Docksway Disposal Site

Annual Environmental Review for Area 2 - 2016

On behalf of **Newport City Council**

NEWPORT CITY COUNCIL
CYNGOR DINAS CASNEWYDD

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1 Introduction

1.1 Background

Docksway Disposal Site is located approximately 3km south of Newport City Centre, Gwent, and is centred on National Grid Reference ST 305 853. The site is operated by Newport City Council, referred to hereafter as NCC. The location of the site is shown on **Figure 1.**

The site is approximately split into a northern part (Area 1) and a southern part (Area 2). Area 1 is an unlined ('dilute and disperse') landfill that was operated under Waste Management Licence (WML) number EAWML30058 and is now closed and in the aftercare phase. Area 2 is an engineered containment landfill that is active and operated under Pollution Prevention Control (PPC) Permit No. DP3733BK, Variation Number V004 (July 2016).

It is a requirement of the PPC Permit for Area 2 (Conditions 4.2.1 and 4.2.2) that a report is provided to Natural Resources Wales (NRW – formerly the Environment Agency) on an annual basis in order to report on the environmental performance of the site. This report is called an Annual Environmental Review.

1.2 Scope

This document reviews the data produced by various environmental monitoring programmes and management systems and provides an analysis of any trends in the data over the preceding 12-month period of December 2015 to December 2016. The data review and analysis is used to provide a review of the potential environmental risks associated with Area 2 of the site. This document includes the following:

- Review and analysis of the Area 2 environmental monitoring results collated over the past 12 months.
- Comments on temporal trends observed in the longer term monitoring data collected.
- A review of the potential risks to sensitive environmental receptors.
- Energy consumption at the site and annual production/treatment.
- Comparison of the current topographical survey and the previous topographical survey and assessment of the settlement behaviour together with volumetric difference.
- Calculation of the remaining capacity.

Guidance for readers of this report is given in **Section 10** of this report.

1.3 Related Work

Much of the environmental data commented on in this report has been issued to NRW previously in the form of monthly or quarterly interim environmental monitoring reports.

2 Surface Water Quality Monitoring

2.1 Current Monitoring Programme

A surface water monitoring programme commenced at Docksway Disposal site in September 2003, in accordance with the requirements of Condition 62 of the Area 1 WML. Since this time, NCC has undertaken monthly surface water monitoring and has reported these results to NRW on a monthly basis. Details of the monitoring programme for the site, (including the range of chemical testing suites used and the laboratory test methods and detection limits), are presented in the Monitoring Plan for Area 1, updated in August 2011[1].

A total of six monitoring locations have been used for assessing the surface water quality over the past 12 months, the locations of which are shown on **Figure 2**, and details are tabulated below:

Table 2.1 – Details of Surface Water Locations Monitored During 2016

Position Monitored	Location
SW1A	Ebbw Upstream
SW11	North Pond
SW23	Discharge to Maes Glas Pill from Docks Drain Outfall (Disused Culvert)
SW24	Oxbow Lake Position 1
SW25	Surface Water Management System Discharge Point
SW26	Area 2 Surface Water

It should be noted that the surface water monitoring location SW02 (River Ebbw Downstream) has not been monitored or sampled since October 2012 due to ongoing safety concerns regarding the access to this location, and is therefore excluded from this AER.

2.2 Surface Water Hydrochemistry over the Preceding 12 Months

2.2.1 Trigger Levels

It was not a requirement of the Area 1 WML to set surface water compliance limits for the site, and consequently none have been set by NRW (formerly EA). Therefore, comments on the surface water hydrochemistry with respect to compliance limits are not presented in this report. Instead, only the data and any temporal trends in the data are presented and commented upon.

The exceptions to this are surface water sampling points SW25 and SW26 which are subject to discharge consents (Consent Number AN0394301 and AN0401301 respectively) with limit values as set by NRW. The chemical test results for SW25 and SW26 are therefore assessed against the discharge consent limits.

2.2.2 SW25

In the last 12 months, SW25 has been sampled twice (January and February) and recorded as dry on each of the remaining monthly monitoring visits.

The following provides commentary on the consented limit values:

- On both occasions that SW25 was sampled, the results were significantly below the discharge consent limit (30mg/l) for Ammoniacal Nitrogen, with recorded values of 1.76mg/l and 3.21mg/l. The concentrations of Ammoniacal Nitrogen recorded in SW25 appear to show an overall gradual decrease since commencement of monitoring in 2004.

- The discharge limit (40mg/l) for Biological Oxygen Demand (BOD) was not exceeded during either monitoring event in 2016 for SW25.

- The recorded pH values were within the required limits of between 6 and 9 on both occasions.

- In relation to Total Suspended Solids (TSS), the discharge consent limit (60mg/l) was not exceeded on either monitoring round. Values of 6mg/l and 2.5mg/l were recorded in January and February, respectively.

There is currently no evidence to suggest that there are any detrimental temporal trends with regard to surface water quality at this location.

2.2.3 SW26

Surface water monitoring point SW26 was included in the monitoring programme for Area 1 at the start of 2013, and has been sampled on thirteen out of forty-eight occasions since commencement (being recorded as dry on each other occasion).

During 2016, SW26 was sampled on two occasions (January and February), and on the remaining months recorded as dry.

The following provides commentary on the consented limit values:

- The results of the testing undertaken indicate concentrations of Ammoniacal Nitrogen of 2.54mg/l and 15.6mg/l in January and February 2016 respectively. There is no limit for Ammoniacal Nitrogen in the discharge consent for SW26, however the concentrations recorded in 2016 are within the general normal range recorded at this location.

- The results of the TSS testing undertaken on the two samples obtained from SW26 during 2016 recorded values of 4.5mg/l and 4mg/l in January and February respectively, and both of these concentrations are within the discharge consent limit for TSS (60mg/l).

- During 2016, pH values were not recorded outside of the required limits of between 6 and 9, in accordance with the discharge consent.

There is currently no evidence to suggest that there are any detrimental temporal trends with regard to surface water quality at this location.

2.2.4 Ammoniacal Nitrogen

Appendix 1/1 presents the results of Ammoniacal Nitrogen concentrations since 2003 at each of the surface water monitoring locations.

It can be seen that Ammoniacal Nitrogen concentrations in SW1A have predominantly been recorded below 0.5mg/l including several times below the method detection limit (MDL) for the laboratory (0.2mg/l) in the last 12 months. This is consistent with the longer term dataset.

In SW11 the Ammoniacal Nitrogen concentrations have been recorded below the method detection limit (MDL) for the laboratory (0.2mg/l) on each sampling visit in the last 12 months and concentrations have predominantly been recorded below 1mg/l since commencement of monitoring.

In SW23 the Ammoniacal Nitrogen concentrations have been relatively consistent over the last 5 to 6 years, continuing a general gradual decrease in concentrations since 2003, and below 50mg/l in the last 5 years.

The remaining surface water monitoring point (SW24) shows a generally consistent trend since commencement of monitoring, with concentrations predominantly below 1mg/l.

2.2.5 BOD and COD

Appendices 1/2 and **1/3** present Biological and Chemical Oxygen Demand concentrations since 2003 at each of the surface water monitoring locations.

All locations appear to be displaying a generally stable trend in BOD concentrations with most results recorded at concentrations below 10mg/l in the last 6 years. A concentration of 56.8mg/l was recorded in SW24 in August 2016, but the subsequent sampling visit in September 2016 recorded a significantly lower concentration of 4.03mg/l.

In general, COD concentrations appeared to be relatively stable at most monitoring locations during 2016 with results generally below or around 100mg/l. The exceptions to this are SW23 and SW11 which have recorded concentrations of 176mg/l and 223mg/l in August and September 2016 respectively. These concentrations are within the range of results recorded at these monitoring locations.

2.2.6 DO and Chloride

Appendix 1/4 presents the results of Dissolved Oxygen (DO) monitoring since 2005 at each of the current Area 1 surface water monitoring locations. In the last 12 months, DO has predominantly been recorded between 6mg/l and 11mg/l, and there appears to be a generally stable trend at each monitoring location.

Appendix 1/5 presents Chloride concentrations at each of the surface water monitoring locations since 2003. The data indicates that most surface water monitoring locations are showing a generally stable trend of Chloride concentrations over the last 12 months with concentrations predominantly below 100mg/l. The exceptions to this are SW23 where concentrations of Chloride have fluctuated significantly (from below 100mg/l to over 8000mg/l) from month to month, as they have done since monitoring commenced, and SW26 where concentrations generally fluctuate from below 100mg/l up to about 400mg/l.

2.2.7 pH and Electrical Conductivity

Appendix 1/6 presents the results of pH monitoring of surface water since 2003 at each of the current Area 1 surface water monitoring locations. In the past 12 months all of the pH readings have generally been recorded between about pH 7.5 and pH 8.5, which is within the normal range for all of the monitoring locations in the last 5 years.

Appendix 1/7 presents Electrical Conductivity (EC) readings in each of the surface water monitoring locations since 2003. The data indicates a stable trend of Electrical Conductivity readings, generally below 5mS/cm at all monitoring locations in the last 12 months with the exception of SW23, where a result of 20.6mS/cm was recorded in August 2016. This is within the range of the overall dataset.

2.2.8 Total Suspended Solids

Appendix 1/8 presents the concentrations of Total Suspended Solids at SW25 since 2007 and SW26 since 2013. The data does not currently indicate trends of increasing concentrations of TSS.

2.3 Review of Potential Risks and Future Monitoring

The environmental data for surface water does not indicate any significant adverse trends developing in surface water quality, and over the last 12 months does not indicate any significant decrease in surface water quality since the previous Environmental Performance Report.

3 Groundwater Quality Monitoring

3.1 Monitoring Programme

A groundwater monitoring/sampling programme commenced at Docksway Disposal Site in September 2003 to monitor groundwater quality within the underlying River Terrace Gravel deposits present beneath the site.

Details of the monitoring methodology and protocols for the site (including the frequency of testing and the range of chemical testing suites used) were presented in the Monitoring Plan for Area 2: Landfill Extension, dated 2005[2], which was accepted by the EA (now NRW) at that time.

The locations of the boreholes used in the current monitoring and sampling programme are indicated on **Figure 2**.

Interim groundwater quality reports have previously been provided to NRW on a quarterly basis (in accordance with the PPC Permit Conditions 3.6.1 and 3.6.2) providing both factual data and interpretive comments where appropriate.

3.2 Monitoring Locations and Compliance Levels

There are fourteen compliance monitoring wells across Area 2, although only eleven of these currently have agreed compliance limits. It is intended that the remaining three wells (GW12_30, GW12_33 and GW12_38) will have compliance limits set in due course.

Table 3.1 – Groundwater Monitoring Locations

Monitoring Location	National Grid Reference	
GW07_40	ST310852	(331007E, 185204N)
GW12_30	ST311852	(331089E, 185194N)
GW09_31	ST312851	(331165E, 185095N)
GW03_09	ST312850	(331166E, 184999N)
GW09_32	ST311849	(331118E, 184919N)
GW12_33	ST311848	(331055E, 184834N)
GW06_34	ST310847	(331015E, 184732N)
GW09_35	ST309848	(330904E, 184755N)
GW06_36	ST308848	(330811E, 184777N)
GW06_37	ST307848	(330715E, 184801N)
GW06_13	ST306849	(330602E, 184887N)
GW12_38	ST307850	(330705E, 184986N)
GW06_14a	ST308851	(330829E, 185098N)
GW06_39	ST309851	(330932E, 185137N)

Control levels and Compliance limits for eight of the compliance monitoring wells were proposed as part of the four yearly review of the Hydrogeological Risk Assessment (HRA) for Area 2 produced in December 2010[3] and accepted by NRW in August 2013. In addition, Control and Compliance limits for the three 'GW09' compliance wells (31, 32, and 35) were proposed in September 2013, and following amendment were subsequently accepted by NRW.

The current control and compliance levels are reproduced in Table 3.2.

Table 3.2 – Accepted Area 2 Groundwater PPC Permit Compliance Limits for Emissions to Groundwater

Monitoring Well	Benzene	Naphthalene	Xylene	Arsenic
	Compliance Limit	Compliance Limit	Compliance Limit	Compliance Limit
	ug/l	ug/l	ug/l	ug/l
GW03_09	2	5	3	35
GW06_13	2	5	3	50
GW06_14a	2	5	3	25
GW06_34	2	5	3	65
GW06_36	2	5	3	30
GW06_37	2	5	3	60
GW06_39	2	5	3	50
GW07_40	2	5	3	35
GW09_31	13	5	3	80
GW09_32	3	5	3	30
GW09_35	2	5	3	50

Monitoring Well	Nickel		Potassium		Ammoniacal Nitrogen	
	Control Level	Compliance Limit	Control Level	Compliance Limit	Control Level	Compliance Limit
	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l
GW03_09	8	10	160	180	30	35
GW06_13	12	14	100	110	30	35
GW06_14a	12	14	160	180	53	60
GW06_34	12	14	310	350	30	35
GW06_36	8	10	100	110	20	23
GW06_37	8	10	100	110	30	35
GW06_39	26.4	30	100	110	20	23
GW07_40	8	10	39.6	45	20	23
GW09_31	8	10	100	110	50	50
GW09_32	8	10	160	180	50	50
GW09_35	8	10	100	110	30	35

3.3 Groundwater Quality

3.3.1 Ammoniacal Nitrogen

Appendices 2/1 to **2/4** present the recorded concentrations of Ammoniacal Nitrogen since 2003 for the Area 2 groundwater monitoring locations. Ammoniacal Nitrogen concentrations in all compliance wells have been relatively consistent in the last 12 months and longer term, and with the exception of GW06_37, there are no distinct trends in the data sets.

One compliance limit exceedance was recorded in GW06_37 during 2016; a concentration of 37.2mg/l (compliance limit 35 mg/l) was recorded in September 2016. The longer term dataset for GW06_37 indicates that concentrations of Ammoniacal Nitrogen increased between 2012 and 2015 but during both 2015 and 2016 appear to have stabilised to remain generally above the control level and occasionally above the compliance limit. It is not considered that at the current time this trend represents a significant potential risk to the groundwater because the concentrations recorded are predominantly below the compliance limit and the trend appears at the current time to have stabilised.

All other monitoring locations remained below the control and compliance limits throughout the monitoring period.

3.3.2 Arsenic

Appendices 2/5 to **2/12** present the results of Arsenic concentration since 2003 for the current Area 2 groundwater monitoring locations. Arsenic concentrations at the majority of Area 2 groundwater monitoring wells are consistent with generally no distinct trends or exceedances of the well-specific compliance limits in the last 12 months. The overall dataset shows a general decrease in arsenic concentration since 2015, with no compliance limit exceedances during 2016.

3.3.3 Benzene, Naphthalene and o-Xylene

Appendices 2/13 to **2/20** present the results of Benzene, Naphthalene and o-Xylene concentrations.

Benzene concentrations in all Area 2 compliance wells have been consistent in the last 12 months, with no exceedances of the compliance limits and the majority of results were recorded below the method detection limit (MDL).

All current Area 2 groundwater monitoring locations are showing stable trends of Naphthalene and o-Xylene concentrations at or below the MDL.

It should be noted that the laboratory MDL has changed a number of times since 2004 for Benzene, Naphthalene and o-Xylene which gives a false impression that some of the results have occasionally exceeded the compliance limit, because the compliance limit tracks the MDL.

3.3.4 Extractable Petroleum Hydrocarbons

Appendices 2/21 and **2/22** present the results of Extractable Petroleum Hydrocarbons (EPH) concentrations. Concentrations of EPH have generally been recorded below 200µg/l in all of the monitoring wells in Area 2 during 2016, and concentrations are generally lower than the results recorded in 2015. There are no compliance limits required for EPH.

3.3.5 Nickel and Potassium

Appendices 2/23 to **2/31** present the results of Nickel and Potassium concentrations in the monitoring wells.

Nickel concentrations at the majority of the compliance wells have remained generally stable throughout the 12-month monitoring period, with only one recorded compliance limit exceedance. A concentration of 15.1mg/l (compliance limit 10mg/l) was recorded in GW07_40 in September 2016, however, a concentration of 2mg/l was recorded on the subsequent monitoring visit in December 2016. Nickel concentrations in GW07_40 and GW09_35 have recorded variable concentrations including exceedance of the compliance limits in each of the last 3 years, however this doesn't appear to be a seasonal trend and the concentrations recorded in the subsequent rounds have always returned below the compliance limits.

Similarly, the majority of current Area 2 groundwater monitoring locations show stable levels of Potassium, with only one exceedance of the compliance limit during the last 12 months. A concentration of 52.9mg/l (compliance limit 45mg/l) was recorded in GW07_40 in April 2016, with subsequent concentrations recorded below the compliance limits.

3.4 Review of Potential Risks and Future Monitoring

The environmental data obtained for the groundwater compliance wells in Area 2 indicates that in general the River Terrace Gravel groundwater chemistry is in a stable condition and that there is therefore no significant deterioration in water quality since the previous Annual Environmental Review.

During 2016, a small number of exceedances of compliance limits were recorded in some monitoring wells, however, these are not considered to represent a significant risk to the groundwater quality because they are not consistently exceeding the compliance limits.

4 Leachate Monitoring

4.1 Leachate Control Measures and Management System

In accordance with Condition 2.7.1 of the PPC Permit, leachate levels are recorded monthly (when access permits) at five locations in Cell 1 and three locations in Cell 2 with samples recovered for analytical testing on a quarterly basis at LF08_07 located within Cell 1 of Area 2, and C2B (when access permits) within Cell 2 of Area 2.

Cell 2 in Area 2 began receiving waste in 2010, and in 2012 analytical testing commenced on leachate samples obtained from Cell 2 on a quarterly basis.

Leachate generated in Area 2 is pumped directly to tankers and removed off site for disposal.

4.2 Leachate Measurements

Leachate head levels at LF08_07, C1A, C1B, C1D, C1E (Cell 1), C2A, C2B and C2C (Cell 2) are scheduled to be recorded on a monthly basis at the site. In accordance with Condition 2.10.15 of the PPC Permit, leachate head levels should not exceed 2m above the base of any cell.

Leachate volumes removed from Area 2 and associated leachate head levels in all cells, recorded over the last 12 months, are presented in Table 4.1.

Table 4.1 – Leachate Measurements at Cell 1 and Cell 2

Monitoring Round	Leachate Head Level above base of cell (m)								Leachate Removed (tonnes)
	LF08_07 (Cell 1)	C1A (Cell 1)	C1B (Cell 1)	C1D (Cell 1)	C1E (Cell 1)	C2A (Cell 2)	C2B (Cell 2)	C2C (Cell 2)	
January 2016	3.44	4.40	-	2.50	2.75	-	-	-	14,067
February 2016	3.54	5.00	-	2.50	2.80	-	-	-	
March 2016	3.74	4.80	-	2.50	2.80	3.25	-	9.70	
April 2016	No access to vertical leachate wells for level monitoring.								
May 2016									
June 2016									
July 2016									
August 2016									
September 2016									
October 2016									
November 2016									
December 2016									

From April 2016 onwards, there has been no access to the vertical leachate monitoring wells, and therefore it has not been possible to determine leachate levels at these locations. Leachate samples have been obtained from the side risers in lieu of access to C2B and LF08_07, and submitted for laboratory analysis.

4.3 Leachate Chemistry

As described above, samples have been obtained from locations associated with LF08_07 (cell 1) and C2B (cell 2). Therefore, the information below relates only to these locations. Cell 2 wells were not monitored during 2015 due to access restrictions, and therefore the data for C2B is incomplete for that year.

4.3.1 Ammoniacal Nitrogen

Appendix 3/1 presents the results of Ammoniacal Nitrogen concentrations. Ammoniacal Nitrogen concentrations at LF08_07 rose on each subsequent monitoring visit through 2016, reaching a peak of 1060 mg/l in September falling to 691mg/l in December 2016.

An Ammoniacal Nitrogen concentration of 1980mg/l was recorded in C2B in March 2016, the highest concentration since monitoring of this well commenced. The recorded concentrations then fell during the subsequent monitoring visits to below 1500mg/l. However, the Ammoniacal Nitrogen concentrations at C2B appear to show a generally upward trend since commencement of monitoring in 2012.

4.3.2 Arsenic

Appendix 3/2 presents the results of Arsenic concentrations over time in leachate in Area 2. Arsenic concentrations at both locations appear to have fluctuated throughout the year, varying from 0.51µg/l to 111µg/l in C2B leachate, and these concentrations are outside of the range established during previous monitoring. In the LF08_07 leachate, concentrations have varied between 32.7µg/l and 46.3µg/l, and these concentrations are within the general range established during previous monitoring rounds.

4.3.3 Benzene and Naphthalene

Appendices 3/3 and **3/4** present the results of Benzene and Naphthalene concentrations in leachate from LF08_07 and C2B.

Benzene concentrations in LF08_07 and C2B leachate have fluctuated over the last 12 months, with concentrations recorded below 5µg/l in LF08_07 and below 9µg/l in C2B in 2016. These Benzene concentrations are within the normal ranges for these sampling locations.

Naphthalene concentrations in LF08_07 leachate have been recorded below the MDL during all monitoring rounds since 2013. Concentrations of 3.09µg/l and 3.64µg/l were recorded in C2B during the first two monitoring rounds in 2016, and then below the MDL in the subsequent two monitoring rounds. These concentrations are within the range of the previous data for these locations.

4.3.4 o-Xylene and EPH

Appendices 3/5 and **3/6** present the results of o-Xylene and EPH concentrations in the Area 2 leachate.

Concentrations of o-Xylene in LF08_07 have been recorded below 5µg/l in 2016 and within the range of previous data. Concentrations of o-Xylene in C2B leachate appear to be gradually falling since commencement of monitoring in 2012 and have been recorded below 12ug/l in 2016.

Concentrations of EPH in LF08_07 were recorded within the normal range (<2000ug/l) for this location in the first half of 2016, and then in the second half of 2016 the concentrations were on three occasions significantly higher than normal at up to >12,000ug/l. There is insufficient data to consider this a trend at the current time and therefore this will be re-reviewed during the next annual environmental performance report.

4.3.5 Nickel and Potassium

Appendices 3/7 and **3/8** present the results of Nickel and Potassium concentrations at LF08_07 (Cell 1) and Cell 2 since commencement of monitoring.

During 2016, Nickel concentrations in LF08_07 have been recorded at generally higher concentrations than previous monitoring rounds. Concentrations of Nickel in C2B leachate have been recorded within the normal range for most of 2016 but recorded on one occasion (March 2016) the highest concentration (254ug/l) since commencement of monitoring.

Potassium concentrations appear to have been rising in LF08_07 during 2016 but they have generally remained within the range of the overall dataset and have generally been recorded below 400ug/l. In C2B Potassium concentrations have been recorded generally within the range of the dataset for this location (generally below 1000ug/l).

4.4 Review of Potential Risks and Future Monitoring

The environmental monitoring data for LF08_07 and C2B indicates that the leachate chemistry has been variable throughout the 12-month monitoring period in both cells, with occasions where the highest concentration of a parameter since commencement of monitoring has been recorded. This could, in part, be due to the change of sampling location as samples have been obtained from side risers rather than directly from the leachate wells as in previous years.

Although concentrations of EPH have increased significantly in the second half of 2016, there is insufficient data to determine whether this is an ongoing trend. Leachate will continue to be collected from Area 2 and tankered off site.

We have not commented on the current leachate head levels in Area 2 with reference to the permitted head level, because of to access problems.

5 External Landfill Gas Monitoring

5.1 Gas Monitoring Locations

There are currently thirteen purpose drilled gas monitoring boreholes present around the perimeter of Area 2. The locations of the boreholes are shown on Figure 2 and coordinates of the gas monitoring points are shown within Table 5.1.

Table 5.1 – Area 2 Landfill Gas Monitoring Boreholes

Monitoring Point	Easting	Northing
GP03_06	331150	185227
GP06_08a	331830	185104
GP05_14	331172	185144
GP05_15	331187	185055
GP05_16	331153	184977
GP05_17	331091	184884
GP09_18	331033	184804
GP05_20	330676	184817
GP05_21	330602	184887
GP05_22	330649	184963
GP12_23	330781	185028
GP06_24	330973	185165
GP06_25	331060	185236

These boreholes all have their response zones situated in the shallow strata (the Alluvial Deposits and the Made Ground above, where it is present). Monitoring started at these boreholes before the commencement of landfilling in Cell 1 to enable comparison of the historical (baseline) soil gas regime around the perimeter of the site with the regime once waste disposal operations had commenced.

It should be recognised that wells GP06_24 and GP06_25 are constructed on the Area 2 side of the in-ground barrier installed between Area 1 and Area 2.

5.2 Monitoring Requirements and Trigger Levels

Landfill gas monitoring has generally been undertaken on a monthly basis with reports being produced for NRW quarterly in accordance with Condition 3.1.7 of the PPC Permit.

Trigger Levels for all the Area 2 wells have previously been submitted to and accepted by NRW.

Well-specific trigger levels for landfill gas as set out in the PPC Permit are presented in Table 5.2 below. There are no trigger levels for carbon dioxide or methane in GP06_24 and GP06_25 or for carbon dioxide in GP05_20 and GP05_21 – in accordance with NRW (formerly EA) requirements.

Table 5.2 – Well-Specific Trigger Levels for Landfill Gas Monitoring for Area 2

Well	Methane (%Volume)	Carbon Dioxide (%Volume)
GP03_06	1.0	6.1
GP06_08A	1.0	2.4
GP05_14	1.0	2.2
GP05_15	1.0	10.4
GP05_16	1.0	7.7
GP05_17	1.0	13.5
GP09_18	1.0	19.0
GP05_20	1.5	n/a
GP05_21	1.5	n/a
GP05_22	1.0	8.3
GP06_24	n/a	n/a
GP06_25	n/a	n/a

5.3 External Landfill Gas Monitoring

5.3.1 Methane

Appendices 4/1, 4/2 and **4/3** present the results of Methane concentrations in the Area 2 gas monitoring wells since commencement of monitoring.

Appendix 4/1 indicates that the majority of the Area 2 wells did not typically detect Methane above the trigger level of 1% during 2016. The exception to this is GP09_18, where Methane concentrations were recorded above the 1% trigger level on nine of the monthly monitoring visits, with a maximum concentration of 19.5% in July 2016. These concentrations represent an abnormal trend at this location, and it will continue to be closely monitored during 2017.

Appendix 4/2 presents the Methane concentrations in GP06_24 and GP06_25, constructed on the Area 2 side of the in-ground barrier installed between Area 1 and Area 2. Methane concentrations have typically fluctuated significantly in GP06_24 since mid-2008 and in GP06_25 since the start of 2012. GP06_24 has recorded a maximum Methane concentration of 86%v/v in September 2016 and this is the highest concentration recorded at this location since commencement of monitoring. GP06_25 typically recorded Methane concentrations in the range 1%v/v to 28.4%v/v during 2016 which is generally lower than the preceding four years.

It is not known why GP06_24 is recording elevated Methane concentrations, however the well response zone is constructed in the lower alluvial deposits, between approximately 3.5mbgl and 6.5mbgl. It is therefore possible that the elevated concentrations may be linked with the generation of natural marsh gas in the Alluvium.

It is not currently known why Methane concentrations in GP06_25 have started fluctuating in the last five years, although in the second half of 2016, no methane was detected in GP06_25.

Appendix 4/3 indicates that concentrations of Methane in GP05_20 and GP05_21 were recorded below the 1% trigger level throughout 2016.

5.3.2 Carbon Dioxide

Carbon Dioxide concentrations have varied with time since the commencement of the landfill gas monitoring programme in the thirteen Area 2 monitoring wells. The majority of the wells with Trigger Levels agreed recorded Carbon Dioxide concentrations below the well specific Trigger Levels during 2016, with the exception of a marginal exceedance in GP05_15 in December 2016 (recorded concentration 10.7% and trigger level 10.4%). Carbon Dioxide graphs showing well specific Trigger Levels are presented in **Appendices 4/4** to **4/15**.

The graphs indicate that in general most data sets show stable trends with some wells (GP09_18, GP05_20 and GP03_06) indicating potential rising trends, however with the exception of methane at GP09_18, the concentrations are generally well below the trigger levels.

5.4 Review of Risks and Future Monitoring

Adverse trends (rising or uncommonly fluctuating concentrations) have been observed in GP09_18, and GP06_24 (Methane), and GP05_15, GP09_18, GP05_20 and GP03_06 (Carbon Dioxide) in the last 12 months. No other adverse trends in landfill gas concentrations have been observed. It is considered that ground gas concentrations in these wells should continue to be monitored closely to determine whether these adverse trends continue and whether further investigative or remedial action is required.

The only monitoring locations that have consistently recorded consistently significant Methane concentrations are GP06_24 since 2006 and GP06_25 since 2012. These wells are located some considerable distance away from the part of the Area 2 site that has to date been used for waste disposal. The elevated Methane concentrations recorded at GP06_24 were present at the time that the in-ground gas barrier was constructed (separating the Area 1 and Area 2 sites) and may therefore represent background concentrations, or natural marsh gas in the Alluvium.

During 2016, concentrations of Methane within GP09_18 were recorded above the trigger level on nine occasions, representing an abnormal trend for this location. This well will continue to be closely monitored during 2017.

Landfill gas will continue to be monitored on a monthly basis and gas conditions will continue to be reported to NRW on a quarterly basis in accordance with the PPC Permit.

6 Landfill Gas Generation and Usage

6.1 Landfill Gas Utilisation Plant

Docksway Disposal Site has a Landfill Gas Utilisation Plant servicing both Area 1 and Area 2 landfills. It currently comprises one 1MW Jenbacher (320) engine together with one 1250m^3/hr flare. Information from Infinis Energy indicates that the plant capacity was reduced in January 2014, with a 330kW Jenbacher (208) engine removed as a result of a reduction in gas availability at the site.

Infinis Energy are currently responsible for the general running and routine maintenance of the gas plant and has provided information to assist in the compilation of this section of the report. The Infinis annual report is presented as **Appendix 5**.

Monitoring of the plant performance and volumes of gas extracted from the gas utilisation plant has been undertaken on a regular basis since 2005 by Novera/Infinis, and the data collected over the last 12 months has been reported directly to NRW.

6.2 Landfill Gas Extraction

In 2016, the total production of energy from the Landfill Gas Utilisation Plant was about 7306MWh with a site efficiency of 29.7%. In 2015 by comparison, the total production of energy was about 6833MWh with a site efficiency of 33.4%. The total energy produced has increased, however, the efficiency of the site appears to have decreased since 2015. Infinis has noted that gas well coverage in Area 2 was increased and they also connected to the leachate wells, increasing the volume of gas extracted and flare operation in 2016.

Engine downtime hours in 2016 were 672, compared to 584 in 2015 which represents an increase in engine downtime from 2015. Engine operation time in 2016 was 8088 hours which is a reduction from the 8176 hours in 2015. Infinis has suggested that this is due to maintenance requirements.

The flare operated in 2016 during periods when the engine was down for maintenance or during a period of surplus landfill gas production. The flare was operating for 5941 hours during 2016 based on the availability of the engine, compared to 699 hours in 2015. This is an increase from 2015 and is due to the increased volume of landfill gas extraction.

Environmental Performance Indicators, provided by Infinis Energy, indicate that there has been a slight decrease in Carbon Monoxide emissions in 2016 compared to 2015, and total Oxides of Nitrogen emissions decreased slightly in the same period. Emissions data critically depends on a number of factors including run hours of engines and availability of landfill gas to them, and whilst they are presented as EPI they should be treated with caution. The Annual Report provided by Infinis is presented in **Appendix 5**.

6.3 Monitoring of Extracted Gas

The PPC Permit (LP3135SB) for the gas installation at the site requires that ‘emissions to air from the engine stacks, fugitive emissions, and odour are monitored and reported annually’. This data is collated and presented directly to the EA by Infinis Energy.

Flare monitoring is only required if the flare is in operation greater than 10% of the time, in accordance with Condition 58 of the WML. Infinis have indicated that emissions testing of the flare was not carried out in 2016 as the flare hours did not exceed the 10% trigger level (in the preceding 12-month period), but they have indicated that flare hours between April 2016 to January 2017 exceed the 10% trigger level and therefore testing will be carried out in 2017 and reported to NRW by Infinis.

Monitoring and reporting will continue by Infinis in accordance with the PPC Permit and the WML.

7 Annual Production / Treatment and Performance Parameters

7.1 Annual Production/Treatment

Table 7.1 – Annual production/treatment reported by NCC and Infinis (Landfill gas)

Leachate:	**Tonnes/year**
Disposed of off-site (Area 2)	14,067
Disposed of to any onsite effluent treatment plant	None
Re-circulated into the waste mass	None
Surface water and/or groundwater:	**Cubic metres/year**
Disposed of off site	N/A
Disposed of to any onsite effluent treatment plant	None
Landfill Gas: (Whole site)	**Normalised cubic metres/year**
Combustion in flares	809,640
Combustion in gas engines	3,763,344
Other methods of gas utilisation	None

7.1 Performance Parameters

Table 7.2 – Performance parameters reported by NCC (Whole site)

Parameter	**Frequency of Assessment**	**Annual Total**	**Unit**
Potable Water Use	Annually	3,158	Cubic metres
Energy Used (including for leachate treatment, Excluding electricity generated)	Annually	163,591	kWh of electricity
Non Potable Water Use	Annually	0	Cubic metres

7.2 Topographic Surveys

The topographical surface of Area 2 of Docksway Disposal Site was surveyed during January 2017 and the results of the survey are presented in **Figure 3**.

It has been calculated by NCC that 51,150 m^3 of waste was placed in Cell 2 in 2016, and this is significantly less than during 2015. It has also been calculated by NCC that a total of 1,830 m^3 of SNRHW was placed in Cell 3A during 2016 and this is the first material placed in this cell. As of January 2017, the total waste volume deposited in Area 2 was 839,107m^3.

The cross sections provided indicate that the slope angles of the permanent waste slopes are in accordance with permitted slope angles (no greater than 1:4).

8 Conclusions

8.1 Assessment of Environmental Performance Trends

This document reviews the environmental data from the last 12 months and also provides an indication of data trends both over the last 12 months and since the various monitoring programmes commenced.

Surface water monitoring indicates generally stable trends since the previous Environmental Performance Review, with no evidence of significant adverse trends developing. On the two occasions that SW25 and SW26 were monitored in 2016, they performed within the discharge consent limits. On the basis of the data available, it is considered that there has been no significant deterioration of the surface water quality in the last 12 months.

Data from the groundwater monitoring wells in Area 2 indicate generally stable trends in the groundwater chemistry since the previous Environmental Performance Review. However, the concentrations of Ammoniacal Nitrogen in GW06_37 are generally recorded above the control level, and occasionally above the compliance limit, following a rising trend that occurred between 2012 and 2015. In addition, the concentrations of Nickel in GW09_35 and GW07_40 have also been variable since 2014 and occasionally exceed the compliance limits, although this only occurred once in the last 12 months. It is considered that further/remedial action is not required for any of these compliance wells at the current time, and that the data from these compliance wells should be closely monitored in the next 6 to 12 months to determine whether there are continued exceedances or adverse trends developing.

We have not commented on the current leachate head levels in Area 2 with reference to the permitted head level because there has been an access problem to the monitoring wells. However, leachate levels in wells at the start of 2016, were recorded above the trigger level of 2m above the cell base (up to 5m above cell base), and it is recommended that active leachate management continues as appropriate. NCC has indicated that the access problem has been resolved and therefore leachate level monitoring will recommence.

Samples could not be recovered from the leachate wells in Area 2 during 2016 and therefore samples were obtained from side risers closest to the monitoring wells, in Cell 1 (LF08_07) and Cell 2 (C2B).

The environmental monitoring data for both cells indicates variable leachate chemistry, including occasions where the highest concentration since commencement of monitoring has been recorded, most notably ammoniacal nitrogen concentrations and arsenic concentrations in C2B, and EPH concentrations in LF08_07. This could in part be due to the change in sampling location with sampling from the side risers rather than direct from the leachate wells. Leachate is collected from Area 2 and tankered off site for appropriate treatment and disposal.

External landfill gas concentrations at Area 2 are predominantly indicating generally stable trends in methane and carbon dioxide, although concentrations of methane and carbon dioxide have risen considerably in GP09_18 and continue to be high in GP06_24, and regularly high in GP06_25. Concentrations in GP09_18 are displaying an abnormal trend for the last 12 months and therefore the monitoring data for this location will be closely monitored in the next 12 months. The data from GP06_24 indicates that the highest concentration of methane since commencement of monitoring was recorded in September 2016, although subsequent readings have returned to within the normal range.

8.2 Future Monitoring Requirements

It is intended that the Docksway Disposal Site Area 2 monitoring programmes shall continue in line with the Permit requirements (and as approved by NRW), providing data which will enable the ongoing assessment of the environmental performance of the site and the provision of environmental performance reports on an annual basis.

9 References

[1] PBA (2011) Docksway Disposal Site, Newport. 2011 Monitoring Plan for Area 1. Peter Brett Associates, August 2011.

[2] PBA (2004). Docksway Disposal Site, Newport. Monitoring Plan for Area 2: Landfill Extension. Peter Brett Associates LLP report reference 14739/010B/CBH. October 2004.

[3] PBA (2010) Docksway Disposal Site, Newport. Review of the Hydrogeological Risk Assessment for Area 2. Peter Brett Associates, December 2010.

10 Guidance for Readers of the Report

This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints they are described in the report text.

1 The opinions and recommendations expressed in this report are based on statute, guidance, and appropriate practice current at the date of its preparation. Peter Brett Associates LLP (PBA) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and we will be pleased to advise if any report requires revision due to changing circumstances, especially those over one year old. Following delivery of any report PBA has no obligation to advise the Client or any other party of such changes or their repercussions.

