RECONSTRUCTION OF PIER AT PAK A, SAI KUNG PROJECT SK-078

FINAL ENVIRONMENTAL MONITORING & AUDIT REPORT

By

Environmental Testing Laboratory of
Compile Engineering & Construction Limited

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EXECUTIVE SUMMARY

This is the final Environmental Monitoring and Audit (EM&A) report for Reconstruction of Pier at Pak A, Sai Kung prepared by the Environmental Testing Laboratory of Compile Engineering and Construction Limited. This report presents the monitoring works for the project from 9th January 2002 to 4th February 2002.

All project works has been completed at 8th January 2002. No construction activity was undertaken during the reporting period.

There were four monitoring stations co-related over coral (W1-W4), three monitoring stations located nearby (W5) and within (W6 and W7) fish culture zone to allow for monitoring and control of impacts due to construction works. Moreover, there was one control station (WR) located far away from site to compare the water quality from potentially impacted sites with ambient water quality. Monitoring was processed on high water, mid-flood and mid-ebb, two readings were taken at deference depth of each location for each parameter. Details of the methodology, locations and results are presented in this report.

Six parameters were taken for monitoring the water quality. The concerned parameter was presented as follows: -

1. Turbidity in Nephelometric Turbidity Units (NTU)
2. Dissolved Oxygen (mg/L)
3. Dissolved Oxygen Saturation (%)
4. Temperature (°C)
5. Salinity (ppt)
6. Suspended Solids (mg/L)

The first five parameters were measured in-situ while the last will be determined in laboratory.

Complaint

No complaint was received during the reporting period.

Notifications of any summons and successful prosecutions

There was no summon and prosecution during the reporting period.

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1 INTRODUCTION

1.1 Scope of the Project

Environmental Testing Laboratory of Compile Engineering and Construction Limited was commissioned by the Hong Kong & Macau Scent On Engineering & Construction Ltd. to conduct Environmental Monitoring and Audit for the Reconstruction of Pier at Pak A, Sai Kung. The objective of project is to provide better berthing and landing facilities for Kaitos, fishing boats and sampans for the benefit of the local villagers and the general public. The scope of works includes the reconstruction of the existing pier to 50m long by 5.5m wide fitting.

2 PROJECT BACKGROUND INFORMATION

2.1 Site Description

The construction site is located within a rural area, Pak A, Sai Kung. Some village houses and a seafood restaurant were built along the coast. There is a fish culture zone located southeast of site, which have been identified as sensitive receivers during the construction phase. Moreover, in the vicinity of proposed new pier, hard corals have been identified by subsequent baseline marine benthic survey. This is another concern during the construction phase.

2.2 Project Organization

Environmental Testing Laboratory of Compile Engineering and Construction Limited as the Contractor's Environmental Team (CET) commissioned by the Hong Kong & Macau Scent On Engineering & Construction Ltd. to conduct Environmental Monitoring and Audit of Improvement of Reconstruction of Pier at Pak A, Sai Kung – Project No. SK-078. Environmental Testing Laboratory of Compile Engineering and Construction Limited is to provide the environmental monitoring prior to commencement, during and after of dredging and foundation laying works.

The CET shall report directly to the Engineer's Representation (ER). As part of its duties, the CET shall provide an assessment of all environmental mitigation

measures.

The Contractor shall be responsible for the provision of all monitoring equipment as specified in the Environmental Monitoring and Audit Manual. The CET shall be responsible for the collection of samples and laboratory testing of the samples for the environmental monitoring works, in addition to reporting the monitoring results to the ER. The format and timing of the results will be agreed with the ER. The project organization are shown as Appendix D

The key personnel contact names and telephone numbers was tabulated as follows:

Table2.1 The Key Personnel Contact Names and Telephone Numbers

Party	Contact Name	Telephone Number
Resident Engineer	Mr. Simon Leung	9860 2241
Site Agent	Mr. Choi	9552 7135
CET Leader	Mr. Peter Cheung	2780 1381
CET	Mr. W. W. Kong	9218 4234
CET	Mr. C. Y. Liu	9355 0979

2.3 Construction Programme

Construction was commenced since 9th July 2001. Provisional Programming of works is as follows:

Marine deposits dredging:	2 to 4 weeks
Laying of pier foundation:	6weeks
Pier construction:	3 to 12 weeks
Finishing works:	4weeks

The timing and duration to complete each activity will vary depending on Contractor's programming and actual conditions. The actual construction programme is shown as Appendix E.

3 SUMMARY OF EM&A REQUIREMENT

3.1 Location of project area and monitoring and control stations.

The construction site is located at Pak A, Sai Kung. The site plan and location of water quality monitoring stations are shown on Figure 1. Area with site boundary is indicated as the project area for reconstruction of pier. The southeast of the site is a designated Fish Culture Zone and it is the main sensitive area. Four monitoring stations co-related over coral (W1-W4), three monitoring stations located nearby (W5) and within (W6 and W7) fish culture zone, one control station (WR), moreover, located far away from site.

3.2 Water Quality Parameters

Monitoring of Turbidity in Nephelometric Turbidity Units (NTU), Dissolved Oxygen (mg/L), Dissolved Oxygen Saturation (%), Temperature (℃), Salinity (ppt) and Suspended Solids (mg/L) were carried out by the CET to ensure that any deteriorating water quality is readily detected and timely action be taken to rectify the situation. The first five parameters are measured in-situ while the last are determined in laboratory.

3.3 Monitoring Methodology

3.3.1 Dissolved Oxygen and Temperature Measurement

Dissolved oxygen and temperature measuring equipment

The Dissolved Oxygen Meter shall be portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, and comprehensive operation manuals and used a DC power source. It shall be capable of measuring a dissolved oxygen level in the range of 0-20 mg/L and 0-200% saturation and have an integral temperature gauge capable of a range 0-45 degree Celsius.

It should have a membrane electrode with automatic temperature compensation complete with a cable.

3.3.2 Salinity Measurement

Salinity measuring equipment

A portable Salinity Meter capable of measuring salinity in the range of 0 – 40 ppt shall be provided for measuring salinity of the water at each monitoring location and setting salinity compensation on the Dissolved Oxygen Meter.

3.3.3 Turbidity Measurement

Turbidity measuring equipment

The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with a comprehensive operation manual. The equipment shall use a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU.

3.3.4 Sampling of Suspended Solids

The water samples can be directly collected or collected with water sampler.

Water sampling equipment

A water sampler comprises a transparent PVC cylinder, and can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

Water samplers for suspended solids measurement shall be collected in clean high-density polythene bottles, packed in a container with ice (cooled to 4℃ without being frozen), and delivered to the laboratory within 24 hours. Standard method, APHA 17ed 2540D, was followed in analysis of S.S.

3.4 Type of Equipment Used

Details of the monitoring equipment used for impact monitoring are given in Table 3.1.

Table 3.1 Water Quality Monitoring Equipment

Parameter	Type
Dissolved Oxygen and Temperature Measurement	YSI Model 58, YSI 5739 probe, YSI 5795A submersible stirrer with reel and 50 ft cable
Turbidity Measurement	HACH Model 2100P
Salinity	YSI Model 30-25

3.5 Review of Monitoring Methodology

The frequency of monitoring during impact monitoring period was three times per week. Environmental change during week can be monitoring effectively at this frequency. Several parameter were measured at water monitoring, Dissolve Oxygen (mg/L), Turbidity (NTU) and Suspended Solid (mg/L) are the most critical.

Silt and sand turn up during dredging foundation laying works were the major environmental impact of ambient water and fish culture zones. Therefore, determine of Turbidity and Suspended Solid was the most effective way to decide the grade of impact due to works. Dissolve Oxygen is one of the essential elements of marine creature for live, as a result that concentration of Dissolve Oxygen is other indicator of water monitoring.

3.6 Action and Limit Levels

The baseline monitoring results form the basis for determining the criteria for impact monitoring. The Action and Limit levels for water quality monitoring were determined according to the limits established from baseline monitoring. The following shows the Action and Limit levels established to which parameter levels from the construction phase would be compared. If the impact monitoring levels do not comply with the established limits, remedial actions will be immediately suggested.

The Action and Limit levels for the water quality monitoring are given in Table 3.2.

Table 3.2: Criteria of Action and Limit Levels of Water Quality Monitoring

Parameter	Action Level	Limit Level
D.O. in mg/L (Surface, Middle &Bottom)	*Surface & Middle* 5 %-ile of baseline data for surface and middle layer. *Bottom* 5 %-ile of baseline data for bottom layer	*Surface & Middle* 4 mg/L except 5 mg/L for FCZ or 1%-ile of baseline data for surface and middle layer *Bottom* 2 mg/L or 1%-ile of baseline data for bottom layer
S.S. in mg/L (Depth-averaged)	95%-ile of baseline data and 120% of upstream control station's S.S. at the same tide of the same day	99%-ile of baseline data, 130% of upstream control station's S.S. of the same day or 50 mg/L at stations W1, W2, W3, W4 and W5
Turbidity in NTU (Depth-averaged)	95%-ile of baseline data and 120% of upstream control station's Turbidity at the same tide of the same day	99%-ile of baseline data and 130% of upstream control station's Turbidity at the same tide of the same day

Note:

1. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
2. For D.O., non-compliance of the water quality limits occurs when the monitoring result is lower than the limits.
3. For S.S. and Turbidity, non-compliance of the water quality limits occurs when the monitoring result is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD and the AFCD may amend the figures whenever it is considered necessary.
5. Water quality limit for suspended solids adjacent to fish culture zones set to 50 mg/L or 100% more than the highest level recorded at the zone during the five years before commencement of work in the vicinity by the AFCD. Additional limit of 50 mg/L has been set for all stations in order to protect patches of fringe coral growing in the bay

Following the criteria establish as previous, the Action and Limit Levels at Pak A, Sai Kung was calculated as showing at Table 3.3

Table 3.3: The Calculated Action and Limit Levels of Water Monitoring

Parameter	Action Level	Limit Level
D.O. in mg/L (Surface, Middle &Bottom)	*Surface & Middle* <5.30 *Bottom* <5.35	*Surface & Middle* <5.21 *Bottom* <5.15
S.S. in mg/L (Depth-averaged)	>5.44 and 120% of upstream control station's S.S. at the same tide of the same day	>5.74 and 130% of upstream control station's S.S. of the same day
Turbidity in NTU (Depth-averaged)	>2.46 and 120% of upstream control station's Turbidity at the same tide of the same day	>2.91 and 130% of upstream control station's Turbidity at the same tide of the same day

3.7 Environmental Mitigation Measures

The following mitigation measures are recommended to alleviate the construction impacts on the ambient environment:

Table 3.4 Environmental Mitigation Measures

Construction Activity	Environmental Mitigation Measure
Dredging	1. For dredging sediment, tightly closing grabs should be used to restrict the loss of the fine sediment to suspension. 2. The descent speed of grabs should be controlled to minimize the seabed impact speed. 3. The barge used for the transport of dredged material should be fitted with tight bottom seals in order to prevent leakage of material during loading and transport. 4. The barge should be filled to a level, which ensures that material does not spill over during loading and transport to the disposal site.
Rock filling and precast seawall concrete block installation	1. The barge used for the transport of rock and precast concrete block should be fitted with tight bottom seals in order to prevent leakage of material during loading and transport
Installation of granite facing stone, construction of in-situ concrete deck and concrete coping	1. The barge used for the transport of raw materials should be fitted with tight bottom seals in order to prevent leakage of materials during loading and transport. 2. Any leakage and direct discharge of silt water produced during construction of in-situ concrete deck to ambient water shall be prohibited.
Common	1. All dusty materials shall be covered properly prior to any loading, unloading, transfer operation as well as storage to prevent dispersion of dusts. 2. There was two silt curtains, the construction and coral silt curtains, had been installed to minimize the pollution due to generation of sediment and silt during construction works and protect coral areas nearby the site. 3. To regularly maintain the machinery and vehicles on site. 4. The speed of boat should be controlled within the works area to prevent stirring up the seabed sediment. 5. To check for any accumulation of waste materials or rubbish on site. 6. To avoid any discharge of chemical waste or oil directly from the site. 7. To remove waste from the site regularly.

4 IMPLEMENTATION STATUS

The project construction works was commenced on 9th July 2001. To minimize the pollution due to generation of sediment and silt during construction works and protect coral areas nearby the site, two geotextile slit curtains, the construction and coral silt curtains, had been installed before the construction works commenced.

The construction silt curtain was installed immediately around the dredging area to contain the bulk of silt and sediment generated by the works. Furthermore, the coral silt curtain was installed between the site and coral area. The location of this silt curtain is shown as Figure 2. There are two purposes for this silt curtain. The first is to protect the nearby *Pavona* and Transplants Areas from ant silt generated from the boat, barge and tugboat activity required at this site. It also clearly demarcate the nearby *Pavona* Area making and obvious barrier to prevent marine vessels from colliding with this sea.

The Contractor had used a tightly closing grab for dredging sediment to restrict the loss of the fine sediment to suspension. The descent speed of grab had been controlled to minimize the seabed impact speed. The barge, which Contractor had used for the transport materials, was fitted with tight bottom seals in order to prevent leakage of material during loading and transport. All dusty materials on the barge were covered properly. No leakage and direct discharge of slit water occurred during all construction period.

5 MONITORING RESULT

5.1 Monitoring Time, Frequency, Duration and Period

The post-impact monitoring was taken three days per week at all designated monitoring stations.

The impact water quality monitoring schedule and weather condition for the reporting period is listed below:

Table 5.1 Impact Monitoring Schedule and Weather Condition

Date	Weather Condition	High Water Time	Middle Flood Time	Middle Ebb Time
09/01/2002	Fine	18:34	14:49	08:59
12/01/2002	Cloudy	10:09	16:44	11:43
14/01/2002	Slight Rain	11:24	17:53	12:58
16/01/2002	Fine	12:36	09:04	14:11
19/01/2002	Cloudy	14:35	10:47	16:19
21/01/2002	Fine	15:57	11:56	18:13
24/01/2002	Cloudy	17:37	13:38	07:45
25/01/2002	Cloudy	18:10	14:21	09:05
28/01/2002	Cloudy	10:09	16:55	11:47
30/01/2002	Fine	11:27	18:45	13:20
01/02/2002	Cloudy	12:52	09:25	14:57
04/02/2002	Cloudy	15:17	11:31	17:49

5.2 Post-impact Monitoring Results

The summaries of post-impact monitoring results are shown as Appendix A.

5.3 Trends of Monitoring Results

5.3.1 Trend of Turbidity (NTU)

Designated Monitoring Station at Pak A (W1-W7)

From graphs plotted at Appendix B1, it shown that Turbidity levels of water at W1`-W7 were tended to increase since September 2001 and reach peak at the end of September 2001. Nevertheless, there was no construction activity undertaken during 14th September 2001 to 5th October 2001. In addition, good conditions of silt curtains were always maintained. Therefore, the increment of Turbidity levels may be due to natural run-off and seasonal change of ambient environment. After October 2001, Turbidity of water commenced to decrease and remain similar with baseline level.

5.3.2 Trend of Suspended Solids (mg/L)

Designated Monitoring Station at Pak A (W1-W7)

From graphs plotted at Appendix B2, it shown that trends of Suspended Solid levels at W1-W7 are similar with Turbidity at same station. There were also tended to increase since September 2001 and reach peak at the end of September 2001. Decrements also appeared after October 2001 and levels of Suspended solid were remained to baseline level.

5.3.3 Trend of Dissolved Oxygen (mg/L)

Designated Monitoring Station at Pak A (W1-W7)

From graphs plotted at Appendix B3, B4 as well as B5, no significant change of Dissolved Oxygen level at surface, mid-depth and bottom depths of monitoring stations were approved during impact monitoring of Pak A. Therefore Dissolved Oxygen level was stable due to construction works.

6 ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT

In project of Reconstruction of Pier at Pak A, Sai Kung, solid wastes came out from marine mud into the water during dredging. All marine mud during dredging are advised to be stored in the contractor's vessel and then dumped to approve marine dump location, East of Ninepin Group.

7 NON-COMPLIANCE AND DEFICIENCY

7.1 Non-compliance

There was no non-compliance during impact monitoring period from 9th July 2001 to 8th January 2002. Summary of non-compliance of during impact monitoring period are shown in Table 7.1

Table 7.1 Summary of non-compliance during impact monitoring

Parameters	Action Level	Limit Level
Dissolved Oxygen (mg/L)	0	0
Suspended Solids (mg/L)	0	0
Turbidity (NTU)	0	0

No remedial action has taken due to non-compliance of monitoring parameter.

7.2 Complaints

No complaint was received during impact monitoring period. .

7.3 Record of all notifications of summons and successful prosecutions

There was no notification of summon and successful prosecution during impact monitoring period

8 CONCLUSION

All project works had been finished at 8th January 2002. According to EM&A manual, post-impact monitoring shall be commenced immediately after finishing all foundation laying work. Therefore, post-impact monitoring commenced at 9th February 2002.

Impact water quality monitoring was undertaken between 9th July 2001 and 8th January 2002. All water monitoring data during impact monitoring period were reviewed and checked, none of exceedance case of water quality parameters was recorded. Environment impacts arise form the construction of project was mild and not significant.

The levels of Turbidity and Suspended Solids since 24th September 2001 were slightly increased compared with baseline levels. Nevertheless, there was no construction activity undertaken during 14th September 2001 to 5th October 2001. In addition, good conditions of silt curtains were always maintained. Therefore, the increment of Turbidity and Suspended Solids levels may be due to natural run-off and seasonal change of ambient environment. The levels of Turbidity and Suspended Solids, moreover, were decreased and restored similar with ambient environmental condition beforetime after October 2001.

No complaints cases had been received during impact monitoring period. No remedial action needed to take due to non-compliance of monitoring parameter.

No notification of summons and successful prosecutions were occurred during impact monitoring period. All constructions works undertaking at projects were legal.

