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MateriaLab

Ref No.: 100440EN150831

Contract No. EP/SP/58/08

Sludge Treatment Facilities

Final Environmental Monitoring and Audit Report

MateriaLab Ref No.: 100440EN150831

Certified by : _____

John K. M. Ho
(Environmental Team Leader)

Date : 08 September 2015

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1. Executive Summary

Construction work commenced on 22 December 2010. It was of main concern to ascertain whether there was any undesirable effect of the construction activities on various environmental parameters over the site area and the surrounding environment. Impact environmental monitoring on water quality, landfill gas, ecology and landscape and visual impact were carried out to acquire data for assessing any impact associated with the construction activities. This final report covers the period from 22 December 2010 to 28 June 2015 inclusive.

Air Quality and Noise Level

Accordance to EIA study, there is no sensitive receiver for air and noise located nears the construction area and hence dust and noise monitoring is not required.

Marine Water Quality

Pursuant to EM&A manual, marine water quality monitoring is required during the foundation piling. Piling work was commenced on 21 February 2011 while marine water quality monitoring was conducted during the foundation piling. The foundation piling work was completed on 13 October 2011 and the pre-bore piling of the STF was completed on 22 February 2012 (the post monitoring for marine water has been completed on 20 March 2012). Although marine water quality monitoring resumed on 03 July 2012 due to the commencement of pre-bore operation for sheet piling, the pre-bore operation as planned was not carry out. Therefore the impact marine water quality monitoring was suspended on 20 August 2012 and post impact monitoring is not required.

4 non-compliance events regarding aluminium were recorded in the reporting period (from 22 December 2010 to 28 June 2015).

The recorded exceedances are not caused by the construction activities so there was no action taken with regards to the action plan.

In general, the marine water quality was not significantly deteriorated after the commencement of the piling work on 21 February 2011.

Stream Water Quality

Pursuant to Clause 5.7.1.1 of the EM&A Manual, stream water quality monitoring shall be carried out during site formation, piling and construction of the access road.

563 non-compliance events regarding dissolved oxygen, turbidity, pH and suspended solids were recorded in the reporting period (from 22 December 2010 to 28 June 2015).

The recorded exceedances are not caused by the construction activities so there was no action taken with regards to the action plan.

In general, the stream water quality was not significantly deteriorated after the commencement of the major construction works on 21 February 2011.

As the above mentioned site construction has been completed on 17 August 2012, four weeks post monitoring was commenced by 20 August 2012 and stream water quality monitoring was ended on 14 September 2012.

Landfill Gas Monitoring

Excavation works has been carried out within the WENT landfill consultation zone during the reporting period. Landfill gas monitoring was carried out by a competent person during the excavation, operation in chamber and confined space within the WENT landfill control zone and no exceedance was found.

Ecology Monitoring

Routine ecology monitoring was carried out throughout the reporting period at the Middle Lagoon. None of the birds showed any apparent signs of disturbance arising from the STF construction activities. All measures were followed to minimize the disturbance of the wildlife. No disturbance was observed while construction work in progress.

Landscape and Visual Monitoring

Monitoring of landscape and visual impact was conducted to ensure compliance with the intended aims of the measures and the effectiveness of the mitigation measures.

Radon Monitoring

Radon monitoring was carried out by a certified indoor air quality inspection body prior to the occupation of the STF buildings and quarterly during the first year of operation of the STF, in accordance with EPD's *ProPECC Note PN 1/99 Control of Radon Concentration in New Buildings Appendix 2, "Protocol of Radon Measurement for Non-residential Building"* to monitor the radon concentrations inside the occupied buildings. Details of the radon measurement before occupation can be referred to the Radon Monitoring Report Ref. No. 100440EN140865(1)A in Appendix 5, Monthly EM&A Report of February 2015.

Works Undertaken During Reporting Period

The construction phase commenced on 22 December 2010, major site activities conducted in the reporting period includes:

- Site clearance;
- Site office / facilities establishment;
- Ground investigation;
- Top layer PFA compaction;
- Backfill at a few areas and trial piling works;
- Piling works;
- Construction of ER and EPC site office;
- Excavation of sludge bunkers at plant A & B;
- Backfilling and compaction;
- Piling works at EEC Building, Viewing Gallery and Plant B;
- Excavation at Plant A & B;
- Substructure works at Plant A & B;

- Waterproofing works at Plant A & B;
- Tree transplant preparation works in Portion 6;
- Site formation;
- Waterproofing;
- Superstructure works at Plant A & B (include steel framework & truss erection);
- Steel works;
- Strut erection;
- Formwork erection;
- Substructure works: including reinforcement, formwork, concreting;
- Structure works: including reinforcement, formwork, concreting;
- Assembly of boiler;
- Structural steel erection;
- Temporary access bridge construction;
- Temporary transformer room construction;
- Welfare facilities construction (include canteen, area for morning exercise);
- Jump form;
- Roof installation;
- Mechanical installation;
- Pre-bore operation and sheet piling;
- Works over- and under-water;
- Heavy lifting;
- Tower crane climb up;
- Façade / curtain wall installation;
- Delivery of heavy machineries;
- E & M installation;
- Inter decoration;
- Precast installation;
- Space truss installation;
- Glass and steel installation;
- Condenser installation;
- Lifting installation;
- Boundary wall;
- Out-Flow Pipe installation;
- Link bridge for Viewing Gallery installation;
- Boundary wall installation;
- EEC building decoration;
- Water pool work;
- Viewing gallery installation;
- West marsahalling area;
- High-voltage Work;
- Bridge construction;
- Gondola operation;
- Road works;
- Viewing gallery construction;
- Pipe jacking;
- Cable laying;
- Water tank fixture;
- Boundary wall installation;
- Water pressure testing;
- Insulation works;
- Gardening;

- High level light;
- Water features;
- Curtain wall;
- Office moving;
- Cable installation;
- Switch board;
- Permanent lighting installation;
- T & C stage at whole work site;
- Permanent road;
- Office demonization;
- Cable ladder installation;
- Landscapes work;
- Chemical work;
- Pipe installation;
- A/C Testing;
- Removal & relocation of canteen;
- Façade cleaning;
- Fire service testing;
- Building service system testing;
- Dangerous goods store inspection;
- Insulation and cladding works;
- Removal of old canteen;
- Decoration works;
- Hard & soft landscape works;
- Fire service system testing;
- Building service installation;
- Swimming pool testing;
- Defect rectification;
- Access control system installation;
- Traffic light installation;
- Steam blow test;
- Testing on administration building;
- Replacement of defect glass;
- Fountain testing;
- Chiller & lift testing;
- Insulation and cladding works in Plant B;
- Maintenance & repair works during shutdown period;
- Air duct flushing works in Turbine B;
- Replacing FRP glasses;
- Lift maintenance;
- Defect rectification works in Turbine A & B;
- Lift inspection at maintenance workshop & admin building; and
- Dismantling of scaffolding.

Works area is shown in Figure 1.1.

Complaints, Summons and Successful Prosecutions

As far as complaints, summons and successful prosecutions on the construction work in respect of the environmental protection and pollution control was concerned, two documented complaints were received on 29 August 2011 and 08 March 2013.

Two environmental complaints were followed up by the Environmental Team in the reporting period. Investigations were carried out. The findings and the proposed mitigation measures were submitted to all relevant parties. The summary of investigation is described in Section 6.

No notification of summons and successful prosecutions was received in the reporting period.

2. Introduction

This final report reviews the progress of the environmental monitoring and audit work at the site for Contract No. EP/SP/58/08 from 22 December 2010 to 28 June 2015 (the reporting period). The monitoring results for water quality and the corresponding graphical plots are shown in Appendix 2. Findings of Landfill Gas, Ecology and Landscape monitoring are presented in Section 4. For radon monitoring, measurement details and results can be referred to the Radon Monitoring Report Ref. No. 100440EN140865(1)A in Appendix 5, Monthly EM&A Report of February 2015.

3. General Review

3.1 Background

The Contractor, VW-VES (HK) Limited, has been awarded a contract by the Environmental Protection Department of the Government of the Hong Kong Special Administrative Region for the Sludge Treatment Facilities. The location of the site is shown in Figure 3.1.

The program commenced in November 2010 and the Construction works for the Sludge Treatment Facilities were completed on 28 June 2015.

The construction schedule was based on the major works associated with the project. The major works under this contract include:

Incineration Plant

a) Sludge receiving, storage and feeding system
b) Fluidized bed incinerators
c) Waste heat recovery and power generation system
d) Flue gas treatment system
e) Ash storage and handling system
f) Residue storage and handling system
g) Fluidized bed sand storage and handing system
h) Reagent reception and storage system
i) Process control and monitoring system

Ancillary and Supporting Facilities

a) Weighbridge
b) Site security
c) Administration building
d) Vehicle washing facilities
e) Maintenance workshop and utility yard
f) Drainage system
g) Sewerage system
h) Sewage treatment works
i) Water supply system
j) Deodorization system

Construction program for the captioned project is enclosed in Appendix 3.

Fugro Technical Services Ltd. – MateriaLab Division (MateriaLab) has been commissioned by the client as the Environmental Team which comprises the monitoring staff and the environmental auditor to undertake the environmental monitoring and audit work for this project. The project management structure and organization chart is shown in Appendix 4.

The contact person and telephone numbers of key personnel for the captioned project are shown in Table 3.1.

Table 3.1 The Contact Persons and Telephone Numbers of Key Personnel

Company / Department	Role in the Contract	Contact Person	Telephone Number
VW-VES (HK) Limited	Contractor	Mr. Vincent Deleu	2253 2600
Environmental Protection Department	Employer	Mr. Kenneth Chan	2872 1800
Environmental Protection Department, EIAO	EIAO Officer	Mr. Thomas To	2835 1103
JACOBS	Employer Representative	Mr. Leslie Swann	2880 9788
Fugro Technical Services Ltd. – MateriaLab Division	Environmental Team	Mr. John Ho	2450 8233
BMT Asia Pacific Ltd.	Independent Environmental Checker	Ms. Claudine Lee	2241 9847

3.2 Summary of Environmental Monitoring and Audit (EM&A) Requirements

The EM&A program requires the monitoring of water quality prior to the commencement of and during the construction. A baseline report was prepared in December 2010 for the contract based on monitoring data acquired before the commencement of construction works.

Impact monitoring of water quality is to be undertaken at the designated monitoring stations. The monitored parameters are summarized in Table 3.2.

Action and Limit (AL) levels are established based on the data from the baseline report. Should the monitoring results indicate any non-compliance of AL levels, actions according to the Event / Action Plan in Appendix 5 are to be followed and appropriate environmental mitigation measures as in Appendix 6 are to be implemented to rectify the situation. The implementation status of mitigation measures is also shown in Appendix 6.

Impact ecology and visual survey are to be conducted at the construction area on regular basis. Monitoring parameters are tabulated in Table 3.2.

Radon monitoring should be carried out by a certified indoor air quality inspection body prior to the occupation of the STF buildings and quarterly during the first year of operation of the STF, in accordance with EPD's *ProPECC Note PN 1/99 Control of Radon Concentration in New Buildings Appendix 2, "Protocol of Radon Measurement for Non-residential Building"* to monitor the radon concentrations inside the occupied buildings. Monitoring parameters are tabulated in Table 3.2.

The Contractors (VW-VES (HK) Limited) is responsible for waste control within the construction site, removal of the waste material produced from the site and to implement any mitigation measures to minimize waste or redress problems arising from the waste from the site. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land, storm sewer, sanitary water, or any waste matter or refuse to be deposited anywhere within the site or onto any adjoining land.

The Contractor shall also pay attention to the Waste Disposal Ordinance, the Dumping at Sea Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance, and carry out the appropriate waste management work. The relevant licence / permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained. The Contractor shall refer to the relevant booklets issued by EPD when applying for the licence / permit.

The environmental mitigation measures and status for waste management are summarized in Appendix 6.

Table 3.2 Summary of Monitored Parameters

Parameters	Monitored Items	Number of Stations	Frequency	Requirement
Marine water	▪ Cadmium ▪ Chromium ▪ Aluminium	2 monitoring stations and 1 control station	Three days per week for mid-ebb and mid-flood tides during foundation piling of the STF.	Sampling is taken at three water depths, namely, 1m below water Surface, mid-depth and 1m above sea bed, except where the water depth be less than 6m, in which case the mid-depth station may be omitted. Shall the water depth be less than 3m, only the mid-depth station will be monitored.
Stream water	▪ pH ▪ Turbidity ▪ Suspended solids ▪ Dissolved oxygen	3 monitoring stations and 2 control stations	Three days per week for mid-ebb and mid-flood tides during site formation and foundation piling of the STF and construction of the access road.	▪ Two consecutive measurements of DO concentration, DO saturation, turbidity and pH are taken at mid-depth at each location. ▪ Water samples for SS measurement is collected at the same depth at each location.
Ecology	Site condition and bird monitoring	Whole Middle Lagoon and 20m from the boundary of the Lagoon	▪ Monthly monitoring for avifauna. ▪ Habitat monitoring at least twice per month. ▪ Monthly vegetation monitoring.	▪ Avifauna and their behavior. ▪ All birds seen and heard should be identified and counted. ▪ Signs of breeding of birds. ▪ Coverage of water and PFA filling activities in Middle Lagoon.

Table 3.2 (Con't)

Parameters	Monitored Items	Number of Stations	Frequency	Requirement
Landscape and Visual Impact	All measures, including compensatory planting, undertaken by both the Contractor and the specialist Landscape Sub-Contractor	East Lagoon	Biweekly.	Ensure compliance with the intended aims of the measures and the effectiveness of the mitigation measures.
Landfill gas	▪ Oxygen ▪ Methane ▪ Carbon dioxide	Excavation, operation in chamber and confined space within the WENT Landfill Control Zone. (See Figure 3.2)	During the construction and operation.	▪ Excavation between 300mm to 1m deep: - Directly after the excavation has been completed. - Periodically whilst the excavation remains open. ▪ Excavation deeper than 1m: - At ground surface before excavations commences. - Immediately before any worker enters the excavation. - At the beginning of each working day for the entire period the excavation remains open. - Periodically whilst the excavation remains open.
Radon	Bq/m^3	45 Sampling Locations	Prior to the occupation of the STF buildings and quarterly during the first year of operation of the STF.	To confirm that the radon level complies with the guideline value stipulated in EPD ProPECC Note PN 1/99.

3.3 Action and Limit Levels

Water Quality Limit

Environmental auditing on the monitoring data is to be undertaken based on the Action and Limit (AL) levels for water quality to check against any non-compliances.

The AL levels for monitored parameters are formulated from the baseline monitoring data. The AL levels for marine and stream water quality are tabulated in Table 3.3.

Table 3.3 Action and Limit Levels for Marine and Stream Water Quality

Parameters	Action Level	Limit Level
DO in mg/L (mid-depth)	≤ 5.16	≤ 4
SS in mg/L (mid-depth)	≥ 41 AND 120% of control station's SS on the same day of measurement	≥ 85 AND 130% of control station's SS on the same day of measurement
Turbidity in NTU (mid-depth)	≥ 36.4 AND 120% of control station's turbidity on the same day of measurement	≥ 78.9 AND 130% of control station's turbidity on the same day of measurement
pH	pH ≤7.55 or pH ≥ 8.11	pH ≤ 6 or pH ≥ 9
Cadmium in μg/L	≥ 0.5	≥ 0.5
Chromium in μg/L	≥ 1	≥ 1
Aluminium in μg/L	≥ 20	≥ 20

Notes:
1. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
2. For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Landfill Gas Limit

Depending on the results of the measurements, actions required will be vary and should be set down by the Safety Officer or other appropriately qualified person. The actions shown in Table 3.4 should be referred as the minimum requirements to be encompassed.

Table 3.4 Action Level for Landfill Gas Measurement

Parameter	Measurement	Action
Oxygen	<19 %	▪ Ventilate to restore oxygen to >19 %
	<18 %	▪ Stop works ▪ Evacuate personnel / prohibit entry ▪ Increase ventilation to restore oxygen to >19 %
Methane	>10 % LEL (i.e. >0.5 % by volume)	▪ Prohibit hot works ▪ Ventilate to restore methane to <10 % LEL
	>20 % LEL (i.e. >1 % by volume)	▪ Stop works ▪ Evacuate personnel / prohibit entry ▪ Increase ventilation to restore methane to <10 % LEL
Carbon dioxide	>0.5 %	▪ Ventilate to restore carbon dioxide to <0.5 %
	>1.5 %	▪ Stop works ▪ Evacuate personnel / prohibit entry ▪ Increase ventilation to restore carbon dioxide to <0.5 %

Objective for Radon Monitoring

The average radon concentration during the measurement period should preferably be lower than the territory-wide mean concentration of 100 Bq/m^3 and in any case, any individual measurement must not exceed 200 Bq/m^3.

4. Construction Phase Environmental Monitoring

The construction phase was commenced on 22 December 2010. During the construction phase, impact water quality monitoring for marine and stream is required.

Impact water quality monitoring was performed at three locations with two control stations at Tsang Kok Stream; and two marine locations with one control station in Deep Bay Zone. Ecology and Visual Impact monitoring were carried out at the East and the Middle Lagoon. The locations of the water monitoring station selected as the nearest water sensitive receivers are shown in Appendix 1.

4.1 Water Quality Monitoring

4.1.1 Monitoring Methodology

Marine Water Quality

During the course of foundation piling of the STF, the impact conditions of marine water quality are measured at two monitoring stations and one control station with coordinates as shown in Appendix 1. The Environmental Team Leader shall agree with the IEC and EPD on all the monitoring stations.

During the course of foundation piling, impact monitoring shall be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling and measurement at the designated monitoring stations.

Samples are to be taken at three water depths, namely 1m below water surface, mid-water and 1m above seabed at both mid-flood and mid-ebb tides, except where the water depth is less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only mid-depth will be monitored.

Water samples should be kept in chilled condition (~4°C) during delivery to laboratory and before commencement of the analysis. The parameters of laboratory analysis include Cadmium, Chromium and Aluminium. The method statements are shown in Table 4.1.

Table 4.1 Method Statements of Laboratory Analysis of Marine Water Quality

Parameters	Method	Detection limit, µg/L
Cadmium	USEPA method 6020A	0.5
Chromium		1
Aluminium		20

Stream Water Quality

Monitoring of pH, turbidity level (NTU), suspended solids level (mg/L), and dissolved oxygen (mg/L) are conducted at the designated locations including three monitoring stations and two control stations as shown in Appendix 1. The method statements are shown in Table 4.2.

Dissolved oxygen, turbidity and pH are measured in-situ while suspended solids content is determined in a HOKLAS accredited laboratory.

Impact monitoring is undertaken three days per week during mid-ebb and mid-flood tides.

Table 4.2 Method Statements of Laboratory Analysis of Stream Water Quality

Parameters	Method	Detection limit, mg/L
Suspended solids	APHA, 18th edition, 2540D	1

4.1.2 Impact Water Quality Monitoring

Graphical plot of average measurement is enclosed in Appendix 2.

During the course of the monitoring work, top layer PFA compaction, cut and fill operation, construction of EPC's office, piling works and excavation of sludge bunkers were observed within the project area.

The number of water quality monitoring events in each month of the reporting period is presented in Table 4.3.

Table 4.3 Summary of Water Quality Monitoring

Monitoring Parameters		22 Dec 2010 to 28 June 2015
Marine water	Cd, Cr and Al	172 events
Stream water	DO, DOS, pH, SS, Temp and Turbidity	267 events

4.1.3 Summary of Non-compliances of the Environmental Quality Performance Limits from 22 December 2010 to 28 June 2015

Marine Water Quality

4 events of non-compliance regarding Aluminium content were recorded on various days from 22 December 2010 to 28 June 2015.

Stream Water Quality

2 events of non-compliance regarding DO, 183 events of non-compliance regarding turbidity, 188 events of non-compliance regarding pH and 190 events of non-compliance regarding SS were recorded on various days from 22 December 2010 to 28 June 2015.

The summary of non-compliance is shown in Table 4.4.

Table 4.4 Summary of Monitoring Non-Compliance

Monitored Parameter		22 Dec 2010 to 28 June 2015	
		Action	Limit
Stream water	Turbidity	22 events	161 events
	Suspended Solid	31 events	159 events
	pH	188 events	0
	Dissolved oxygen	2 events	0

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Table 4.4 (Con't)

Monitored Parameter		22 Dec 2010 to 28 June 2015	
		Action	Limit
Marine water	Cadmium	0	
	Chromium	0	
	Aluminium	4 events	

Remark: The number of non-compliances is shown

4.1.4 Review of the Events Non-compliance

4.1.5.1 Marine Water Quality Monitoring

Jan 2012

- Sheet piling and associated pre-drilling works for the construction of seawater intake has been carried out since 21 December 2011. The water was clear around the sampling location during marine water quality monitoring.
- 1 event of exceedance of aluminium was recorded at mid-flood on 10 January at M1. Since the exceedance recorded was the first exceedance reported, so it is not possible to confirm the cause of the exceedance with limited data. The aluminium content recorded in the afternoon of the same day (mid-ebb) returned to <20 µg/L.
- After received the most updated results, the aluminium content of seawater collected on the consecutive days (12 and 14 January 2012) after the incident was found to return below the trigger level (<20µg/L). No potential source of impact was identified and hence, the exceedance should not be related to the Project.
- With regards the exceedance and pursuant to the Action Plan, the frequency of monitoring has been increased to daily basis starting on 21 January 2012. After received the most updated results, the aluminium content of seawater collected on the consecutive days after the incident was found to return below the trigger level.

July 2012

- 1 event of exceedance of aluminium was recorded at mid-flood on 03 July 2012 at M1. Since the pre-bore operation for sheet piling has not commenced yet, so that the exceedance was not caused by the construction work. The aluminium content in the afternoon (mid-ebb) returned to <20 µg/L. No potential source of impact was identified and hence, the exceedance should not be related to the Project.

Aug 2012

- 2 events of exceedance of aluminium were recorded at mid-ebb on 25 July 2012 at M1. Since the pre-bore operation for sheet piling has not commenced yet, so that the exceedance was not caused by the construction work. Heavy rainstorm occurred in the morning, the seabed sediment was stirred up by rainstorm also contributed to the aluminium level at M1. The marine water quality monitoring conducted on 27 July 2012 indicated that the aluminium content returned to <20

µg/L. No potential source of impact was identified and hence, the exceedance should not be related to the Project.

4.1.5.2 Stream Water Quality Monitoring

Feb 2011

- The exceedance was due to low suspended solids content and turbidity recorded at control station, C2.

Mar 2011

- The exceedance was due to low suspended solids content and turbidity recorded at control station, C2.
- 2 events of exceedance, one related to suspended solids and one for turbidity, are higher than A/L level derived from baseline data on 1st March 2011 (mid-flood) and 19 March 2011 (mid-flood). Both cases were caused by stir up of river bed and not construction activities related.
- 6 events of exceedance of pH were recorded on 01 and 03 March 2011 at various location, the exceedance was subjected to influent of high pH from C2.

Apr 2011

- The exceedance was due to low suspended solids content and turbidity recorded at control station, C2.
- 2 events of exceedance related to suspended solids are higher than A/L level derived from baseline data on 16 April 2011. Both cases were recorded at W1 that was influent by Deep Bay water and not construction activities related.
- 15 events of exceedance of pH were recorded on 02, 09, 12, 14 and 16 April 2011 at various location, the exceedance was subjected to influent of high pH from C2.