2 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used.

3 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

4 It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and manmade effects.

5 This report has been written for the sole use of the Client stated at the front of the report. This report shall not be relied upon or transferred to any other party without the express written authorisation of PBA. Any such party relies upon the report at its own risk.

6 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc., unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

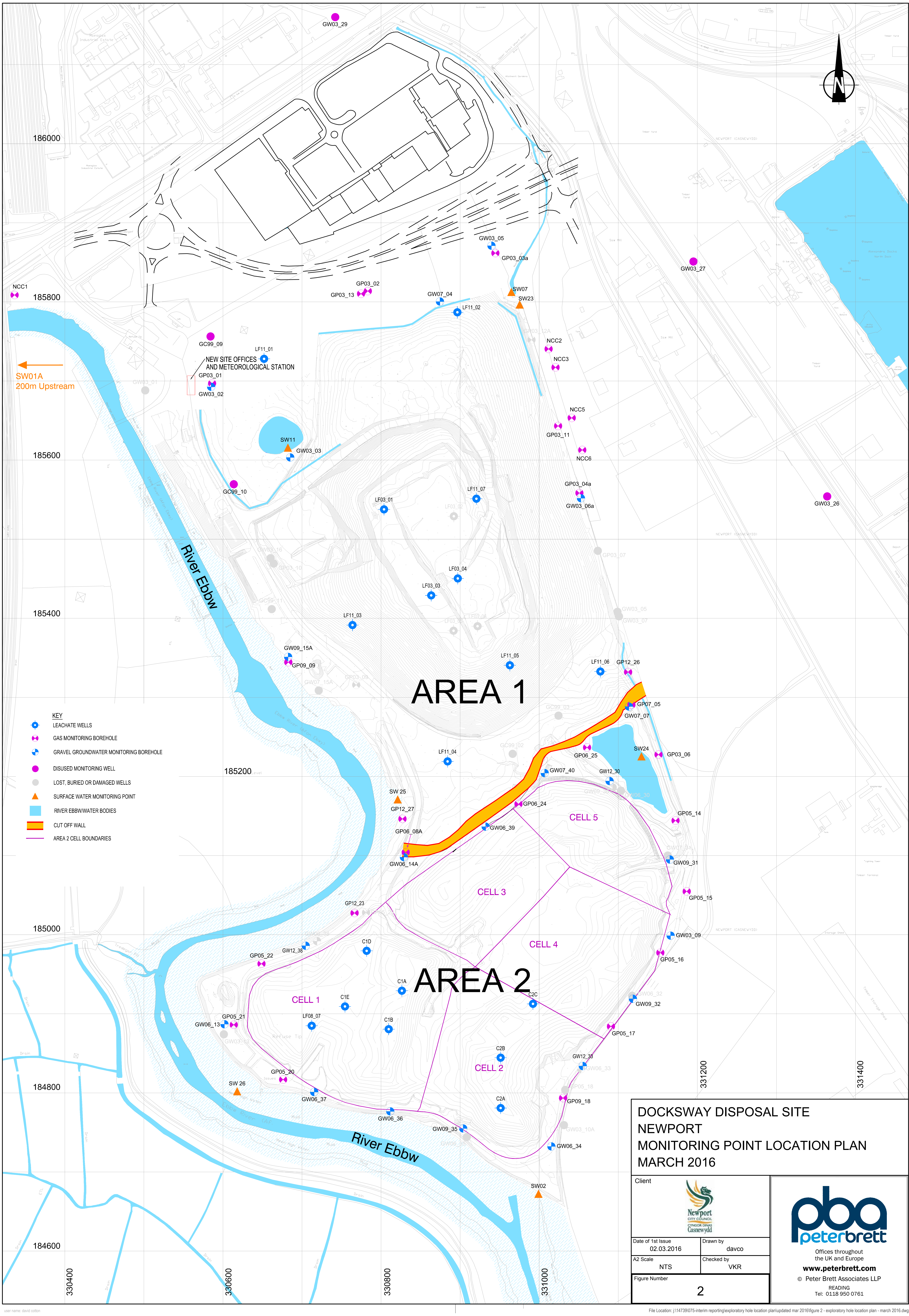
7 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as Natural Resources Wales, Natural England or Local Authority) have taken place only as part of this work where specifically stated.

Figures

Site Grid Reference: ST 309 852

pba peterbrett Offices throughout the UK and continental Europe. **www.peterbrett.com**	Client NEWPORT CITY COUNCIL	DOCKSWAY DISPOSAL SITE NEWPORT SITE LOCATION PLAN	Date 01.04.2015 A4 Scale 1:50 000 Drawn by davco Checked by VKR Revision 0
			FIGURE 1

J:\14739\155 - Permit Revision 2015\03_ Figures & Drawings\Corel



KEY
LEACHATE WELLS
GAS MONITORING BOREHOLE
GRAVEL GROUNDWATER MONITORING BOREHOLE
DISUSED MONITORING WELL
LOST, BURIED OR DAMAGED WELLS
SURFACE WATER MONITORING POINT
RIVER EBBW/WATER BODIES
CUT OFF WALL
AREA 2 CELL BOUNDARIES
AREA 1
AREA 2
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
River Ebbw
River Ebbw
SW01A
200m Upstream
NEW SITE OFFICES
AND METEOROLOGICAL STATION
186000
185800
185600
185400
185200
185000
184800
184600
330400
330600
330800
331000
331200
331400
GW03_29
NCC1
GP03_02
GP03_13
GW07_04
LF11_02
GW03_05
GP03_03a
SW07
SW23
GW03_27
GC99_09
LF11_01
GP03_01
GW03_02
NCC2
NCC3
NCC5
GP03_11
NCC6
SW11
GW03_03
GC99_10
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LF11_07
LF03_01
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GW09_15A
GP09_09
LF11_05
LF11_06
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SW24
GP03_06
GP06_25
GW07_40
GW12_30
LF11_04
SW 25
GP12_27
GP06_24
GW06_39
GP06_08A
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GP05_14
GW09_31
GP05_15
GP12_23
GW03_09
GP05_16
C1D
GW12_38
GP05_22
C1A
C1E
C2C
GW09_32
GP05_21
GW06_13
LF08_07
C1B
GP05_17
C2B
GW12_33
GP05_20
SW 26
GW06_37
GW06_36
C2A
GP09_18
GW09_35
GW06_34
SW02

DOCKSWAY DISPOSAL SITE
NEWPORT
MONITORING POINT LOCATION PLAN
MARCH 2016

Client	Newport City Council / Cyngor Dinas Casnewydd
Date of 1st Issue: 02.03.2016	Drawn by: davco
A2 Scale: NTS	Checked by: VKR
Figure Number: 2	

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Tel: 0118 950 0761

user name: david cotton

File Location: j:\14739\075-interim reporting\exploratory hole location plan\updated mar 2016\figure 2 - exploratory hole location plan - march 2016.dwg

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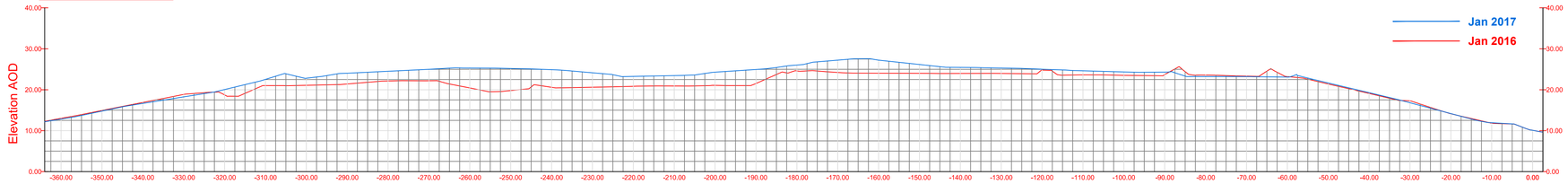

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January 2017	12.823	14.775	16.658	18.262	20.053	22.527	22.805	24.029	24.505	24.980	25.305	25.190	24.890	24.137	23.259	23.453	24.293	24.957	26.026	27.236	27.225	26.174	25.457	25.296	25.011	24.634	24.350	24.301	23.229	23.192	23.081	21.658	19.290	16.828	14.175	11.938	10.080
Jan 2016	13.004	14.930	16.897	18.856	18.751	21.002	21.077	21.398	22.145	22.181	20.443	19.801	20.597	20.615	20.840	20.905	21.070	21.516	24.591	24.209	24.029	23.997	23.985	23.972	24.794	23.626	23.510	23.712	23.572	23.316	23.214	21.388	19.089	17.302	14.129	11.809	10.080
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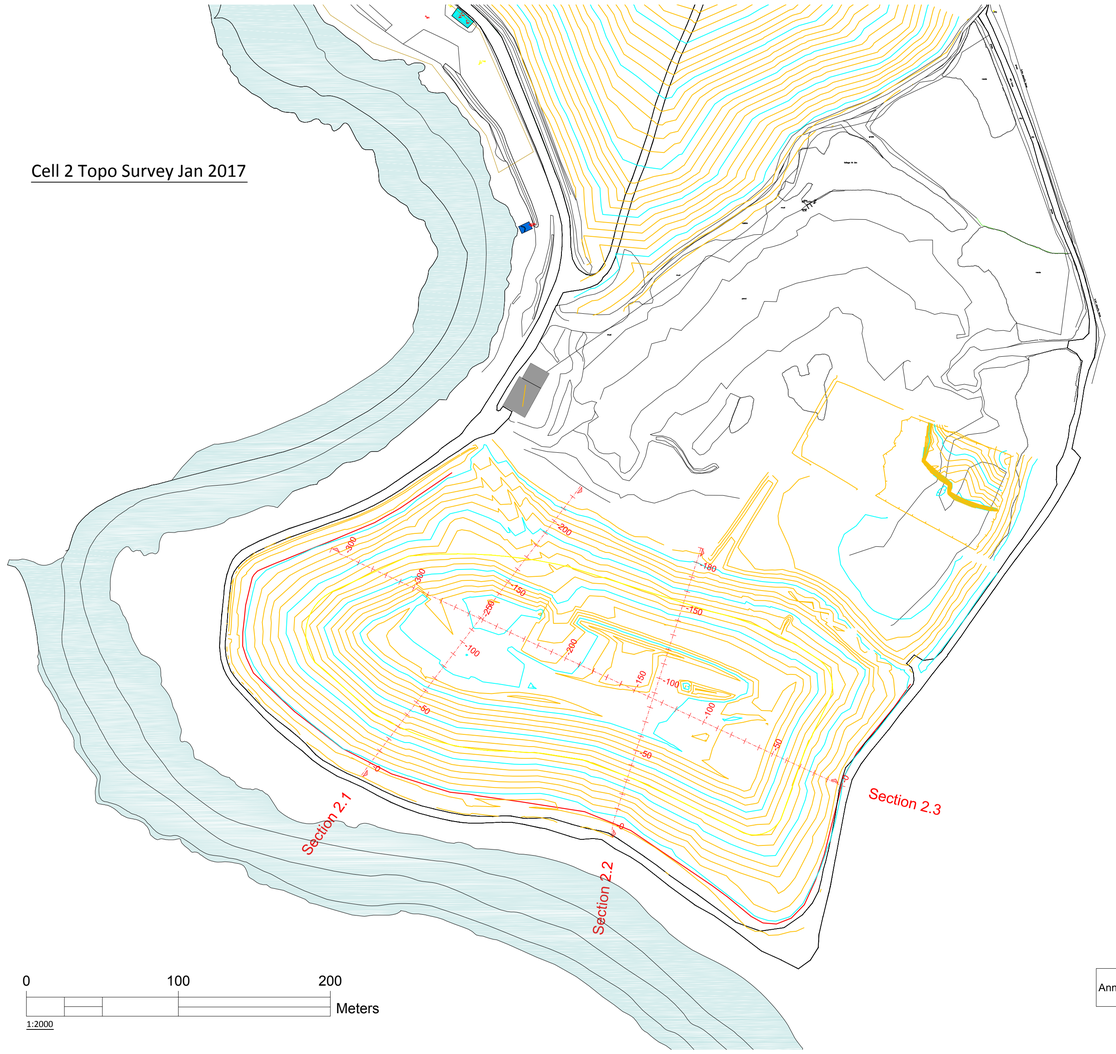
Cell 2 Topo Survey Jan 2017



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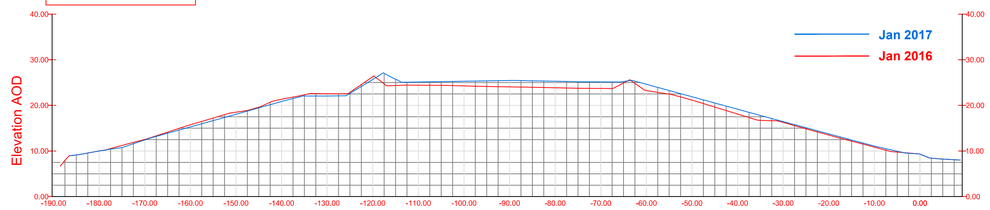

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January 2017	10.004	12.407	15.271	18.056	20.843	22.061	25.691	25.112	25.280	25.448	25.287	25.158	24.618	21.883	19.146	16.433	13.754	11.075	9.322	
Jan 2016	10.004	12.535	15.750	18.505	21.361	22.548	26.317	24.416	24.262	24.060	23.861	23.706	23.253	21.152	18.088	16.248	13.485	10.831	9.322	
Annual Level Difference	0.00	-0.13	-0.48	-0.45	-0.52	-0.49	-0.63	0.70	1.02	1.40	1.43	1.45	1.37	0.73	1.06	0.19	0.27	0.24	0.000	

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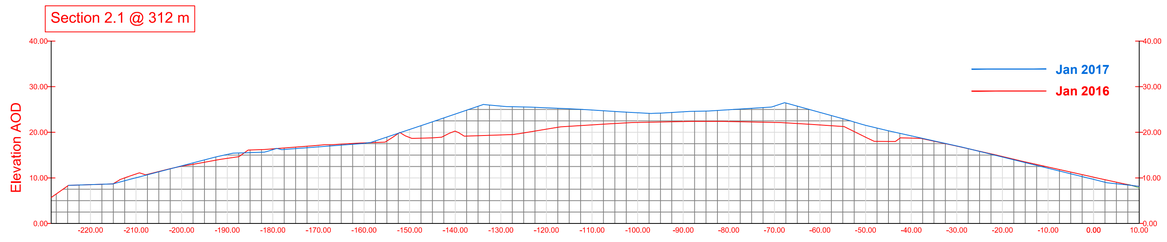

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January 2017	8.512	10.030	12.636	15.145	16.200	16.802	17.546	20.615	24.001	25.749	25.355	24.889	24.278	24.492	24.939	25.750	24.353	21.510	19.212	16.989	14.566	12.118	9.665	8.114
Jan 2016	8.512	10.855	12.567	14.281	16.374	17.144	17.671	18.852	20.229	19.418	20.691	21.613	22.166	22.342	22.351	22.165	21.610	18.908	18.717	16.966	14.693	12.376	10.153	8.114
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A1

NOTES

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Cells 1 □ 2 Volume Summary 201□		
Period	In□ut Volume (m3)	Cumulative Volume (m3)
□□to □an 2016		□612□
□an 2016 □an 201□	□11□0	□3□2□□
Total Waste De□osited 2016	□11□0	

Docksway Waste Dis□osal Site		
Cell 3A Volume Summary □Asbestos□		
Period	In□ut Volume (m3)	Cumulative Volume (m3)
□□to March 201□	1□30	

Rev	Details	Dr	Ch	A□	Date

Streetscene
Andrew Morris CEng. MICE
Head of Streetscene
Newport City Council
Civic Centre, Newport
South Wales, NP20 4UR.
Telephone: 01633 656656
Email: streetscene@newport.gov.uk

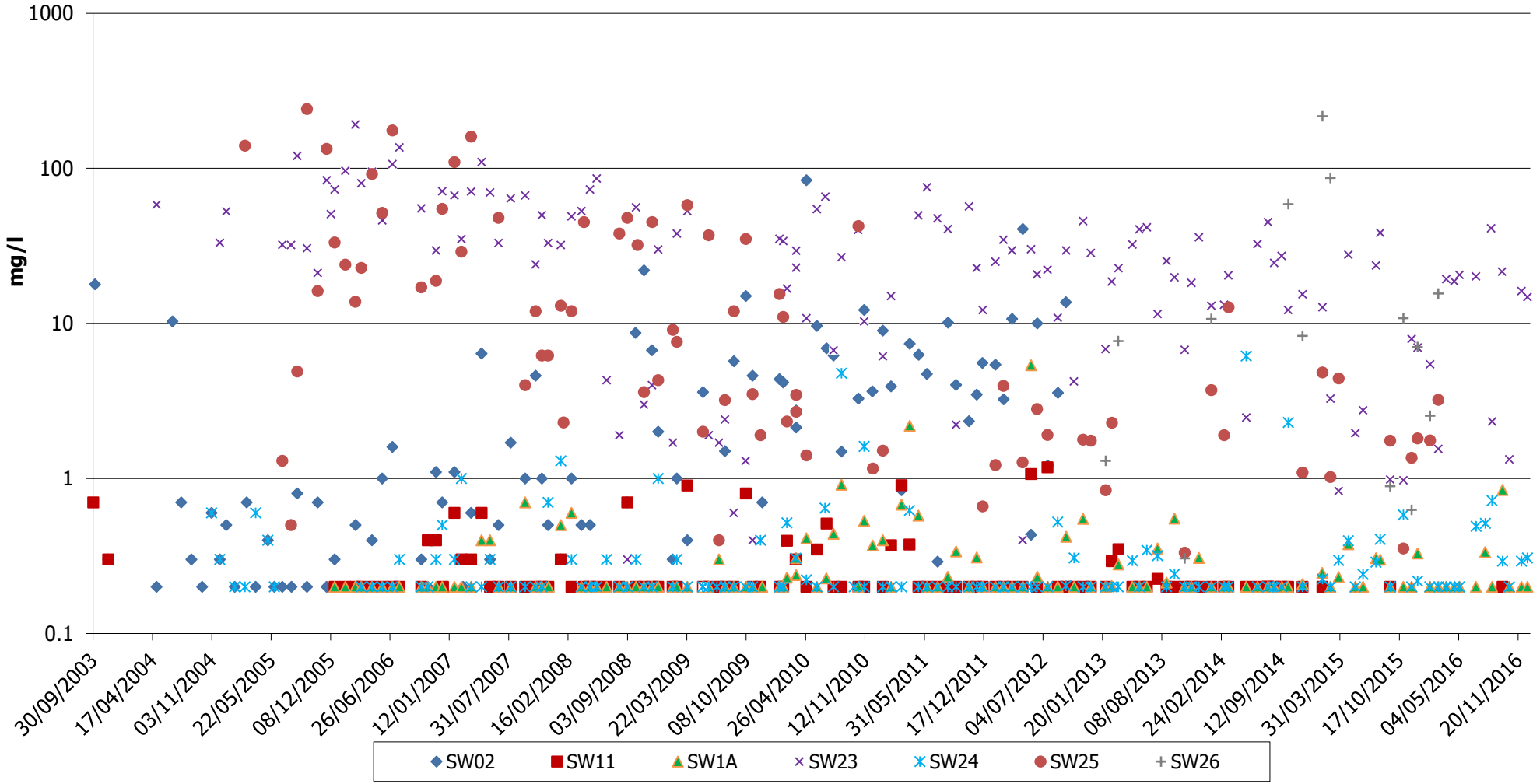
Newport City Council / Cyngor Dinas Casnewydd

Pro□ect
Docksway Waste Dis□osal Site
Cells 1 □ 2 □3 TOPO Survey □anuary 201□
□Ph2 Waste Levels □an 2016 □□an 201□□

File No. □NA1□□6				Status: For Consultation	
Drawn □y	MDH	Checked □y		A□roved □y	
Date	Mar 1□	Date		Date	
Scales	1□2000				
Drawing No. 1□□6 □C1□2□3A □AEPR 2016□201□					3

Appendix 1

Appendix 1/1
Docksway Disposal Site - Ammoniacal Nitrogen in Surface Water



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Client

Newport City Council

Docksway Disposal Site

Date	March 2017
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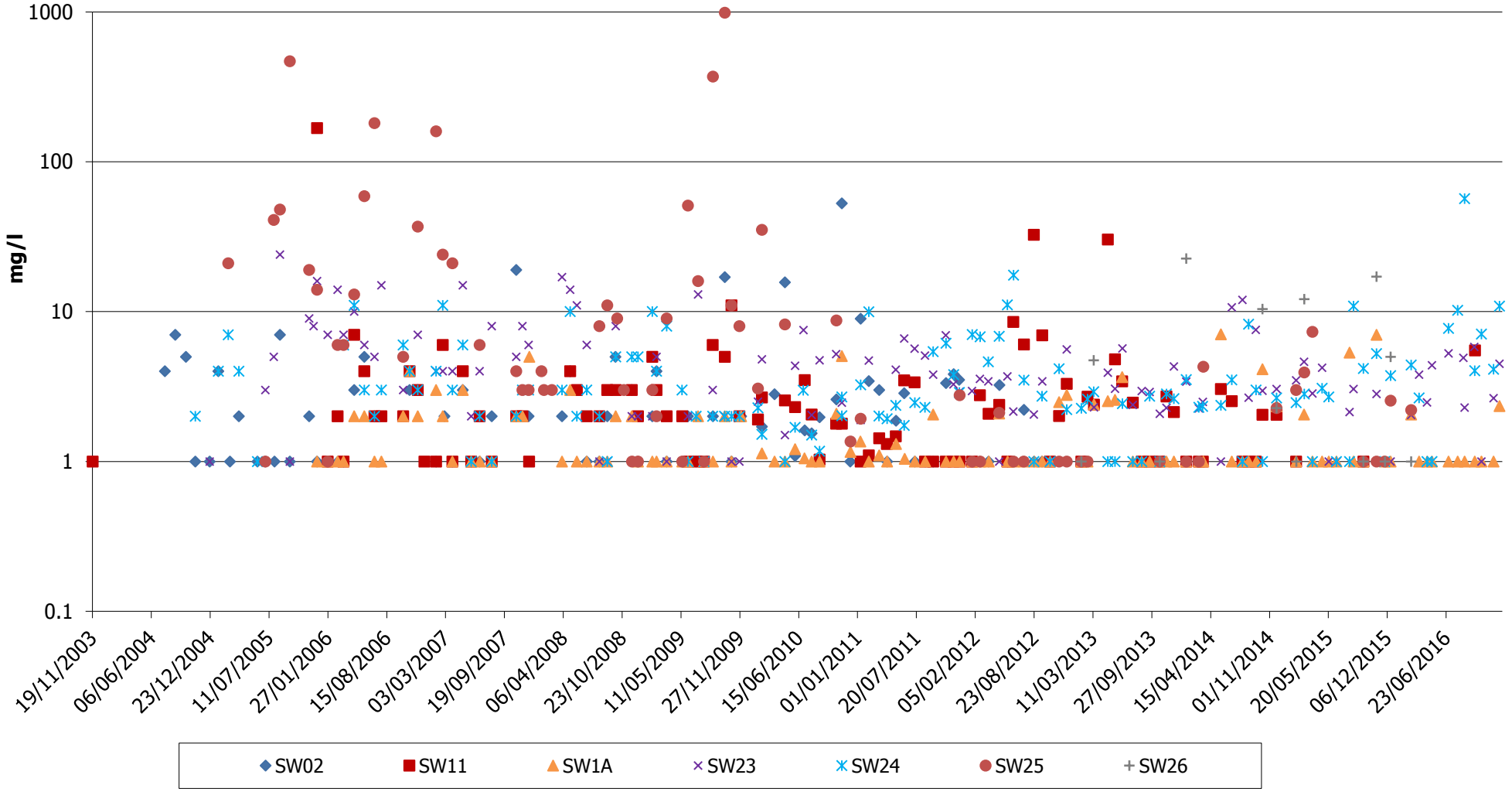
Appendix 1-1	

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-1 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

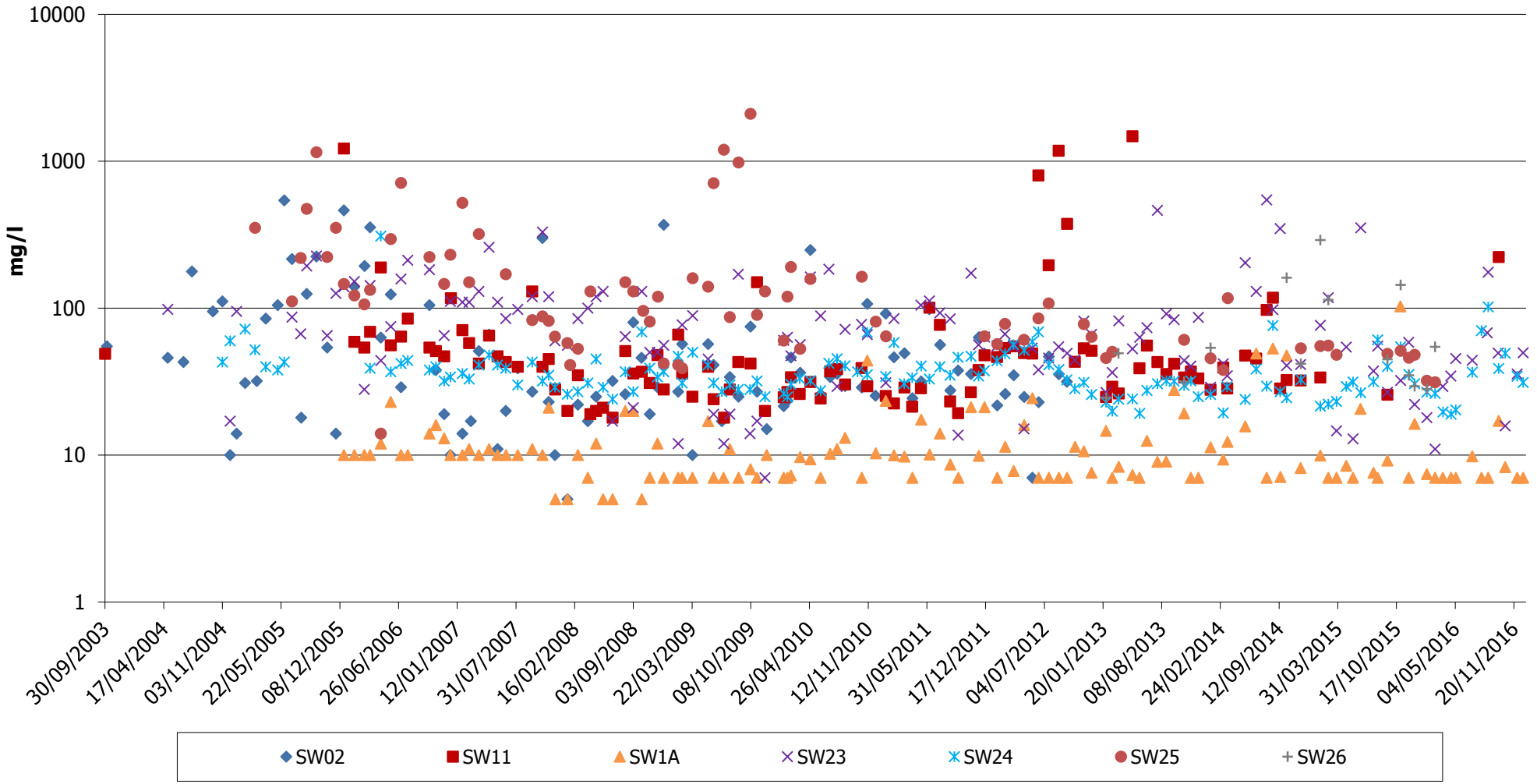
Appendix 1/2
Docksway Disposal Site - Biochemical Oxygen Demand in Surface Water



peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 1-2
Caversham Bridge House, Waterman Place, Reading, RG1 8DN Tel 0118 950 0761 Fax 0118 959 7499			

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-2 Bochemical Oxygen Demand 2.xls]A4 LS

Appendix 1/3
Docksway Disposal Site - Chemical Oxygen Demand in Surface Water



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Docksway Disposal Site

Date	March 2017
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Appendix 1-3	

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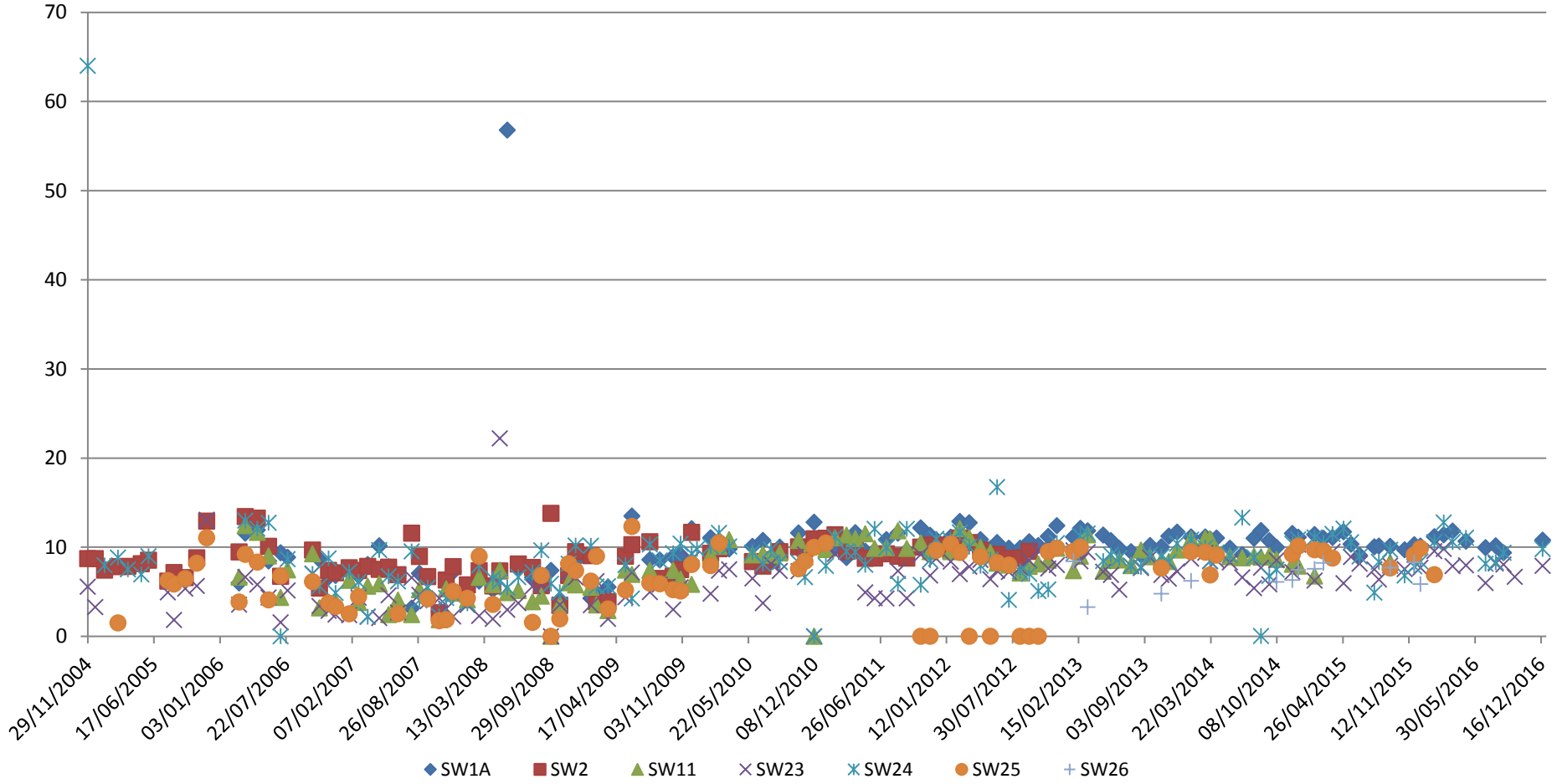
Appendix 1/4
Docksway Disposal Site - Dissolved Oxygen in Surface Water (mg/l)



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Docksway Disposal Site

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Drawn	oe
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Appendix 1-4	

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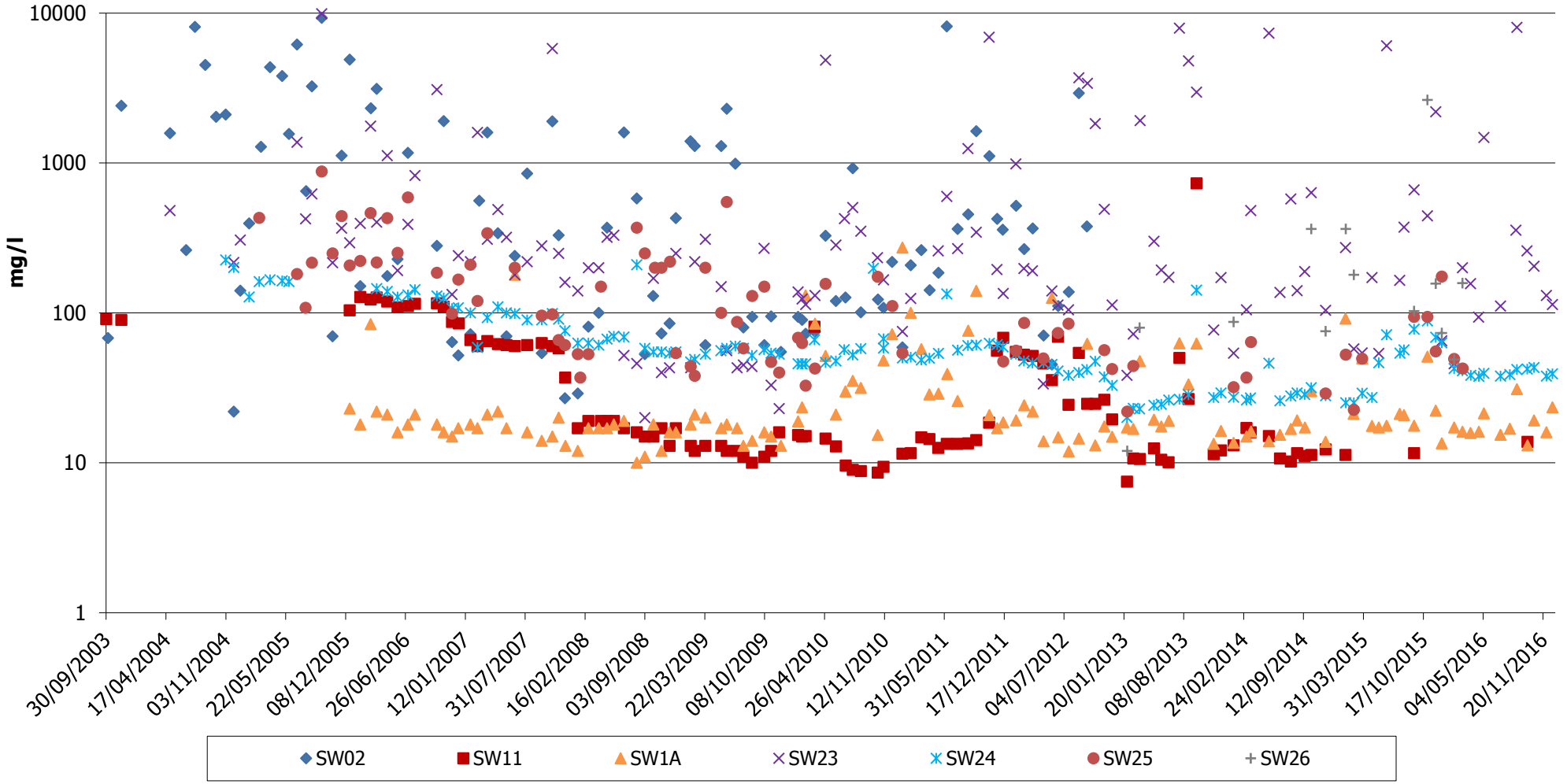
Appendix 1/5
Docksway Disposal Site - Chloride in Surface Water



