Recycling and recovery UK

Environmental Permit EPR/QP3999CD

Aldon Landfill Site

Hydrogeological Risk Assessment to Support Strategic Leachate Management in Aftercare

Report Issue Form

Issue History

Issue	Description	Originated	Checked	Approved	Date
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Executive Summary

This Hydrogeological Risk Assessment (HRA) has been prepared by SUEZ Recycling and Recovery UK Limited for Aldon Landfill Site which is regulated in accordance with Environmental Permit EPR/QP3999CD.

Aldon Landfill Site accepted waste from the 1960s to 1998 and has been operated and managed to present day under largely unchanged conditions set in its Waste Disposal Licence issued in February 1994. Prior to February 1994, the Site had been developed as a rural valley fill without any requirement for engineering containment of the waste mass or contemporary control of emissions.

The Waste Disposal Licence states in Condition D16 that leachate levels will be managed in the two chambers present in the final active cell that was being filled in 1994. Level limits in the two chambers were introduced through limits specified in Condition D18. There are no other requirements for leachate management across the remainder of the Site.

With the Site now in established and stabilised aftercare, leachate volumes removed from the Site by road tanker are well defined at a nominal rate of 600m^3/year. Following the final capping of the Site at the end of the 1990s, groundwater quality has improved over the passing decades but is still representative of the residual impact of a dilute and disperse landfill site overlying the local groundwater aquifer.

With the Site approaching the mid-point of its formal period of aftercare, SUEZ has taken the opportunity to review and - as required - redefine the Site's Conceptual Site Model to quantify the relationship between the residual leachate source term and the receiving water environment. Through this fundamental assessment, SUEZ has assessed the difference in the environmental impact of the Site when the limited leachate extraction from two leachate wells is turned off. The resultant modelled change in water quality below the Site is assessed to be small and to remain within the observed range of groundwater quality observed at the Site up to the end of 2025.

With no active management of landfill gas, the ending of leachate extraction at the Site would mark the move of the Site from an active management phase into a semi-passive management phase with the Site continuing to be monitored while retaining the ability – if ever required – for leachate pumping to be recommenced. In looking to follow the core guidance principles developed by the Environment Agency for progressing leachate management at a landfill from active to semi-passive status, SUEZ has proposed an extended range of water monitoring locations downgradient of the Site and has revised leachate level compliance limits to ensure that surface breakout of leachate does not occur.

While this report is one of the first prepared by the UK landfill sector to end leachate extraction, it is acknowledged that leachate management at the Site cannot continue in perpetuity in order to try to minimise the residual impact of a landfill on the water environment. This reflects the history and era of a Site that was developed without any basal lining system or the ability to collect and remove leachate in an engineered manner from the base of the waste mass.

1 Introduction

1.1 Introductory Statement

This Hydrogeological Risk Assessment (HRA) has been prepared by SUEZ Recycling and Recovery UK Ltd ('SUEZ') for Aldon Landfill Site ('the Site') under Environmental Permit EPR/QP3999CD ('the Permit') held by Shropshire Waste Management Limited.

Aldon Landfill Site accepted waste from the 1960s to 1998 and has been operated and managed to present day under largely unchanged conditions that were detailed in a Waste Disposal Licence issued February 1994 during the filling of the final cells of the site. Few – if any – environmental conditions were set at the Site prior to 1994 for what was a rural landfill, developed – as was typical for the time of filling through the 1970s and 1980s - without any requirement for engineered containment of the waste mass or contemporary control of emissions.

Having managed the Site into its third decade of aftercare, SUEZ has reviewed with the local Area Team at the Environment Agency options for regularising the Site's Environmental Permit to reflect a contemporary understanding of the Site's risk going forward from 2026. This includes adoption of a contemporary risk based approach to the assessment of residual landfill gas emissions (reported under separate cover) along with the assessment of residual leachate management options at the Site in what is an aged landfill that was developed on the basis of natural attenuation of leachate into the receiving groundwater and distant surface water environment.

In order to support the assessment of residual leachate impact for the remaining decades of managed aftercare, SUEZ has completed a contemporary Hydrogeological Risk Assessment at the Site, this report being the first groundwater risk assessment completed at the site since the issue of a Waste Disposal Licence in 1994. The Hydrogeological Risk Assessment has then been extended to assess the potential impact that would arise from ending active leachate extraction from the two extraction points present within the 10.1Ha landfill footprint.

In producing this HRA for Aldon Landfill Site, SUEZ has:

- Represented the environmental setting and regulatory history of the Site;
- Defined a contemporary Conceptual Site Model (CSM) for source, pathway, and receptor linkages;
- Developed Semi-Quantitative Impact Models for the Site under three defined scenarios:
  - Model 1: operational period with active leachate management (a retrospective assessment);
  - Model 2: aftercare period with active leachate management; and
  - Model 3: aftercare period with passive leachate management, but on-going environmental monitoring of leachate, groundwater and surface waters.

- Developed Quantitative Impact Models for the Site under each scenario supported by LandSim modelling software;
- Proposed updated requisite surveillance to continue to provide appropriate assurance of the residual leachate impact on the local water environment at the site.

1.2 Key Guidance Documents Supporting this Assessment

In completing this HRA, SUEZ has followed (as appropriate) current guidance on How to Complete an HRA and associated monitoring approaches as published on GOV.UK set out within:

https://www.gov.uk/guidance/landfill-operators-environmental-permits/what-to-include-in-your-hydrogeological-risk-assessment

with reference made to all contemporary standards for environmental monitoring and assessment of landfill impact / interaction with the water environment contained within Landfill Technical Guidance Note 2: Monitoring of Landfill Leachate, Groundwater and Surface Water.

https://www.gov.uk/government/publications/monitoring-of-landfill-leachate-groundwater-and-surface-water-lftgn-02.

Further, key references are made to the Environment Agency's Internal Notes to Support Permit Variations developed by the Environment Agency's Geoscience Team (GOT) on how to move a landfill site from active to passive management measures.

Internal Environment Agency Note: Permit Variation Application: Removal of Active Management Controls at Landfills (April 2024).

1.3 Summarisation of Key Trends in Data within the Report

Throughout this report, SUEZ has used all reasonable opportunity to summarise extended data sets into key trend / time series plots in order that key changes in leachate and water chemistry can be assessed over time. While graphical summaries of 20+ years of monitoring data could be presented for more than 20 determinands, SUEZ has focussed on the presentation the key determinands such as: leachate elevation, chloride concentration, and ammoniacal nitrogen concentration to attempt to summarise accurately and appropriately the on-going evolution of the Site's Conceptual Model for its impact on the local water environment since the 1990s.

2 Site Setting and Regulatory History

2.1 Site Setting

The Site is centred on National Grid Reference SO 43100 80121, north west of Aldon Village, approximately 10km north west of Ludlow, Shropshire.

The Site was developed as a landfill within a steep sided valley, in a rural area dominated by rough grazing and arable land, with the valley floor falling steadily to the south east. The Site cap area is 10.1Ha. The layout of the Site and key management / monitoring wells with respect to leachate and groundwater monitoring are presented in Figure 1. A full photographic record showing the state of the Site in late 2025 is provided in Appendix A.

The Site has subsequently been fully restored for grassland grazing and continues to be managed by SUEZ through its extended aftercare period. As detailed within this report, active control systems present at the Site from 1994 to present day comprises solely of leachate extraction from two wells. There is no active management of landfill gas.

2.2 Site Regulatory History

No record is retained of the authorisations set in place for the filling of the Site through the 1960s up to 1994. In line with all operational and regulatory practice of the era, few – if any – conditions were set regarding the control of environmental emissions from the Site.

Following the introduction of the Environmental Protection Act in 1990 and ahead of the introduction of the Waste Management Licensing Regulations on 1st May 1994, on the 15th February 1994, Aldon Landfill Site was issued a Waste Disposal Licence (WDL). Prior to February 1994, it is understood that the Aldon Landfill Site was operated under historical resolution agreements issued by Shropshire County Council. In late 1993, in line with government direction on waste disposal facility management by local authorities, operation of Aldon Landfill Site transferred from Shropshire County Council to the newly formed private company Shropshire Waste Management Limited.

Since the February 1994 WDL permit, two further administrative permit variations have been issued for Aldon Landfill Site to date, the first on the 18th July 2005 in the form of a Waste Management License (WML) and the second on the 30th June 2016 to update the registered address for Shropshire Waste Management Limited.

The Site has continued to be operated in line with environmental obligations, set either in the Site's licence and/or the site's approved Monitoring and Management Plan (MMP) last updated in August 2018 (SUEZ, 2018). This in turn reflects (as is appropriate) the requirements of former Waste Management Papers 4 and 26a with the key monitoring conditions transposed into LFTGN02 – which remains as of 2026 the primary guidance for appropriate standards for landfill monitoring.

2.2.1 Leachate Management and Compliance

Due to the simplicity of leachate management at the Site, there has been no formal Leachate Management Plan for the site. Leachate levels are managed to comply with the arbitrary Compliance Limits originally set in the WDL in 1994. Licence/permit condition D18 states that '*The level of leachate in pumping chambers referred to in Condition D16 shall be monitored at monthly intervals. The level of leachate in Chamber 1 shall not be allowed to rise higher than 0.5 meters above base of that chamber. The level of leachate in chamber 2 shall not be allowed to rise above the inlet pipe invert at 234.9m AOD*'.

Chamber 1 refers to leachate well AL2/04L which has a compliance limit of 231.5m AOD, derived from the addition of 0.5m head onto an assumed historic basal level of 231m AOD. Chamber 2 refers to leachate well AL5/01L and the "inlet pipe level" refers to a historic pipe entering the chamber that extends northwards into Phases 1 to 3 (see Section 3.1 below). These wells are located in the Central Area of the Site within the final phase of filling that was on-going in 1994 – by which time the (non-engineered) base of the Site was covered with waste. The arrangement of the two chambers / wells with respect to the inlet pipe from the Northern Area of the Site is presented as a schematic drawing in Figure 2.

It is noted that the setting of leachate limits for the two wells in the Site were based – as was typical for the era when leachate levels were first regulated within licences as standard – on arbitrary low limits (the default position for leachate head limits in 1994 was a "1m fixed head limit"). Linkages of leachate level to risk only formally commenced after the introduction of Regulation 15 of the Waste Management Licensing Regulations from the 1st May 1994.

Two additional leachate monitoring points which were retrospectively drilled in 1997. These wells, AL/03L and AL/04L, are located in the Southern Area of the Site, which had been fully filled and partially restored in 1994. Neither of these wells have formal compliance limits.

The original WDL stated that, as per condition D22, that '*leachate samples shall be taken from the pumping chambers, referred to in condition D16, every month and analysed for the parameters in Suite 1 Table 21 in Condition D13. Every 6 months the leachate samples shall be analysed for the parameters in Suite 2 in Table 1 in Condition D13'.* Suite 1 was limited to the measurement of pH, conductivity, and chloride. Suite 2 consisted of a wider set of substances including ammoniacal nitrogen.

Leachate quality monitoring continues at the Site in accordance with the MMP on an annual basis.

A short and contemporary Leachate Management Plan for the Site has been prepared by SUEZ to meet the requirements of the GOT Note on transitioning sites from active to semi-passive systems and is included as Appendix B.

2.2.2 Groundwater

Groundwater monitoring requirements were stated in the 1994 Licence in Conditions D12 and D13. These conditions required groundwater level monitoring on a monthly basis with quality samples collected on a monthly basis for the aforementioned Suite 1 parameters, and on a six-monthly basis for the original Suite 2 parameters. As agreed in the Site MMP, groundwater monitoring currently consists of level and quality sampling on a six-monthly basis.

No requirement or condition was included in the WDL, or any succeeding permit, to produce or review a Regulation 15 Assessment / Hydrogeological Risk Assessment (HRA).

2.2.3 Surface Water

In Condition D14 of the original WDL for the Site, it was stated that surface water samples shall be collected from the stream below the Site surface water outfall on a monthly basis for Suite 1, and a six-monthly basis for Suite 2. This sampling location, now referred to in the MMP as AL7/01W, is monitored six-monthly for 9 parameters.

2.2.4 Landfill Gas

Residual landfill gas generated at the Site is monitored in accordance with the MMP which requires that monitoring is conducted on a quarterly frequency, with compliance limits set at 1%v/v for methane, and 1.5%v/v carbon dioxide. The original WDL included Condition D10 which stated that monitoring of perimeter gas at these points shall continue until concentrations below the 1%v/v methane and 1.5% carbon dioxide limits are recorded continuously for 24 months on at least six-monthly intervals.

While not part of this HRA Report, a contemporary assessment of the impact of residual perimeter gas conditions at Aldon Landfill Site has been completed by SUEZ and was submitted for approval by the Area Environment Agency Team in October 2025 as a separate standalone report.

3 Defining the Conceptual Site Model for Groundwater Risk in 2026

The following section defines the Conceptual Site Model (CSM) at Aldon Landfill Site and presents a contemporary understanding of the residual source, pathways, and receptors associated with the landfill. Visualisation of the CSM for the risks associated with landfill leachate at Aldon Landfill Site is presented in Figure 3.

The integrity of the monitoring infrastructure, a key component in the determination of the CSM, was subject to an extensive internal audit carried out in June 2025 (Appendix C). This audit found that based on the current condition of the leachate and groundwater wells in terms of structural integrity and dip to base and liquid, the monitoring network continues to be in a “fit for purpose” state.

SUEZ retain in a contemporary digital format / database all environmental records at the site since 2004. The majority of records prior to 2004 are paper based.

3.1 Source

Aldon Landfill Site accepted a range of inert, non-hazardous, and putrescible wastes from the mid-1960s through to August 1998.

3.1.1 Landfill Design

The Site comprises four unlined/non-engineered Phases covering a capped area of 10.1Ha. Phases 1 to 3 are located in the Northern Area and are composed of the oldest waste. It is presumed that this area was filled between the late 1960s and the mid 1980s before filling moved into Phase 4.

Filling of Phase 4 occurred in four Cells (or stages). Cells 1 and 2 form the southern most area of the site and were filled before the final area of filling in Cells 3 and 4 – referred to as the Central Area of the site.

As the waste mass infilled a moderately steep valley feature in the landscape, the waste thickness and base varies, with the greatest thickness along the central spine, thinning to the peripheral edges. Nominally, the waste mass thickness varies from at least 10m in the Northern and Southern Areas, and up to 20m in the Central Area. Based on the current ground levels this waste mass depth equates to a basal level of approximately 255m AOD in the Northern Area, 230m AOD in the Central Area, and 210m AOD in the Southern Area.

In line with the standards for waste disposal in the 1960s to 1990s, all four phases were built under the principles of passive management of leachate and gas with no engineered basal engineering or engineered basal drainage blankets/pipework constructed beneath the waste mass. The requirement for active leachate management in the final area of tipping was introduced in 1994 in the transition of the regulatory regime from Waste Disposal Licensing to Waste Management Licensing era.

Two historic topographic surveys remain available to SUEZ showing the acceptance of waste into the final cells, Drawing AL/WP/0693/03 dated June 1993, provided in Figure 4, and Drawing AL/MON/11/1993/1 produced on the 9th December 1993 (preserved in hardcopy): the latter shows waste levels around AL2/04L and AL5/01L to be at approximately 237mAOD or higher.

All phases have been capped to a range of engineering standards that were applicable at the time of Site restoration. Capping in the Northern and Southern Areas of the Site consists of semi-engineered clay overlain by approximately 1m of restoration soils (confirmed by an extensive trial pit investigation, SITA, 2015). Capping of the Central Area between 1998 and 2000 consists of a Bentomat liner, overlain by between 0.5m and 1m of clays and restored using approximately 0.5m of restoration soils.

3.1.2 Leachate Level Monitoring

Leachate levels continue to be monitored at four points since the 1990s, as shown in the Monitoring and Extraction Point Plan (MEPP) provided in Figure 1. These four points are located in the Central and Southern Areas (Figure 5).

Leachate in the Central Area is monitored by two leachate monitoring points, AL2/04L and AL5/01L, which also act as extraction points, each fitted with a single pneumatic pump. It is understood that AL5/01L is connected to a single lateral pipe which runs into the Phases 1 to 3. It is unknown how far the pipe extends laterally however, given the age of the landfill and probability of settlement and pipe collapse, it is likely it collects leachate from less than 100m north of the well. It is not possible to access this lateral pipe (for example to undertake a CCTV survey) due to the depth of the pipe within the landfill at the base of a leachate chamber.

Leachate monitoring wells AL/03L and AL/04L are located in the Southern Area of Phase 4 and were retrospectively drilled in 1997. There are no leachate monitoring wells in the oldest Northern Area of the Site (Phases 1 to 3).

Overview of Data

Leachate level data and graphs are provided in Appendix D and Figure 6 respectively.