May 2011

- The exceedance was due to low suspended solids content and turbidity recorded at control station, C2.
- 2 events of exceedance related to suspended solids are higher than A/L level derived from baseline data on 14 May 2011. Events were recorded at W1 and W2 that was influent by Deep Bay water and not construction activities related.
- 17 events of exceedance of pH were recorded on 26, 28, 30 April 2011, 03, 09, 12 and 17 May 2011 at various location, the exceedance was subjected to influent of high/low pH from upstream of the Tsang Kok stream.

June 2011

- The exceedance was due to low suspended solids content and turbidity recorded at control station, C2.
- One event of exceedance related to turbidity and suspended solids are higher than A/L level derived from baseline data at mid-flood on 11 June 2011. Events were recorded at W1 and W2 that was influent by Deep Bay marine water and not construction activities related.

- One event of exceedance of pH were recorded at mid-flood on 28 May 2011 at various location, the exceedance was subjected to influent of high pH from upstream of the Tsang Kok stream.

July 2011

- The exceedances were due to heavy rain which could affect the results.
- 9 events of exceedance of pH were recorded at mid-flood or mid-ebb during July 2011 at various locations, the events were recorded at W2 and W3 due to influence of low pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Aug 2011

- The exceedances were were subject to the influent of the high or low pH from C1 and/or C2.
- 18 events of exceedance of pH were recorded at mid-flood or mid-ebb during August 2011 at various locations, the events were recorded at W1, W2 and W3 due to influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.
- 2 events of exceedance of SS were recorded at mid-flood or mid-ebb of late July at various locations, the events were recorded at W1 and W3 due to occasional collection of dense solid particles at W3 as the low turbidity was taken at W3 during the same sampling period, and stirring up of seabed materials near W1 when the Deep Bay water surface became rough after Typhoon Signal No.1 was hoisted.

Sept 2011

- The exceedances were subject to the influent of the high or low pH from C1 and/or C2.
- 28 events of exceedance of pH were recorded at mid-flood or mid-ebb during September 2011 at various locations. The events were recorded at W1, W2 and W3 due to influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.
- 3 events of exceedance of SS were recorded at mid-flood or mid-ebb of September 2011 at W2. The events were recorded at W2 due to occasional collection of dense solid particles at W2 and stirring up of riverbed sediment near W2 during tidal movement. The exceedances were not related to construction activity.

Oct 2011

- The exceedances were subject to the influent of the low pH from C2. The exceedances recorded on 20 October 2011 were caused by tidal wave and the stirring up of riverbed sediment. Ad-hoc Turbidity and SS monitoring at location near estuary were 6.54 / 5.85 NTU and 6.0 / 5.0 mg/L respectively, so that the exceedances were not related to the construction activities.
- 21 events of exceedance of pH were recorded at mid-flood or mid-ebb during October 2011 at various locations. The events were recorded at W1, W2 and W3 due to influence of low pH from upstream of the Tsang Kok stream, tidal wave

and the stirring up of riverbed sediment and not owing to construction activities related.

- 1 event of exceedance of turbidity was recorded at mid-ebb of October 2011 at W1. The event was recorded at W1 due to tidal wave and the stirring up of riverbed sediment. The exceedance was not related to construction activity.
- 2 events of exceedance of SS were recorded at mid-ebb of October 2011 at W1 and W2. The events were recorded at W1 and W2 due to tidal wave and the stirring up of riverbed sediment. The exceedances were not related to construction activity.

Nov 2011

- 2 events of exceedance of dissolved oxygen were recorded at mid-ebb on 03 November 2011 at W1 and W2. The event was recorded at W1 and W2 due to occasional stagnancy of stream water. The stream water quality monitoring conducted in the afternoon of 03 November 2011 indicated that DO level restored to normal condition. Thus, the exceedance should not be related to the Project.
- 8 events of exceedance of pH were recorded at mid-flood or mid-ebb during November 2011 at various locations. The events were recorded at W1, W2 and W3 due to the influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.
- 1 event of exceedance of SS was recorded at mid-flood on 01 November 2011 at W1. The event was caused by tidal wave and the stirring up of riverbed sediment. Hence, the exceedance should not be related to the Project.

Dec 2011

- 2 events of exceedance of turbidity were recorded at mid-flood on 01 December 2011 at W1 and W2. 1 event of exceedance of SS was recorded at mid-flood on 01 December 2011 at W1. The events were due to the stirring up of riverbed sediment by tidal wave. Hence, the exceedance should not be related to the Project.
- 13 events of exceedance of pH were recorded at mid-flood or mid-ebb during December 2011 at various locations. The events were recorded at W1, W2 and W3 due to the influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Jan 2012

- 5 events of exceedance of pH were recorded at mid-ebb during January 2012 at various locations. The events were recorded at W1, W2 and W3 due to the influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Feb 2012

- 2 events of exceedance of pH were recorded at mid-ebb during February 2012 at various locations. The events were recorded at W2 and W3 due to the influence of low pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Mar 2012

- 3 events of exceedance of turbidity were recorded at mid-flood on 24 March 2012 at W1, W2 and W3. 2 events of exceedance of SS were recorded at mid-flood on 24 March 2012 at W2 and W3. The events were caused by occasional floating debris. The stream water quality monitoring conducted in the afternoon of 24 March 2012 indicated that NTU level and suspended solids content restored to normal condition. Hence, the exceedance should not be related to the Project.
- 7 events of exceedance of pH were recorded at mid-ebb during March 2012 at various locations. The events were recorded at W2 and W3 due to the influence of low or high pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Apr 2012

- 4 events of exceedance of turbidity were recorded at mid-flood on 05 and 19 April 2012 at various locations. 4 events of exceedance of SS were recorded at mid-flood on 05 and 19 April 2012 at various locations. The events were caused by heavy rainstorm which occurred in the afternoon, soil and other runoff was flushed into the river and the riverbed sediment at upstream of W1 was stirred up by the runoff. During the flood tide the stirred up muddy water was flowing to W1, W2 and W3, and caused the exceedance. Hence, the exceedance should not be related to the Project.
- 5 events of exceedance of pH were recorded at mid-ebb and mid-flood during April 2012 at various locations. The events were recorded at various locations due to the influence of low or high pH from upstream of the Tsang Kok stream. Heavy rainstorm occurred in the afternoon, soil and other runoff was flushed into the river. Rainwater with pH near 7.0 caused the pH at W1, W2 and W3 dropped to below 7.55, so that the exceedance was not owing to construction activities related.

May 2012

- 2 events of exceedance of pH were recorded at mid-ebb on 30 April 2012 at various locations. The events were recorded at various locations due to the influence of low pH from upstream of the Tsang Kok stream, so that the exceedance was not owing to construction activities related.

June 2012

- 2 events of exceedance of pH were recorded at mid-ebb on 13 June 2012 at various locations. The events were recorded at various locations due to the influence of low pH from upstream of the Tsang Kok stream, so that the exceedance was not owing to construction activities related.

July 2012

- 1 event of exceedance of turbidity was recorded at mid-ebb on 23 July 2012 at W1. 1 event of exceedance of SS was recorded at mid-ebb on 23 July 2012 at W1. The events were caused by heavy rainstorm occurred in the afternoon, soil and other runoff were flushed into the river and the riverbed sediment at

upstream of W1 was stirred up by the runoff. Muddy discharge from the WENT Landfill also contributed to the turbidity and suspended solids levels at W1. Hence, the exceedances should not be related to the Project.

- 11 events of exceedance of pH were recorded at mid-ebb during July 2012 at various locations. The events were recorded at W1, W2 and W3 due to the influence of low pH from upstream of the Tsang Kok stream and not owing to construction activities related.

Aug 2012

- 15 events of exceedance of pH were recorded at mid-ebb or mid-flood during August 2012 at various locations. The events were recorded at W1, W2 and W3 due to the influence of low pH from upstream of the Tsang Kok stream, heavy rainstorm occurred in 27 July 2012, soil and other runoff were flushed into the river, and rainwater with pH near 7.0 caused the pH at W1, W2 and W3 dropped to below 7.55 and not owing to construction activities related.

Sept 2012

- 1 event of exceedance of pH was recorded at mid-flood during September 2012 at W3. Since W3 was located at the downstream of C2, so that the exceedance was subject to the influent of the high pH and the natural flow from C2, and not owing to construction activities related.

4.2 Landfill Gas Monitoring

4.2.1 Monitoring methodology

4.2.1.1 Routine monitoring should be carried out in all excavations, manholes, chambers, relocation of monitoring wells and any other confined spaces that may have been created. All measurements in excavations should be made with the extended monitoring tube located not more than 10mm from the exposed ground surface. Monitoring should be performed properly to make sure that the area is free of landfill gas before any man enters into the area.

4.2.1.2 For excavations deeper than 1m measurements should be carried out:

- at the ground surface before excavation commences;
- immediately before any worker enters the excavation;
- at the beginning of each working day for the entire period the excavation remains open; and
- periodically through out the working day whilst workers are in the excavation.

4.2.1.3For excavations between 300mm and 1m deep, measurements should be carried out:

- directly after the excavation has been completed; and
- periodically whilst the excavation remains open.

4.2.1.4 For excavations less than 300mm and 1m deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.

4.2.1.5 Depending on the results of the measurements, actions required will vary and should be set down by the Safety Officer or other appropriately qualified person. As a minimum these should encompass those actions specified in Table 3.4.

4.2.2 Monitoring result

Excavation works has been carried out within the WENT landfill consultation zone for the following construction activities during the reporting period (from 22 December 2010 to 28 June 2015): Excavation of Eastern Water Detention Basin at South East corner of Works Portion 1; Portion 1 (next to Plant B); Portion 1 (next to Water Treatment); Portion 1 (AEE Storage Yard); Portion 1 (Landscaping Pond); Portion 3 (next to Canteen); Portion 3 (next to / near Tree T758); East Road near AEE Storage Yard. The excavation depth is more than 1m, and landfill gas monitoring was conducted by a competent person according to methodology stated in section 4.2.1.

Full compliance was achieved in the reporting period (from 22 December 2010 to 28 June 2015).

Summary of Landfill Gas Monitoring is presented in Table 4.5.

Table 4.5 Summary of Landfill Gas Monitoring

Sampling Location	22 Dec 2010 to 28 June 2015
Excavation of Eastern Water Detention Basin at South East corner of Works Portion 1	18 monitoring events
Portion 1 (next to Plant B)	287 monitoring events
Portion 1 (next to Water Treatment)	28 monitoring events
Portion 1 (AEE Storage Yard)	481 monitoring events
Portion 1 (Landscaping Pond)	541 monitoring events
Portion 3 (next to Canteen)	168 monitoring events
Portion 3 (next to / near Tree T758)	415 monitoring events
East Road near AEE Storage Yard	355 monitoring events
Total	2293 monitoring events

4.3 Ecological Monitoring

4.3.1 Routine ecology monitoring was carried out throughout the reporting period (from 22 December 2010 to 28 June 2015) at the Middle Lagoon to assess the measures in place to minimise the disturbance impact to wildlife. The 3m high hoarding to reduce disturbance impact of human activities on adjacent areas (namely the Middle Lagoon and other natural habitats) remains in place. No observations of disturbance through construction operations to wildlife on adjacent habitats were made during the reporting period.

4.3.2 Monthly monitoring of avifauna and their notable behaviour, such as breeding activities in the Middle Lagoon, was conducted in the reporting period. The Monitoring Area included the whole Middle Lagoon and area extending 20m from the boundary of the Lagoon (see Figure 4.1). All birds seen and heard were identified and counted. Any signs of breeding (e.g. nests, recently fledged juveniles) of birds (e.g. Little Grebe) were also recorded. The coverage of water and PFA filling activities in the Middle Lagoon as well as construction activities were also recorded as reference information.

Summary of Ecological Monitoring is presented in Table 4.6.

Table 4.6 Summary of Ecological Monitoring

Monitored Parameters		22 Dec 2010 to 28 June 2015
Ecology	Avifauna	55 monitoring events
	Habitat	137 monitoring events
	Vegetation	134 monitoring events

4.4 Landscape and Visual Impact Monitoring

The landscape and visual impact assessment of the EIA Study recommended a series of mitigation measures to ameliorate the landscape and visual impacts of the Project. The measures for the construction phase as recommended in the EIA Report are summarized in 4.7.

Site inspections for the monthly EM&A Record for Landscape and Visual Impact were undertaken in the reporting period (from 22 December 2010 to 28 June 2015). Observation of the implementation of proposed landscape and visual mitigation measures are summarized in Table 4.7.

Table 4.7 Record of Implementation of the Proposed Landscape and Visual Mitigation Measures in Construction Phase

ID No.	Nature / Type	Landscape and Visual Mitigation Measures	Status	Remarks
CM1	Design / Construction Planning	Topsoil, where identified, should be stripped and stored for re-use in the construction of the soft landscape works, where practical.	Not applicable.	Suitable topsoil already imported for planting during landscape planting phase. As per observation on site, the PFA excavated out due to site formation work had been under treatment (dehydration), and is backfilled to its original location inside the site boundary. Capping of the PFA is established to prevent spreading in air.
CM2	Site Practice	Existing trees to be retained on site should be carefully protected during construction.	The contractor has confirmed T758 to be retained on site and proper tree protection would be required for T758. Amendment to the tree felling application already updated and sent to DLO on 17 July 2013.	

Table 4.7 (Con't)

ID No.	Nature / Type	Landscape and Visual Mitigation Measures	Status	Remarks
CM3	Design / Construction Planning	Trees unavoidably affected by the works should be transplanted where practical.	Total 13 nos. of transplant trees have been transplanted back to the site.	There have 2 transplant trees are found dead in March 2014. Compensatory trees have been proposed in the revised compensatory planting proposal in compensation for the loss of the 2 trees. Condition of the other transplanted trees is under close monitoring.
CM4	Design / Construction Planning	Compensatory tree planting should be provided to compensate for felled trees.	All of the compensatory trees planting required have been completed. Trees sizes, girth, species tallied with the submitted compensatory tree plan.	All of the compensatory trees planting required has been completed.
CM5	Site Practice	Control of night-time lighting.	In progress.	Night-time work was implemented from 7pm to 6am for certain period in the reporting period. The lighting is confined to the construction site without affecting the periphery area.
CM6	Design / Construction Planning	Erection of decorative screen hoarding compatible with the surrounding setting.	Completed.	Erection of decorative screen hoarding has been set up along the site boundary.

CM1 - Topsoil, where identified, should be stripped and stored for re-use in the construction of the soft landscape works, where practical.
Topsoil found within the project site is PFA. Suitable topsoil already imported for planting. All PFA excavated during the tree felling works has been retained in the site confinement. The PFA has been under dehydration and concealed properly to prevent spreading in the air. Backfill of PFA to its original location inside site area has been completed.

CM2 – Existing trees to be retained on site should be carefully protected during construction. The Tree felling work approved under the Phase 1 and 2 tree felling application has been completed. Proper procedures of tree felling have been observed. The tree felling works should not cause damages to the existing trees on site. T758 has been confirmed to be retained on site. Proper tree protection should be set up for T758.

CM3 – Trees unavoidably affected by the works should be transplanted where practical.

Total 13 nos. of transplant trees have been transplanted back to the site in August and September 2013. There have 2 more transplant trees found dead in the March 2014. Compensatory trees will be proposed in the revised compensatory planting proposal in compensation for the loss of the 2 trees. Status of the other transplant trees is under close monitoring.

CM4 – Compensatory tree planting should be provided to compensate for fell trees.
Revised compensatory planting plan amendment submission awaiting approval from DLO. All of the compensatory tree planting has been completed. Trees sizes, girth, species tailored with the submitted compensatory tree plan.

CM5 – Control of night-time lighting.
Night-time work was implemented from 7pm to 6am for certain period in the reporting period. The lighting is confined to the construction site without affecting the periphery area.

CM6 – Erection of decorative screen hoarding compatible with the surrounding setting.
Construction of decorative screen hoarding compatible with the surrounding setting has been set up in January 2011.

Summary of Landscape and Visual Impact Monitoring is presented in Table 4.8.

Table 4.8 Summary of Landscape and Visual Impact Monitoring

Monitored Parameters		22 Dec 2010 to 28 June 2015
Landscape	Compliance of mitigation measures	109 monitoring events

4.5 Radon Monitoring

Radon monitoring measurement for Sludge Treatment Facilities in East Ash Lagoon area at Tsang Tsui was conducted from 25 August 2014 to 01 February 2015.

Monitoring methodology, equipment, calibration certificates, sampling locations, results and recommendations can be referred to the Radon Monitoring Report Ref. No. 100440EN140865(1)A in Appendix 5, Monthly EM&A Report of February 2015.

5. Construction Site Environmental Audit

Site Audit

Site audit is necessary to ensure:

- No unacceptable practice on site;
- Identification of potential impacts associated with construction activities; and
- Implementation of additional mitigation measures if necessary.

In the reporting period, 238 site inspections were carried out for the Project.

Regarding the air quality, access road were watered regularly by water truck or water sprinklers. Most of the site area has been covered by backfill material or coarse asphalt / aggregate. Moisture content of backfill materials and PFA stockpile had to be kept at the designed level before backfilling operation. Contractor should follow the good site practice to minimize the pulverized fuel ash from blowing up from dried surface.

With respect to water quality monitoring, one temporary water detention basin has been constructed at the North of the Lagoon near the ER's office (the west water detention basin has been backfilled). If there is any wastewater generated which will be pumped into the basin and will not be discharged out of the site. Construction of drainage system and the site drainage has been completed.

Waste Management

C&D Waste	Backfill and excavation works were conducted during the reporting period. C&D waste was generated from construction activities and sent to public fill.
General Refuse	Paper / cardboard, metal and plastics were collected by recycling collectors as far as practicable and general refuse was collected and sent to WENT Landfill.
Chemical Waste	177,323 kg solid and 14,032 litres liquid chemical waste were generated during the reporting period and collected by licensed contractor
Wastewater	Rain water was treated by the silt removal facilities before discharged outside the site. Waste was collected by licensed collector.

Waste Flow Summary is presented in Table 5.1.

Ref No.: 100440EN150831

Table 5.1 Waste Flow Summary

Type of Waste	Cumulative Quantity during Construction Period
Inert C&D waste*	30,949.070m^3
Chemical waste (Liquid)	14,032.000 L
Chemical waste (Solid)	177,323.000kg
Metal	2,904,617.463kg
Paper / Cardboard Packaging	55,027.500kg
Plastic	6,897.000kg
Others, e.g. general refuse	6,167.544m^3

Remarks: Density of Inert C&D waste and general refuse is 1.9 tonne/m^3 and 1.6 tonne/m^3 respectively
* The total quantity generated of Insert C&D Waste in April 2012 and May 2012 were revised as the quantities of reused in other projects need to be included

6. Summary of Complaints, Summons and Successful Prosecutions

As far as complaints, summons and successful prosecutions on the construction work in respect of the environmental protection and pollution control was concerned, two documented complaints were received on 29 August 2011 and 08 March 2013. Two environmental complaints were followed up by the Environmental Team in the reporting period. Investigations were carried out. The findings and the proposed mitigation measures were submitted to all relevant parties.

One documented complaint was received on 29 August 2011 regarding to tree cutting outside the construction area, which caused dust emission and the dumping of construction wastes were observed. After the investigation, ET were informed by the Contractor and checked the registry in Lands Department that the subject location belongs to CLP but not the public places. The Contractor has removed grass for survey work inside CLP's land that was agreed with CLP, and no tree felling was conducted in that area. The Contractor have placed some imported C&D materials to cover the exposed PFA after grass cutting to reduce the risk of dust emission. Based on the findings, ET found no environmental related non-compliance at the location stated in the compliant received.

One documented complaint was forwarded by EPD from a Hong Kong Citizen on 08 March 2013. The complainant discovered that the wheels of vehicles leaving the STF construction site were not washed off such that mud was deposited along Lung Kwu Tan Road and re-suspended in air to cause fugitive dust emission. Referring to the weekly site inspection conducted on 01 and 07 March 2013, the Contractor provided a workable and effective wheel washing system at the exit point of the site, comprising with high pressure water jets, metal grating capable for supporting the heaviest vehicles and a tough for collecting waste water. The floor area of the site exit point had been paved and was watered by site workers at the exit point. The site workers /security guards has stopped those vehicles leaving the site without wheel cleaning or bypass the wheel washing system and Bob Cat with sweeper was used to clean out the mud on paved road.

Furthermore, a TSP monitoring station was set up near the site exit to monitor the level of airborne TSP due to site operation. The average TSP levels measured on 04 and 08 March 2013 were 101 μg/m³ and 84 μg/m³ respectively and they were not exceed the action level. This reflected that the dust mitigation control measures in the proximity of the site exit e.g. watering frequency, implementation of the wheel washing system etc., were remained effective.

The Contractor was reminded to review on the control of construction site emissions, such as increase the watering frequency on dusty areas, ensuring all vehicles leaving the site are washed either by wheel washing facility or manually by high pressure water jet. In addition, some reminder notices were distributed to remind all site personnel with cars for wheel washing before they leave. Also, the notice was posted at the site exit to remind all vehicle drivers to stop and ensure that their cars were cleaned properly.

No summons and successful prosecutions in association with the construction activities concerning the environmental protection and pollution control were received in the reporting period.

Summary of Environmental Complaints and Prosecutions is presented in Table 6.1.

Table 6.1 Summary of Environmental Complaints and Prosecutions

Complaints Logged	Summons Served	Successful Prosecution
2	0	0

7. Review of the Validity of EIA Predictions

Air Quality

The potential air quality impacts from the construction of the Project would mainly be related to construction dust from excavation, materials handling, filling activities and wind erosion. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation, dust impact on nearby air sensitive receivers would be minimal.

Noise Impact

No existing or planned noise sensitive receivers (NSRs) were identified within 300m from the site boundary of the Project. Potential impacts due to noise generated from the construction of the Project and fixed plant noise from the operation of STF are not expected.

Water Pollution

The potential sources of water quality impact arising during the construction phase of the Project include construction site runoff and drainage, wastewater generated from general construction activities, and sewerage from the workforce. With implementation of the recommended mitigation measures and site practices outlined in ProPECC PN 1/94, no unacceptable residual impacts on water quality are expected.

Ecology

Most of the identified habitats in the Assessment Area have low ecological value, except the Middle Lagoon which was ranked as moderate, and the East Lagoon, secondary woodland, the watercourse W1 and W2 were ranked low to moderate.

A total of approximately 7.8 ha of habitats would be permanently lost under this Project. Over 79% of the affected habitats are man-made habitats including approximately 6 ha ash lagoon, 0.1 ha developed area/disturbed area, 0.02 ha plantation and 1.6 ha grassland/shrubland. A very small area of an estuary would probably be affected during the construction of vehicular bridge temporarily. As the proposed Project is a land based project, no marine ecological habitats would be affected.

The construction of the STF would affect the potential breeding ground of Little Grebe in the East Lagoon. The impact is considered minor as alternative similar habitat for Little Grebe is available in the adjacent Middle Lagoon.

Mitigation measures such as provision of 3m high hoarding along the boundary of the works areas, screening (i.e. fencing with climbers or plantation) along the STF site boundary and the two sides of access road, good site practices, use of quiet construction methods and machinery, measures to control potential sedimentation / water quality impacts as well as habitat enhancement (i.e. tree planting and creation of pond(s) for Little Grebe) have been recommended to minimize potential indirect impacts to wildlife. As a precautionary measure, the works area will be thoroughly

inspected by experience ecologist(s) to confirm no breeding activities of Little Grebe would be affected by the construction activities before commencement of any site works.