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Newport City Council

Docksway Disposal Site

Date	March 2017
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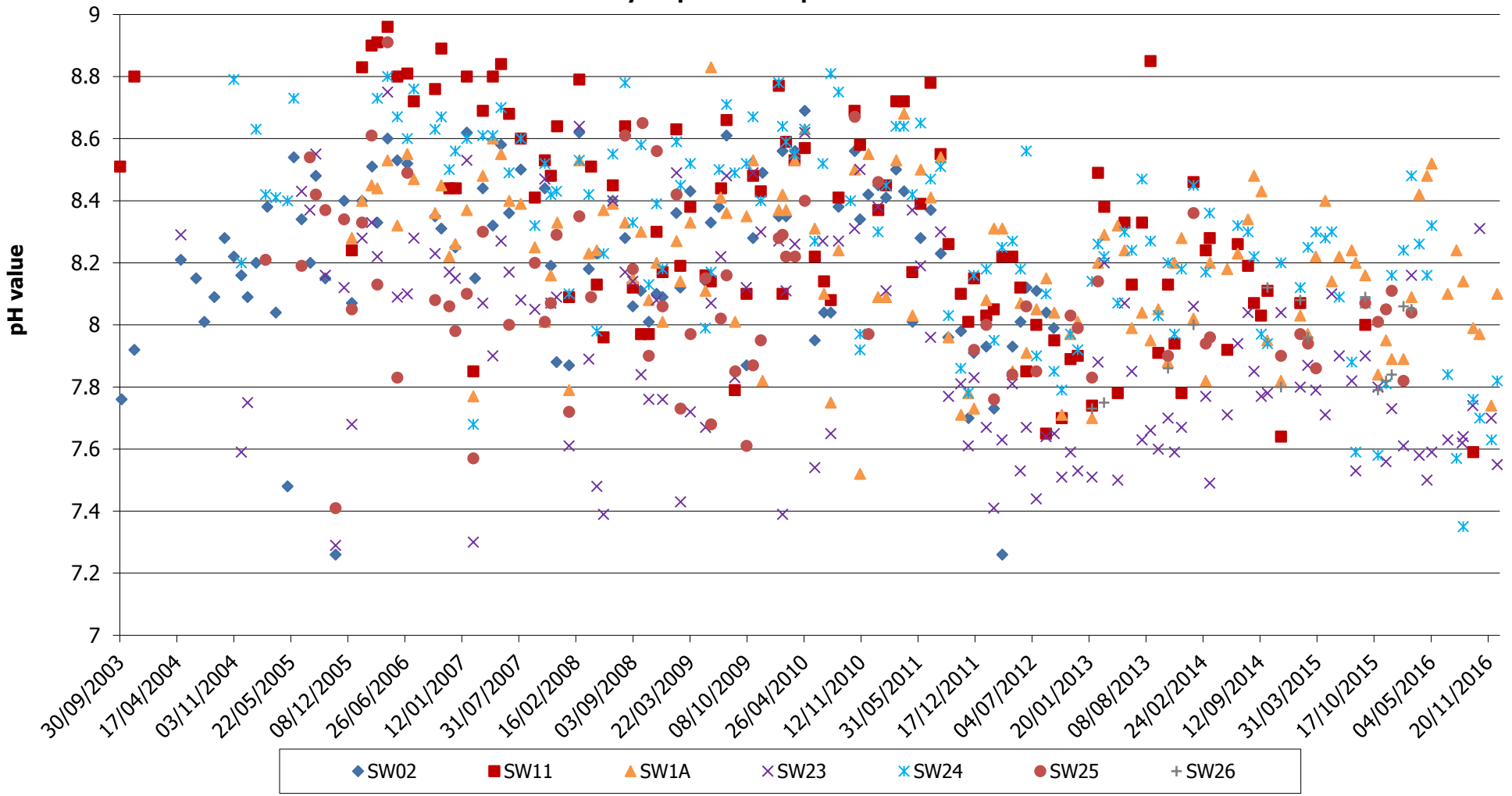
Drawn	oe
Checked	vkr
Appendix 1-5	

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-5 Chloride 2.xls]A4 LS

Appendix 1/6
Docksway Disposal Site - pH in Surface Water



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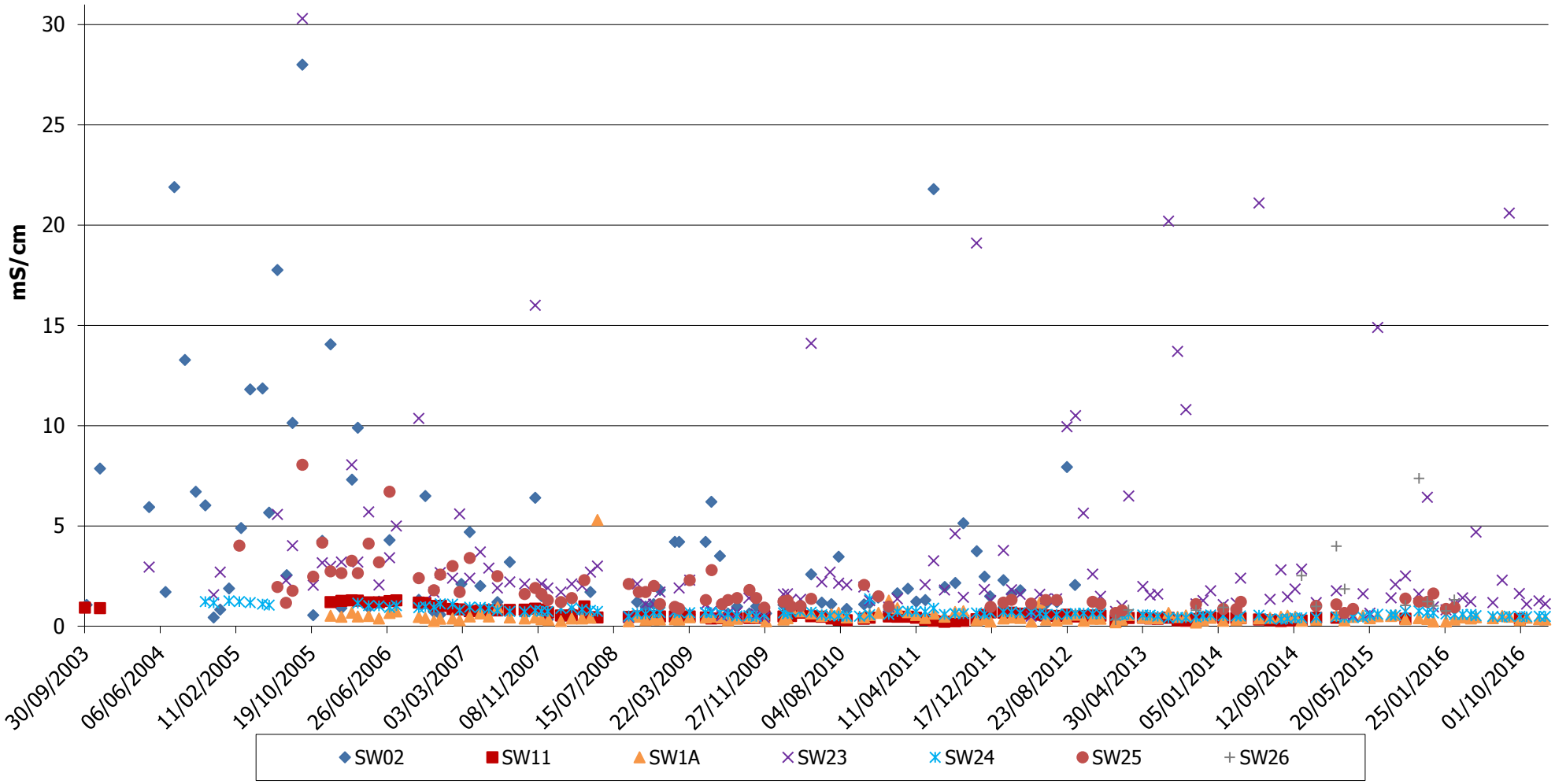
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 1-6	

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-6 pH 2.xls]A4 LS

Appendix 1/7
Docksway Disposal Site - Electrical Conductivity in Surface Water



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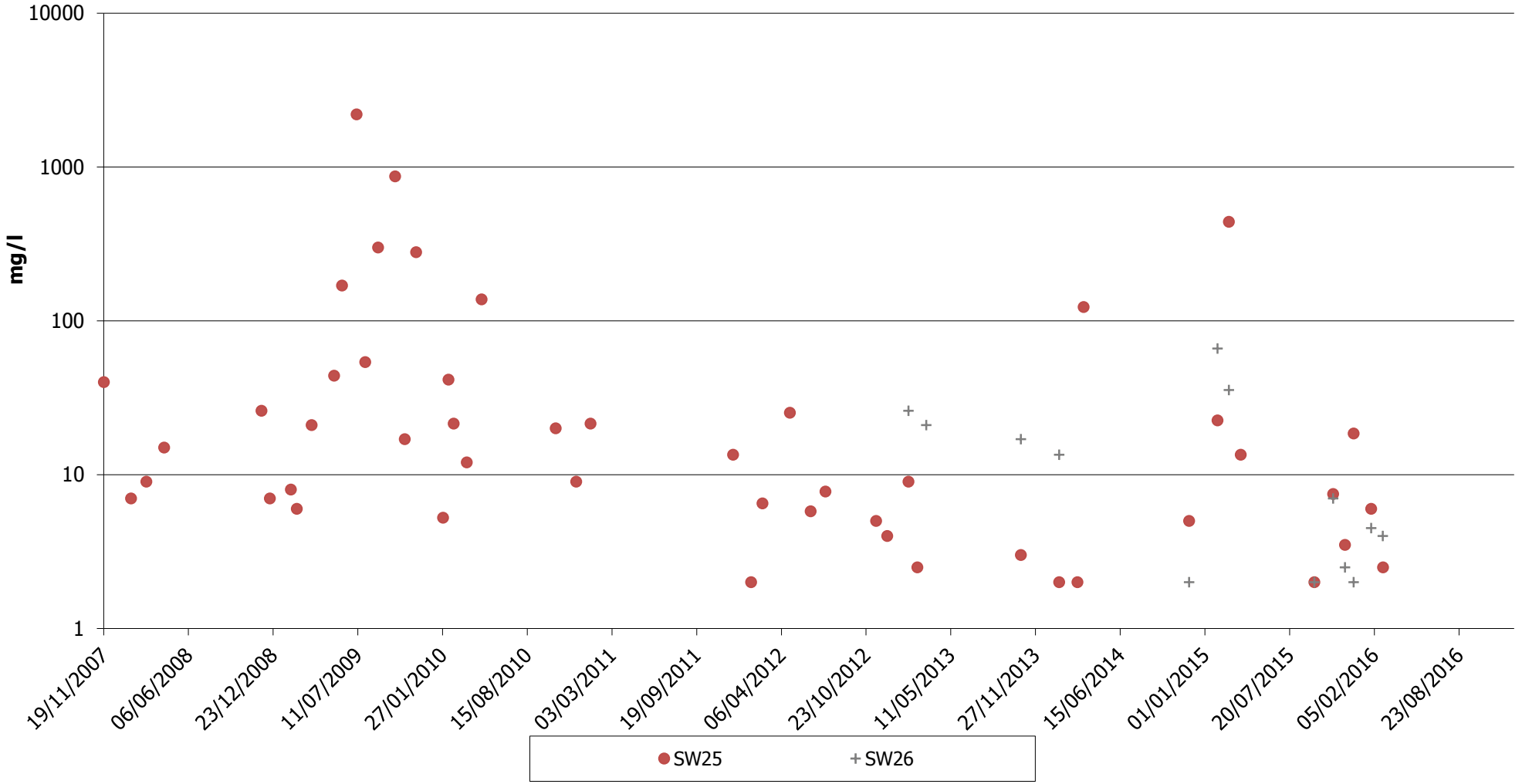
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 1-7	

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-7 rev1 Electrical Conductivity 2.xls]A4 LS

Appendix 1/8
Docksway Disposal Site - Total Suspended Solids in Surface Water



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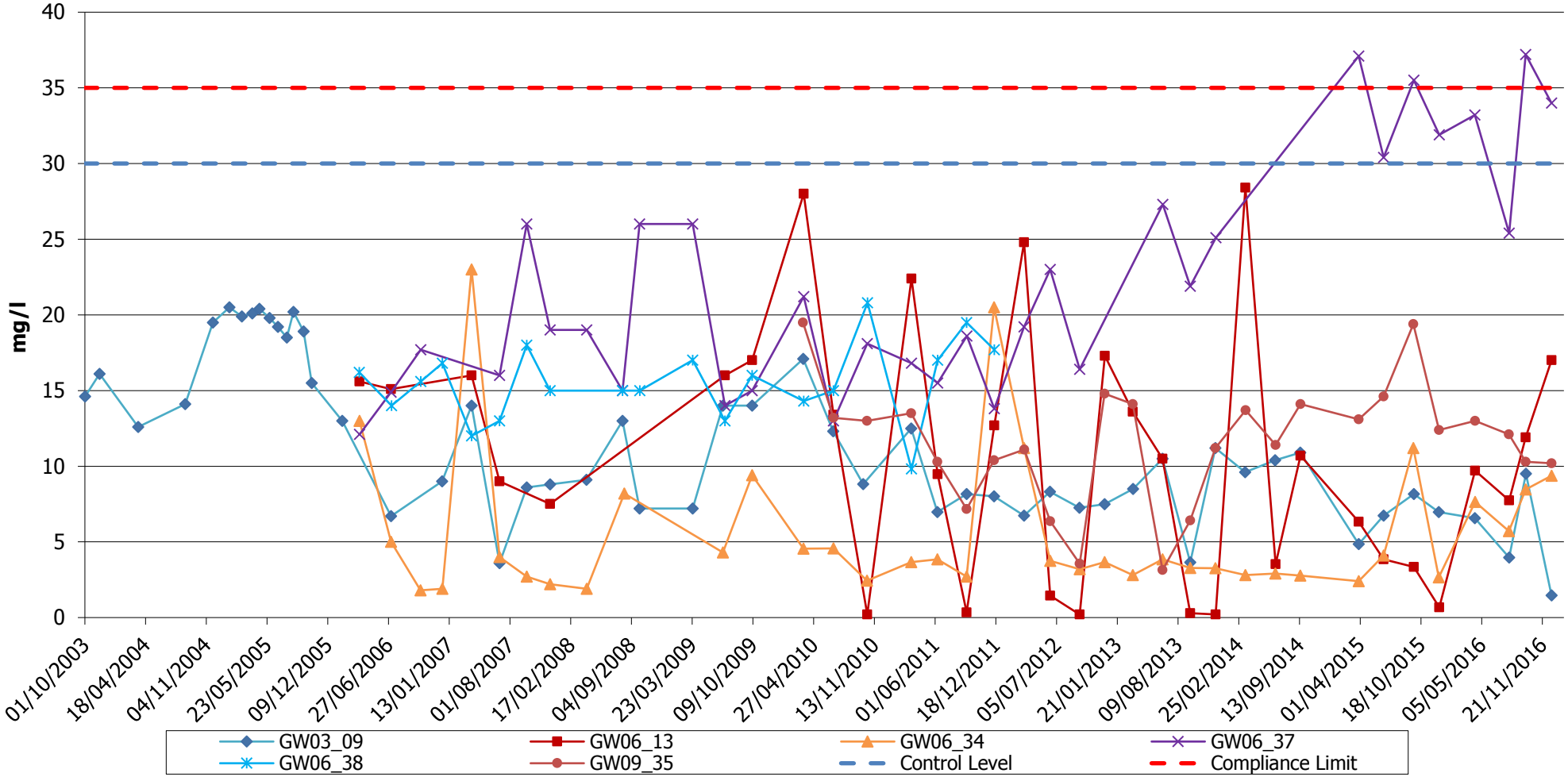
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 1-8	

J:\14739\3524 AEPRs 2016\Area 1\A1 Appendix 1 Surface Water\[1-8 TOTAL SUSPENDED SOLIDS 2.xls]A4 LS

Appendix 2

Appendix 2/1
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater



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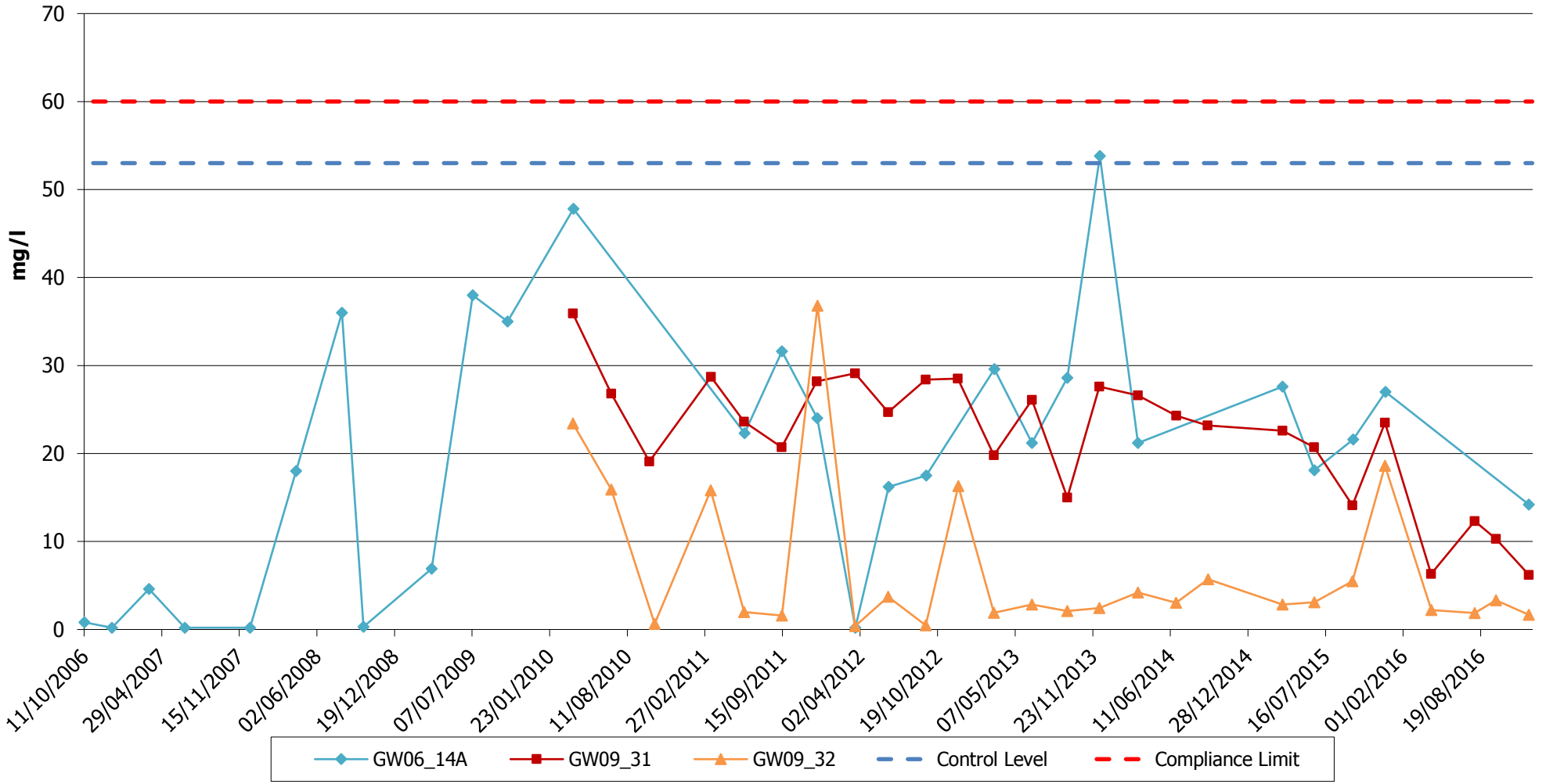
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-1 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

Appendix 2/2
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-2
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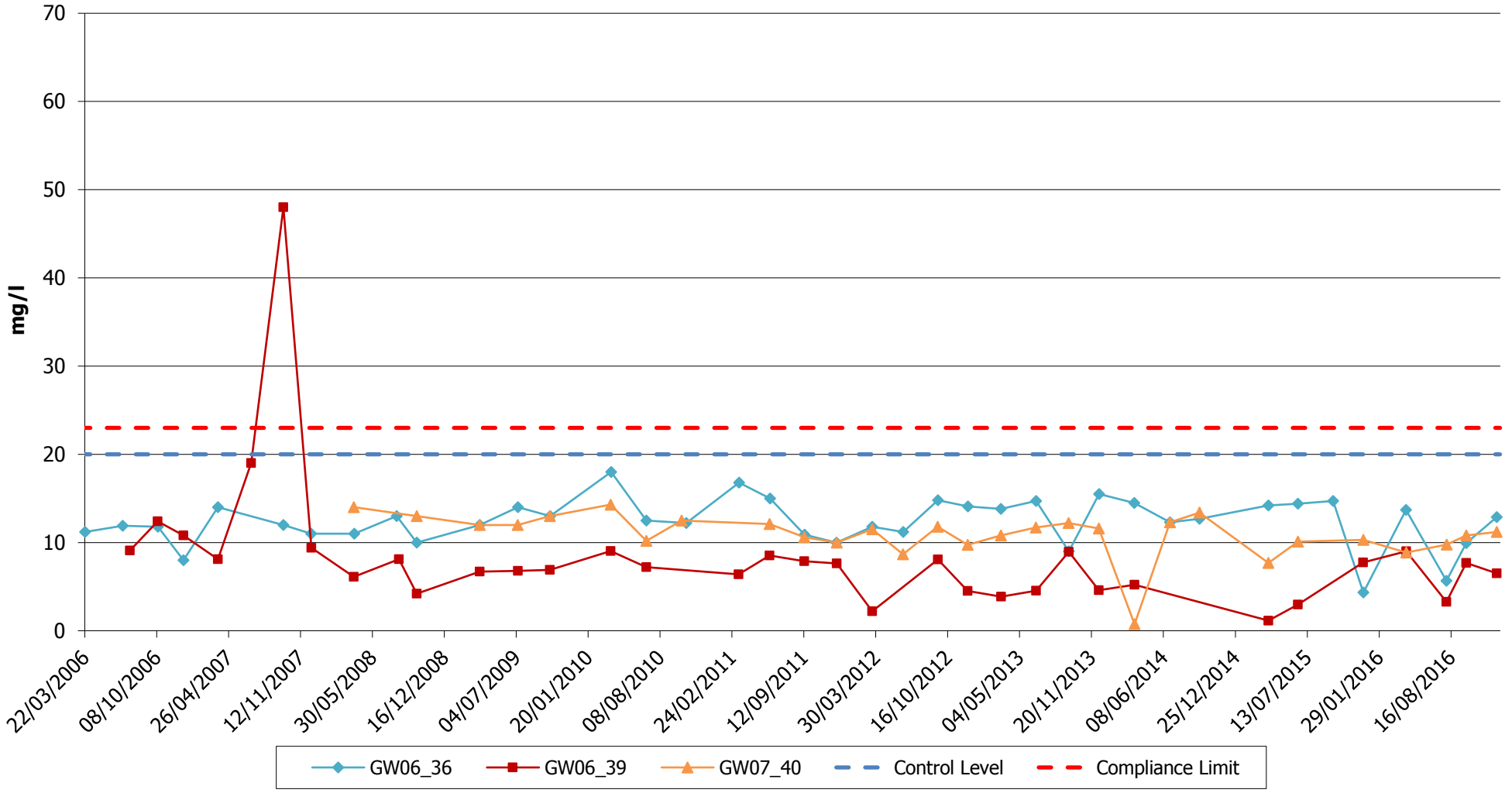
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-2 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

Appendix 2/3
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater



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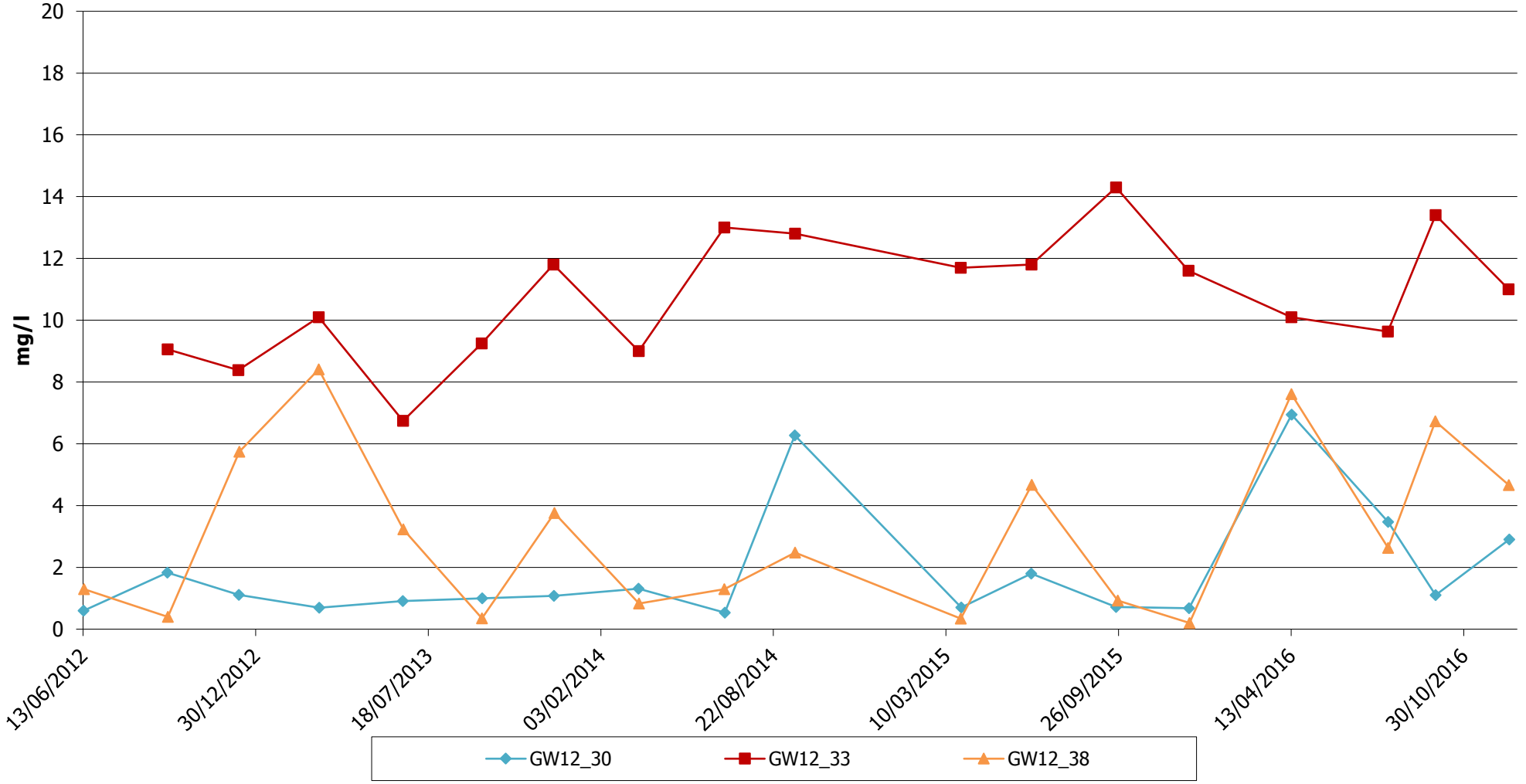
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-3	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-3 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

Appendix 2/4
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater



pba peterbrett	Client **Newport City Council**	**Docksway Disposal Site**	Date March 2017 A4 Scale nts Drawn oe Checked vkr Appendix 2-4
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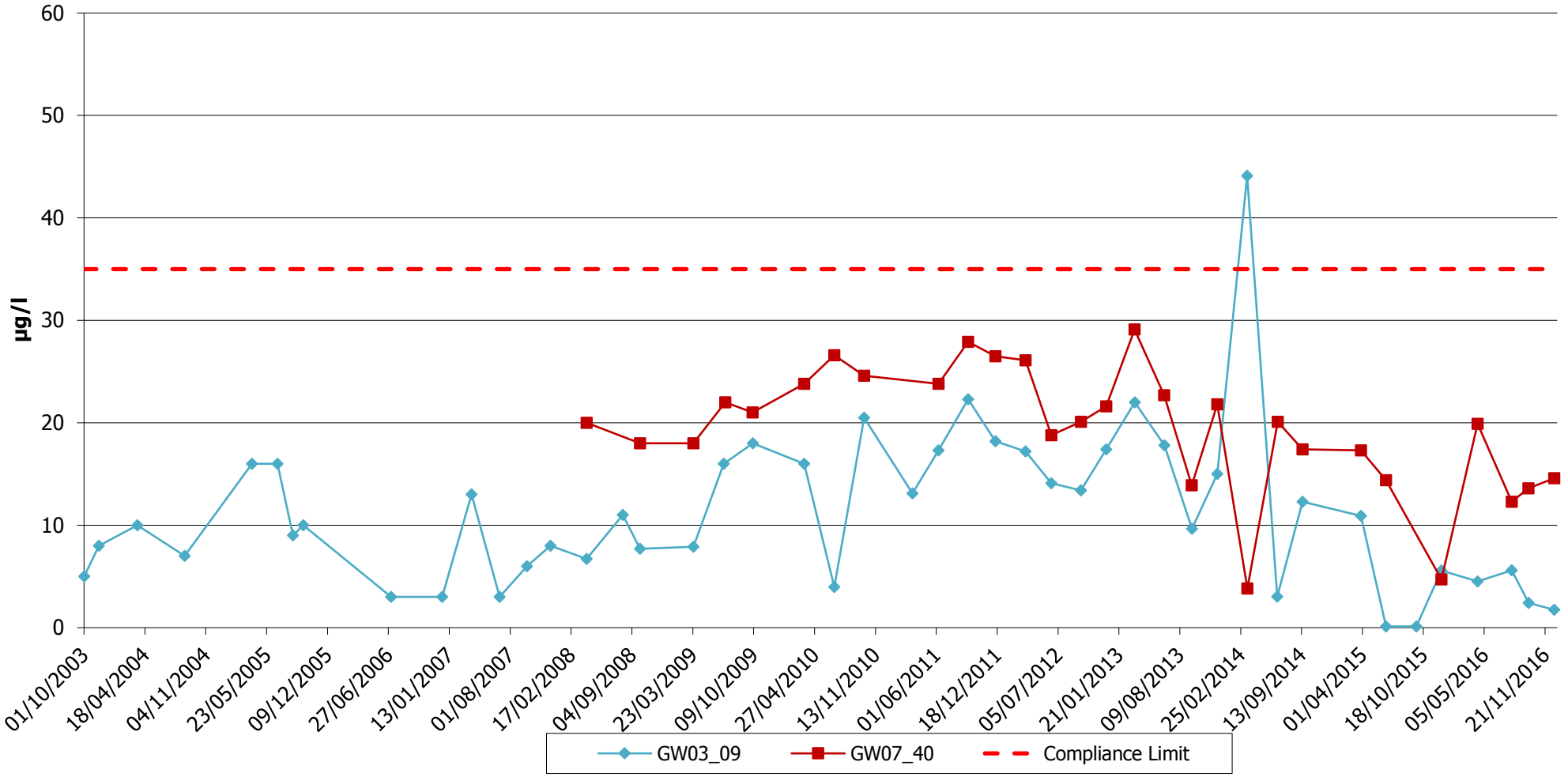
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-4 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

Appendix 2/5
Docksway Disposal Site - Arsenic in Groundwater



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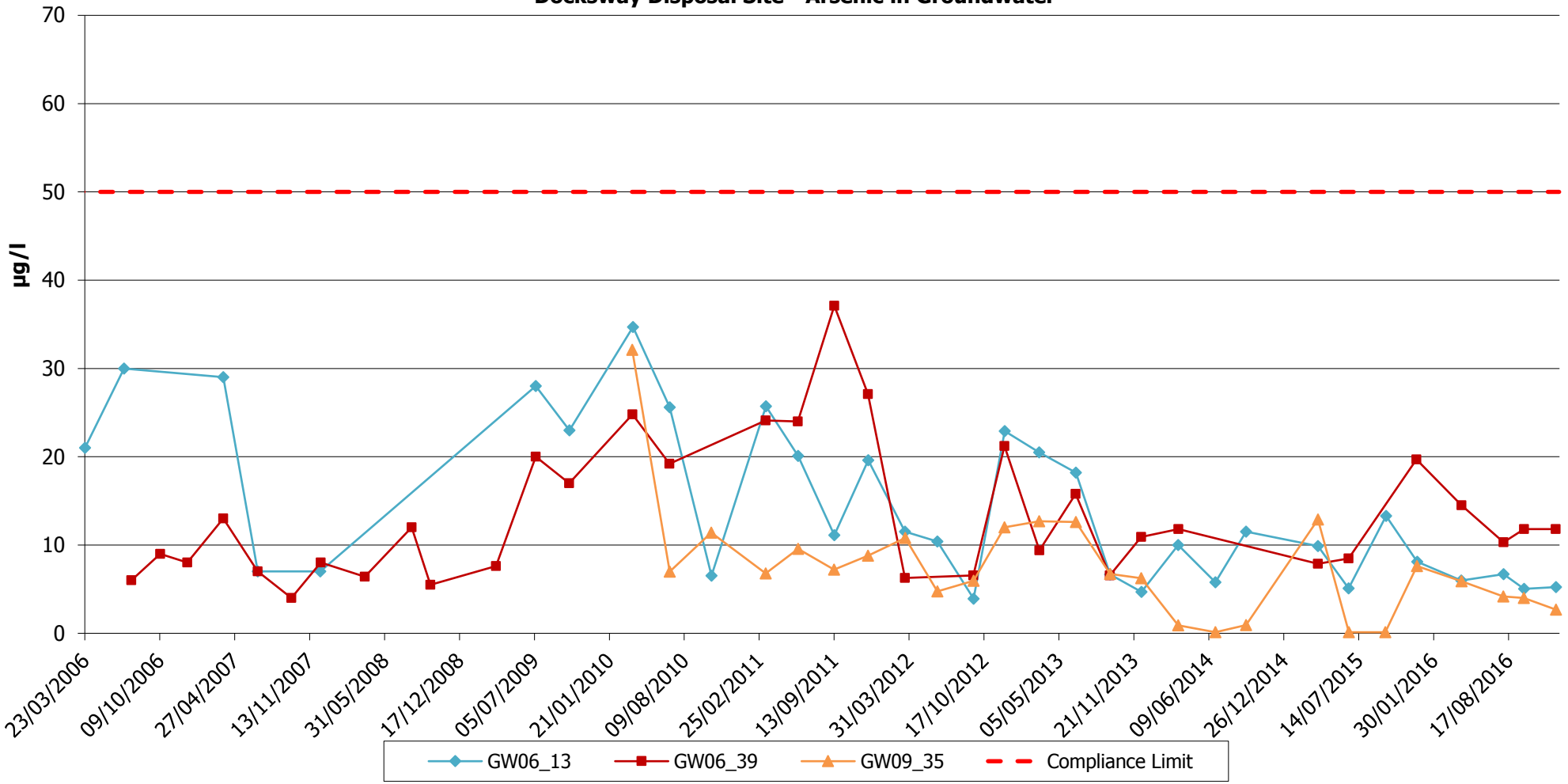
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-5	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-5 Arsenic 2.xls]A4 LS

Appendix 2/6
Docksway Disposal Site - Arsenic in Groundwater



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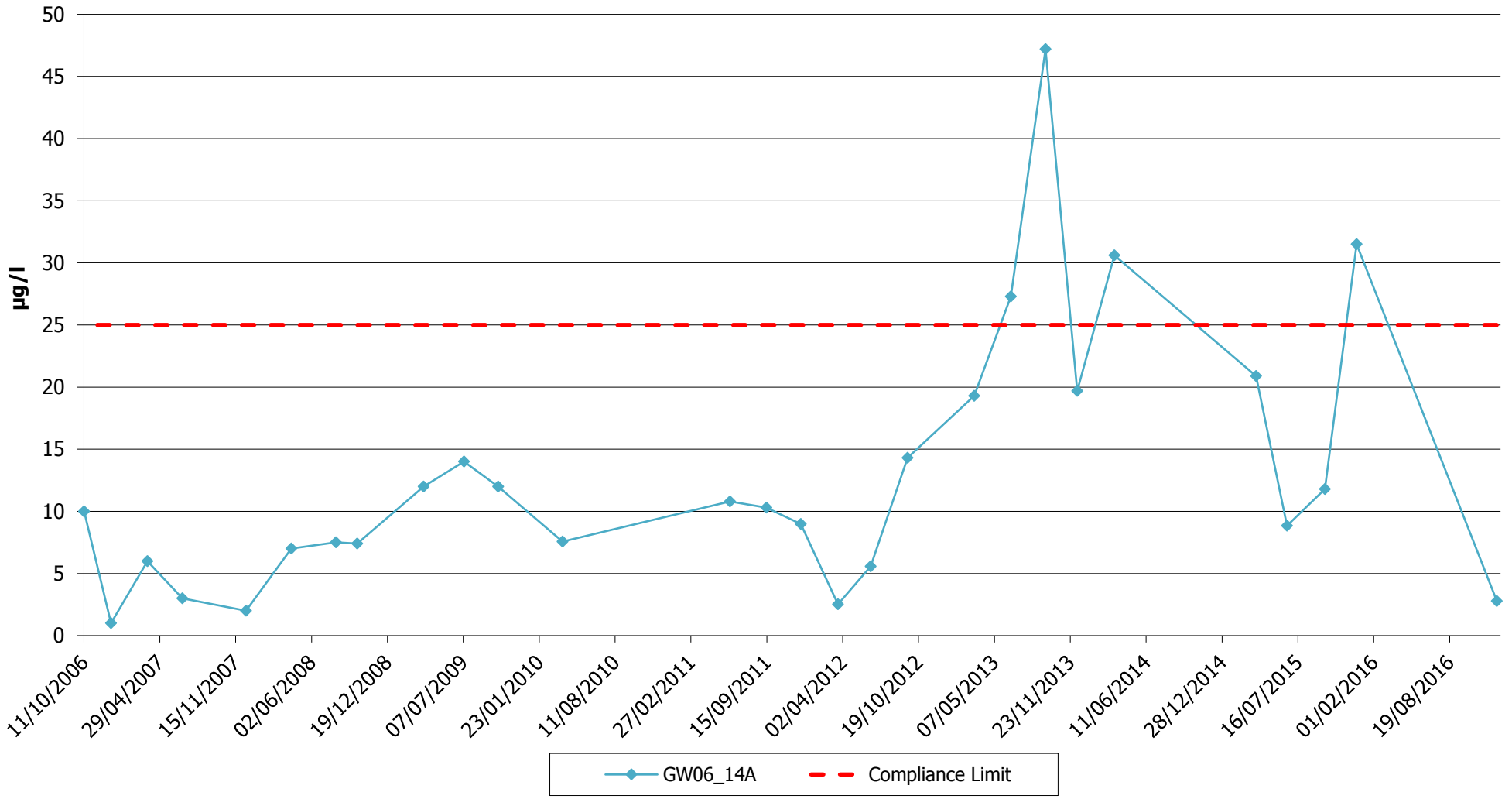
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-6	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-6 Arsenic 2.xls]A4 LS