Leachate levels in the Southern Area have remained broadly stable throughout the monitoring history at Aldon Landfill Site typically in the range of 215mAOD to 222mAOD, with an equivalent head of approximately 1m to 3m in AL/03L, and 8m to 9m in AL/04L (assuming that both retro-drilled wells are installed to be near the full thickness of the waste mass). The range and limited fluctuation of leachate levels in the monitoring wells confirms relatively steady state conditions for leachate storage / flux in this area of the waste mass, as would be expected for landfilled wastes that have been capped for 30+ years.

Leachate levels in the Central Area of the Site typically vary between 231mAOD and 238mAOD depending on the degree of pumping that can be supported at the Site.

Based on an updated leachate well cover level survey undertaken in October 2025 (Figure 7) and hard dips to base measured in February 2025, the basal level of AL2/04L and AL5/01L are 231.33 mAOD and 232.31 mAOD respectively. Comparing these values to the current compliance limits, the equivalent leachate head compliance level in AL2/04L is 0.28m and in AL5/01L is 2.59m.

With such low compliance limits within an otherwise non-engineered site, it has been and remains impossible for SUEZ to achieve compliance in well AL2/04L. Without a basal leachate drainage blanket to utilise for leachate storage and extraction, compliance in well AL5/01L is intermittent rather than being sustained, even though leachate is removed on a continuous basis when present in the well through the use of an air pump that operates “on demand” when leachate drains into the well.

Leachate Drawdown Pumping Test

In June 2025, SUEZ carried out leachate drawdown testing in the two leachate extraction wells AL2/04L and AL5/01L in order to determine the rate of change in leachate level in response to the ceasing and then restarting of leachate extraction. Worksheets and graphical plots of the test data are provided in Appendix E and Figure 8 respectively.

The drawdown pumping test included collecting a pre-pumping leachate level and leachate levels at set times whilst the pump operated continuously. The pump cycle rate per minute was also recorded during the test, each cycle being reflective of the removal of 1 litre of leachate by the pump. A summary of key data from the test is provided in Table 1.

Table 1. Leachate Drawdown Pumping Test Summary

LMP	Base of Site (mAOD)	Pre-Pumping Leachate Level (mAOD)	Pumped Leachate Level (mAOD) (24 hours)	Drawdown (m) (24 hours)	Residual Head in Well (m)
AL2/04L	231.33	236.41	232.16	4.25	0.83
AL5/01L	232.31	235.98	233.85	2.13	1.54

Over the 24 hours the pump rate in AL2/04L decreased from 4 cycles per minute to less than 1 cycle per minute, indicating it had reached steady state conditions with the surrounding leachate entering the well. Analysis of the test data suggests limited hydraulic conductivity and storage between the well and the surrounding waste mass, with the pump only likely to be drawing leachate from an area of ~ 10m to 15m radius around the well. Long-term yields from the well are monitored to be less than 0.5m^3/day.

Leachate flows and level responses in well AL5/01L indicate a more transmissive connection between the well and the surrounding waste mass, which is consistent with the known pipework connection from AL5/01L northwards into Phases 1 – 3. Through pumping, it is possible to achieve a level of leachate that is below the pipe invert level into the base of the chamber (at 234.9mAOD).

In noting published hydraulic properties for aged landfilled waste at a depth of greater than 15m, the design principles of the Site and the observed rested levels of leachate in the Site before commencement of the pumping trials, it is likely that true leachate level across the Cells 3 and 4 of Central Area of the Site is at 236mAOD to 238mAOD, with a limited volume of leachate stored in the base of the waste mass through the collapse of drainable pore space over time associated with the degradation of the waste mass structure in aftercare.

3.1.3 Leachate Quality and Quality Trends

Leachate quality is monitored at all four leachate wells and a composite sample is collected from the leachate tank. Monitoring has been ongoing in the two extraction wells since 2008, with monitoring in the two remote monitoring wells commencing in 2014: the tank has been analysed since 2019. Leachate quality data is provided in Appendix F, with graphical plots of the key source term determinands, ammoniacal nitrogen and chloride, provided in Figure 9.

Leachate Quality in the Central Area / Interface Between Phases 1 – 3 and Cells 3 and 4 of Phase 4

Over the past two decades, ammoniacal nitrogen concentrations in the Central Area of the Site have decreased from 100 - 150mg/l in 2008 to approximately 80mg/l in 2025. Chloride concentrations have also decreased from 200 - 500mg/l in 2008 to around 120mg/l in 2025, which would be in line with the stabilisation of leachate quality over time through an extended period of aftercare management that is observed across many landfills in the UK in aftercare.

The most recent round of hazardous substances testing was completed in November 2025 from a leachate sample obtained from the Site's leachate storage tank. Analysis has confirmed a very low presence of VOCs, SVOCs, herbicides and hazardous metals in the leachate, with the vast majority being at or marginally above the laboratory limit of detection. A full summary of the hazardous substances analysis is included as Appendix G.

Leachate Quality in the Southern Area of the Site (Cells 1 and 2 of Phase 4)

The retained leachate quality data set in wells AL/03L and AL/04L suggest a weaker leachate within the aged areas of the Site, with chloride concentrations now consistently below 25mg/l and ammoniacal nitrogen below 10mg/l.

This aged leachate residual source term may reflect both the type of wastes deposited in the area of leachate monitoring and also the flushing of the Site over decades to 2026. It is acknowledged that leachate quality in in the Southern Area of the Site will have been stronger back in the 1980s when this area of the site was being infilled.

Summary of Key Non-Hazardous and Hazardous Substances for Risk Assessment in Leachate

Based on the leachate quality data retained by SUEZ at Aldon Landfill Site, the below Table 2 presents the Key Non-Hazardous and Hazardous Substances for Inclusion in the subsequent risk assessment.

Table 2. Key Non-Hazardous and Hazardous Substances in Leachate

Substance	No. Samples / No. Samples > LOD	Concentration		Substance Type
		50th Percentile	95th Percentile	
Ammoniacal Nitrogen (mg/l)	146 / 146	77	253	Non-Hazardous - Inorganic Cation
Benzene (µg/l)	1 / 0	<0.5	<0.5	Hazardous – Mobile Organic Compound
Chloride (mg/l)	204 / 204	124	528	Non-Hazardous – Un-Retarded Inorganic Anion
Lead (mg/l)	59 / 3	0.0005	0.005	Hazardous – Metallic ion
Nickel (mg/l)	79 / 64	0.005	0.029	Non-Hazardous – Metallic ion

The above substances have been chosen to examine the fate of a range of non-hazardous and hazardous substances that are typically associated with non-hazardous landfill leachate and its interaction with the water environment.

The residual leachate source term in 2026 is that of an aged leachate with very low concentrations of hazardous substances in the leachate source term. Lead is present at concentrations above the limit of detection. However, SUEZ has used appropriate and conservative thinking to the inclusion of hazardous substances such as benzene within the risk assessment process set out in this report to assess / confirm the possible past and current impact of hazardous substances that may no longer be present in the Site's source term in 2026.

These five substances appropriately focus the modelling of the Site and requisite surveillance as detailed in Sections 4 and 5 below.

3.2 Pathway

3.2.1 Geology and Hydrogeology

The Site is partially underlain by the mudstones and siltstones of the Upper Ludlow Shales Group, which in-turn overlie interbedded limestones and mudstones of the Aymestry Limestone Formation which surrounds the Site. No superficial deposits are present. Regionally, the strata dip approximately 8° to the south east with a fault crossing the lower part of the Site in a north-east direction; down-throwing the north-west strata.

Hydrogeologically, the Upper Ludlow Shales Group is classified as a Secondary B aquifer, whereas the Aymestry Limestone Formation is classed as a Secondary A aquifer. As such, the Aymestry limestone exhibits moderate permeability through predominantly fissure flow, whereas the Ludlow Shales permeability is limited to localised fracturing.

Formal monitoring of groundwater quality and levels at the site only commenced in the early 1990s following the commencement of application of environmental conditions set out in the Environmental Protection Act 1990. The date of installation of the groundwater monitoring wells at the site is unknown and no borehole records are retained by SUEZ. The date of installation of the network of perimeter gas wells around the site boundary was in 1990.

Early monitoring records for groundwater level and quality are retained as hard copies only, with SUEZ' contemporary Monitor Pro database retaining records from 1998.

3.2.2 Groundwater Levels

A total of 336 groundwater levels have been monitored in three monitoring wells since 2004.

Groundwater level data is provided in Appendix H, with graphical plots of level provided in Figure 10.

The upgradient groundwater monitoring point, AL1/03W, is located in the grounds of private land at View Edge Farm with the borehole acting as a drinking water abstraction point. Due to the structure of the well, SUEZ has only be able to analyse pumped water quality as there has never been the ability to routinely monitor groundwater levels. It is however clear based on the local hydrogeology and topography that this point is and will remain hydraulically upgradient of the Site.

Of the three groundwater level monitoring points, AL1/04W is located on the eastern boundary of the Central Area, with a groundwater level ranging seasonally from 209m AOD to 218m AOD. The two remaining points, AL1/01W and AL1/02W are located south of the Southern Area, with AL1/01W being located approximately 10m from the toe of the landfill and AL1/02W being located 130m south. Groundwater varies seasonally from 190m AOD to 198m AOD.

Beyond seasonal variation, no long term changing groundwater trends are present in the dataset, with flow continuing down valley to the south / south-south-east.

From the observed data sets, an unsaturated zone between the base of the landfill and the groundwater table is present throughout the year beneath the entire site. The zone size varies as a result of the relief of the valley and groundwater table gradient however, based on waste thickness and groundwater monitoring data, the unsaturated zone varies from 10m to 25m where the shallowest zone is present beneath the Southern Area of the Site, and the largest unsaturated zone being present beneath the Northern Area. As a result of the fissure flow dominance in the fractured limestone making up the unsaturated zone, the break through travel time for the migration of leachate from the waste mass to the groundwater table is likely to be relatively short ranging between ten to twenty years after waste placement commenced, the time depending on the specific thickness of zone and lithological properties of the unsaturated zone.

3.2.3 Groundwater Quality

Raw groundwater quality data and analytical summaries are provided in Appendix I, with graphical plots of ammoniacal nitrogen and chloride provided in Figure 11 including all downgradient groundwater quality retained by SUEZ since 1994.

Upgradient groundwater quality, as it is used as a drinking water abstraction point, is of high quality with low concentrations of the majority of determinants, including ammoniacal nitrogen, chloride, lead, and nickel throughout its monitoring history.

The downgradient impact on groundwater quality from Aldon Landfill Site has been steadily decreasing from peak emissions in the mid 1990s to the range of concentrations now observed at groundwater monitoring borehole AL1/01W located at the southern (down gradient) boundary of the site.

In the 1990s, it is likely that elevated concentrations of a number of substances related to landfill leachate emission were present given the increased rates of leachate generation whilst the Site was only partially or temporarily capped, enabling more infiltration, and the relatively short groundwater travel time from the Site to the downgradient monitoring point AL1/01W.

From review of all groundwater quality data retained since 1994, the impact of the landfill derived substances on the downgradient network has been limited to elevated concentrations of ammoniacal nitrogen in well AL1/01W and chloride in the wells AL1/01W and AL1/02W. Breakthrough of the chloride front into groundwater is observed to have occurred in 1996 in well AL1/01W with concentrations of chloride and ammoniacal nitrogen rising rapidly to the end of the decade.

Although AL1/02W is located approximately 130m south of the Site, the same clear impact is not detected. It has been reported that there is a fault line present in the intermediate area between AL1/01W and AL1/02W which may be acting as a preferential pathway for leachate: it is however likely that this leachate bearing groundwater is being discharged to the Springhead Gutter surface water stream downgradient of the Site.

Hazardous substance testing carried out in November 2025 in AL1/01W and AL1/02W confirmed that a very low presence of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), a broad range of herbicides/pesticides and hazardous metals is present with the vast majority being at or marginally above the laboratory limit of detection, with the data tabulated in Appendix J.

The elevated ammoniacal nitrogen concentrations recorded in AL1/01W consists of a decrease in concentration from approximately 40 - 50mg/l from 1998 to 2005, steadily decreasing to approximately 10mg/l from 2011 onwards to present day.

Although the peak chloride concentrations recorded in the downgradient monitoring wells is well specific, consistent / sustained trends are present whereby concentrations have decreased to typically less than 50mg/l from 2020 onwards.

The rate of change in these substance concentrations indicates that while the leachate emission was at its maximum in the mid to late 1990s, the ammoniacal nitrogen concentrations at the nearby AL1/01W potentially reached 70mg/l and chloride peaked at 300 to 500mg/l.

Summary of Key Non-Hazardous and Hazardous Substances for Risk Assessment in Groundwaters

Based on the groundwater quality data retained by SUEZ at Aldon Landfill Site, the below Table 3 presents the concentrations both upgradient and downgradient of the key Non-Hazardous and Hazardous Substances identified in leachate source term.

Table 3. Key Non-Hazardous and Hazardous Substances in Upgradient and Cross / Downgradient Groundwater

Substance	No. Samples / No. Samples > LOD	Concentration	
		50th Percentile	95th Percentile
Upgradient Groundwater			
Ammoniacal Nitrogen (mg/l)	50 / 17	0.02	0.18
Benzene (µg/l)	0 / 0	unknown	unknown
Chloride (mg/l)	50 / 50	7	11
Lead (mg/l)	23 / 16	0.002	0.020
Nickel (mg/l)	34 / 28	0.003	0.014
Cross-Downgradient Groundwater			
Ammoniacal Nitrogen (mg/l)	451 / 267	0.15	19.79
Benzene (µg/l)	2 / 0	<0.5	<0.5
Chloride (mg/l)	498 / 443	17	123
Lead (mg/l)	73 / 5	0.0005	0.001
Nickel (mg/l)	102 / 50	0.001	0.004

3.2.4 Surface Water Quality

Surface water quality has been monitored in a small spring (AL7/01W) located 160m south of the southern boundary of the Site since 2008 (Photograph 11 in Appendix A). Surface water quality data is provided in Appendix K. The spring drains into a surface water stream which forms the upper headwaters of the Springhead Gutter (Photograph 10 in Appendix A) which flows into the Aldon Gutter and Stonehouse Pools and eventually enters the River Onny.

Prior to 2017, monitoring data indicates that the surface water was of good quality with low concentrations of the majority of substances including ammoniacal nitrogen (less than 0.1mg/l) and chloride ranging from 10 to 20mg/l, with no long term increasing or decreasing quality trends.

Since 2017, the majority of monitoring visits have confirmed that the spring has been dry or insufficient for sampling.

No routine monitoring has ever been undertaken in the receiving stream up to 2025.

3.3 Receptors

In accordance with the Environmental Permitting Regulations, 2016, Schedule 22 (Groundwater Activities), the identified primary receptors to the Site are as follows:

Hazardous Substances	the base of the unsaturated zone;
Non-Hazardous Substances	the groundwater at the downgradient boundary of the Site, represented by monitoring boreholes: AL1/01W and AL1/02W

The secondary receptor in the CSM is the spring south of the Site, where groundwater ultimately discharges into the small surface water stream. Water quality can be assessed in the stream below the Site against published Environmental Quality Standards for the key substances discharged by the landfill into the local groundwater environment.

3.4 Management Scenarios and Model Outputs

In developing a qualitative approach to assessing the change in risks to the water environment over a period of decades, SUEZ has considered the risks from three different management scenarios:

- Operational Period – with active leachate management
- Aftercare Period – with active leachate management
- Aftercare Period – with active leachate management having ended.

It is noted that in defining the period of assessment in each model considered – there is a lag between model date (Operational Period in 1985) and the monitoring of peak impact(s) from the modelled scenario. This reflects the recognised time lag for leachate to cross the unsaturated zone beneath the site and then for groundwater to travel beneath the site to the down gradient site boundary. The time date for the Aftercare Period with active leachate management at present has been selected to enable assessment of groundwater quality observed at AL1/01W in 2026, reflecting a typical lag of ~ 10 years between the release of leachate from the base of the site and the monitoring of groundwater quality at the site boundary.

While records of filling and restoration during the Site's operational period are limited, an understanding of the core elements of the CSM for a landfill without basal engineering suggests that the peak impact from the Site is likely to have occurred in the mid 1980s when all waste had been placed in Phases 1 – 3 (but with limited – if any capping) and Phase 4 was operational. This reflects a credible interpretation of how a Site such as

Aldon Landfill was progressively filled in an era when restoration requirements were minimal until after the site was completed.

Modelling the impact of the Site in aftercare with active leachate management – following capping and restoration of waste mass as detailed in Section 3.1.1 and Section 4.2 – reflects the site in the period from 1998 to present day (2026). It is noted that while the placement of capping across the site was completed by the early 2000s, improvements in groundwater quality reflect an extended transition period from higher concentrations to lower concentrations of key contaminants as a result of reduced rates of leachate production at (and then egress from) the Site.