With the implementation of the recommended mitigation measures, it is anticipated that the construction and operation for the proposed works would not result in unacceptable impacts on ecological resources. The implementation of all mitigation measures would be subject to regular audit as part of the EM&A programme.

Landscape and Visual

Implementation of mitigation measures, such as careful protection of the existing trees to be retained, compensatory planting, control of night-time lighting, erection of decorative screen hoarding, would reduce the impacts to the visual sensitive receivers (VSRs) during the construction phase.

Human Health Risk

Design measures for radon, such as a soil cover beneath the buildings before construction works and sufficient ventilation would reduce radon influx; regular maintenance for floor slabs and walls shall make radon reduction techniques more effective and cost-efficient.

Landfill Gas Hazard

A number of protection measures have been recommended for the Project to safeguard the safety of the site workers and all personnel presence at the Project site. No adverse impact of landfill gas hazard on this Project is anticipated.

8. Comments

Air Quality

There is no nearby sensitive receiver identified by EIA study hence dust monitoring is not required. The site activities performed in the reporting period did not cause significant dust impact. The Contractor deployed necessary dust mitigation measures to reduce potential impacts from construction works to a minimum, which include frequent water spraying at dust generation areas.

Noise Level

Same as air quality, no sensitive receiver is close to the construction site. In the reporting period, no deterioration of the environment noise level is noted.

After commencement of piling works, Contractor deployed necessary noise mitigation measures to minimize the influence to the wildlife in the Middle Lagoon. Close monitoring of any impact to the habitat were in place.

Water Quality

During the reporting period, non-compliance of aluminium content, dissolved oxygen, turbidity, pH and suspended solids was recorded according to the A/L levels stated in Table 3.2. The exceedances were not related to the construction activities Impact monitoring data indicates the water quality is similar to that of baseline level. The construction activities were located in the North part of the Lagoon and far apart from the Tsang Kok Stream. Hence, the exceedance recorded is not related to the construction activities.

Ecology Monitoring

Contractor has followed the mitigation measures to prevent any disturbance to the wildlife in the Middle Lagoon. After commencement of the piling work on 21 February 2011, no significant impact to the wildlife was observed.

Landscape and Visual Impact Monitoring

In general, the implementation of the proposed measures in construction phase were followed and no non-compliance was observed in the reporting period.

Radon Monitoring

After remedy measures and re-measurement of some locations, all the sampling locations complied with the Practice Note Objective.

The impact water quality monitoring programme ensured that any environmental impact to the receivers would be readily detected and timely actions could be taken to rectify any non-compliance. The environmental monitoring results indicated that the construction activities in general were in compliance with the relevant environmental requirements and were environmentally acceptable. The weekly site inspection ensured that all the environmental mitigation measures recommended in

the EIA were effectively implemented. Despite the minor deficiencies found during site audits, the Contractor had taken appropriate actions to rectify deficiencies within reasonable timeframe. Therefore, the effectiveness and efficiency of the mitigation measures were considered high in most of the time.

The environmental monitoring methodology was considered well established as the monitoring results were found in line with the EIA predictions.

9. Recommendations and Conclusions

The construction phase EM&A programme of Sludge Treatment Facilities Project commenced on 22 December 2010 and substantially completed on 28 June 2015.

Water quality monitoring, landfill gas monitoring, ecological monitoring, landscape and visual monitoring, radon monitoring and weekly site inspections were carried out in the reporting period, in accordance with the updated EM&A manual.

Two (2) environmental complaints were followed up by the Environmental Team in the reporting period. Investigations were carried out. The findings and the proposed mitigation measures were submitted to all relevant parties. The summary of investigation is described in Section 6.

No notification of summons and prosecution was received in the reporting period.

Mitigation measures had been implemented by the Contractors to minimize the environmental impacts due to construction activities. Site inspections carried out by ET and IEC showed that the Contractors rectified the problems observed promptly and no major environmental deficiency was induced. The EM&A programme was considered successfully and adequately conducted during the course of the reporting period.

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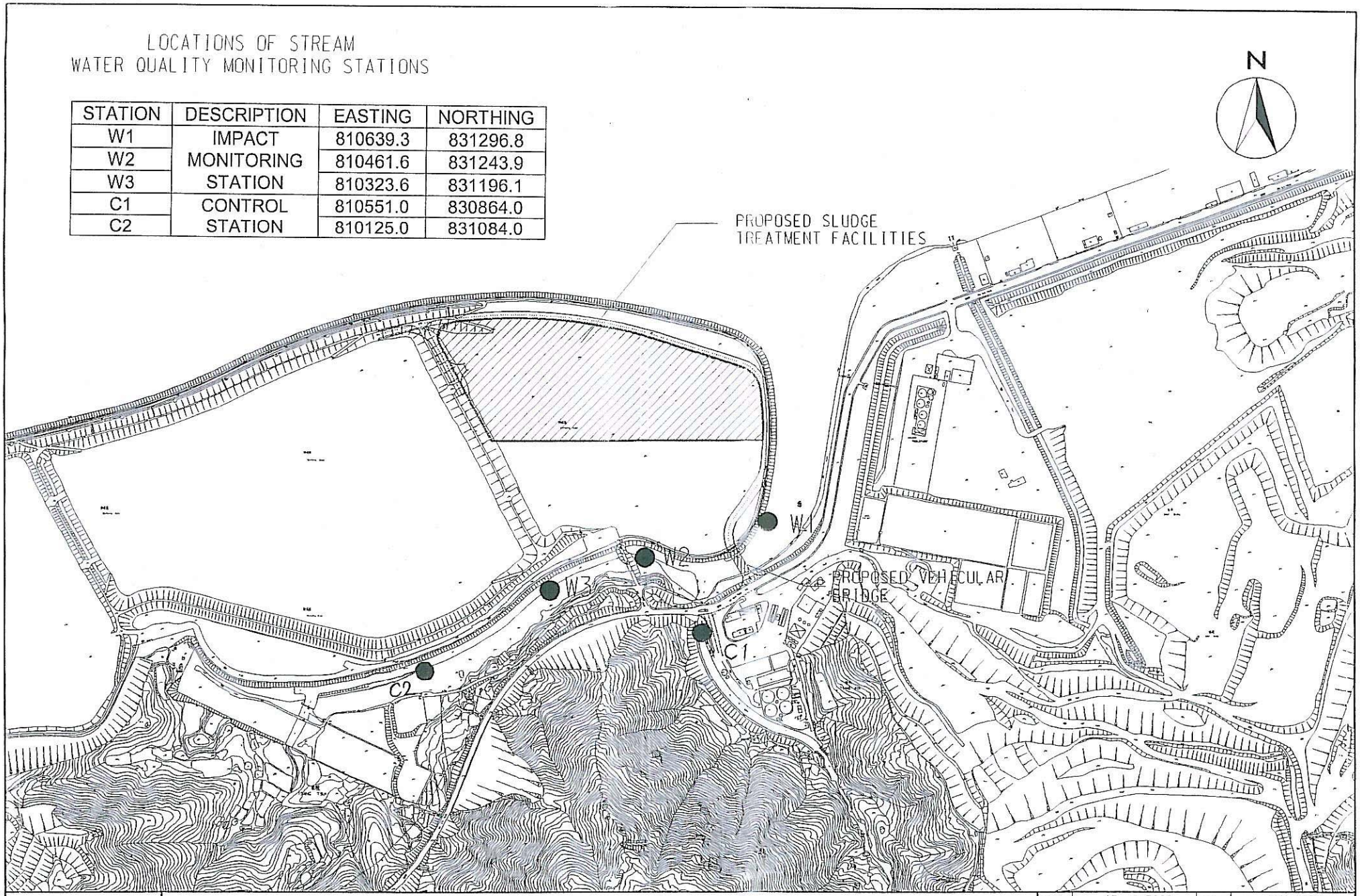
Appendix 1

Water Quality Monitoring Location

LOCATIONS OF STREAM
WATER QUALITY MONITORING STATIONS

STATION	DESCRIPTION	EASTING	NORTHING
W1	IMPACT MONITORING STATION	810639.3	831296.8
W2		810461.6	831243.9
W3		810323.6	831196.1
C1	CONTROL STATION	810551.0	830864.0
C2		810125.0	831084.0



MAUNSELL | AECOM
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY

LOCATION OF WATER QUALITY MONITORING STATIONS (Sheet 1 of 2)

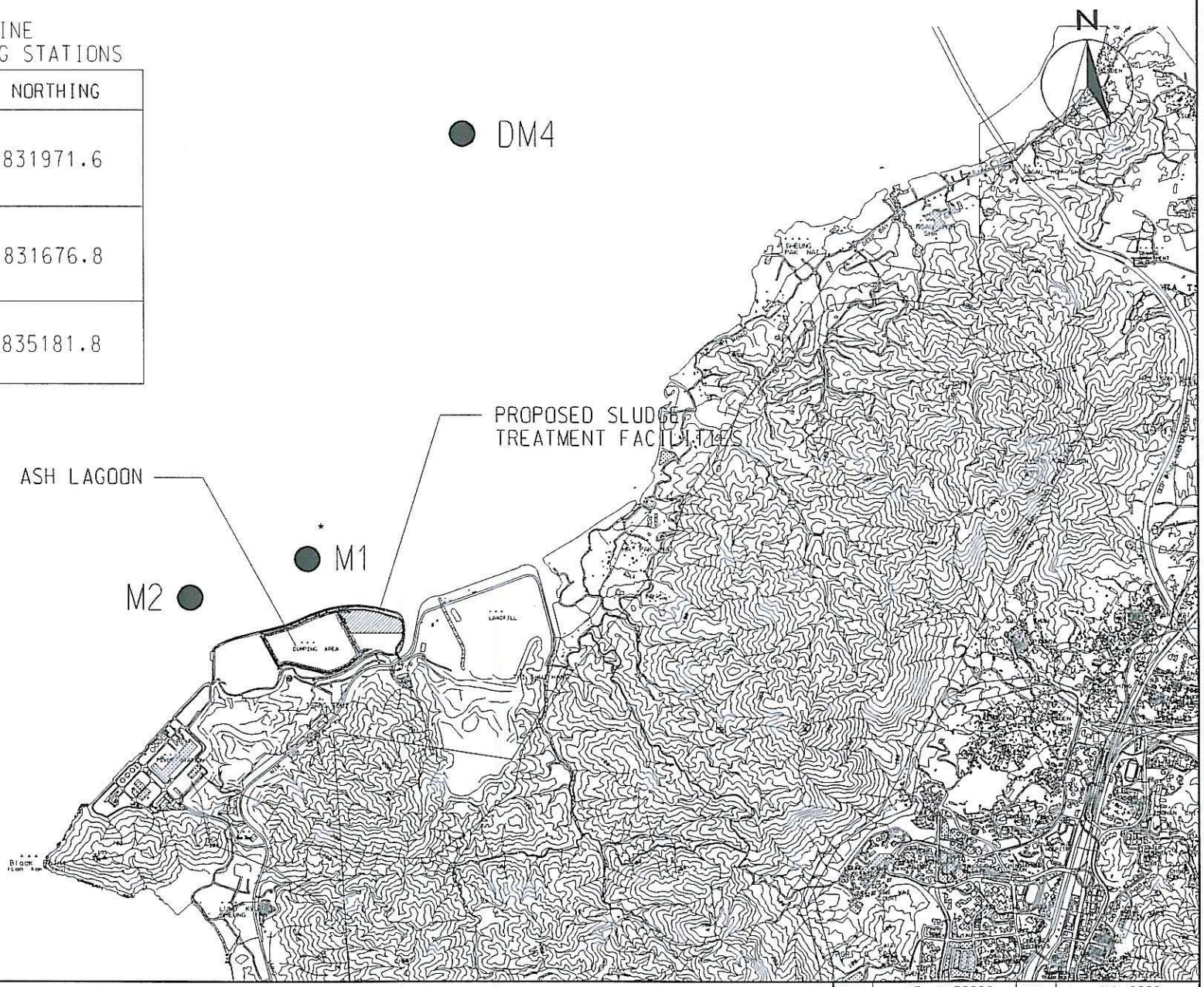
SCALE	A3 1:5000	DATE	JUN 2008
CHECK	AKYC	DRAWN	LMWI
JOB No.	60039510	DRAWING No.	FIGURE 5.1
		REV	-

DATE: $DATE$

P:/60039510/1.01/CAD/Drawing/Report/WQ/Fig5.1_sheet 1.dgn

LOCATIONS OF MARINE
WATER QUALITY MONITORING STATIONS

STATION	EASTING	NORTHING
M1 (IMPACT MONITORING STATION)	809915.3	831971.6
M2 (IMPACT MONITORING STATION)	809026.4	831676.8
DM4 (CONTROL STATION)	811092.2	835181.8



DATE: $DATE$

MAUNSELL | AECOM
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY
LOCATION OF WATER QUALITY MONITORING STATIONS
(Sheet 2 of 2)

SCALE	A3 1:30000	DATE	JUN 2008
CHECK	AKYC	DRAWN	LMWI
JOB NO.	60039510	DRAWING NO.	FIGURE 5.1
		REV	-

P:/60039510/1.01/CAD/Drawing/Report/WQ/Fig5.1_sheet 2_v2.dgn

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Appendix 2

Graphical Presentation of Monitoring Data

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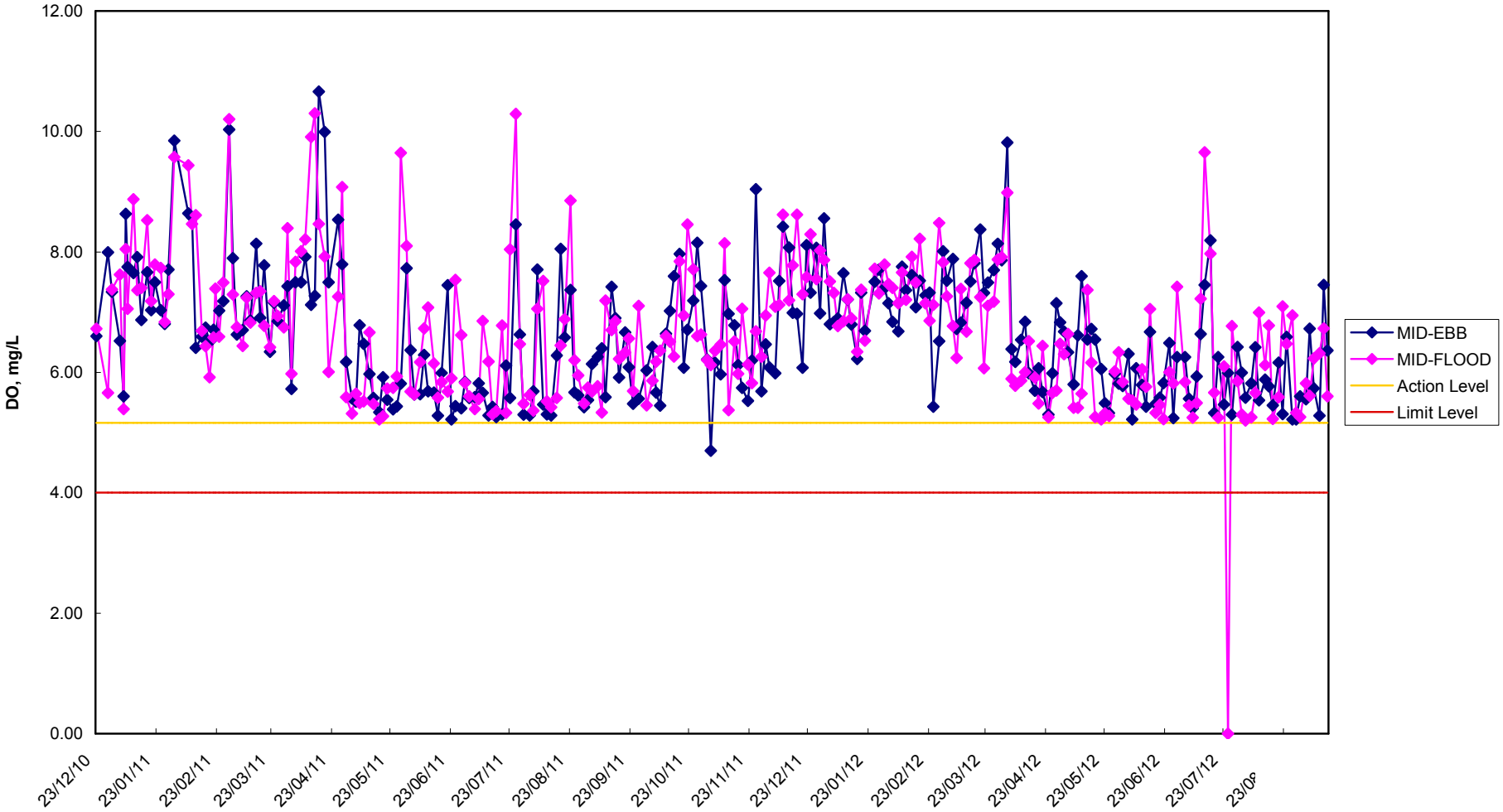
W1 - Dissolved Oxygen Content



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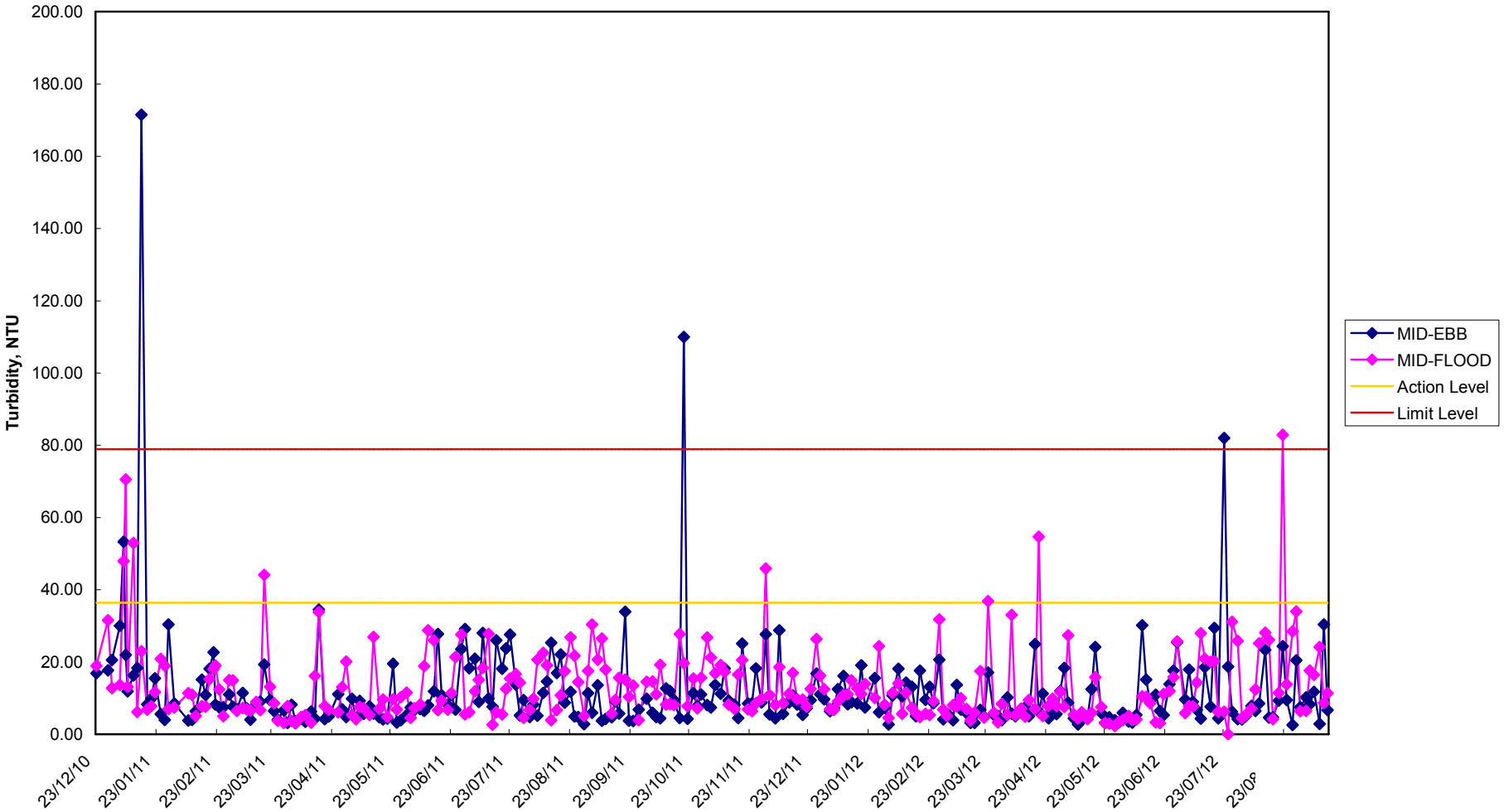
W1 - Turbidity



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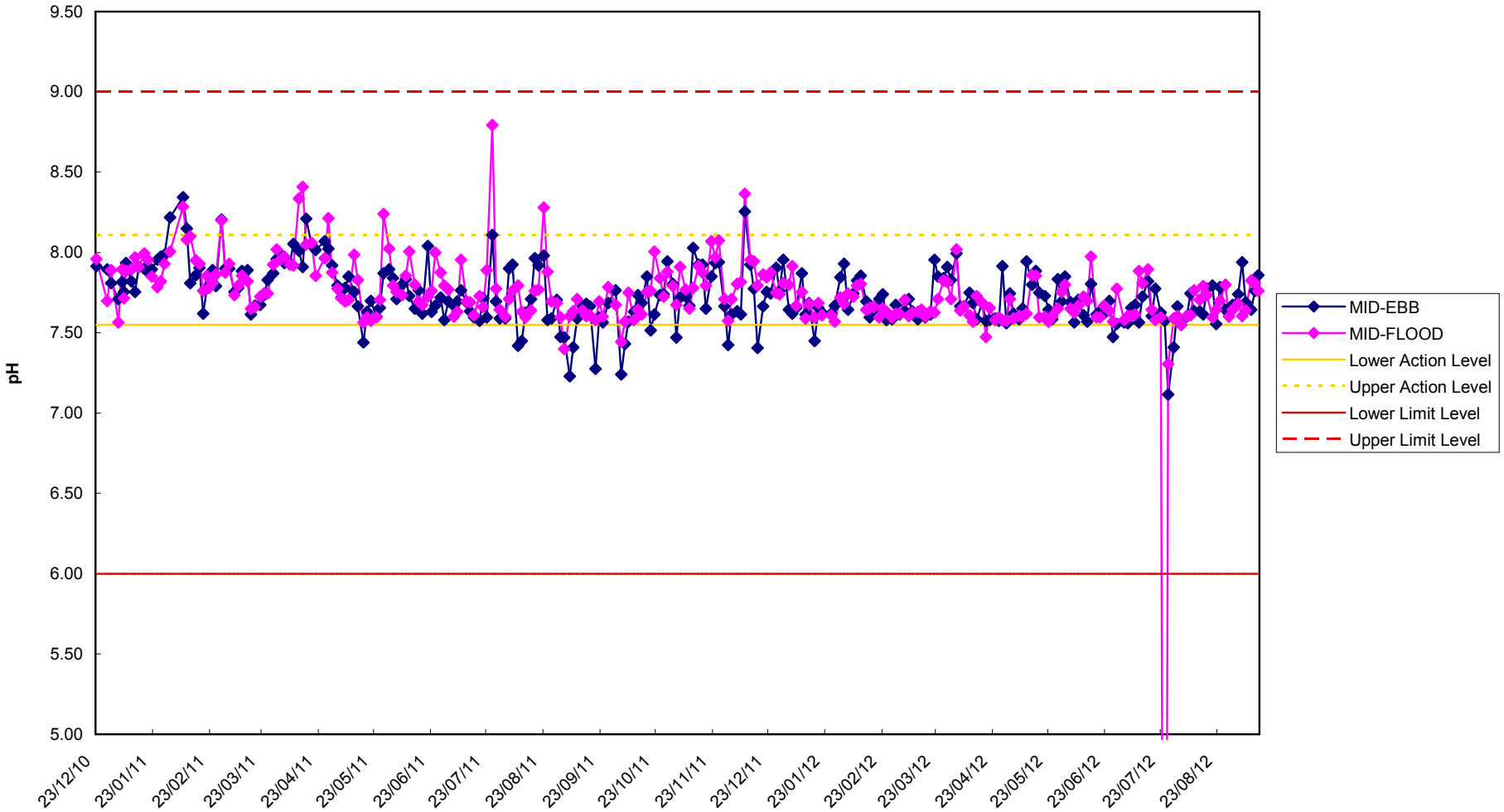
W1 - pH