Appendix 2/7
Docksway Disposal Site - Arsenic in Groundwater



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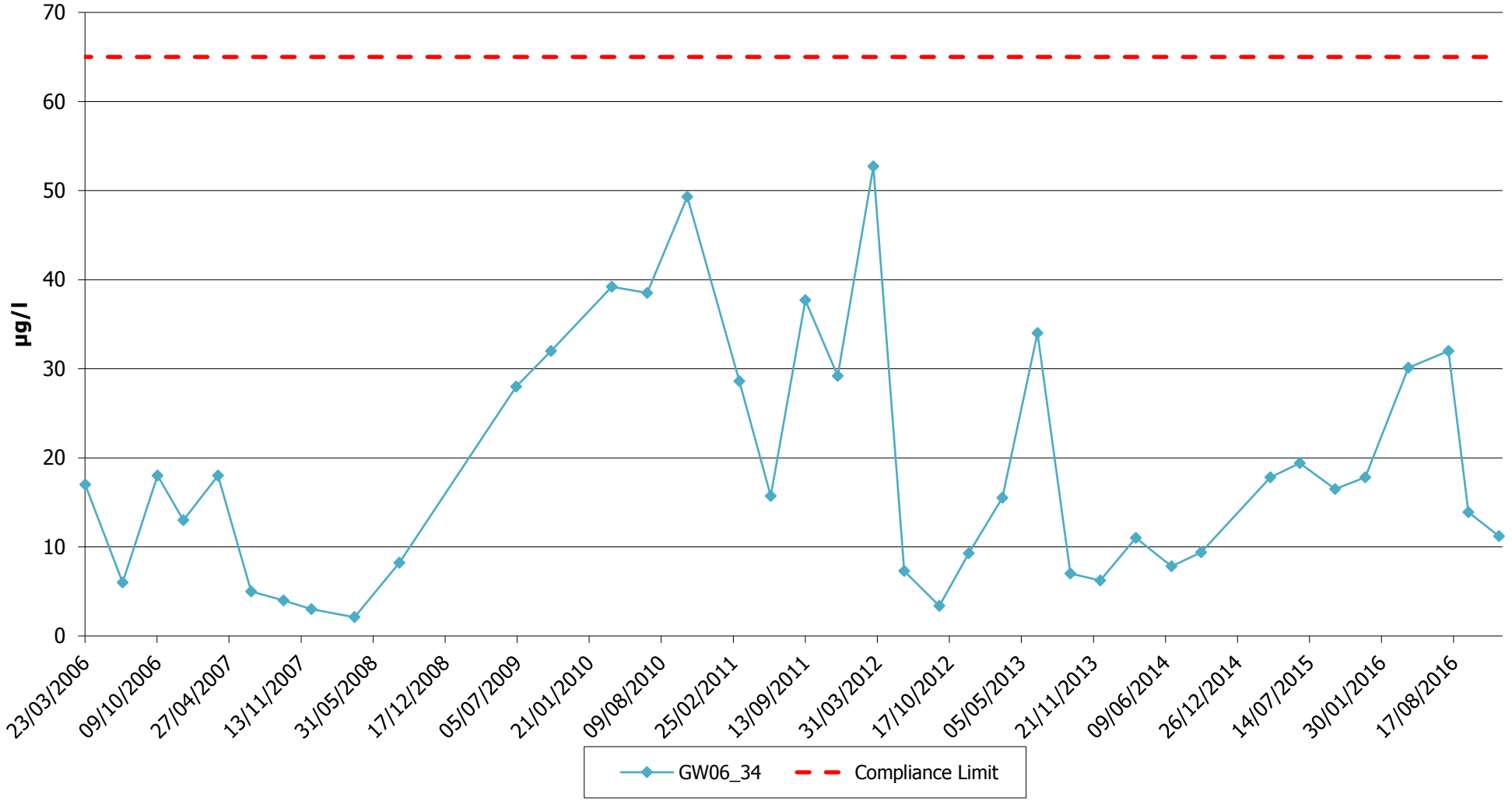
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-7 Arsenic 2.xls]A4 LS

Appendix 2/8
Docksway Disposal Site - Arsenic in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-9
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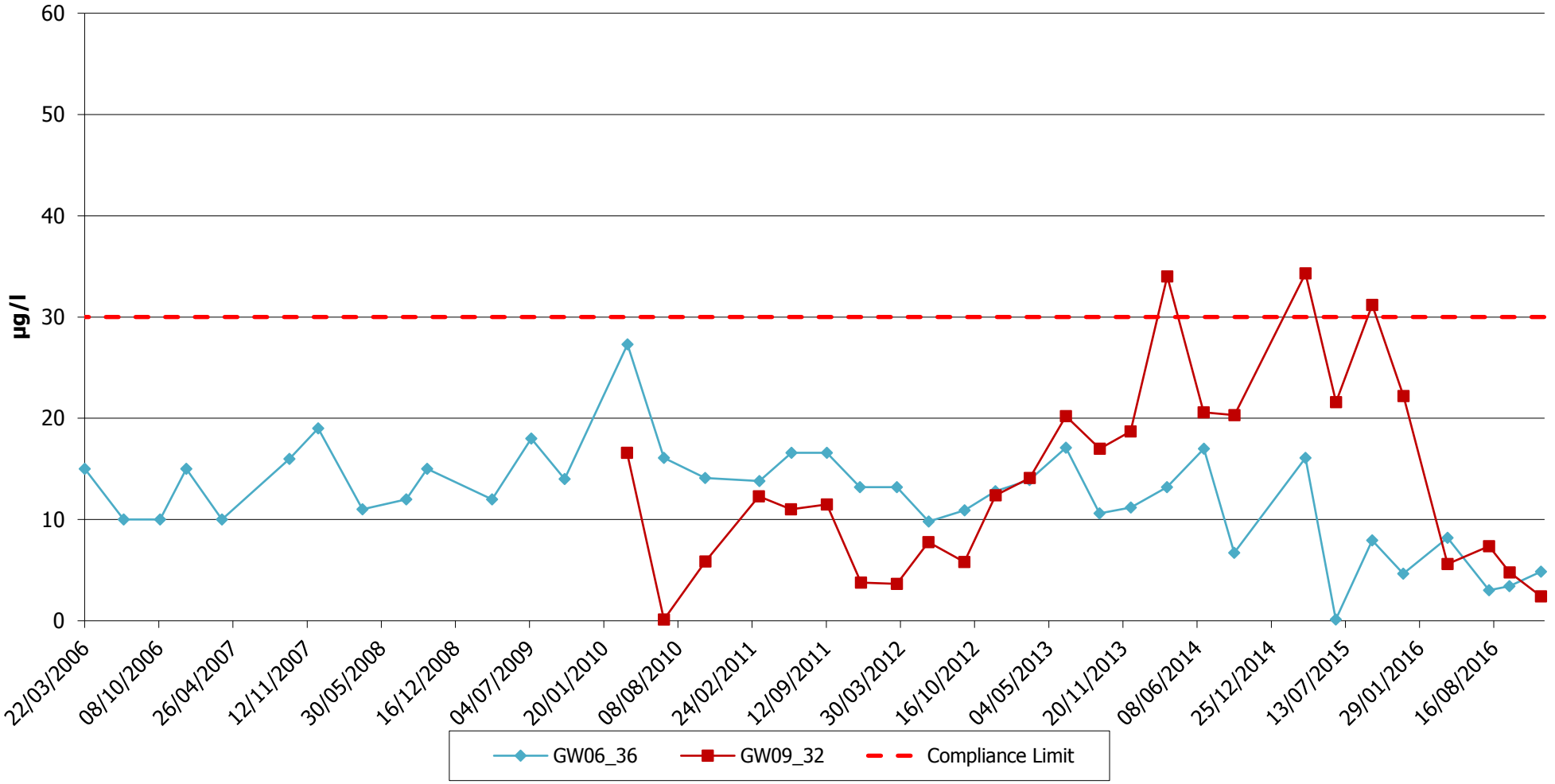
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-8 Arsenic 2.xls]A4 LS

Appendix 2/9
Docksway Disposal Site - Arsenic in Groundwater



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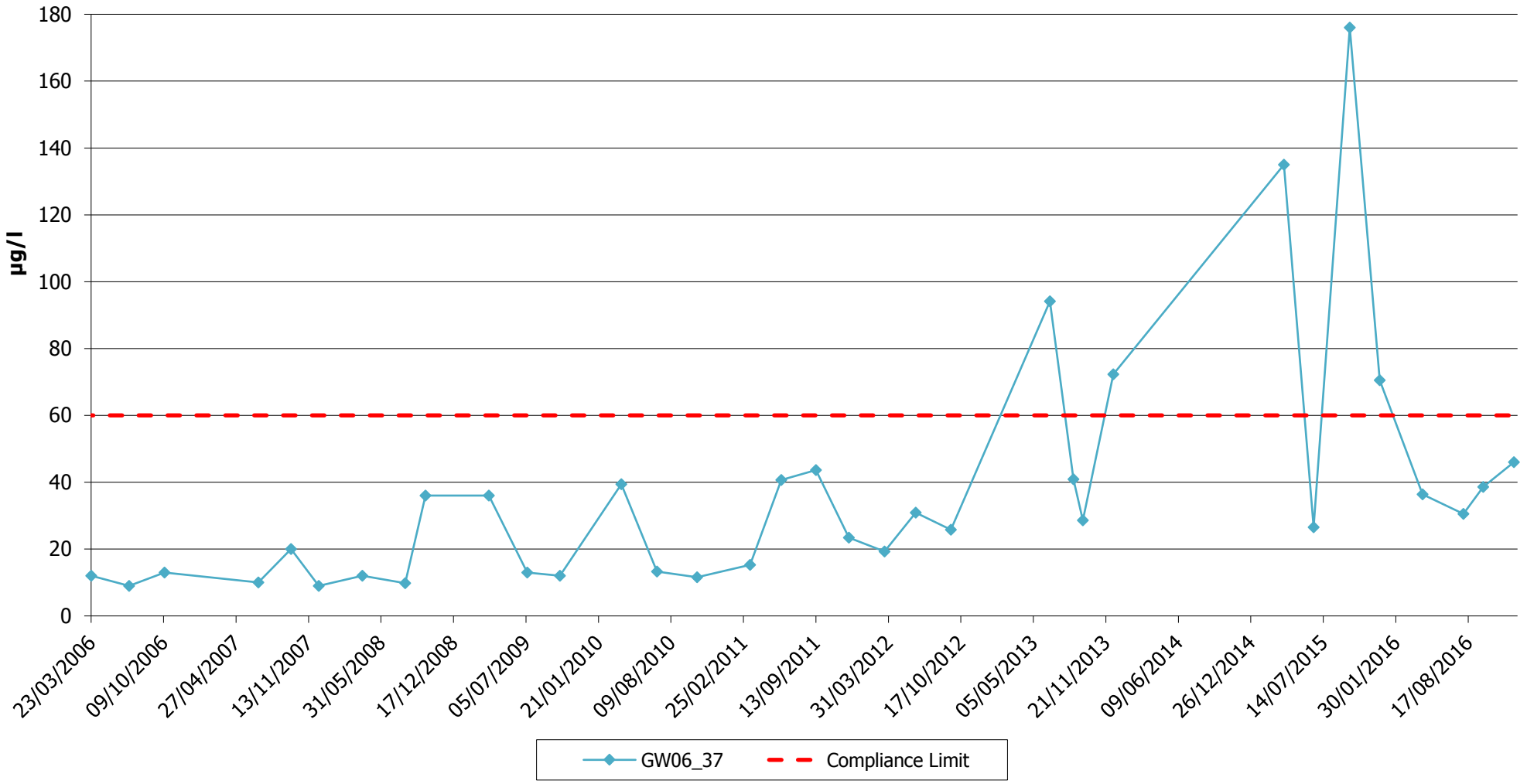
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-9	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-9 Arsenic 2.xls]A4 LS

Appendix 10
Docksway Disposal Site - Arsenic in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-10
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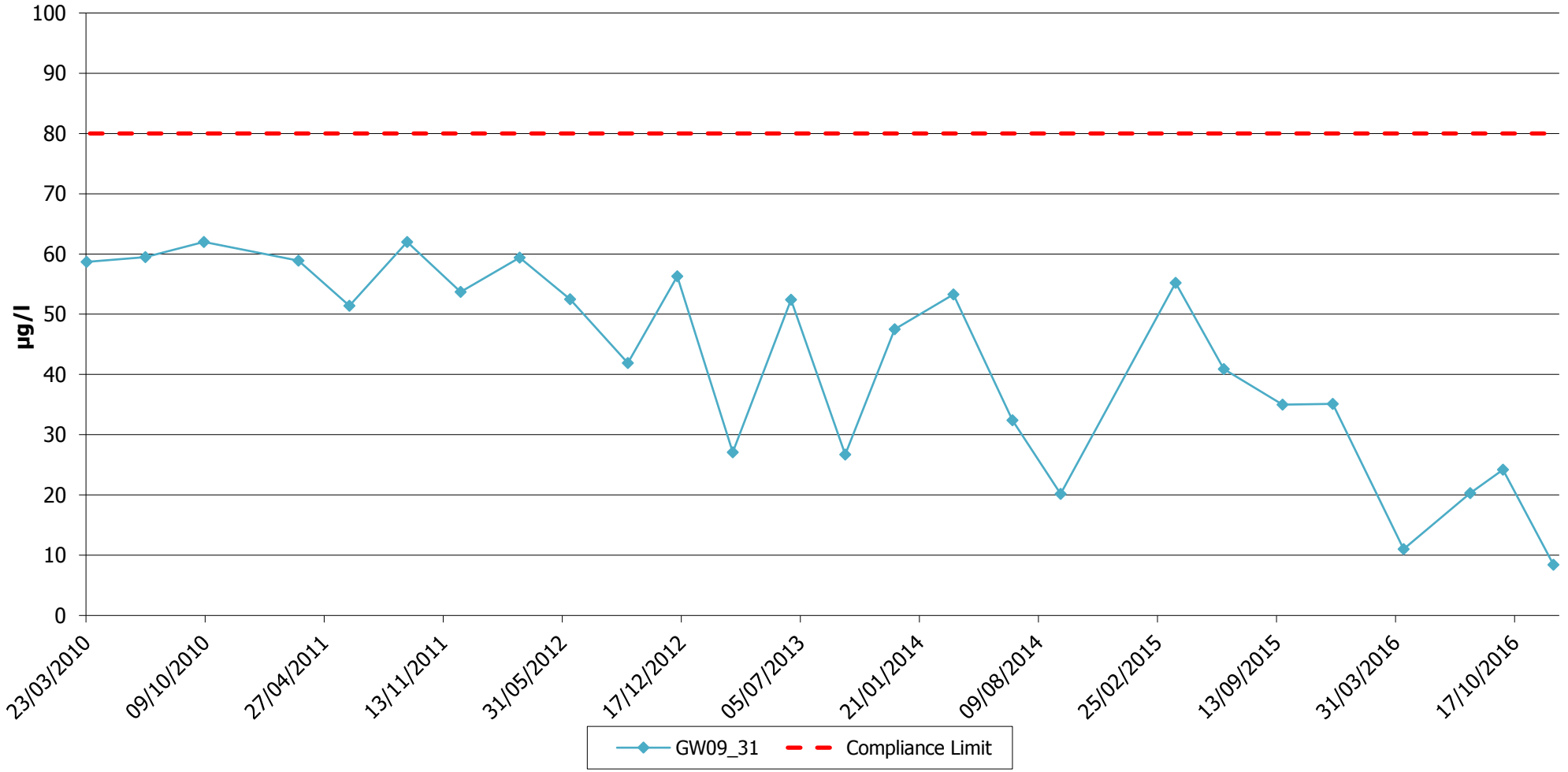
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-10 Arsenic 2.xls]A4 LS

Appendix 2/11
Docksway Disposal Site - Arsenic in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-11

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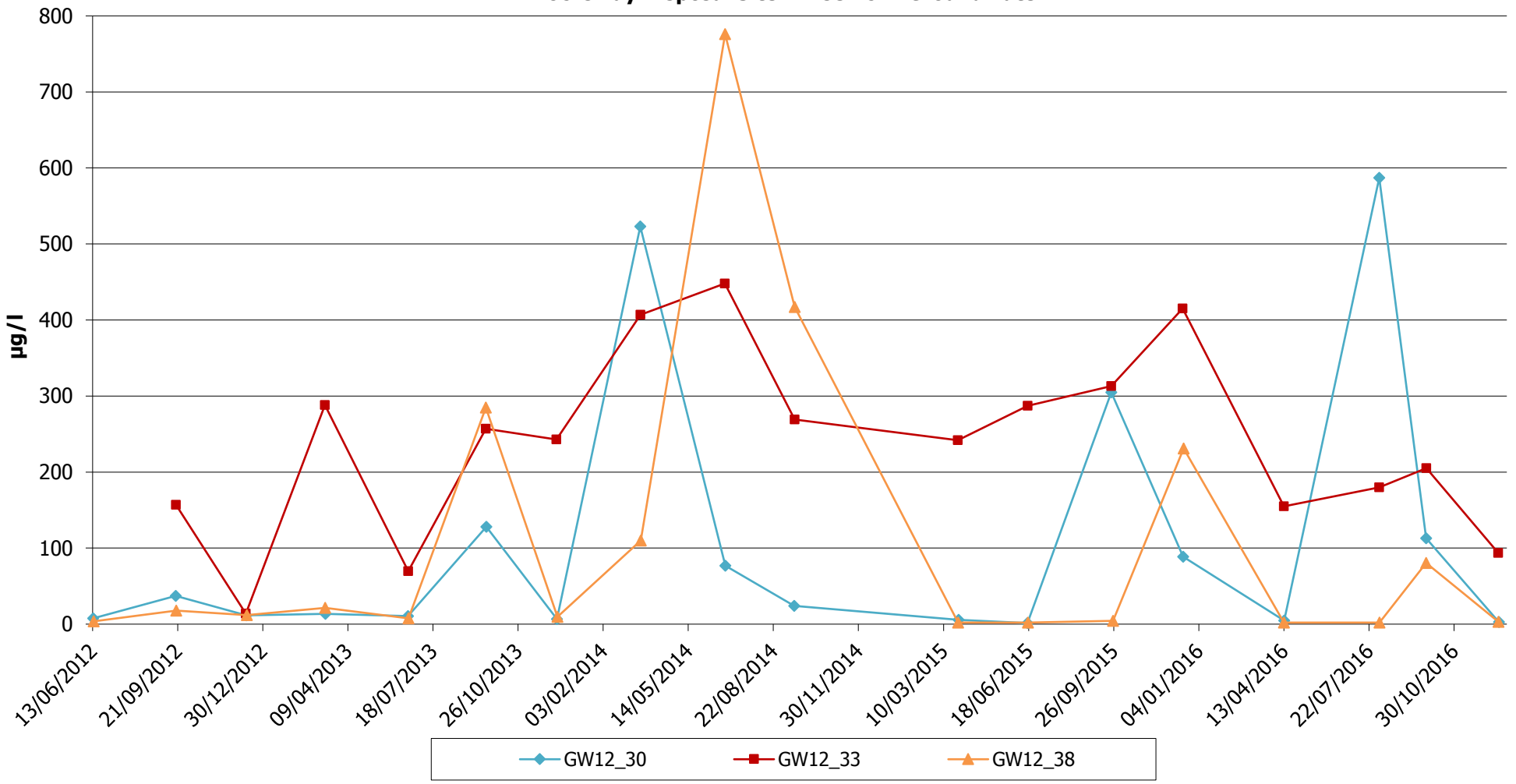
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-11 Arsenic 2.xls]A4 LS

Appendix 2/12
Docksway Disposal Site - Arsenic in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-12

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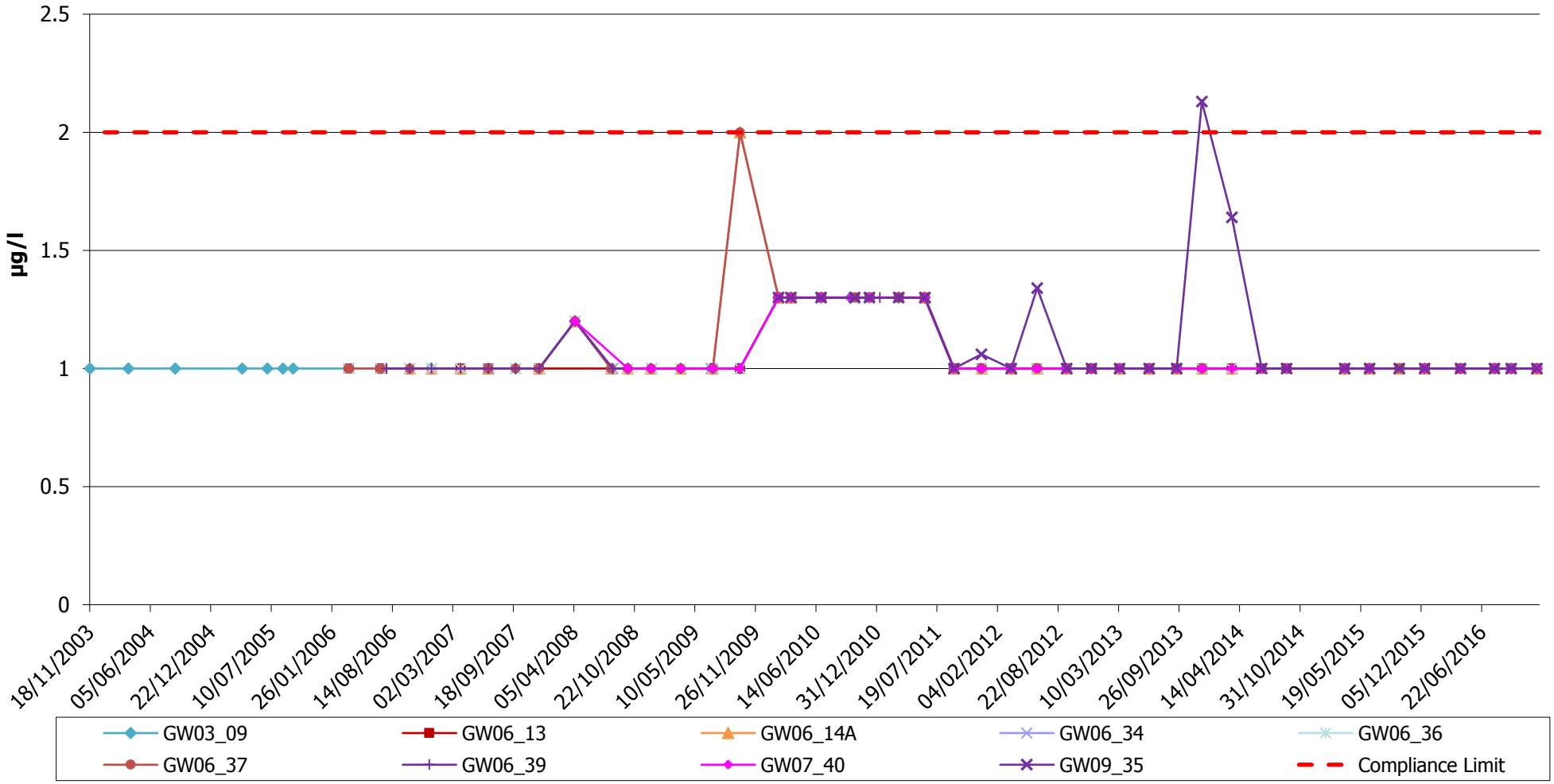
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-12 Arsenic 2.xls]A4 LS

Appendix 2/13
Docksway Disposal Site - Benzene in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-13
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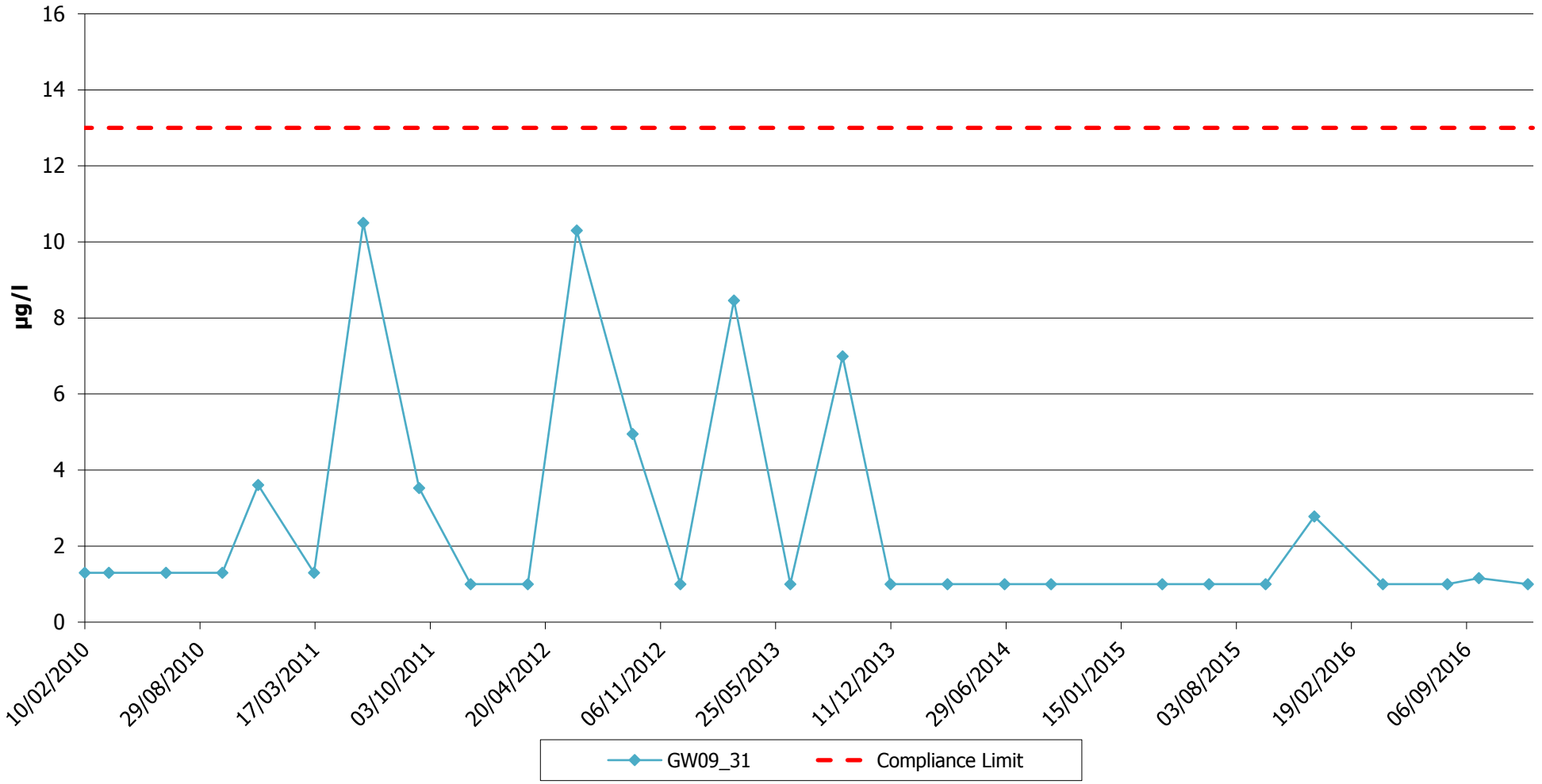
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-13 Benzene 2.xls]A4 LS

Appendix 2/14
Docksway Disposal Site - Benzene in Groundwater



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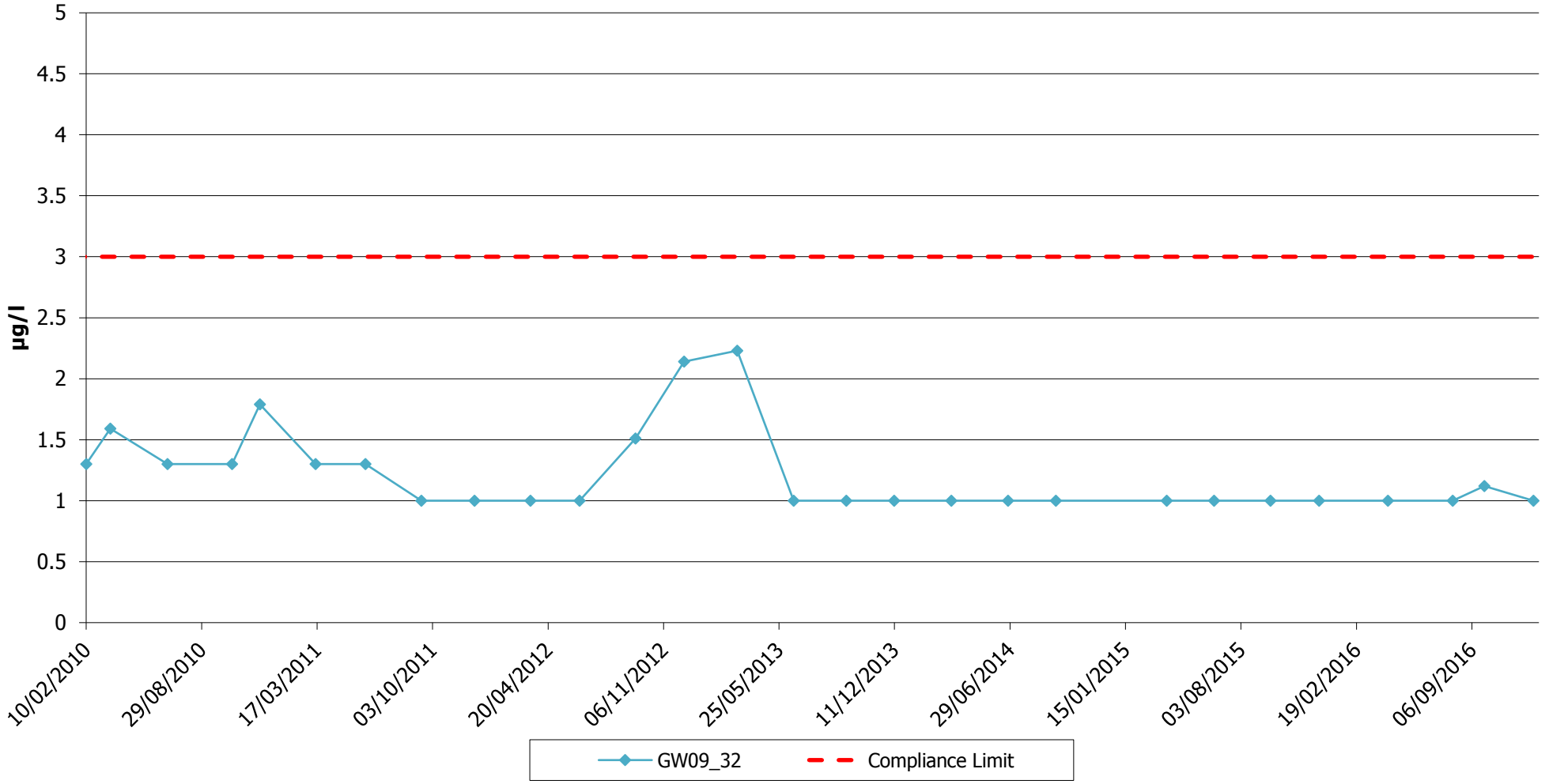
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-14	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-14 Benzene 2.xls]A4 LS

Appendix 2/15
Docksway Disposal Site - Benzene in Groundwater



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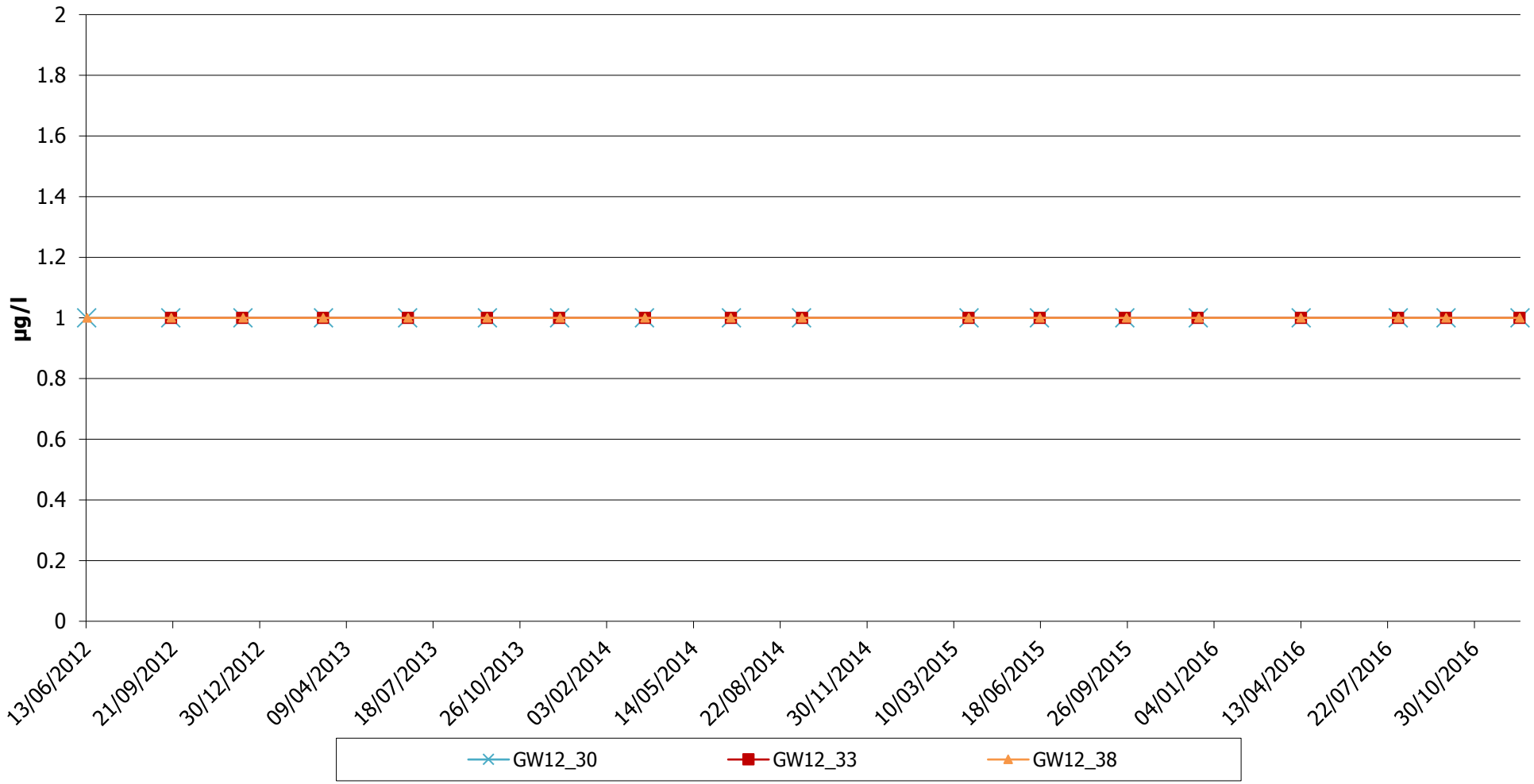
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-15	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-15 Benzene 2.xls]A4 LS

Appendix 2/16
Docksway Disposal Site - Benzene in Groundwater



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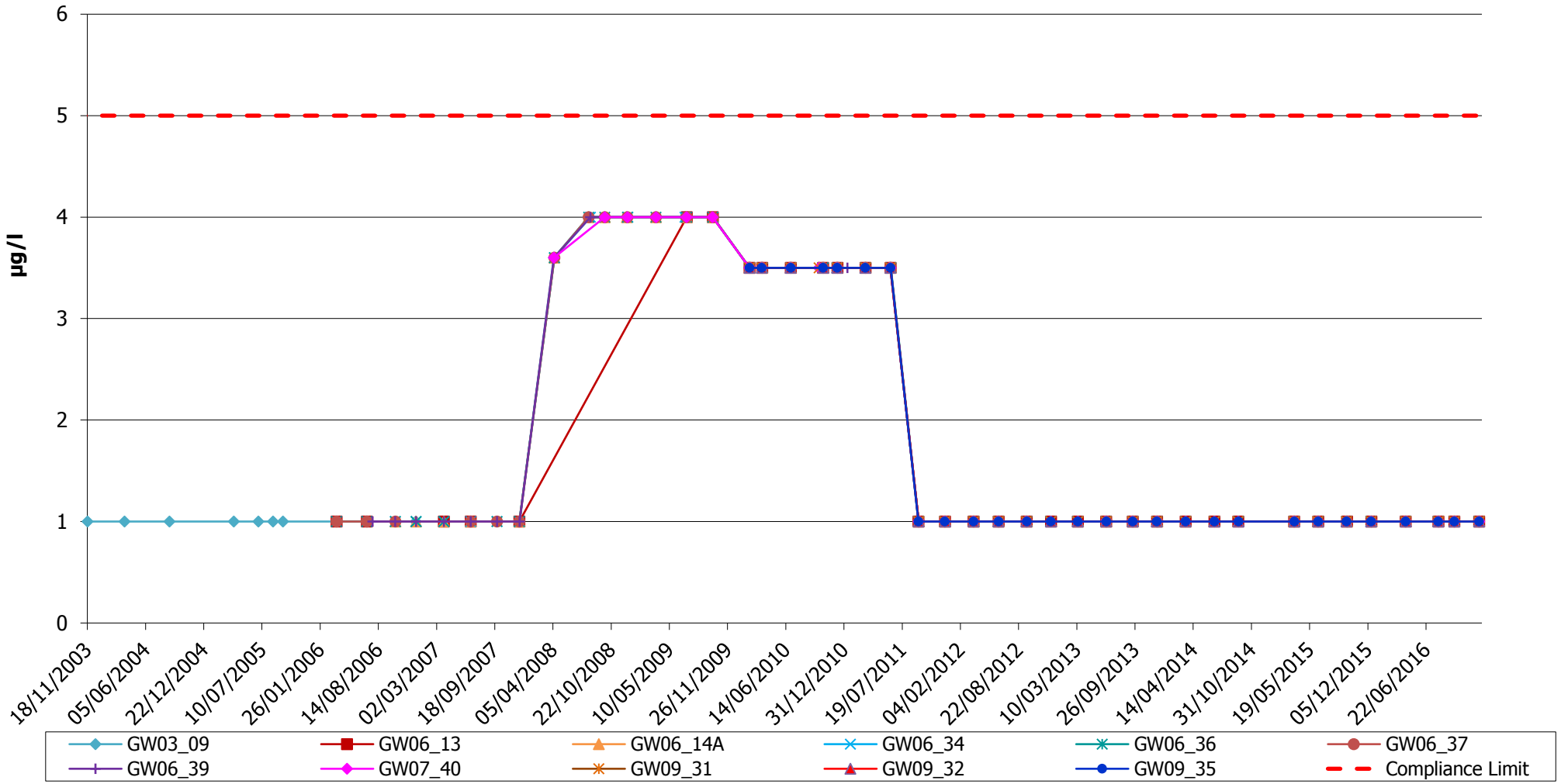
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-16	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-16 Benzene 2.xls]A4 LS