Appendix A

Post-impact Water Quality Monitoring Results

The Results of Turbidity (NTU)

Depth-Averaged Turbidity during High Water

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	1.75	1.71	1.50	1.83	1.47	1.84	1.10	1.61
12-Jan-02	0.78	1.03	1.67	1.19	1.20	1.42	1.20	1.38
14-Jan-02	2.27	1.82	2.06	1.34	2.00	1.56	1.53	1.22
16-Jan-02	0.87	1.01	1.02	0.96	1.86	1.17	1.53	1.24
19-Jan-02	1.27	1.93	0.74	1.21	1.60	1.24	1.14	1.33
21-Jan-02	2.30	2.21	1.65	1.53	1.43	1.06	1.26	1.59
24-Jan-02	1.08	1.85	1.49	1.17	1.36	1.37	1.10	1.45
25-Jan-02	1.18	1.31	1.15	1.24	1.36	1.19	1.08	1.30
28-Jan-02	1.85	1.77	1.66	1.28	1.65	1.08	0.94	1.79
30-Jan-02	0.78	0.89	1.09	1.04	1.57	1.40	1.18	0.86
01-Feb-02	0.70	0.98	0.86	1.26	0.94	0.84	0.97	0.92
04-Feb-02	0.83	1.07	0.85	1.02	0.94	1.01	0.96	0.99

Depth-Averaged Turbidity during Middle Flood

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	1.63	1.74	1.45	1.68	1.70	1.65	1.04	1.77
12-Jan-02	0.68	1.49	0.92	1.38	1.17	1.58	1.23	1.34
14-Jan-02	1.94	1.79	1.99	1.54	1.75	1.69	1.51	1.43
16-Jan-02	1.68	1.75	1.92	1.71	1.56	1.83	1.48	1.61
19-Jan-02	1.50	1.69	1.40	1.22	1.74	1.41	1.38	1.13
21-Jan-02	2.08	2.04	1.51	1.25	1.42	1.33	1.32	1.32
24-Jan-02	1.18	1.95	1.74	1.22	1.33	1.45	1.20	1.55
25-Jan-02	0.91	1.29	1.31	1.25	1.35	1.23	1.13	1.36
28-Jan-02	1.68	1.54	1.62	1.43	1.48	1.35	1.19	1.61
30-Jan-02	0.86	0.94	0.96	0.95	1.19	1.29	1.03	1.26
01-Feb-02	0.55	0.88	0.81	1.13	0.67	0.67	0.71	1.13
04-Feb-02	1.15	0.89	0.94	1.08	1.07	1.08	0.94	1.06

Depth-Averaged Turbidity during Middle Ebb

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	1.83	1.93	1.60	2.11	1.91	2.04	1.15	1.72
12-Jan-02	0.77	1.22	1.35	1.31	1.18	1.16	1.19	1.38
14-Jan-02	1.43	1.52	1.66	1.32	1.55	1.34	1.34	1.32
16-Jan-02	1.43	1.43	1.54	1.47	1.61	1.53	1.54	1.42
19-Jan-02	1.38	1.48	1.05	1.21	1.54	1.35	1.24	1.57
21-Jan-02	2.18	2.14	1.61	1.35	1.52	1.43	1.42	1.42
24-Jan-02	1.20	2.01	1.39	1.38	1.65	1.51	1.23	1.60
25-Jan-02	1.50	1.40	0.98	1.20	1.37	1.16	0.99	1.21
28-Jan-02	1.41	1.14	1.41	1.37	1.15	1.37	1.22	1.29
30-Jan-02	0.93	0.71	0.83	0.82	1.21	1.17	0.81	1.03
01-Feb-02	0.69	1.08	0.94	1.31	0.89	0.84	0.94	1.13
04-Feb-02	0.74	1.03	0.94	1.13	1.06	1.10	1.05	1.21

The Results of Suspended Solids (mg/L)

Depth-Averaged Suspended Solids during High Water

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	4.00	4.00	3.50	4.00	3.33	4.67	2.67	4.33
12-Jan-02	2.00	2.00	4.00	2.50	3.00	3.67	2.67	3.67
14-Jan-02	5.00	4.00	5.00	3.00	5.00	4.00	4.00	3.67
16-Jan-02	2.00	2.00	2.50	3.00	4.33	3.00	3.67	3.67
19-Jan-02	3.00	5.00	2.00	3.00	4.00	2.67	2.67	3.67
21-Jan-02	6.00	5.00	4.00	4.00	3.33	2.67	3.00	4.33
24-Jan-02	3.00	5.00	4.00	3.00	3.33	3.33	2.67	4.33
25-Jan-02	3.00	3.00	3.00	3.00	3.33	2.67	2.67	3.33
28-Jan-02	5.00	4.00	4.00	3.00	4.33	3.00	2.33	5.00
30-Jan-02	2.00	2.00	2.50	2.50	3.67	3.33	3.00	2.67
01-Feb-02	2.00	2.00	2.00	3.50	2.33	2.00	2.33	2.67
04-Feb-02	2.00	3.00	2.00	2.50	2.33	2.33	2.33	3.00

Depth-Averaged Suspended Solids during Middle Flood

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	4.00	4.00	3.50	4.00	4.33	4.00	2.33	5.00
12-Jan-02	2.00	4.00	2.50	3.00	3.00	4.00	3.00	3.67
14-Jan-02	5.00	4.00	5.00	4.00	4.33	4.33	4.00	4.00
16-Jan-02	4.00	4.00	4.50	4.50	3.67	4.33	3.67	4.33
19-Jan-02	4.00	4.00	3.50	3.00	4.33	3.67	3.33	3.33
21-Jan-02	5.00	5.00	3.50	3.50	3.67	3.33	3.33	3.67
24-Jan-02	3.00	5.00	4.50	3.00	3.33	3.67	3.00	4.33
25-Jan-02	2.00	3.00	3.00	3.00	3.33	3.00	2.67	4.00
28-Jan-02	4.00	4.00	4.00	3.00	3.67	3.00	2.67	4.33
30-Jan-02	2.00	2.00	2.50	2.50	3.00	3.00	2.33	3.33
01-Feb-02	2.00	2.00	2.00	3.00	2.00	1.67	2.00	3.67
04-Feb-02	3.00	2.00	2.50	2.50	2.67	2.67	2.00	3.00

Depth-Averaged Suspended Solids during Middle Ebb

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	4.00	5.00	4.00	5.00	4.67	5.00	2.67	4.67
12-Jan-02	2.00	3.00	3.50	3.00	2.67	3.00	3.00	4.00
14-Jan-02	4.00	4.00	4.00	3.50	3.67	3.33	3.33	4.00
16-Jan-02	4.00	4.00	4.00	3.50	3.67	3.67	4.00	4.00
19-Jan-02	3.00	4.00	2.50	3.00	3.67	3.00	3.00	4.33
21-Jan-02	5.00	5.00	4.00	3.50	3.67	3.67	3.33	4.00
24-Jan-02	3.00	5.00	3.00	3.50	4.00	3.67	3.00	4.00
25-Jan-02	4.00	3.00	2.50	3.00	3.33	3.00	2.33	3.33
28-Jan-02	4.00	3.00	3.50	3.50	2.67	3.33	3.00	3.67
30-Jan-02	2.00	2.00	2.00	2.50	3.00	3.00	2.00	3.33
01-Feb-02	2.00	3.00	2.00	3.00	2.33	2.00	2.33	3.33
04-Feb-02	2.00	3.00	2.00	3.00	2.67	2.67	2.33	3.33

The Results of Dissolved Oxygen at Surface Depth (mg/L)

Dissolved Oxygen at Surface Depth during High Water

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.80	7.77	6.85	7.24	6.36	7.45
12-Jan-02			7.86	7.77	6.84	6.81	6.59	7.89
14-Jan-02			7.19	7.34	7.96	7.68	7.42	8.17
16-Jan-02			7.87	7.74	7.15	7.09	6.66	7.68
19-Jan-02			7.85	8.08	7.43	7.84	6.91	7.96
21-Jan-02			7.75	7.76	7.62	7.59	7.71	7.86
24-Jan-02			7.81	7.89	7.30	7.57	6.97	7.90
25-Jan-02			7.62	7.43	6.90	7.15	7.11	7.65
28-Jan-02			6.88	6.74	6.51	6.22	6.10	7.06
30-Jan-02			7.23	7.12	6.89	6.92	6.86	7.25
01-Feb-02			7.55	7.58	7.25	7.18	7.31	7.60
04-Feb-02			7.35	7.27	6.95	6.87	6.96	7.41

Dissolved Oxygen at Surface Depth during Middle Flood

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.74	7.81	7.13	7.15	6.36	7.36
12-Jan-02			7.97	7.86	7.01	6.69	6.51	7.59
14-Jan-02			7.34	7.55	7.63	7.17	7.35	7.83
16-Jan-02			7.52	7.76	7.36	6.72	7.29	7.54
19-Jan-02			8.16	8.10	7.43	6.72	6.62	8.24
21-Jan-02			7.73	7.58	7.32	7.42	7.41	7.89
24-Jan-02			7.81	7.87	7.20	7.45	7.12	7.87
25-Jan-02			7.76	7.61	6.91	7.38	7.32	7.64
28-Jan-02			6.92	6.91	6.64	6.39	6.24	7.23
30-Jan-02			7.12	6.95	6.72	6.68	6.67	7.15
01-Feb-02			7.56	7.44	7.13	7.00	7.41	7.74
04-Feb-02			7.54	7.44	7.19	7.13	7.30	7.67

Dissolved Oxygen at Surface Depth during Middle Ebb

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.87	7.71	6.57	7.31	6.31	7.61
12-Jan-02			7.91	7.79	6.90	6.76	6.58	7.71
14-Jan-02			7.57	7.51	7.27	7.17	6.94	7.91
16-Jan-02			7.62	7.77	7.21	6.89	7.00	7.62
19-Jan-02			7.99	8.08	7.42	7.35	6.78	8.09
21-Jan-02			7.73	7.58	7.32	7.42	7.41	7.89
24-Jan-02			7.85	7.87	7.39	7.70	6.83	8.00
25-Jan-02			7.72	7.56	7.17	7.19	7.23	8.03
28-Jan-02			6.81	6.87	6.57	6.40	6.22	7.14
30-Jan-02			7.30	7.18	6.87	6.77	6.82	7.37
01-Feb-02			7.68	7.57	7.24	7.13	7.45	7.77
04-Feb-02			7.31	7.25	6.94	6.88	6.97	7.42

The Results of Dissolved Oxygen at Middle Depth (mg/L)

Dissolved Oxygen at Middle Depth during High Water

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	7.59	8.02			6.95	7.11	6.19	7.52
12-Jan-02	7.82	7.67			7.27	6.93	6.63	7.87
14-Jan-02	7.26	7.44			7.36	6.72	6.85	7.62
16-Jan-02	7.87	7.66			7.07	6.92	7.03	7.72
19-Jan-02	7.62	8.01			7.40	7.27	6.37	7.78
21-Jan-02	7.47	7.83			7.44	7.53	7.63	7.56
24-Jan-02	7.90	7.56			7.16	7.14	6.70	7.94
25-Jan-02	7.39	7.53			6.66	6.98	6.92	7.60
28-Jan-02	6.70	6.83			6.24	5.98	6.13	6.99
30-Jan-02	7.25	7.37			6.68	6.51	6.79	7.19
01-Feb-02	7.35	7.59			7.04	6.82	7.28	7.59
04-Feb-02	7.20	7.38			6.81	6.75	6.91	7.37

Dissolved Oxygen at Middle Depth during Middle Flood

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	7.64	8.24			7.08	7.08	6.29	7.44
12-Jan-02	8.01	8.01			7.36	7.03	6.95	7.91
14-Jan-02	7.28	7.50			7.10	6.69	6.72	7.59
16-Jan-02	7.25	7.64			6.89	6.61	6.65	7.57
19-Jan-02	7.96	7.59			7.42	6.70	6.43	8.10
21-Jan-02	7.46	7.68			7.34	7.02	7.23	7.58
24-Jan-02	7.83	7.55			6.99	7.10	6.74	7.88
25-Jan-02	7.63	7.65			6.86	7.17	7.30	7.67
28-Jan-02	6.89	6.96			6.47	6.12	6.24	7.11
30-Jan-02	7.10	7.22			6.55	6.46	6.62	7.13
01-Feb-02	7.58	7.52			6.99	6.75	7.19	7.70
04-Feb-02	7.60	7.62			7.02	6.84	7.17	7.59

Dissolved Oxygen at Middle Depth during Middle Ebb

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02	7.49	7.85			6.84	7.11	6.14	7.52
12-Jan-02	7.91	7.82			7.28	7.00	6.76	7.88
14-Jan-02	7.64	7.65			7.33	6.90	6.83	7.72
16-Jan-02	7.50	7.65			6.95	6.74	6.86	7.60
19-Jan-02	7.77	7.78			7.39	6.98	6.37	7.92
21-Jan-02	7.46	7.68			7.34	7.02	7.23	7.58
24-Jan-02	8.01	7.53			7.37	7.27	6.66	7.98
25-Jan-02	7.55	7.68			6.71	7.15	6.81	7.82
28-Jan-02	6.83	6.92			6.51	6.07	6.21	7.04
30-Jan-02	7.24	7.39			6.78	6.71	6.75	7.30
01-Feb-02	7.53	7.65			7.11	6.88	7.35	7.74
04-Feb-02	7.33	7.43			6.84	6.65	6.94	7.39

The Results of Dissolved Oxygen at Bottom Depth (mg/L)

Dissolved Oxygen at Bottom Depth during High Water

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.60	7.73	7.05	7.18	6.25	7.44
12-Jan-02			7.42	7.60	7.19	7.00	7.30	7.44
14-Jan-02			7.49	7.32	6.97	6.36	6.53	7.28
16-Jan-02			7.30	7.93	6.82	7.04	7.18	7.24
19-Jan-02			8.05	8.01	7.21	7.49	6.46	7.78
21-Jan-02			7.76	7.76	7.44	7.54	7.48	7.51
24-Jan-02			7.80	7.80	7.10	6.63	6.35	7.69
25-Jan-02			7.38	7.50	6.44	6.71	6.23	7.45
28-Jan-02			6.68	6.54	6.16	6.07	6.34	6.95
30-Jan-02			7.14	7.20	6.60	6.47	6.63	7.10
01-Feb-02			7.50	7.51	6.99	6.89	7.20	7.42
04-Feb-02			7.28	7.26	6.77	6.53	6.75	7.15

Dissolved Oxygen at Bottom Depth during Middle Flood

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.48	7.69	7.14	7.17	6.33	7.38
12-Jan-02			7.14	7.91	7.31	7.11	7.22	7.52
14-Jan-02			7.25	7.62	6.93	6.64	6.60	7.38
16-Jan-02			7.04	7.82	6.88	6.95	6.64	7.45
19-Jan-02			8.00	7.87	7.40	6.73	6.29	8.04
21-Jan-02			7.66	7.79	7.31	6.89	7.41	7.64
24-Jan-02			7.72	7.77	7.00	6.54	6.30	7.68
25-Jan-02			7.52	7.68	6.55	6.86	6.56	7.53
28-Jan-02			6.72	6.87	6.38	6.09	6.60	7.05
30-Jan-02			7.00	7.08	6.48	6.31	6.36	6.91
01-Feb-02			7.49	7.45	6.97	6.69	6.78	7.43
04-Feb-02			7.49	7.47	6.94	6.77	6.87	7.44

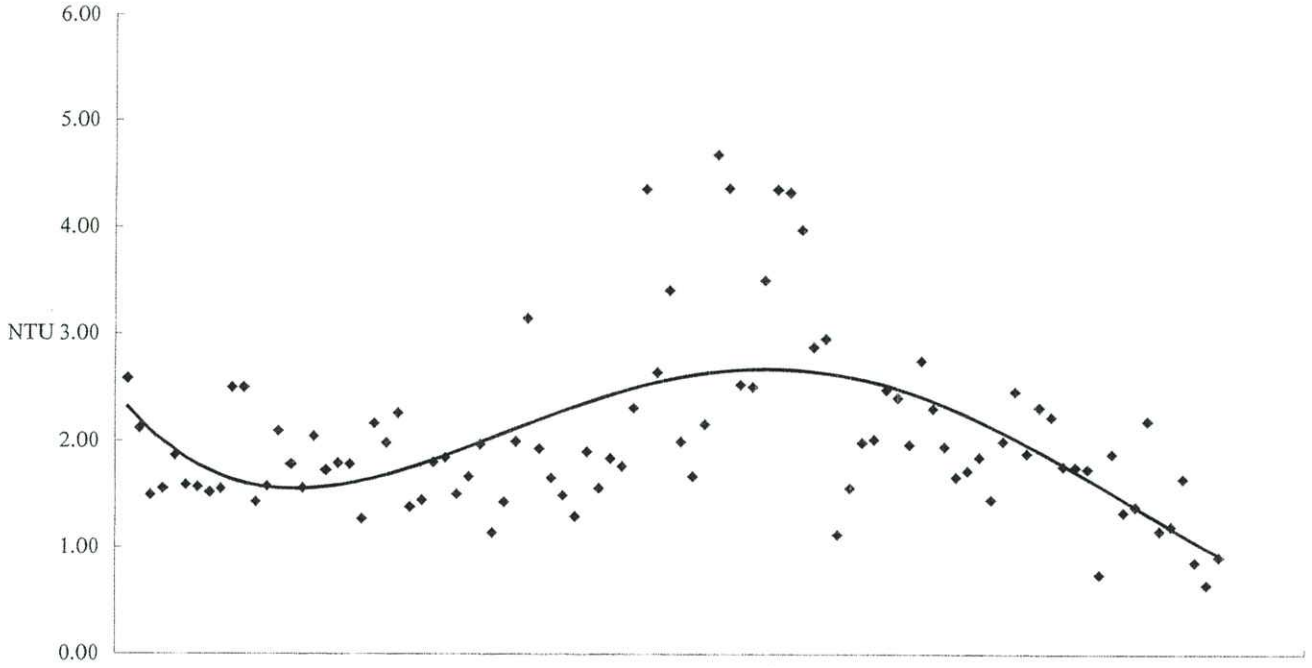
Dissolved Oxygen at Bottom Depth during Middle Ebb

Date	W1	W2	W3	W4	W5	W6	W7	WR
09-Jan-02			7.73	7.77	6.95	7.17	6.12	7.57
12-Jan-02			7.27	7.69	7.22	7.02	7.23	7.50
14-Jan-02			7.35	7.53	7.11	6.74	6.92	7.41
16-Jan-02			7.16	7.89	6.88	6.96	6.87	7.35
19-Jan-02			8.01	7.93	7.30	7.16	6.40	7.88
21-Jan-02			7.66	7.79	7.31	6.89	7.41	7.64
24-Jan-02			7.80	7.81	7.30	6.78	6.45	7.81
25-Jan-02			7.55	7.64	6.71	6.97	6.22	7.70
28-Jan-02			6.64	6.94	6.34	6.00	6.60	6.95
30-Jan-02			7.25	7.26	6.66	6.44	6.41	7.05
01-Feb-02			7.56	7.51	7.04	6.86	7.07	7.50
04-Feb-02			7.24	7.29	6.72	6.54	6.78	7.18