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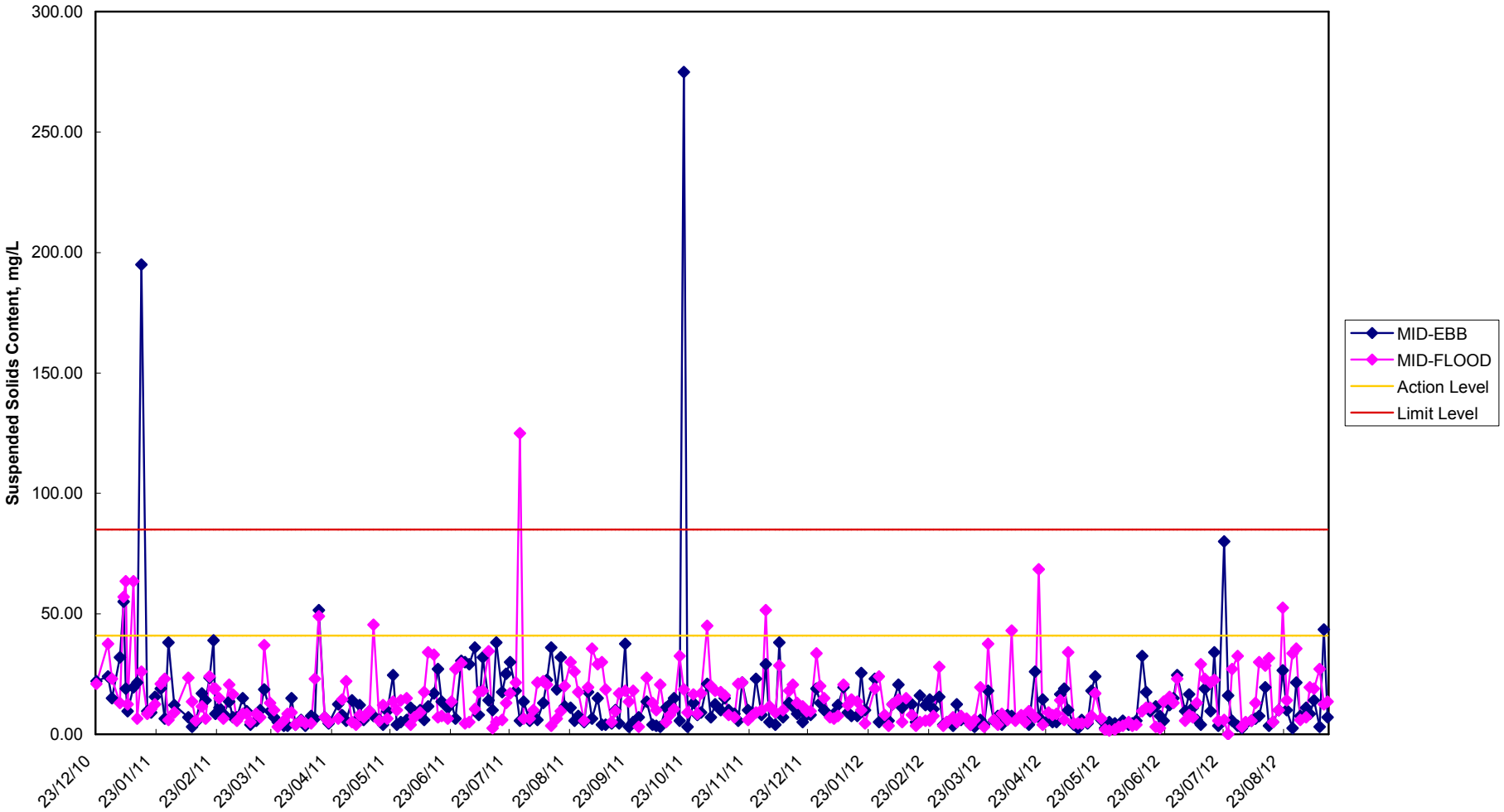
W1 - Suspended Solid Content



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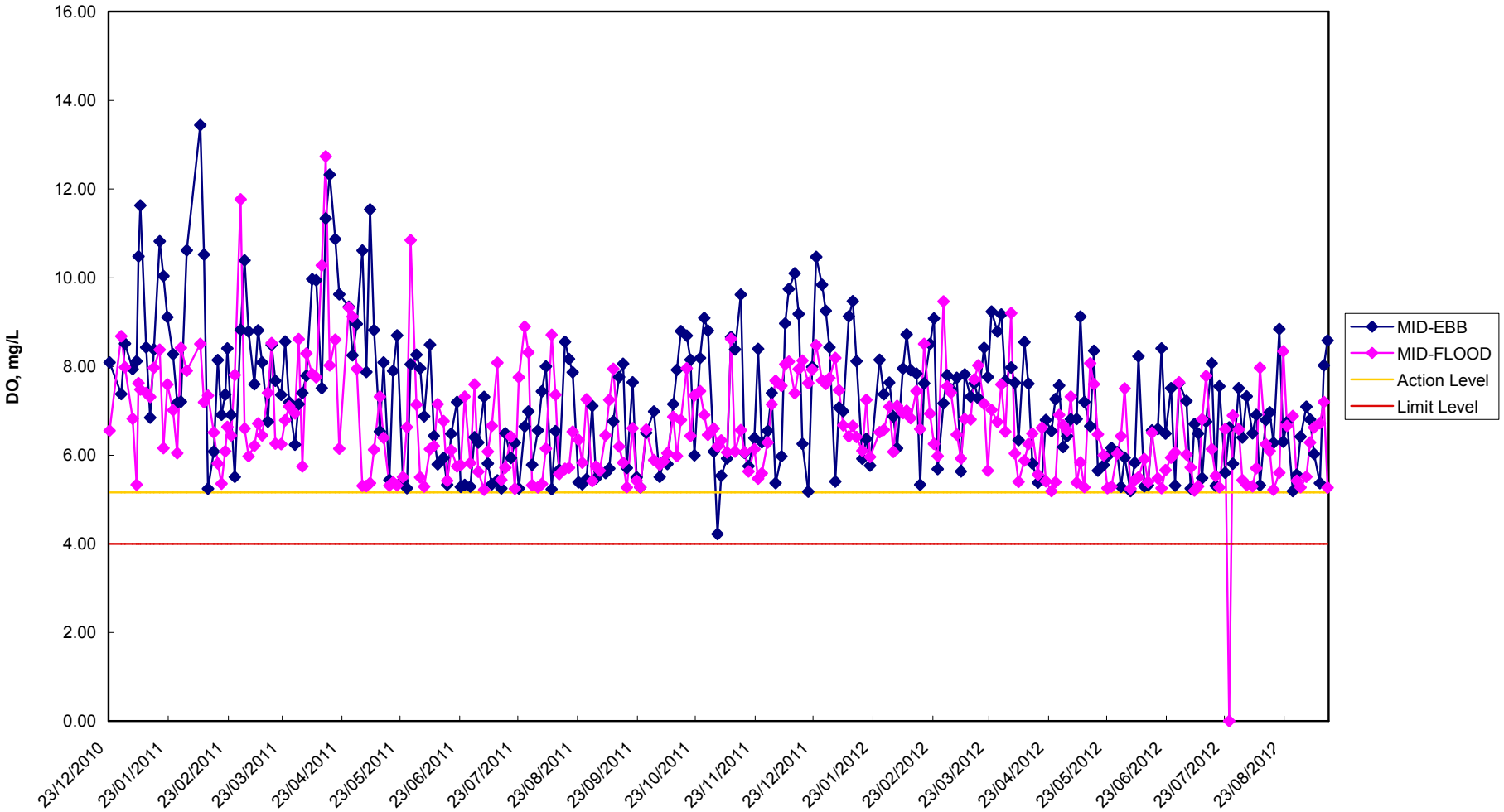
W2 - Dissolved Oxygen Content



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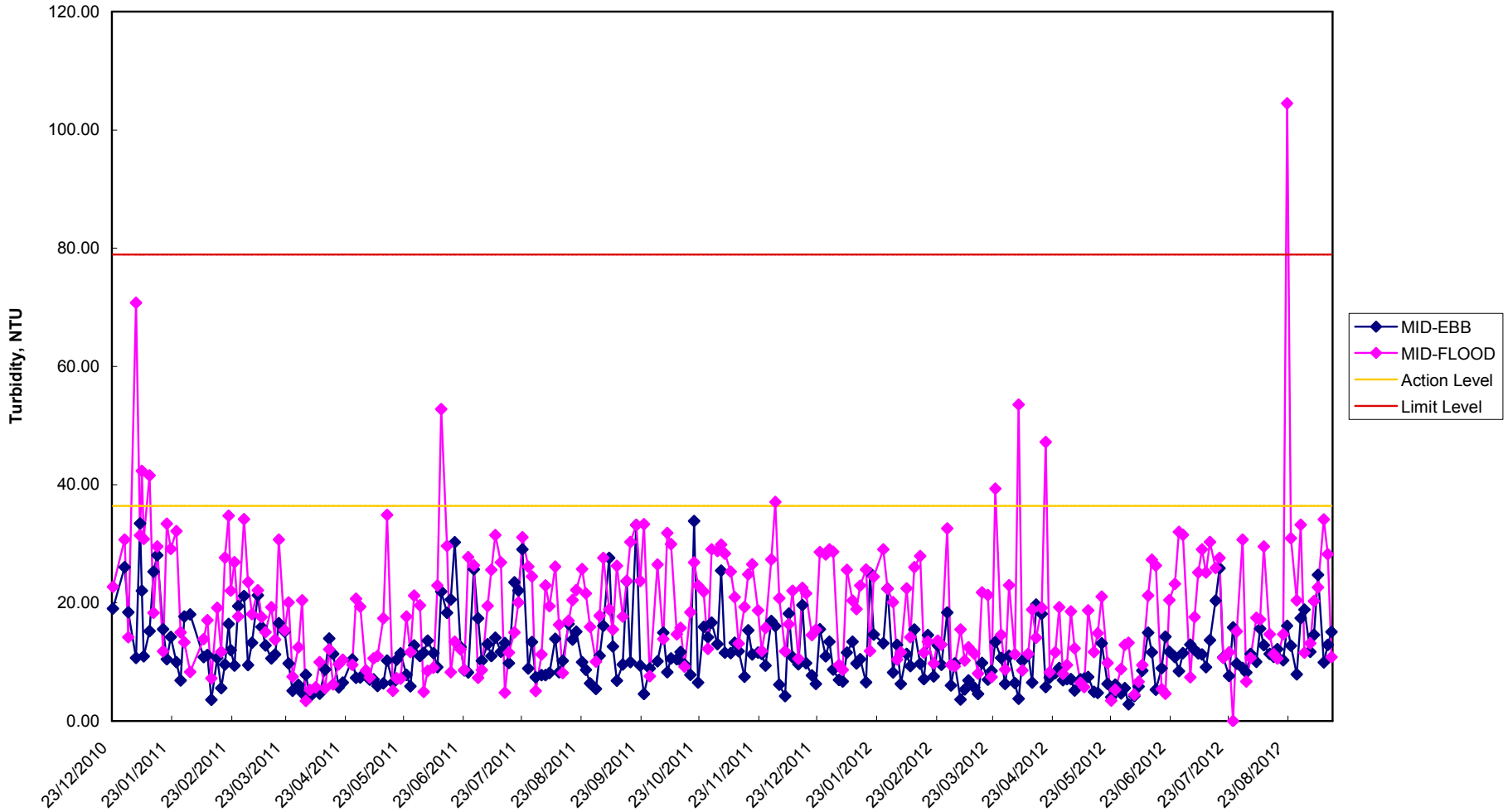
W2 - Turbidity



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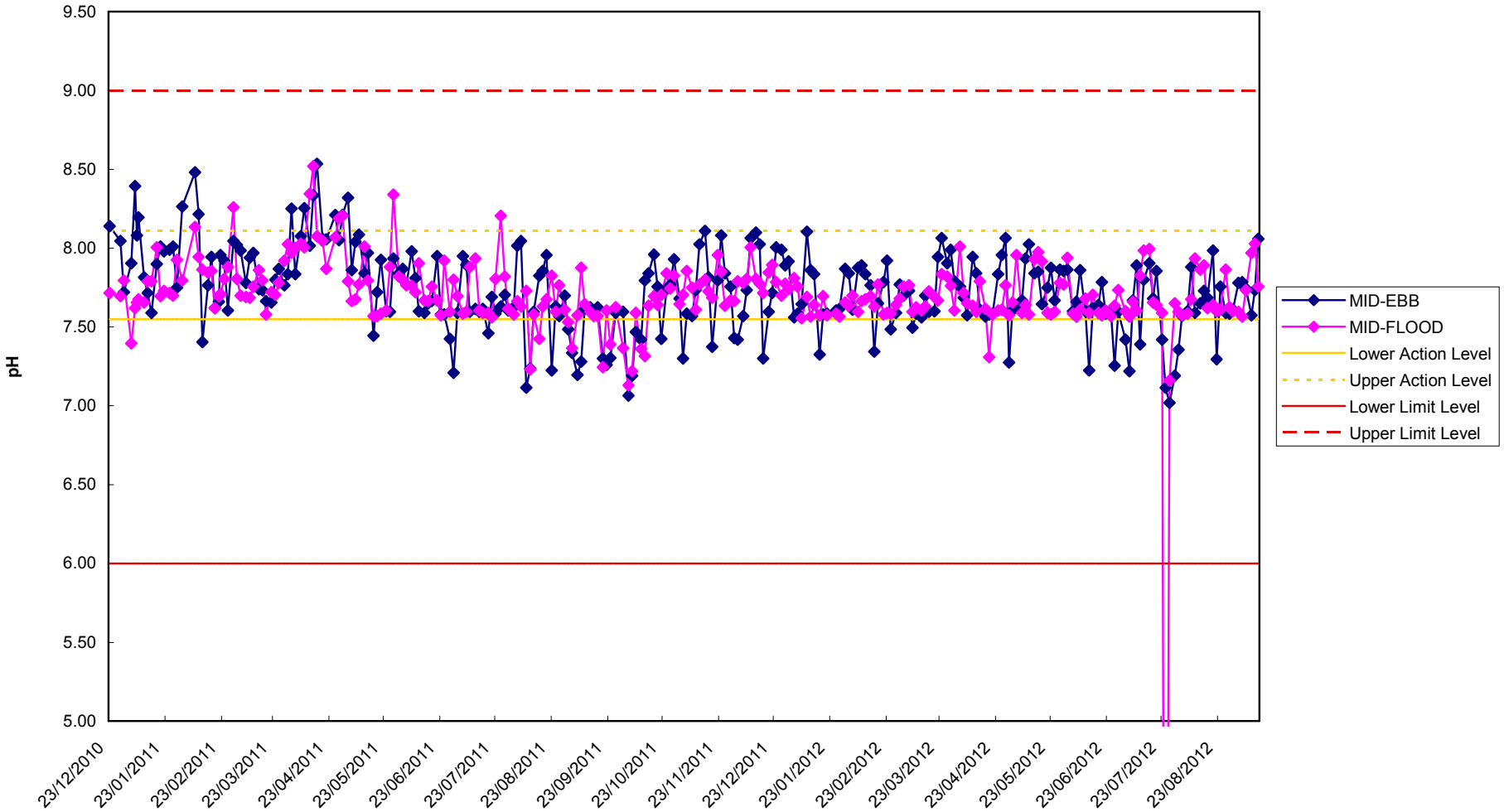
W2 - pH



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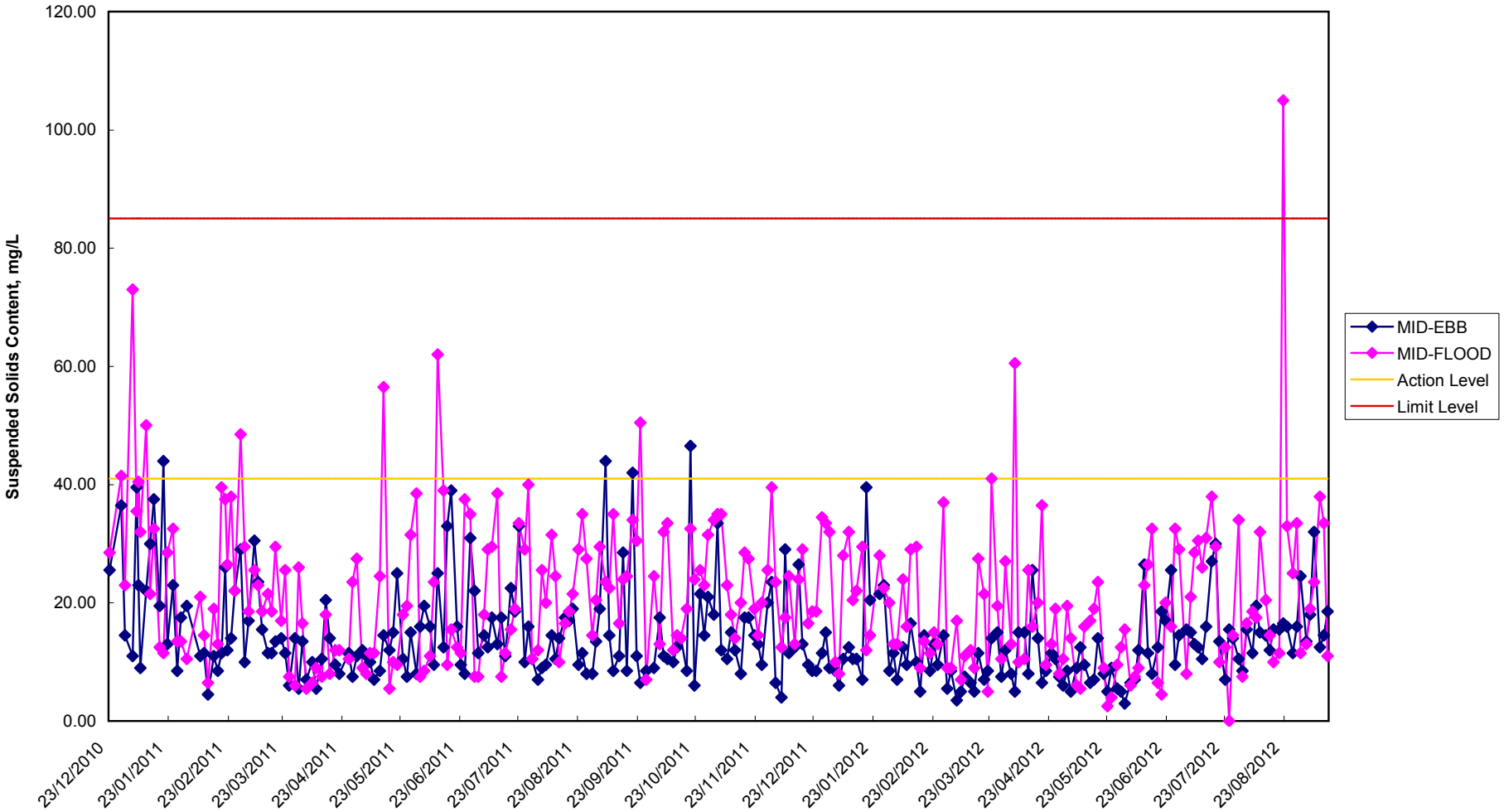
W2 - Suspended Solid Content



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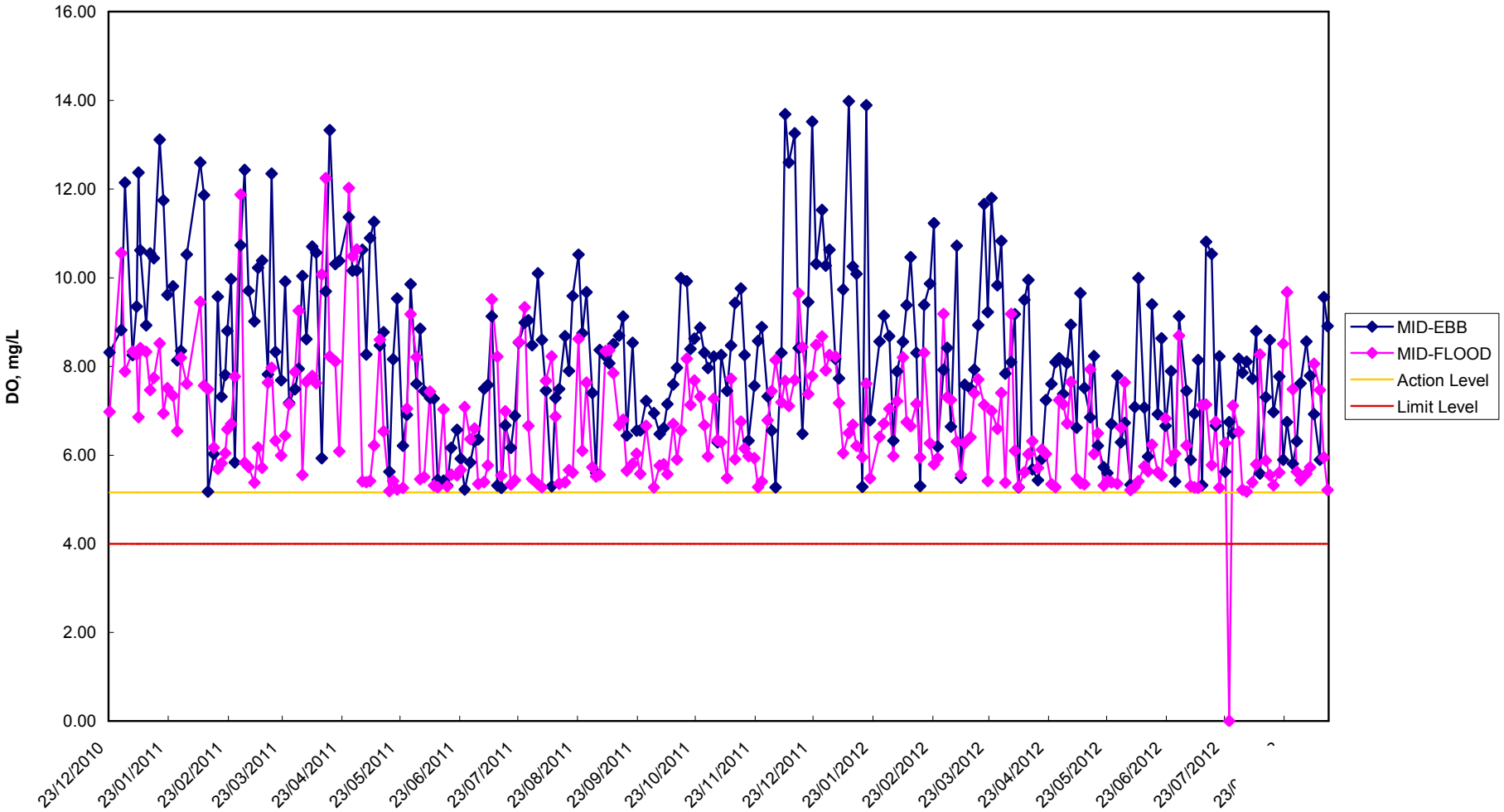
W3 - Dissolved Oxygen Content



