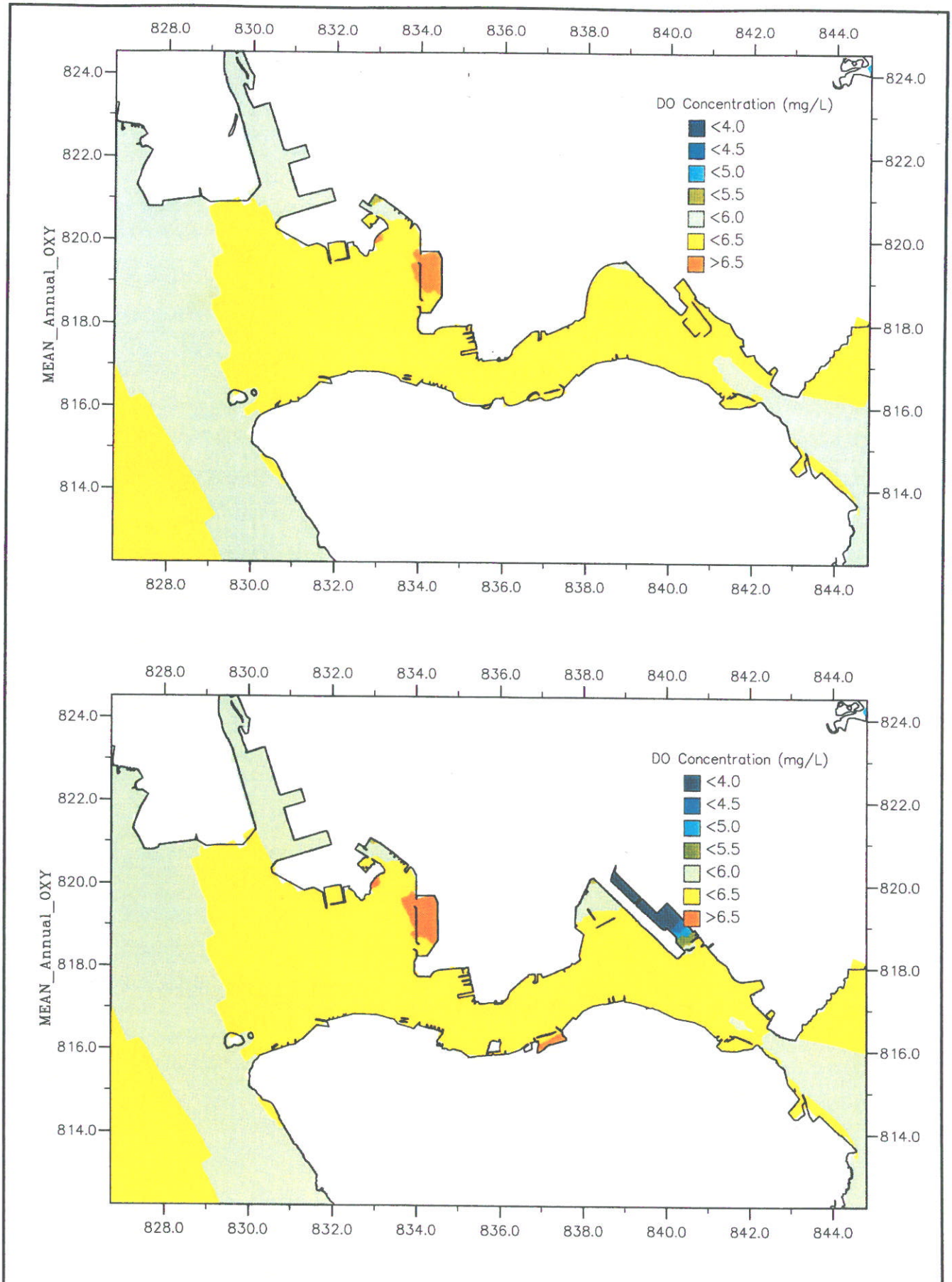
Note: Numbers in bold indicated non-compliance of WQO.

Table 3c2 Predicted Water Quality at Water Intakes for Scenario 3b and Scenario 3c in Year 2016 (annual average)