Appendix 2/17
Docksway Disposal Site - Naphthalene in Groundwater



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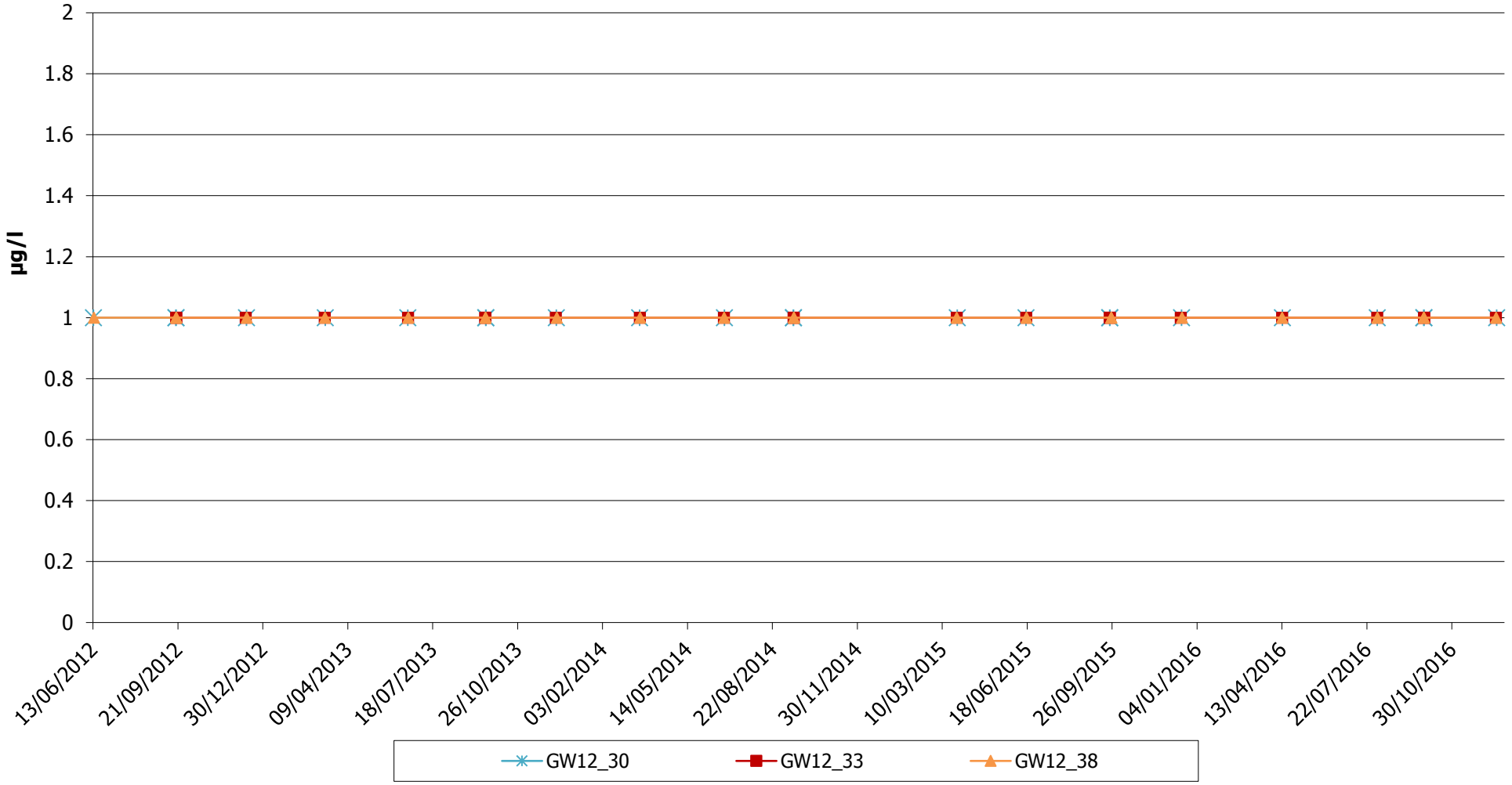
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-17 Naphthalene 2.xls]A4 LS

Appendix 2/18
Docksway Disposal Site - Naphthalene in Groundwater



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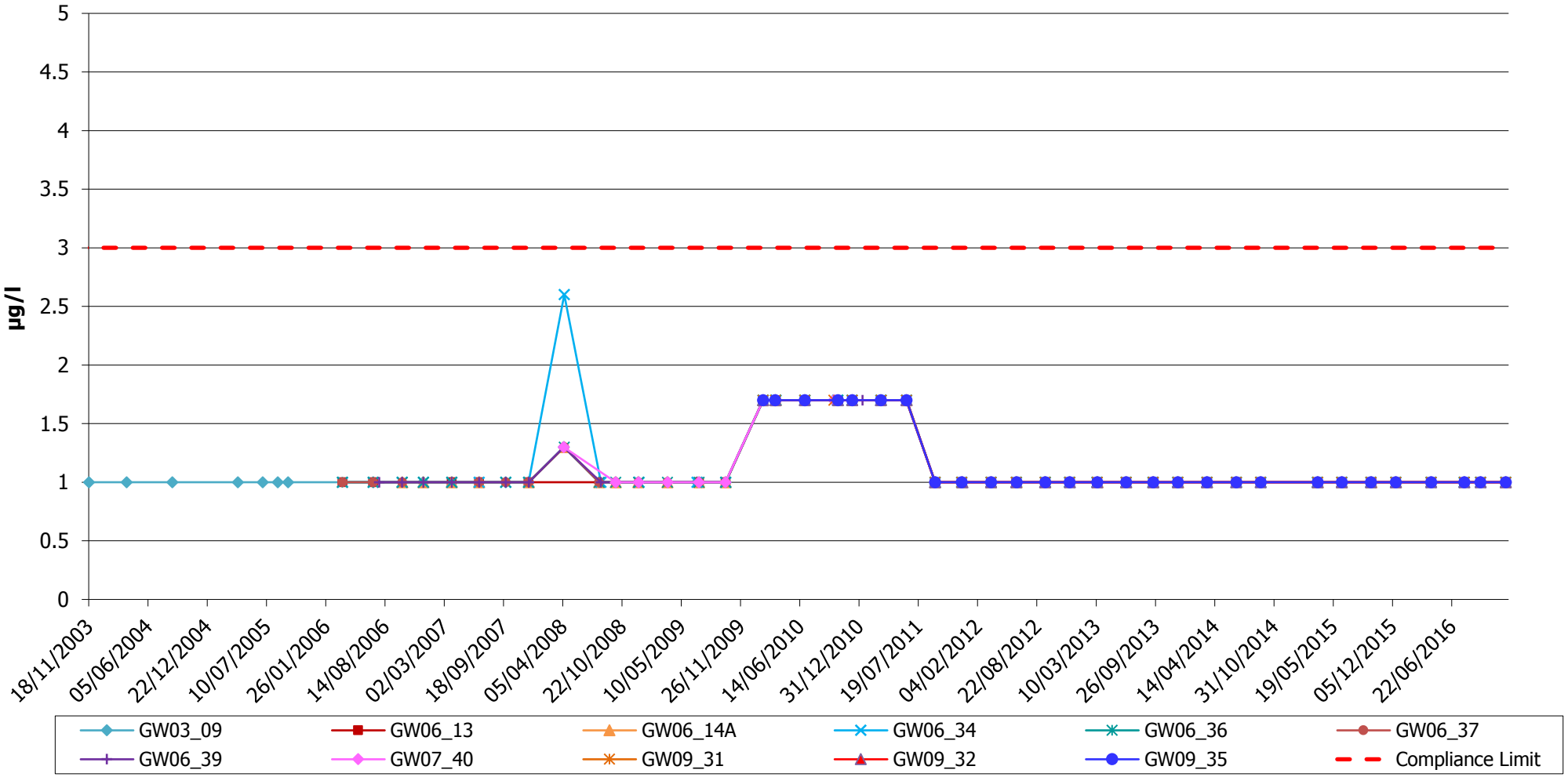
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-18	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-18 Naphthalene 2.xls]A4 LS

Appendix 2/19
Docksway Disposal Site - Xylene in Groundwater



peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-19
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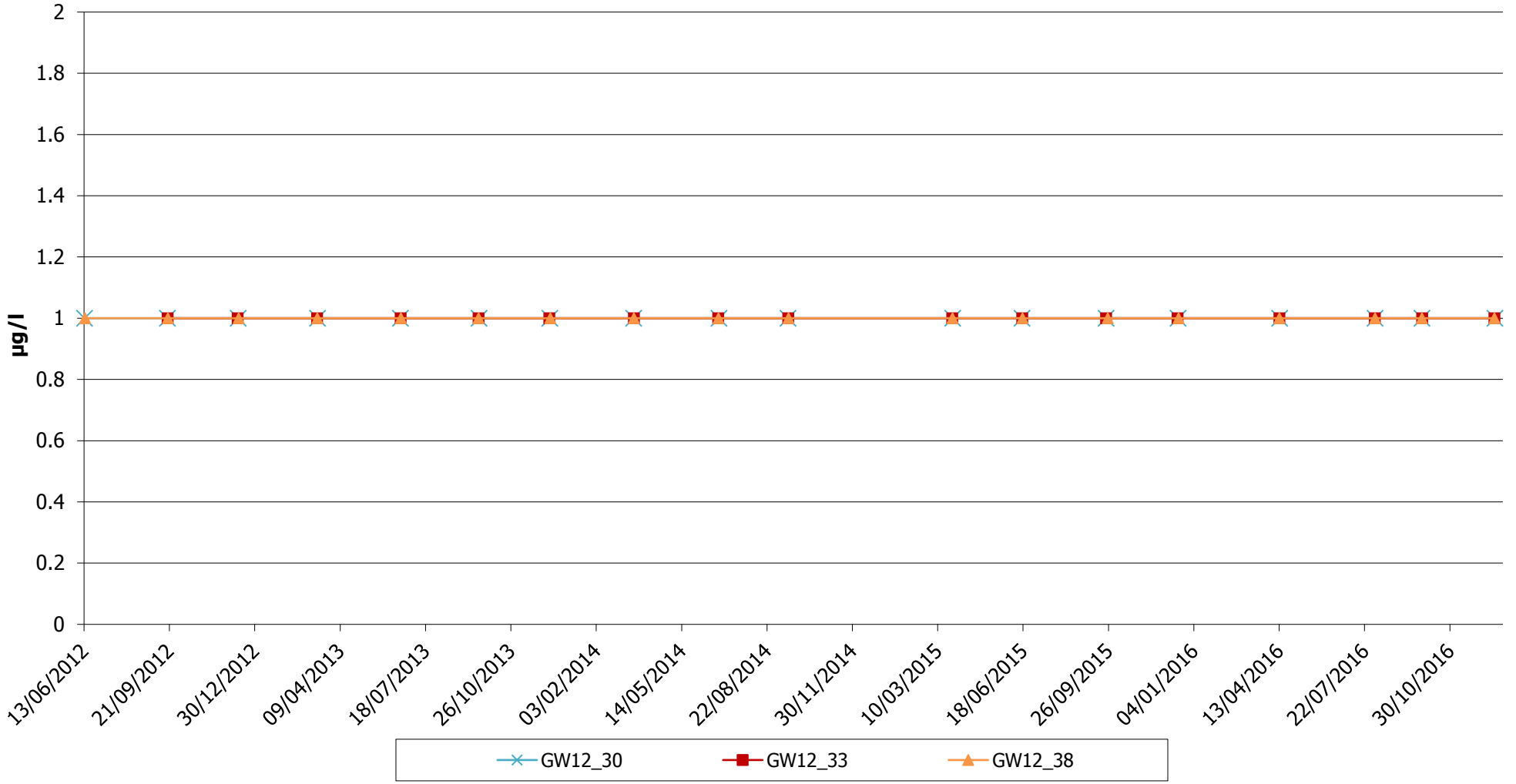
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-19 o-Xylene 2.xls]A4 LS

Appendix 2/20
Docksway Disposal Site - Xylene in Groundwater



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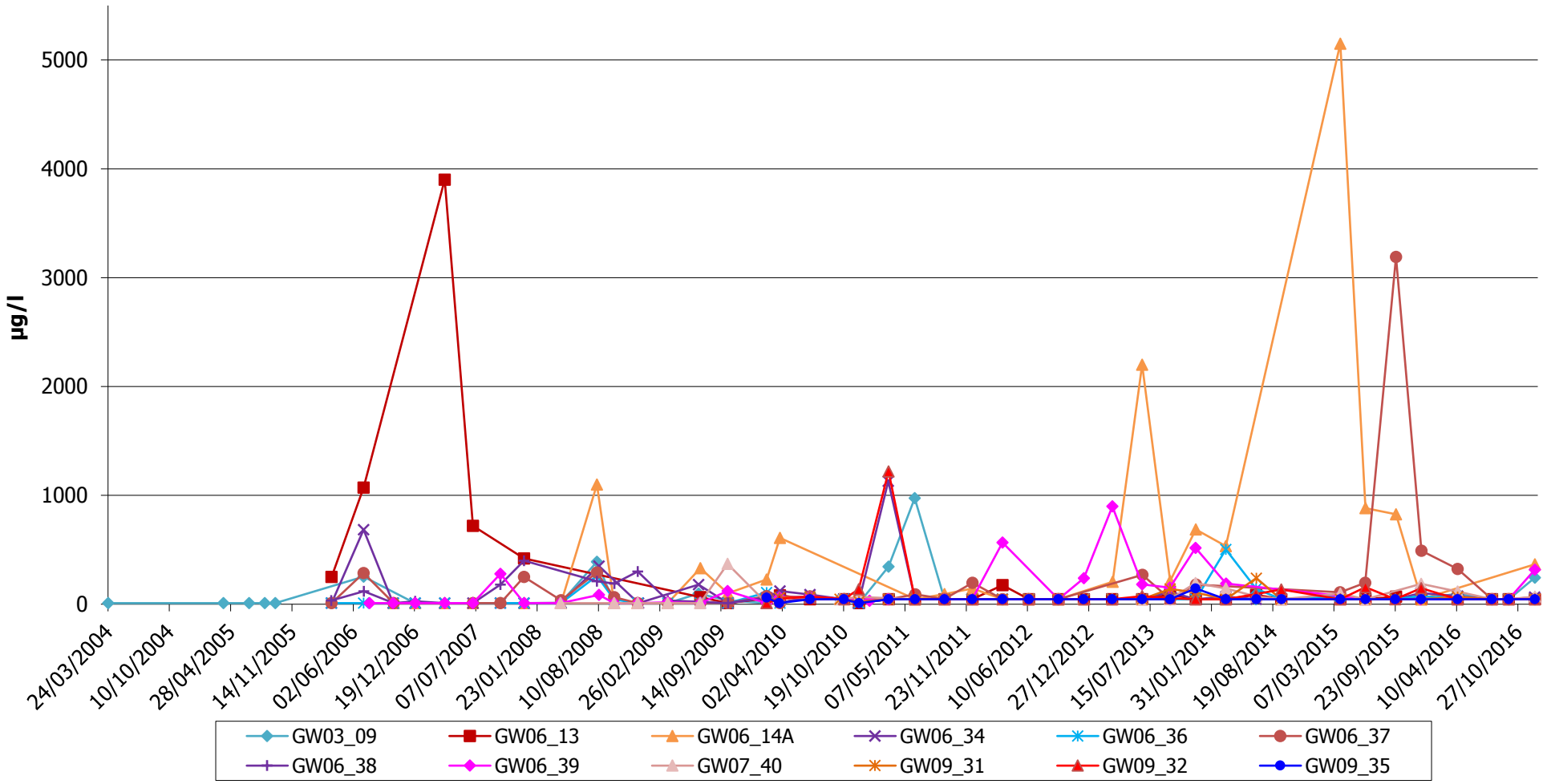
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-20	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-20 o-Xylene 2.xls]A4 LS

Appendix 2/21
Docksway Disposal Site - EPH in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-21
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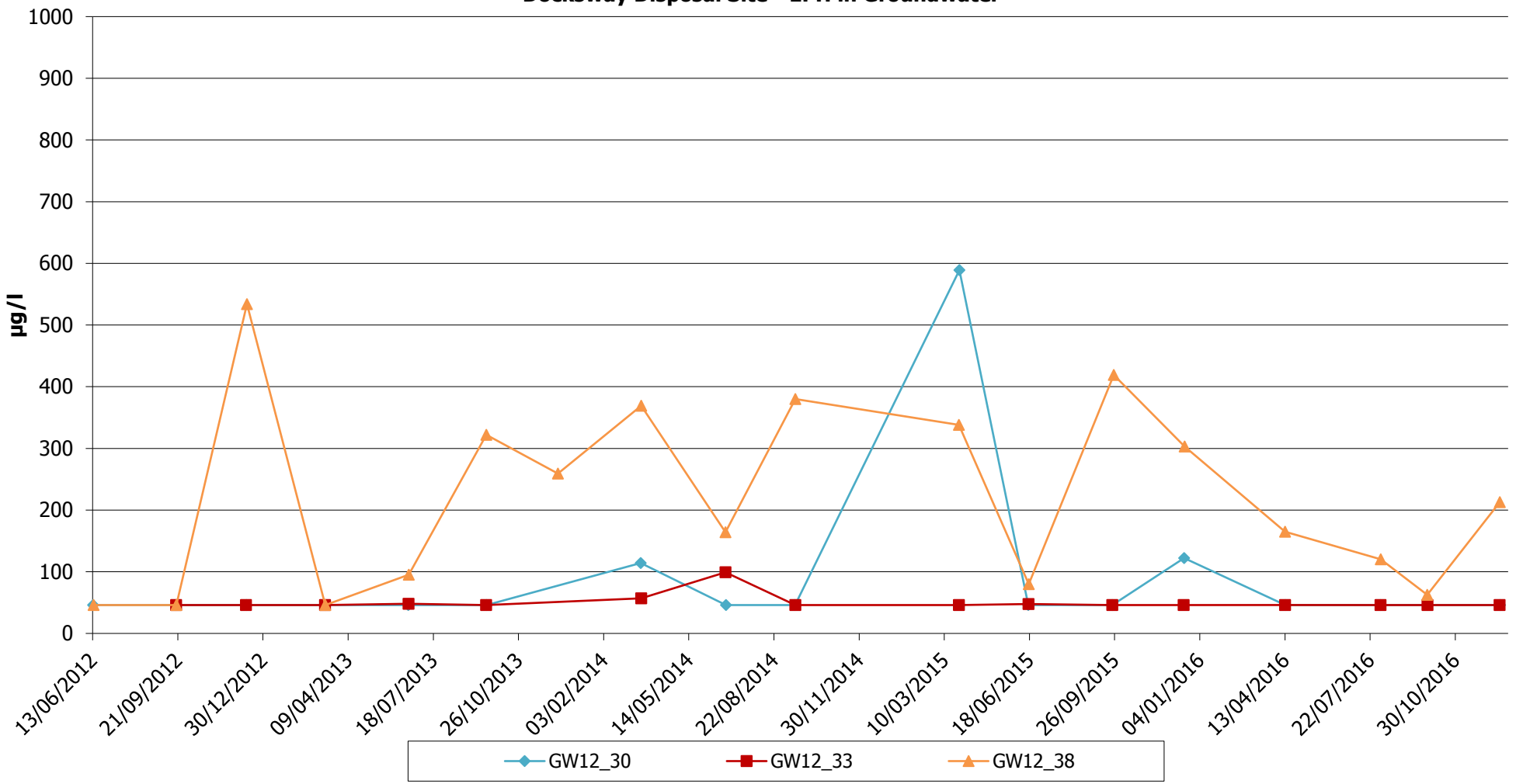
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-21 EPH 2.xls]A4 LS

Appendix 2/22
Docksway Disposal Site - EPH in Groundwater



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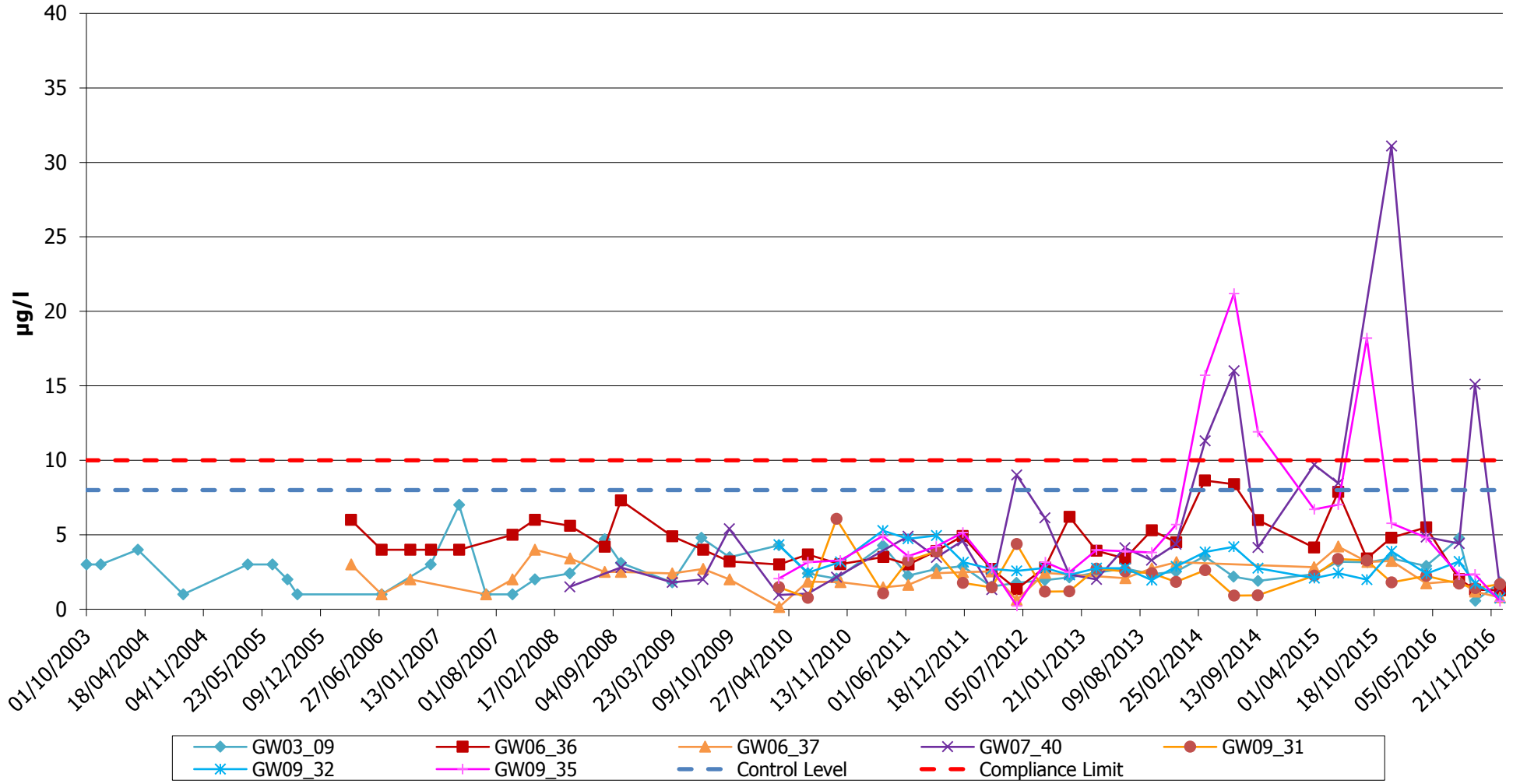
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-22	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-22 EPH 2.xls]A4 LS

Appendix 2/23
Docksway Disposal Site - Nickel in Groundwater



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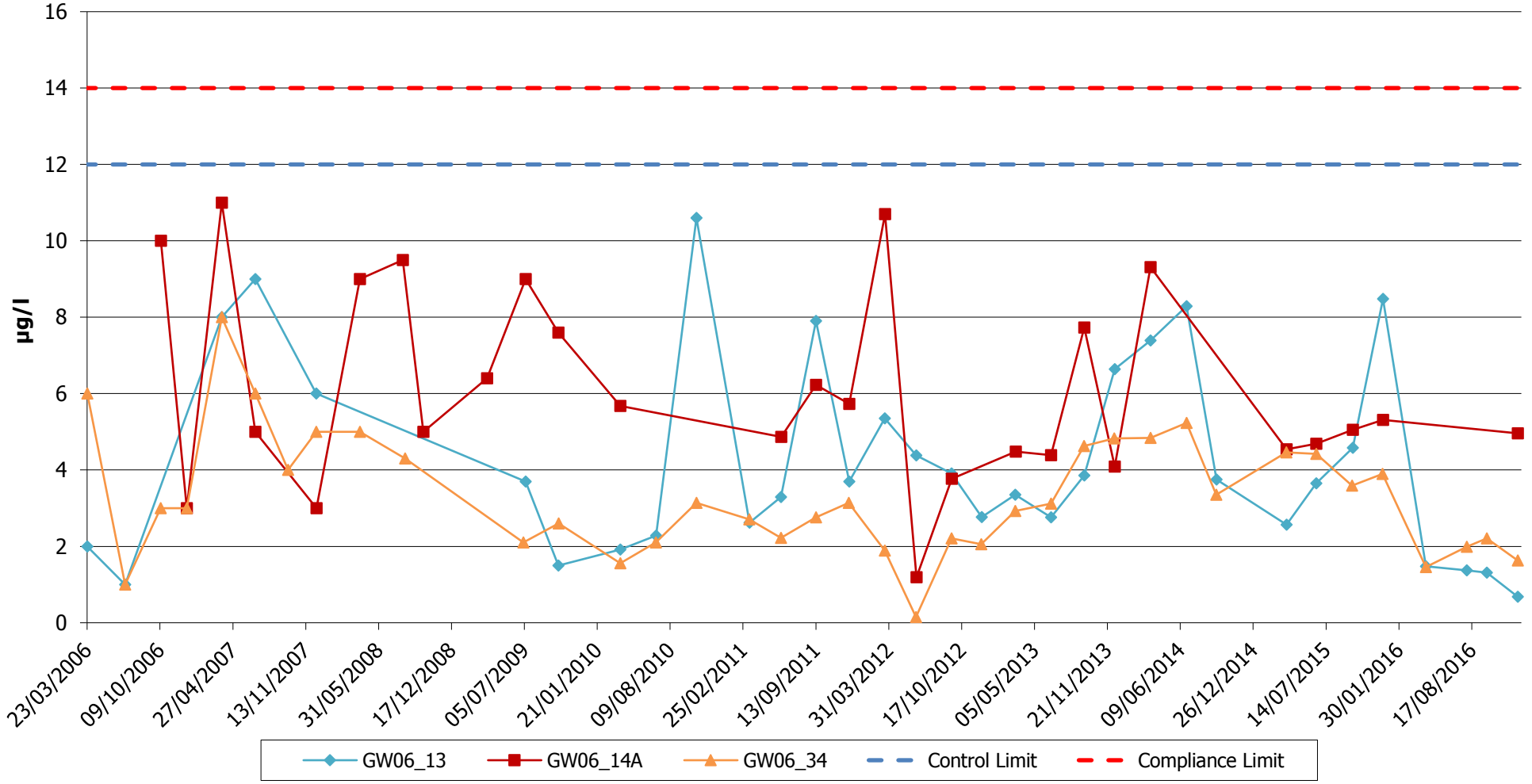
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-23	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-23 Nickel 2.xls]A4 LS

Appendix 2/24
Docksway Disposal Site - Nickel in Groundwater



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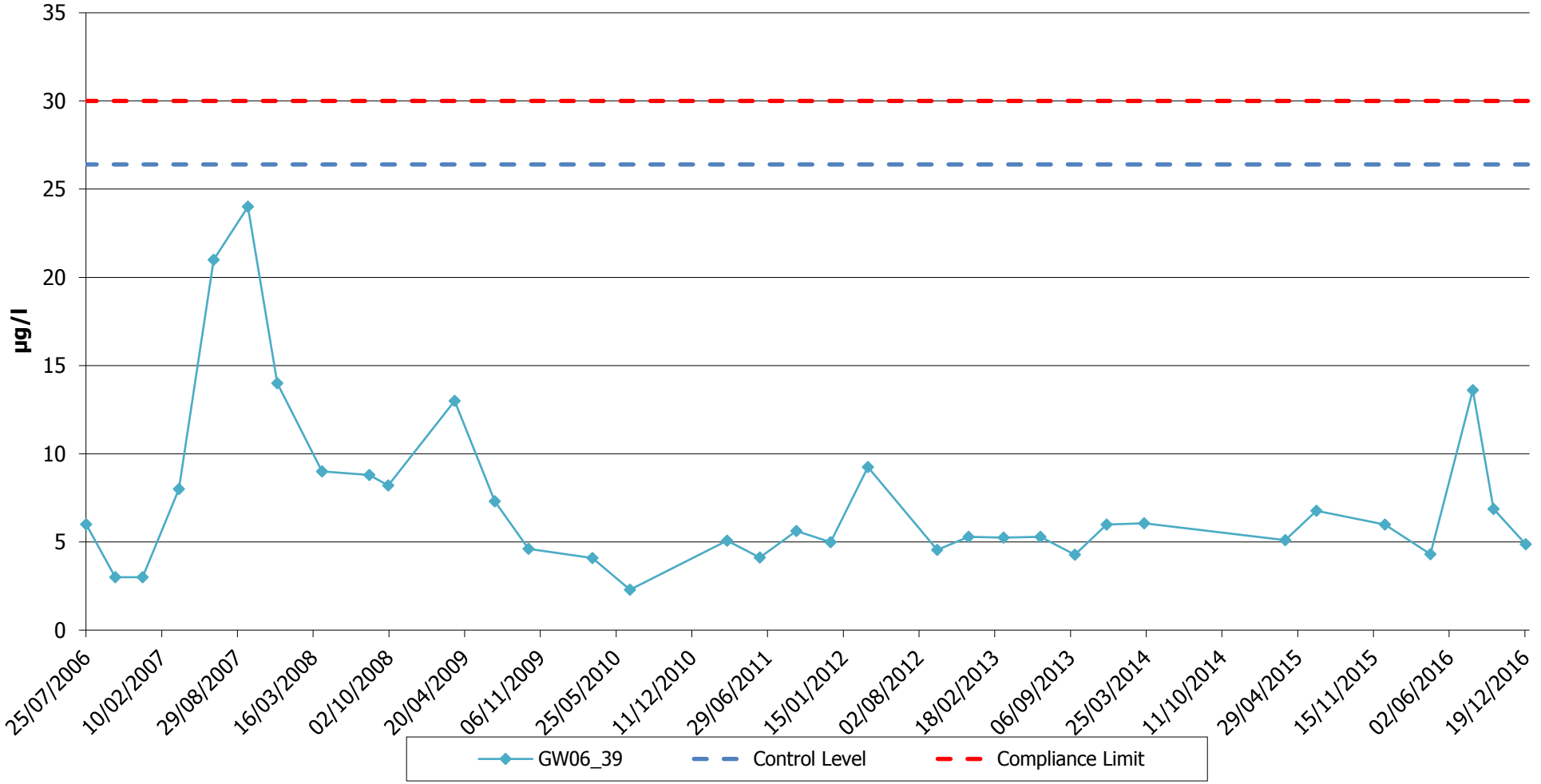
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-24	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-24 Nickel 2.xls]A4 LS

Appendix 2/25
Docksway Disposal Site - Nickel in Groundwater



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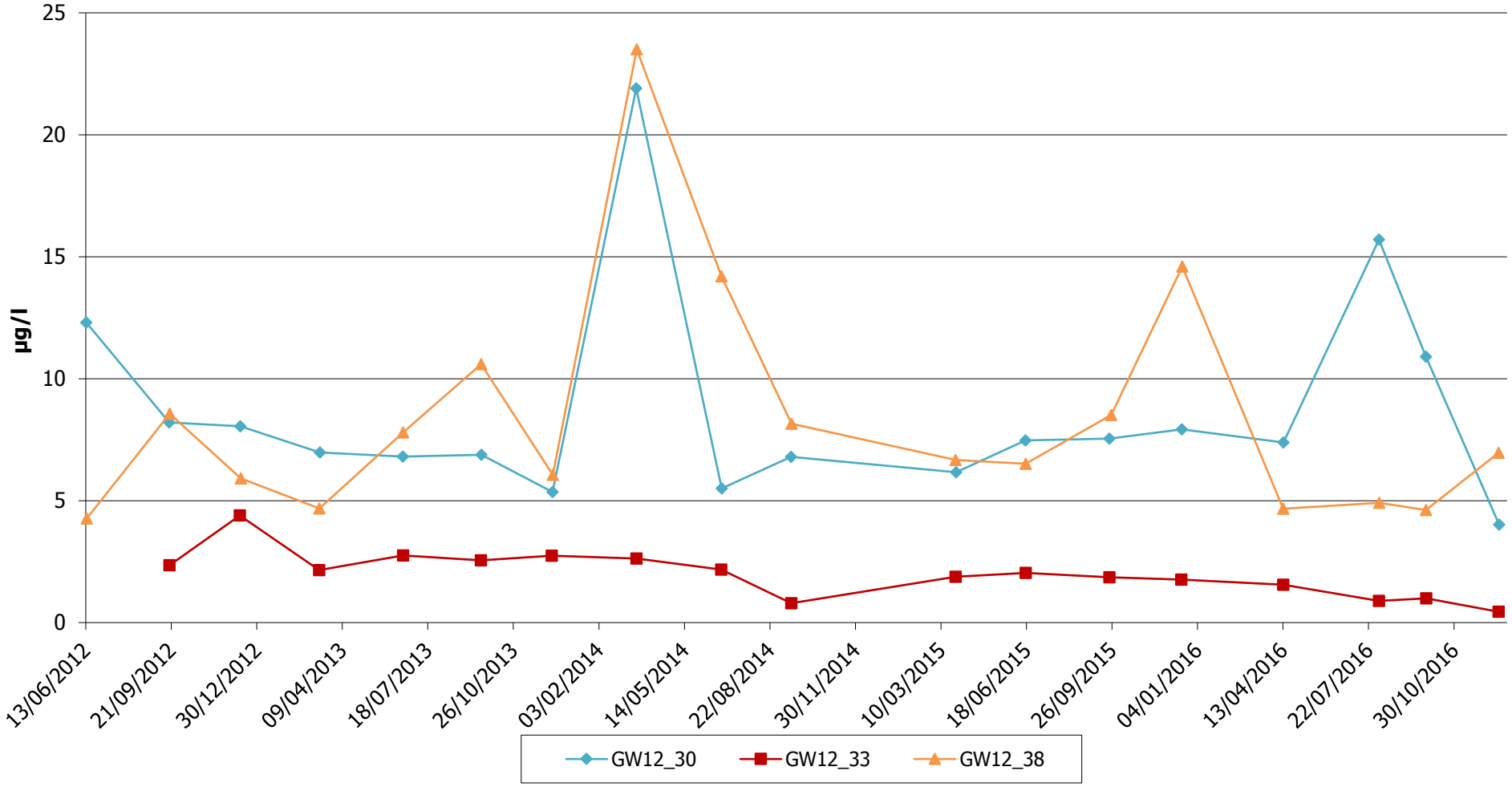
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-25	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-25 Nickel 2.xls]A4 LS