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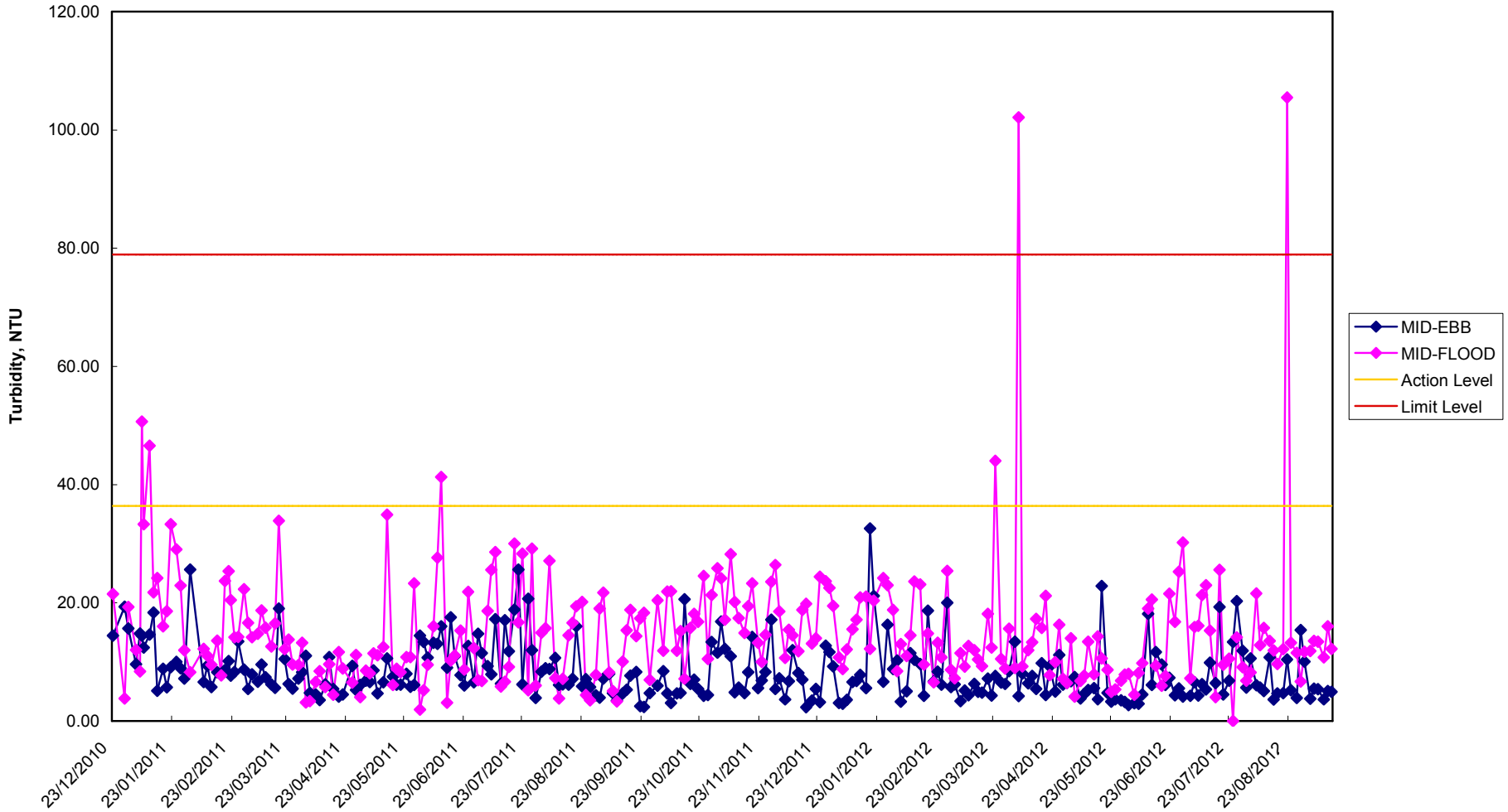
W3 - Turbidity



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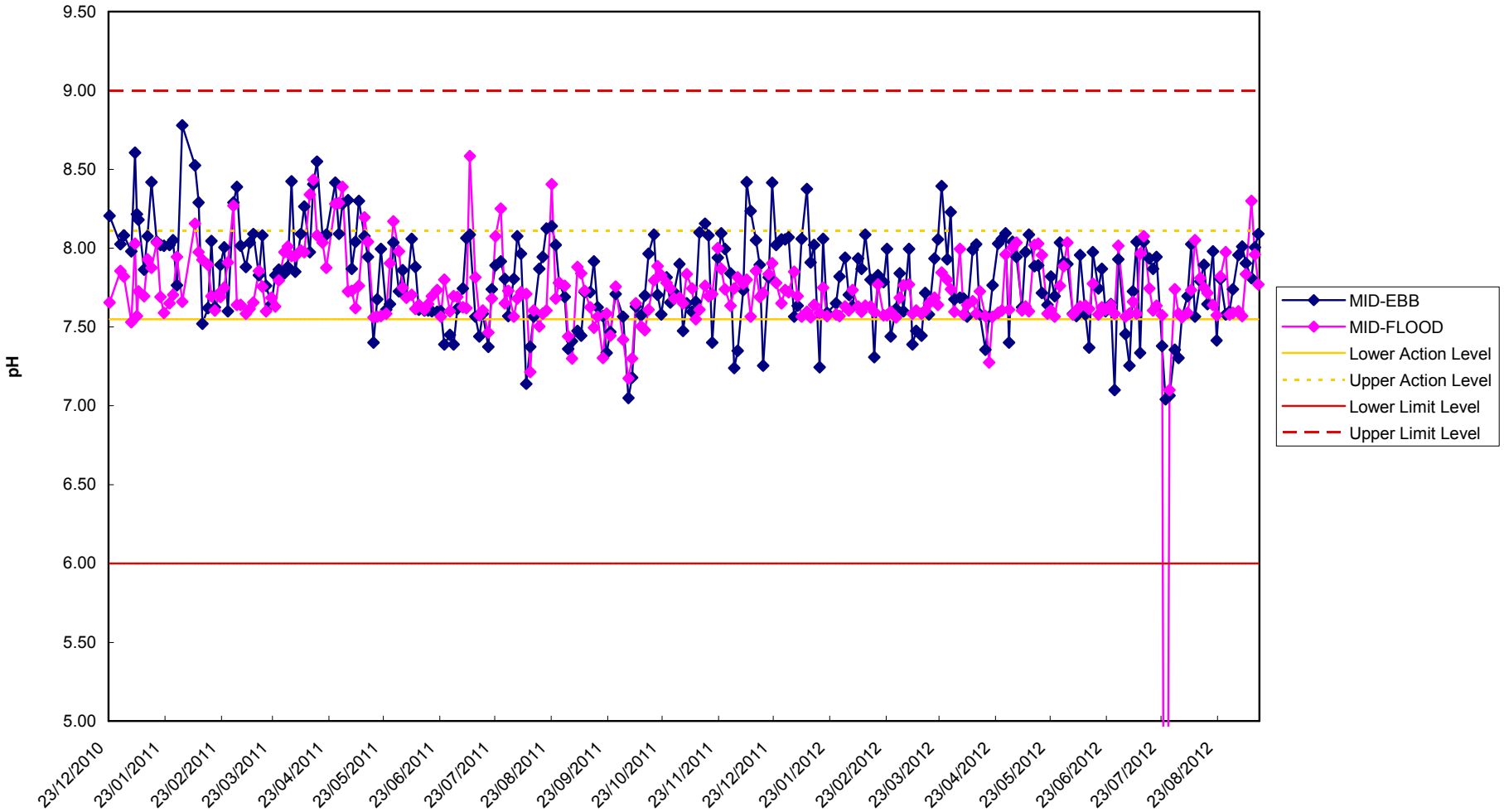
W3 - pH



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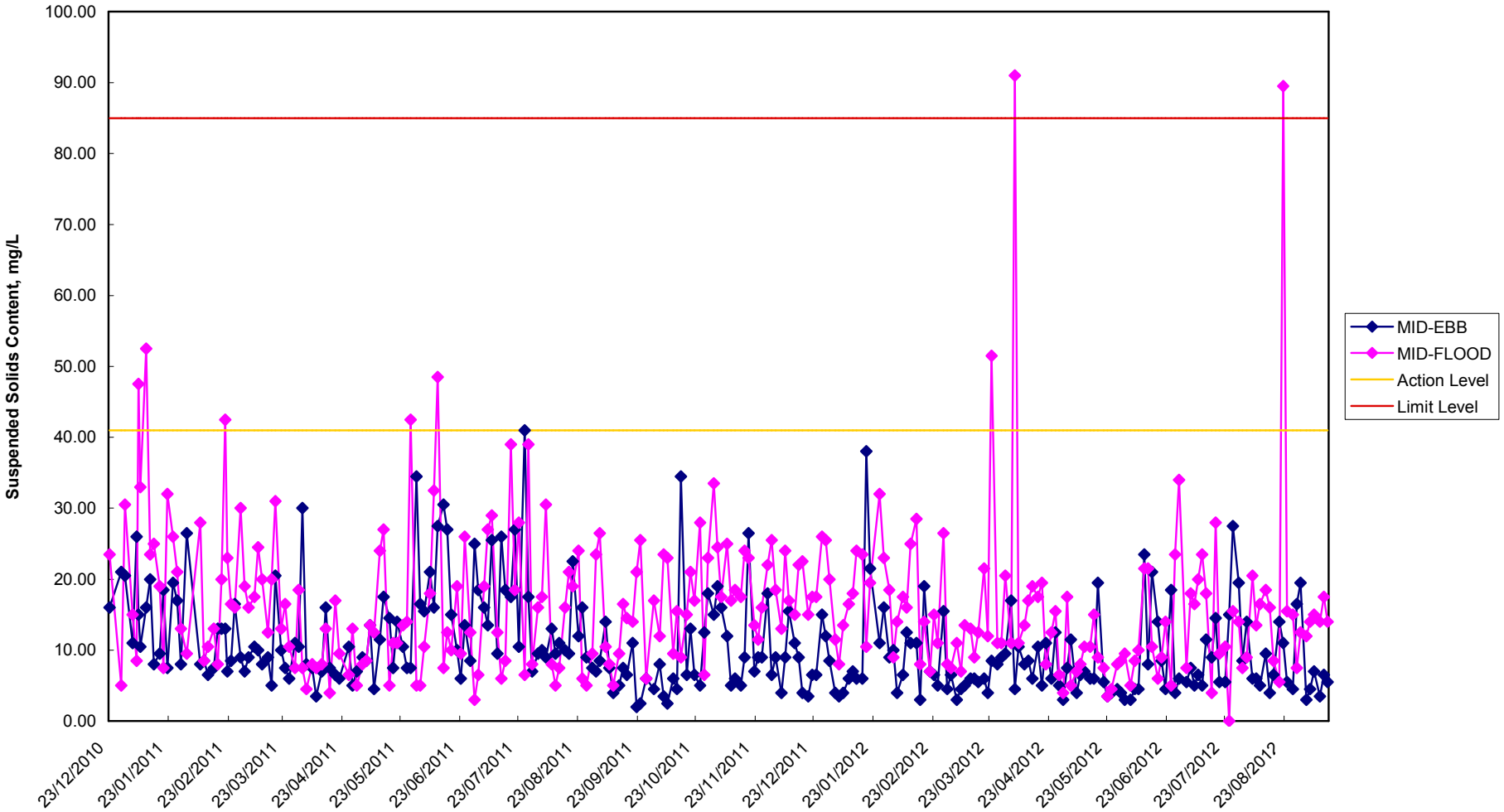
W3 - Suspended Solid Content



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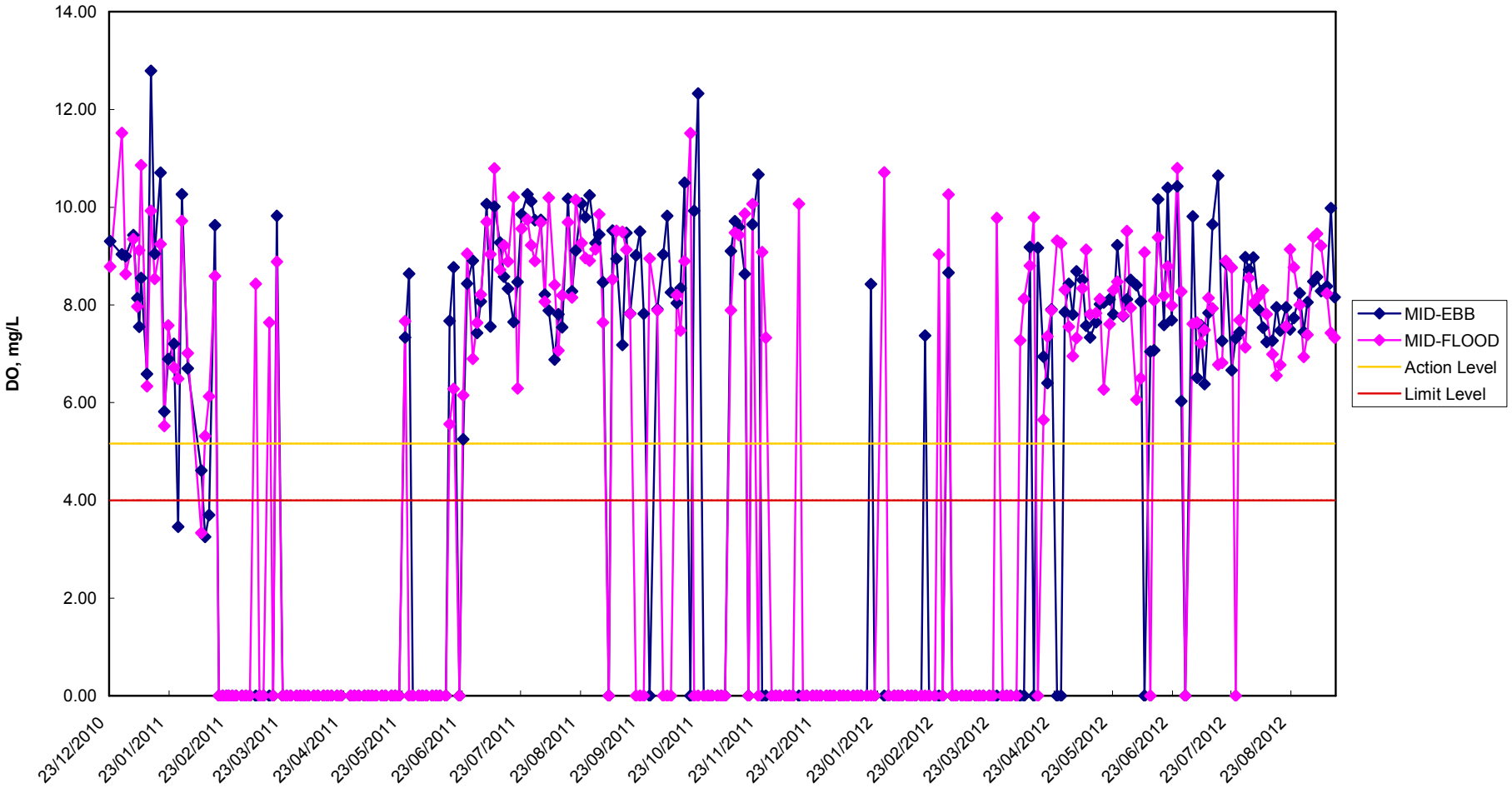
C1 - Dissolved Oxygen Content



Remark: No water at C1 occasionally after 17/02/2011. Zero values are shown in the graph

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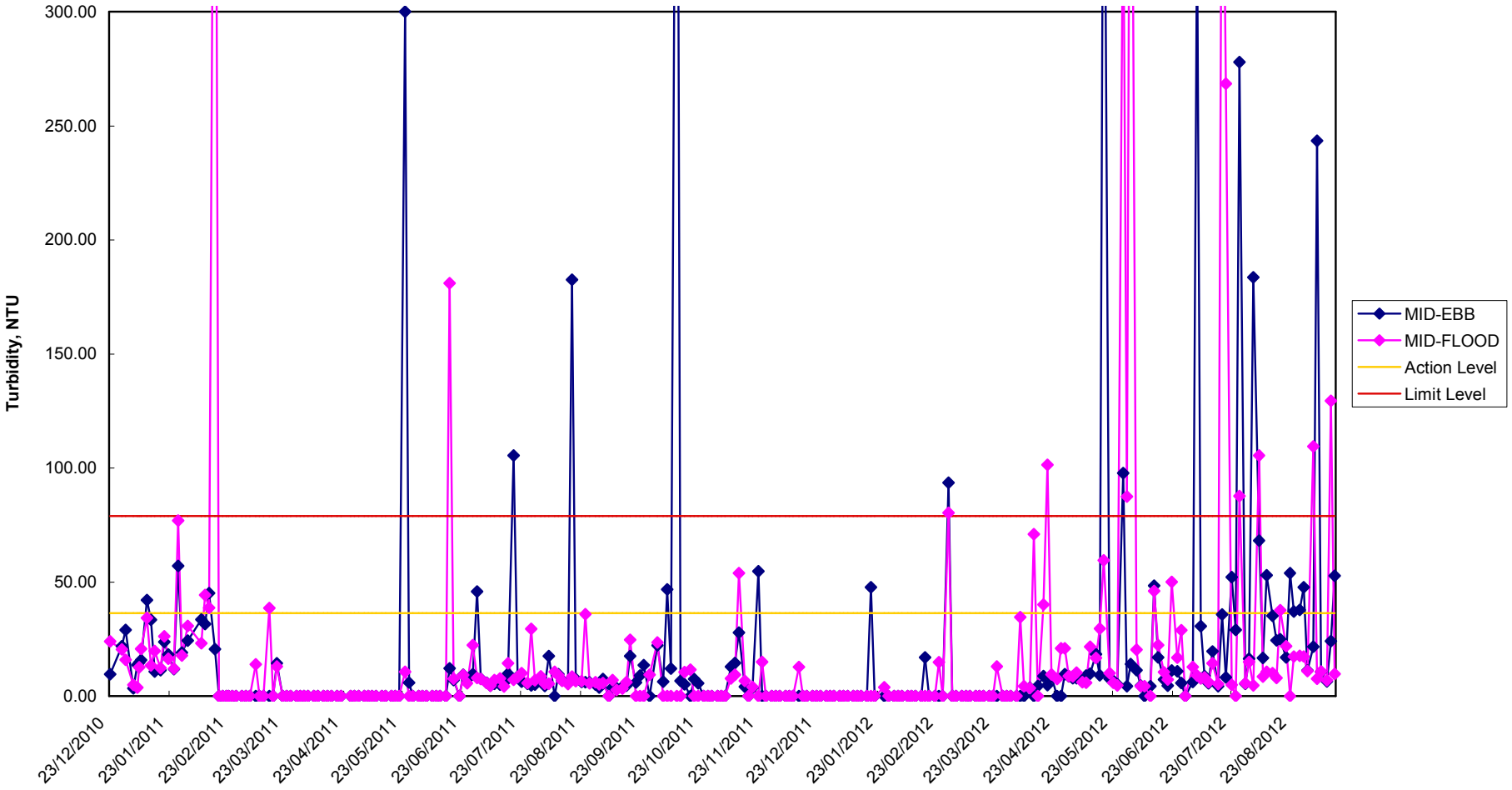
C1 - Turbidity



Remark: No water at C1 occasionally after 17/02/2011. Zero values are shown in the graph

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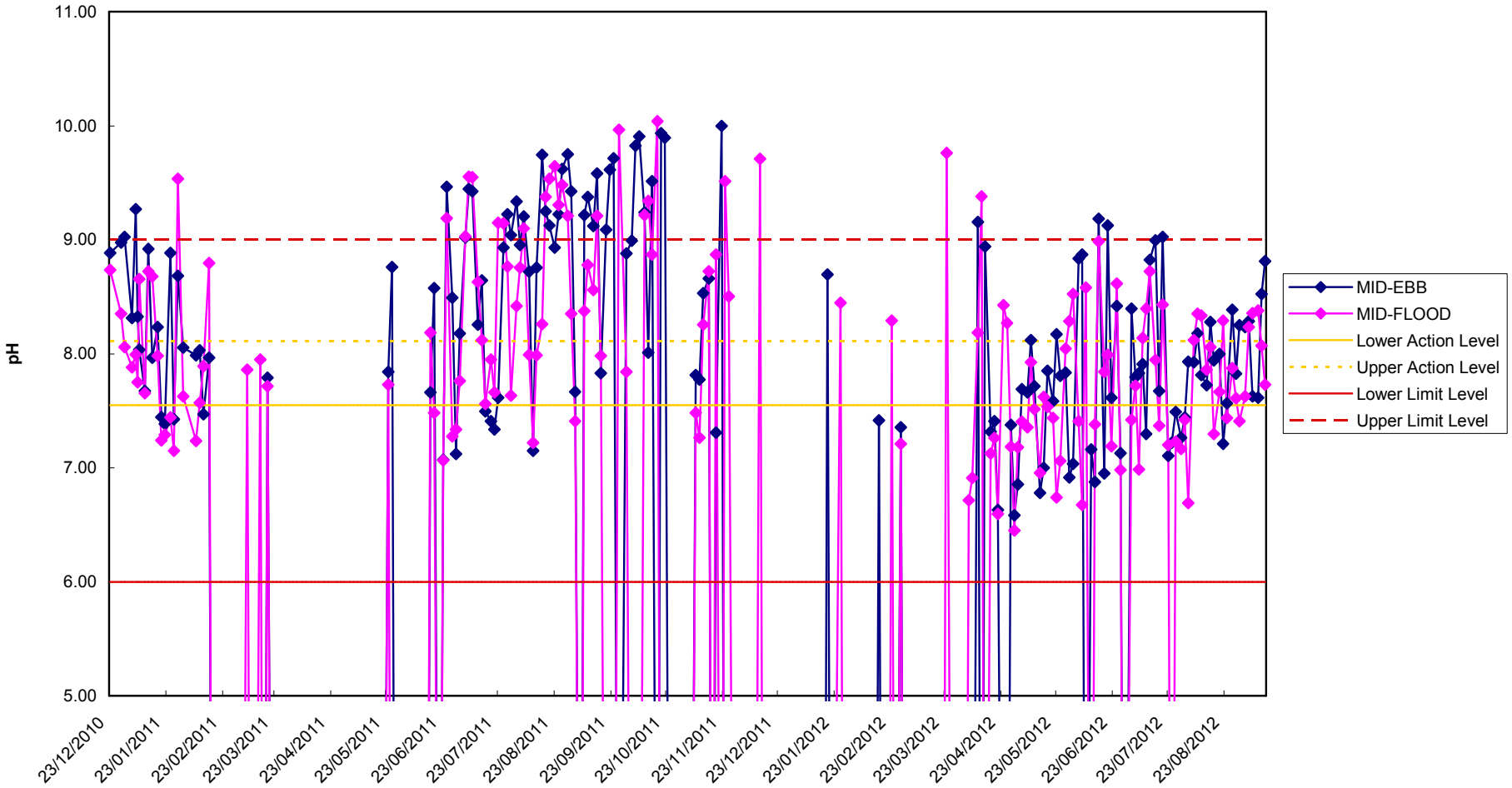
C1 - pH