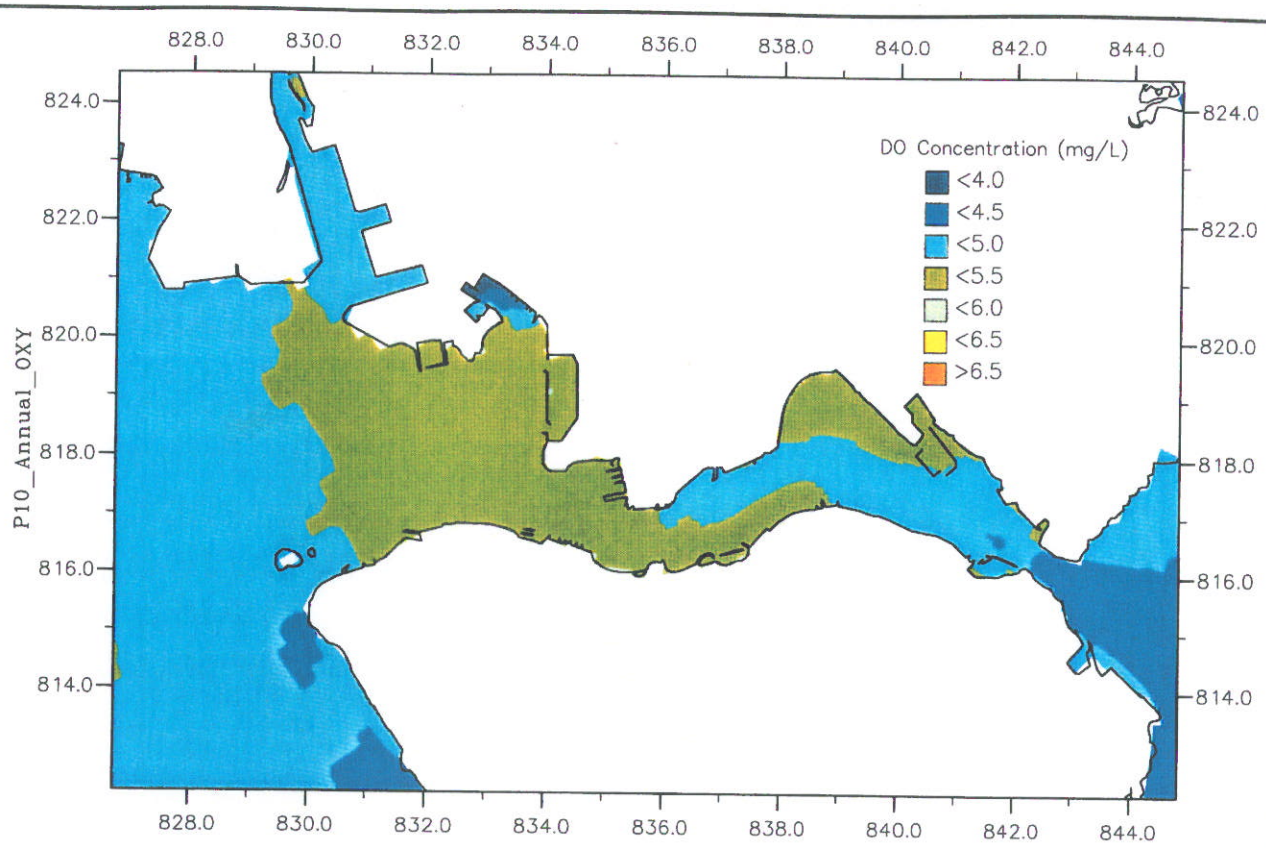
Indicator Point	Scenario	DA DO (mg/L)	DA DO 10 %tile (mg/L)	DA TIN (mg/L)	DA UIA (mg/L)	DA SS (mg/L)	DA *E. coli* (no/100mL)
WSD Salt Water Intake (Figure 4.3)							
Tsuen Wan (26)	Scenario 3c	5.90	5.04	0.28	0.007	6.98	6230
	Scenario 3b	5.89	5.04	0.28	0.007	6.99	6120
Tsing Yi (27)	Scenario 3c	5.90	4.94	0.29	0.006	6.66	1050
	Scenario 3b	5.88	4.93	0.29	0.006	6.67	1060
Cheung Sha Wan (28)	Scenario 3c	5.77	4.47	0.47	0.018	**10.20**	17300
	Scenario 3b	5.70	4.37	0.48	0.019	**10.30**	17300
Yau Ma Tei (19)	Scenario 3c	6.36	5.63	0.28	0.006	5.73	389
	Scenario 3b	6.33	5.59	0.28	0.006	5.71	409
Tai Wan (20)	Scenario 3c	6.15	5.24	0.24	0.007	5.09	247
	Scenario 3b	6.14	5.24	0.28	0.007	5.03	1030
Cha Kwo Ling (21)	Scenario 3c	6.20	5.32	0.26	0.008	4.98	312
	Scenario 3b	6.14	5.12	0.18	0.004	4.69	215
Yau Tong (22)	Scenario 3c	6.15	5.18	0.21	0.006	4.81	1090
	Scenario 3b	6.12	5.08	0.17	0.004	4.66	1020
Kennedy Town (15)	Scenario 3c	6.06	5.01	0.26	0.004	5.46	311
	Scenario 3b	6.05	5.02	0.26	0.004	5.44	322
Sheung Wan (14)	Scenario 3c	6.17	5.28	0.30	0.006	5.48	970
	Scenario 3b	6.15	5.29	0.30	0.005	5.41	1050
Central Water Front (13)	Scenario 3c	6.20	5.33	0.31	0.006	5.51	827
	Scenario 3b	6.18	5.34	0.31	0.005	5.42	845
Wan Chai (12b)	Scenario 3c	6.25	5.50	0.26	0.005	5.19	924
	Scenario 3b	6.23	5.48	0.26	0.005	5.19	1650
North Point (25)	Scenario 3c	6.14	5.05	0.20	0.004	4.80	1080
	Scenario 3b	6.11	5.02	0.20	0.004	4.76	1150
Quarry Bay (16)	Scenario 3c	6.12	5.02	0.19	0.004	4.76	1610
	Scenario 3b	6.10	5.01	0.19	0.004	4.72	1620
Sai Wan Ho (17)	Scenario 3c	6.11	4.97	0.18	0.004	4.66	1410
	Scenario 3b	6.09	4.93	0.18	0.004	4.64	1520
Siu Sai Wan (18)	Scenario 3c	6.13	4.86	0.10	0.003	4.37	3480
	Scenario 3b	6.11	4.82	0.10	0.003	4.36	3500
Cooling Water Intake (Figure 4.3)							
Princes Building (11)	Scenario 3c	6.21	5.37	0.27	0.005	5.27	930
	Scenario 3b	6.19	5.36	0.28	0.005	5.23	977
HSBC Intake (10)	Scenario 3c	6.22	5.39	0.27	0.005	5.28	1130
	Scenario 3b	6.22	5.42	0.28	0.006	5.28	4510

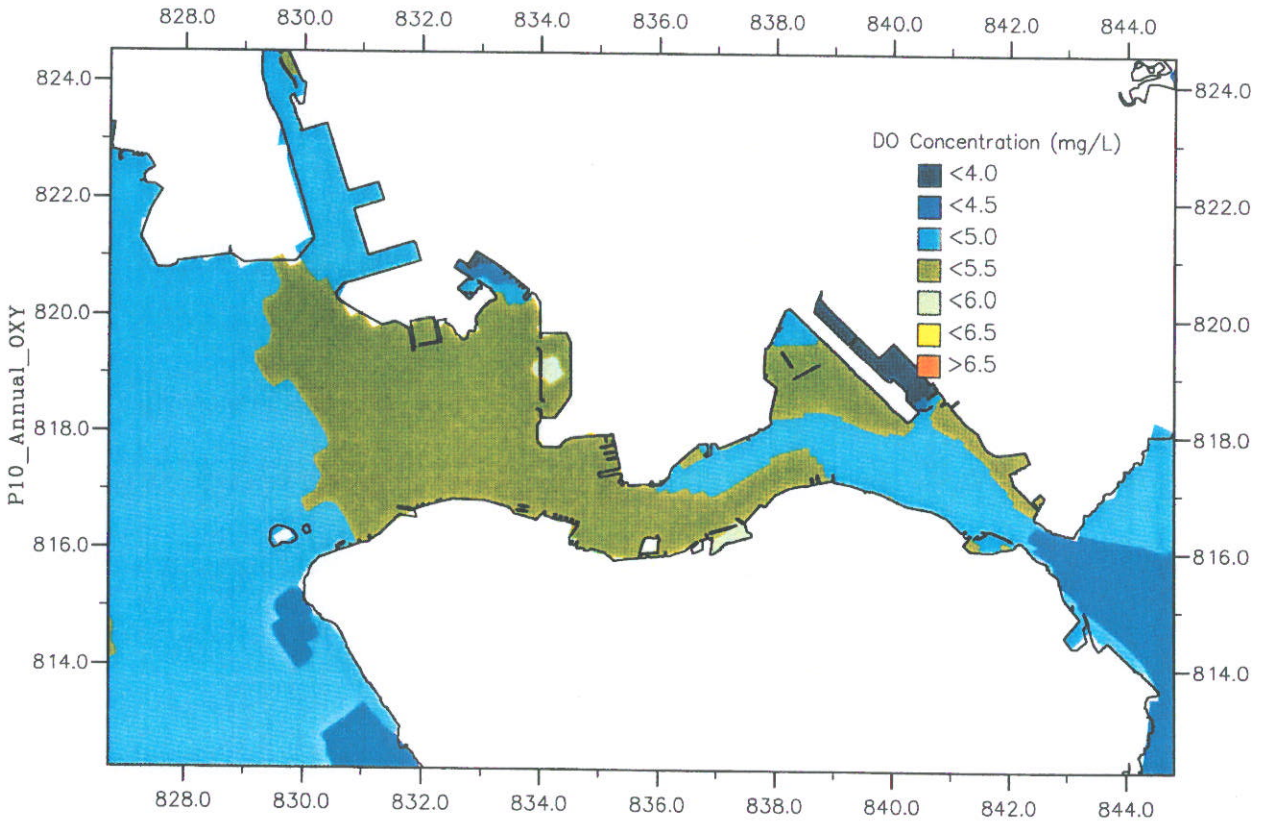
Indicator Point	Scenario	DA DO (mg/L)	DA DO 10 %tile (mg/L)	DA TIN (mg/L)	DA UIA (mg/L)	DA SS (mg/L)	DA *E. coli* (no/100mL)
Queensway Government	Scenario 3c	6.23	5.41	0.27	0.005	5.28	1010
	Scenario 3b	6.22	5.42	0.28	0.005	5.25	3430
DCS Zone 1 (23)	Scenario 3c	6.23	5.41	0.27	0.005	5.28	1010
	Scenario 3b	6.22	5.42	0.28	0.005	5.25	3430
Telecom House (7) (8) (6b)	Scenario 3c	6.21	5.38	0.27	0.005	5.21	1270
	Scenario 3b	6.19	5.37	0.27	0.005	5.16	1610
Great Eagle Centre (4) (5) (6a)	Scenario 3c	6.21	5.38	0.27	0.005	5.21	1270
	Scenario 3b	6.19	5.37	0.27	0.005	5.16	1610
Windsor House (1) / Excelsior Hotel / World Trade Centre (2)	Scenario 3c	6.57	5.93	0.24	0.005	5.38	1130
	Scenario 3b	6.47	5.85	0.25	0.005	5.28	1080
DCS Zone 4 (24)	Scenario 3c	6.33	5.65	0.26	0.006	5.31	8420
	Scenario 3b	6.30	5.63	0.26	0.006	5.25	7980
Intake at SEKD	Scenario 3c	6.13	5.35	0.30	0.009	5.58	215
	Scenario 3b	6.08	5.33	0.57	0.016	5.78	2090