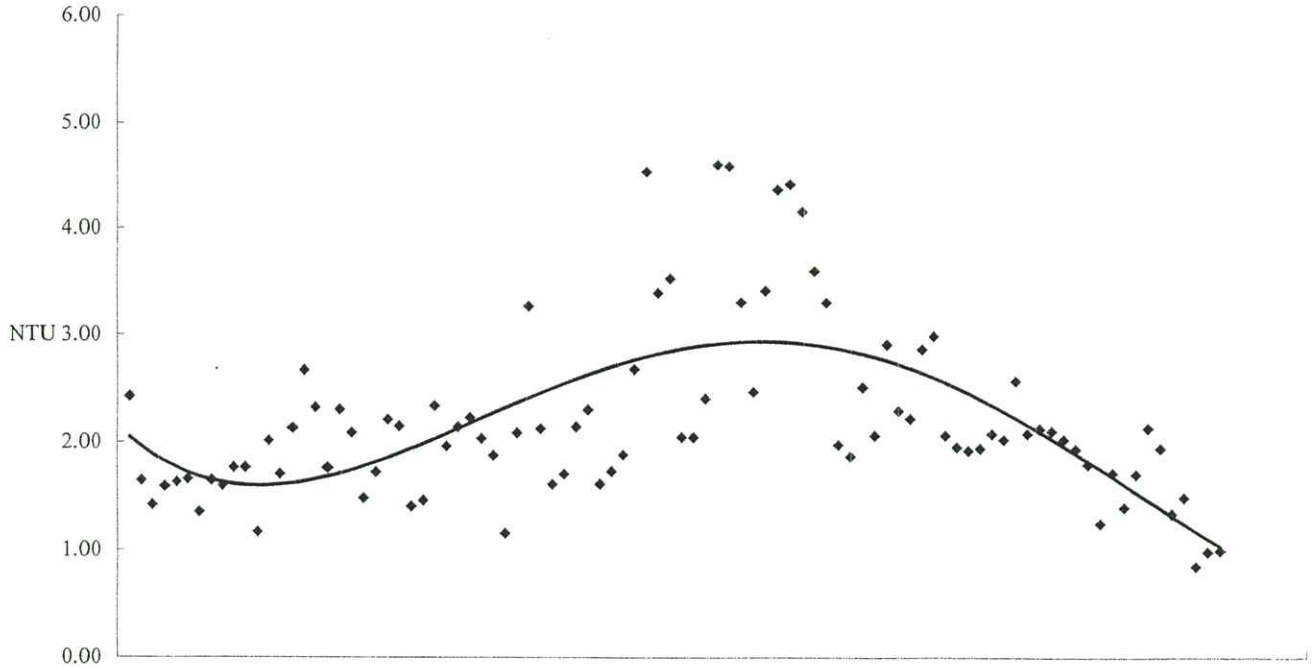
Appendix B1

Trend of Turbidity (NTU)