Modelling of the Site after the end of leachate extraction reflects a slightly higher rate of leakage from the Site than has been modelled in the aftercare period with active leachate management. The additional leakage rate associated with this third model of Site impact is simply the inclusion of the volume of leachate previously tankered from the Site into the underlying unsaturated zone beneath Central Area of the Site. No other changes in Site impact on the water environment will occur should leachate extraction be ended from the two leachate extraction wells at the site.

It is noted that many of the key parameters modelled by SUEZ will be common across all three models developed. The impacts of the different leakage rates and leachate fluxes / loadings into the local water environment can be assessed from comparing the outputs of each model.

In assessing the potential changes in quality in the receiving water environment, groundwater quality refers to groundwater quality at monitoring well AL1/01W. Surface water quality refers to the surface water quality in the receiving stream as monitored at a new/future permanent monitoring location AL7/02W located at the Springhead Gutter which flows into the Aldon Gutter and eventually to the Stonehouse Pools and into the River Onny.

3.5 Summary of CSM Time Periods and Linkages

Graphical representations of the three key components of the CSM are presented in Figure 3. These sections present the Site during three periods considered to assess the site risks when the site has been Operational, is in present Aftercare with active leachate management, and in future Passive Aftercare.

In the three periods, there is a single linkage present whereby the leachate source term generated migrates through the unsaturated zone pathway, enters the groundwater present in the Aymestry Limestone Formation, and is monitored in the downgradient groundwater borehole AL1/01W which serves as a point of monitoring in the primary receptor. This groundwater flow continues away from the Site to the south east following a subdued reflection of the topographic profile to the ultimate, secondary receptor, the spring south of the Site, monitored at AL7/01W and/or within the stream itself. It is noted that there may be two possible flow pathways for groundwater flow between the site and the stream (a) direct flow along the shortest possible distance between the site and stream via a combination of fissure and matrix flow within the Aymestry Limestone and/or (b) a possible faulted pathway that may be present between groundwater wells AL1/01W and AL1/02W. Both pathways ultimately discharge all groundwater and leachate present at the down gradient site boundary into the surface water stream (the Springhead Gutter) which then contributes to flow in the River Onny.

As the Site was designed without an engineered base, following the contemporary practises for a pre-Landfill Directive site, the majority of leachate dilutes and disperses into the groundwater present beneath the Site. In accordance with the licence issued in 1994, the remaining unfilled Central Area of the Site (Phase 4, Cells 3 and 4) was required to have active leachate extraction (via AL5/01L and AL2/04L) with compliance limits introduced. It is found that in the event that the active leachate extraction transitions to semi-passive leachate management, no change to the Conceptual Site Model linkages would occur, with the sole difference between the two models developed for the Site at present and a future date post 2030 being the minor increase in the volume of leachate entering the unsaturated zone (and then groundwater / surface waters) beneath the Central Area of the Site.

In line with all current published guidance for a contemporary landfill risk assessment model, SUEZ has proposed that the fate of the following key substances will be assessed to quantify the impact of leachate on the local groundwater / surface water environment:

Hazardous Substances:

- Lead and Benzene

Non Hazardous Substances:

- Ammoniacal nitrogen, Chloride and Nickel

4 Qualitative/Semi-Quantitative Modelling Approach

4.1 Modelling Approach / Overview

This Section presents a qualitative / semi-quantitative review of the impact of leachate arising in Aldon Landfill Site on the local water environment (Appendix L), drawing on the Conceptual Site Model presented in Section 3.

In modelling the impact of leachate on the groundwater downgradient of the Site boundary (monitoring point AL1/01W), as well as at the surface water quality in the spring stream (where groundwater ultimately discharges), it is necessary to develop with the model for the site the following key elements:

- The upgradient groundwater catchment which defines the groundwater quantity and quality travelling beneath the Site;
- The quantity and quality of leachate leakage from the landfill into the unsaturated zone between the waste and the groundwater;
- The effect that leachate leakage into the groundwater travelling beneath the Site will have on downgradient groundwater quality; and,
- The effect that downgradient groundwater quality will have on the quality of water in the surface water in the stream south of the Site.

At this stage of the assessment, key focus has been given to core calibration of a semi-quantitative, spreadsheet based model of Site impact drawing on the long term trends in leachate and groundwater quality retained for key parameters chloride and ammoniacal nitrogen. This reflects the criticality of understanding the fate of the two highest risk / key substances of possible impact from leachate egress into groundwater before considering the fate of a broader range of substances that would normally be included in an HRA report.

4.2 Upgradient Groundwater Catchment

Groundwater locally flows from the north to the south. A ridge line north of the Site forms the edge of the conservative, minimum possible, catchment area for groundwater upgradient of the Site. This catchment area boundary runs from the northern boundary of the Site, up to the hilltop View Edge Farm (where AL1/03W is located), forming an area that is approximately 36,000m^2. Multiplying the catchment area with the estimated infiltration into the subsurface provides a total recharge value for the quantity of groundwater entering the system upgradient of the landfill. Based on an estimated 350mm per year infiltration rate (approximately a third of the total rainfall over 2025 at the local Aldon Weather Station), the total recharge value equates to 12,640m^3 per annum.

Whilst the quantity of groundwater upgradient, passing beneath the Site can be estimated with the above method, the rate of groundwater flow beneath the Site requires the input of an aquifer hydraulic conductivity and head. Using the groundwater network monitoring history, it can be estimated that, over a distance of 450m, groundwater levels drop approximately 20m, generating a head gradient of 0.04. Based on the known lithology and borehole logs which record features including moderate fracturing, a hydraulic conductivity of $1*10^{-5}$ has been professionally judged as appropriate.

The 20 year monitoring history recorded at the upgradient AL1/03W enables background quality to be estimated, with an ammoniacal nitrogen concentration of 0.02mg/l, and a chloride concentration of 7mg/l.

4.3 Landfill Leakage Rates

At Aldon, a summary of the approach to modelling / assessing the rates of leachate leakage from a fully restored landfill is defined as the balance of:

Inflow Volume = (Leakage Rate + Volume of Leachate Removed + Change in Storage in Site)

with all units standardised to be m^3/year, where

- Infiltration Volume Rate through the restored and capped Site surface as a product of cap area and infiltration rate. Noting for sites developed below the groundwater table, there would be an additional volume of inflow into the waste mass: within the Aldon Landfill Site CSM, this is not applicable and set to zero.

- Volume of Leachate Removed by road tankering from leachate pumped from two wells.

- Change in Storage in Site is assessed to be “zero” with year on year steady state leachate levels in the waste mass.

Aldon Landfill Site consists of three discrete areas of filling with set plan areas, Table 4.

Table 4. Aldon Landfill Site Plan Areas

Area	Plan Area, m^2
Phases 1 – 3 (Northern Area)	49,750
Phase 4 Cells 1 and 2 (Southern Area)	21,900
Phase 4 Cells 3 and 4 (Central Area)	28,900
Total	100,600 (10.1Ha)

Estimating the rates of cap infiltration into landfilled waste have been progressed by SUEZ through review of the long-term leachate production rates at landfills operated by SUEZ that were operational in the 1990s and closed and capped by 2004. For simplicity and consistency, SUEZ started the semi-quantitative modelling of the Site with the following range of infiltration rates provided in Table 5.

Table 5. Aldon Landfill Site Area Infiltration Rates

Area	Infiltration Rate, mm/year	
	Operational	Aftercare
Phases 1 – 3 (Northern Area)	120	80
Phase 4 Cells 1 and 2 (Southern Area)	120	80
Phase 4 Cells 3 and 4 (Central Area)	120	40

During the Operational Phase as modelled in approximately 1985, at the time of commencement of the filling of Phase 4 Cells 3 and 4, the earliest areas - Phases 1 to 3 and Phase 4 Cells 1 and 2 - were only partially capped. At this time, greater rates of infiltration will have been present than those observed in 2025/2026, therefore the infiltration rates for these areas were increased 150% (120mm/year) generating an estimated total annual leachate leakage of 8,600m^3.

In the future 2030+ model with passive leachate management, the infiltration rates compared to the active leachate management aftercare model remain unchanged however, an additional 500m^3 was added to Phase 4 Cells 3 and 4 to reflect the ceasing of leachate extraction from the area.

Leachate quality in the Central and Southern Areas in the current, and in the future can be estimated based on known monitoring data collected at the leachate sampling points: as no sampling points are present in the Northern Area, it is assumed that further leachate maturation will have decreased concentrations to that of the Southern Area. The leachate quality values used to represent both aftercare model source terms are based on the leachate quality recorded in approximately 2015 to reflect the travel time to the receiving downgradient groundwater point. In the Operational model, leachate quality in both the Southern and the Northern Areas are estimated to be of greater concentration reflecting the peak concentration expected shortly after placement, with the Northern Area having a slightly greater strength as a result of the southern waste having just been placed.

4.4 Downgradient Groundwater Quality Impact

The downgradient groundwater concentrations are calculated based on the combining of the upgradient groundwater quality and quantity flowing beneath the Site with the quality and quantity of leachate being leaked through the unsaturated zone into the groundwater.

At this modelled downgradient location, Aldon Landfill Site groundwater monitoring borehole AL1/01W is located, enabling good comparison between modelled and observed impact.

It is noted that two possible pathways may be present for groundwater flow beneath the site and its surface water discharge. This reflects the possible influence of a fault zone that was highlighted in environmental reports written at the Site in the 1990s – which may be based on a difference in geology observed between monitoring wells AL1/01W and AL1/02W. While no formal documentation of the borehole logs is retained in

2026, such a difference in local geology would account for the clear difference in groundwater quality observed in the two down gradient groundwater monitoring wells.

4.5 Surface Water Impact

Groundwater beneath the Site ultimately discharges into the surface water spring and stream south of the Site. Based on the same principles used to calculate the quantity of groundwater recharging in the upgradient area, it is possible to calculate both the groundwater recharge in the area between the Site and the point of surface water discharge, as well as the total catchment area of the spring discharge excluding the Site contribution and that of the upgradient and downgradient areas.

The downgradient area between the Site and the stream is approximately 19,600m^2 giving rise to an additional contribution of approximately 6,860m^3 of groundwater into the model.

The total catchment of the stream has been estimated based on the location of the new additional surface water monitoring point AL7/02W (further details provided in Section 7.3) located at Nation Grid Reference SO 43138 79608, 160m downstream of the spring (AL7/01W). The total catchment is approximately 889,000m^2 giving rise to an additional contribution of approximately 311,100m^3 of surface water into the model when assessing the resultant surface water quality below the Site.

4.6 Model Results

Qualitative model results for each management scenario are provided in the below Tables 6 to 8.

Table 6. Qualitative/Semi Quantitative Operational Model Results

Management Scenario		Groundwater Concentrations		Surface Water Concentrations	
		Ammoniacal Nitrogen	Chloride	Ammoniacal Nitrogen	Chloride
Operational	Modelled	69	384	4.3	31
Operational	Observed	45mg/l +/- 10 mg/l (peak in 2004	400mg/l +/- 50mg/l (peak in 1995)	No data	No data

Table 7. Qualitative/Semi Quantitative Aftercare Period 2026 Model Results

Management Scenario		Groundwater Concentrations		Surface Water Concentrations	
		Ammoniacal Nitrogen	Chloride	Ammoniacal Nitrogen	Chloride
Aftercare Period 2026	Modelled	13	43	0.8	9.1
Aftercare Period 2026	Observed	10+/- 5	40+/-13	No data	No data

Table 8. Qualitative/Semi Quantitative Aftercare Period 2030+ Model Results

Management Scenario		Groundwater Concentrations		Surface Water Concentrations	
		Ammoniacal Nitrogen	Chloride	Ammoniacal Nitrogen	Chloride
Aftercare Period 2030+	Modelled	15	47	0.9	9.4
Aftercare Period 2030+	Observed	tbc	tbc	tbc	tbc

Note. tbc: to be monitored in the years ahead (see Requisite Surveillance, Section 7).

The downgradient groundwater concentrations during the operational period are four to eight times greater than concentrations observed during both active management of leachate, and then in a future semi-passive management period of aftercare management post 2030. Although limited contemporary monitoring results exist to compare the model output with observed quality for the operational model, the model output for Site aftercare at present is closely aligned with the concentrations observed in AL1/01W where ammoniacal nitrogen is typically recorded at 10mg/l and chloride is recorded between 30mg/l to 50mg/l.

Ending active leachate management will result in a small additional release of leachate into the unsaturated zone beneath Phase 4 – Central Area. The impact of this additional input into the water environment is modelled to give rise to a small concentration increase in both key substances considered at this semi-quantitative stage of assessment:

+ 2mg/l for ammoniacal nitrogen concentration and + 4mg/l for chloride concentration above 2026 conditions.

To provide context on this increase, the observed variance of groundwater quality in borehole AL1/01W monitoring point (from 2020 to present) expressed as One Standard Deviation from the Mean is calculated to be:

+/- 5mg/l for ammoniacal nitrogen concentration and +/- 13mg/l for chloride concentration.

The additional impact of the long term leachate leakage from Phase 4 would not be observable within the range of groundwater quality downgradient currently recorded at the Site.

During the operational period the modelled impact on the surface water stream at the Springhead Gutter (AL7/02W) is approximately four times greater in ammoniacal nitrogen and three times greater in chloride, demonstrating the decrease in impact from the Site now in aftercare. As no observed monitoring data is available for this location, no appropriate comparison can be made.

The relative impact of ceasing active leachate management after 2030 on the surface water quality in the Springhead Gutter equates to an increase of 0.1mg/l ammoniacal nitrogen and 0.3mg/l chloride in the downgradient / down catchment surface water quality below the Site.

5 Quantitative Modelling Approach

As Aldon Landfill Site is situated entirely above the local water table with a permanent unsaturated zone, detailed quantitative modelling of the site is possible using the LandSim software. However, it is noted that the primary purpose of the modelling work is to support assessment of the difference in impact between active leachate management and passive leachate management at the site and the resultant change in impact on the water environment.

5.1 Model Input Files/ Scenarios

In line with the qualitative modelling approach, three models have been produced to represent the site: the first during site operation (Model 1), the second in current aftercare with active leachate management (Model 2), and the final in future aftercare with no active leachate management (Model 3).

Models 1 to 3 split the Site into three constituent areas - Phases 1 to 3, Phase 4 Cells 1 and 2, and Phase 4 Cells 3 and 4. A copy of the Input Parameters with justifications for the 2026 aftercare Model 2 is included in Appendix M. Models 1 and 3 use the same input parameters as Model 2 with the exception of the cap design infiltration rates and the leachate source term concentrations for ammoniacal nitrogen and chloride.

Model 1 uses a cap design infiltration rate of 120mm/year in both Phases 1 to 3 and Phase 4 Cells 1 to 2 in line with the qualitative model to account for the temporary partial capping present during this time of operation. The leachate source term concentration of ammoniacal nitrogen is increased to 200mg/l in Phases 1 to 3, and to 100mg/l in Phase 4 Cells 1 to 2 to account for the peak leachate strength during this period: chloride is also increased to 1,000mg/l and 800mg/l in Phases 1 to 3, and Phase 4 Cells 1 to 2 respectively. In order to calibrate Model 1, Phase 4 Cells 3 and 4 have been included with an unchanged cap design infiltration from Model 2, however, a negligible leachate source term has been used to represent pre-waste disposal conditions.

The changes from Model 2 to Model 3 are limited to modelling the additional leachate leakage, which is achieved by increasing the cap design infiltration rate from 69mm/year in Model 2 to 80mm/year.

Groundwater quality within the model has been assessed at two points of interest: the down gradient Site boundary, and then at a distance of 160m further down gradient of the site boundary (at the point of groundwater discharge into the Springhead Gutter.

It is noted it is not possible for LandSim to assess the fate of groundwater quality into a receiving surface water environment.

5.2 Model Results

The Models 1 to 3 LandSim files are provided in Appendix N, with results provided in Appendix O: graphical plots of the predicted substance concentrations are provided in Figure 12. A summary of the model results are provided in the below Table 9.

Key Leachate Indicator Parameters (Non Hazardous Substances)

Table 9. LandSim Model Output

Substance		Model 1 Operational 1985	Model 2 Aftercare 2026	Model 3 Aftercare 2030
Ammoniacal Nitrogen	Time of First Appearance, yrs[1]	7	9	9
	Time of Max Concentration, yrs	11	64	64
	Max Concentration, mg/l	104.6	21.2	21.5
Chloride	Time of First Appearance, yrs[1]	7	9	9
	Time of Max Concentration, yrs	11	64	64
	Max Concentration, mg/l	553.6	73.3	73.9

Note[1] Time of First Appearance represented modelled concentrations of greater concentration than those recorded in upgradient groundwater baseline conditions.

Other Key Leachate Parameters (Hazardous and Non-Hazardous Substances)

In Models 1 to 3, the maximum predicted concentrations of nickel, and both hazardous substances, benzene and lead, did not exceed the current laboratory limits of detection (for nickel and benzene 0.001mg/l, and for lead 0.0002mg/l) and therefore are not modelled to have any measurable impact on the downgradient groundwater and not therefore discussed further. This is substantiated by the results of routine groundwater monitoring data returned for nickel and lead and the first "one off" monitoring of organic substances undertaken in groundwater in 2025.