Note: Numbers in bold indicated non-compliance of WQO.

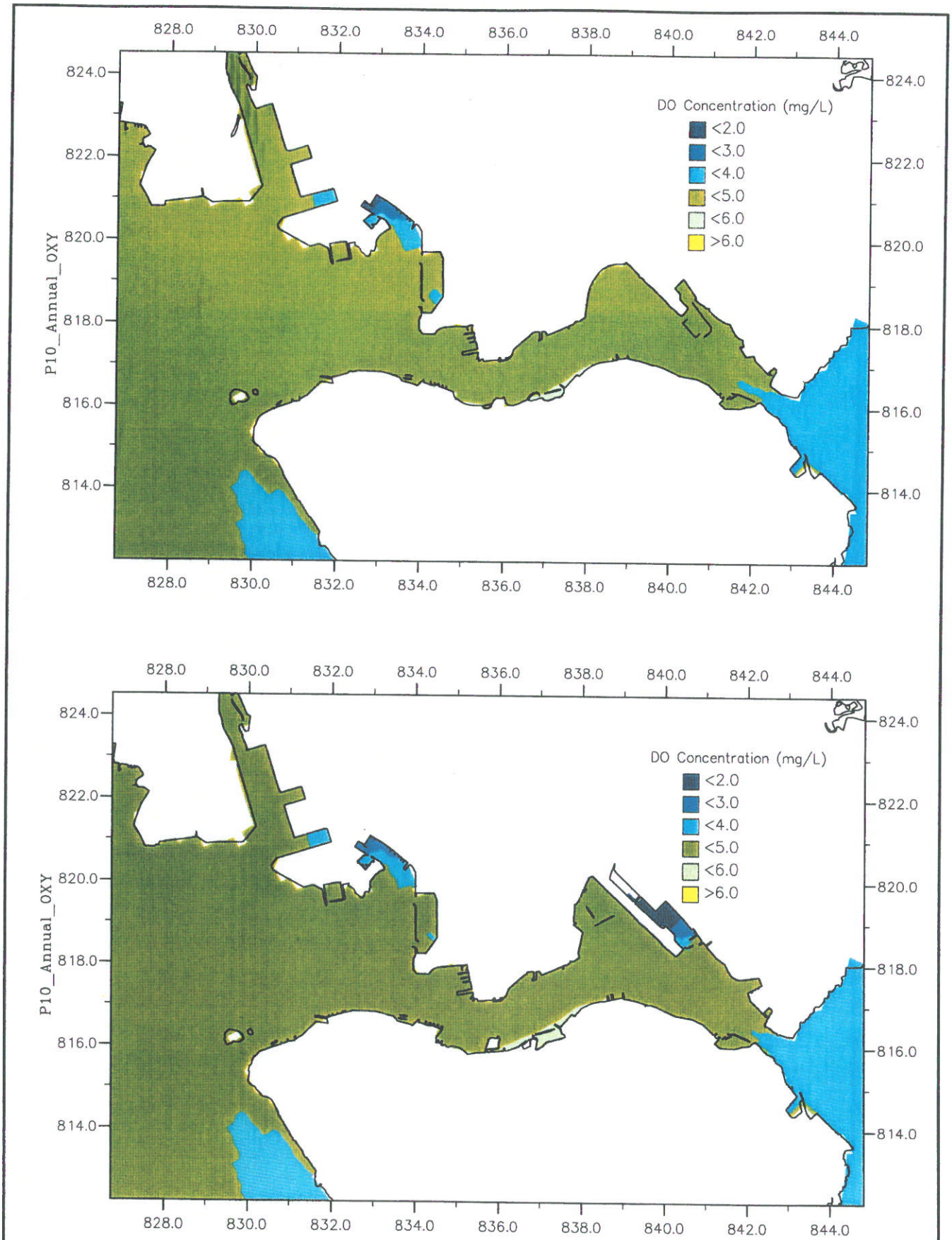


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Dissolved Oxygen Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c1	
Drainage Services Department	Feb 04	scen3bc–c.ssn