Appendix 2/26
Docksway Disposal Site - Nickel in Groundwater



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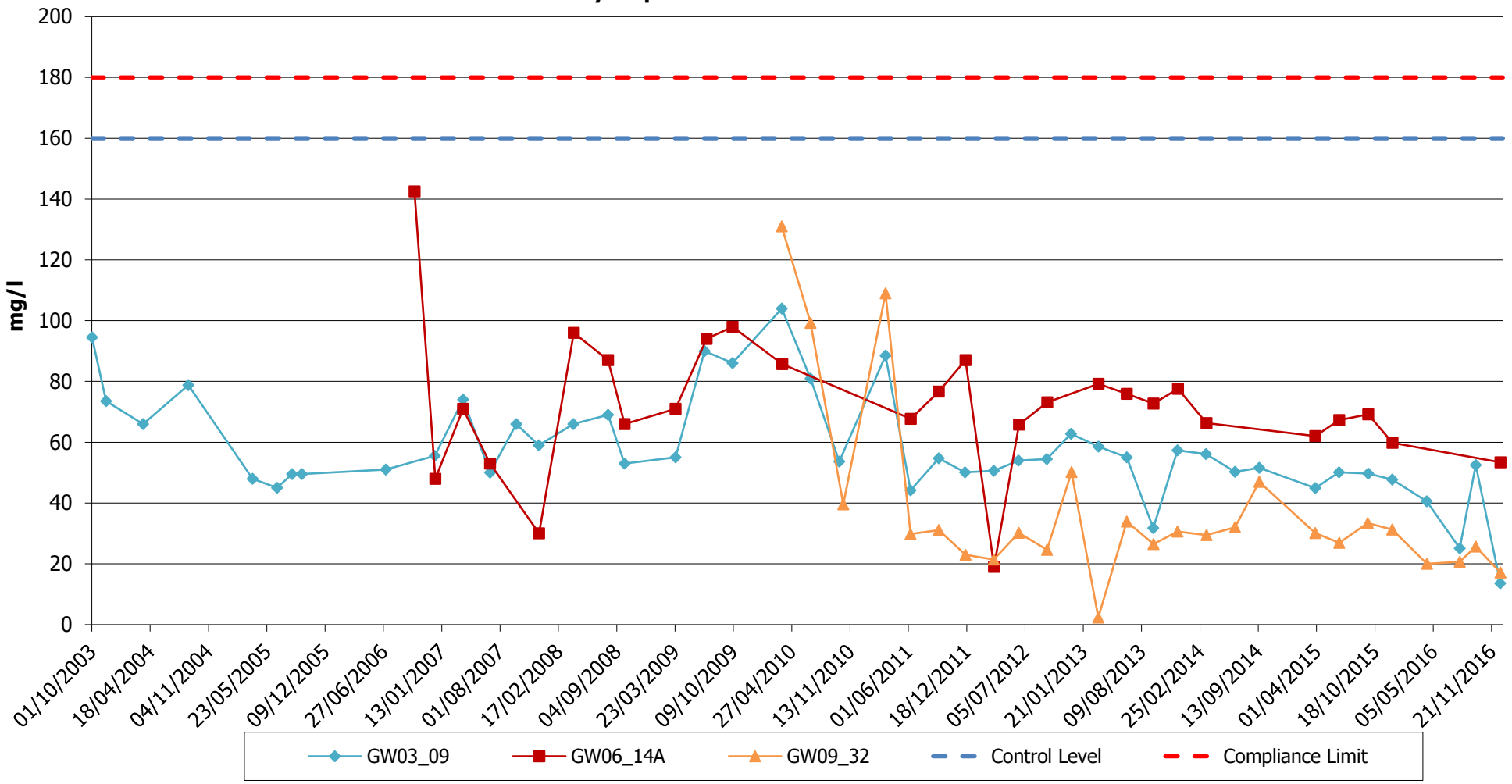
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-26	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-26 Nickel 2.xls]A4 LS

Appendix 2/27
Docksway Disposal Site - Potassium in Groundwater



peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-27
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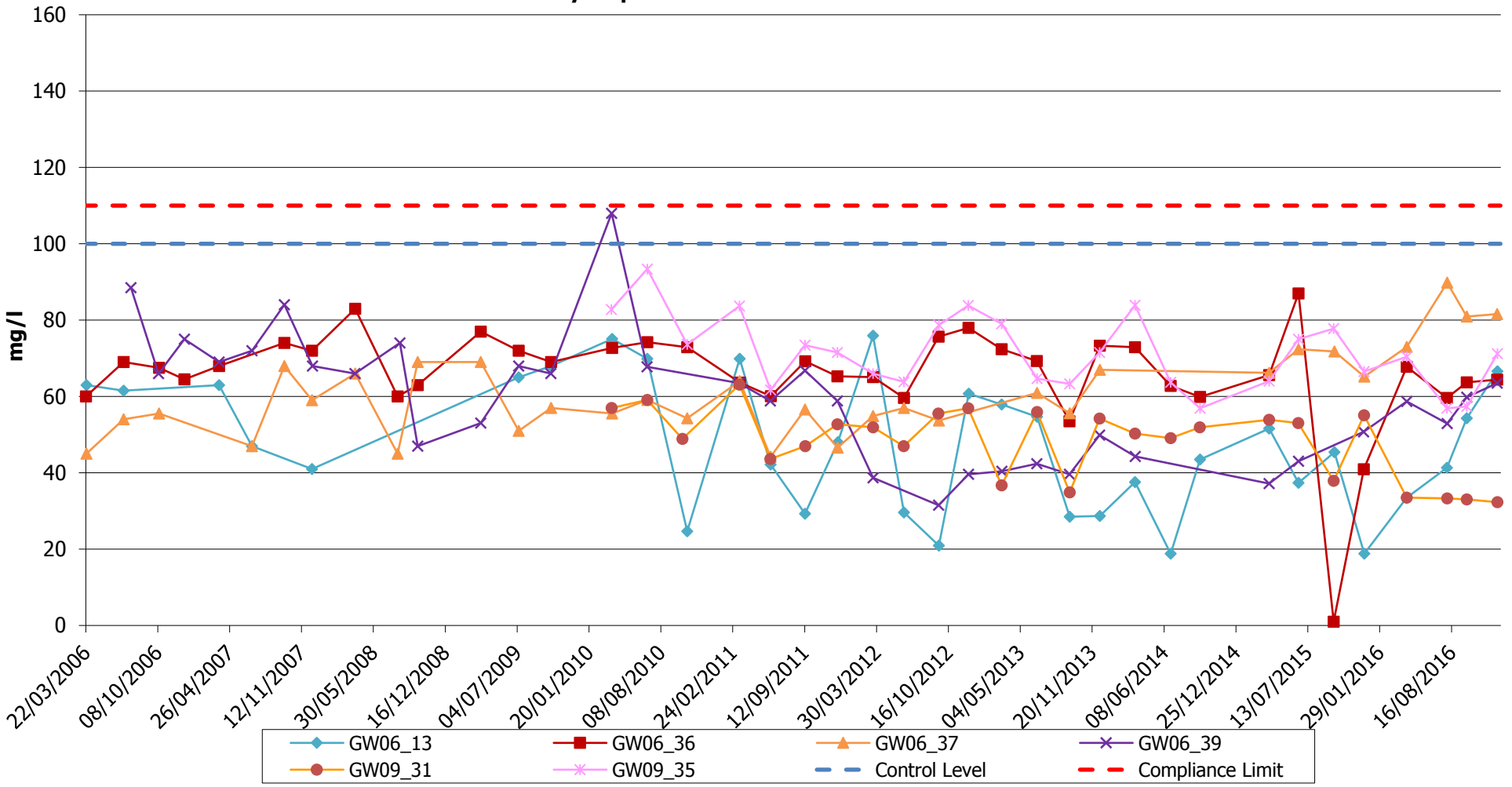
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-27 Potassium 2.xls]A4 LS

Appendix 2/28
Docksway Disposal Site - Potassium in Groundwater



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-28

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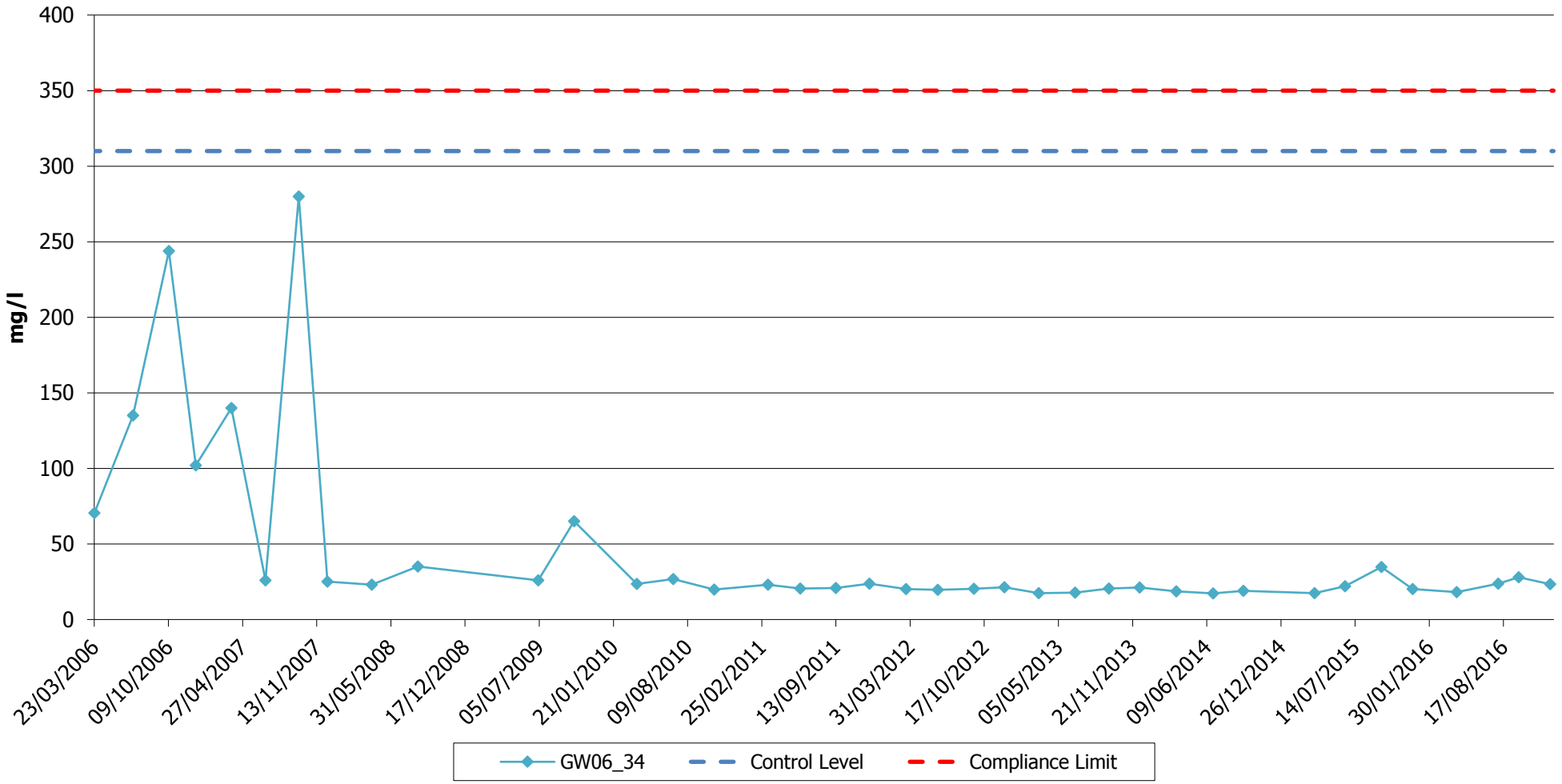
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-28 Potassium 2.xls]A4 LS

Appendix 2/29
Docksway Disposal Site - Potassium in Groundwater



peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 2-29

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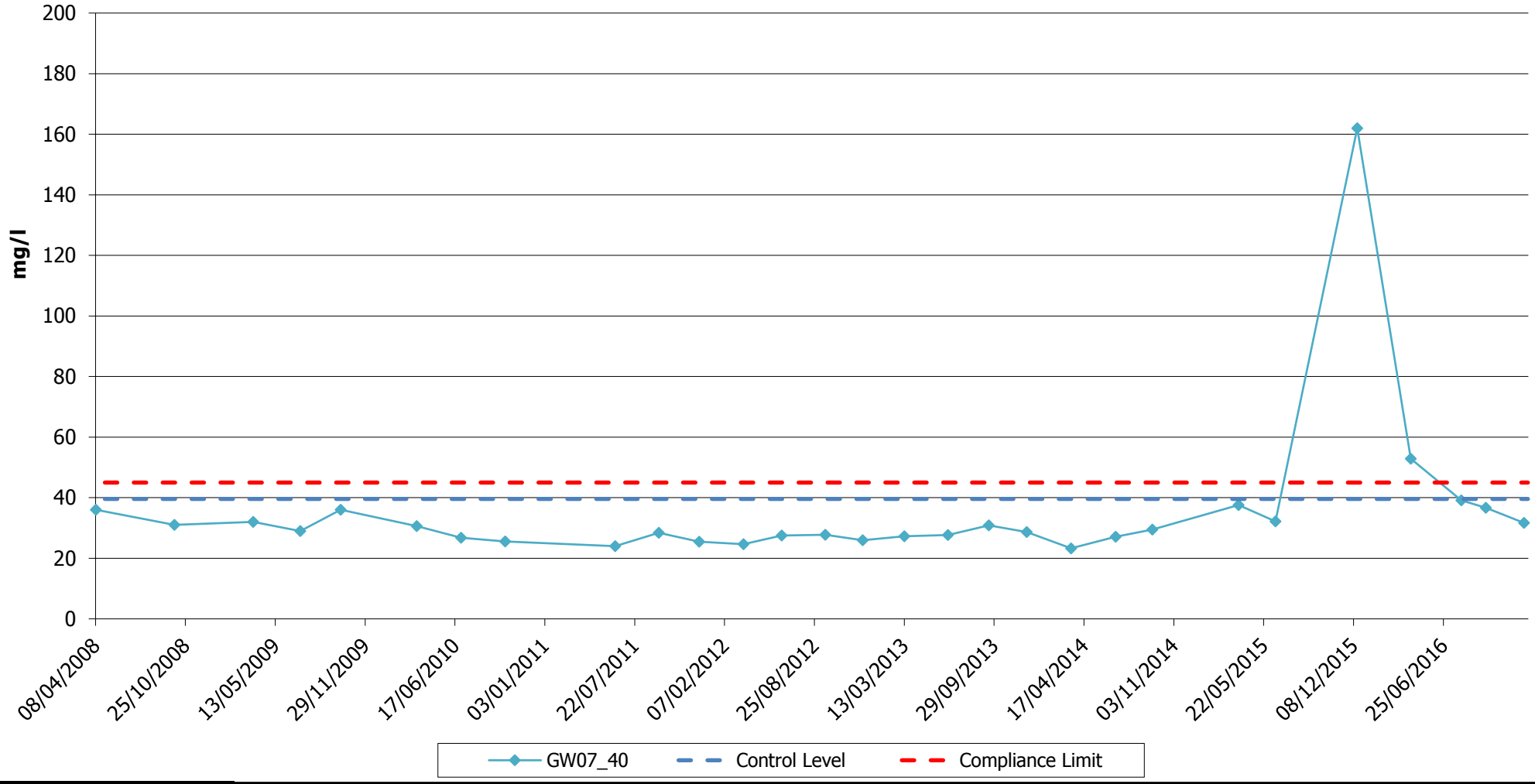
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-29 Potassium 2.xls]A4 LS

Appendix 2/30
Docksway Disposal Site - Potassium in Groundwater



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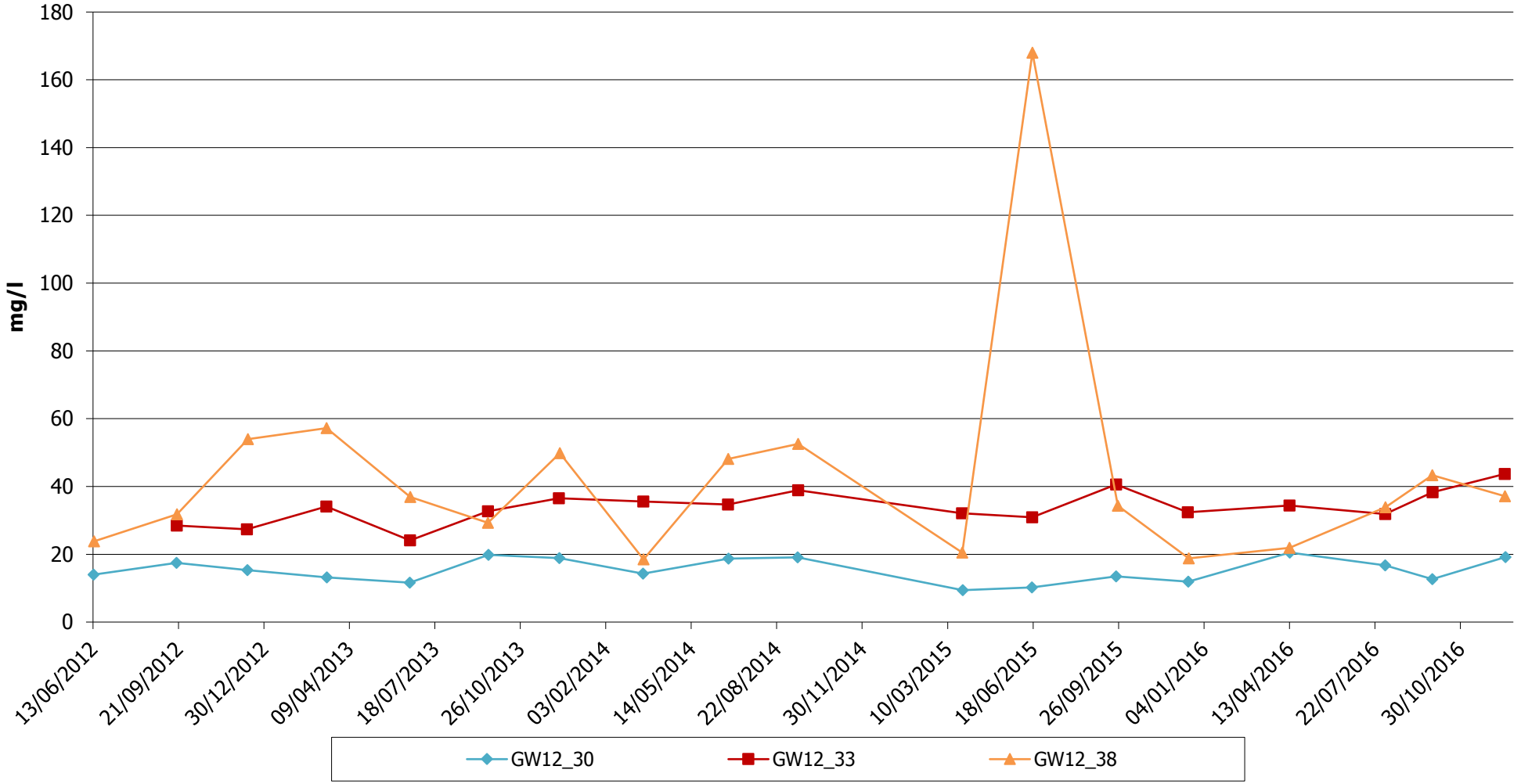
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 2-30	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-30 Potassium 2.xls]A4 LS

Appendix 2/31
Docksway Disposal Site - Potassium in Groundwater



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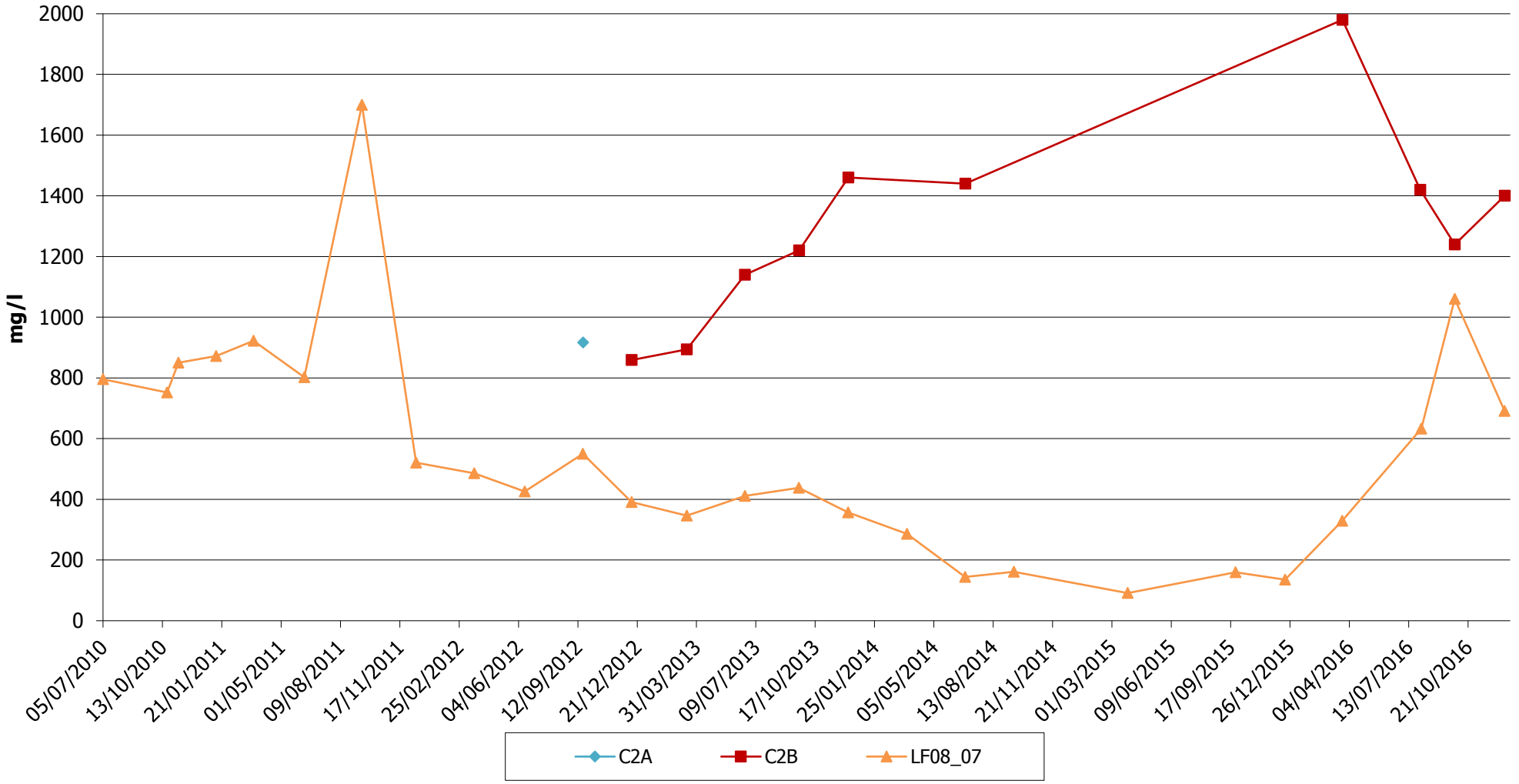
J:\14739\3524 AEPRs 2016\Area 2\A2 App 2 Groundwater\[2-31 Potassium 2.xls]A4 LS

Appendix 3

Appendix 3/1
Docksway Disposal Site - Ammoniacal Nitrogen in Leachate



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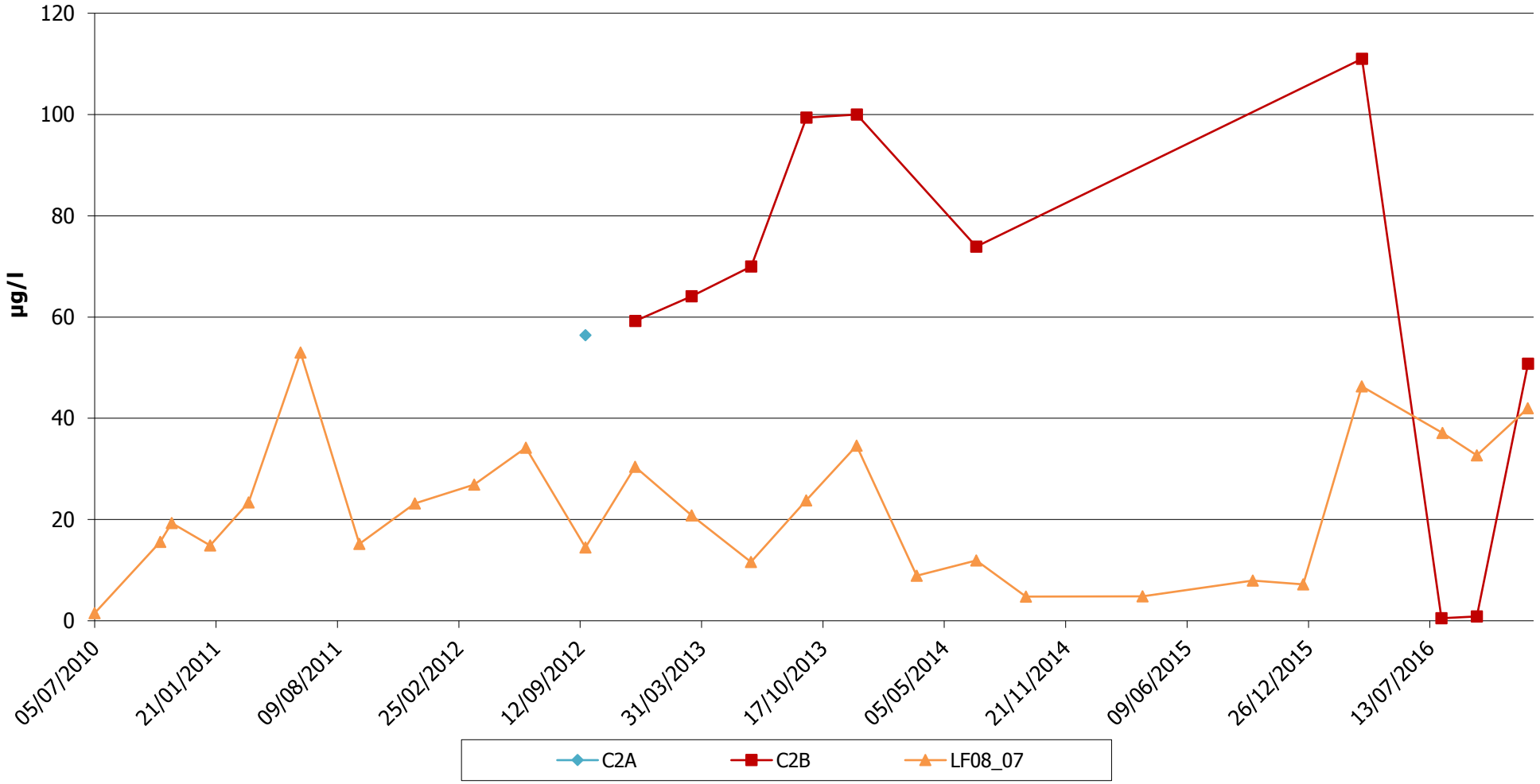
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 3-1	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-1 Ammoniacal Nitrogen (Nitrogen) 2.xls]A4 LS

Appendix 3/2
Docksway Disposal Site - Arsenic in Leachate



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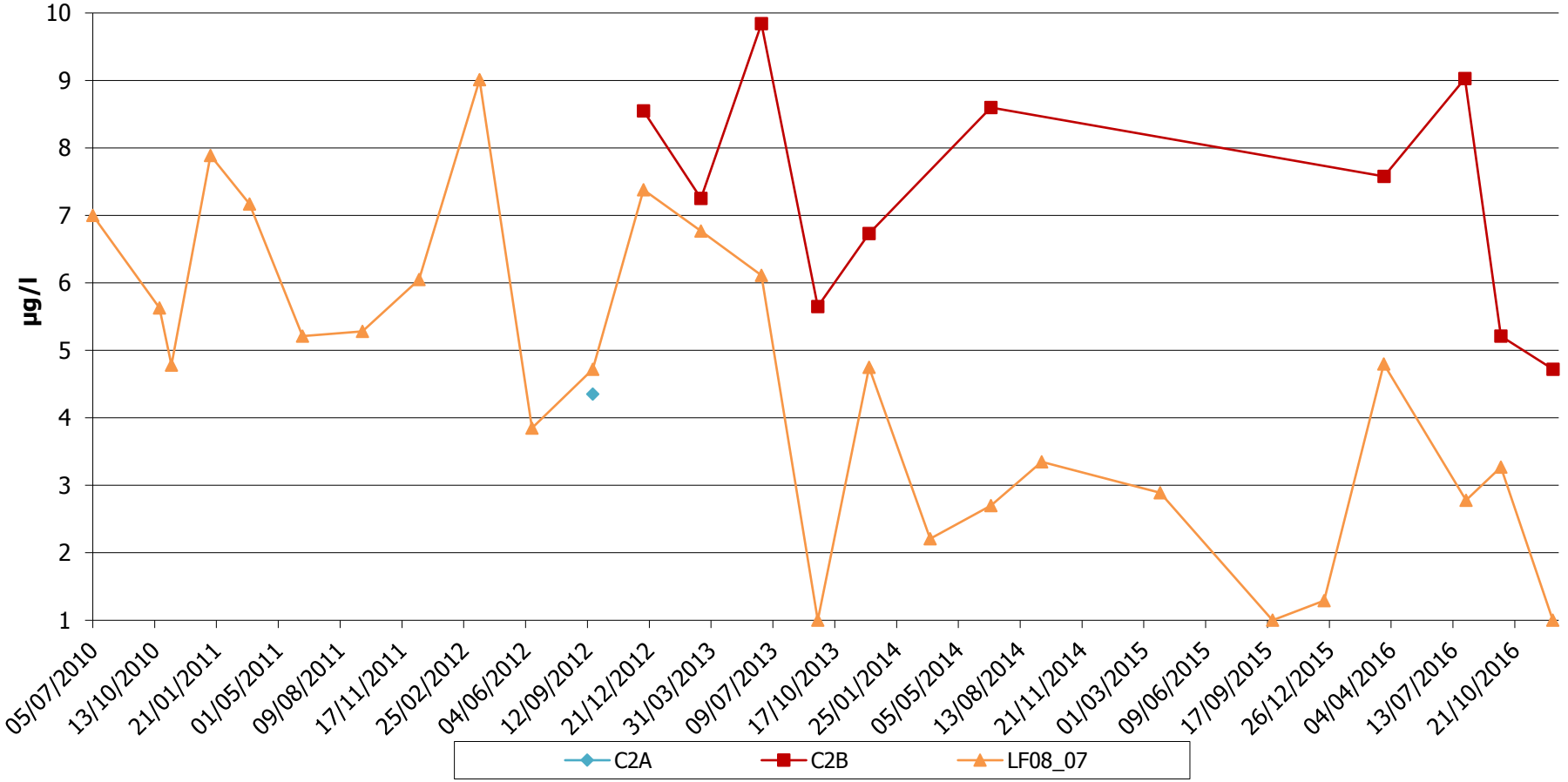
J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-2 Arsenic 2.xls]A4 LS

Appendix 3/3
Docksway Disposal Site - Benzene in Leachate



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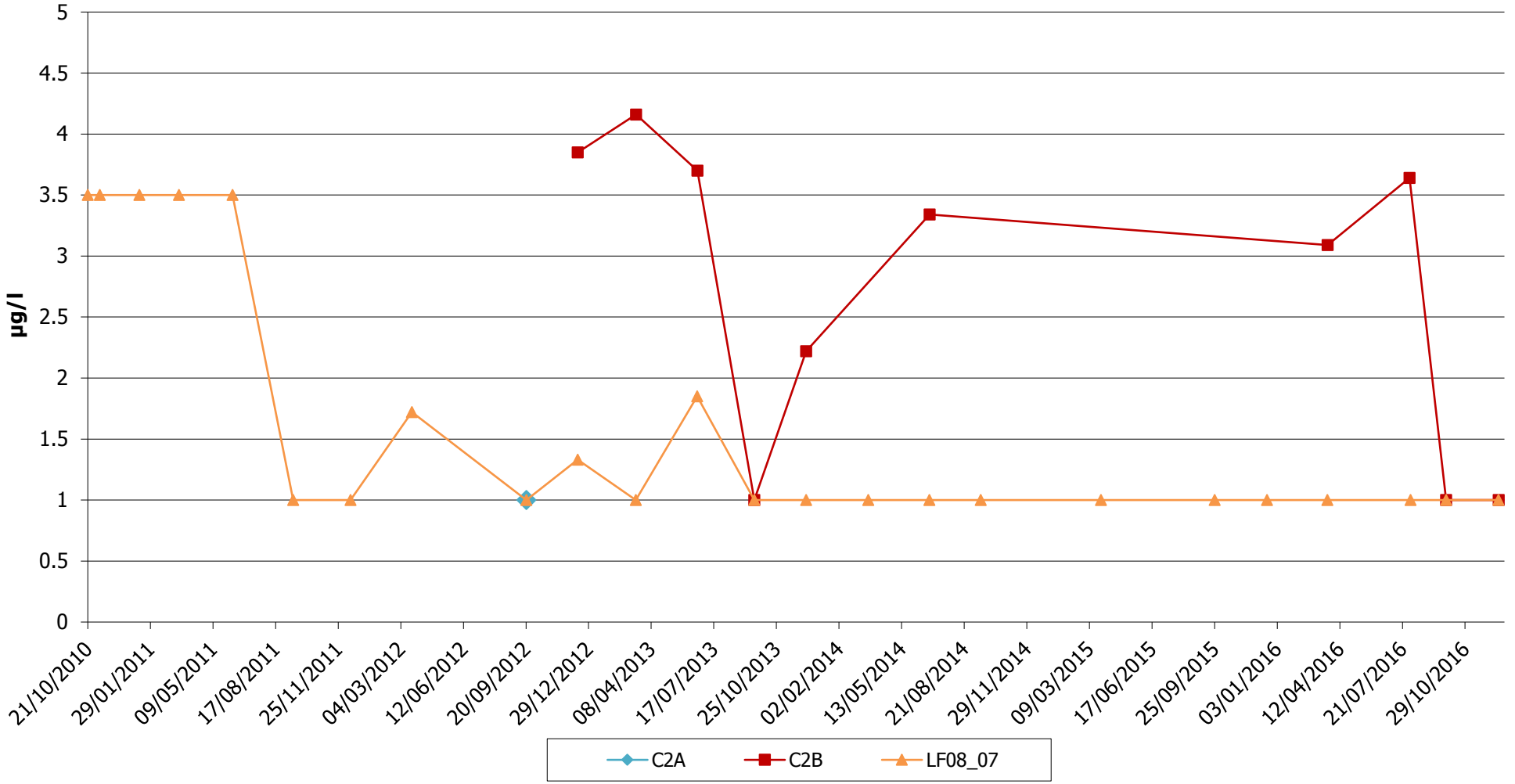
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 3-3	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-3 Benzene 2.xls]A4 LS

Appendix 3/4
Docksway Disposal Site - Napthalene in Leachate



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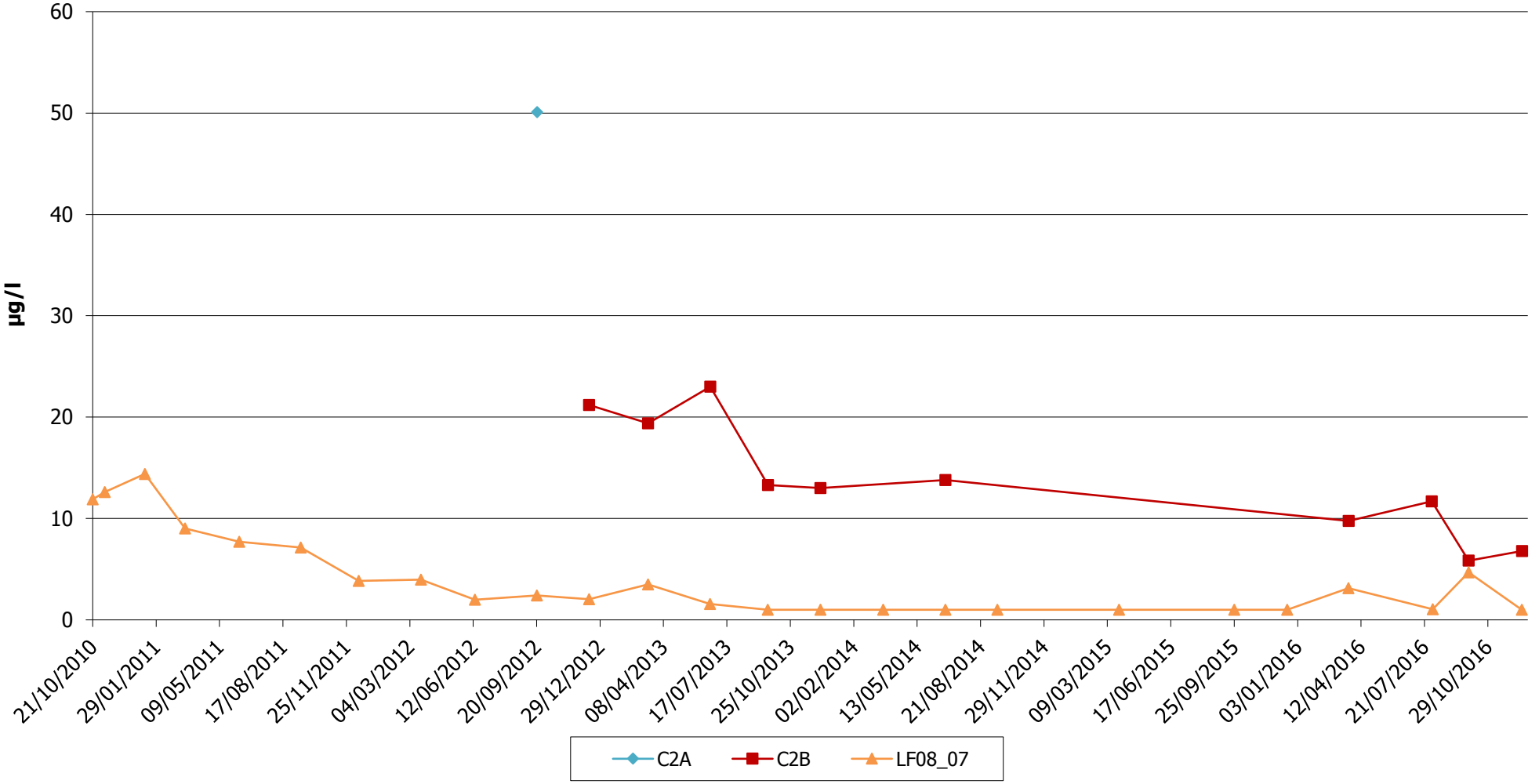
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 3-4	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-4 Naphthalene 2.xls]A4 LS