The first appearance and impact of both ammoniacal nitrogen and chloride on the modelled downgradient groundwater compliance point in Model 1 is predicted after a period of 7 years, whereas Models 2 and 3 predict a period of 9 years. SUEZ estimate that the most likely travel time for substances from Aldon Landfill Site to the modelled groundwater compliance point is approximately 10 years: the reduced travel times predicted are likely to be a product of the conservative nature of the modelling software estimating the minimum travel time. Although it is expected that the observed first appearance of chloride will occur in shorter time period than ammoniacal nitrogen, both share first appearance dates as a result of the background concentrations of ammoniacal nitrogen and chloride differing in the local groundwater environment.

It is in the timing and concentration of peak emission that the models are more clearly divided, with Model 1 predicting a considerably earlier time of max concentration – owing to the shorter duration of filling modelled – and greater maximum concentration, a result of the increased infiltration due to temporary and / or partial capping of the waste mass during the 1980s and greater leachate strength at the time. As the interim period between 1985 and 2026 saw the installation of a low permeability cap, and steady decrease in leachate strength, Models 2 and 3 predicted considerably lower peak concentrations of both key parameters, consistent with the observed groundwater monitoring data collected at the Site.

Models 2 and 3 predict two main peaks in both key substance concentrations, the first occurring approximately 15 years from the start of the model, consistent with the ending of Phases 1 to 3 filling, and a second larger peak after approximately 60 years, followed by an exponential decrease and steady tailing off of elevated concentrations long term.

The modelled difference between Model 2 and Model 3, representing the change from present active leachate management to passive management, is limited to a 1.4% increase in peak ammoniacal nitrogen concentrations (by+0.29mg/l above Model 2), and a 0.9% increase in peak chloride concentrations (at 0.66mg/l above Model 2). The change in output between Models 2 and 3 is very minor and not indicative of any statistically measurable change in downgradient impact from the site.

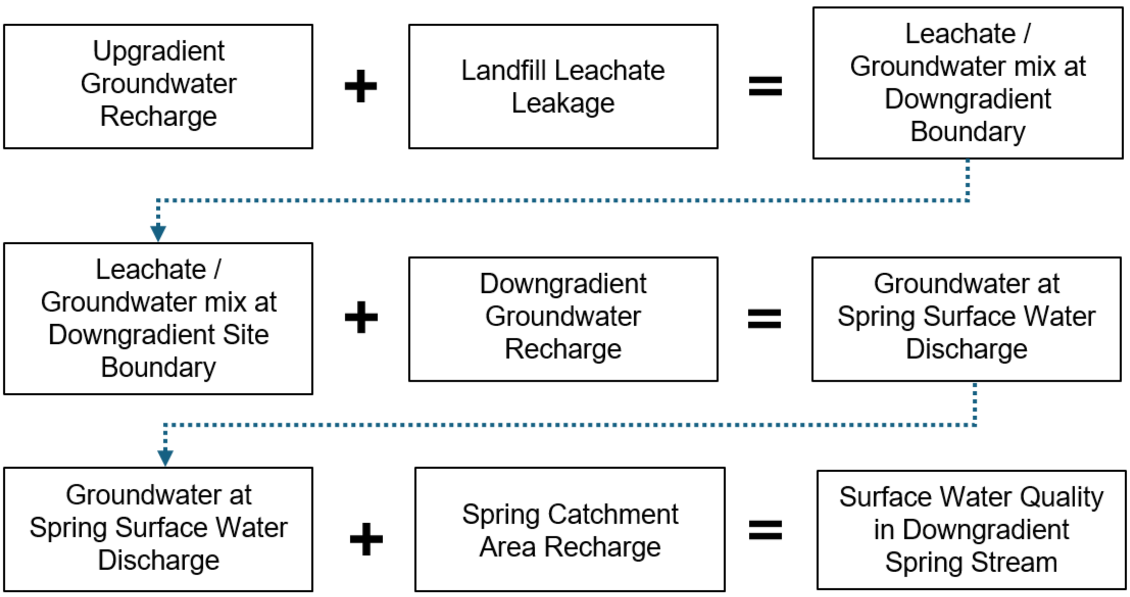
Models 1 to 3 produced a negligible difference in the predicted concentrations of all modelled substances at the 160m further down gradient monitoring point representing the point of groundwater discharge into the Springhead Gutter.

6 Discussion

6.1 Review of Observed and Modelled Changes in Water Quality at the Site

From updating and defining the Conceptual Site Model for the Site as it approaches the start of its fourth decade of managed aftercare, SUEZ has defined the relationship between leachate leakage from an unlined landfill site into the local water environment to be as follows:

Summary of Relationship between Landfill Leachate Leakage and the Local Water Environment



Which proposes:

The leakage rate from the site in aftercare in late 2025 / into 2026 at 6,890m^3/year mixes with an upgradient groundwater flow of approximately 12,640m^3/year to give a simple dilution ratio of approximately 1 part leachate : 2 parts groundwater.

Below the Site, mixed groundwater and leachate moves downgradient away from the Site boundary to enter the Springhead Gutter stream where the stream catchment provides further dilution of the leachate / groundwater contribution by a factor of approximately 1 part groundwater / leachate : 10 parts surface water dilution.

All of the above modelling work conservatively assumes limited retardation of contaminants moving within a fissure dominant aquifer system.

Groundwater quality down gradient of the Site has been observed to have improved over recent decades following the capping of the Site in the late 1990s. Such a response is consistent with the change in Conceptual Site Model for a non-engineered dilute and disperse landfill site when the site transitions from an operational phase to an aftercare phase of management.

Using both semi-quantitative and then full quantitative modelling techniques, it has been possible to develop robust numerical models to assess the past, current and future impacts of the Site on the local groundwater environment, with appropriate adjustment of key model parameters to reflect different water inputs / outputs from the Site during each of the three key phases considered by SUEZ.

As discussed in the Section 3 of this report, the impact from the Site on the groundwater quality downgradient is primarily limited to AL1/01W, the point 10m south of the Site. Groundwater quality in this monitoring point historically recorded concentrations of ammoniacal nitrogen and chloride at up to 70mg/l and 200mg/l respectively, and it has been possible to calibrate in a credible leakage rate / flux in 1985 to give rise to these concentrations in groundwater. The slight disparity in modelled results versus observed concentrations at AL1/01W is the timing of the peak concentration as the model predicts an elongated latter peak, reflecting a possible overestimation of the travel time from the Site to the monitoring point.

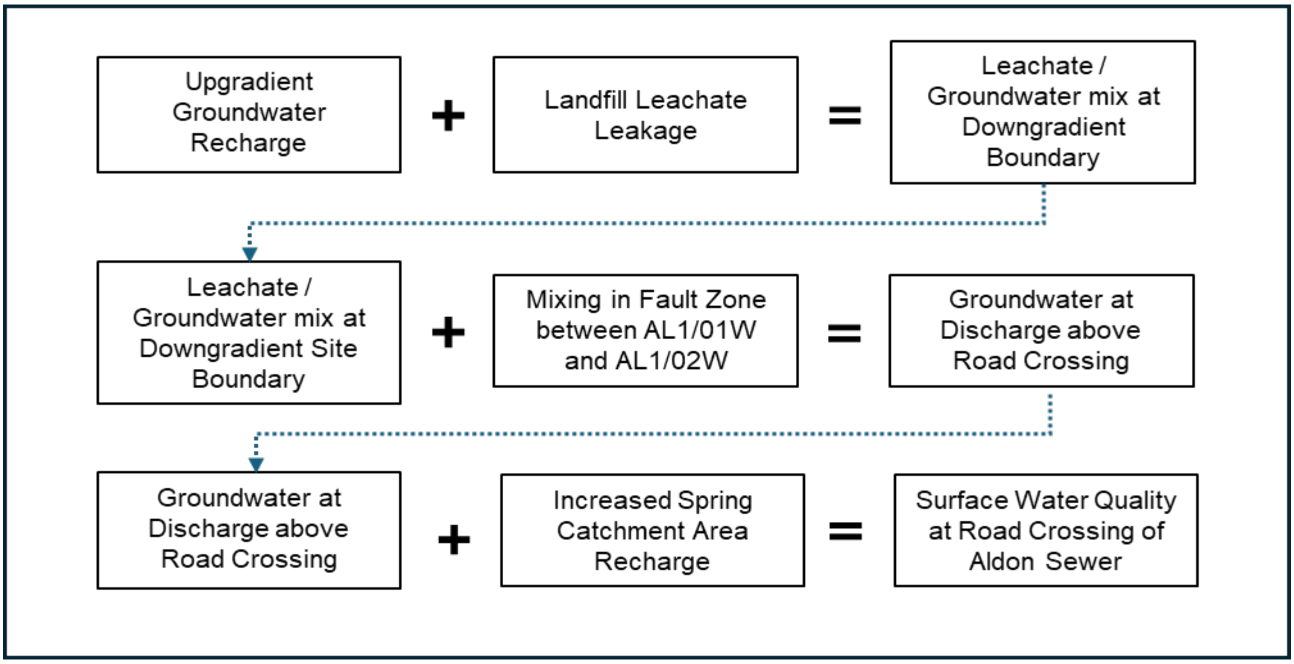
The groundwater passing underneath the Site to the downgradient wells 10m to 130m south eventually contributes to the baseflow of the spring steam located 160m south of the landfill site, monitored by spring water point AL1/07W. Based on the water mass balance (Appendix L) for the Site and surrounding environment, the contribution of the landfill leachate currently entering the water environment equates to approximately 3.7% of the water catchment downstream of the Site. With the ceasing of active leachate extraction, this figure increases by 0.3% further demonstrating the very low impact on the environment should active leachate management end at the Site.

Although recent surface water quality samples have not been collected as a result of the discharge being insufficient or dry, all monitoring that has been carried out indicates that there has not been a recorded impact on this water from the Site. This is likely to be reflective / supportive of groundwater flow in a fissure dominated environment, which may locally by-pass immediate points of discrete monitoring. As such, SUEZ has proposed a new and extended wider monitoring programme of the receiving surface water stream to ensure that the impact of all groundwater passing beneath the Site is assessed at appropriate locations.

6.2 Alternate Groundwater: Surface Water Connection / Linkage

As discussed above in Section 3.2.3, there is anecdotal evidence to suggest there is a possible permeable fault zone between groundwater wells AL1/01W and AL1/02W based on Site reports prepared in the early 1990s. This would be supported by the limited evidence of impact on groundwater quality observed in AL1/02W compared to that observed in AL1/01W.

The alternate overview of the relationship between leachate leakage from an unlined landfill site into the local water environment would be as follows:



It is noted that in both scenarios identified by SUEZ, the source is unchanged as is the receiving surface water quality point of assessment within the environment.

6.3 Proposed Transition to Passive Leachate Management

From the detailed assessment approach set out in this report, SUEZ is proposing to move the Site into a passive leachate management phase while noting the requirements of the Environment Agency to retain key aspects of Site's active leachate management systems, should recommencement of leachate extraction be required at a future date. At Aldon Landfill Site, this would require retaining the Site's leachate storage tank, compressor and leachate pumps – albeit with the systems left in a condition that the infrastructure could be recommissioned in the event that leachate levels rise to approach surface cap limits. Details of this are contained in the 2026 Leachate Management Plan included as Appendix B.

SUEZ has proposed a detailed and extended programme of leachate, groundwater and surface water monitoring at the Site to ensure that resources are redirected to best manage the residual leachate source term through the second half of the Site's aftercare period while ensuring completion of a contemporary programme of environmental monitoring of both local groundwater and also – going forward – local surface water quality. While unlikely to occur, appropriate assessment of any risk of leachate breakout at the Site surface has been addressed by SUEZ by the retention of an appropriate Leachate Action Level in the Central Area of the Site.

7 Requisite Surveillance

In order to continue monitoring emissions at Aldon Landfill Site, it is appropriate to review the current requisite surveillance as per the current MMP (SUEZ, 2018), and update where appropriate in line with published Environment Agency guidance.

7.1 Leachate Monitoring and Limits

Currently leachate level is monitored on a quarterly basis, with quality monitoring carried out annually. Leachate level compliance limits are set for AL2/04L and AL5/01L at 231.05m AOD, and 234.9m AOD respectively, with the limit for AL2/04L being unachievable as discussed in Sections 2 and 3.

In line with the findings of this report, it is proposed to amend the current leachate level trigger level with a single future Action Level - set to ensure surface breakout of leachate at ~249mAOD does not occur - as provided in Table 10.

Table 10. Proposed Leachate Action Levels

Leachate Level – Compliance Schedule	
Monitoring Points	**Action Level**
AL2/04L, AL5/01L	245m AOD

An updated monitoring schedule for leachate quality and level monitoring to support the revised leachate level limit is provided in the below Table 11. Amendments to this schedule include the addition of BTEX products testing and the removal of temperature testing.

Table 11. Proposed Updated Leachate Monitoring Schedule

Leachate – Monitoring Regime		
Monitoring Points	**Frequency**	**Determinands**
AL2/04L, AL5/01L, AL/03L and AL/04L	Quarterly	Leachate Level
AL2/04L, AL5/01L, AL/03L and AL/04L	Annually	Dip to Base
AL5/01L	Annually	Ammoniacal Nitrogen, BOD, Cadmium, Calcium, COD, Chloride, Copper, Chromium, Electrical. Conductivity, Iron, Lead, Magnesium, Manganese, Nickel, pH, Potassium, Sodium, Sulphate, Zinc, BTEX substances

7.2 Groundwater Monitoring

Currently both groundwater level and quality monitoring is carried out on a six-monthly basis (hard dip to base is carried out annually) with no Action Levels or Compliance Limits.

Based on the findings of this report, it is deemed appropriate to introduce new Action Levels for the two key landfill emission substances, ammoniacal nitrogen and chloride, in all downgradient points in order to respond effectively to any increased concentration trends. Proposed Action Levels are provided in Table 12 below.

Table 12. Proposed Updated Groundwater Compliance Schedule

Groundwater – Compliance Schedule		
Monitoring Points	**Parameter**	**Action Level (mg/l)**
AL1/01W	Ammoniacal nitrogen	12
	Chloride	50
AL1/02W	Ammoniacal nitrogen	0.5
	Chloride	30

These Action Levels are based on the 95th percentile values for each groundwater monitoring point from 2020 to present, in order to highlight whether any sustained increasing trend in concentration occurs in the future. These Action Levels will be subject to future review in an upcoming HRA to determine whether they remain suitable or require revising with additional groundwater quality data.

It is proposed to revise the monitoring frequency of groundwater down gradient of the site to reflect the possible transition period associated with the ending of leachate management and also to be aligned to a broader range of surface water monitoring (as detailed in Section 7.3). The revised schedule is provided in Table 13.

Table 13. Proposed Updated Groundwater Monitoring Schedule

Groundwater – Monitoring Regime		
Monitoring Points	**Frequency**	**Determinands**
Up gradient AL1/03W	Annually	Ammoniacal nitrogen, chloride, electrical conductivity, pH, calcium, magnesium, potassium, sulphate, sodium, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, BTEX substances.
Down / Cross gradient AL1/01W, AL1/02W, AL1/04W	Quarterly*1	Level, Ammoniacal nitrogen, chloride, electrical conductivity, pH,
	Annual	Dip to Base (m) calcium, magnesium, potassium, sulphate, sodium, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, BTEX substances.

Note 1. Monitoring frequency to be reviewed after a period of 6 years post ending of leachate management.

SUEZ note that the parameters / determinands listed above – while meeting all current requirements of published guidance on landfill monitoring within Technical Guidance Note LFTG02 – may evolve under discussion with the Environment Agency when new guidance for groundwater sampling of persistent organic pollutants (under development by the Environment Agency in 2026) is published and implemented.

7.3 Surface Water Monitoring

Currently, the single surface water monitoring point is tested for quality on a six-monthly basis however, this monitoring has not been possible due to the point discharge being insufficient for sampling or dry. It is therefore proposed to add in an additional surface water monitoring point, AL7/02W (National Grid Reference SO 43138 79608), located in the Springhead Gutter approximately 150m south east / downstream of AL7/01W. This location will benefit from a continual headwater feed above the sampling point, reducing the number of dry sampling events. It is however proposed to retain AL7/01W despite its frequent insufficient / dry for sampling status.

At these points, it is proposed to increase monitoring to a quarterly basis, with an expanded list of parameters for testing including the addition of hazardous BTEX substances – provided in Table 14 below.

Table 14. Revised Surface Water Monitoring Schedule

Surface Water – Monitoring Regime		
Monitoring Points	**Frequency**	**Determinands**
AL7/01W, AL7/02W	Quarterly	Ammoniacal nitrogen, chloride, pH, suspended solids, visual oils.
	Annually	As above plus: calcium, magnesium, potassium, sulphate, sodium, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, BTEX substances.