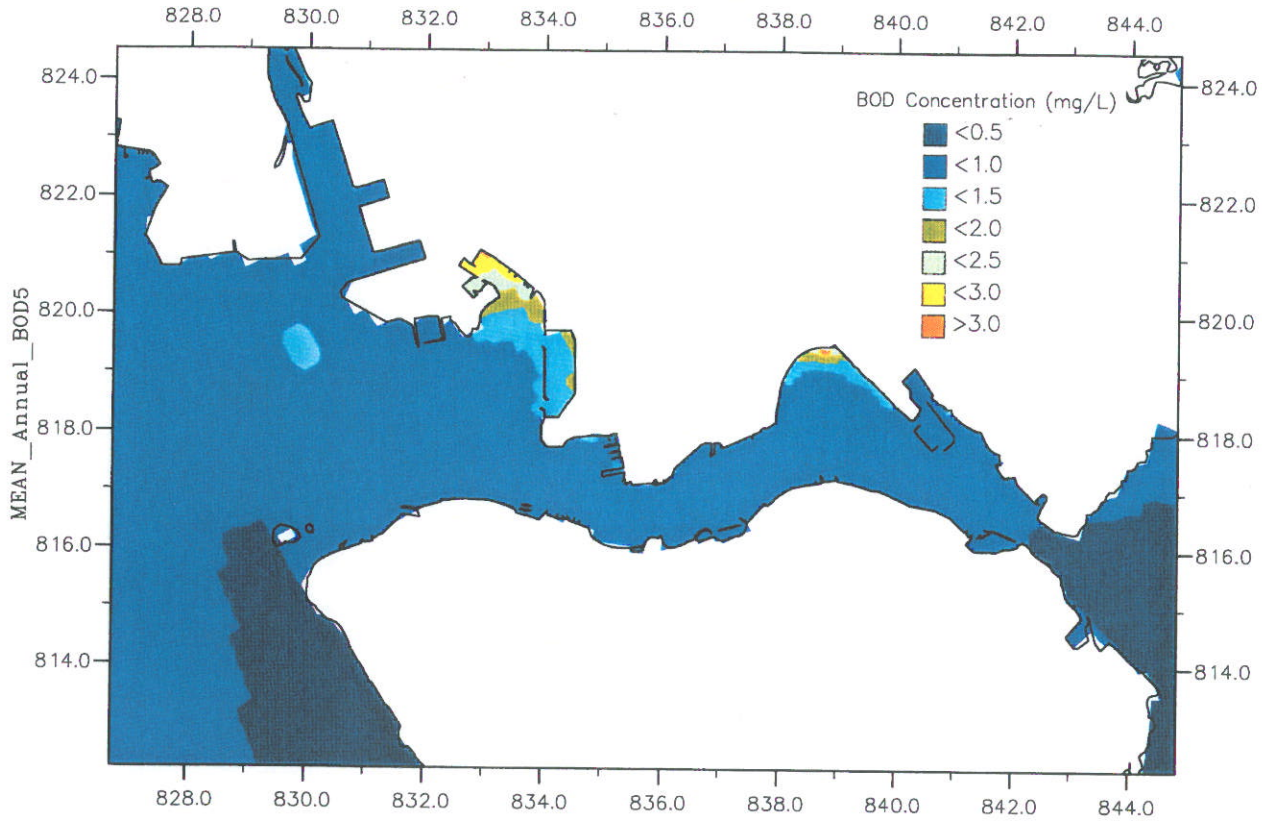


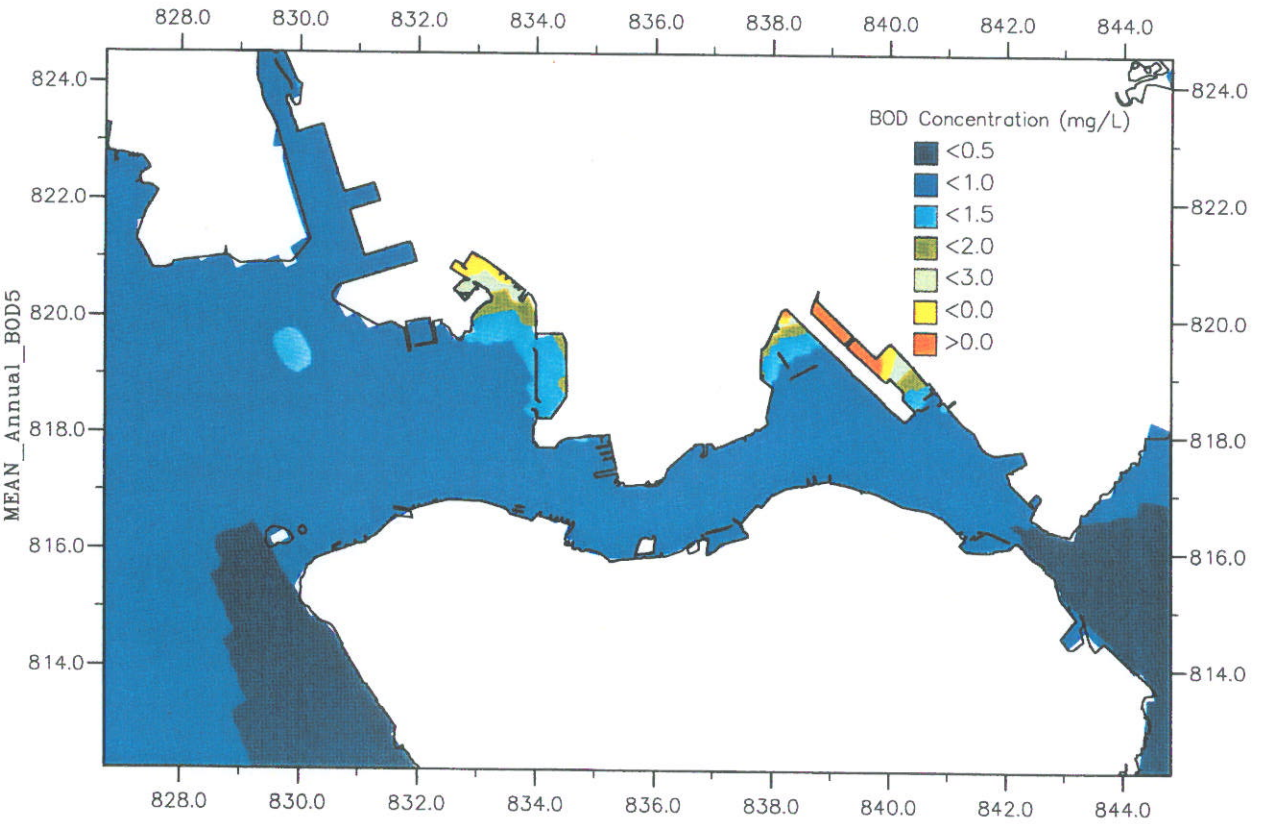


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA 10 Percentile of Depth–Averaged Dissolved Oxygen Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c2	
Drainage Services Department	Feb 04	scen3bc–c.ssn