Appendix 3/5
Docksway Disposal Site - Xylene in Leachate



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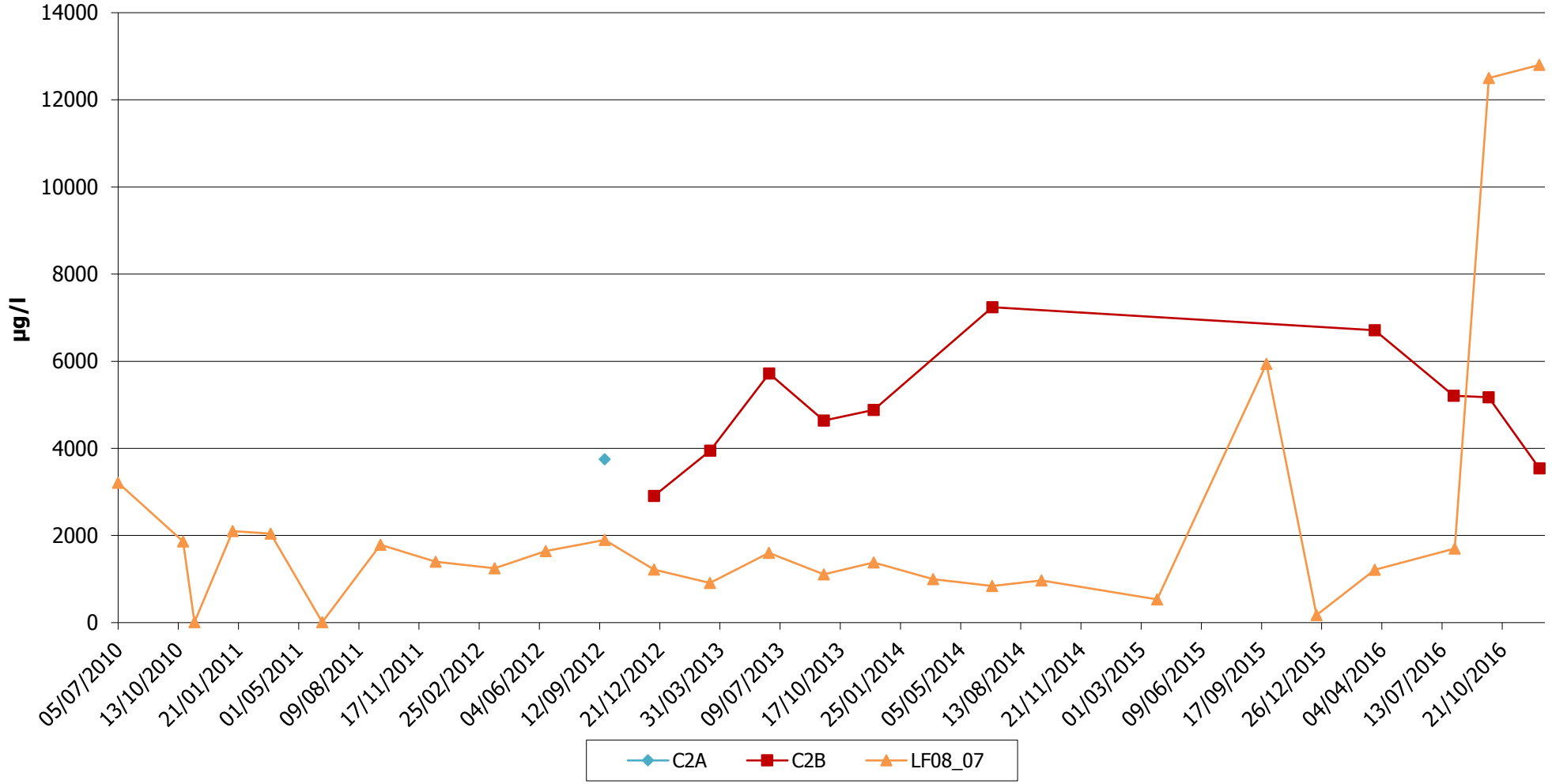
J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-5 o-Xylene 2.xls]A4 LS

Appendix 3/6
Docksway Disposal Site - EPH in Leachate



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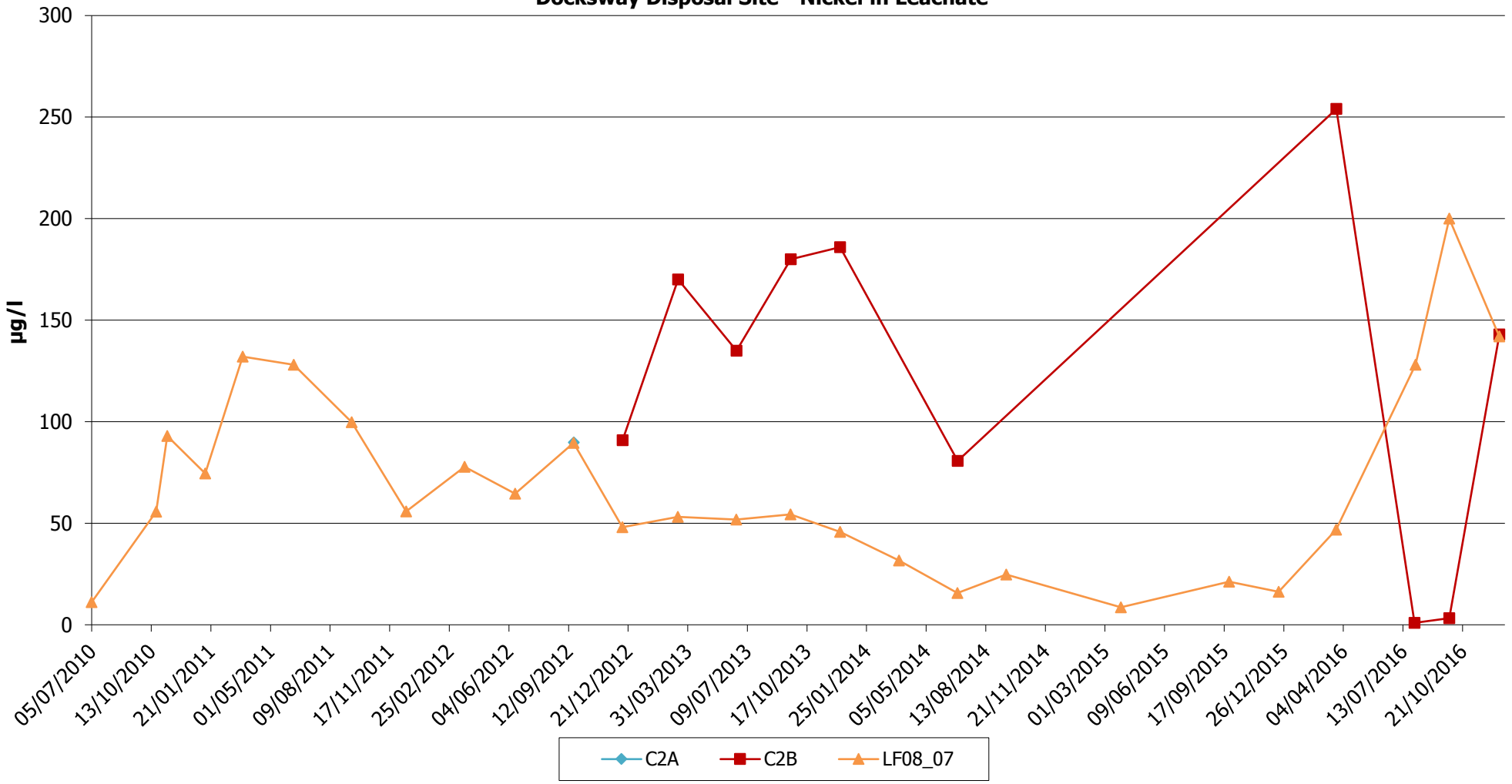
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 3-6	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-6 EPH 2.xls]A4 LS

Appendix 3/7
Docksway Disposal Site - Nickel in Leachate



pba peterbrett	Client: **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 3-7

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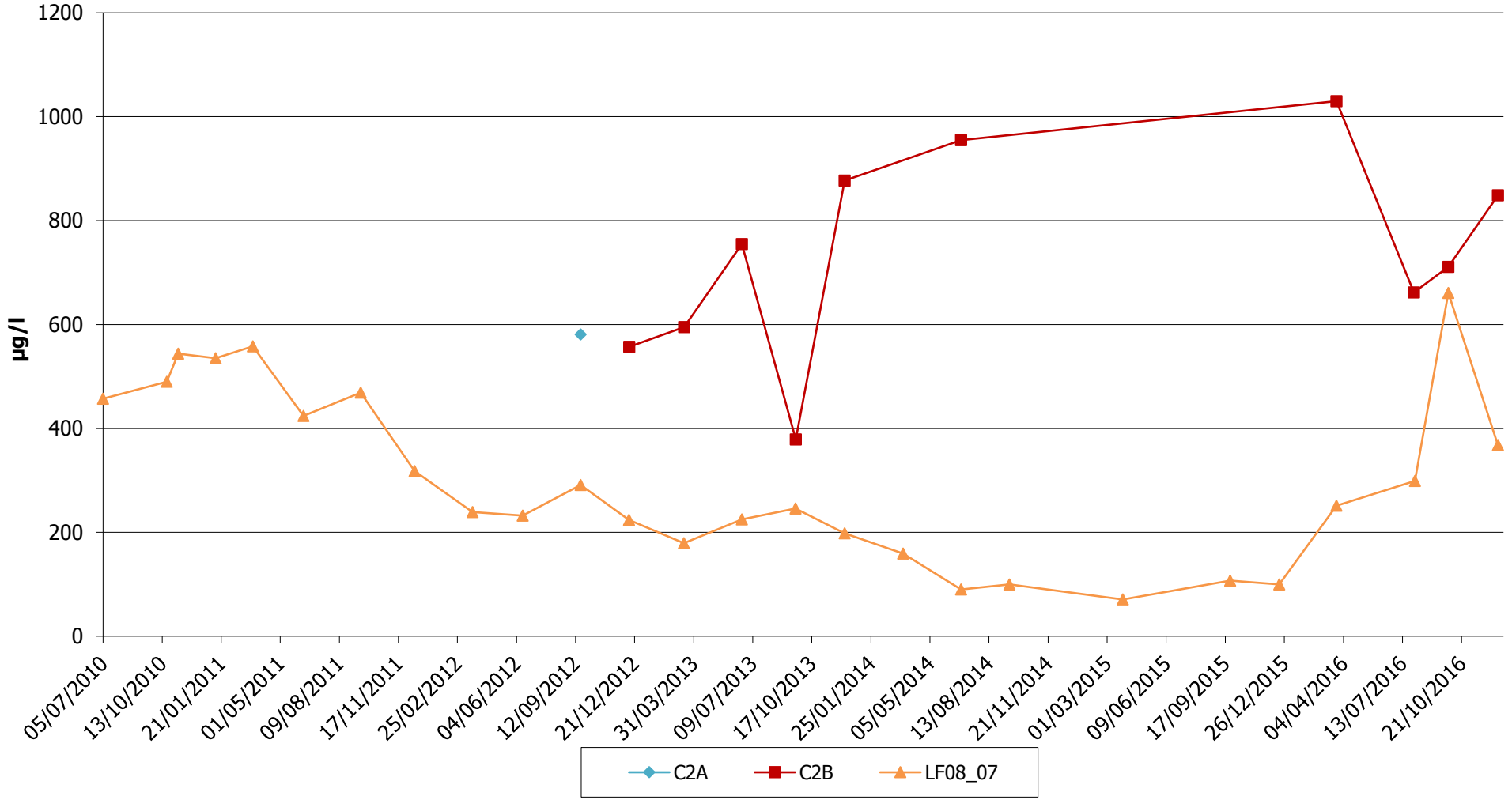
J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-7 Nickel 2.xls]A4 LS

Appendix 3/8
Docksway Disposal Site - Potassium in Leachate



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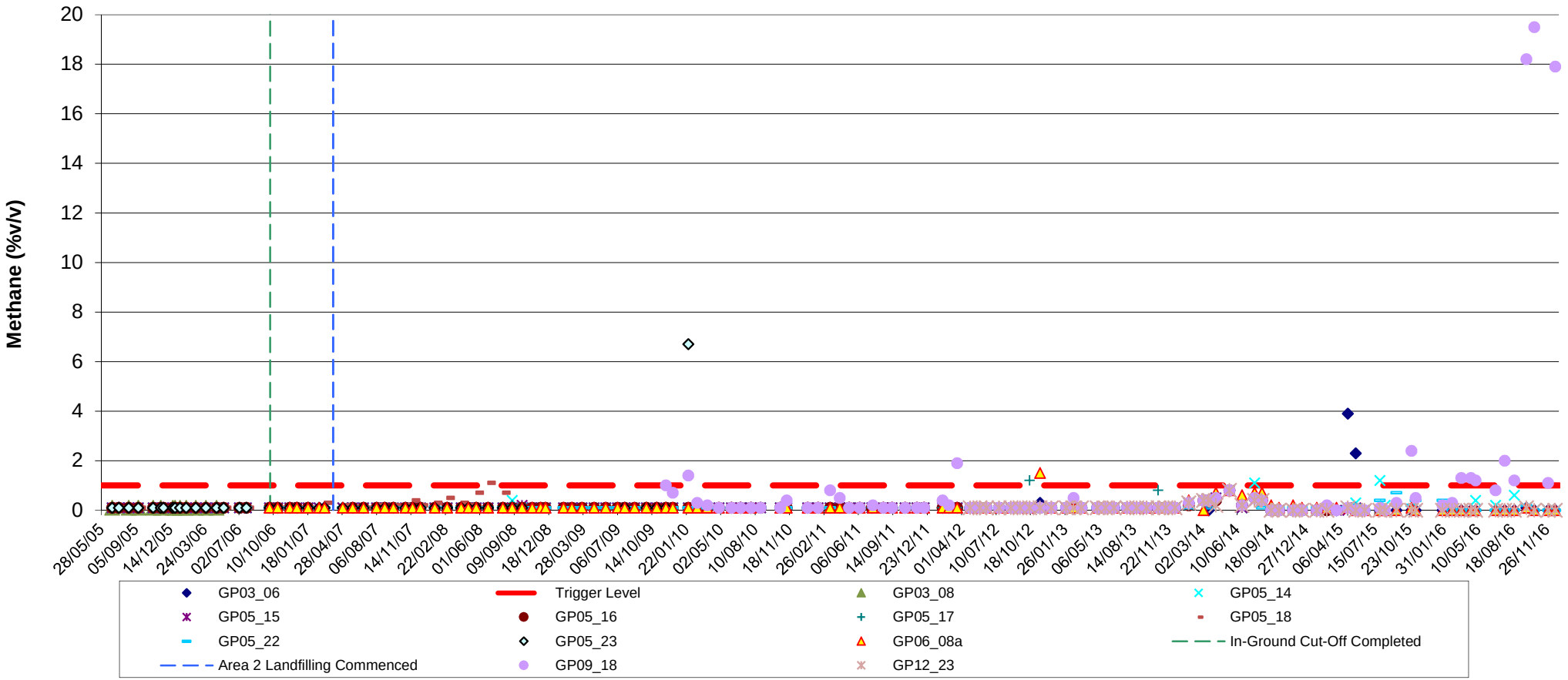
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 3-8	

J:\14739\3524 AEPRs 2016\Area 2\A2 App 3 Leachate\[3-8 Potassium 2.xls]A4 LS

Appendix 4

Appendix 4/1
Docksway Disposal Site - Methane Concentrations in Area 2 Gas Monitoring Wells
(Excluding GP05_20, GP05_21, GP06_24, GP06_25)



pba peterbrett Caversham Bridge House, Waterman Place, Reading, RG1 8DN Tel 0118 950 0761 Fax 0118 959 7499	Client **Newport City Council**	**Docksway Disposal Site**	Date: March 2017 A4 Scale: nts Drawn: oe Checked: vkr Appendix 4-1

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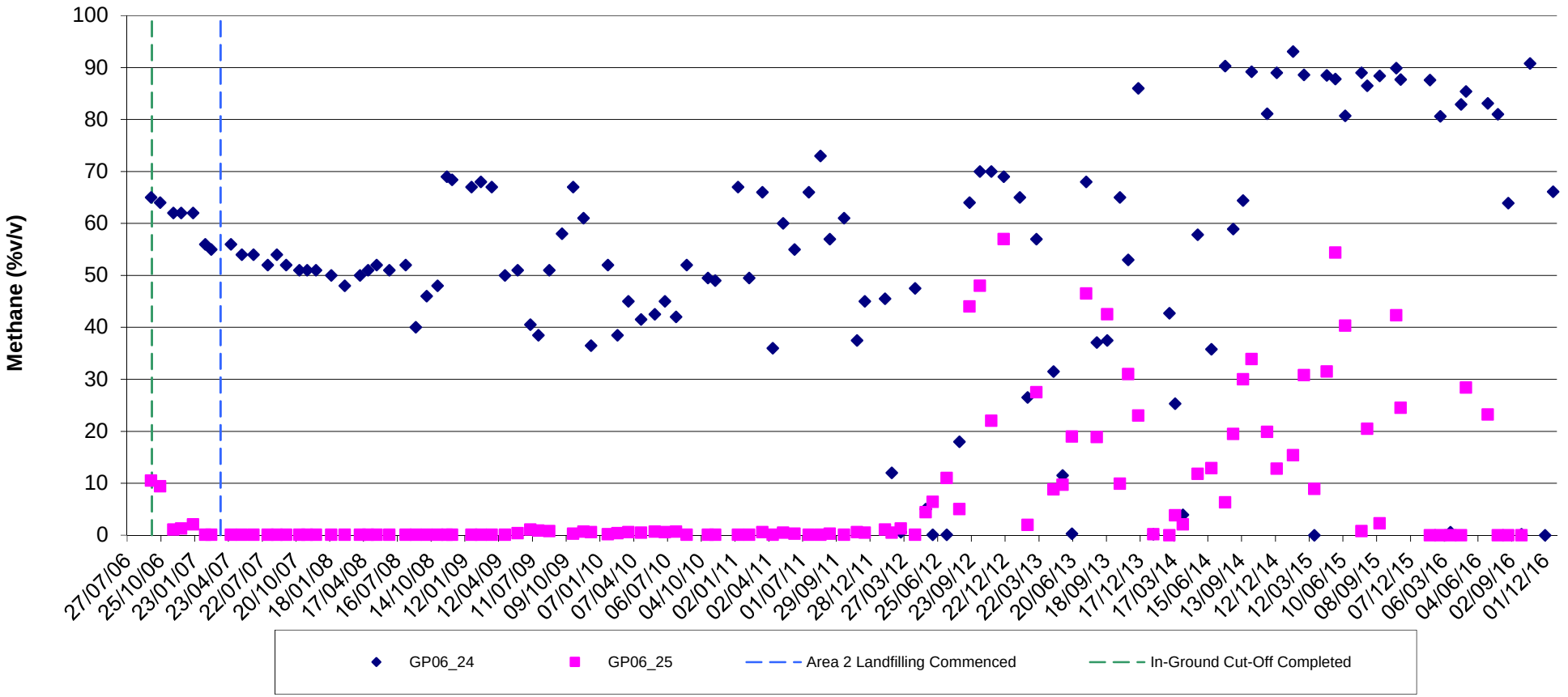
Appendix 4/2
Docksway Disposal Site
Recorded Methane Concentrations for GP06_24 and GP06_25



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-2	

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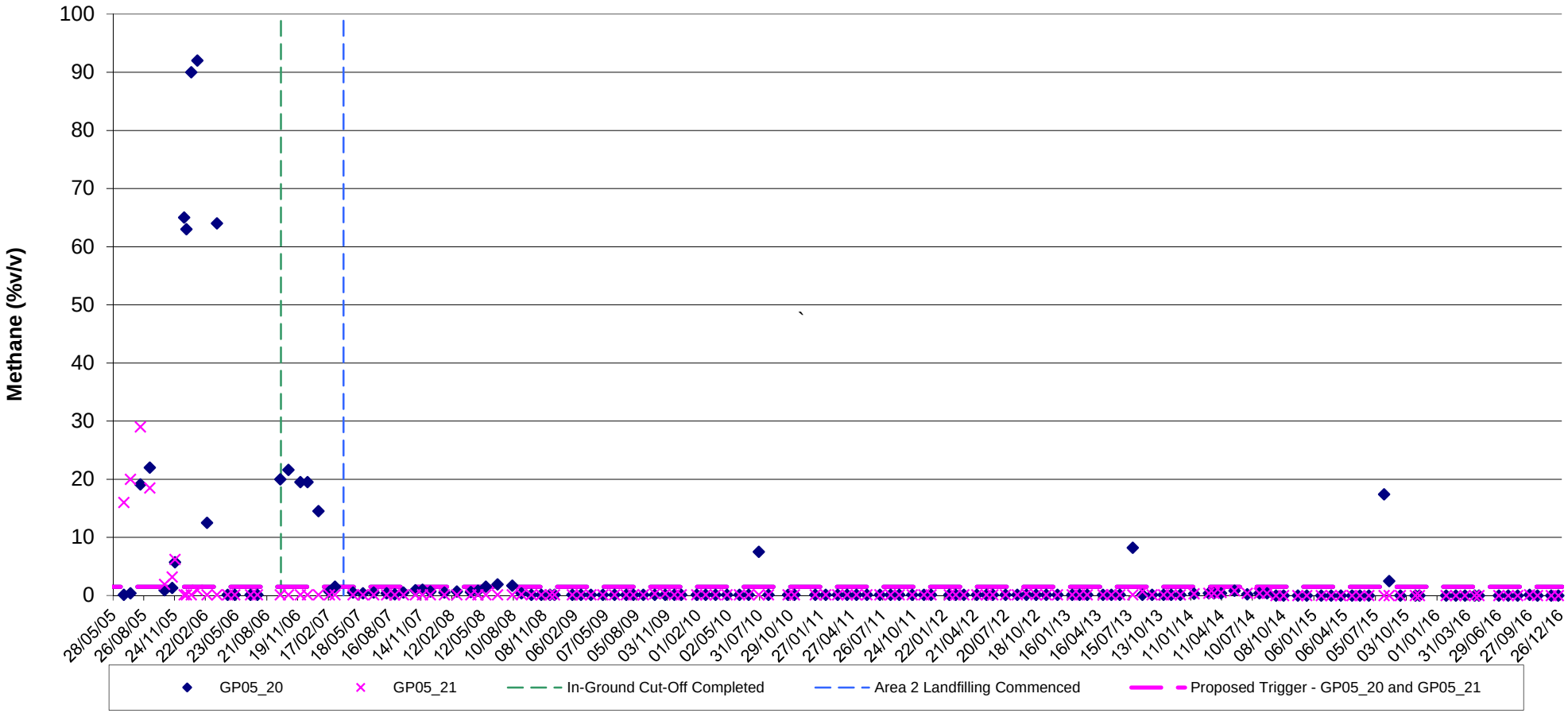
Appendix 4/3
Docksway Disposal Site
Recorded Methane Concentrations in GP05_20 and GP05_21



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-3	

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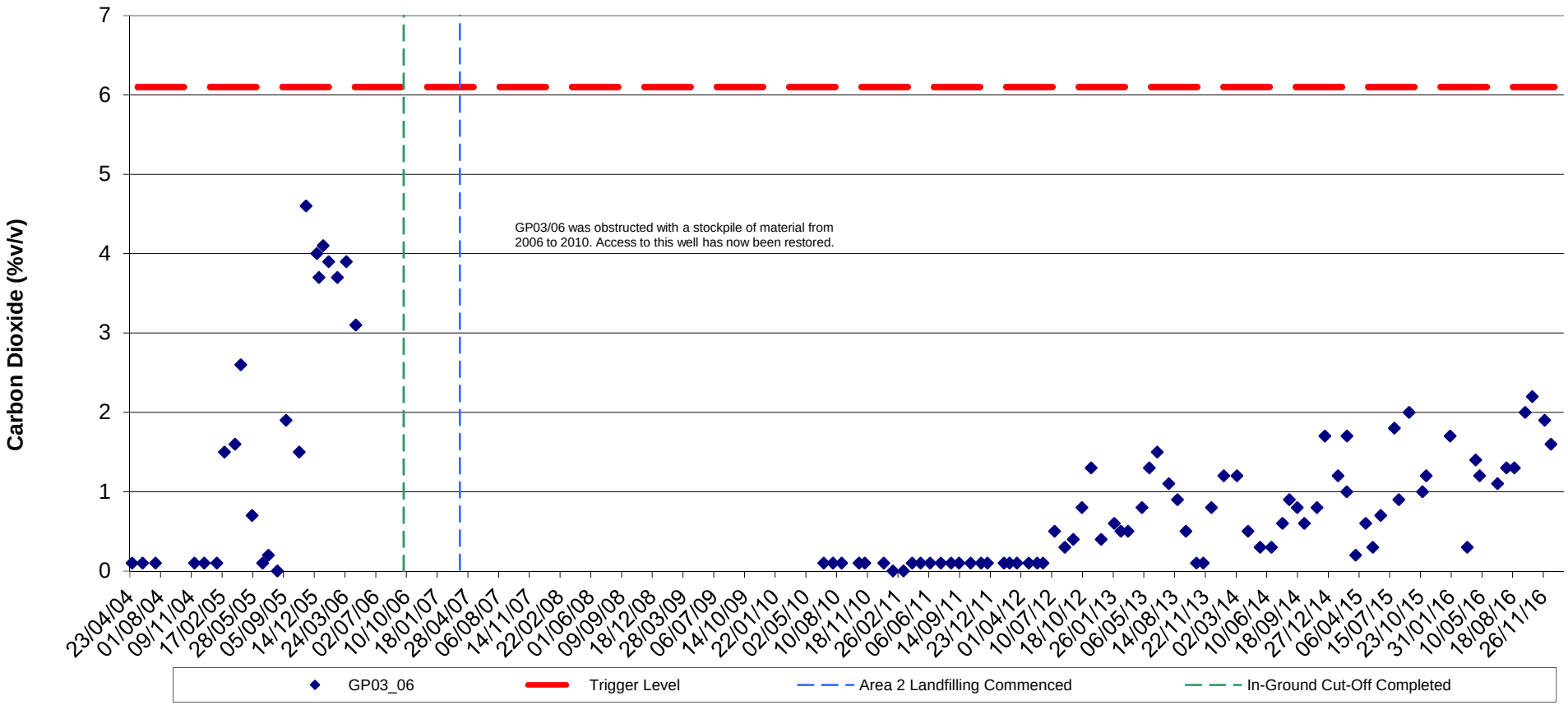
Appendix 4/4
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP03_06



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-4	

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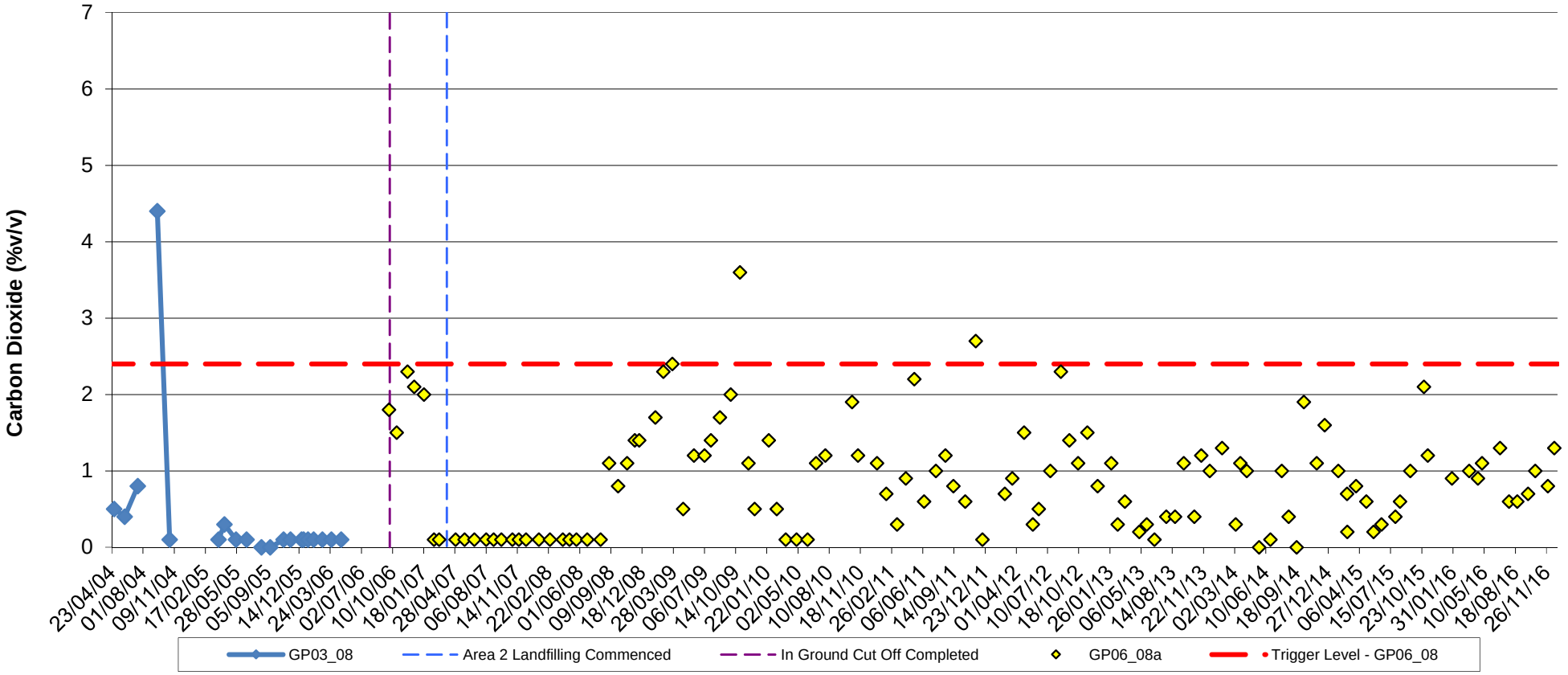
Appendix 4/5
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP06_08a



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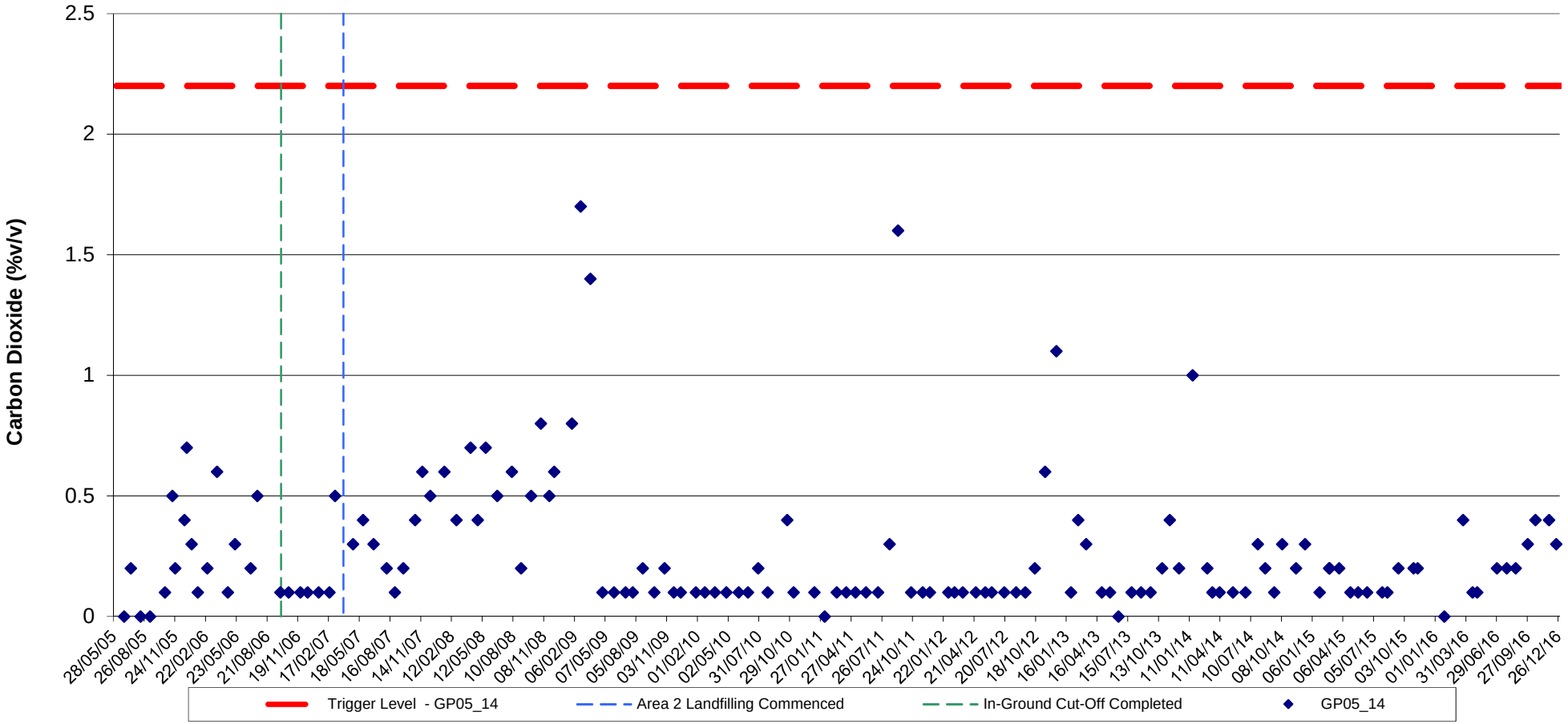
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-5	

\\pba.int\cbh\Projects\14739\3524 AEPRs 2016\Area 2\A2 App 4 Gas\[gas graphs 2.xls]4-5

Appendix 4/6
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_14



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-6	

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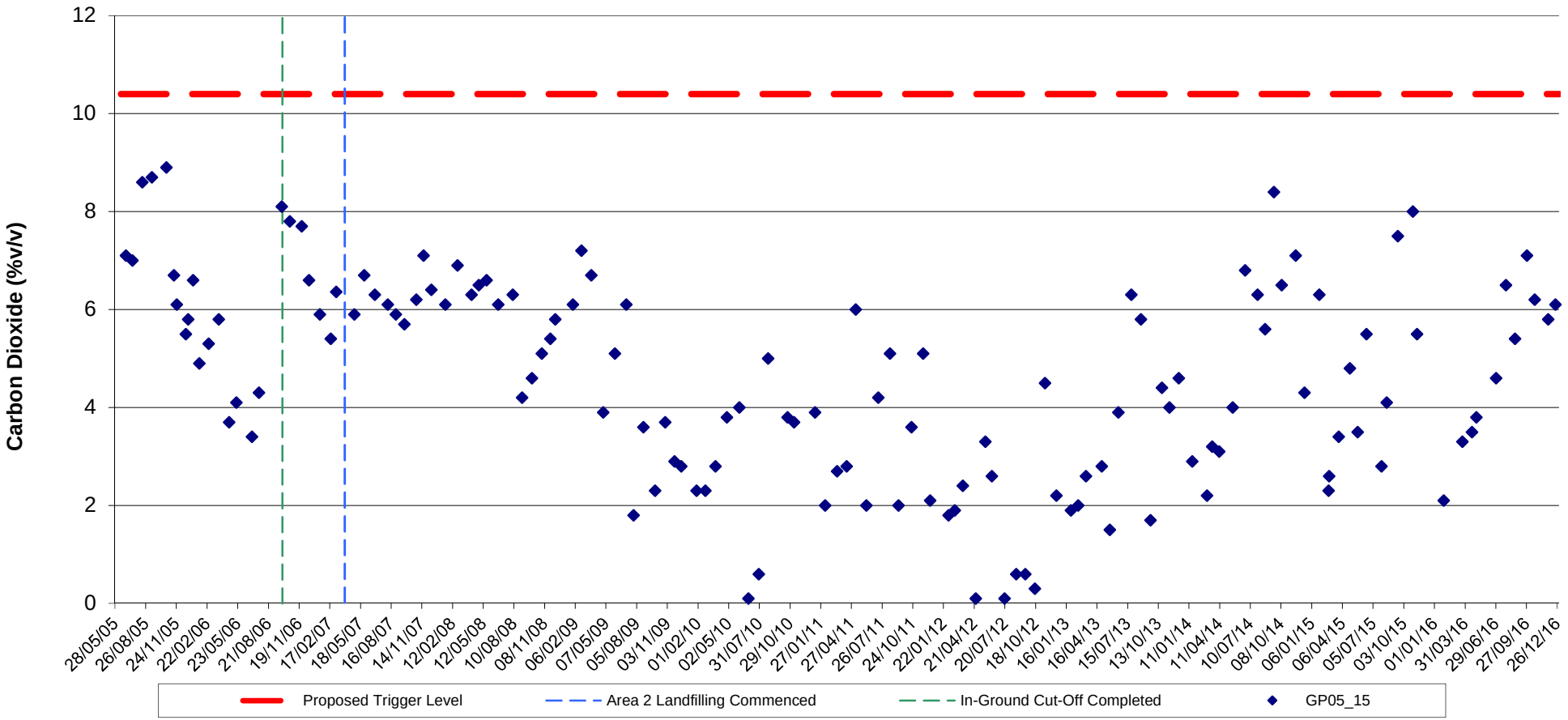
Appendix 4/7
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_15