SUEZ note that in obtaining sufficient data to characterise changes in surface water quality over time, samples may be analysed for annual suites for every quarterly sample obtained in the stream until sufficient data has been obtained to enable contemporary statistical trend analysis if required. Reflecting the known importance of surface water quality down gradient of the Site, SUEZ will undertake additional 'ad hoc' samples of surface water quality for varying analysis suites outside of the regular Revised Surface Water Monitoring Schedule.

7.4 Updated Contingency Actions for Breaches of Action Levels and Compliance Limits

It is necessary to update the actions in the event of a leachate level compliance limit breach, and to introduce new contingency actions in the event of a groundwater quality action level breach.

The current leachate level contingency action plan is provided in Table 15 below, with the updated contingency actions in the event of a leachate level compliance limit breach provided in Table 16.

Table 15. Current Leachate Level Contingency Action Plan

Contingency Action	Response Time	Responsibility
Leachate shall be pumped to a bunded storage tank prior to removal from the site	24 hours	Site Manager
Submit a report to the Environment Agency containing all leachate level, volume and quality data	Annually	Risk Team

Table 16. Revised Future Leachate Level Contingency Actions (including reinstatement of active extraction)

Leachate Level – Action Level Exceedance		
On exceeding the Leachate Action Level	**Response Time**	**Responsibility**
Notify Site Management, Technical Team and EIR Team.	24 hours	Aftercare Team
Confirm data and trends over time	7 days	Aftercare Team / Site Management
Define the actions required to reinstate active leachate extraction from the Site	28 days	Aftercare Team / Site Management
Complete a preliminary assessment of causes / risk associated with rise in leachate level(s)	28 days	Aftercare Team / Technical Team
Notify the EA of findings and proposed outcomes should active leachate management be required	2 months	Site Management / EIR Team

The proposed contingency actions which are to be followed in the event of a groundwater quality Action Level breach are provided in Table 17 below.

Table 17. Proposed Future Groundwater Action Level Contingency Actions

Groundwater Quality – Action Level Exceedance		
Contingency Action	**Response Time**	**Responsibility**
Notify Site Management, Technical Team and EIR Team	24 hours	Aftercare Team
Check with the laboratory to confirm the accuracy of the results and QA procedures	1 week	Aftercare Team
Where required, undertake a repeat sample following return of the laboratory data	1 month	Aftercare Team
In the event of three consecutive exceedances, inform the EA and complete an internal technical review of groundwater network and assess risk to the environment	3 months	Site Management, EIR Team

7.5 Reporting and Review

In updating both the leachate and (in parallel) gas management techniques / compliance arrangements (discussed under separate cover), SUEZ will:

- Submit an annual monitoring review for the Site to the Environment Agency to confirm the stability of emissions to the environment (as reflected in leachate and groundwater quality) each year for 3 years after variation of the permit and to report to the Environment Agency time series graphs of key monitoring data sets obtained at the Site.

- Submit a full HRA Review scheduled for 2032. However, earlier remodelling of the Site will be completed in the event of groundwater quality having a significant and sustained adverse change from that modelled in this report.

8 Conclusions

This Hydrogeological Risk Assessment has been prepared by SUEZ Recycling and Recovery UK Ltd (‘SUEZ’) for Aldon Landfill Site (‘the Site’) which is regulated under Environmental Permit EPR/QP3999CD (‘the Permit’) held by Shropshire Waste Management Limited.

With the Site approaching the mid-point of its formal period of aftercare, SUEZ has taken the opportunity to review and - as required - redefine the site’s Conceptual Site Model to quantify the relationship between the residual leachate source term and the receiving water environment. The Hydrogeological Risk Assessment has then been extended to assess the potential impact that would arise from ending active leachate extraction from the two extraction points present within the fully restored landfill footprint covering an area of approximately 10Ha.

It is only with the passing of time – now 32 years after the issue of the first Waste Disposal License in the final years of filling of the site – that assessment can be made on the purpose / intent of the instruction in 1994 to start formal leachate extraction in the last operational area of the Site and to impose arbitrary leachate level limits in the two points of abstraction. Without any basal lining system or engineered leachate drainage blanket within the Site, active leachate management at Aldon Landfill Site has only affected leachate egress into groundwater in one specific small area of the site. With the site now fully capped and in an extended period of aftercare, the impact of leachate removal from the site compared to the residual leakage rates from the remainder of the Site is considered to be of very little environmental benefit to the local water environment. From this assessment completed by SUEZ, it is concluded that ending of leachate extraction at the Site would not adversely affect the quality of groundwater or surface water in the locality of the Site when compared to the residual impact of the dilute and disperse / attenuate landfill that was developed from the 1960s up to February 1994. The assessment highlights the challenges that arose in the introduction of new and at the time arbitrary environmental standards and approaches through the Environmental Protection Act (1990) and subsequent Waste Management Licensing Regulations (1994) without an understanding or appreciation of risk, recognising that the development and understanding of landfill risk assessment approaches has developed over the past 30 years.

In producing this HRA for Aldon Landfill Site, SUEZ has drawn upon all current published guidance on completing a groundwater risk assessment and the Environment Agency Internal Guidance Note on how to transition a site from active leachate management to passive or semi passive management methods and as such have:

- Presented the environmental setting and regulatory history of the Site;
- Defined a contemporary Conceptual Site Model (CSM) for source, pathway, and receptor linkages;
- Developed Semi-Quantitative Impact Models for the Site under three defined scenarios:
    - Model 1: operational period with active leachate management;
    - Model 2: aftercare period with active leachate management; and

- Model 3: aftercare period with passive leachate management, but on-going environmental monitoring of leachate, groundwater and surface waters.

- Developed Quantitative Impact Models for the Site under each scenario supported by appropriate use of LandSim modelling software to verify the change in impact on groundwater quality down gradient of the Site.
- Proposed an updated Requisite Surveillance for the Site to continue to provide appropriate assurance of the residual leachate impact on the local water environment at the site.
- Updated the Leachate Management Plan for the Site.

With leachate in the Site being now an aged source term as the 30th anniversary of the end of active waste placement approaches, few hazardous substances remain in leachate at the Site. Ending active leachate management will not result in any discernible and unacceptable increase from the risk of Hazardous Substances entering the wider water environment.

The results of the modelling of ending active leachate management at the two pumped wells located in the final cell filled at the Site indicate that there would be a very small increase in two key water quality parameters (chloride and ammoniacal nitrogen) immediately downgradient of the Site. This would in time be translated into an even smaller increase of both determinands in the receiving surface water stream, the Springhead Gutter. However, the magnitude of the increase in both key substances in groundwater is within the range of existing and current groundwater quality monitored at the Site since the 1990s through to the range of current groundwater quality monitored in 2026.

With no active management of landfill gas, the ending of leachate extraction at the Site would mark the move of the Site from an active management phase into a semi-passive management phase with the Site continuing to be monitored while retaining the ability – if ever required – for leachate pumping to be recommenced. In looking to adhere to the core guidance principles developed by the Environment Agency for progressing leachate management at a landfill from active to semi-passive status, SUEZ has proposed an extended range of water monitoring locations downgradient of the Site and has revised leachate management limits to ensure that surface breakout of leachate does not occur. This would require Condition D16 of the Site's Permit to be replaced with an alternate wording or to be formally revoked.

While this report is one of the first prepared by the UK landfill sector to end leachate extraction, it is acknowledged that

(a) leachate management at the Site cannot continue in perpetuity - with the sole aim of continued extraction being to try to seek the lowest possible residual impact of a landfill on the water environment; and

(b) there has to be recognition of the history and era of both the development and then licensing of the Site in understanding the residual risk(s) posed by the site to the water environment from 2026 onwards - noting the Site was developed without any basal lining system or the ability to collect and remove leachate in an engineered manner from the base of the waste mass.

It is noted that all monitoring schedules presented by SUEZ for the future long-term monitoring arrangements at the Site reflect current published guidance by the Environment Agency for the monitoring of landfill sites and that these requirements may evolve with time in response to changes in the regulatory approaches for closed, aged landfills such as Aldon.

9 References

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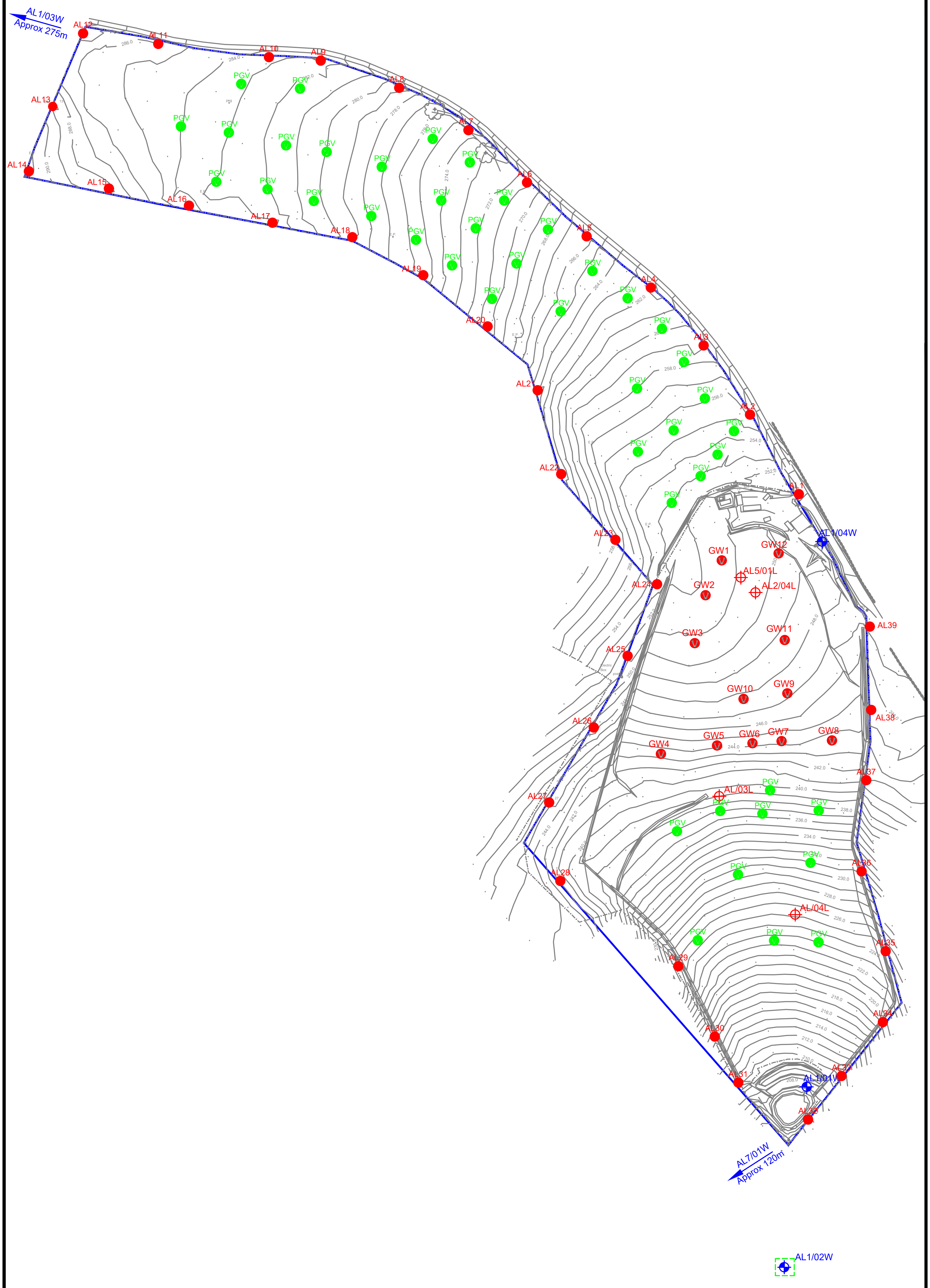
SUEZ, 2025. Aldon Landfill Site. Review of the Approach to Perimeter Gas Compliance.

Recycling and recovery UK

Figures

Figure 1. Aldon Monitoring and Extraction Point Plan (MEPP)



Notes

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PPC Boundary and Licence Boundary WML 479

Groundwater Monitoring Point

Gas Monitoring Point

Leachate Monitoring Point

Surface Water Monitoring Point

GW1 Gas Vent

PGW Passive Gas Vent

Rev	subject	date

suez

Darwen Resource Recovey Park, Lower Eccleshill Road, Darwen, BB3 0RP
Tel:(01254)819700, Fax:(01254)819749, Email: richard.bisset@suez.co.uk