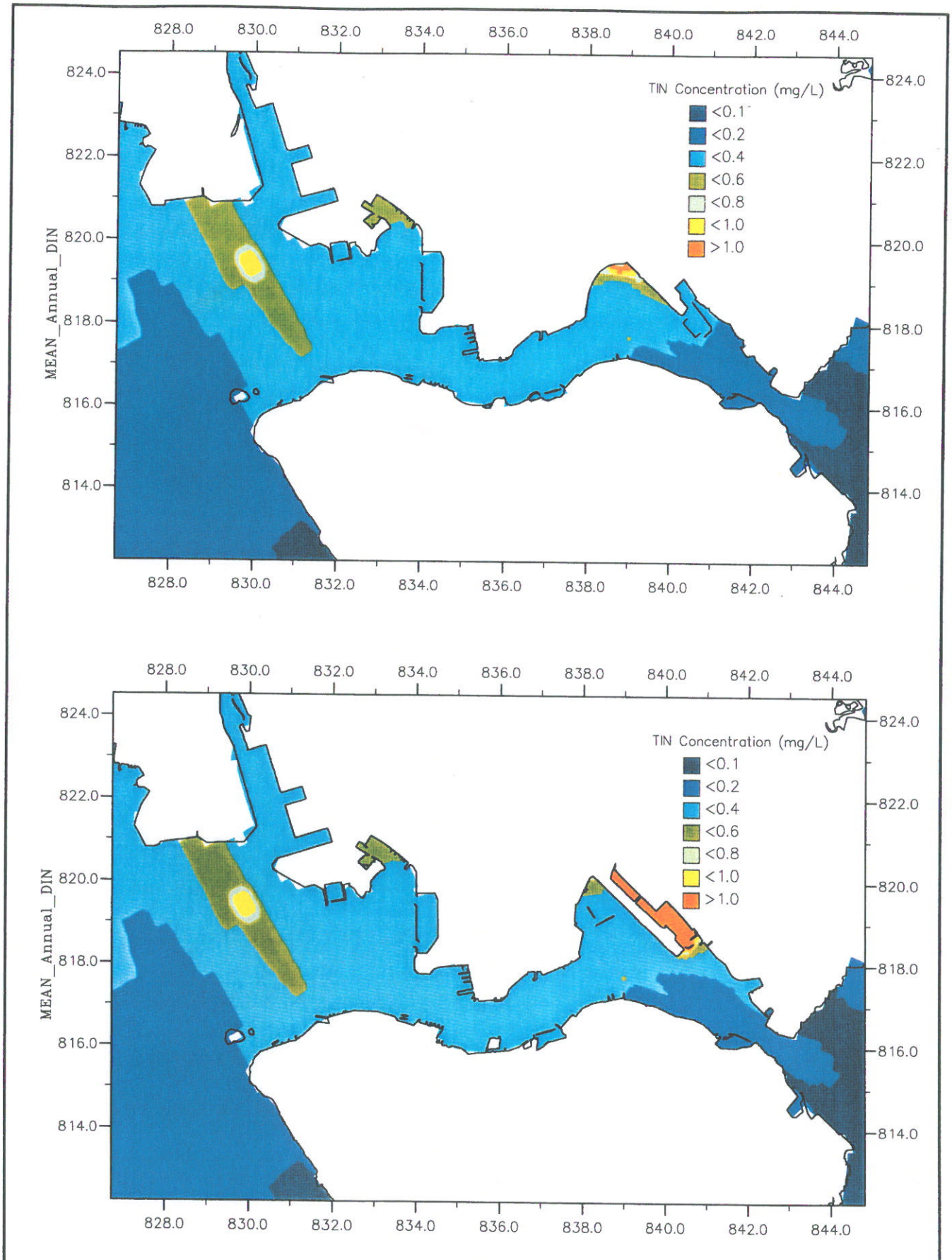


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA 10 Percentile of Bottom Dissolved Oxygen Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c3	
Drainage Services Department	Feb 04	scen3bc–c.ssn