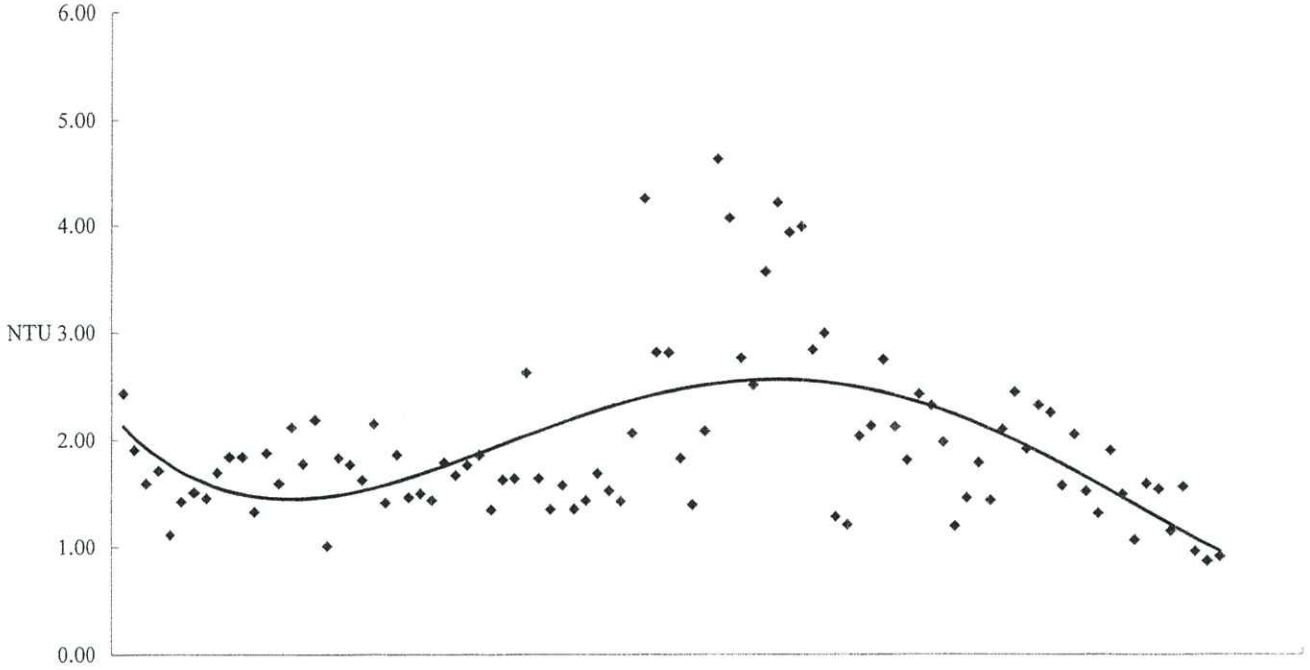
Trend of Turbidity (NTU) of W1



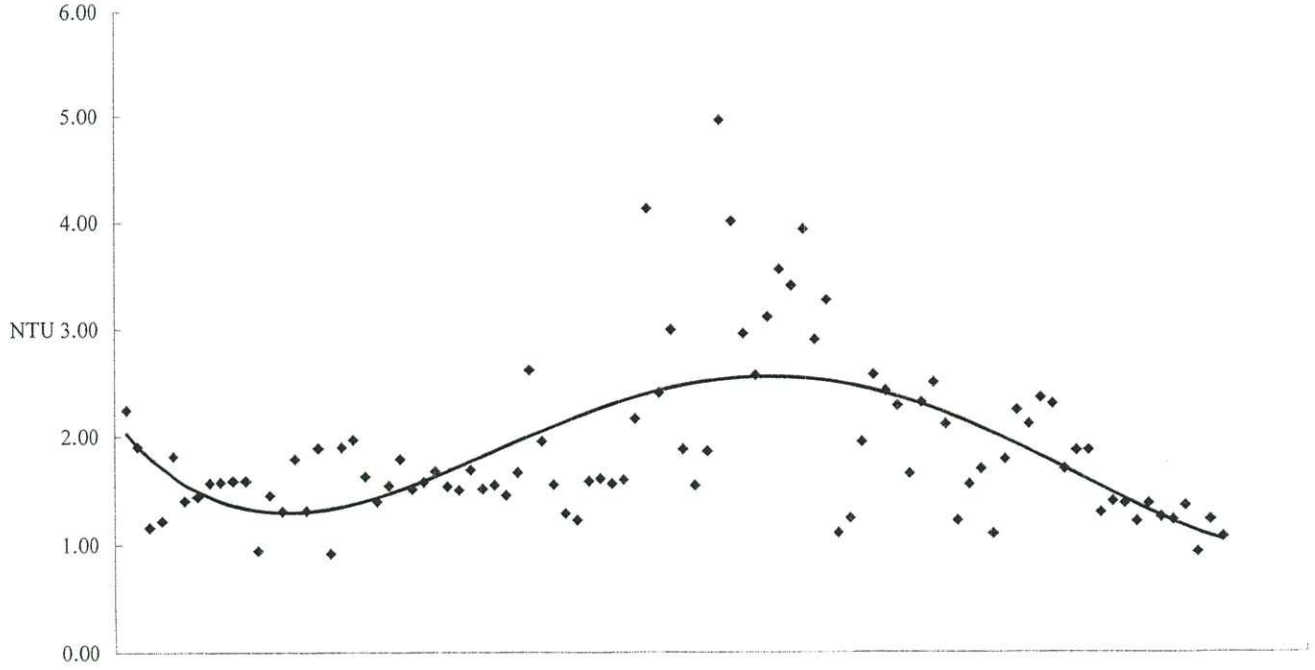
Trend of Turbidity (NTU) of W2



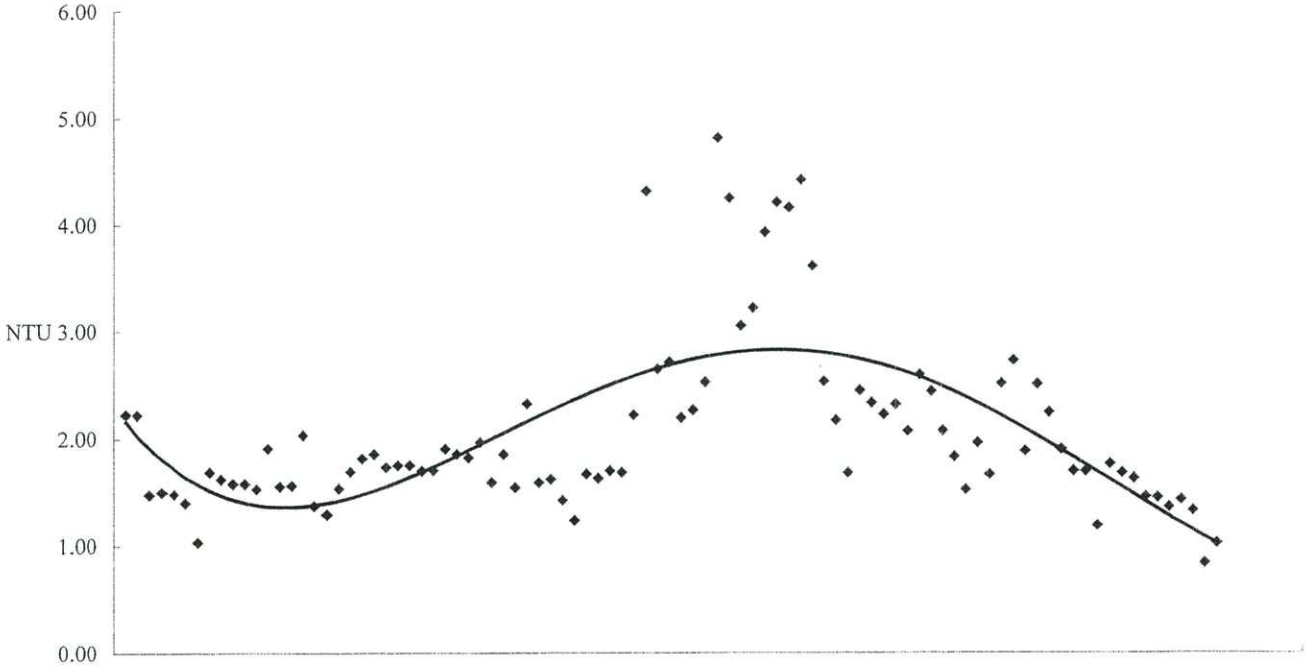
Trend of Turbidity (NTU) of W3



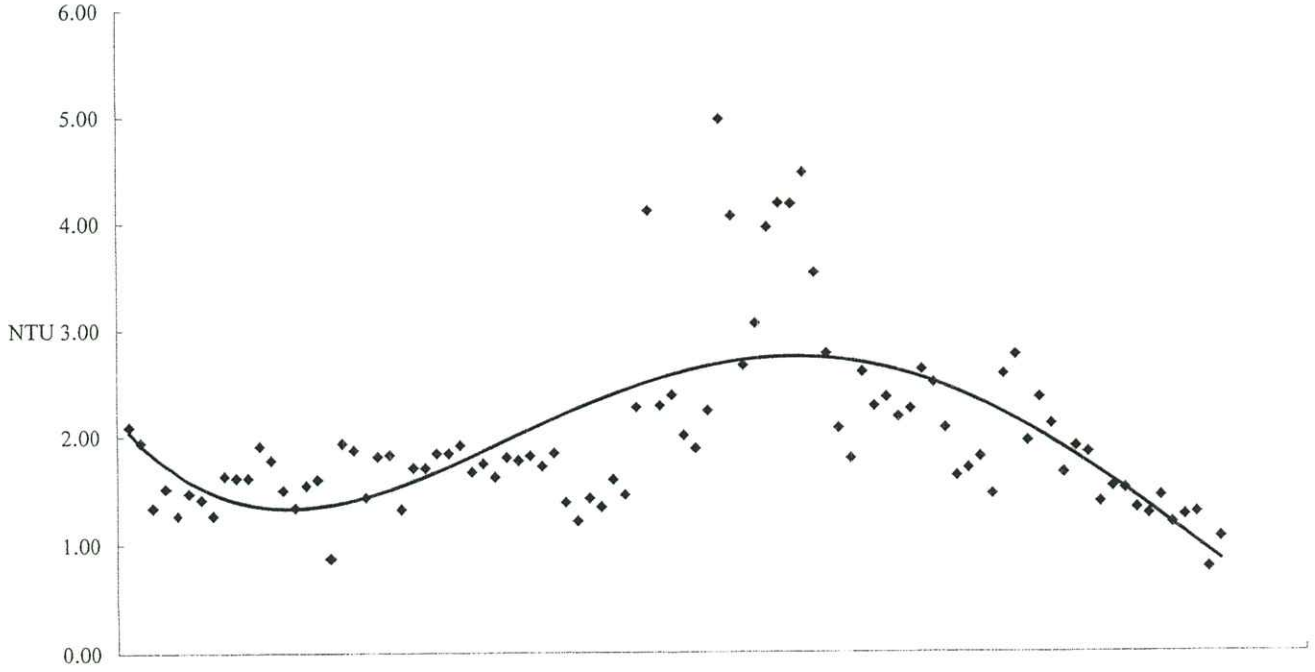
Trend of Turbidity (NTU) of W4



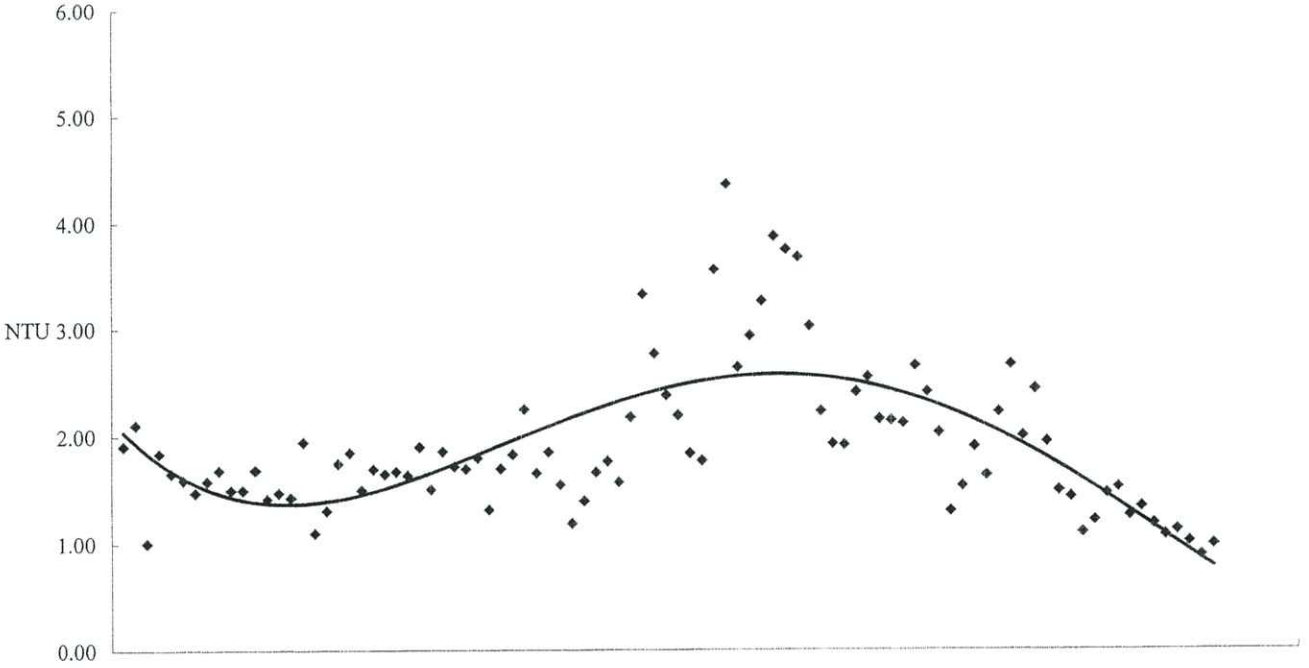
Trend of Turbidity (NTU) of W5



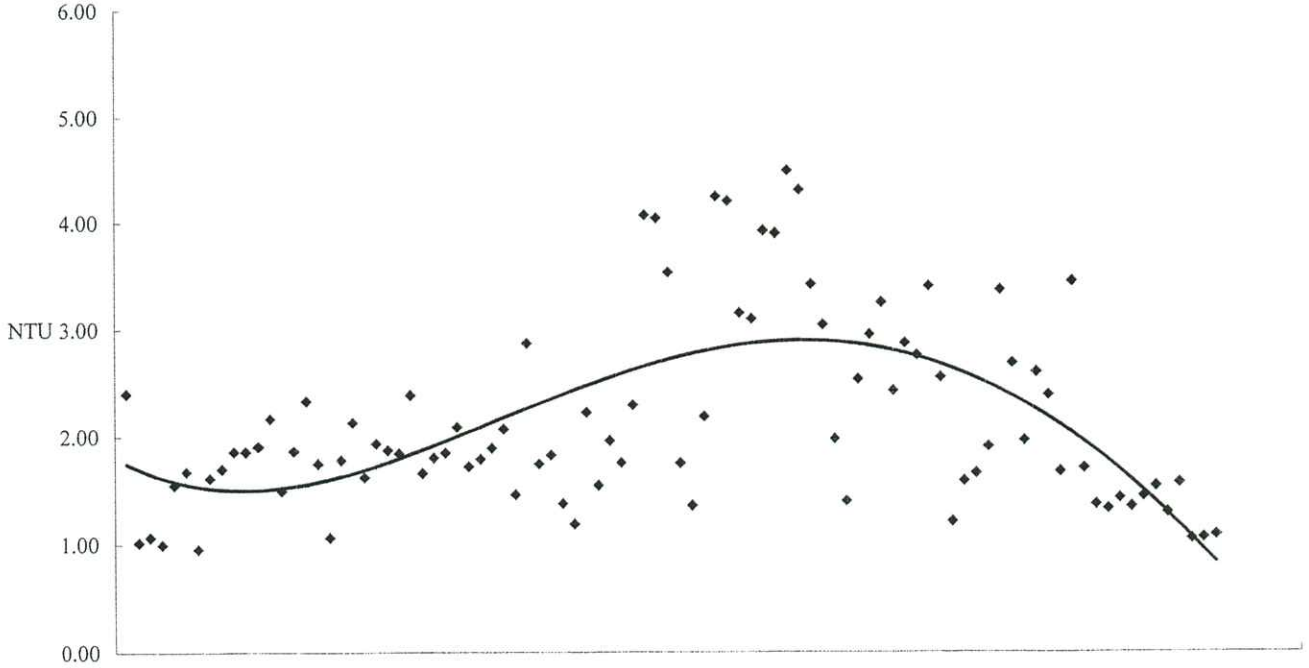
Trend of Turbidity (NTU) of W6



Trend of Turbidity (NTU) of W7



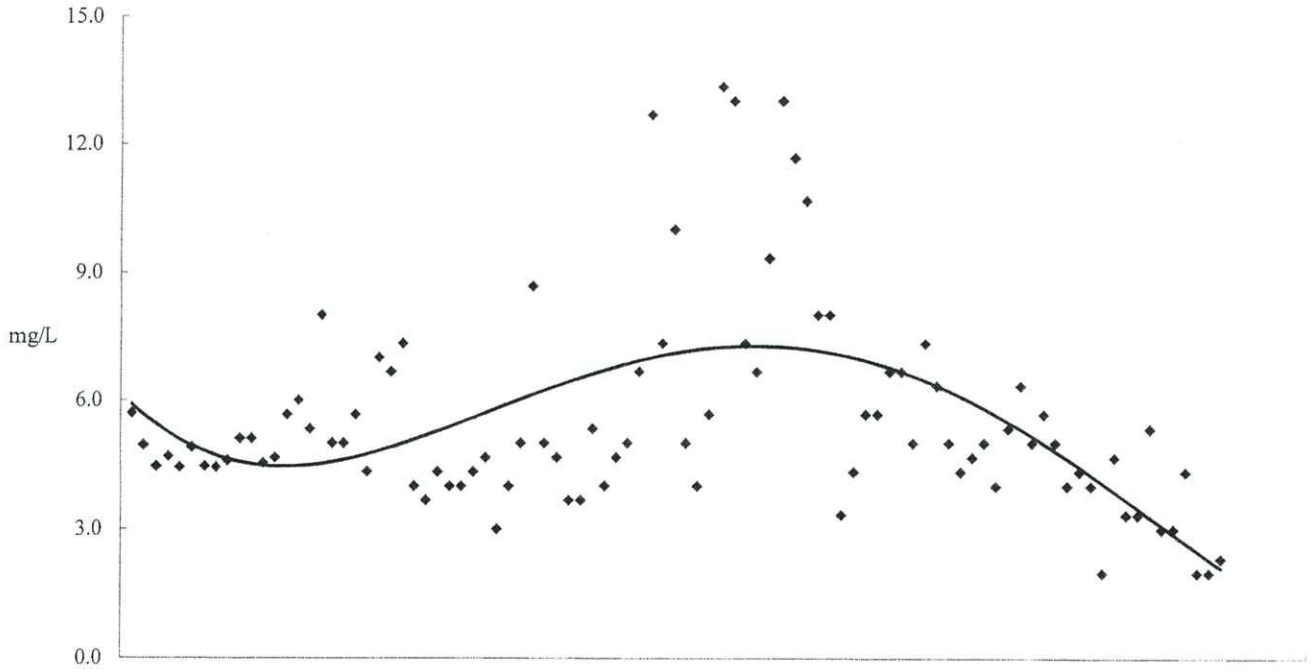
Trend of Turbidity (NTU) of WR



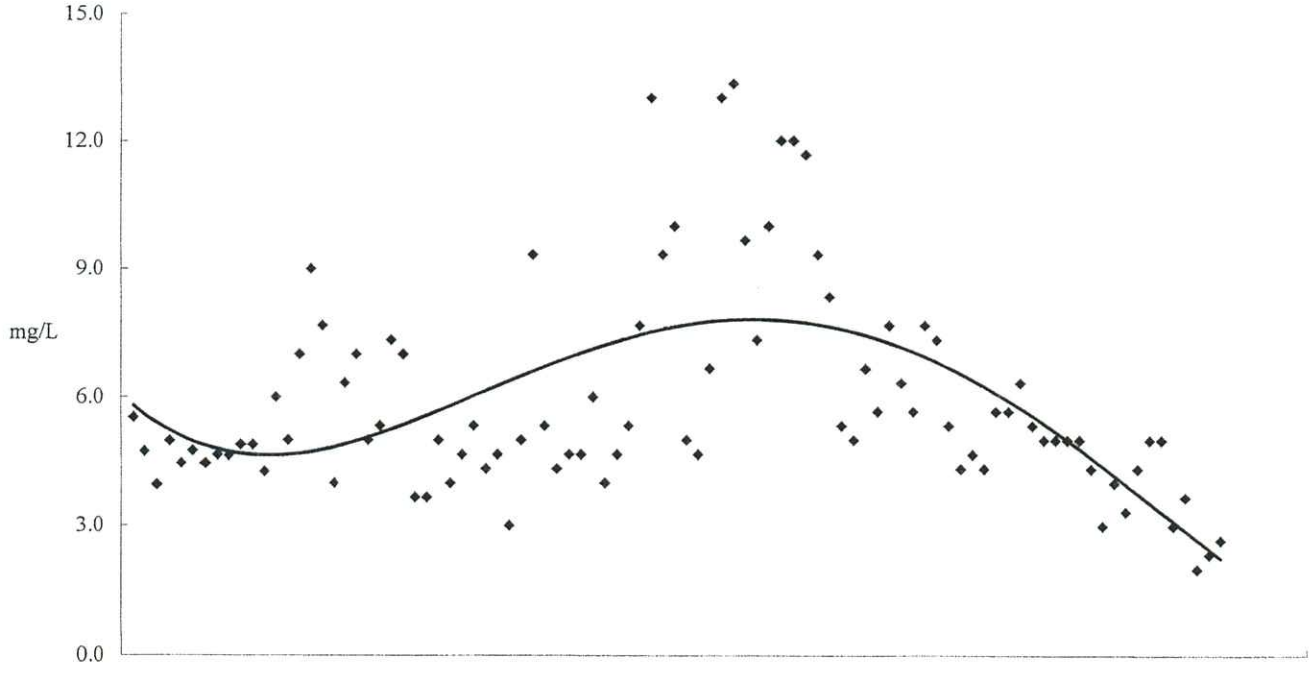
Appendix B2

Trend of Suspended Solids (mg/L)