Remark: No water at C1 occasionally after 17/02/2011. Zero values are shown in the graph

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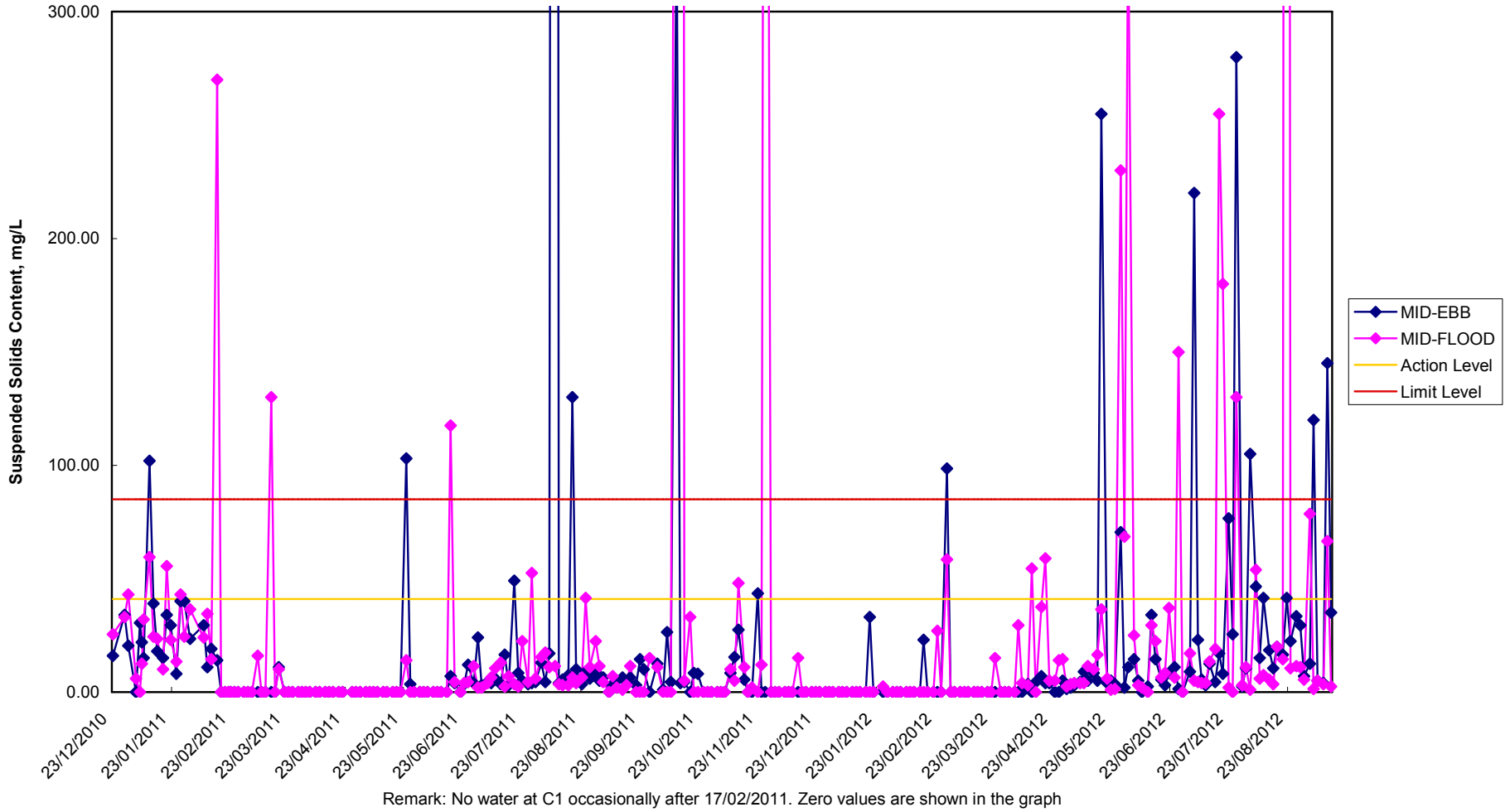
C1 - Suspended Solid Content



Remark: No water at C1 occasionally after 17/02/2011. Zero values are shown in the graph

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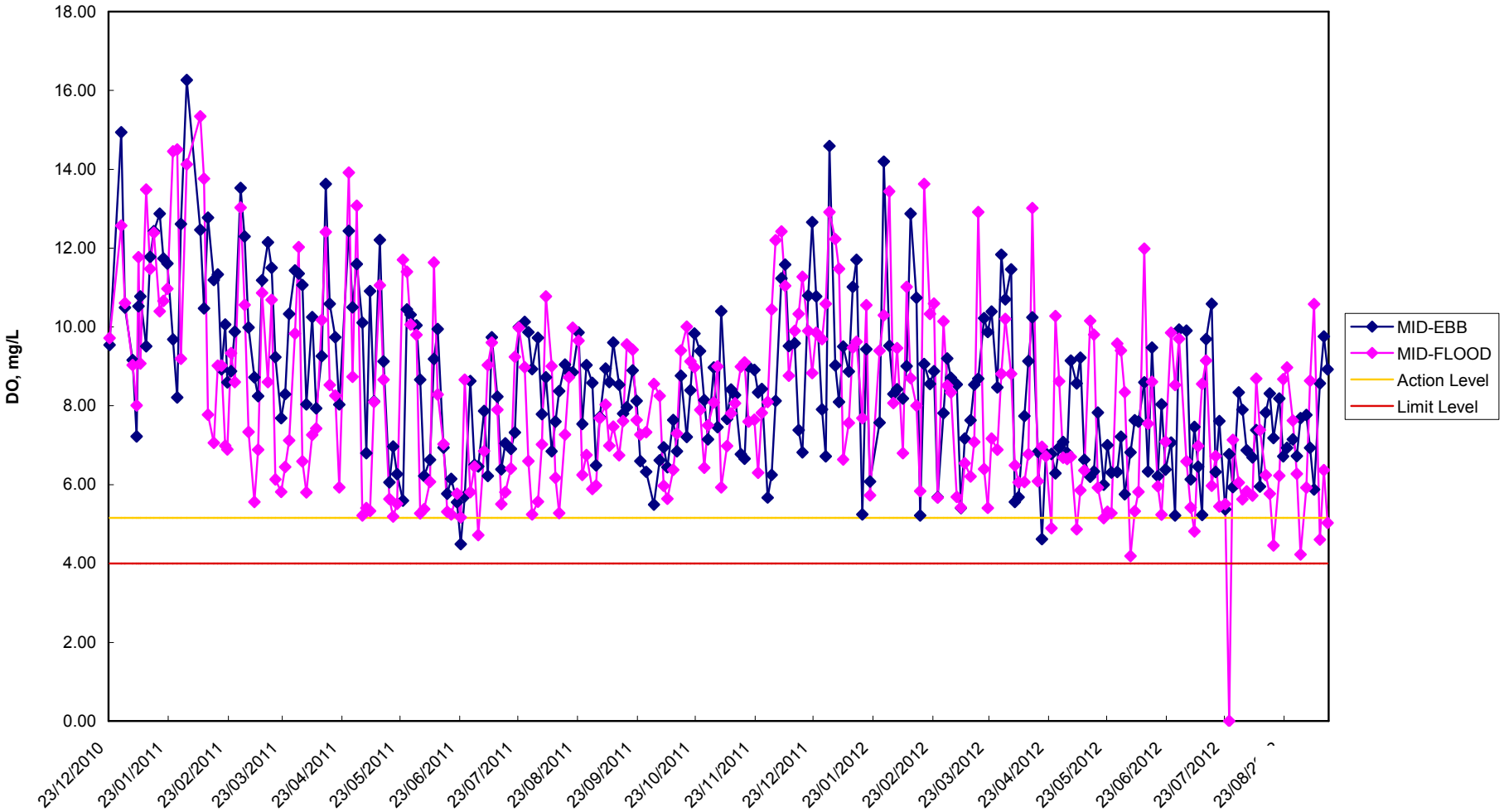
C2 - Dissolved Oxygen Content



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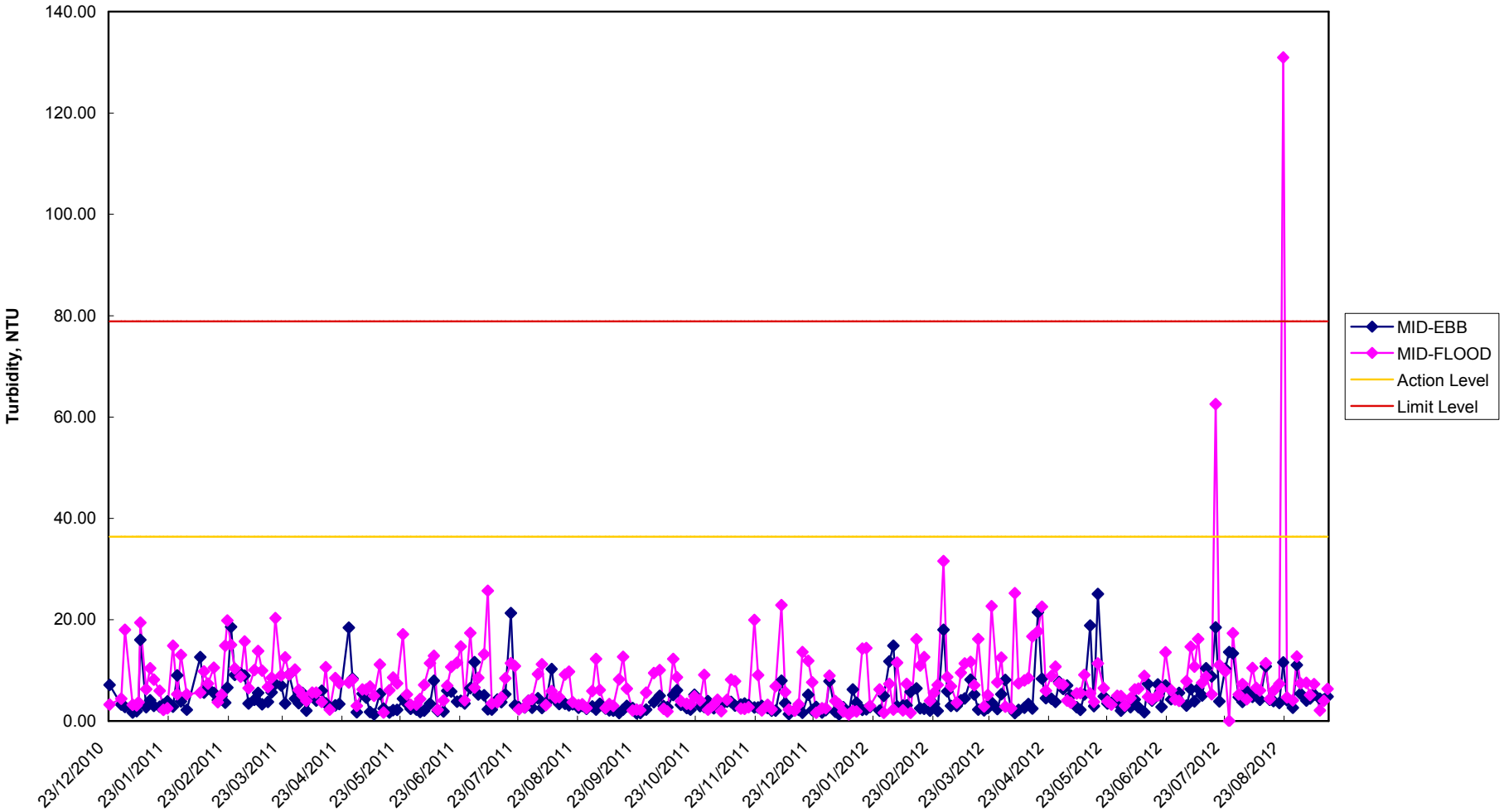
C2 - Turbidity



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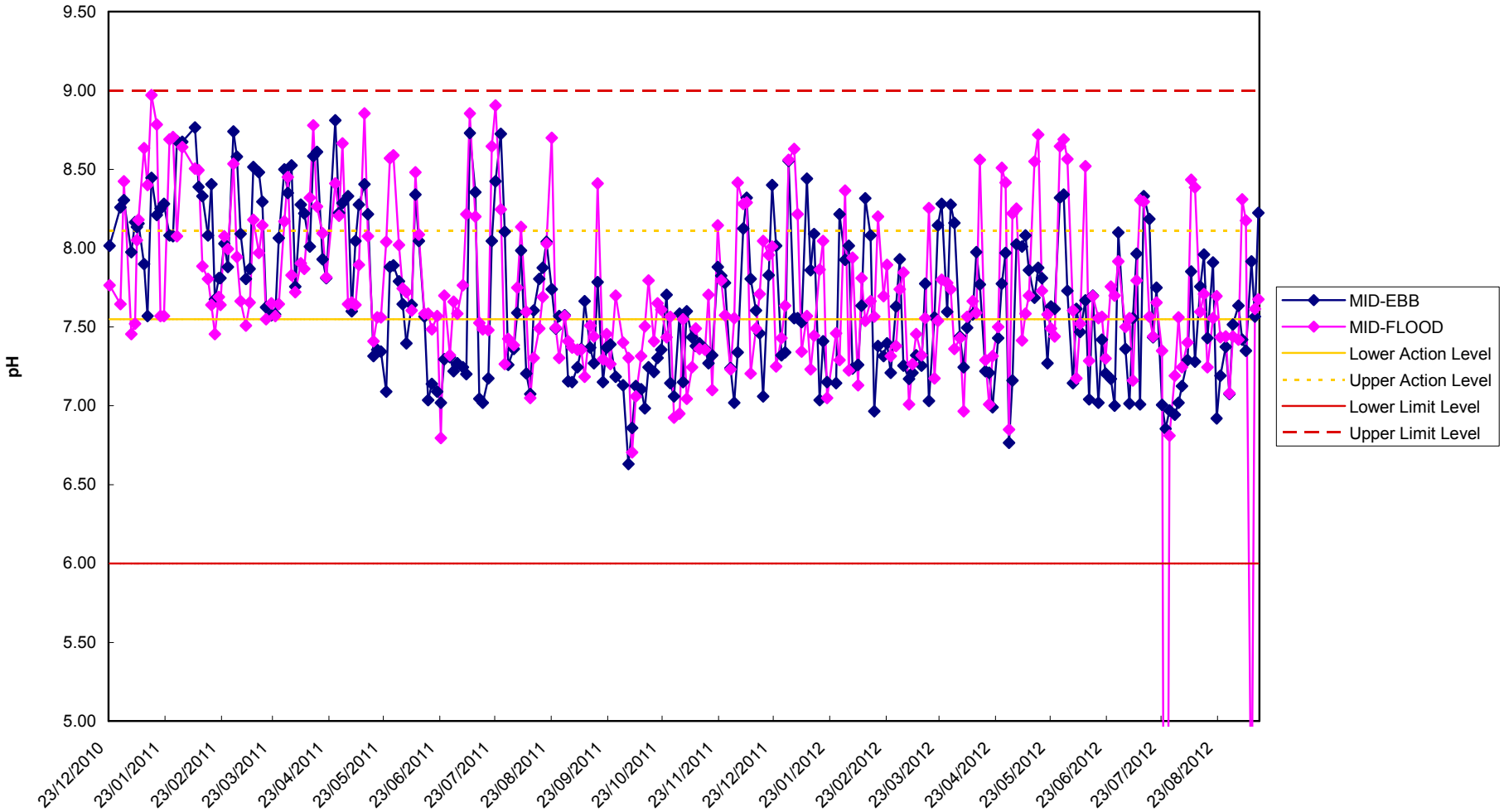
C2 - pH



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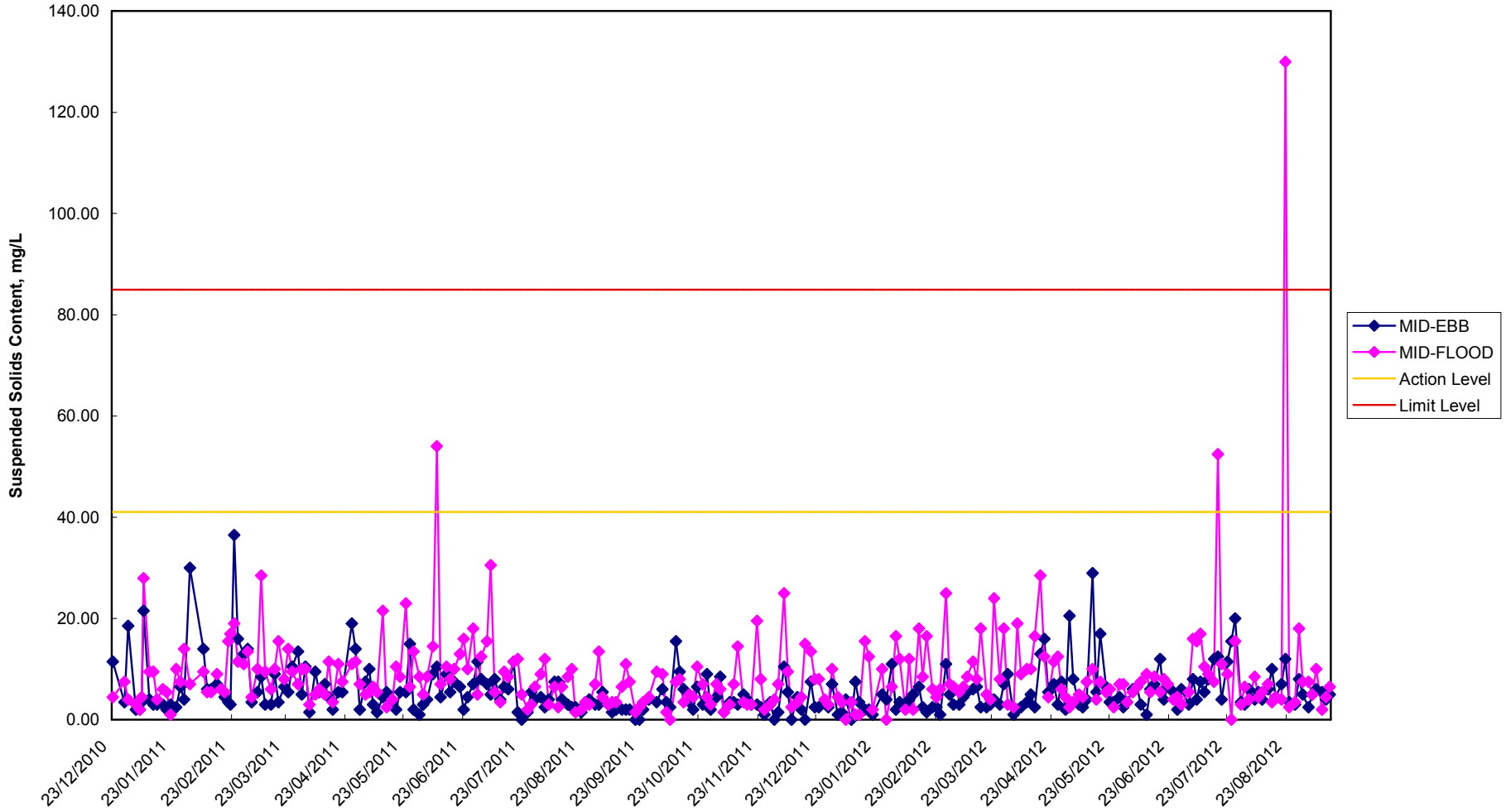
C2 - Suspended Solid Content



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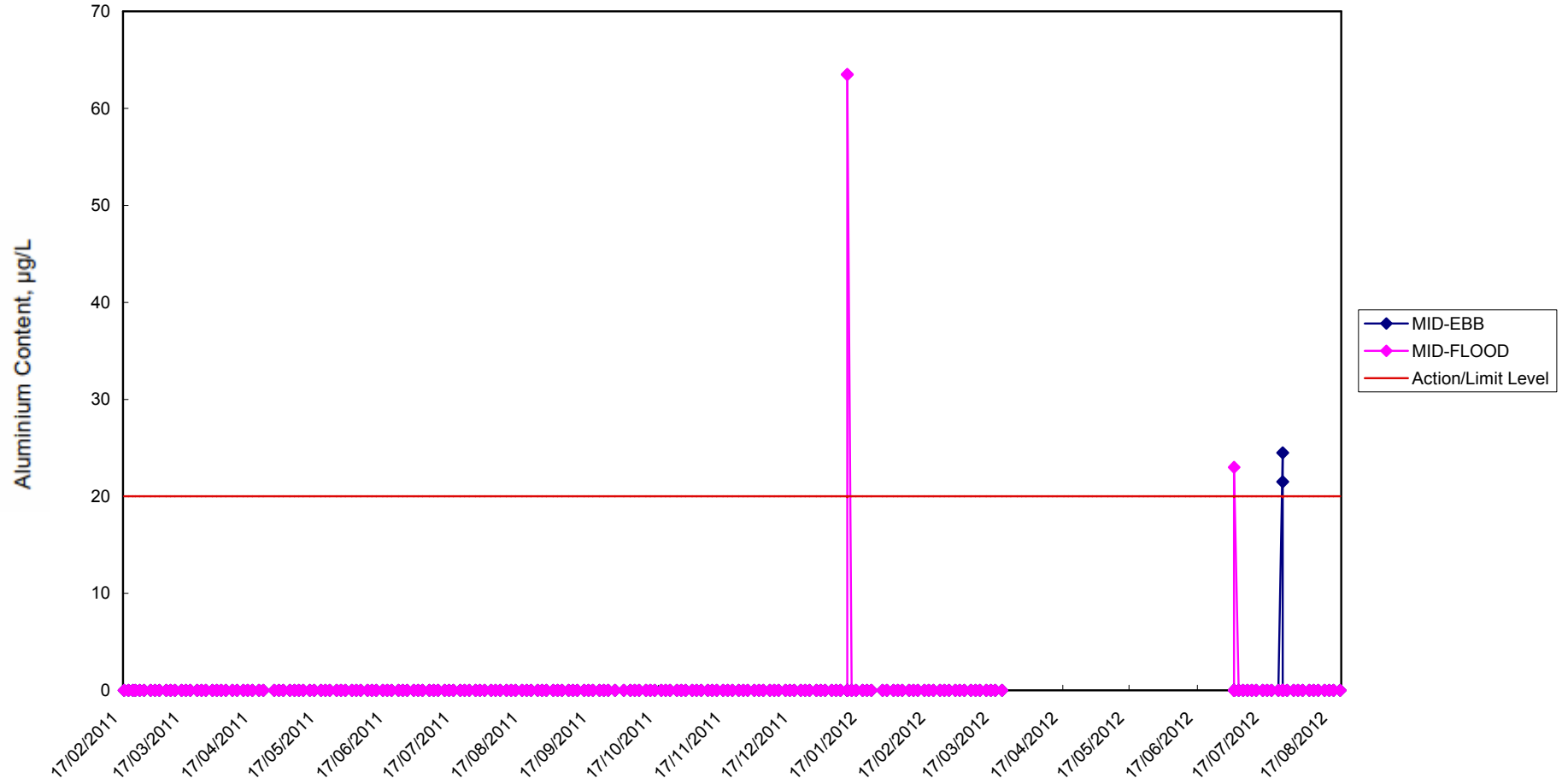
M1 - Aluminium Content