Site: Aldon Landfill Site

Title: Site Monitoring Plan

Scale: 1:2500 on A3

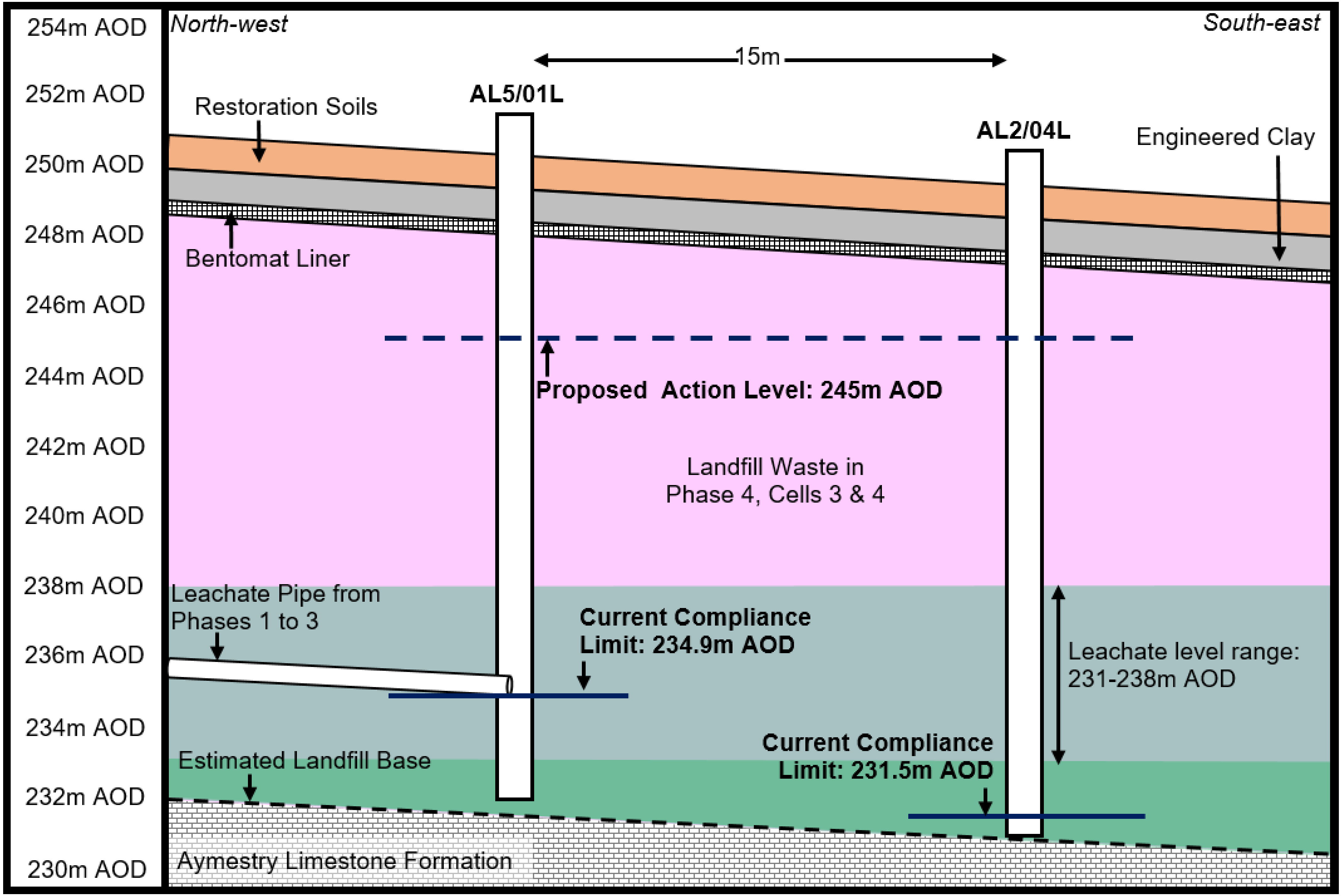
Date: March 2026

Drawing Ref: Ald-P4-0326-01

Drawn by: RB

Checked by: TW

Figure 2. Phase 4, Cells 3 & 4 Leachate Technical Section

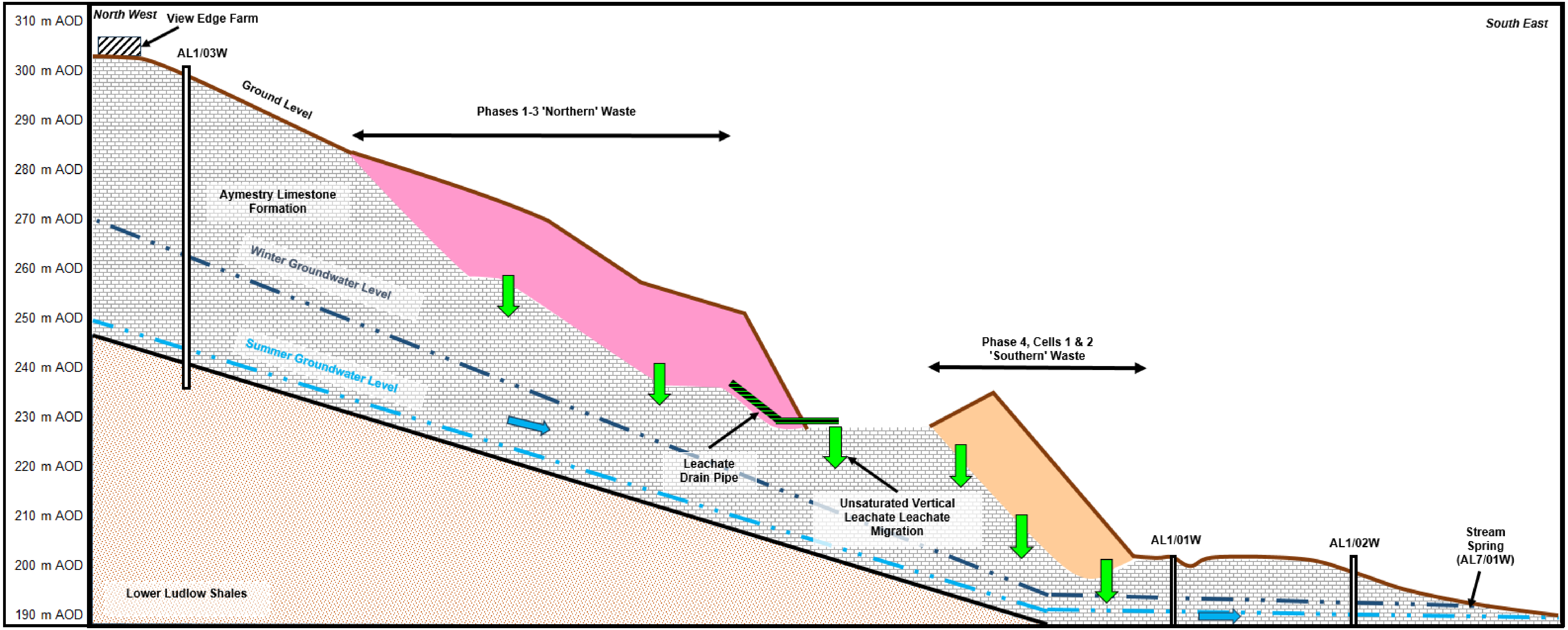


254m AOD
252m AOD
250m AOD
248m AOD
246m AOD
244m AOD
242m AOD
240m AOD
238m AOD
236m AOD
234m AOD
232m AOD
230m AOD
North-west
South-east
15m
AL5/01L
AL2/04L
Restoration Soils
Engineered Clay
Bentomat Liner
Proposed Action Level: 245m AOD
Landfill Waste in Phase 4, Cells 3 & 4
Leachate Pipe from Phases 1 to 3
Current Compliance Limit: 234.9m AOD
Leachate level range: 231-238m AOD
Current Compliance Limit: 231.5m AOD
Estimated Landfill Base
Aymestry Limestone Formation

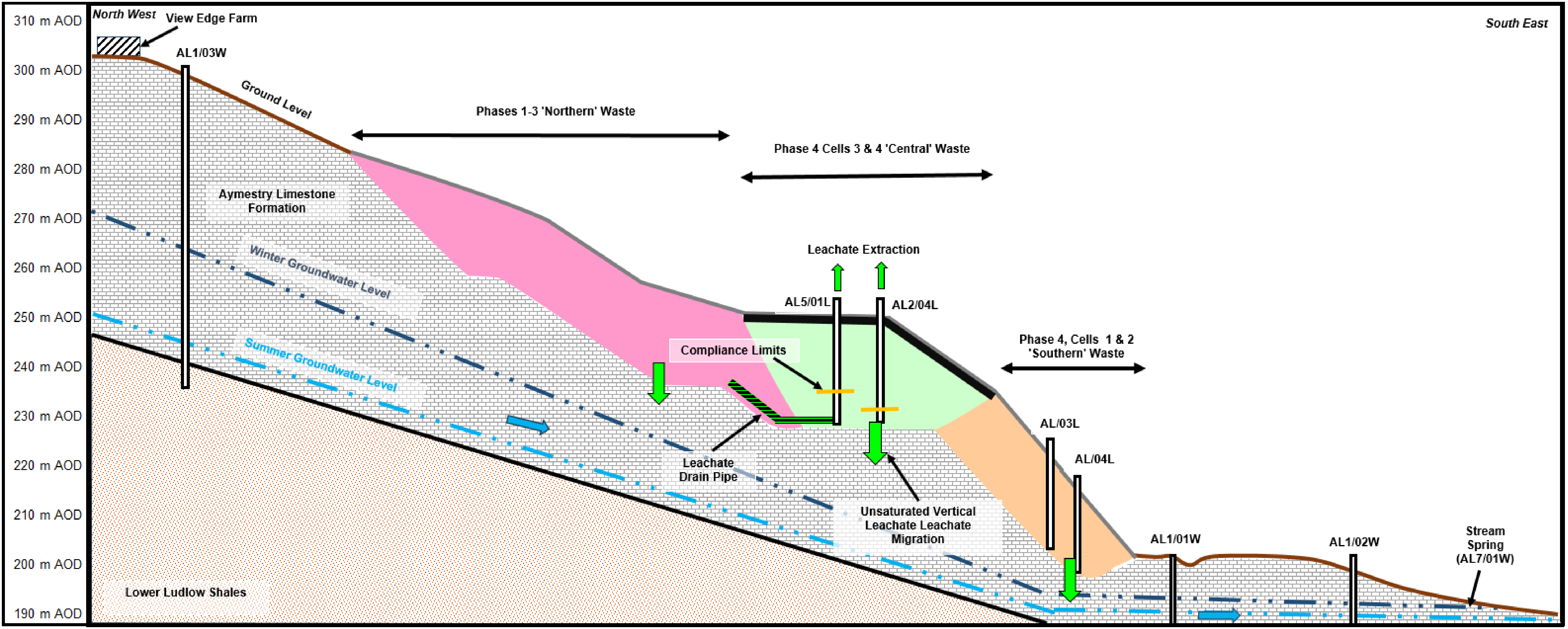
General

Figure 3. Conceptual Site Model

Aldon Landfill Site Conceptual Site Model: Operational Phase



Aldon Landfill Site Conceptual Site Model: Aftercare Phase with Active Leachate Management



Aldon Landfill Site Conceptual Site Model: Aftercare Phase with no Active Leachate Management

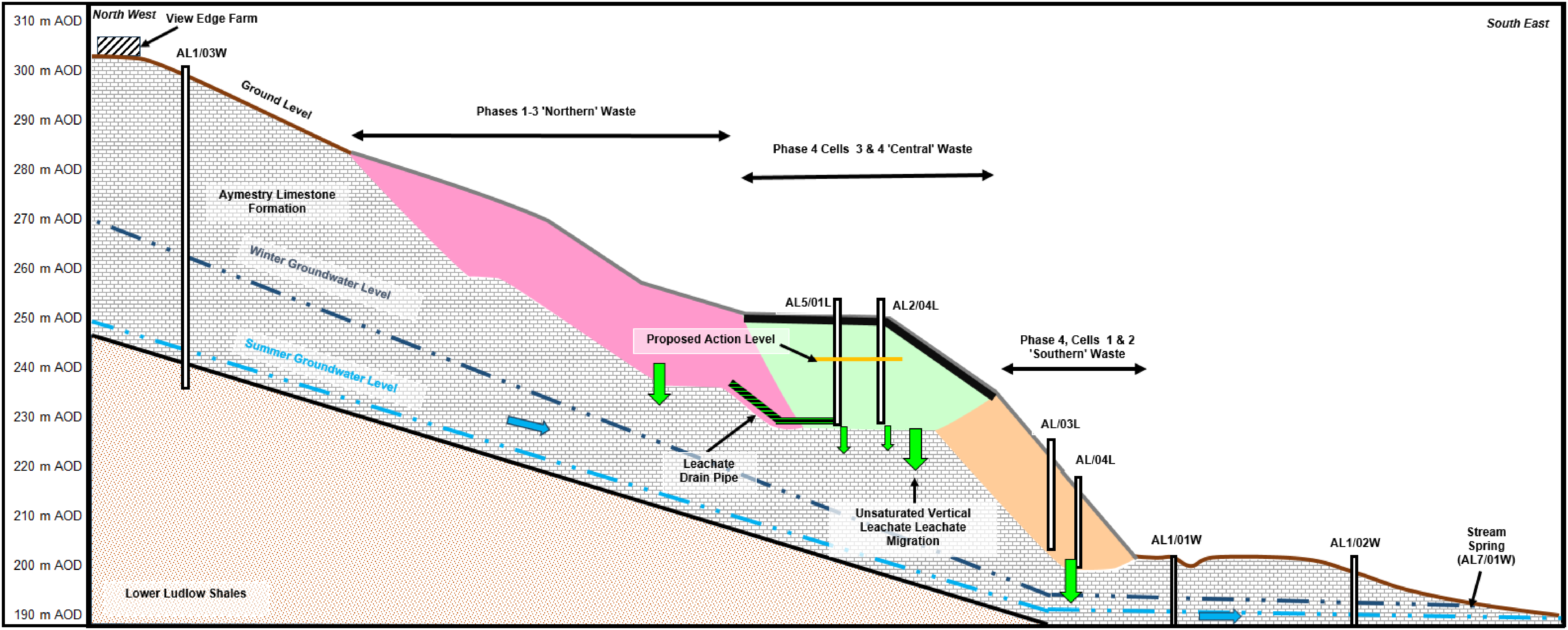
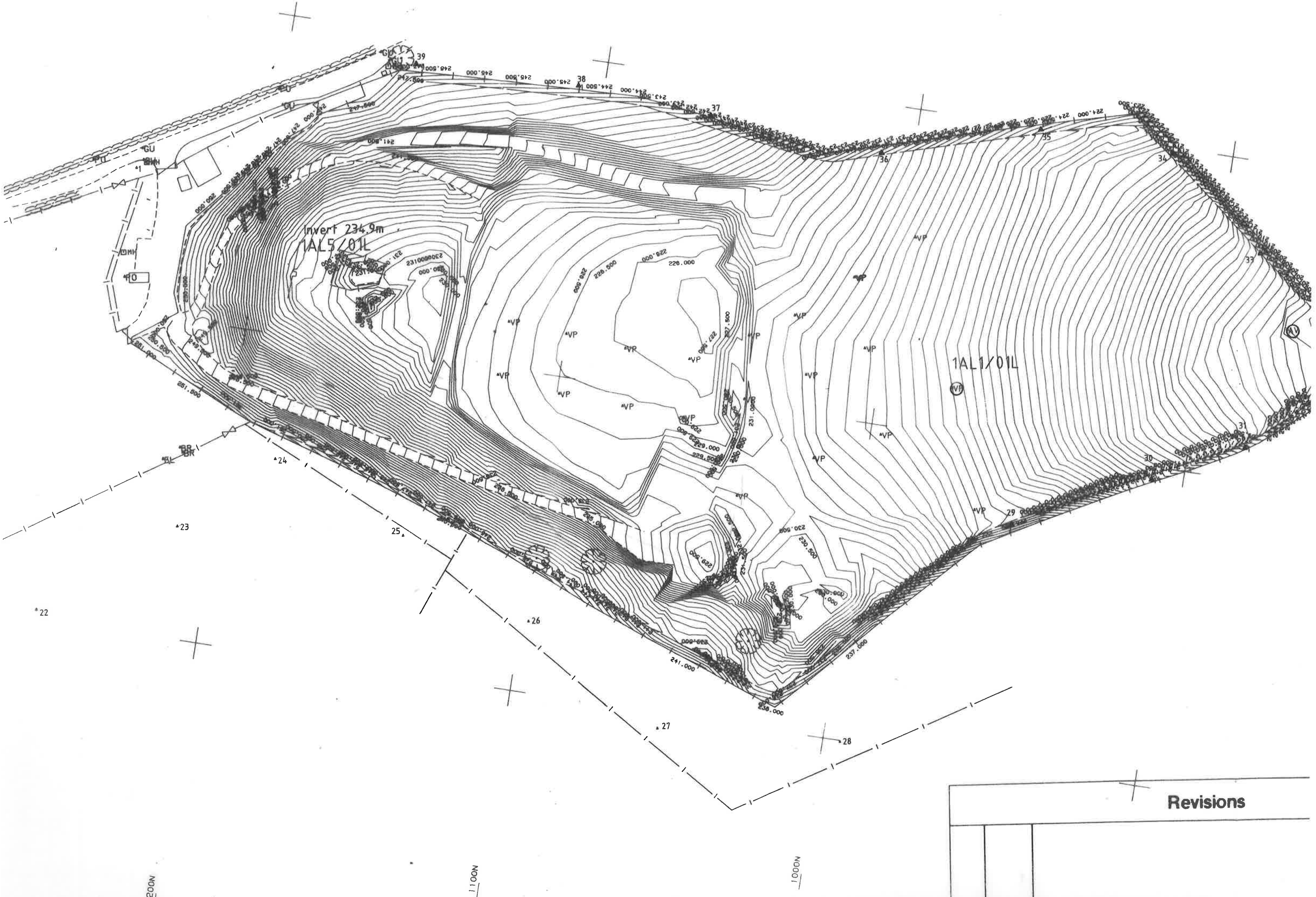
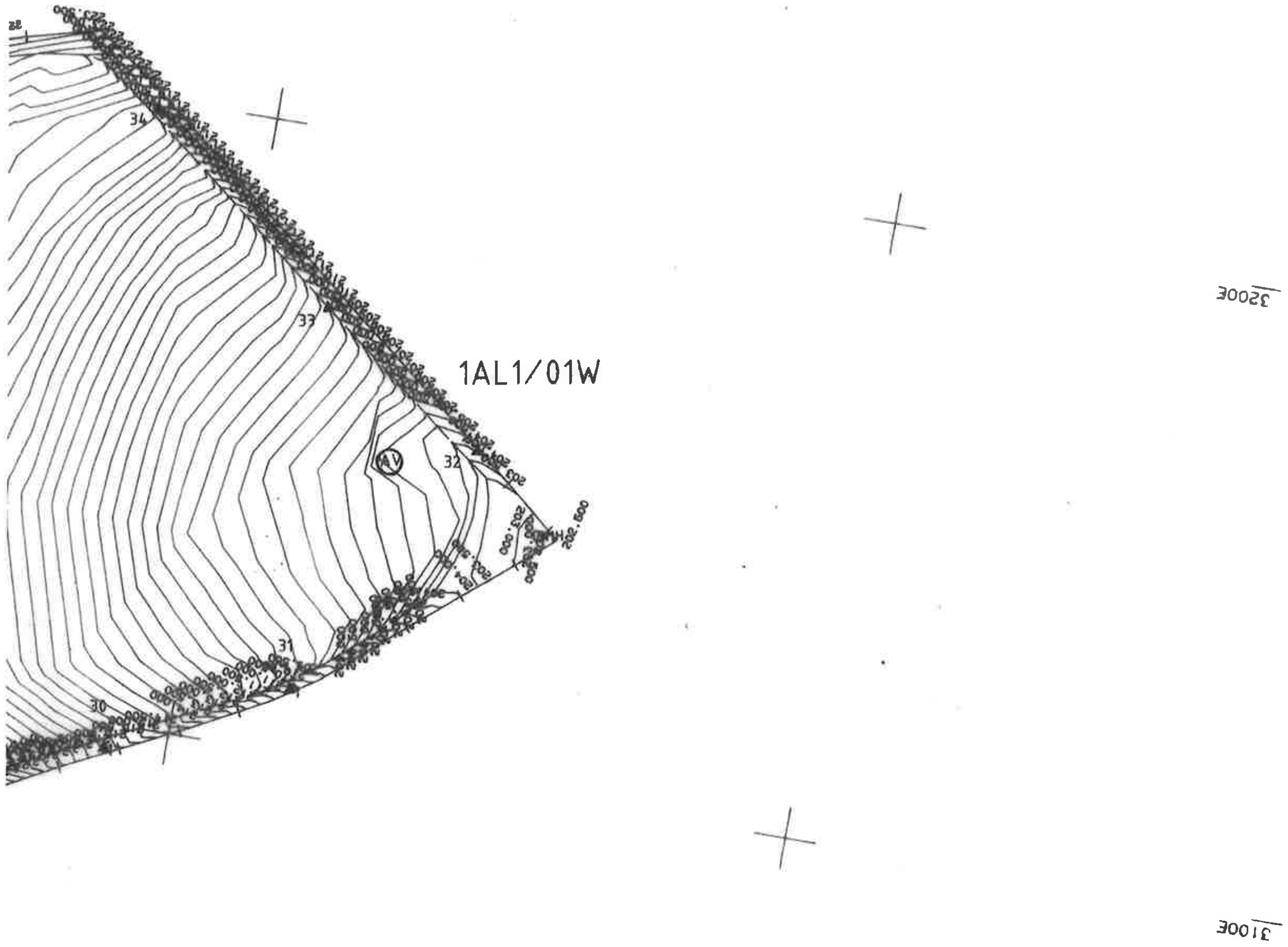