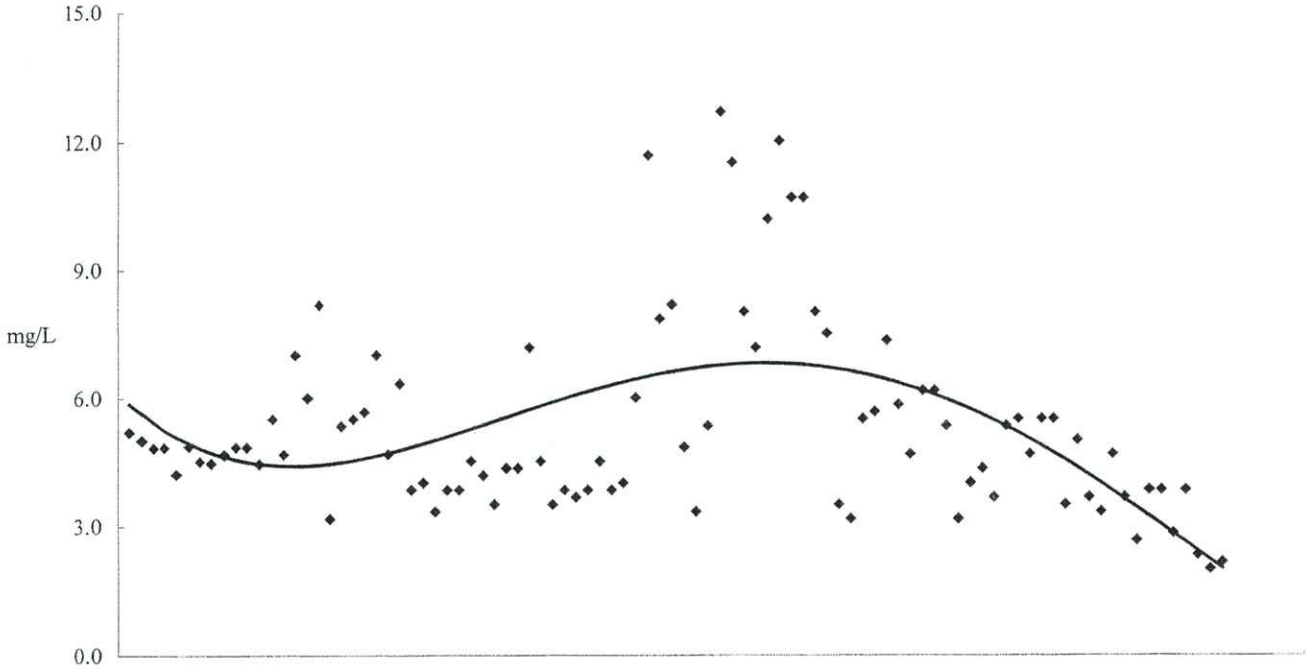
Trend of Suspended Solids (mg/L) of W1



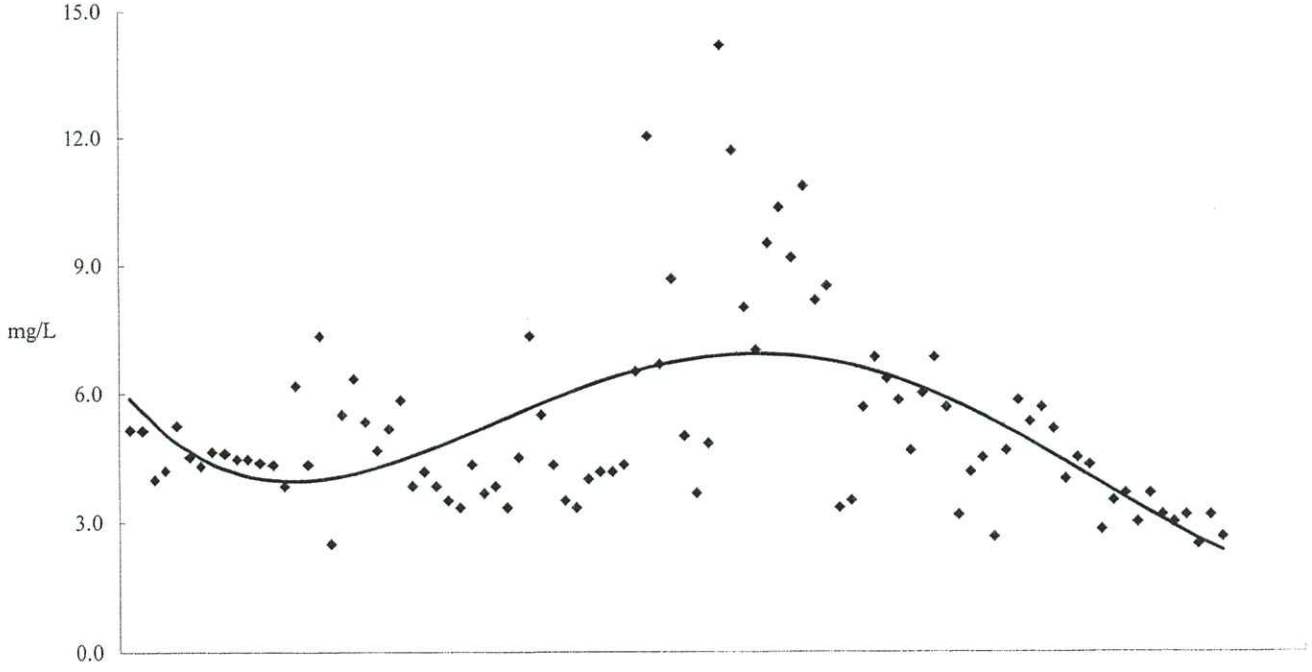
Trend of Suspended Solids (mg/L) of W2



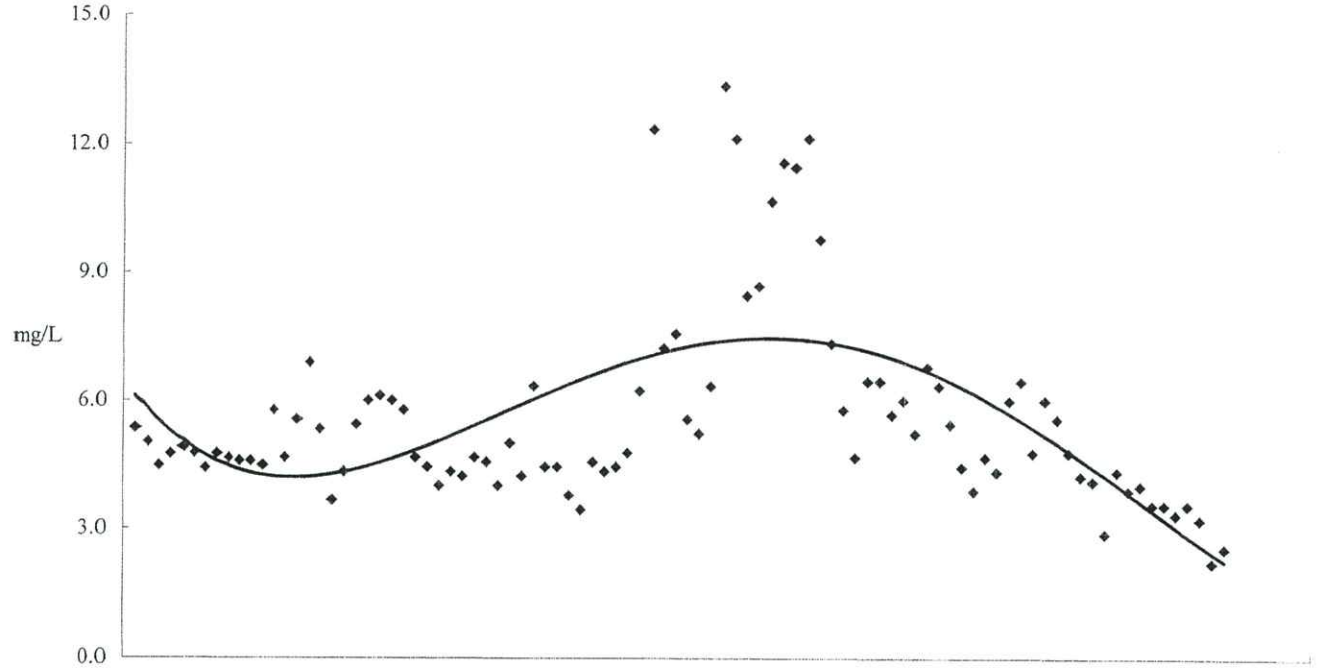
Trend of Suspended Solids (mg/L) of W3



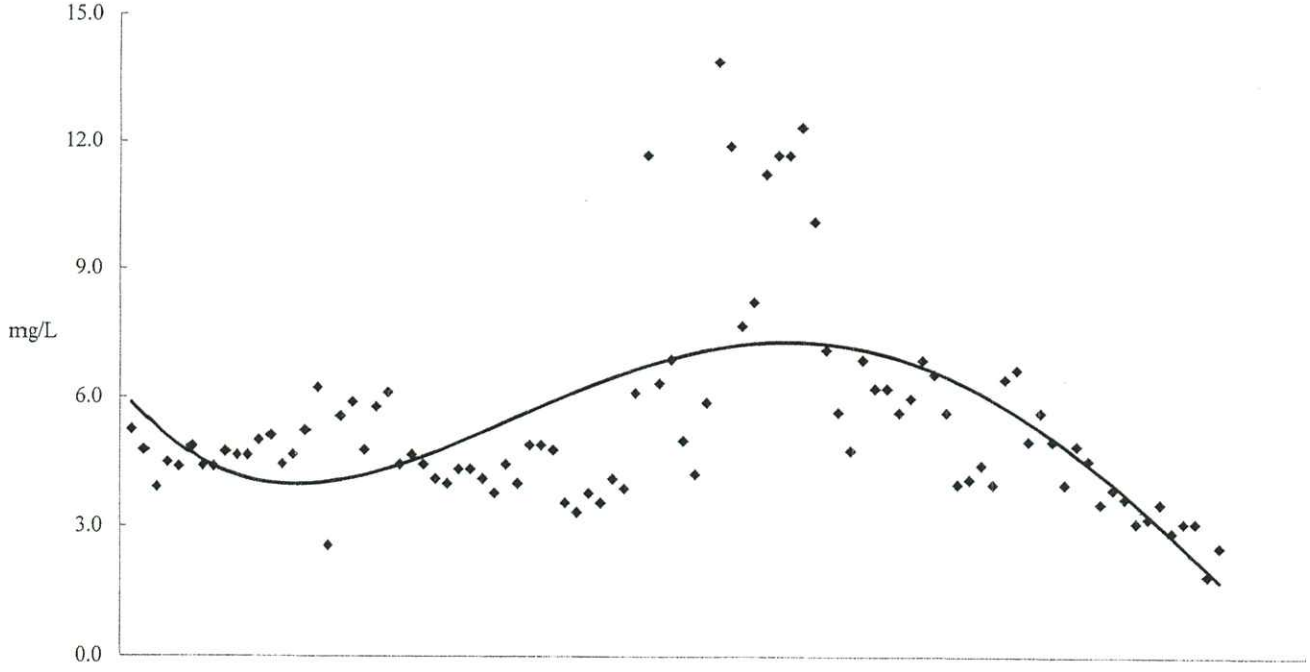
Trend of Suspended Solids (mg/L) of W4



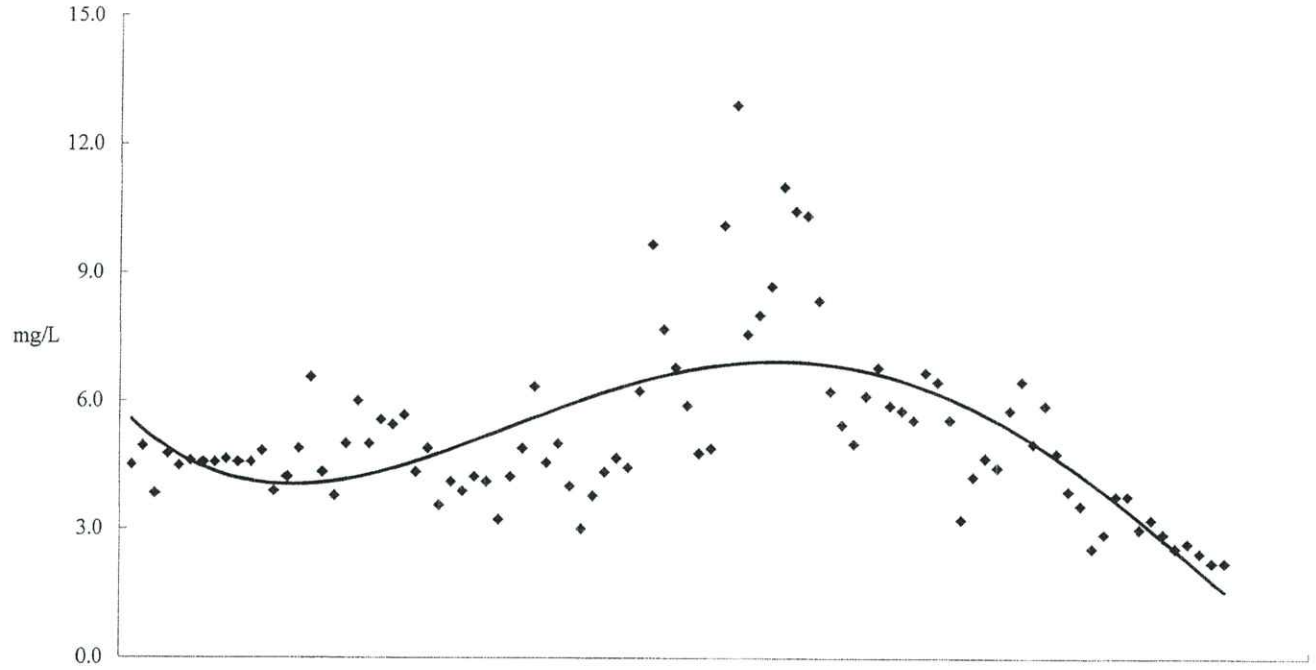
Trend of Suspended Solids (mg/L) of W5



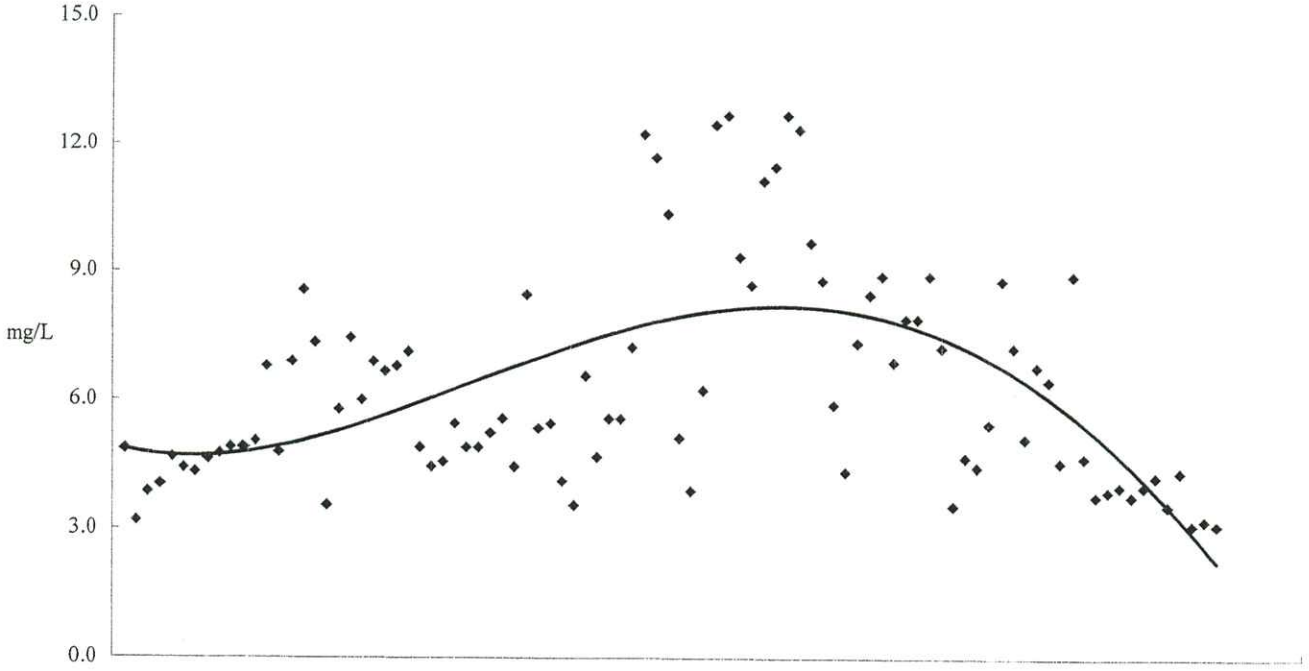
Trend of Suspended Solids (mg/L) of W6



Trend of Suspended Solids (mg/L) of W7



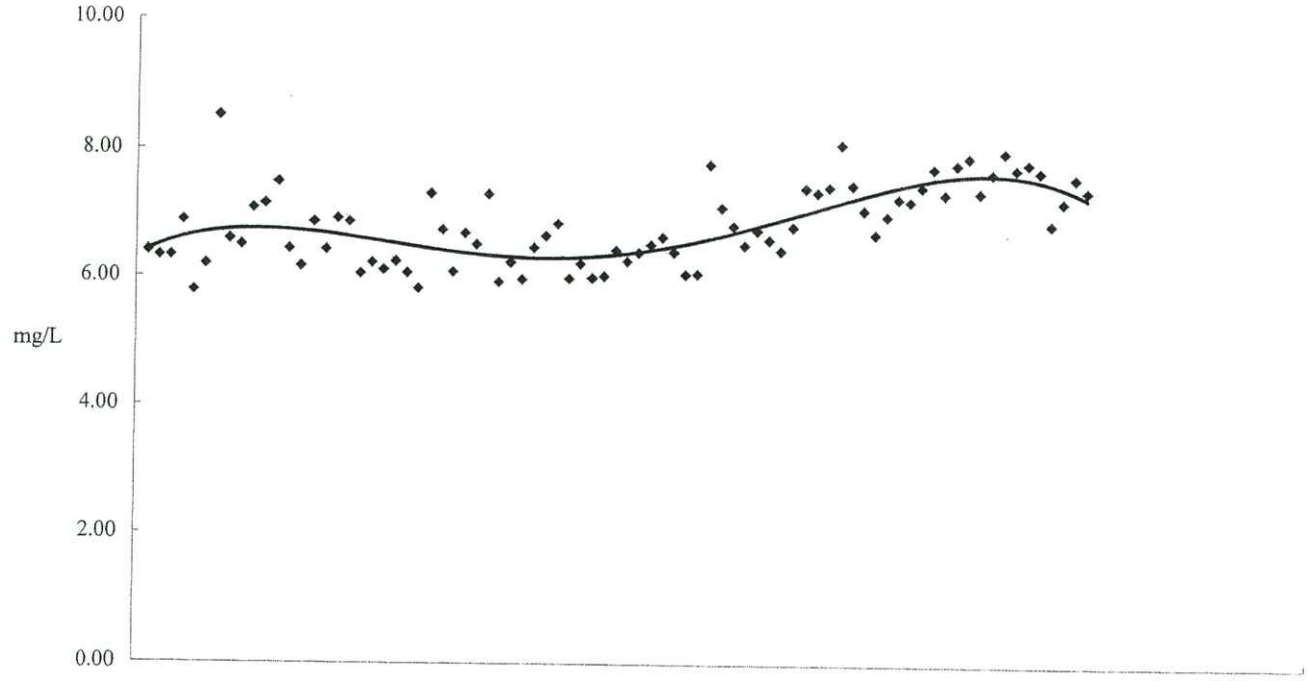
Trend of Suspended Solids (mg/L) of WR



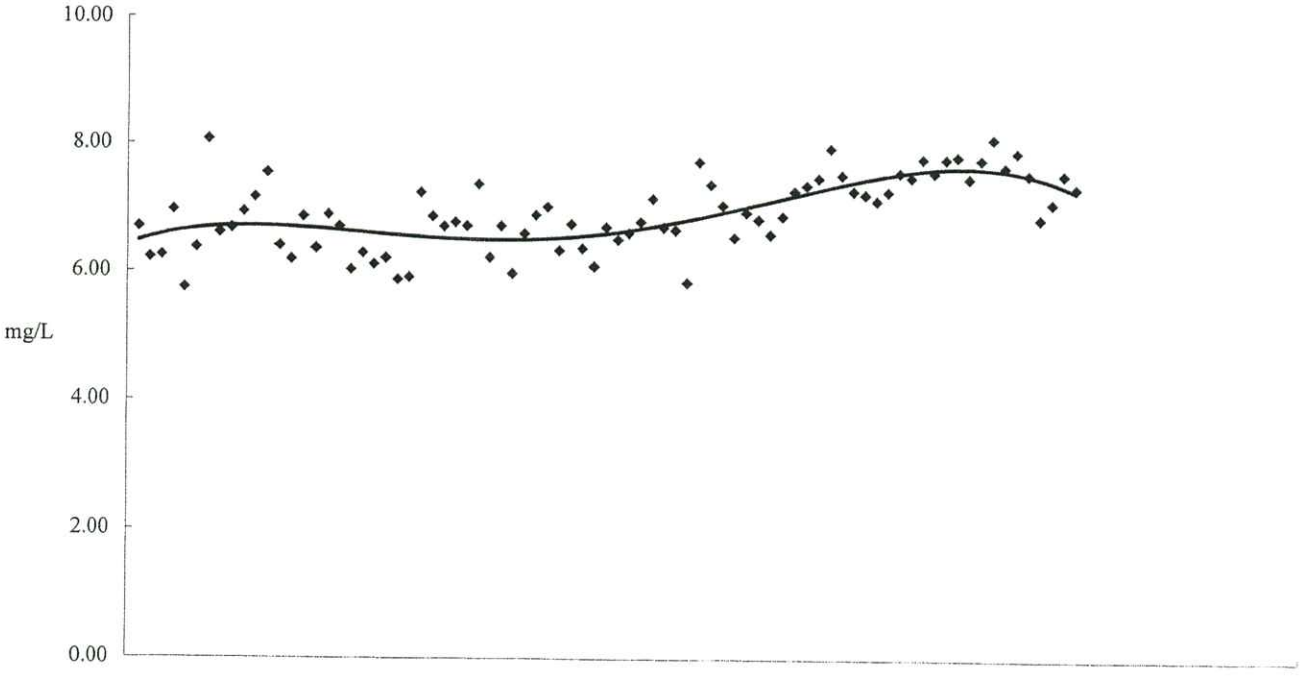
Appendix B3

Trend of Dissolved Oxygen (mg/L) at Surface Depth

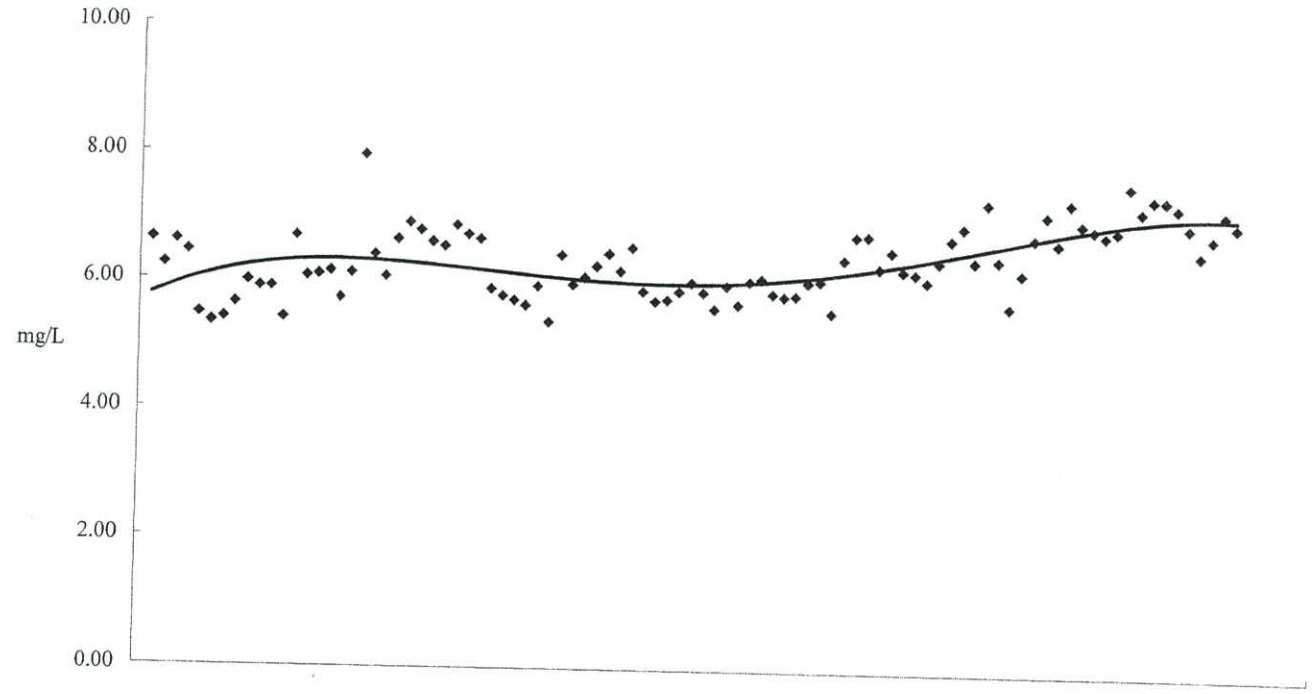
Trend of Disolved Oxygen (mg/L) of W3 at Surface Depth



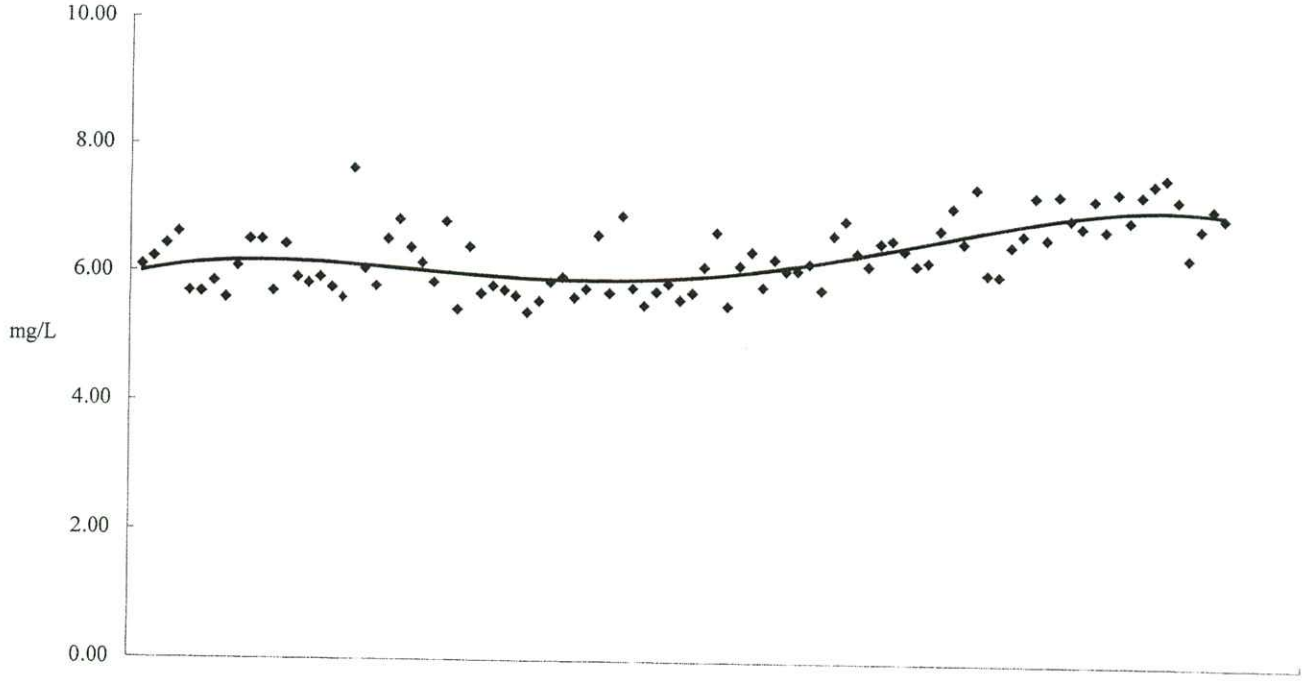
Trend of Disolved Oxygen (mg/L) of W4 at Surface Depth



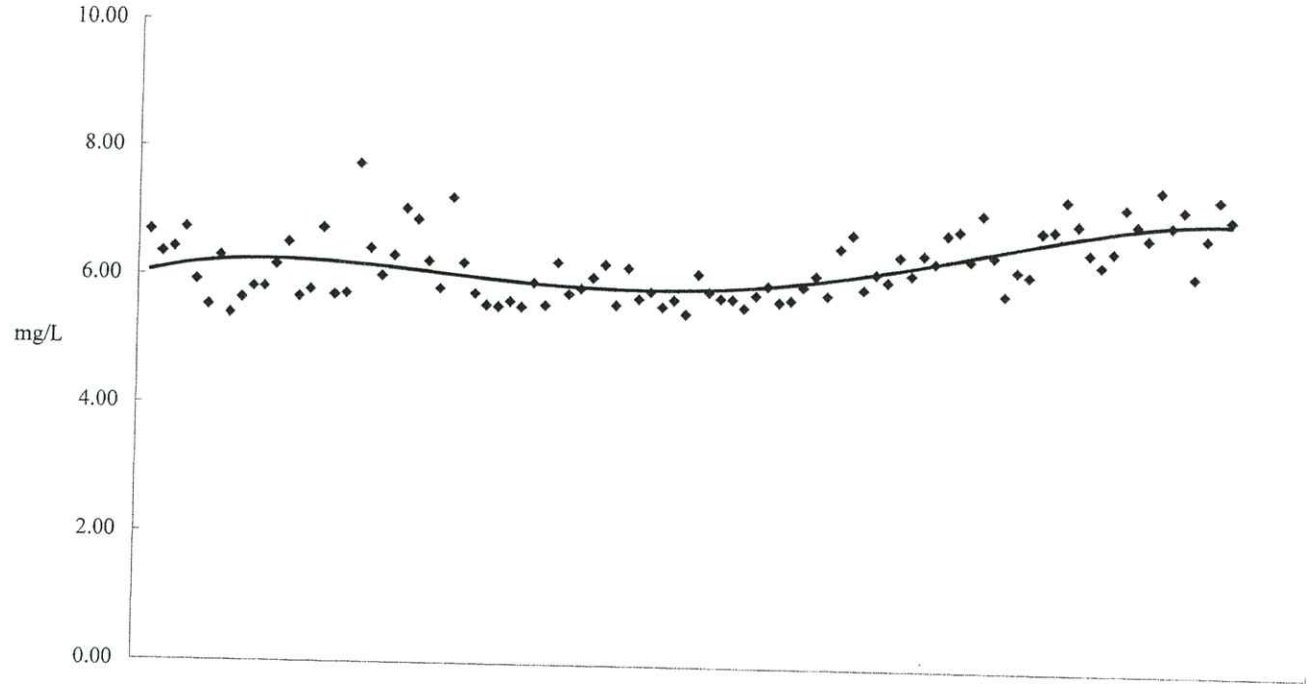
Trend of Disolved Oxygen (mg/L) of W5 at Surface Depth