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-7	

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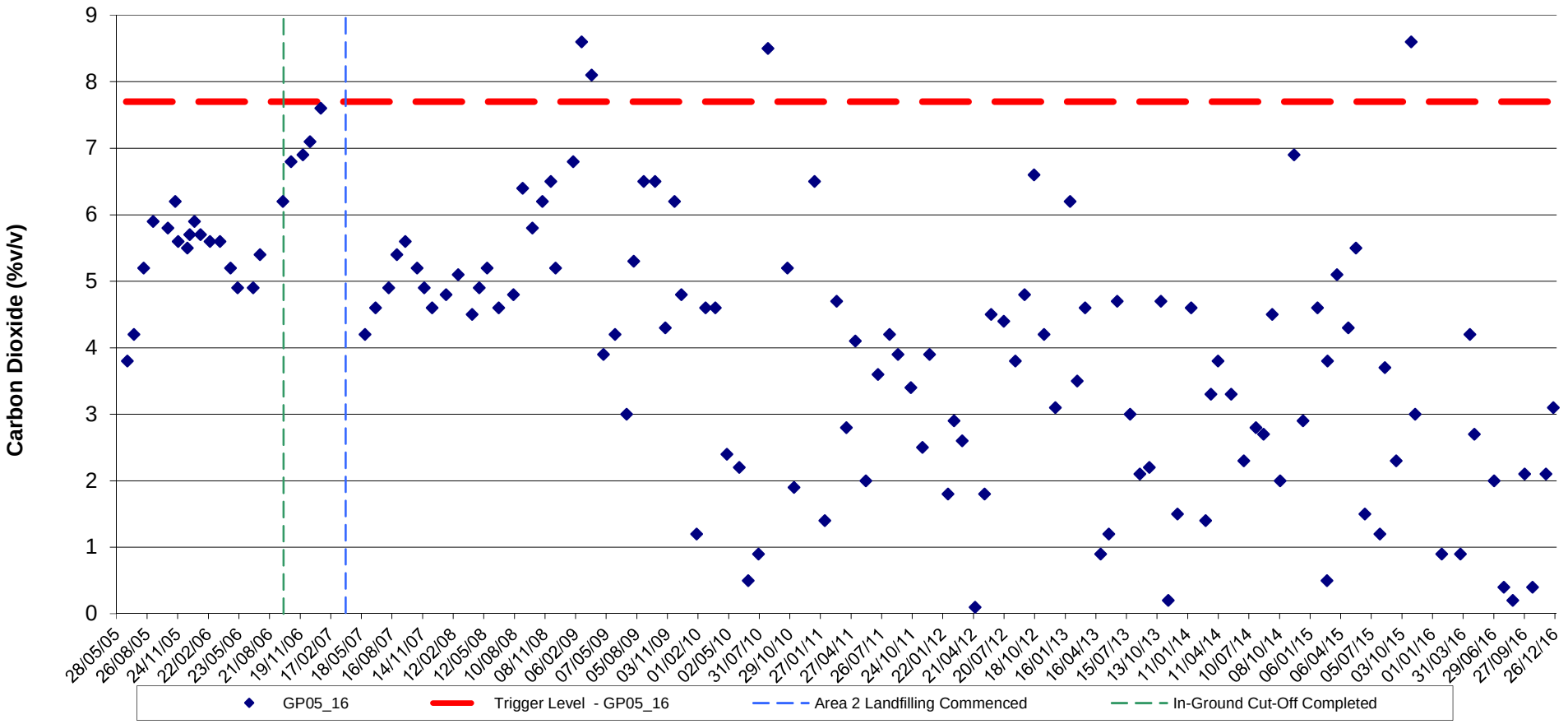
Appendix 4/8
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_16



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-8	

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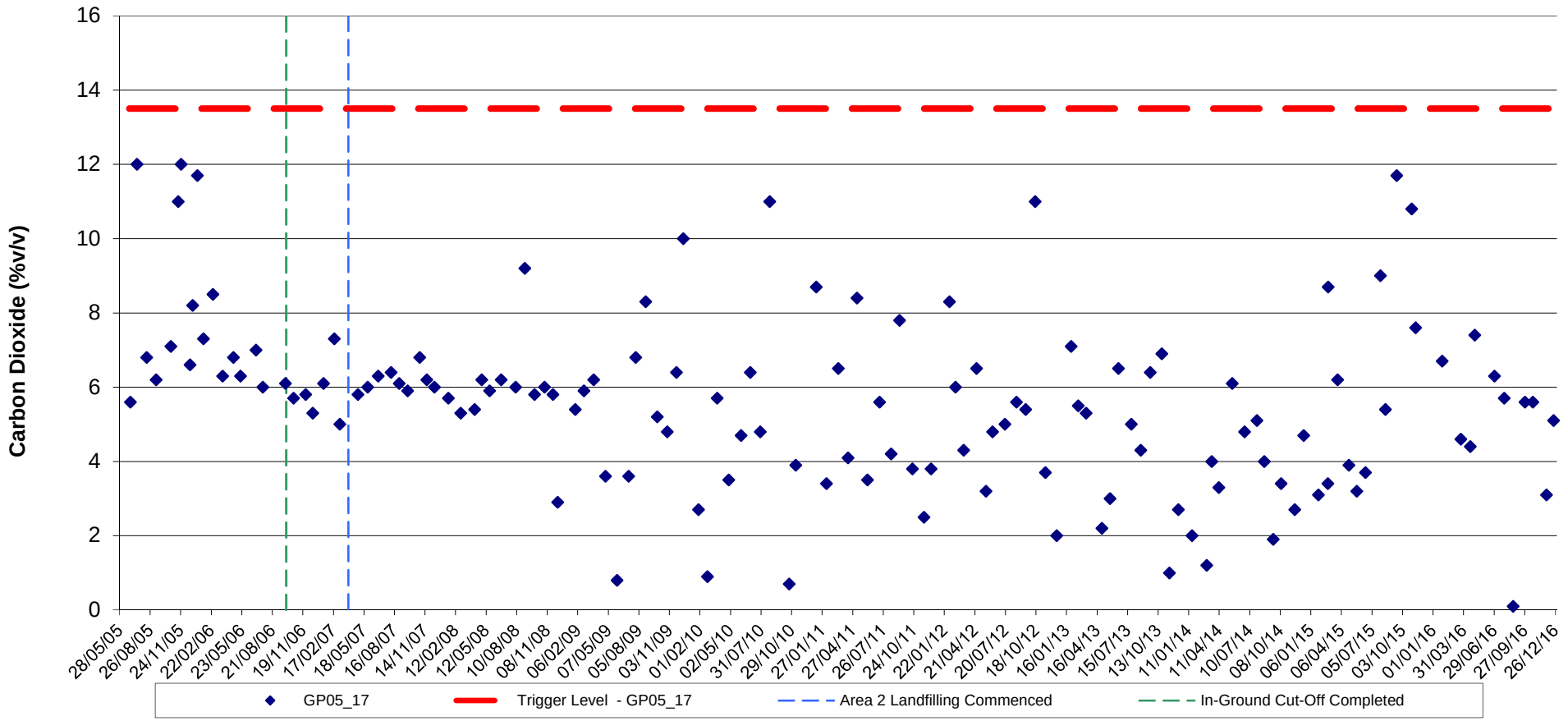
Appendix 4/9
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_17



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-9	

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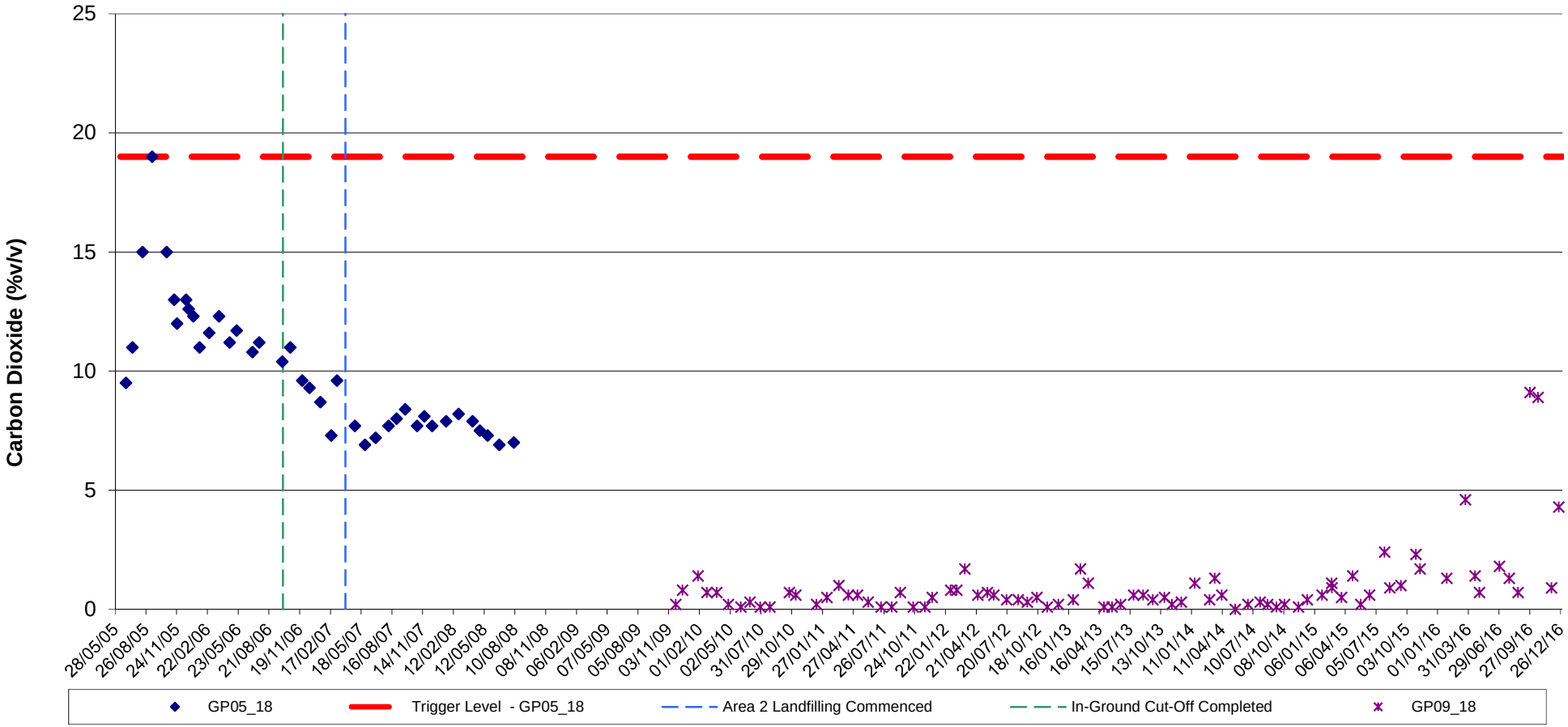
Appendix 4/10
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_18 and GP09_18



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-10	

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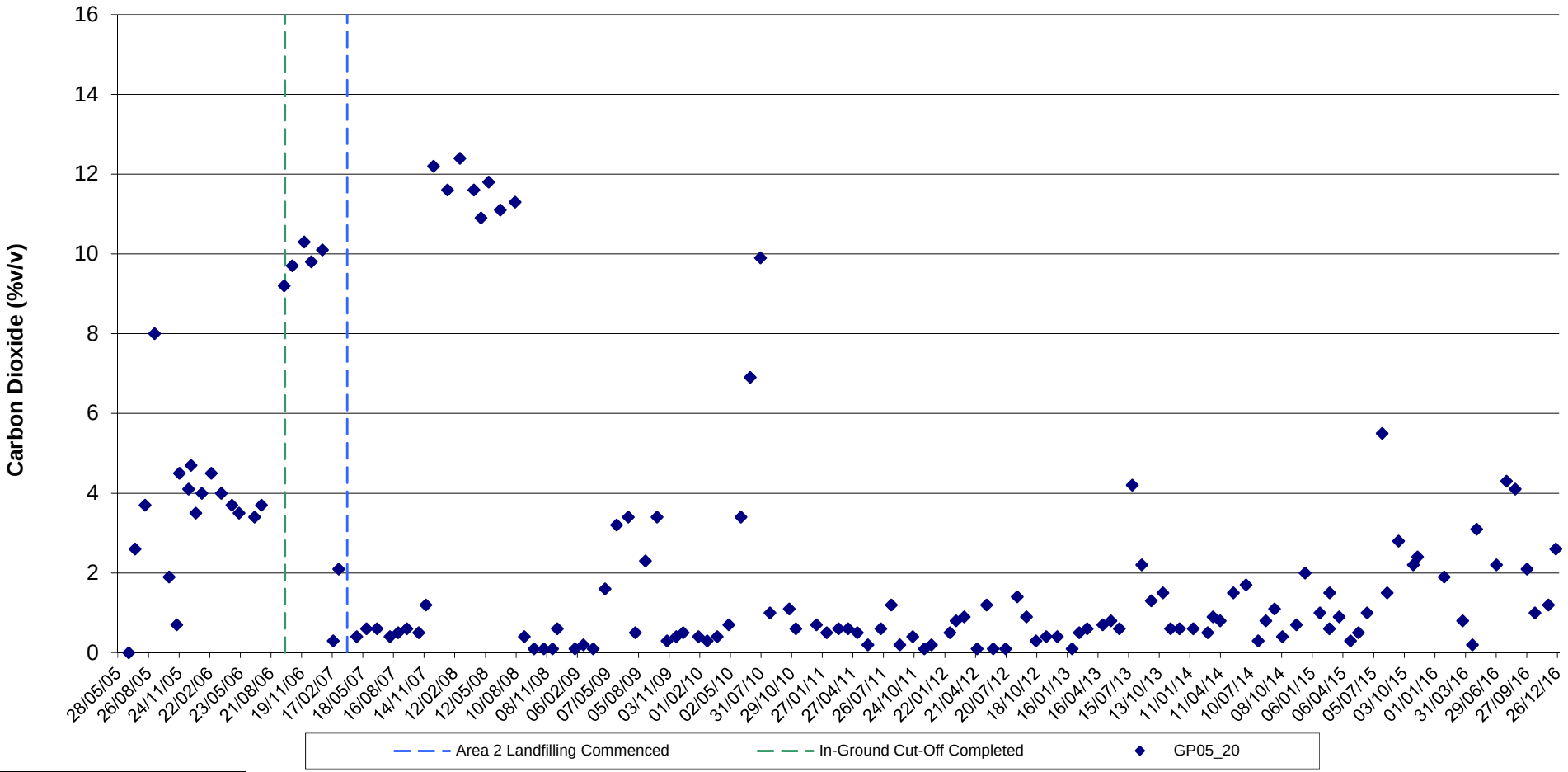
Appendix 4/11
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_20



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-11	

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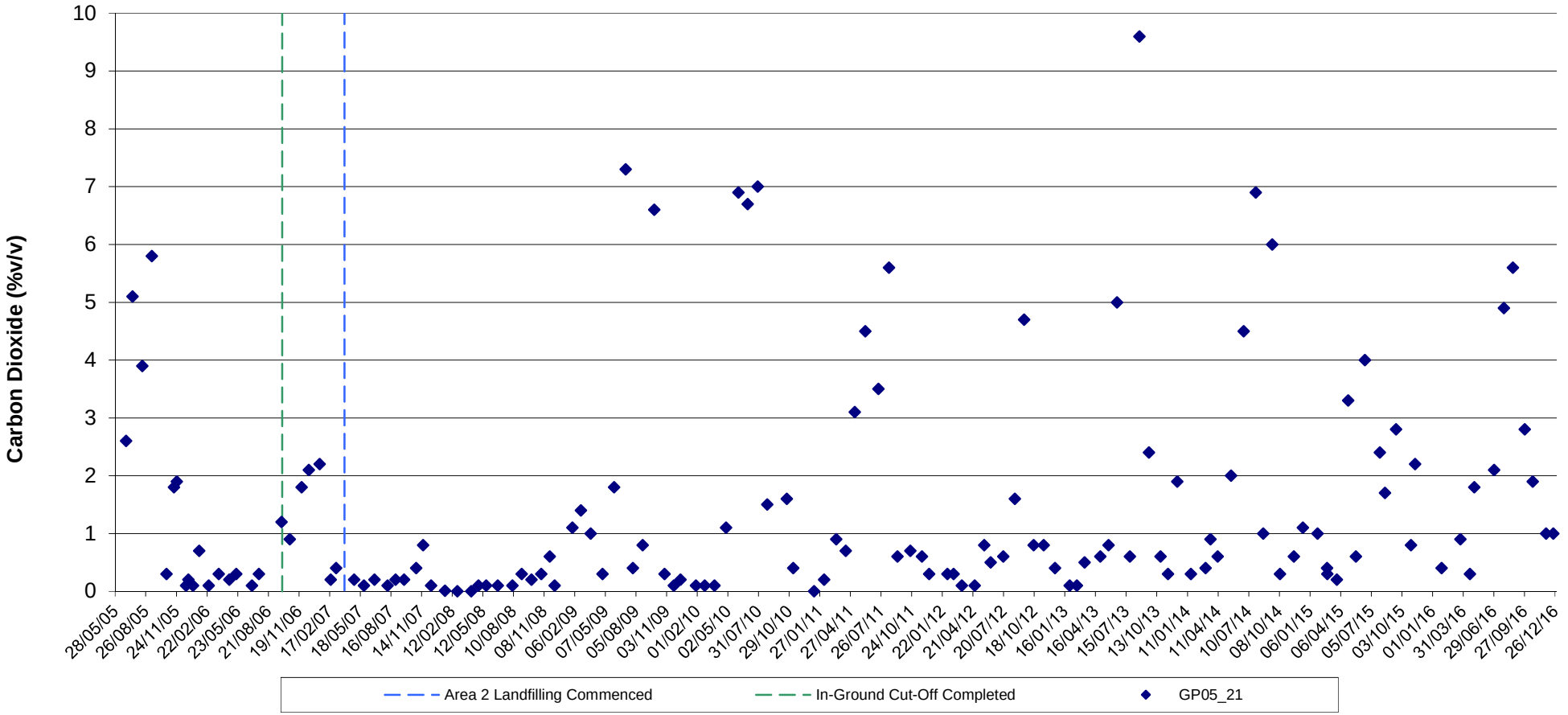
Appendix 4/12
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_21



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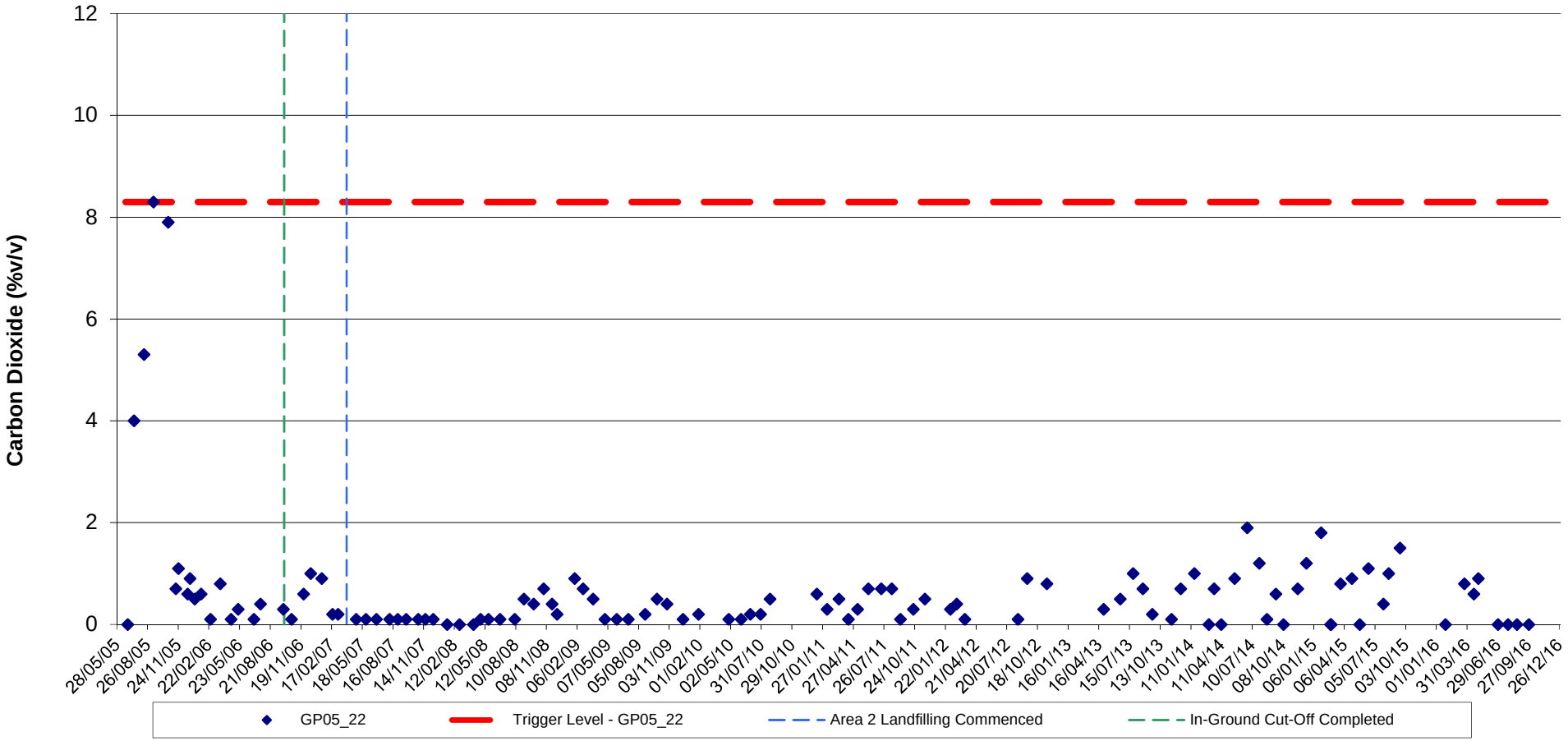
Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-12	

\\pba.int\cbh\Projects\14739\3524 AEPRs 2016\Area 2\A2 App 4 Gas\[gas graphs 2.xls]4-12

Appendix 4/13
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_22



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Docksway Disposal Site

Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-13	

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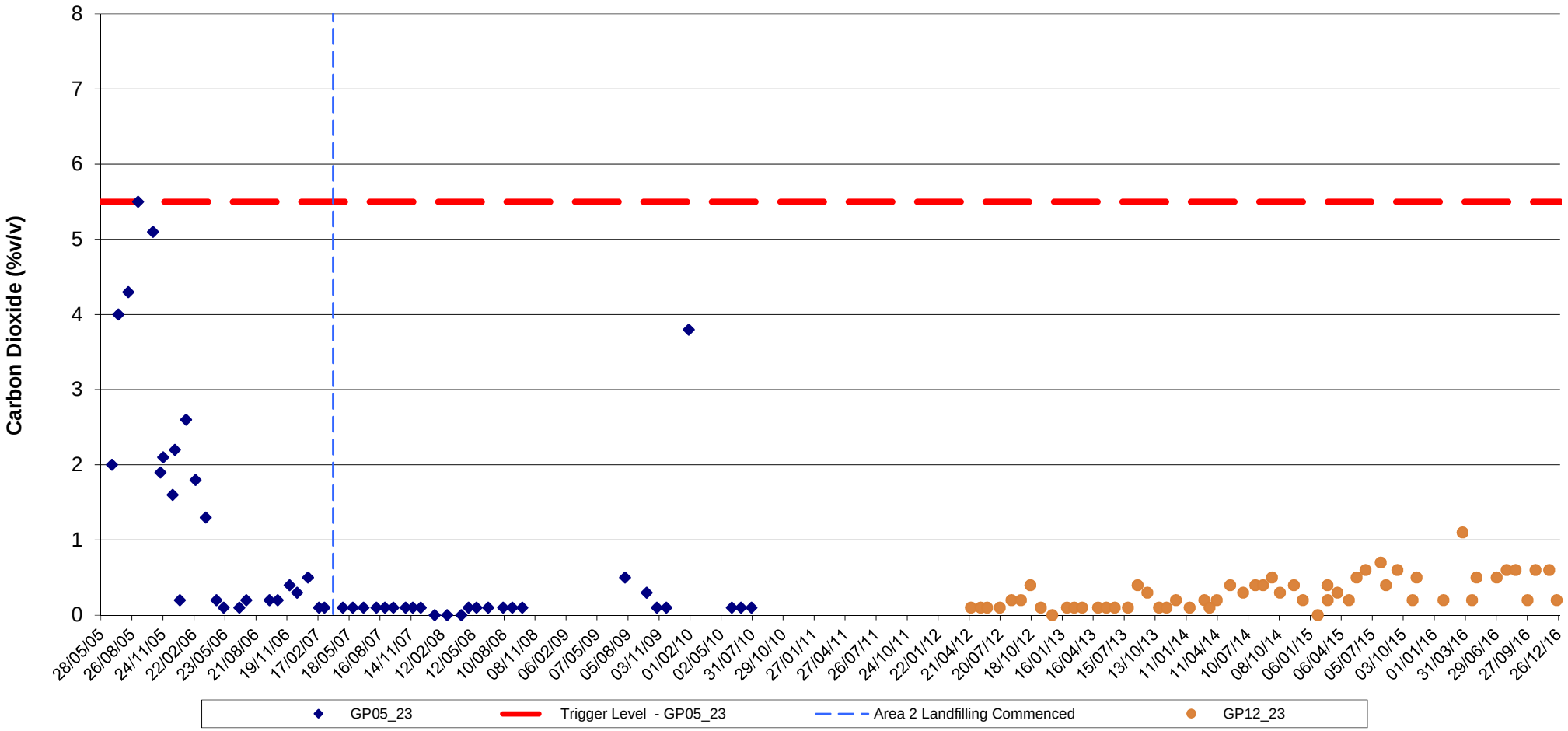
Appendix 4/14
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_23 and GP12_23



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	Docksway Disposal Site
Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
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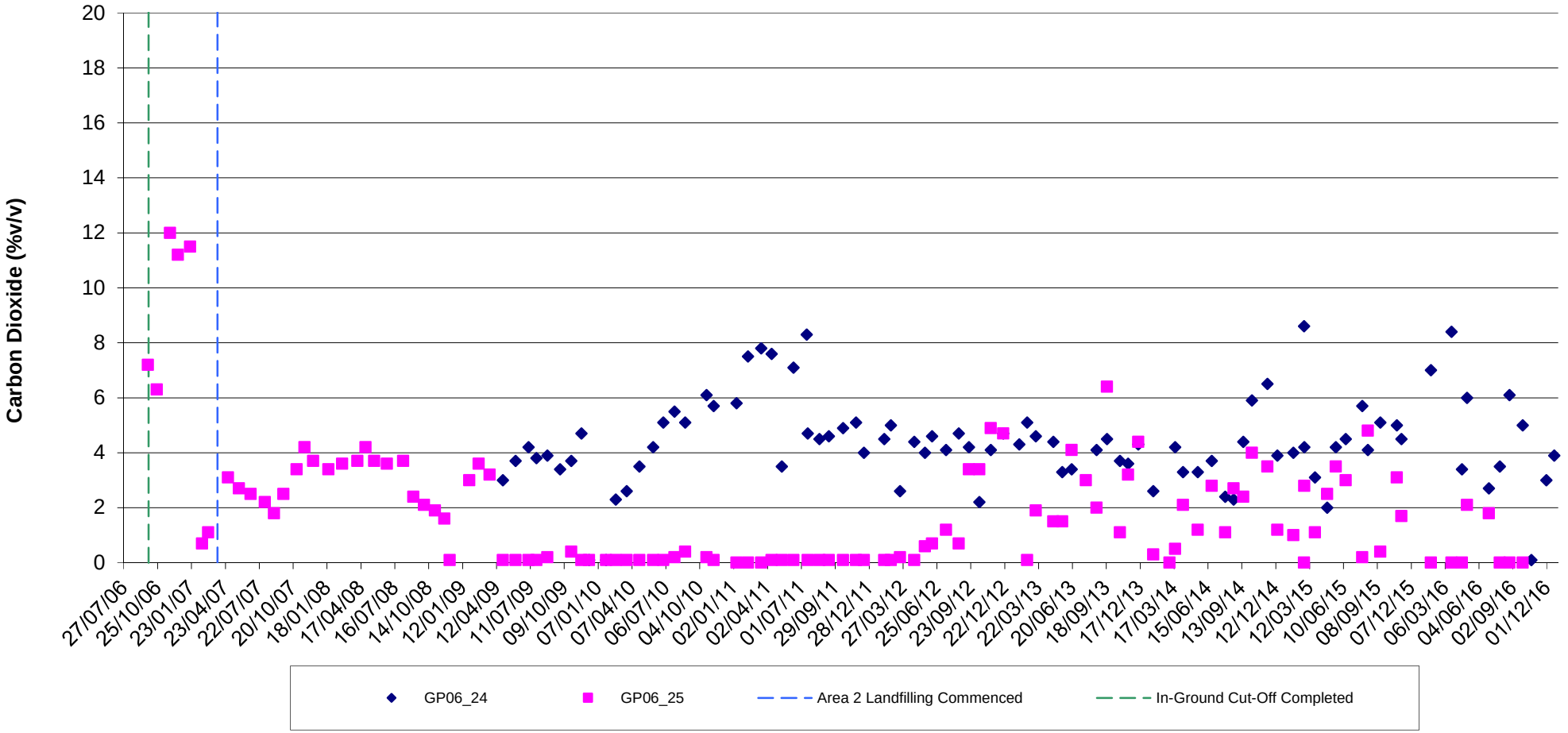
Appendix 4/15
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations for GP06_24 and GP06_25



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Date	March 2017
A4 Scale	nts
Drawn	oe
Checked	vkr
Appendix 4-15	

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Appendix 5

Annual permit report

Installation	Docksway
Permit reference	LP3135SB
Reporting period	Jan - Dec 2016
Permit Operator	Novera Energy

Author: Kate Phillips  Date: 17/01/2017

Authorised to sign as representative of the Operator

Fugitive Emissions Review		Reporting period: Jan - Dec 2016
Installation Name:	Docksway Landfill gas utilisation plant	Permit reference LP3135SB

Substances Released/Potentially	Description of event and any contamination/decontamination of the site which has occurred
Landfill gas	Details of any notifiable events have been submitted to NRW in accordance with our notification procedure
Spillages	No significant spillages, contamination or decontamination to report for this installation

Site Management System Review	Docksway
Date of recent review / issue	Date next review required*
28/02/2015	28/02/2017

*Site Management Systems (SMSs) incorporate details regarding site protection and monitoring.

Site Closure plan review	Docksway
Date of recent review / issue	Date next review required*
27 February 2015	February 2019

The Permit requires that the site closure plan is reviewed at least every four years

Raw Materials (& Water) Assessment Table					
Site:	Docksway	**Reporting period:**	Jan - Dec 2016	**Permit Reference:**	LP3135SB

Raw Materials	Application	Current Measures to Ensure Efficiency and Waste Minimisation	Annual Quantity Used	Fate of Material	Environmental Impact Potential	Reason Alternatives are Not Practicable	Details of Process Modifications which Could Result in Savings
Landfill gas	Fuel for engines to produce electricity	Kilowatt generation from volumes processed is maximised through effective operation, maintenance and servicing of plant	Variable depending on site conditions	Combustion	Potentially flammable, explosive, toxic, asphyxiant, ecotoxic, corrosive and odorous, greenhouse gas	N/A - Combustion of landfill gas essential for environmental control	N/A - environmental benefits to be gained from conversion of methane to CO2
Lubricating oils	To ensure efficiency of utilisation plant is maintained in accordance with manufacturer's instructions	Efficient use of lubricating oil is maximised through oil analysis to identify requirement for oil changes	10,000 litres of oil purchased in 2016	Reprocessing	Ecotoxic and odorous	Specification determined by engine manufacturer to ensure maximum performance and efficiency	Oil used is speciaised for landfill gas fuel as recommended by the OEM. Oil change intervals are based on oil analysis therefore maximising efficiency and minimising use
Water	Coolant for engine block and domestic water supply	Cooling water is recirculated around the engines to maximise efficiency and minimise consumption	No water supply on site.	Treatment	Inert	N/A - Inert therefore best practicable environmental option	Re-use of water for coolant purposes ensures volumes used are as low as reasonably practicable. Cleaning practices assessed and minimal volumes used, cleaning practices are infrequent
	Hygiene purposes	handwashing and (where available) toilet facilities		where installed toilet waste is removed from site and treated as sewerage	Inert	n/a	n/a
Glycol	Antifreeze for use in coolant water	Glycol is recirculated around the engines to maximise efficiency and minimise consumption	Glycol contained within enclosed-loop system is drained into a container for re-use. OEM* recommends change of glycol every 20,000 hours. Infinis policy is to change following natural depletion or contamination.	Reprocessing	Toxic, ecotoxic	Specification determined by engine manufacturer to ensure maximum performance and efficiency	Antifreeze mix is specific to engine type and pre-determined by the OEM*. Levels are topped-up following natural depletion or contamination
Battery Acid	In batteries used for engine start-up and to provide back-up power to ensure rapid restart following any loss of mains power supply	Battery use is essential minimised to the applications listed (see left)		Recycled	Corrosive	Portable electrical supply required for start-up	Minimal use of battery during start-up only therefore opportunity for savings is insignificant

*OEM: Original Engine Manufacturer

Waste Minimisation, Recovery and Disposal Assessment

Installation Name:	Docksway Gas Utilisation Plant	**Permit Reference:**	LP3135SB	**Reporting period:**	Jan - Dec 2016

Waste Stream	**Application/Source**	**Current Measures to Ensure Efficiency and Waste Minimisation**	**Fate of Material**	**Reason Alternatives are Not Practicable**	**Details of Process Modifications which Could Result in Savings**
Oil Filters (205ltr Drum) (EWC 16-01-07)	Engine maintenance	Predetermined by manufacturers' recommendations to ensure efficiency	Reprocessing	Oil and filtration devices predetermined by manufacturers to ensure efficiency	Not applicable: oil filters changed at pre-determined life based on oil analysis and differential pressure
Oil Contaminated Rags & Absorbents (205ltr Drum) (EWC 15-02-02)	Engine maintenance and housekeeping	Control measures in place to prevent spillage	Reprocessing	As above	No further modifications considered possible: Preventative maintenance and procedural practices minimise spillage and the requirement for oil absorbancy products
Waste Engine Oil (Bulk) (EWC 13-02-05)	Engine maintenance	Efficient use of lubricating oil is maximised through oil analysis to identify requirement for oil changes	Reprocessing	As above	No further modifications considered possible: Oil used is specific to the landfill gas fuel in use and as recommended by the OEM*. Oil change intervals are based on oil analysis therefore maximising efficiency and minimising use
Batteries (EWC 16-06-01)	Engine maintenance	Recharged	Recycled	Batteries essential for engine start-up and ensuring rapid restart	Batteries only replaced when they no longer hold a charge. Maintenance practices are in place to lengthen battery life
Fluorescent Tubes (EWC 20-01-01)	Lighting	Replacement when faulty or damaged	Reprocessing	Alternatives not considered practicable due to warm-up time of energy saving bulbs	Tubes are only replaced when they have expired
General Waste	Packaging	Waste streams which can be reprocessed or recycled are identified and segregation facilities provided where appropriate	Disposal	Materials not segregated/ reprocessed are produced in small quantities only making alternatives not viable	Not applicable as a result of small quantities only being produced
Waste water/effluent	Welfare facilities	Facilities are maintained to ensure minimal water usage	Road tanker to treatment plant	Connection to mains sewer not practical - quantities produced are small.	Not applicable as a result of small quantities only being produced

*Original Engine Manufacturer

Annual Reporting of Other Performance Indicators

Installation:	Docksway Landfill Gas Utilisation Plant	**Permit Reference:**	LP3135SB

Parameter	**Jan - Dec 2016**	**Units**
Flare operation hours	5941	hrs
Gas engine downtime hours	672	hrs*
Gas engine operation hours	8088	hrs
Volume of landfill gas combusted	809,640	m3 (treated by flare)
	3,763,344	m3 (treated by engines)
	4,572,984	m3 (total treated by engines & flare)

Operator's Comments:
This site was reclassified as a Directly Associated Activity following the implementation of the Industrial Emissions Directive. An engine was removed from the site in January 2014.

Reporting of Performance Indicators (Form Ref: PI1)

Installation:	Docksway Landfill Gas Utilisation Plant	**Permit Reference:**	LP3135SB

Annual Production/Treatment (MWh)	
Total production of energy	7306

Environmental Performance Indicators

Parameter	**Annual Average Jan - Dec 2016**	**Units**	**Trends in Environmental Performance**	
			2014	**2015**
Total oxides of nitrogen (expressed as NO2) emission	2.0	Kg/MWh	2.1	2.0
Total carbon monoxide emission	4.4	Kg/MWh	4.9	4.4
Total engine downtime (downtime hrs/available operation time in hrs)	7.7	%	7.6	6.7

Reporting period	**Energy Imported (Primary Energy Usage) (MWh)**	**Parasitics (MWh)**	**Energy Exported (MWh)**	**Energy Used on Site (MWh)**	**Site Efficiency**
Jan - Dec 2016	13	352	6954	365	29.7

*site efficiency has been calculated as follows: ((Engine efficiency (%) x (gas to generation/total gas) x (power export / (power generation + imported power)).

Installation:	Docksway Landfill Gas Utilisation Plant	**Permit Reference:**	LP3135SB

Accident Management Plan Review	**Jan - Dec 2016**
Date of next review	
Reviewed monthly following a review of notifiable events	

Permit requires that the accident management plan is reviewed at least every 2 years, or as soon as practicable after an accident (whichever is the earlier).

Operator's comments:
No accidents occurred during this period which would require amendment to the Accident Management Plan for this installation.

Installation:	Docksway Landfill Gas Utilisation Plant	**Permit Reference:**	LP3135SB
Emissions to Air Reporting	**Jan - Dec 2016**		
Report Submission Date		05-May-16	
Submitted to		David Willey	