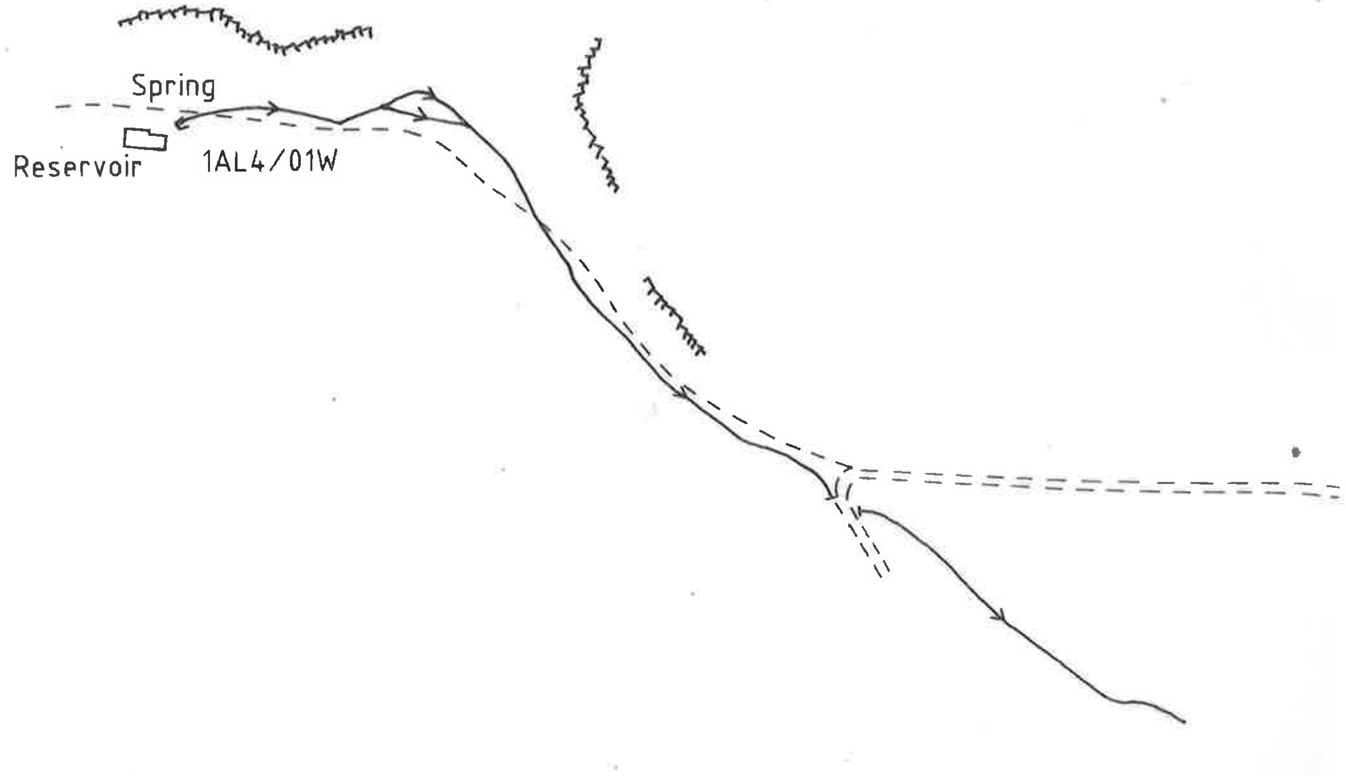
Figure 4. Drawing ALWP069303 June 1993



Revisions


1AL1/03W
Restored Phases
1000N
900N
800N
Aldon Waste
Disposal Site (Active)
80
3300E
1AL1/01W
1AL1/02W
Spring
Reservoir
1AL4/01W





INSET: Scale:- 1:2500

Key:-

▲VP Gas Vent.

▲3 Gas monitoring point.

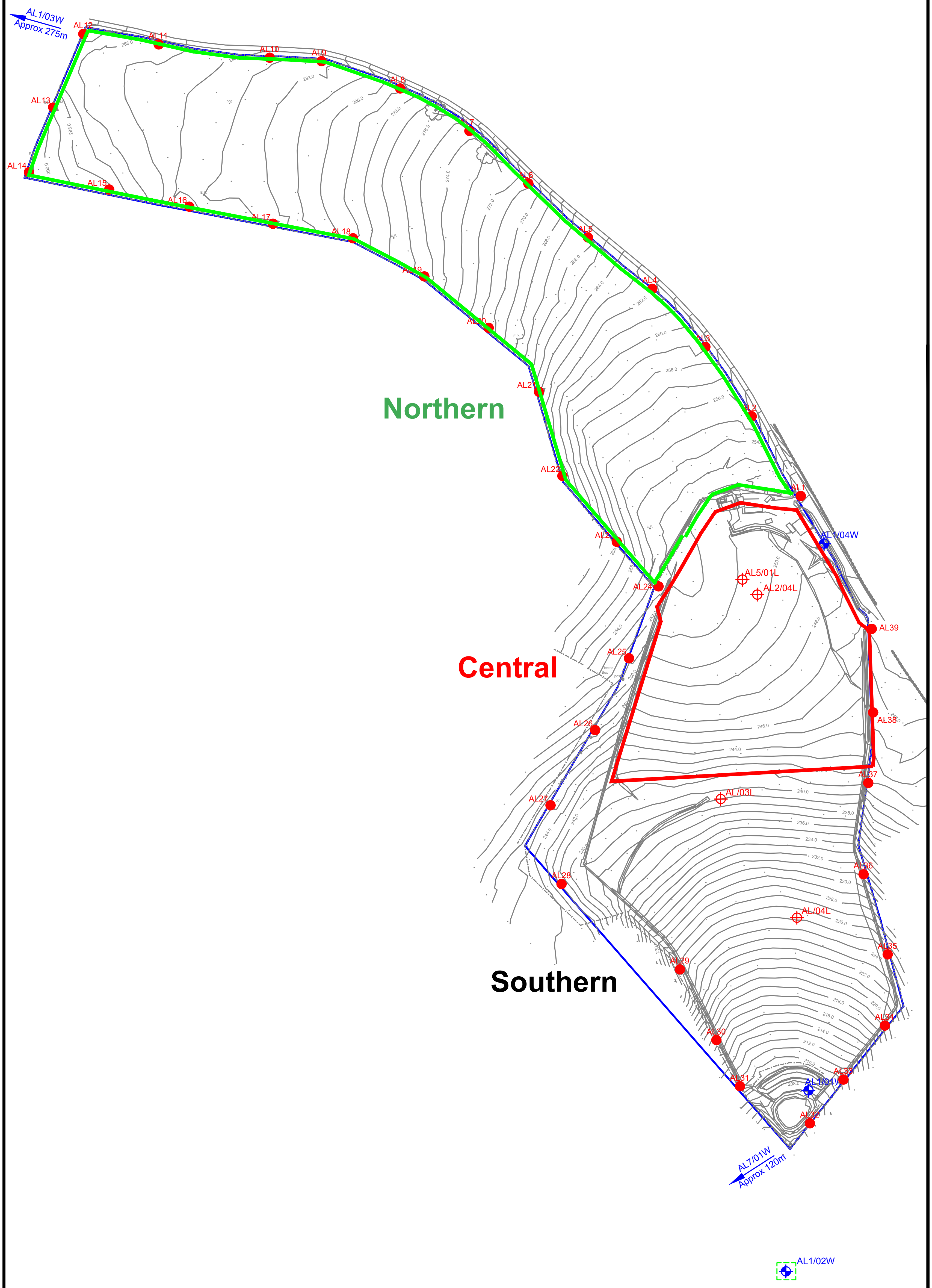
○ Leachate/water monitoring point.

Rock Outcrop.

Track.

Revisions	DRAWN: M.G.L.		ALDON REFUSE SITE WATER MONITORING POINTS
	TRACED:		
	CHECKED:		
	DATE: JUNE 1993		Scale 1 / 1000 — Drg. No. AL/WP/0693/03

Figure 5. Aldon Landfill Areas



Notes

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PPC Boundary and Licence Boundary WML 479

Groundwater Monitoring Point

Gas Monitoring Point

Leachate Monitoring Point

Surface Water Monitoring Point

Rev	subject	date

suez

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Tel:(01254)819700, Fax:(01254)819749, Email: richard.bisset@suez.co.uk

Site
Aldon Landfill Site

Title
Site Monitoring Plan

Scale
1:2500 on A3

Date
June 2018

Drawing Ref
Ald-P4-0618-01

Drawn by
RB

Checked by
EW

Figure 6. Leachate Level Graphs

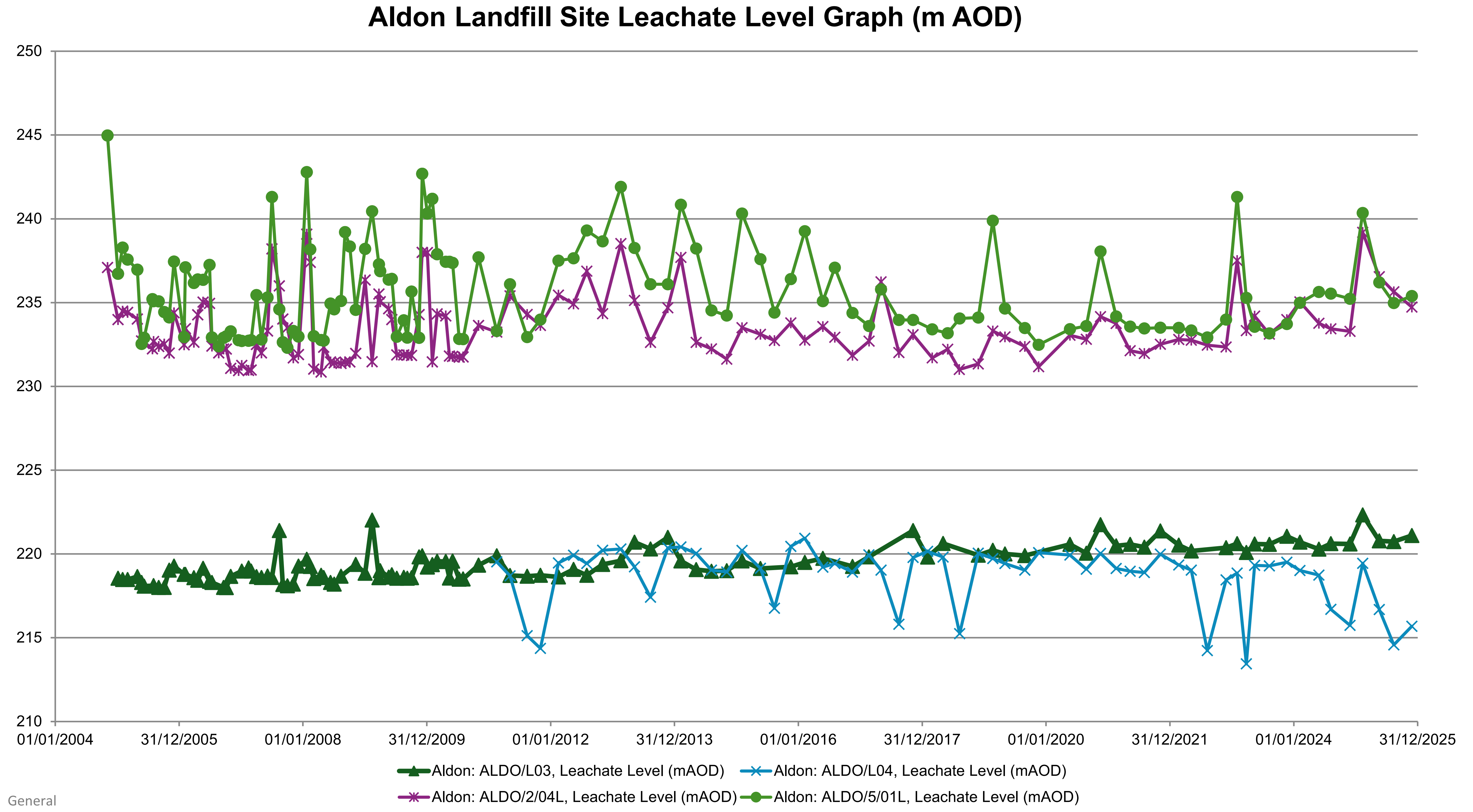
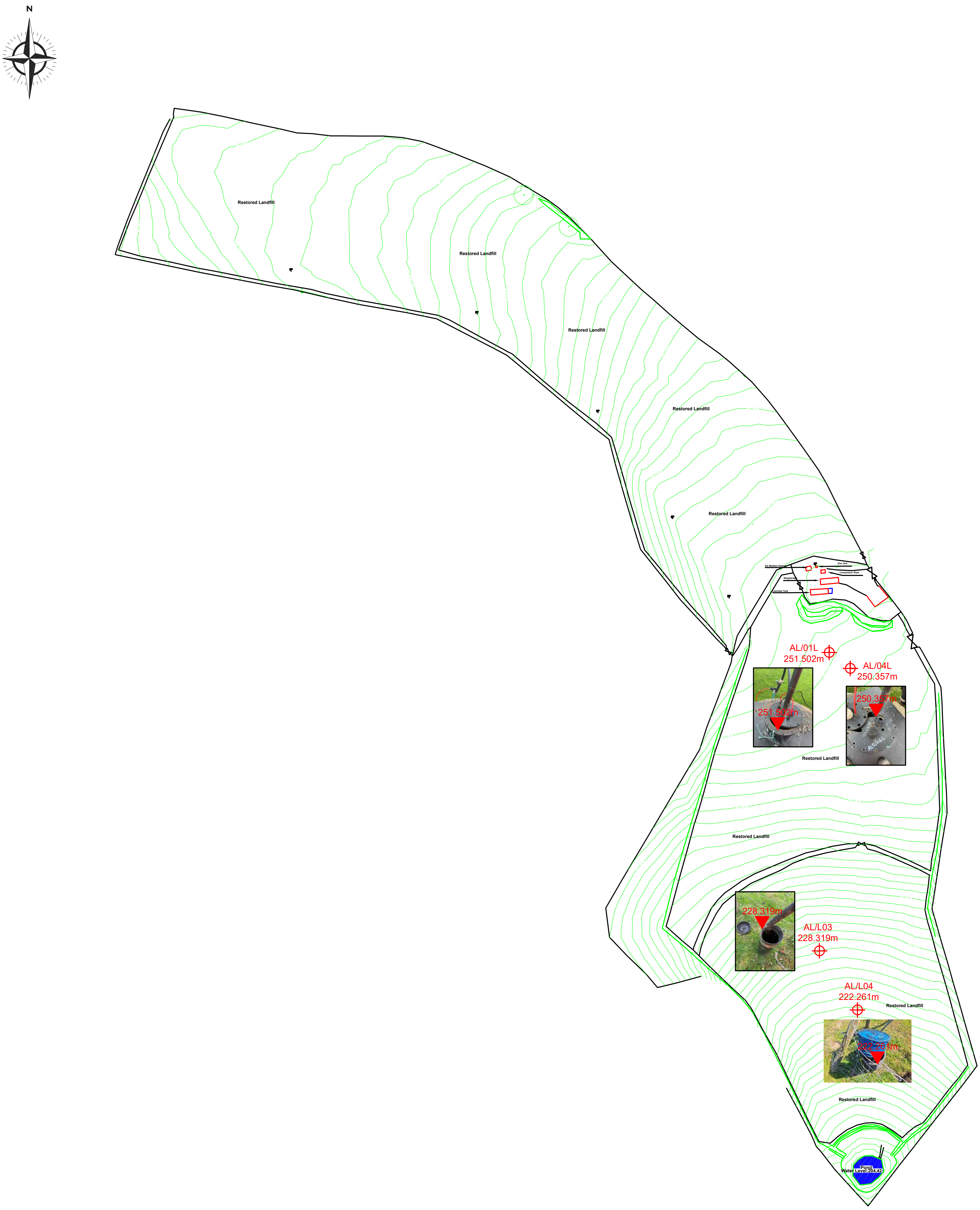