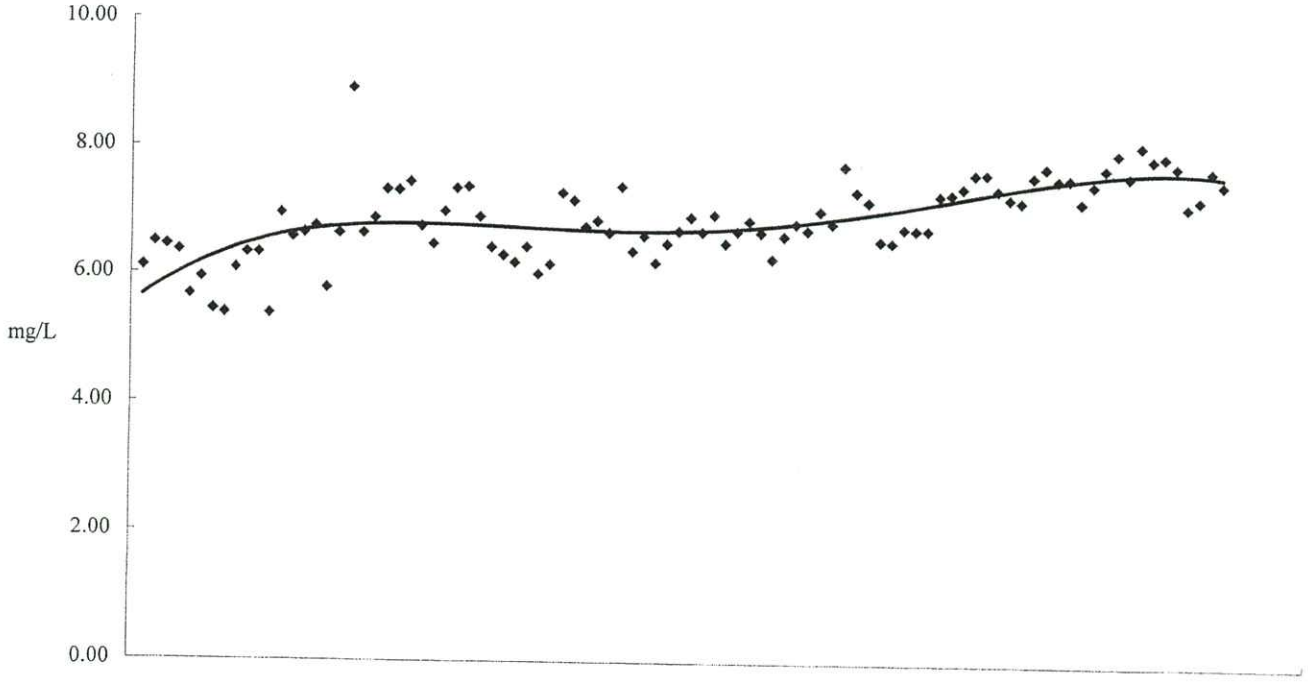
Trend of Disolved Oxygen (mg/L) of W6 at Surface Depth



Trend of Disolved Oxygen (mg/L) of W7 at Surface Depth



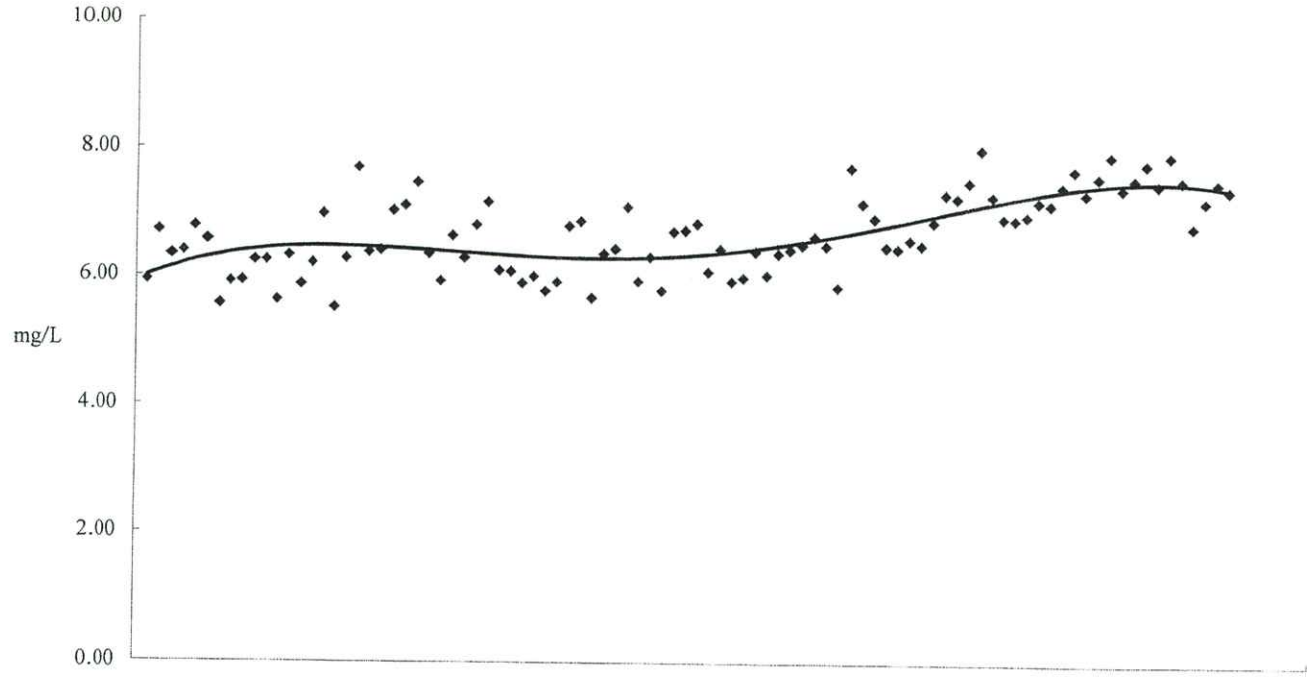
Trend of Disolved Oxygen (mg/L) of WR at Surface Depth



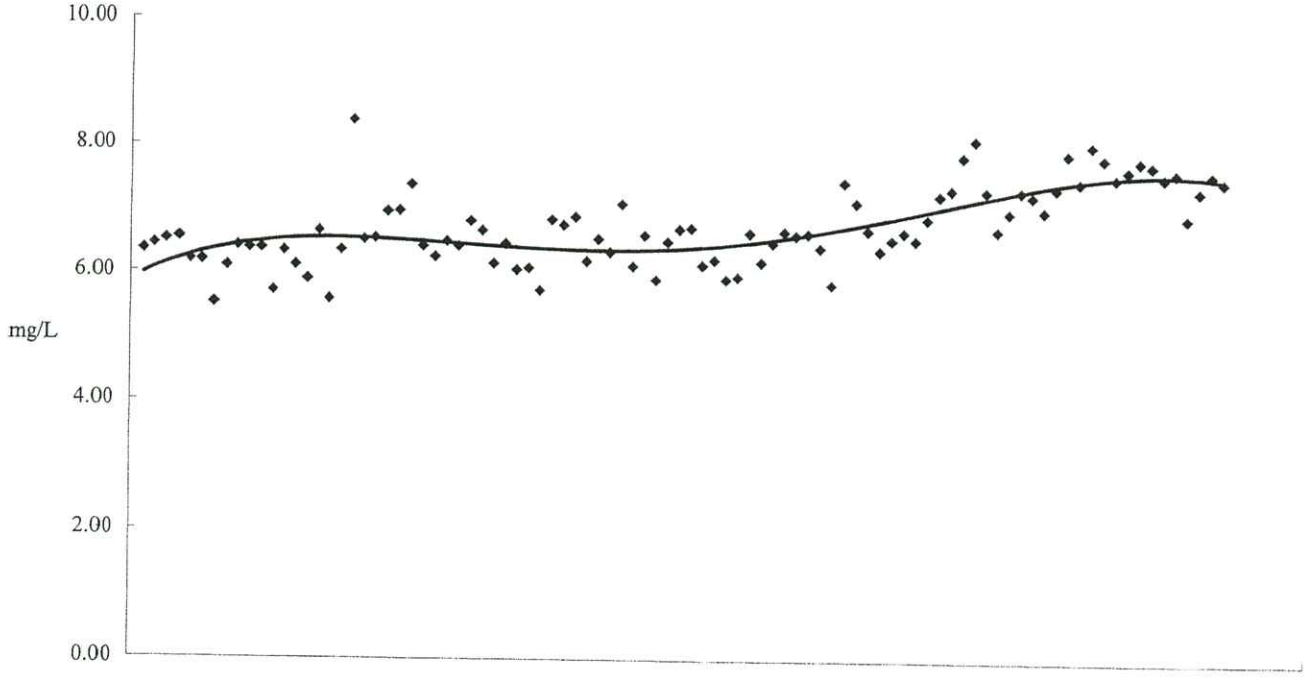
Appendix B4

Trend of Dissolved Oxygen (mg/L) at Middle Depth

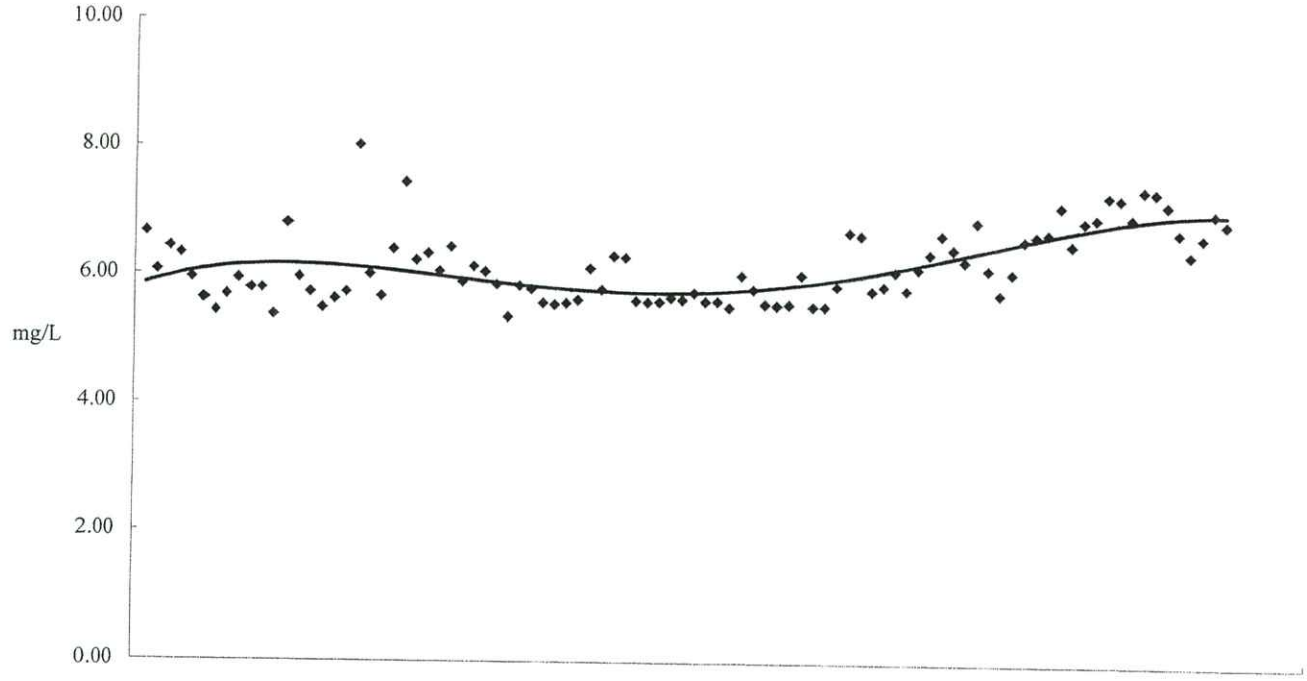
Trend of Disolved Oxygen (mg/L) of W1 at Middle Depth



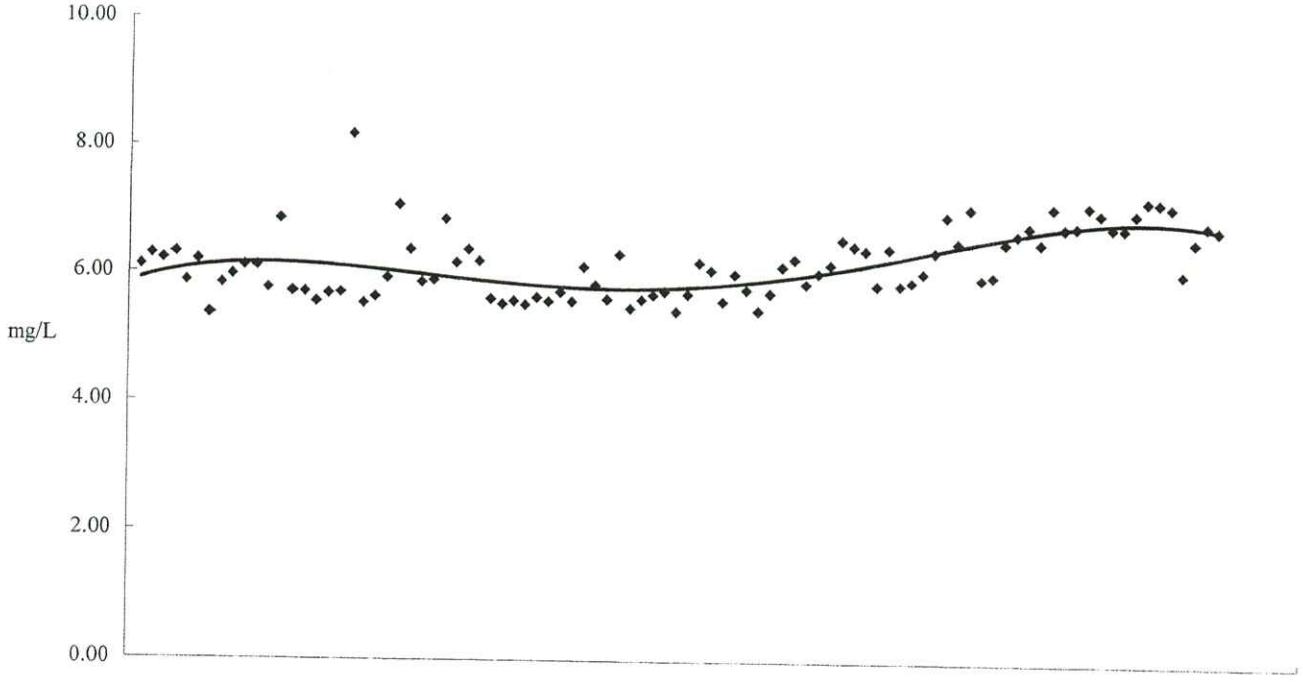
Trend of Disolved Oxygen (mg/L) of W2 at Middle Depth



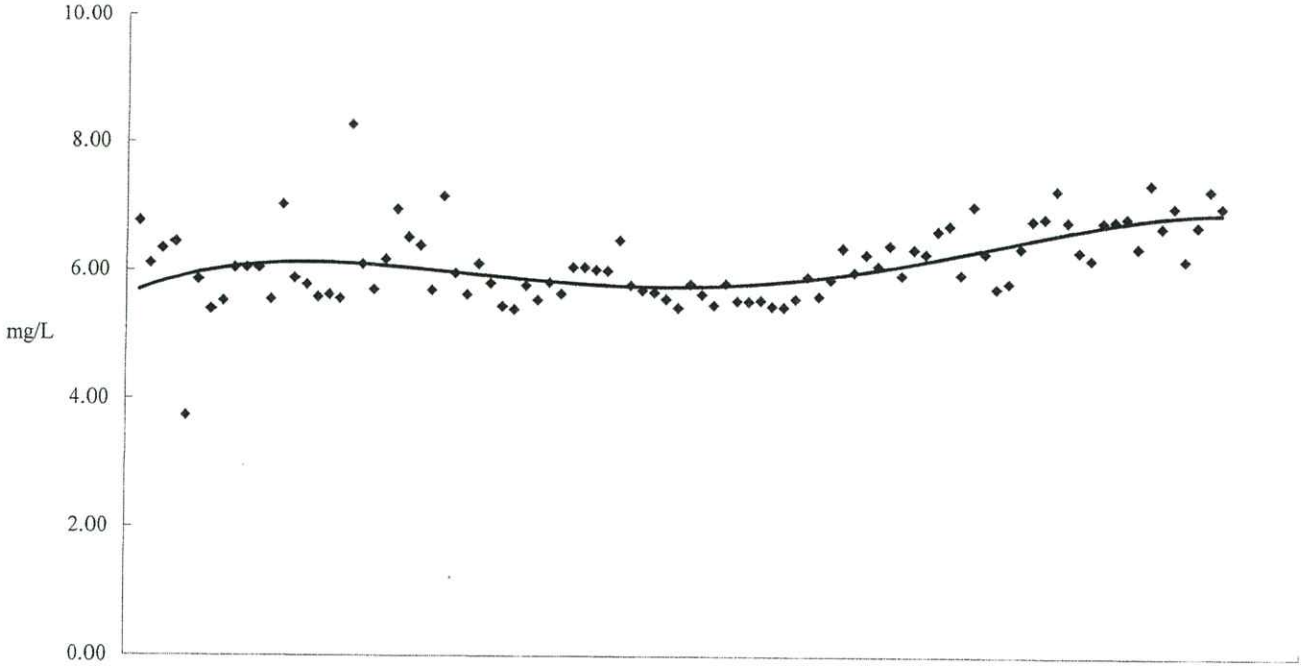
Trend of Disolved Oxygen (mg/L) of W5 at Middle Depth