Remark: Other than 10 January, 03 & 25 July 2012, the results of Aluminium Content were less than detection limit **(<20µg/L)**
Zero values are shown in the graph

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Appendix 3

Construction Program

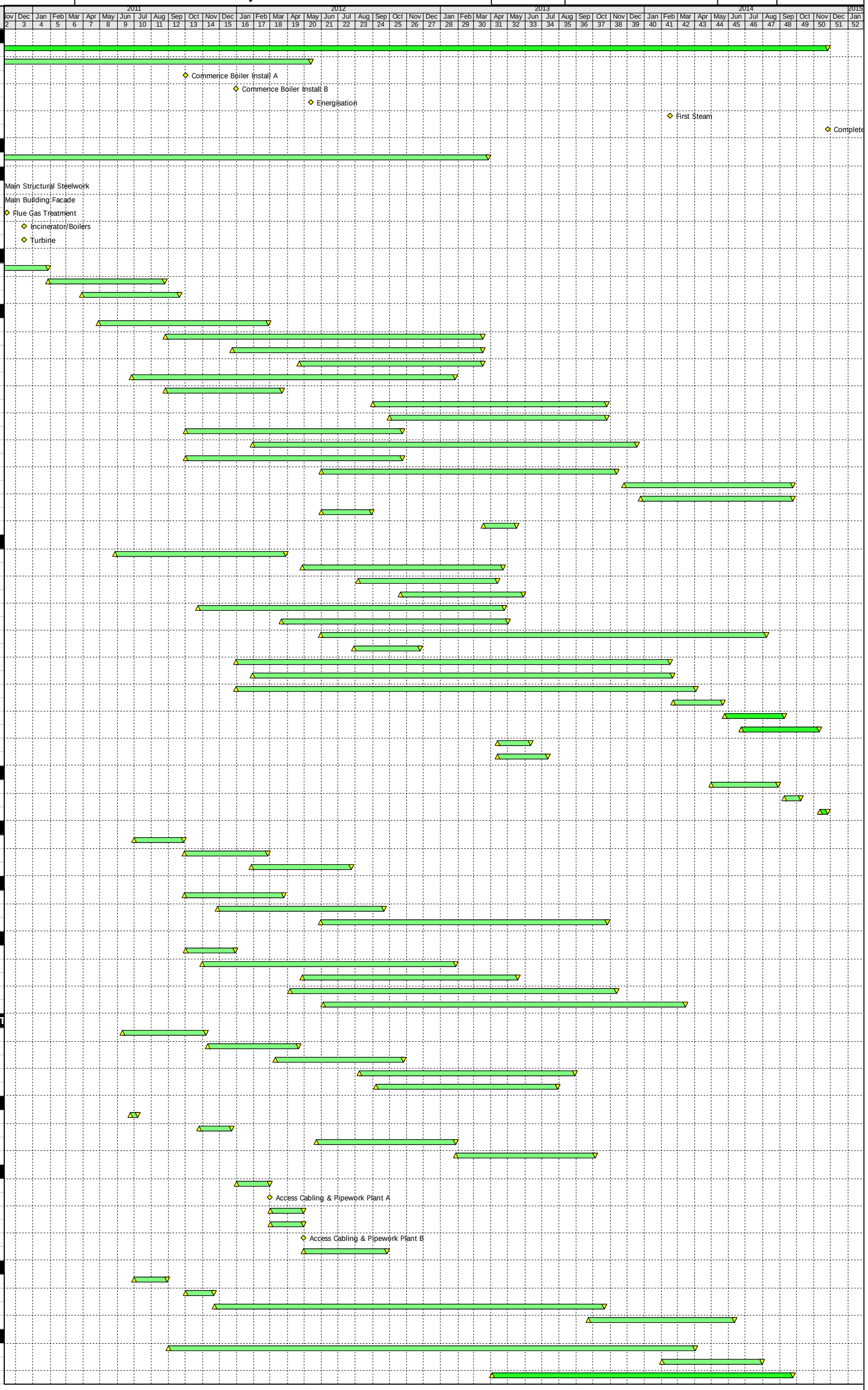
Printed On : 12-Mar-14

SLUDGE TREATMETN FACILITIES

Project Overview

Date	Revision	Checked	Approved
02-Dec-10	VLJH-W-PT-ZZ-0002-D01	RGU	NPR

Activity ID	Activity Name
KEY DATES	
50	SPECIFIED CONTRACT PERIOD 37 MONTHS
60	Ancillary Power from CLP
90	Commence Boiler Install A
140	Commence Boiler Install B
80	Energisation
150	First Steam
170	Complete Section I&II
DESIGN & APPROVALS	
100	Design Submissions & Approvals
MAJOR PROCUREMENT AWARDS	
190	Main Structural Steelwork
200	Main Building Facade
180	Flue Gas Treatment
110	Incinerator/Boilers
160	Turbine
SITE WORKS	
115	Advanced Works
120	Site Formation
130	Foundations Plant A & B
PLANT A	
2010	Substructure + UG Utilities
2040	Supenstr (Roof) inc Glazing/Cladding - Area 1
2080	Superstr (Roof) inc Glazing/Cladding - Area 3
2070	Superstr (Roof) inc Glazing/Cladding - Area 2
2015	Sub - Superstructure Common Plant Area 3
2016	Main Plant Elect & Chillers
2017	Sludge Receiving/ Storage/Feeding
2018	Deoderisation Plant
2020	Process Train 1 Installation - Incin/Boiler
2025	Process Train 1 - 2 Installation - FGT
2030	Process Train 2 Installation - Incin/Boiler
2035	Ash / Additives Handling / Storage
2050	Process Train 1 Commissioning
2060	Process Train 2 Commissioning
2090	Steam Loop Complete - Plant A
2100	Superstr (Roof) - Area 4
PLANT B	
3010	Substructure + UG Utilities
3040	Supenstr (Roof) inc Glazing/Cladding - Area 1
3070	Superstr (Roof) inc Glazing/Cladding - Area 3
3080	Superstr (Roof) inc Glazing/Cladding - Area 2
3015	Sub - Superstructure Common Plant Area 3
3016	Main Plant Elect & Chillers
3017	Sludge Receiving/ Storage/Feeding
3018	Deoderisation Plant
3020	Process Train 3 Installation - Incin/Boiler
3025	Process Train 3 - 4 Installation - FGT
3030	Process Train 4 Installation - Incin/Boiler
3035	Ash / Additives Handling / Storage
3050	Process Train 3 Commissioning
3060	Process Train 4 Commissioning
3100	Superstr (Roof) - Area 4
3090	Steam Loop Complete - Plant A
SYSTEM & PLANT COMMISSIONING	
4030	Training
4010	Plant Commissioning Section 1
4020	Plant Commissioning Section 2
ADMINISTRATION TOWER	
5010	Substructure (Basement)
5020	Substructure & Facade
5030	Fitout including MEP
ANCILLARY BUILDING - MAINTENANCE BLG	
6010	Foundations / Substructure
6020	Superstructure
6030	BW & MEP Fitout
ANCILLARY BUILDINGS - TURBINE A & B	
7010	Foundations / Substructure
7020	Superstructure
7030	BW & MEP Fitout
7040	Process Equipment Installation Plant A
7050	Process Equipment Installation Plant B
ANCILLARY BUILDINGS - WATER TREATMENT	
8005	Intake / Outfall
8015	Foundations / Substructure
8020	Superstructure
8030	BW & MEP Fitout
8040	Process Equipment installation
ANCILLARY BUILDINGS - CONDENSER A & B	
7500	Foundations - Condensor A & B
7510	Substructure - Plant A & B
7520	Installation Condenser Plant A
7530	Installation Condenser Plant B
VISITOR GALLERY	
8500	Steelwork Erection Plant A
8520	Access Cabling & Pipework Plant A
8510	Ext Facade/Cladding/Gallery Plant A
8550	Steelwork Erection Plant B
8570	Access Cabling & Pipework Plant B
8560	Ext Facade & Fit Gallery Plant B
EEC BUILDING	
9010	Foundations
9040	Substructure
9020	Superstructure + Facade
9030	Fitout including MEP Incl Exhibition Space
EXTERNAL WORKS	
10010	Roads & U/G Utilities
10030	Habitat
10020	Site Landscaping



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Appendix 4

Management Structure and Organization Chart

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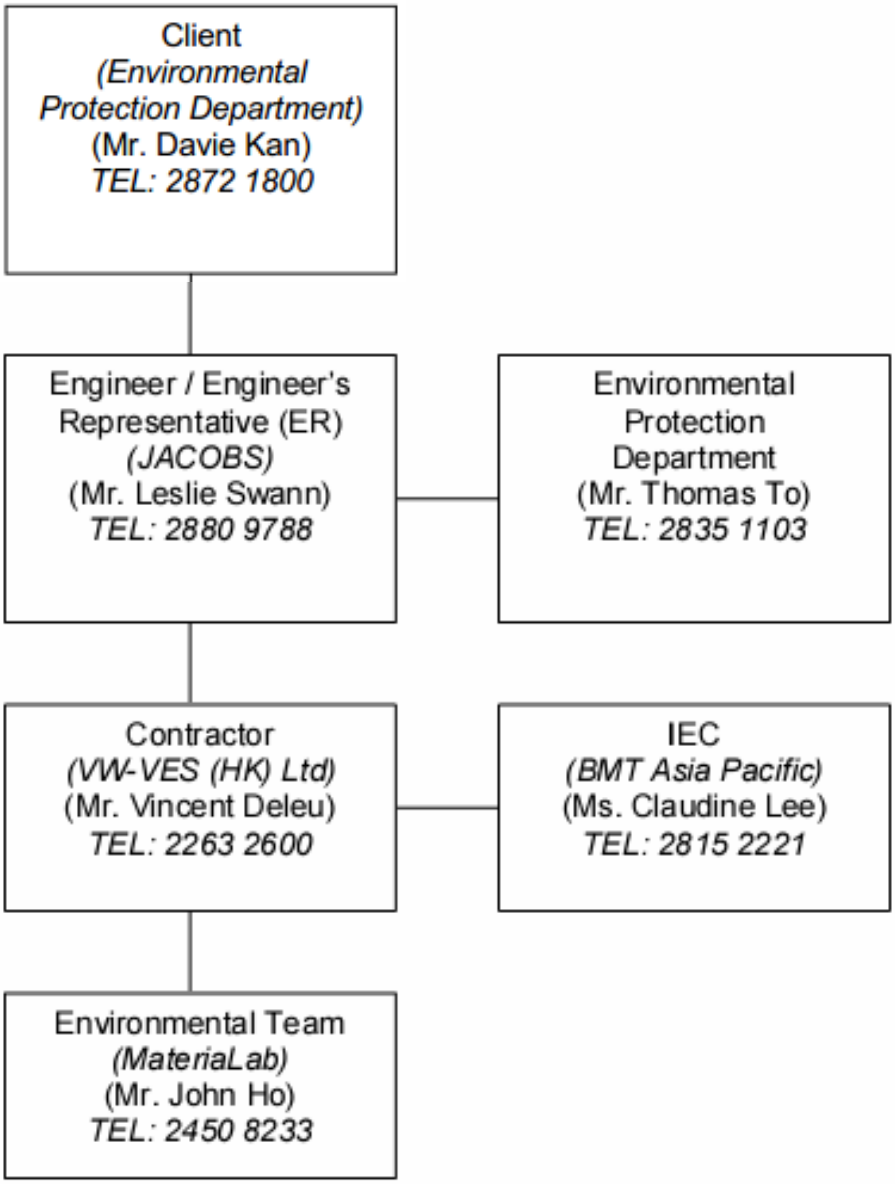
Ref No.: 100440EN150831

Management Structure and Organization Chart



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Appendix 5

Event / Action Plan for Water Quality

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Ref No.: 100440EN150831

Event/Action Plan for Water Quality

Event	ET Leader	IEC	SOR	Contractor
Action level being exceeded by one sampling day	• Repeat *in situ* measurement to confirm findings; • Identify reasons for non-compliance and source(s) of impact; • Inform IEC and Contractor; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC and Contractor; • Repeat measurement on next day of exceedance.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the SOR accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC on the proposed mitigation measures; • Make agreement on the mitigation measures to be implemented. • Assess the effectiveness of the implemented mitigation measures.	• Inform the SOR and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET and IEC and propose mitigation measures to IEC and SOR; • Implement the agreed mitigation measures.
Action level being exceeded by more than one consecutive sampling day	• Repeat *in situ* measurement to confirm findings; • Identify reasons for non-compliance and source(s) of impact; • Inform IEC and Contractor; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC and Contractor; • Ensure mitigation measures are implemented; • Prepare to	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the SOR accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC on the Proposed mitigation measures; • Make agreement on the mitigation measures to be implemented; • ♦ Assess the effectiveness of the implemented mitigation measures.	• Inform the SOR and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; Consider changes of working methods; • Discuss with ET and IEC and propose mitigation measures to IEC and SOR within three working days; • Implement the agreed mitigation measures.

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Ref No.: 100440EN150831

	increase the monitoring frequency to daily; • Repeat measurement on next day of exceedance.			
Limit level being exceeded by one sampling day	• Repeat *in situ* measurement to confirm findings; • Identify reasons for non-compliance and source(s) of impact; • Inform IEC Contractor and EPD; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC, SOR and Contractor; • Ensure mitigation measures are implemented; • Increase the monitoring frequency to daily until no exceedance of Limit level.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the SOR accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC, ET and Contractor on the proposed mitigation measures; • Request Contractor to critically review the working methods; • Make agreement on the mitigation measures to be implemented; • Assess the effectiveness of the implemented mitigation measures.	• Inform the SOR and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET, IEC and SOR and propose mitigation measures to IEC and SOR within three working days; • Implement the agreed mitigation measures.
Limit level being exceeded by more than one consecutive sampling day	• Repeat *in situ* measurement to confirm findings; • Identify reasons for non-compliance and source(s) of impact; Inform IEC Contractor and EPD; • Check monitoring data, all plant, equipment and Contractor's working methods;	• Discuss with ET and • Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the SOR accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC, ET and Contractor on the proposed mitigation measures; • Request Contractor to critically review the working methods; • Make agreement on the mitigation measures to be implemented; • Assess the effectiveness	• Inform the SOR and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET, IEC and SOR and

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	• Discuss mitigation measures with IEC, SOR and Contractor; • Ensure mitigation measures are implemented; • Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.		of the implemented mitigation measures; • Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	propose mitigation measures to IEC and SOR within three working days; • Implement the agreed mitigation measures; • As directed by the SOR, to slow down or to stop all or part of the construction activities.

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Appendix 6

Implementation Schedule of Mitigation Measures

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Table 1. Implementation Schedule and Status of Proposed Air Quality Mitigation Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S3.8.1	Implementation of the Air Pollution Control (Construction Dust) Regulation and good site practices: • Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather. • Use of frequent watering for particularly dusty construction areas and areas close to ASRs. • Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines. • Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs. • Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. • Establishment and use of vehicle wheel and body washing facilities at the exit points of the site. • Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading points, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.	Work site / During the construction period	Contractor		√ √ √ √ √ √ √			Air Pollution Control (Construction Dust) Regulation

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	• Imposition of speed controls for vehicles on unpaved site roads. Ten kilometers per hour is the recommended limit.				√			
	• Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs.				√			
	• Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.				√			

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Table 2. Implementation Schedule of Proposed Human Health Risk Mitigation Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	Human Health Risk Associated with Radon *Prevention of radon influx from the PFA to the STF buildings* • A soil cover can be provided beneath the buildings on top of ash lagoon prior to construction works because it reduces the level of radon influx significantly • Slab-on-grade can be an option on foundation design • Soil suction can also prevent radon from entering the building by drawing the radon from below the building and venting it through a pipe, or pipes, to the air above the building. *Provision of Sufficient ventilation of the interior of the STF buildings* • Forced and natural ventilation should be introduced properly to enhance air exchange rate in the STF buildings. • Basement areas should be pressurized by using a fan to blow air into the basement areas from outdoors is suggested. This would create enough pressure at the lowest level indoors to prevent radon from entering into the STF buildings. *Regular maintenance for the floor slabs and walls* • Cracks and other openings in the foundation should be properly sealed to reduce radon ingress. Sealing the cracks limits the flow of radon into the building thereby making other radon reduction techniques more effective and cost-efficient. It also reduces the loss of conditioned air.	STF buildings / During the design, construction and operation of the STF.	Contractor / STF Operator		√ √ √ √ √ √			EPD's ProPECC Note PN 1/99 Control of Radon Concentration in New Buildings Appendix 2

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Table 3. Implementation Schedule of Proposed Waste Management Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S5.5.1	*Good Site Practices* Recommendations for good site practices during the construction activities include: • Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site • Training of site personnel in proper waste management and chemical handling procedures • Provision of sufficient waste disposal points and regular collection of waste • Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.	Work site / During the construction period	Contractor		√ √ √ √ √			Waste Disposal Ordinance (Cap.354) ETWB TCW No. 19/2005
S5.5.1	*Waste Reduction Measures* • Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:	Work site / During planning & design stage, and construction stage	Contractor		√			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	• The design of the foundation works should minimize the amount of excavated material to be generated.				√			
	• Excavated soil should be reused on site as far as possible, e.g. for landscape works, in order to minimize the amount of public fill to be disposed off-site.				√			
	• Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.				√			
	• Encourage collection of aluminium cans by individual collectors by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force				√			
	• Proper storage and site practices to minimize the potential for damage or contamination of construction materials.				√			
	• Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste.				√			
S5.5.1	*General Refuse* General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.	Work site / During the construction period	Contractor		√			Public Health and Municipal Services Ordinance (Cap. 132)

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S5.5.1	*Construction and Demolition Material* In order to minimize the impact resulting from collection and transportation of C&D material for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below: • A Waste Management Plan, which becomes part of the Environmental Management Plan, should be prepared in accordance with ETWB TCW No.19/2005. • A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed. • In order to monitor the disposal of C&D material at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be included. One may make reference to ETWB TCW No. 31/2004 for details.	Work site / During design stage & construction period	Contractor	√	√ √ √ √			ETWB TCW No. 33/2002 ETWB TCW No. 19/2005 ETWB TCW No. 31/2004
S5.5.1	*Chemical Waste* If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible	Work site / During the construction period	Contractor		√			Waste Disposal (Chemical Waste)(General) Regulation)

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.							

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Table 4. Implementation Schedule of Proposed Land Contamination Preventive Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S5.6.3	*Fuel Oil Tank Construction and Test* • The fuel tank to be installed should be of specified durability • Double skin tanks are preferable • Underground fuel storage tank to be installed should be placed within a concrete pit • The concrete pit shall be accessible to allow regular tank integrity tests to be carried out at regular intervals • The tank integrity tests should be conducted by an independentqualified surveyor or structural engineer • Any potential problems identified in the test should be rectified as soon as possible	Fuel Oil Storage Tank /	Contractor/ STF Operator	√	√ √ √ √ √			
S5.6.3	*Fuel Oil Pipeline Construction and Test* • Installation of aboveground fuel oil pipelines is preferable; if underground pipelines are unavoidable, concrete lined trenches should be constructed to contain the pipelines • Double skin pipelines are preferable • Distance between the fuel oil refuelling points and the fuel oil storage tank shall be minimized • The integrity tests for the pipelines should be conducted by an independent qualified surveyor or structural engineer at regular intervals • Any potential problems identified in the test should be rectified as soon as possible	Fuel Oil Pipelines/ Design, Construction and Operation Phase	Contractor/ STF Operator	√	√ √ √ √ √			
S5.6.3	*Fuel Oil Leakage Detection* • Installation of leak detection device at storage tank and pipelines	Fuel Oil Storage Tank	Contractor/ STF Operator	√	√			

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Table 5. Implementation Schedule of Proposed Water Pollution Control Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S6.7.2	Construction Runoff and Drainage • Site practices outlined in ProPECC PN 1/94 "Construction Site Drainage" shall be followed as far as practicable in order to minimize surface runoff and the chance of erosion: √ • At the start of site establishment, internal drainage works and erosion and sedimentation control facilities shall be implemented. Channels, earth bunds or sand bag barriers shall be provided on site to direct stormwater to silt removal facilities. The detailed design and installation of the temporary on-site drainage system shall be undertaken by the contractor prior to the commencement of construction. √ • Before commencing any site formation work, all sewer and drainage connections shall be sealed to prevent debris, soil, sand etc. from entering public sewers/drains. √ • Boundaries of earthworks shall be surrounded by dykes or embankments for flood protection, as necessary. √ • Sand/silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove sand/silt particles from runoff to meet the standards of the Technical	Work site / During the construction period	Contractor					ProPECC PN 1/94; WPCO

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	Memorandum under the Water Pollution Control Ordinance. The design of silt removal facilities shall be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures shall be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. • Water pumped out from foundation piles shall be discharged into silt removal facilities. • During rainstorms, exposed slope/soil surfaces shall be covered by a tarpaulin or other means, as far as practicable. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94. • Exposed soil areas shall be minimized to reduce potential for increased siltation and contamination of runoff. • Earthwork final surfaces shall be well compacted and subsequent permanent work or surface protection shall be immediately performed. Open stockpiles of construction materials or construction wastes on- site of more than 50m3 shall be covered with tarpaulin or similar fabric during rainstorms. • All vehicles shall be cleaned before leaving the works area to ensure no earth, mud and debris is deposited on roads. An adequately designed and				√ √ √ √ √			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	sited wheel washing bay shall be provided at every site exit. The wheel washing facility shall be designed to minimize the intake of surface water (rainwater). Wash-water shall have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process.							
S6.7.2	*General Construction Activities* • Debris and refuse generated on-site shall be collected, handled and disposed of properly to avoid entering the nearby water bodies and public drainage system. Stockpiles of cement and other construction materials shall be kept covered when not being used. • Oils and fuels shall only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to nearby water bodies and public drains, all fuel tanks and storage areas shall be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund shall be drained of rainwater after a rain event.	Work site / During the construction period	Contractor		√ √			ProPECC PN 1/94;
S6.7.2	*Sewage Effluents* • Temporary sanitary facilities, such as portable chemical toilets, shall be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities.	Work site / During the construction period	Contractor		√			ProPECC PN 1/94; WPCO