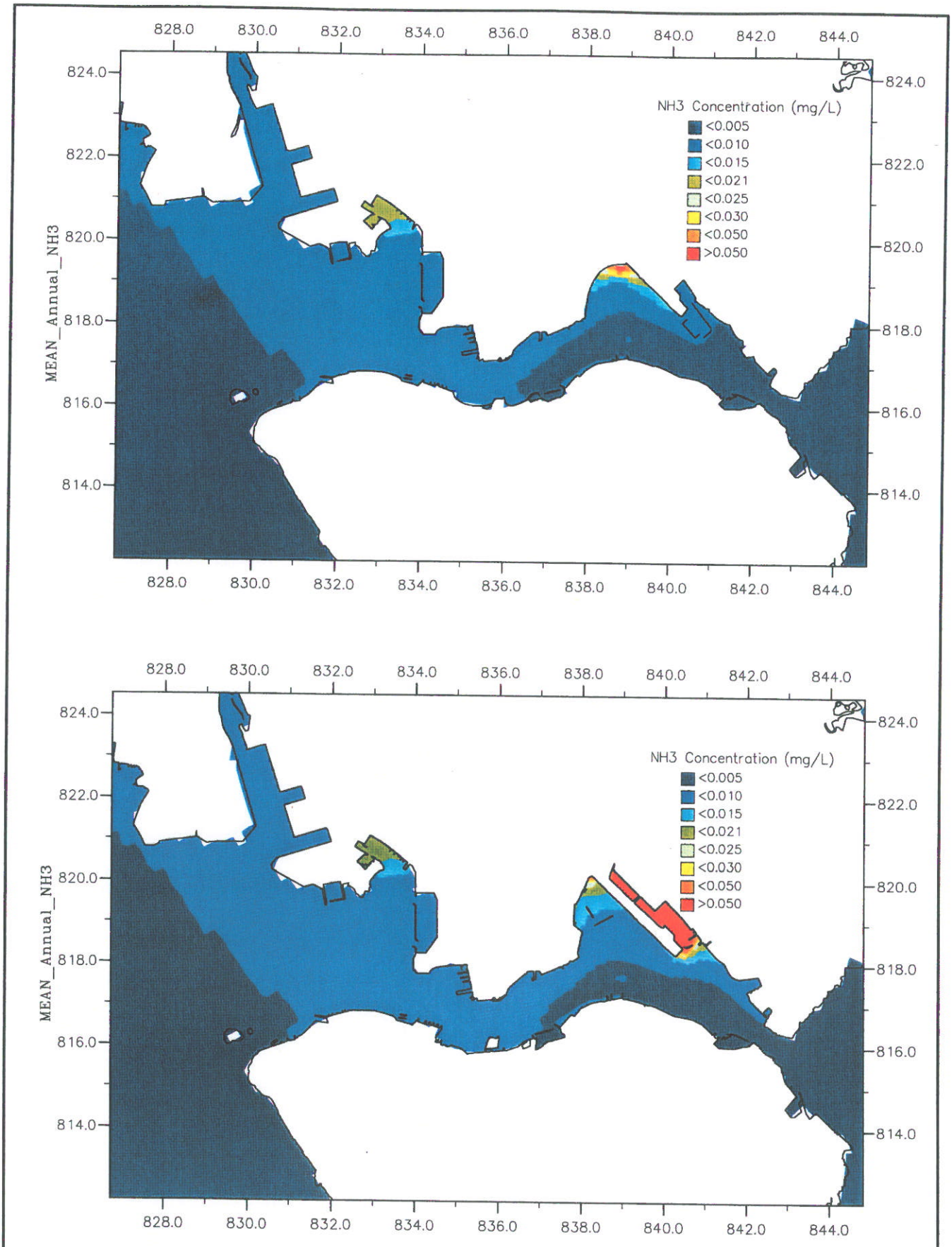




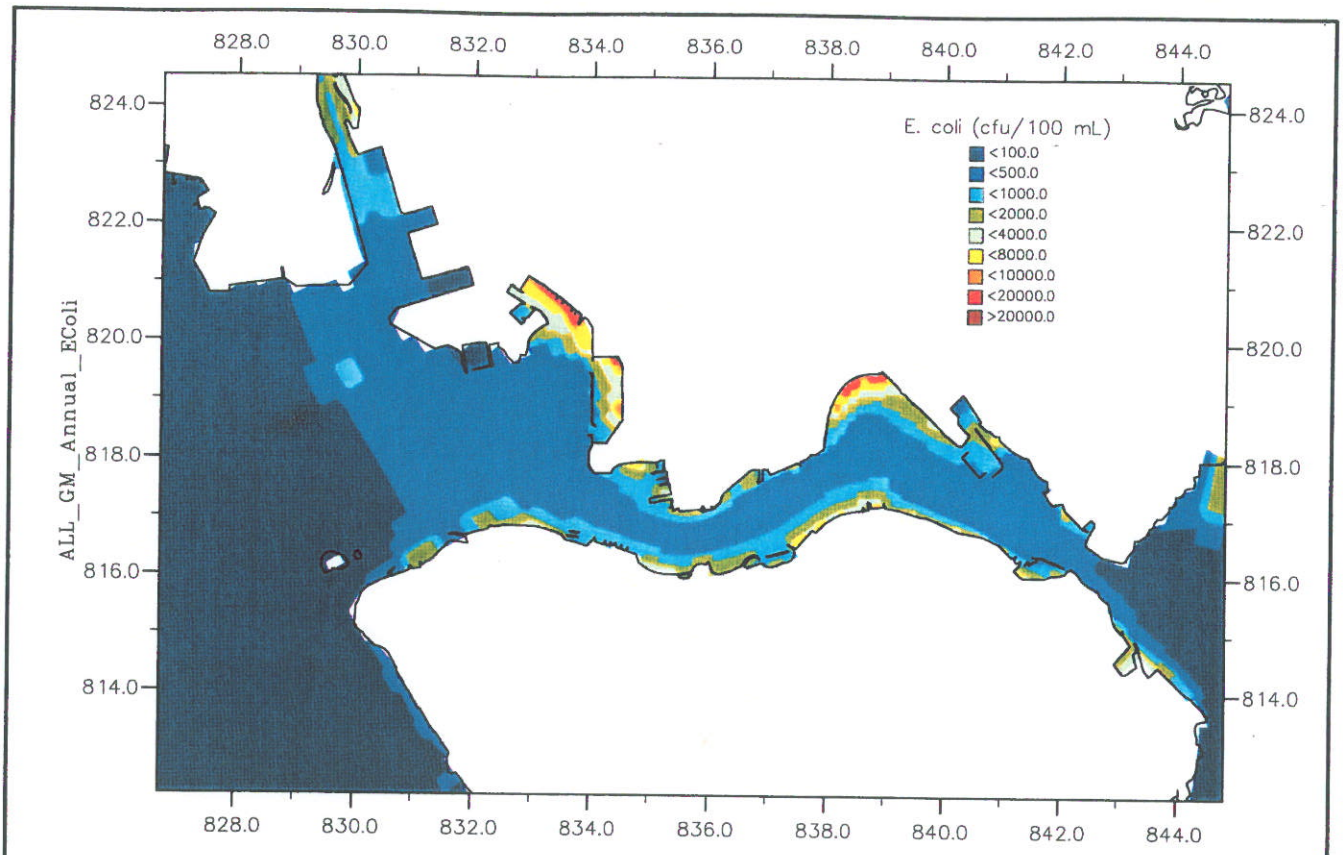
Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged BOD5 Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c4	
Drainage Services Department	Feb 04	scen3bc–c.ssn

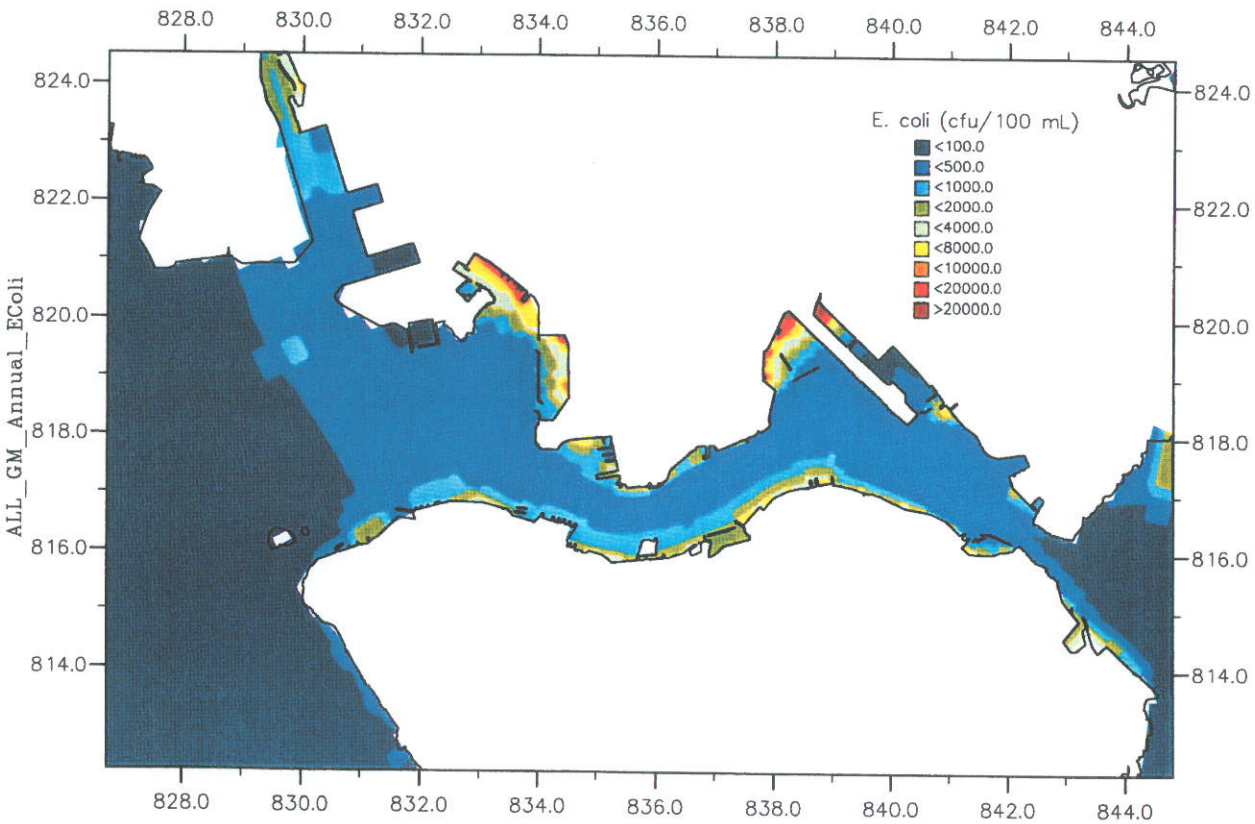


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Total Inorganic Nitrogen Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c5	
Drainage Services Department	Feb 04	scen3bc–c.ssn