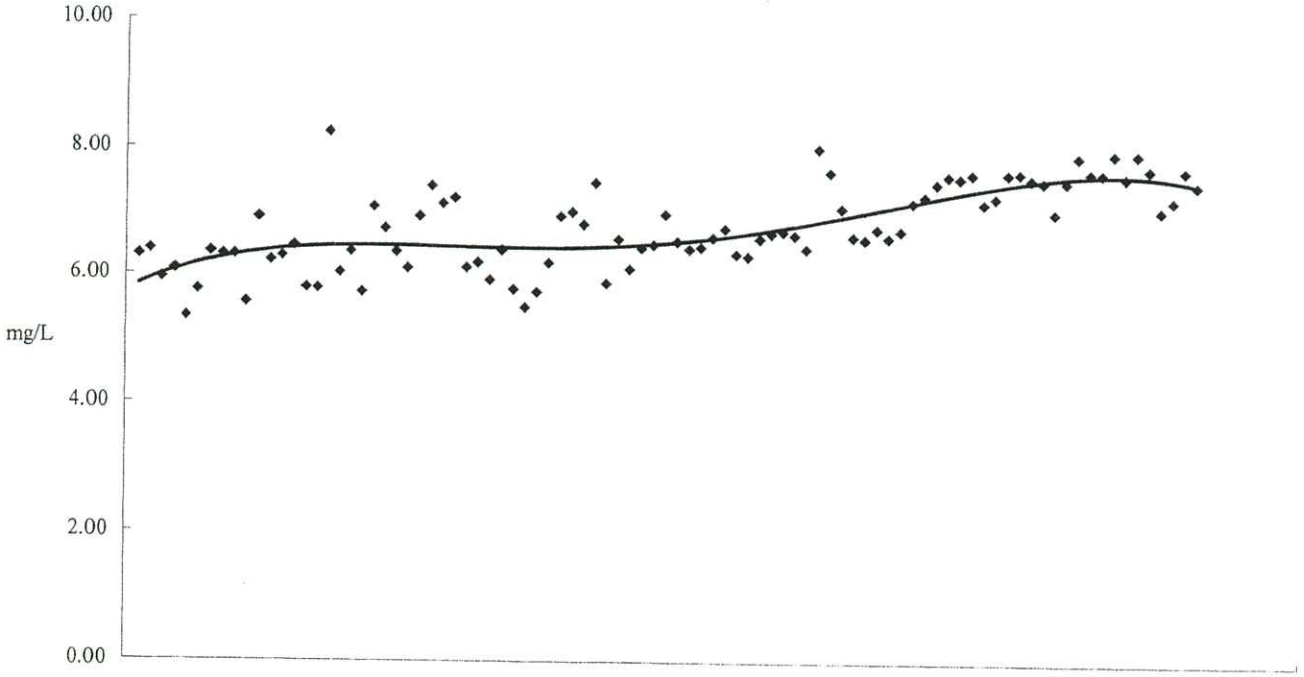
Trend of Disolved Oxygen (mg/L) of W6 at Middle Depth



Trend of Disolved Oxygen (mg/L) of W7 at Middle Depth



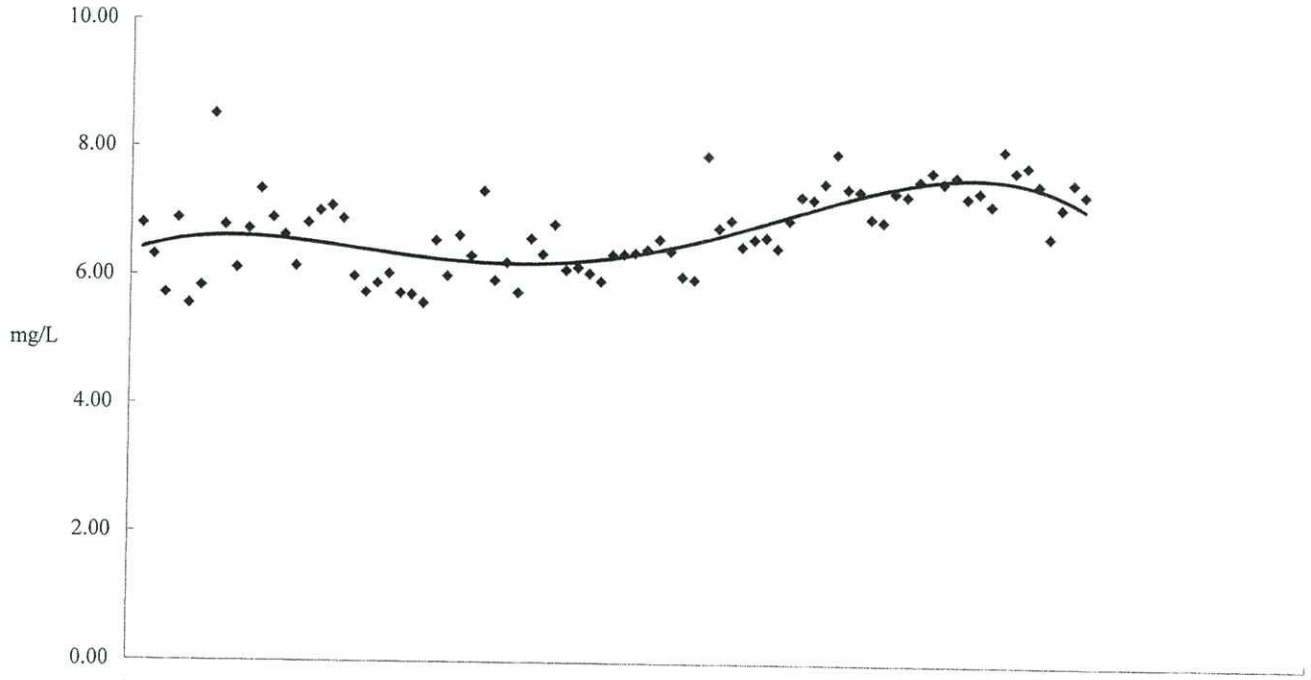
Trend of Disolved Oxygen (mg/L) of WR at Middle Depth



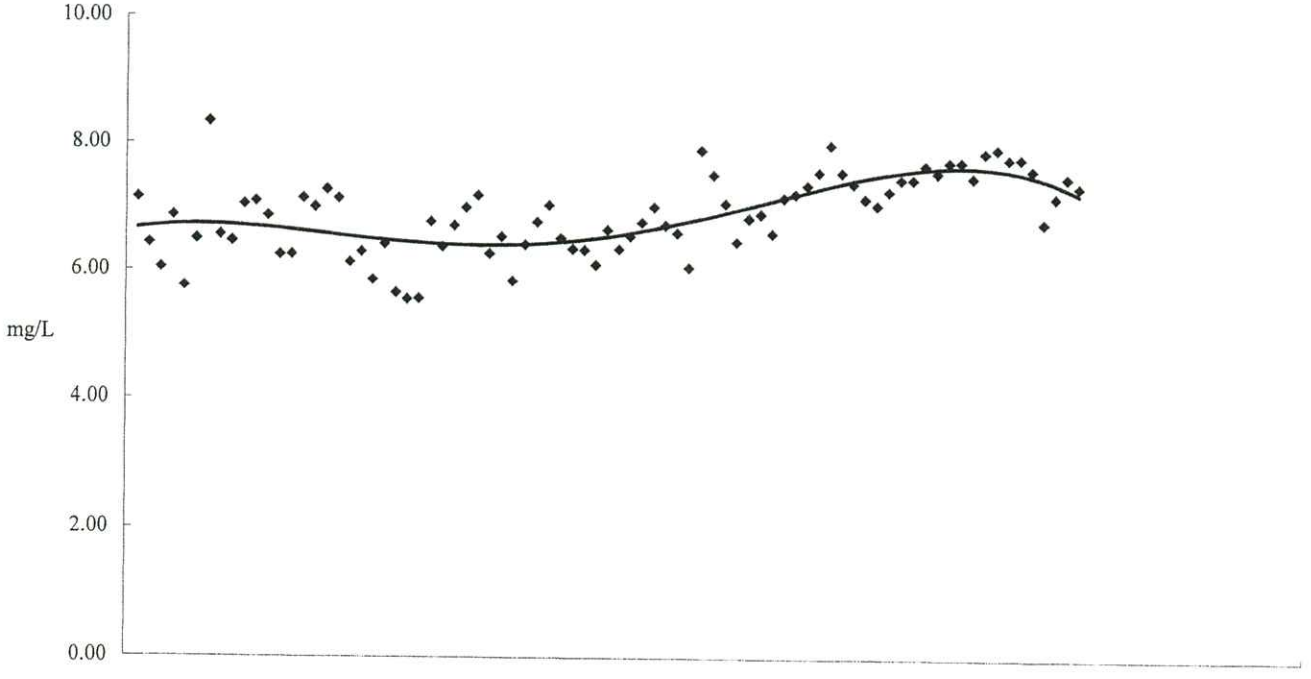
Appendix B5

Trend of Dissolved Oxygen (mg/L) at Bottom Depth

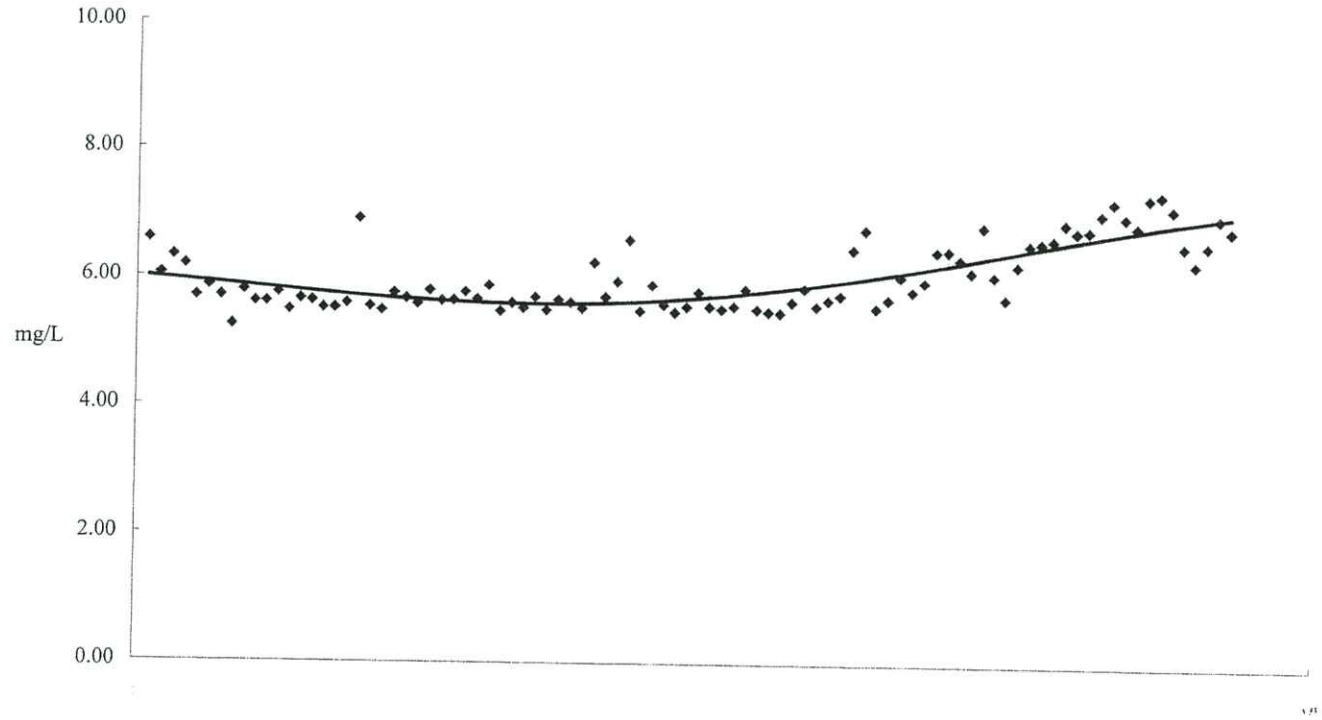
Trend of Disolved Oxygen (mg/L) of W3 at Bottom Depth



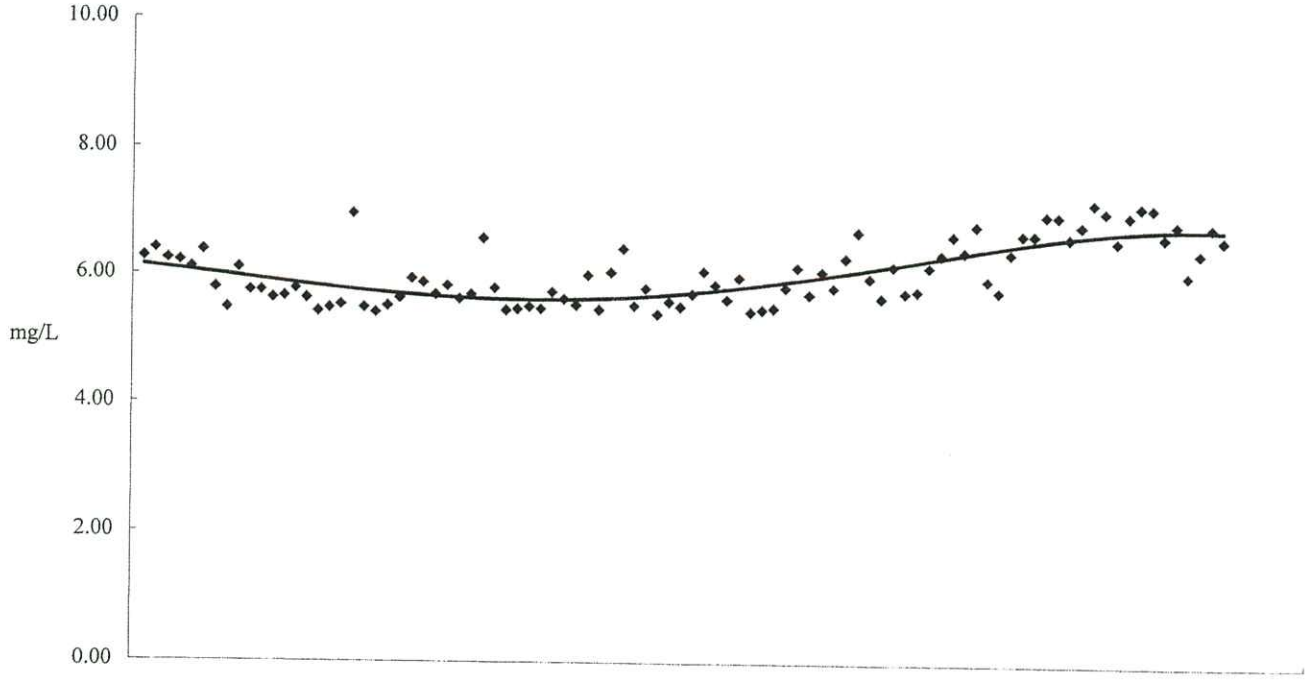
Trend of Disolved Oxygen (mg/L) of W4 at Bottom Depth



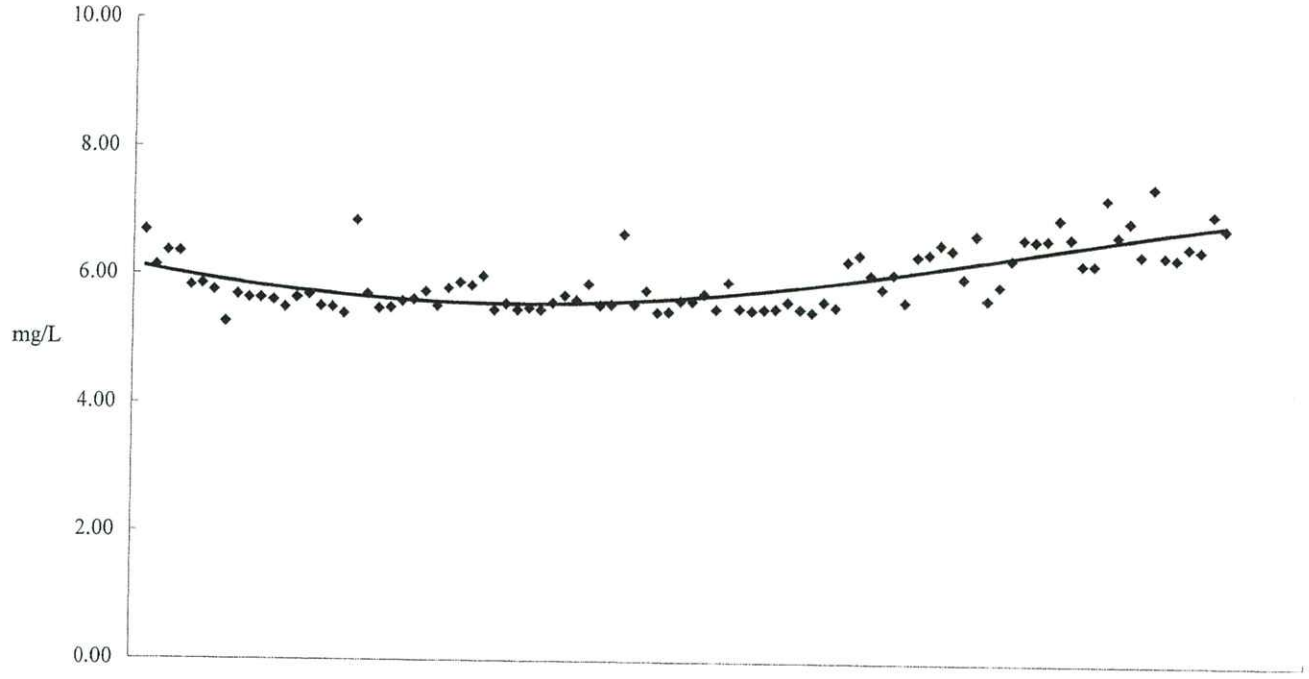
Trend of Disolved Oxygen (mg/L) of W5 at Bottom Depth