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S6.7.2	*Release of PFA Leachate from Ash Lagoon into the Aquatic Environment* • Environmental monitoring and audit (EM&A) should be included to ensure that the foundation construction would not cause an unacceptable release of PFA leachate into the Deep Bay waters. The parameters to be measured should include the heavy metals such as cadmium, chromium and aluminium, which have the greatest tendency to leach from the lagooned PFA into the seawater. Details of the measurement requirements are presented in the EM&A manual	Deep Bay Water outside the Ash Lagoon / During the construction period	Contractor		√			WPCO

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Table 6. Implementation Schedule of Proposed Ecological Mitigation Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S7.8.2	Measures to Minimize Disturbance Impact to Wildlife							
	• Hoarding of 3m high shall be set up along the boundary of the works areas and associated site access to shield the fauna and breeding population of Little Grebe in the Middle Lagoon from the disturbance impact of machinery.	Boundary of works areas/ Construction Phase	Contractor		√			
	• The works boundaries shall not go beyond the proposed Project Area. All work crews, equipment and human activities shall be confined within the designated works area only. No personnel should encroach or wilfully disturb any wild animals and their habitats. Traffic and human access from the western side of the Project Area should be avoided.	Boundary of works areas/ Construction Phase	Contractor		√			
	• Fencing with climbers or plantation shall be provided, where appropriate, along the STF site boundary and the two sides of access road to screen the surrounding habitats from the STF works areas.	Boundary of works areas/ Operation Phase	Contractor		√			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S7.8.2	Measures to Minimize Impact to natural habitats							
	• Where practicable, all proposed works shall be conducted in existing built up area to minimize impact to natural habitats.	Works areas/ Design and Construction Phase	STF Designer/ Contractor	√	√			
	• The abutment (permanent structure) for the vehicular bridge shall avoid streambed. The number and size of the temporary supporting structures to be installed over the streambed during construction shall be minimized as far as practicable.	Vehicular bridge/ Design and Construction Phase	STF Designer/ Contractor	√	√			ETWB TC (Works) No. 5/2005 Protection of natural streams/ rivers from adverse impacts arising from construction works
	• The temporarily affected natural habitats, including streambed, shall be reinstated after the completion of works.	Works Area/ Operation Phase	Contractor		√			
	• For affected natural stream section, placement of substrates of similar size and composition to those of original streambed shall be considered to encourage colonization.	Works Area/ Operation Phase	Contractor		√			
S7.8.2	*Minimise sedimentation/water quality impacts to waterbodies*	Whole Site/ Construction Phase	Contractor					ETWB TC (Works) No. 5/2005 Protection of natural streams/ rivers from adverse impacts arising from construction works
	• Measures to control potential sedimentation/ water quality impacts during the construction phase shall be implemented.				√			
	• To minimize the potential water quality impacts from the construction works located at any river channels, natural streams or seafront, the practices outlined in				√			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	ETWB TC (Works) No. 5/2005 "Protection of natural streams/rivers from adverse impacts arising from construction works" shall be adopted where applicable.							
S7.8.2	*Minimize noise disturbance* • Noise mitigation measures including the use of quieter piling machinery and construction plants shall be implemented to lower the noise level due to construction works. • Only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction programme. • Machines and plant which may be in intermittent use shall be shut down to a minimum. • Plant known to emit noise strongly in one direction, shall be oriented so that the noise is directed away from the Middle Lagoon, where possible. • Silencers or mufflers on construction equipment shall be utilized and shall be properly maintained during the construction period. • Mobile plant (such as generator) shall be sited as far away from the Middle Lagoon as possible. • Material stockpiles and other structures shall be effectively utilized, where practicable, to screen noise from on-site construction activities.	Whole Site/ Construction Phase	Contractor		√ √ √ √ √ √ √			ETWB TC (Works) No. 5/2005 Protection of natural streams/ rivers from adverse impacts arising from construction works

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S7.8.3	*Measures to Mitigate the Loss of Vegetation* • All vegetation located within the work areas shall be preserved as far as practicable. • To compensate for the loss of the vegetation and habitats, tree planting shall be provided in the site area where possible. Species chosen for planting shall be similar to the species identified in the survey and be native to Hong Kong or the Southern China.	Whole Site / Design, Construction and Operation Phase	Contractor / STF Operator	√	√ √			
S7.8.4	Enhancement Measures to Create Additional Habitat for Little Grebe • An additional habitat for Little Grebe shall be created in a less disturbed area located at the northeastern part of the proposed STF. • The created habitat shall be provided in form of shallow pond(s) incorporating suitable habitat characteristics for Little Grebe. The water level of the created pond shall be kept between 1.5 m to 2 m. • Emergent vegetation shall be planted and fish population shall be controlled to allow development of aquatic invertebrate populations as prey of Little Grebe. • To screen the created habitat from disturbance due to nearby landfill traffic, planting of native plants shall be provided on the boundary of the pond(s) as appropriate. • Prior to construction of the pond(s), detailed Habitat Creation and Management Plan (HCMP) of the created habitat prepared by experienced ecologist(s) with over seven year experience in relevant field shall be circulated to relevant departments including AFCD for comment.	Within Project Area/ Design Phase, Construction and Operation Phase	Contractor / STF Operator	√	√ √ √ √ √			

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Table 7. Implementation Schedule for Landscape and Visual Impact

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
Table 9.4 CM-01	*Contaminant/ Sediment Control* – Suitable temporary barriers, covers and drainage provisions shall be provided around construction works to avoid discharge of contaminants (such as bleeding from in-situ concrete works) and sediments into sensitive water-based habitats, especially the tidal streams and the mangrove.	Work site / During the construction period	Contractor		√			
Table 9.4 CM-02	Early Planting of Tall Trees – Tall trees proposed under mitigation measure OM-02 shall be planted early, providing visual effect also during construction.	Work site / During the construction period	Contractor		√			
Table 9.4 CM-03	Good Site Practice – Construction activities should be restricted to works areas and should be clearly demarcated onsite. Piling of construction materials onsite shall be carefully considered for possible impacts before carrying out.	Work site / During the construction period	Contractor		√			
Table 9.4 CM-04	Existing Trees within Works Areas – All existing trees within work sites shall be properly maintained and protected for their crowns, trunks and roots.	Work site / During the construction period	Contractor	√	√			
Table 9.4 OM-01	Sensitive Bridge Design – The bridge of the proposed access road shall be sensitively designed to minimize impact to the tidal stream and mangrove. It shall be constructed with minimal use of in-situ concreting and with maximum use of precast or prefabricated elements. No pile or support shall be erected within the stream channel.	Bridge of access road / During the design & construction phases	Contractor	√	√			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
T able 9.4 OM-02	Tall trees for Chimney – Fast-growing tall trees shall be planted along the east side of the ash-lagoon to counterbalance possible exotic silhouettes, such as from the chimney, of the proposed sludge treatment facilities for sensitive viewers in Pak Nai. The trees shall be planted during the early stage of the construction to ensure effectiveness during operation. They will also help to lessen the visual impact during construction, as already suggested in mitigation measure CM-02.	East side of ash lagoon / During the design & construction phases	Contractor	√	√			
Table 9.4 OM-03	Suitable Reinstatement at Ash-lagoon – Affected perimeter of the proposed works area within the ash-lagoon shall be reinstated with suitable planting materials. Traditional reinstatement planting approach for construction projects may not work well for this project. Certain existing grasses and small shrubs have self-seeded the ash- lagoon, demonstrating their tolerance to salts, alkalinity and possible trace metals in the ash. Therefore the same or similar species of vegetation shall be used.	Perimeter of works area / During the design & construction phases	Contractor	√	√			
Table 9.4 OM-04	Existing Tree Transplanting – The proposed access roadworks may affect few existing trees, which shall be transplanted as far as practical. A comprehensive tree survey is recommended to locate these trees.	Access road / During the design & operation phases	Contractor	√	√			
Table 9.4 OM-05	Planting at Road Intersection – Suitable planting of woodland trees and shrubs shall be provided for the proposed access roadworks at the junction with Nim Wan Road.	Junction of access road with Nim Wan Road / During the design & operation phases	Contractor	√	√			

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Table 8. Implementation Schedule of Proposed Landfill Gas Hazard Protection Measures

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S10.7.2	**Appointment of Safety Officer** Appoint a properly trained safety officer and provide with appropriate equipment to measure and monitor LFG hazard.	Work Site / During the construction phase	Contractor		√			
S10.7.2	**Safety Measures - Excavation** Staff should receive appropriate training on working in areas susceptible to landfill gas, fire and explosion hazards. Excavation procedures and code of practice should be implemented.	Work Site / During the construction phase	Contractor		√			
S10.7.2	*Safety Measures – Welding, Flame-Cutting and Hot works* Hot works should be confined to open areas away from any trench or excavation. Should hot works must be carried out in trenches or confined space, "permit to work" procedures should be followed.	Work Site / During the construction phase	Contractor		√			
S10.7.2	**Safety Measures – Enclosed Spaces** Site offices or buildings located within WENT Landfill Consultation Zone which have the capacity to accumulate landfill gas, then they should either be located in an area which has been proven to be free of landfill gas; or be raised clear of the ground by a minimum of 500mm.	Enclosed Spaces within WENT Consultant Zone / During the construction phase	Contractor		√			
S10.7.2	**Safety Measures – Electrical Equipment** Any electrical equipment, such as motors and extension cords, should be intrinsically safe.	Work Site / During the construction phase	Contractor		√			

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S10.7.2	**Safety Measures – Piping** During piping assembly or conduiting construction, all valves/seals should be closed immediately after installation. As construction progresses, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. All piping/conduiting should be capped at the end of each working day.	Work Site / During the construction phase	Contractor		√			
S10.7.2	**Safety Measures – Fire Safety** Adequate fire safety equipments should be provided on site. Workers and visitors should be notified of the potential fire hazards. Safety notices should be posted around the site warning the anger and potential hazards.	Work Site / During the construction phase	Contractor		√			
S10.7.2	**Safety Measures – Confined Spaces** Precautionary measures should include ensuring that staff members are aware of the potential hazards of working in confined spaces, and that appropriate monitoring procedures are in place to prevent hazards in confined spaces.	Confined Spaces at Work Site / During the construction phase	Contractor		√			
S10.7.2	**Monitoring** Periodically during ground-works within the Consultation Zone, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment. The monitoring frequency and areas to be monitored shall be set down prior to commencement of ground-works. Depending on the results of the measurements, actions required will vary. As a minimum these should encompass those actions specified in Table 10.6 of the EIA Report.	Work Site / During the construction phase	Contractor		√			

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Figure 1.1

Construction Works Area

General Layout of Sludge Treatment Facilities (STF)

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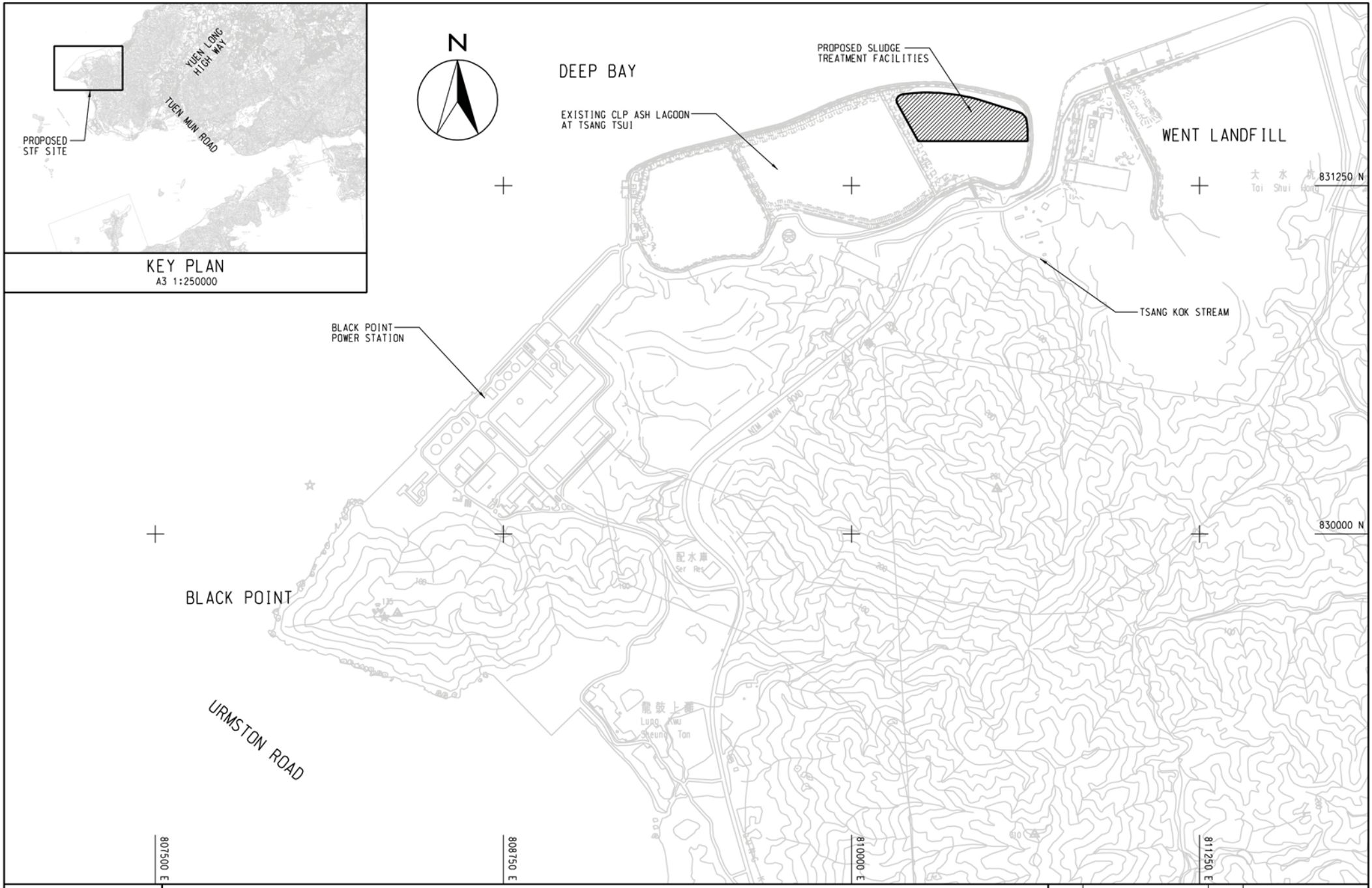
Figure 3.1

Site Layout Plan



MAUNSELL | AECOM
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY

LOCATION PLAN OF PROPOSED SLUDGE TREATMENT FACILITIES

SCALE	A3 1:12500	DATE	SEP. 2008
CHECK	PPMY	DRAWN	XCF
JOB No.	60015756	DRAWING No.	FIGURE 1.1
		REV	-

DATE: GUOXH 2008-9-30

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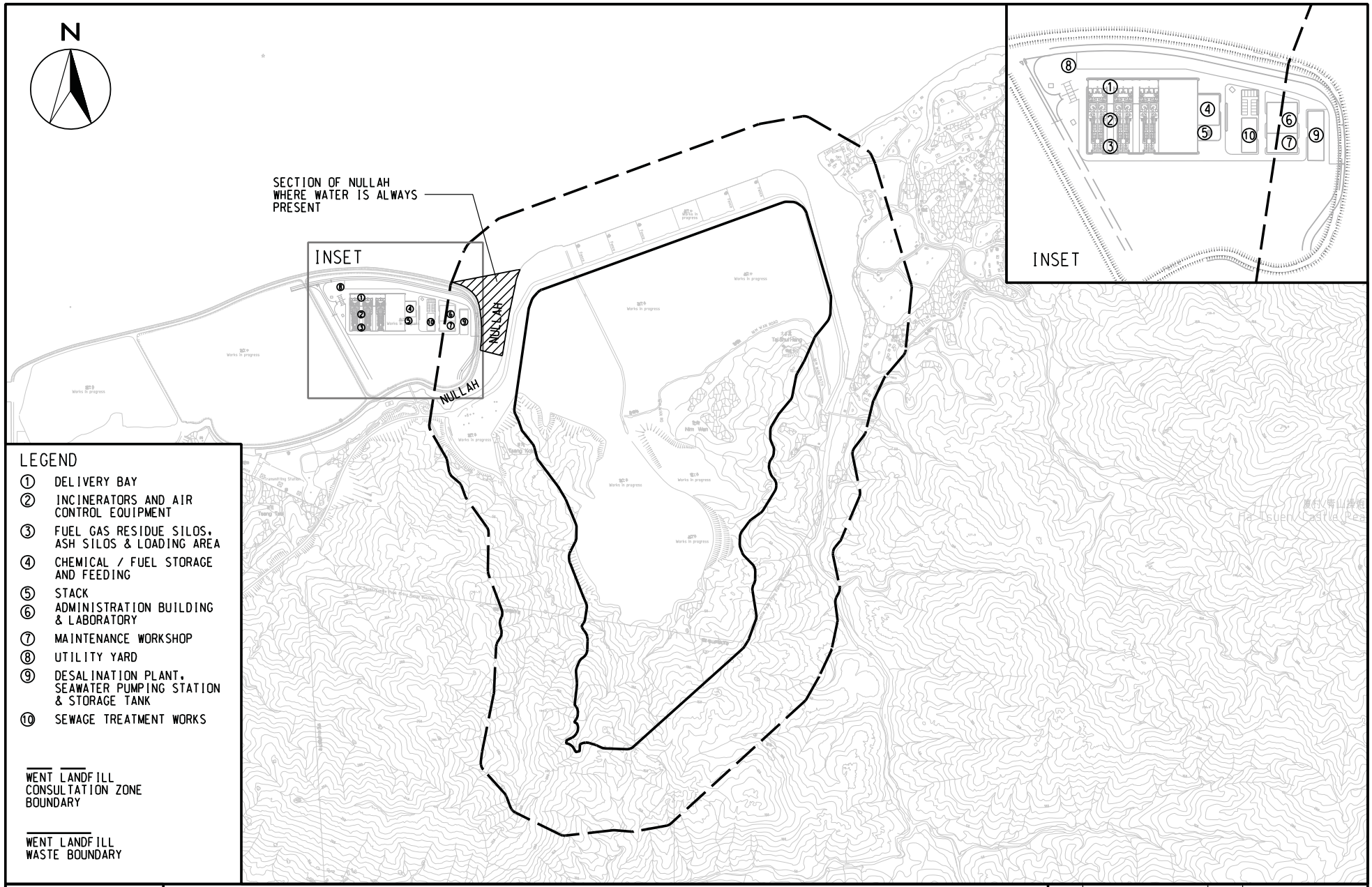
Figure 3.2

WENT Landfill Gas Control Zone



MAUNSELL AECOM
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY

WENT LANDFILL CONSULTATION ZONE

SCALE	1:11000	DATE	APR. 2008
CHECK	TCYC	DRAWN	ALFA
JOB No.	60039510	DRAWING No.	FIGURE 10.1
		REV	-

DATE: $DATE$

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FUGRO TECHNICAL SERVICES LIMITED
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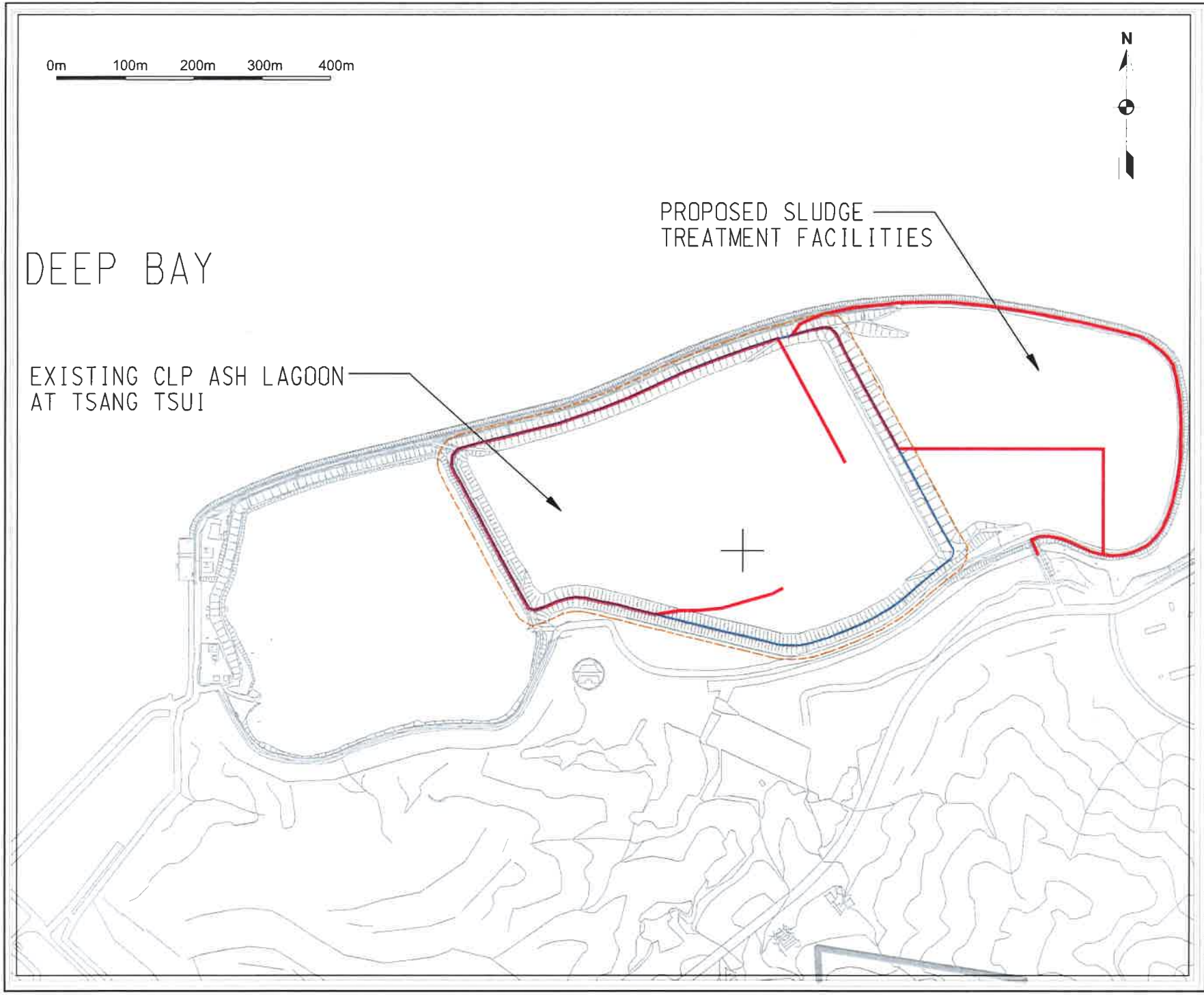
Figure 4.1

Ecological Transect Route



Notes:

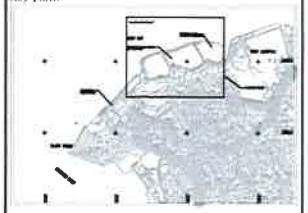
- Survey Route
- Middle Lagoon Boundary
- 20m from Middle Lagoon Boundary

Asia Ecological Consultants Ltd

Project Title:

Contract No. EP/SP/58/08
Sludge Treatment Facilities

Key Plan:



Drawing Title:

Ecological Transect Route

Drawn:	SK	Scale:	As shown
Checked:	DJS	Date:	May 2011
Approved:	DJS	File:	--

Drawing Number: --

Revision: 1