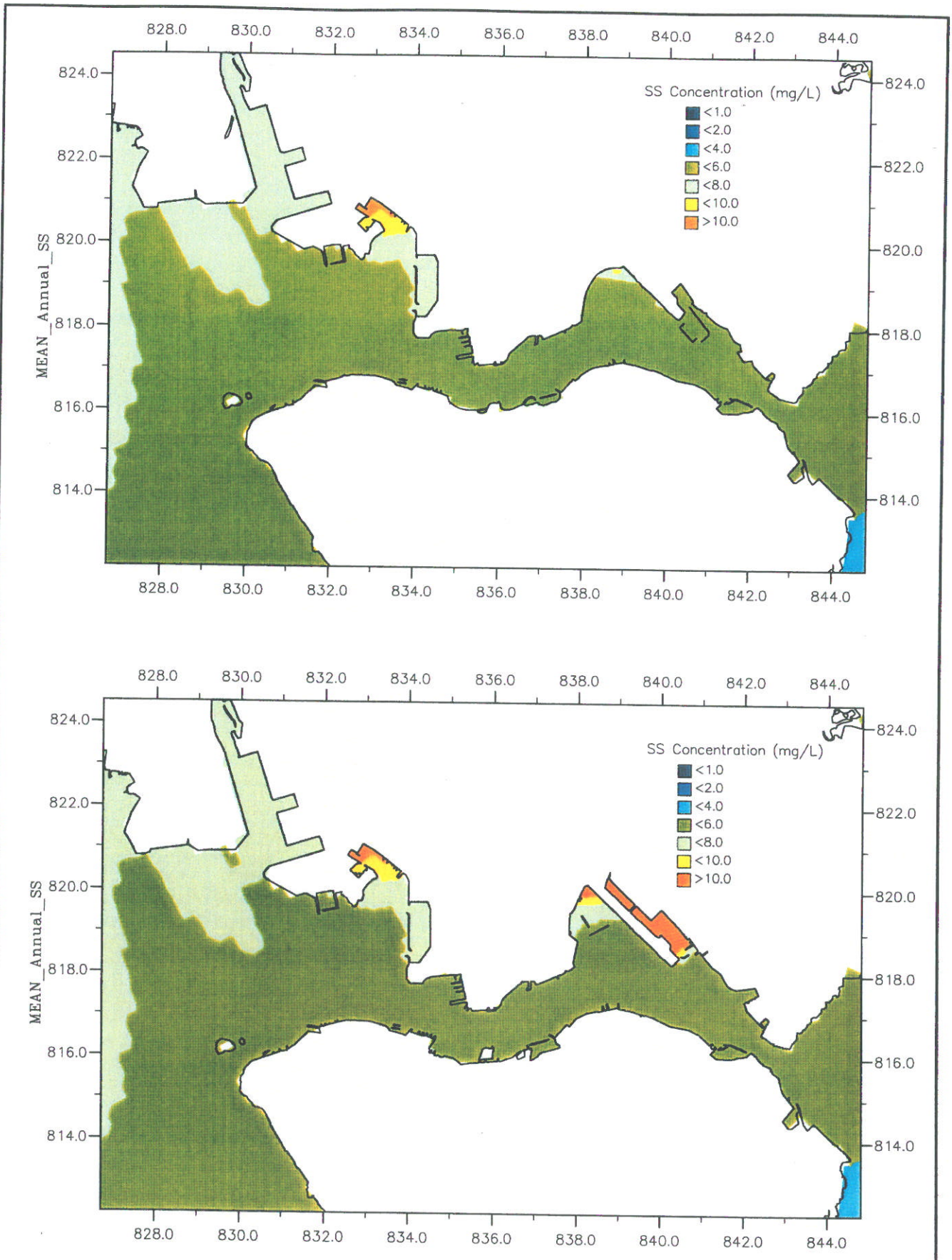


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Unionised Ammonia Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c6	
Drainage Services Department	Feb 04	scen3bc-c.ssn