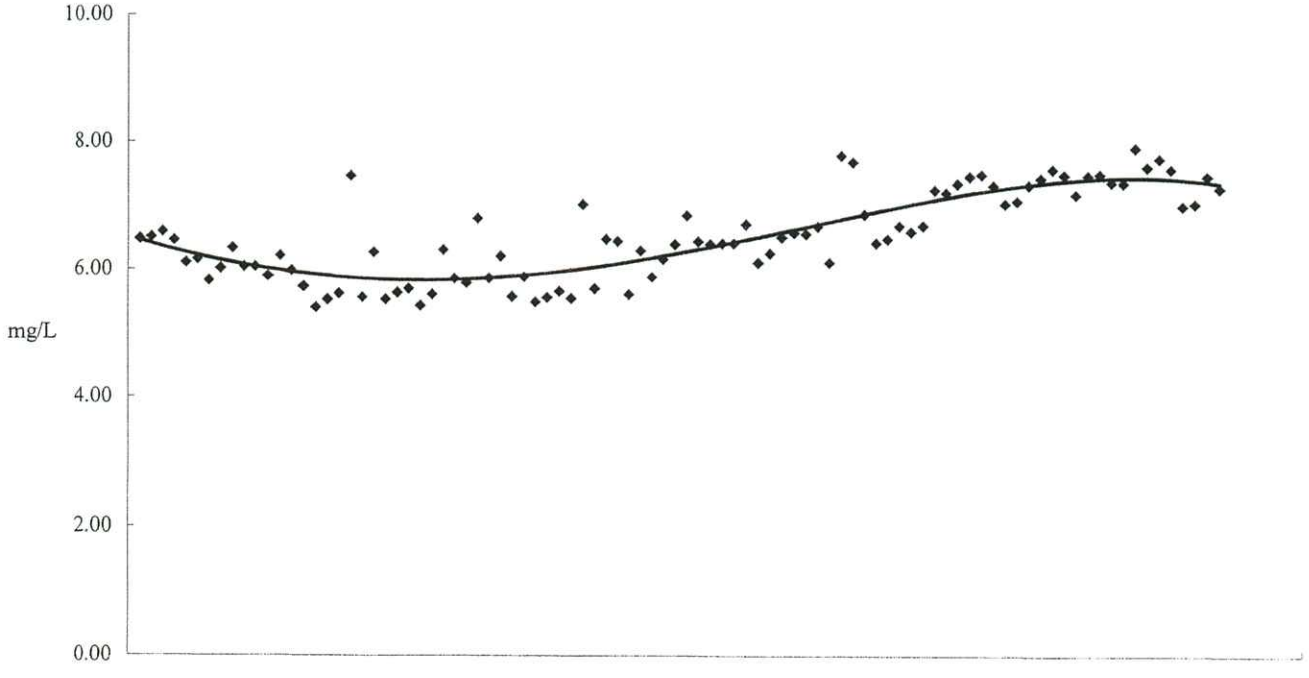
Trend of Disolved Oxygen (mg/L) of W6 at Bottom Depth



Trend of Disolved Oxygen (mg/L) of W7 at Bottom Depth



Trend of Disolved Oxygen (mg/L) of WR at Bottom Depth



Appendix C

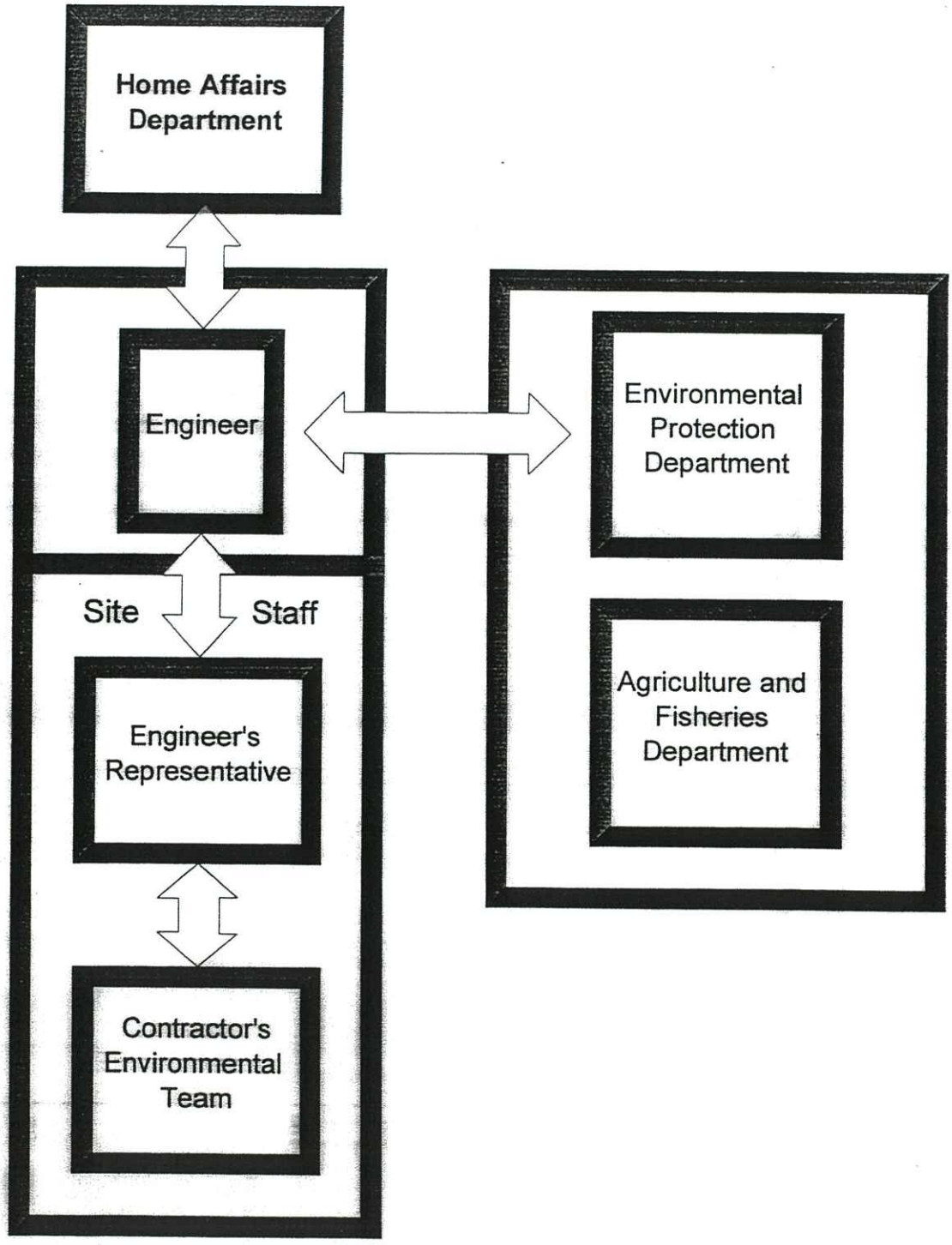
Summary of Complaints

Complaints Log

Item	Date Received	Received by	Complainant	Complaint details	Action taken	Status	Resolved Date	Remark
No Complaint								

Appendix D

Project Organization



Appendix D Project Organization

Appendix E

Construction Progamme

Construction Progamme

Reconstruction of Pier at Pak A, Sai Kung, Project No. SK-078

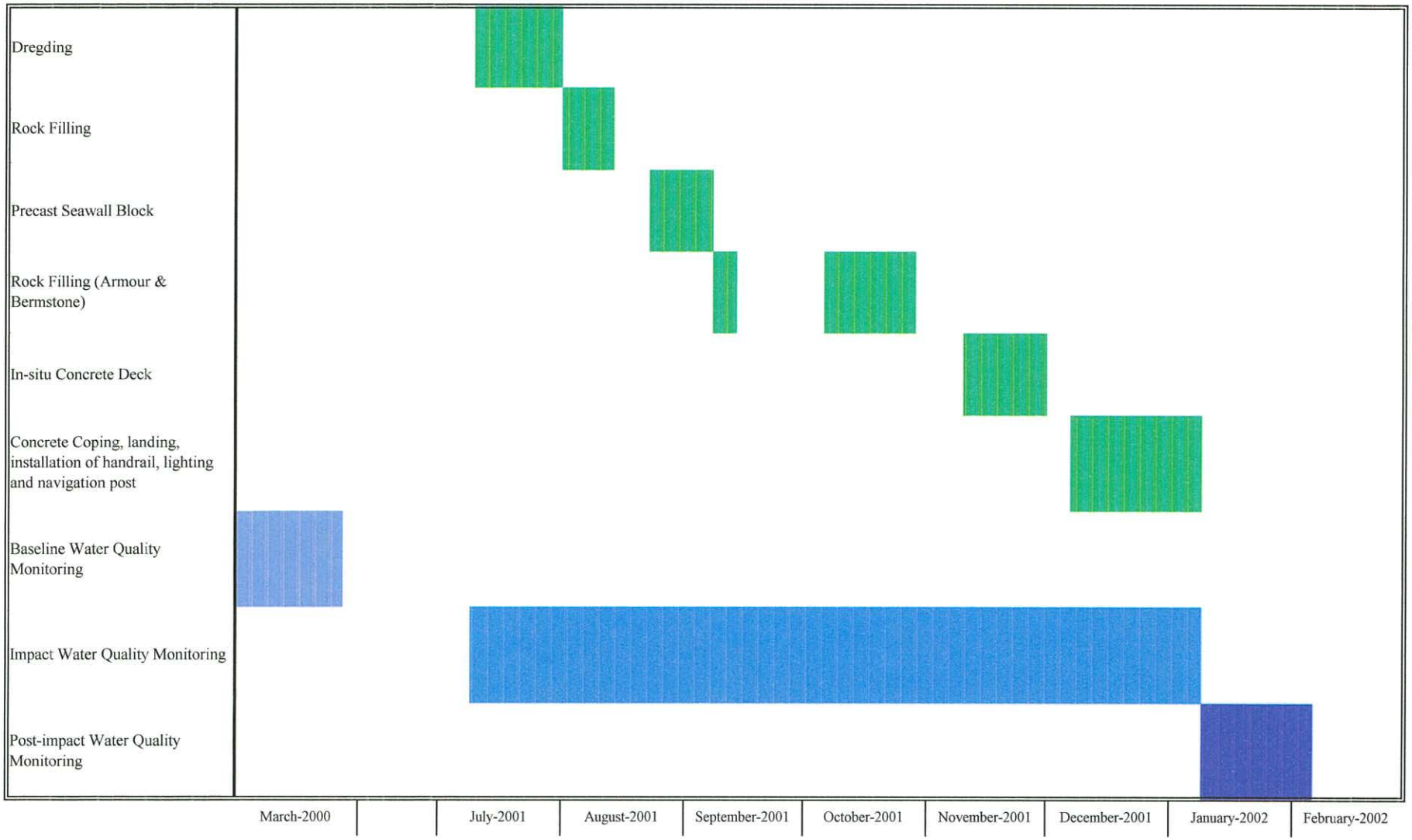


Figure 1

SK-078 Site Plan and Location of Water Quality Monitoring Stations

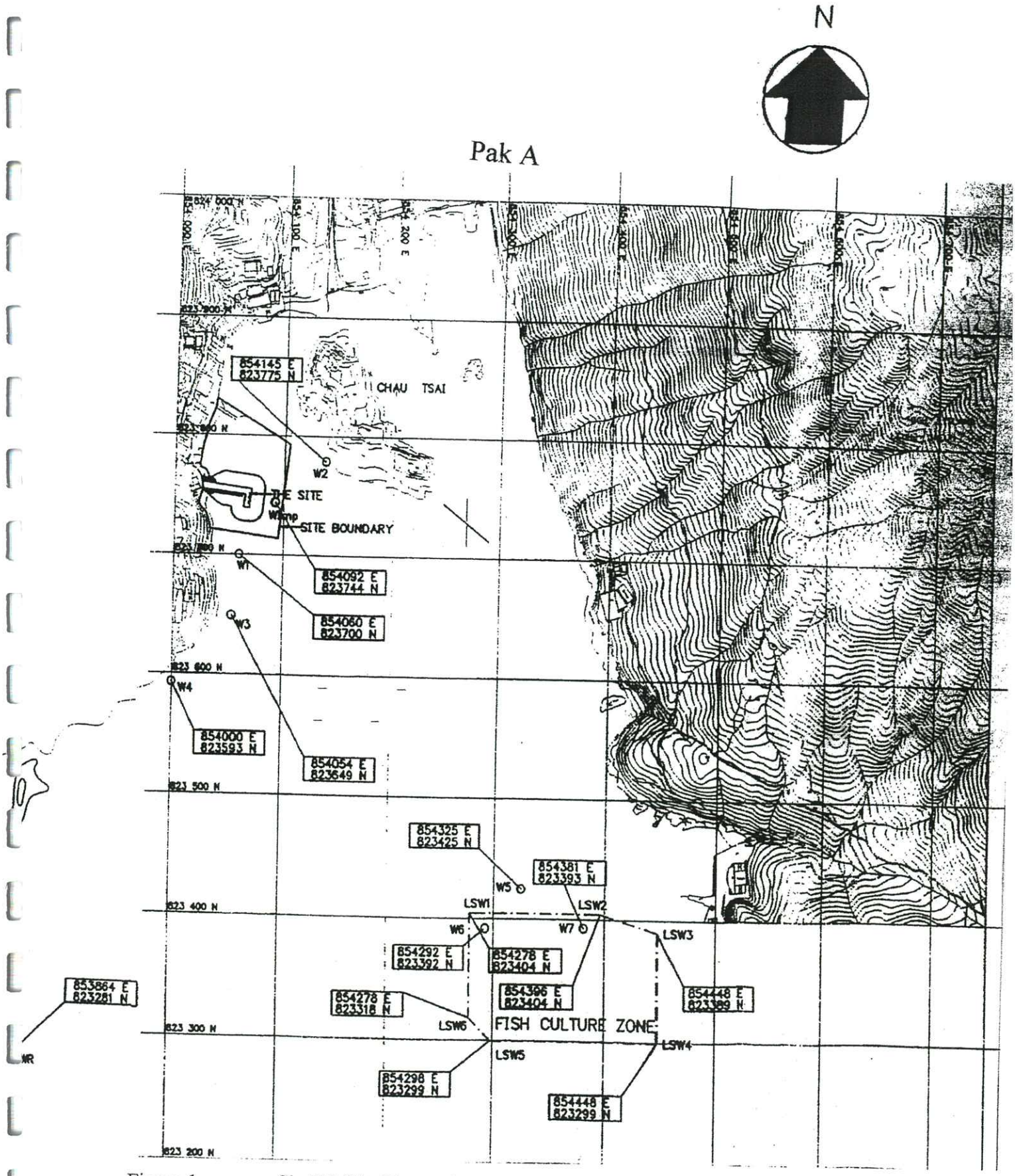


Figure 1 Sk-078 Site Plan and Location of Water Quality Monitoring Stations

Figure 2

Location of the Coral Area Silt Curtain at

Pak A, Sai Kung, HK

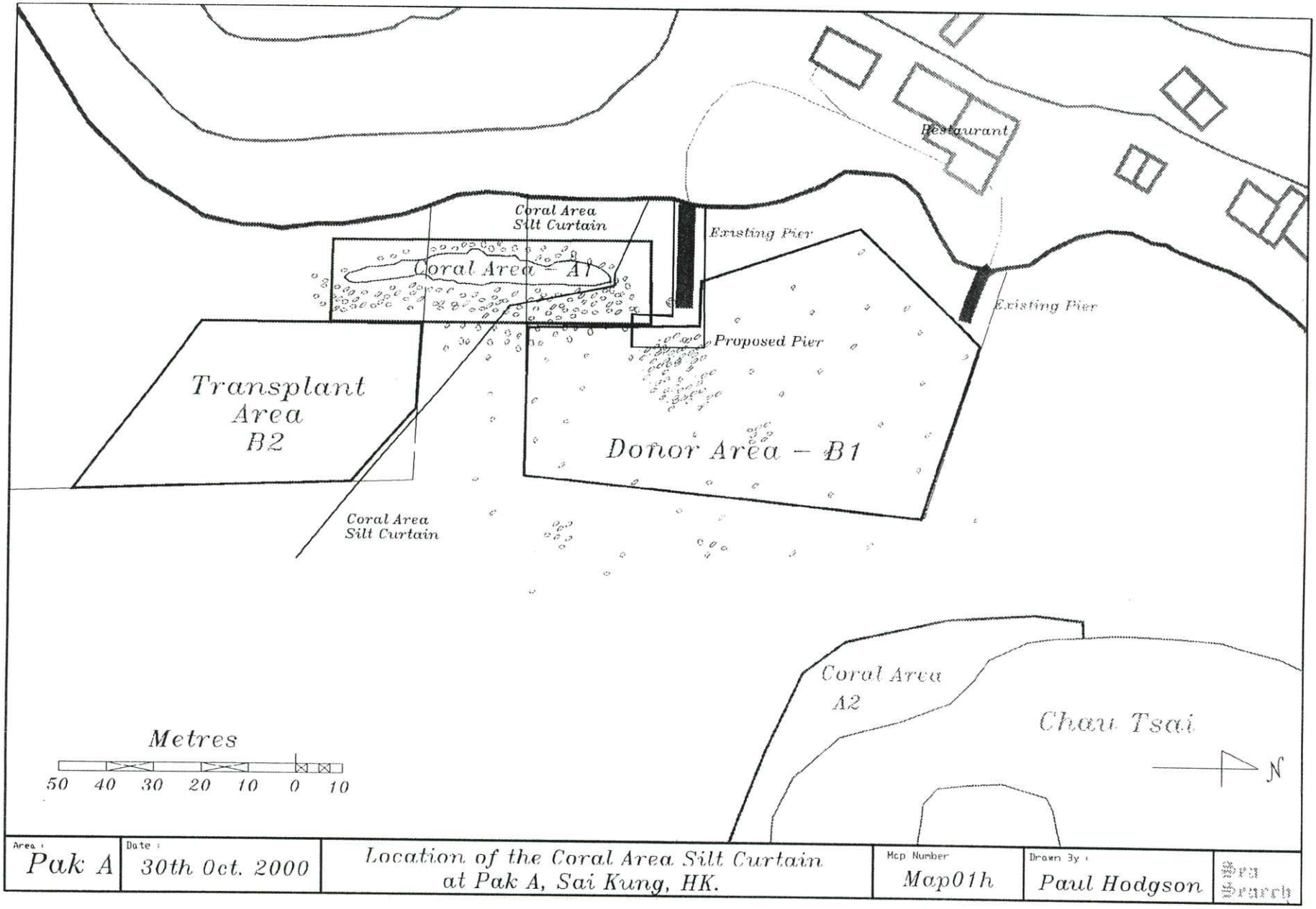

Restaurant
Coral Area
Silt Curtain
Existing Pier
Coral Area – A1
Existing Pier
Proposed Pier
Transplant
Area
B2
Donor Area – B1
Coral Area
Silt Curtain
Coral Area
A2
Chau Tsai
Metres
50 40 30 20 10 0 10
N
Area :
Pak A
Date :
30th Oct. 2000
Location of the Coral Area Silt Curtain
at Pak A, Sai Kung, HK.
Map Number
Map01h
Drawn By :
Paul Hodgson
Sea
Search

Figure2