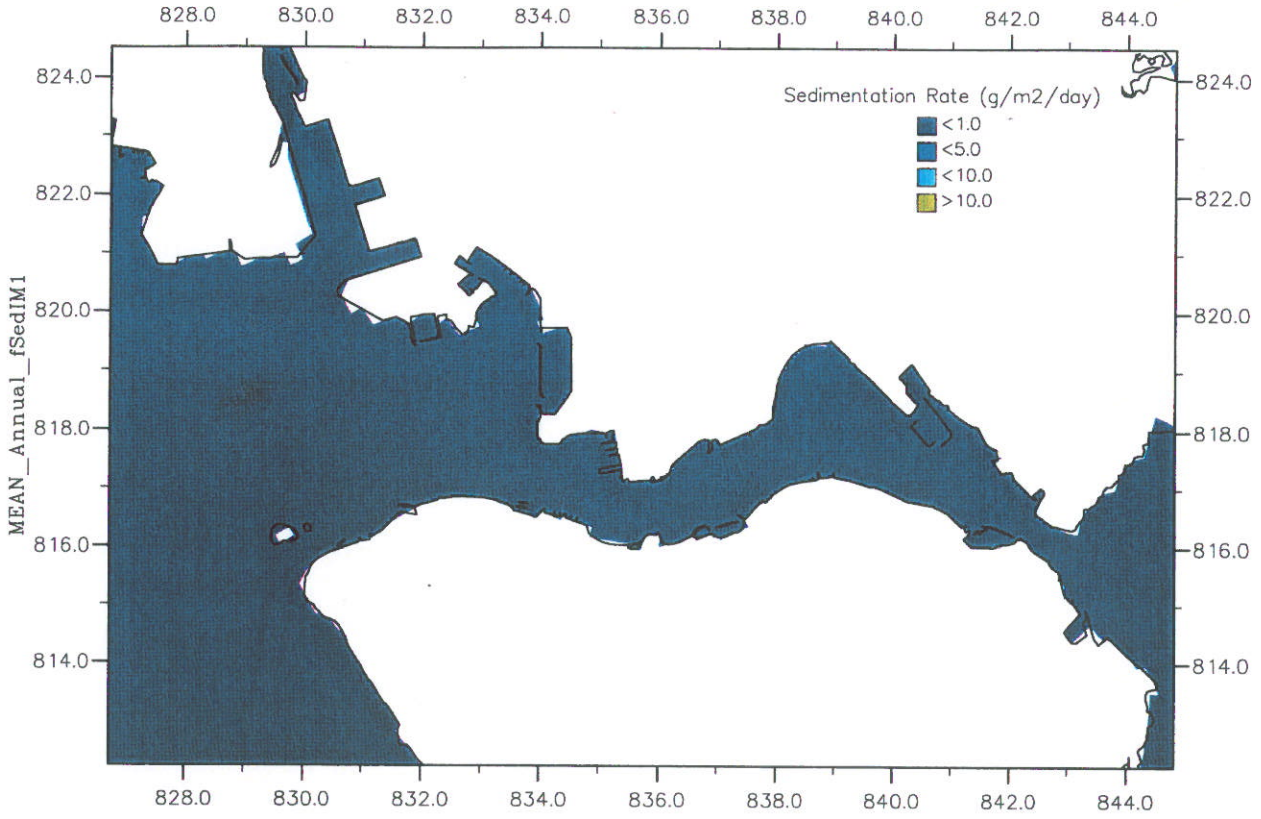


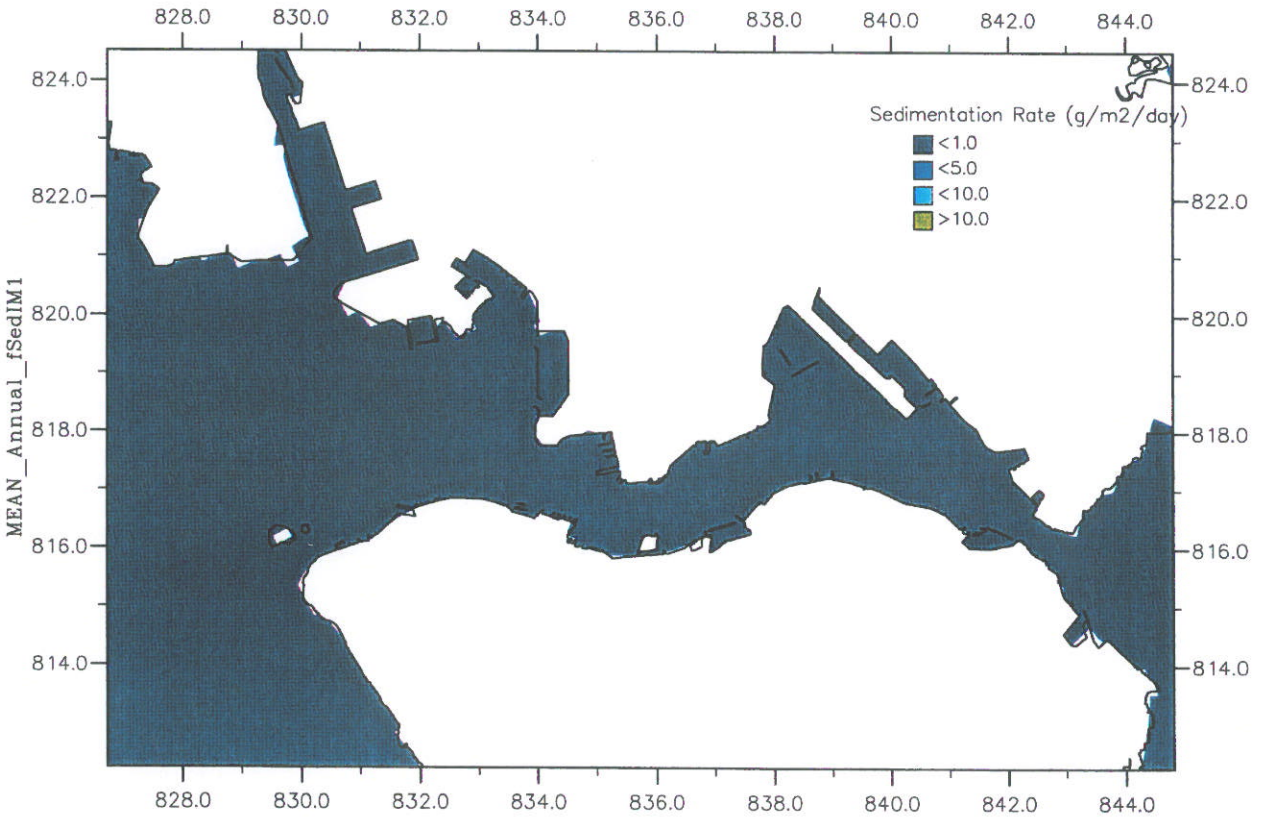


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged E. coli Concentration (Geometric Mean) in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c7	
Drainage Services Department	Feb 04	scen3bc–c.ssn

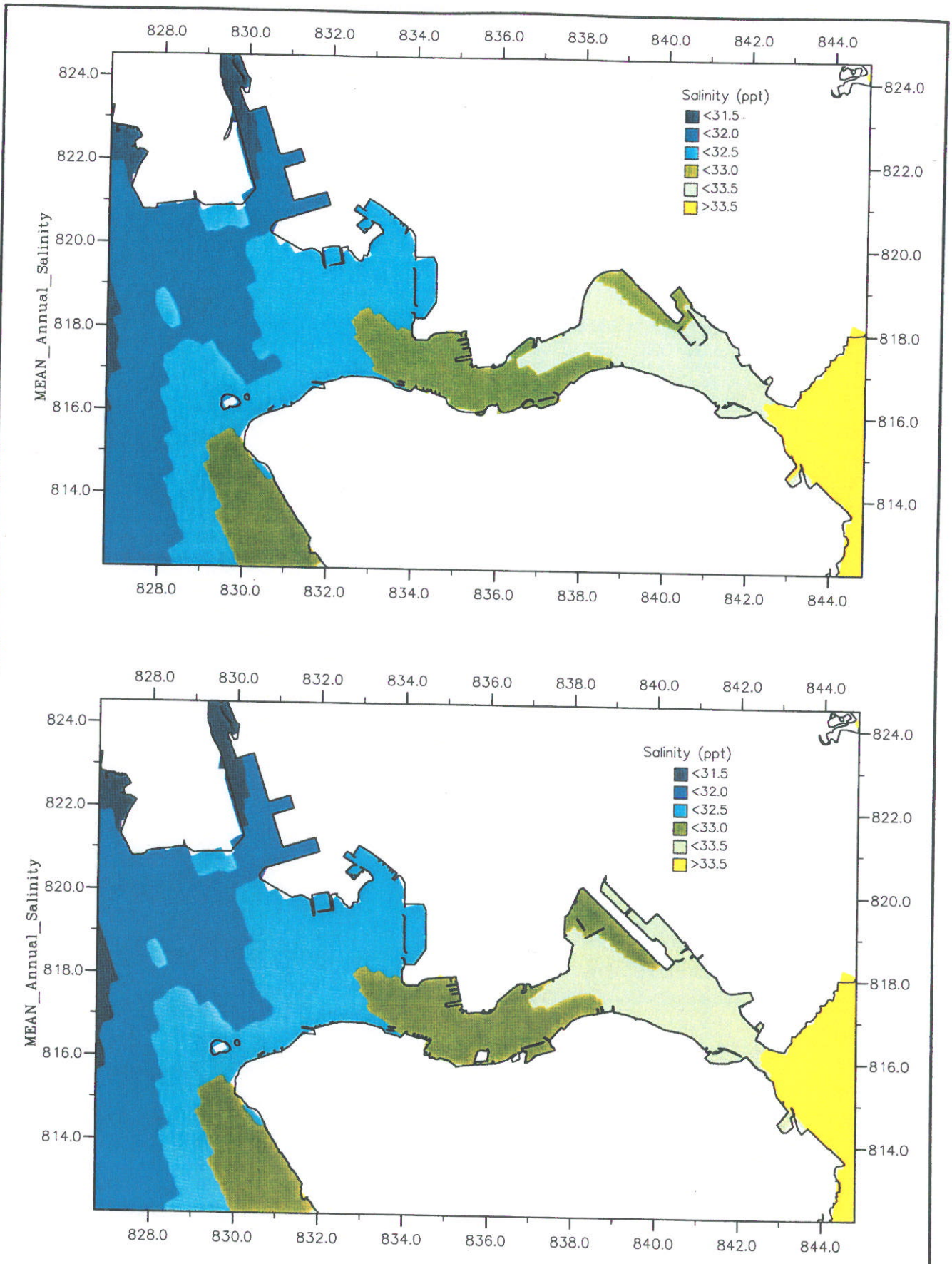


Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Suspended Solids Concentration in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c8	
Drainage Services Department	Feb 04	scen3bc-c.ssn





Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Sedimentation Rate in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c9	
Drainage Services Department	Feb 04	scen3bc–c.ssn



Agreement No. CE 43/2001, Tai Po Sewage Treatment Works Stage V – EIA Annual Depth–Averaged Salinity in Victoria Harbour (Upper: Scenario 3b; Lower: Scenario 3c)	Scenario 3bc	2016
	Figure 3c10	
Drainage Services Department	Feb 04	scen3bc–c.ssn