Aldon Landfill Site Leachate Level Graph (m AOD)
250
245
240
235
230
225
220
215
210
01/01/2004
31/12/2005
01/01/2008
31/12/2009
01/01/2012
31/12/2013
01/01/2016
31/12/2017
01/01/2020
31/12/2021
01/01/2024
31/12/2025
Aldon: ALDO/L03, Leachate Level (mAOD)
Aldon: ALDO/L04, Leachate Level (mAOD)
Aldon: ALDO/2/04L, Leachate Level (mAOD)
Aldon: ALDO/5/01L, Leachate Level (mAOD)

Figure 7. Leachate Well Survey. October 2025



Notes

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Leachate Well

0 80m 200
Metres
1:2500

Darwen Resource Recovey Park, Lower Eccleshill Road, Darwen, BB3 0RP
Tel:(01254)819700, Fax:(01254)819749, Email: richard.bisset@suez.com

Site	Aldon Landfill Site	Scale	1:2500 @ A3	Drawn by	JA
		Date	October 2025		
Title	Leachate Well Survey	Drawing Ref	Ald-MON-1025-01	Checked by	CD

Rev	subject	date

Figure 8. Leachate Drawdown Pumping Test Graphs

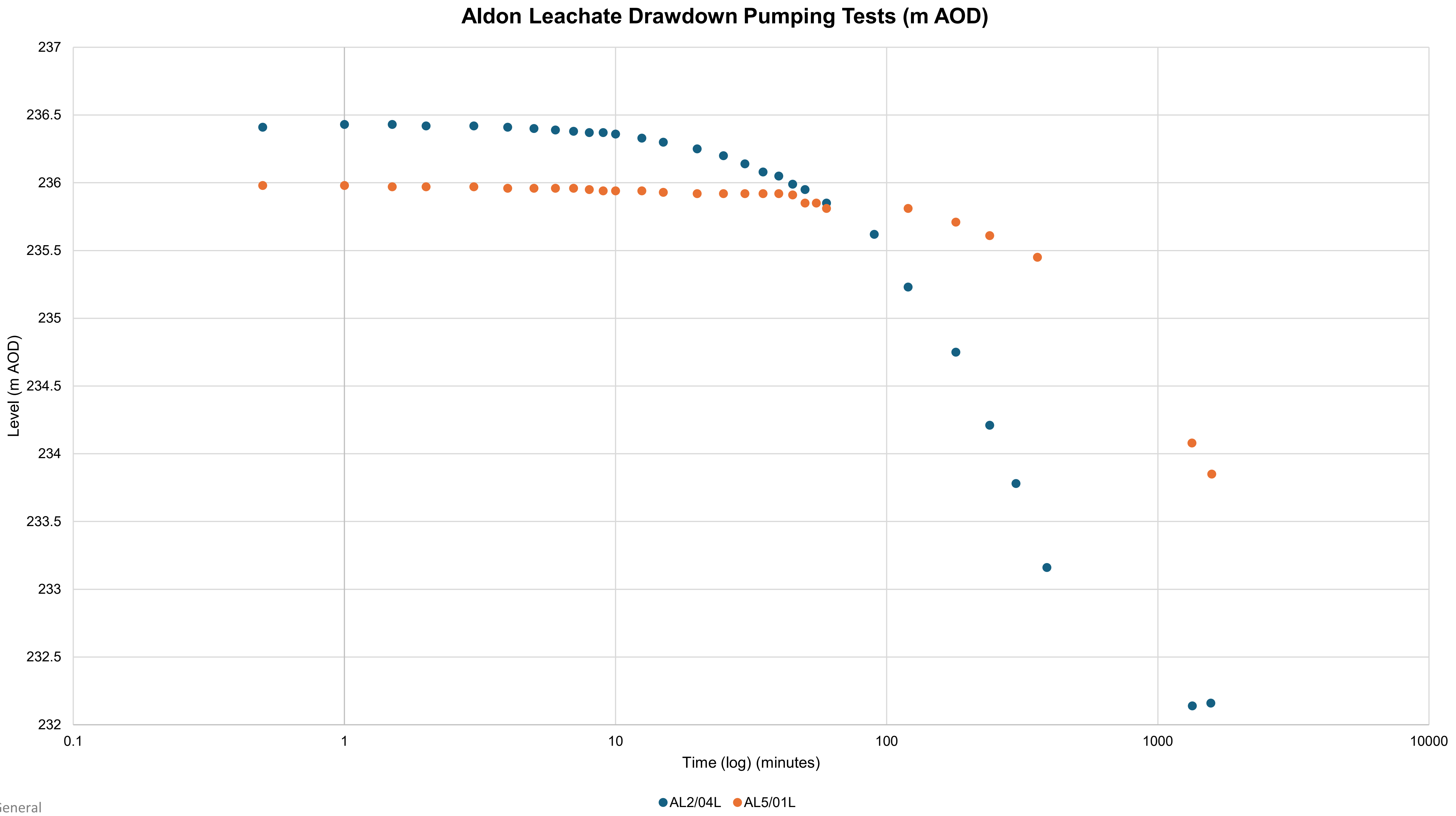
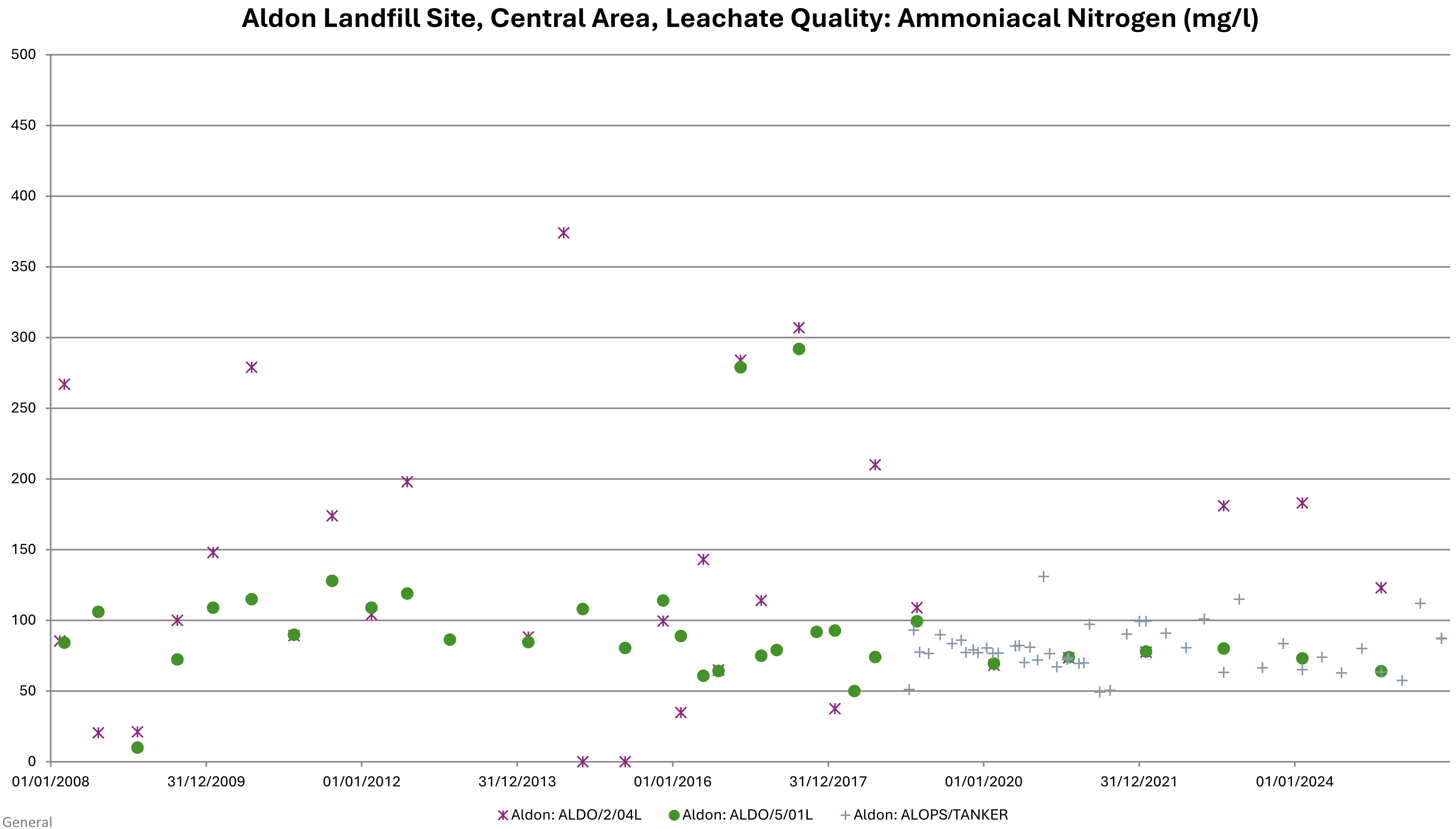
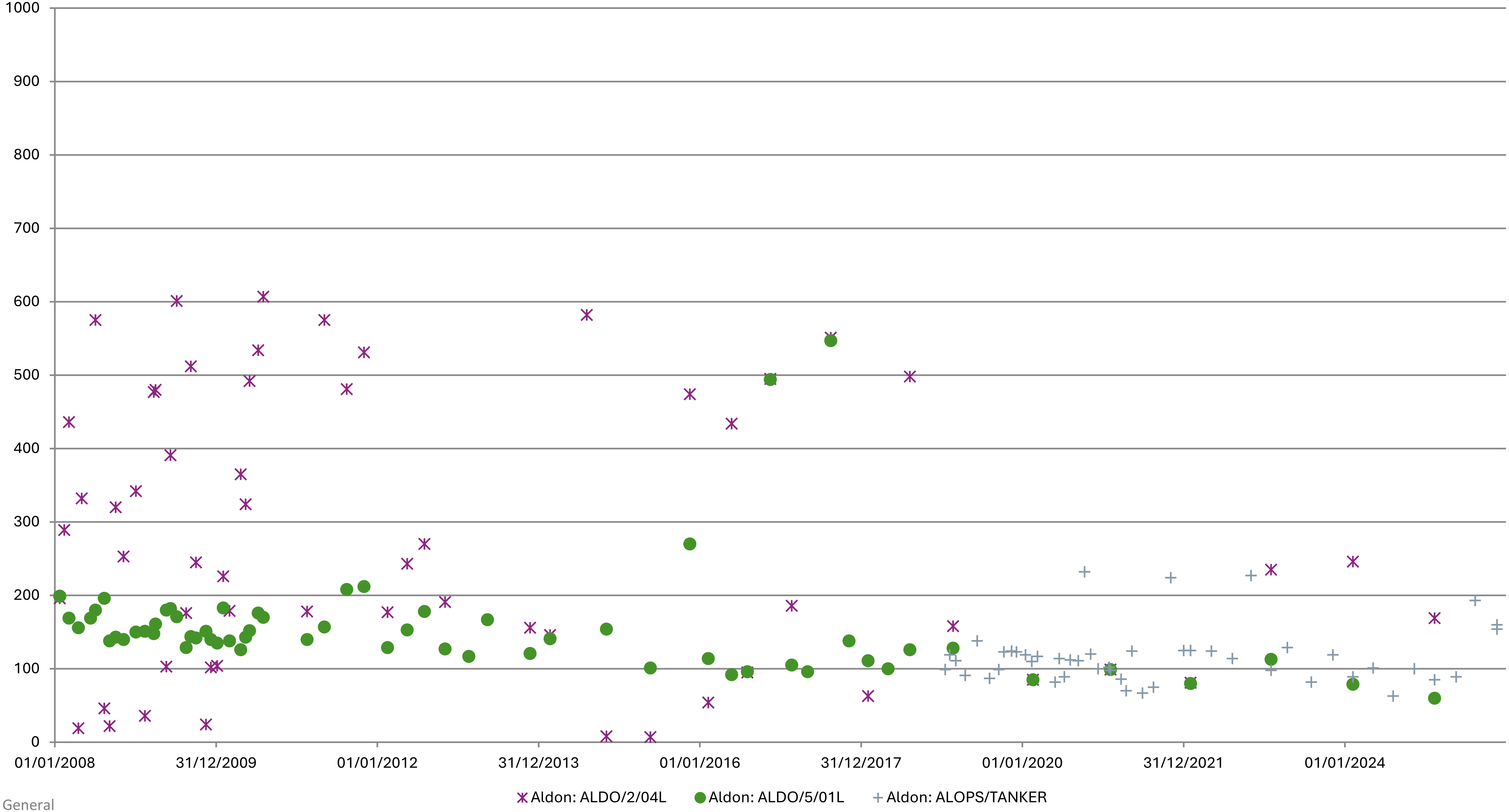

Aldon Leachate Drawdown Pumping Tests (m AOD)
237
236.5
236
235.5
235
234.5
234
233.5
233
232.5
232
Level (m AOD)
0.1
1
10
100
1000
10000
Time (log) (minutes)
AL2/04L
AL5/01L

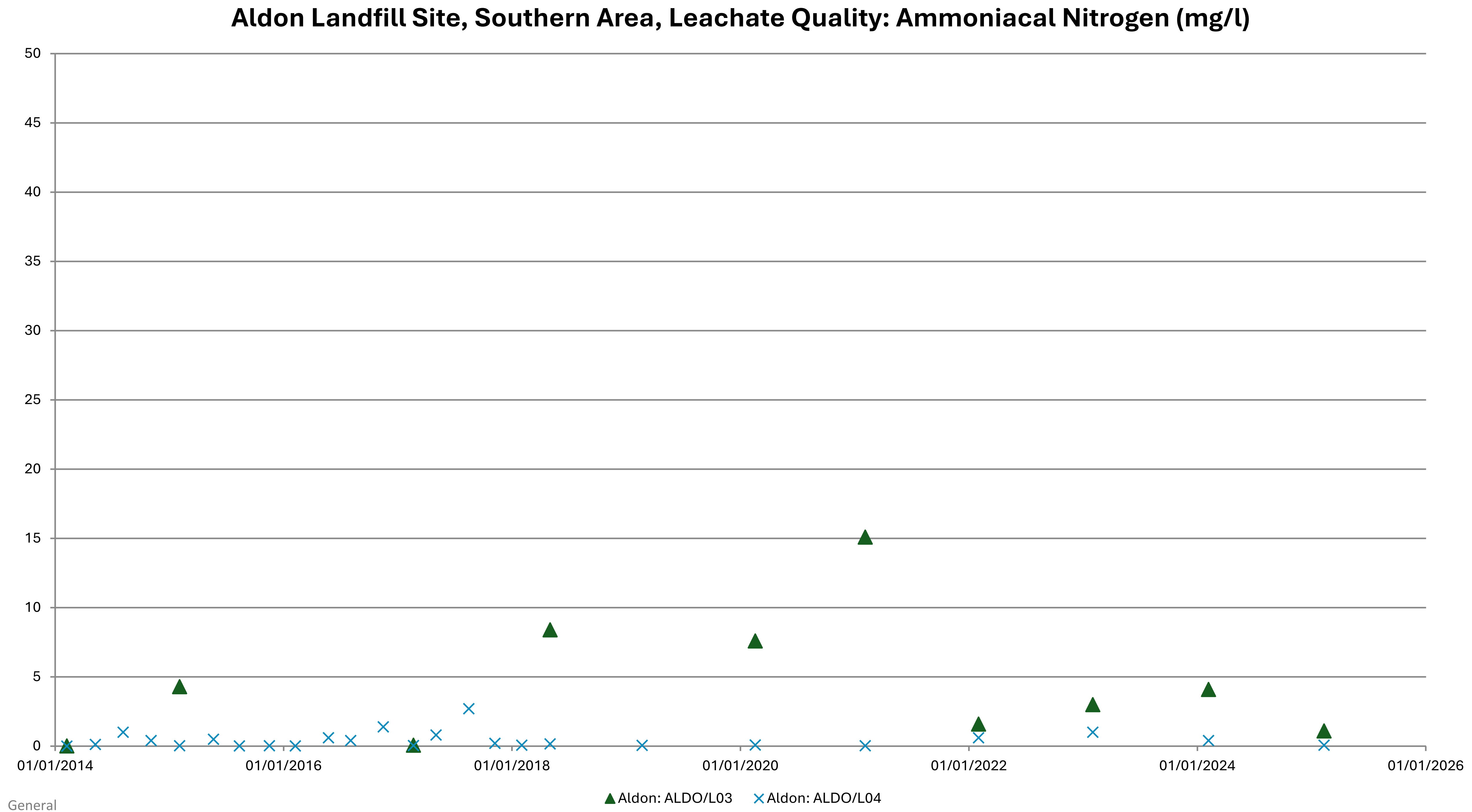
Figure 9. Leachate Quality Graphs


Aldon Landfill Site, Central Area, Leachate Quality: Ammoniacal Nitrogen (mg/l)
500
450
400
350
300
250
200
150
100
50
0
01/01/2008
31/12/2009
01/01/2012
31/12/2013
01/01/2016
31/12/2017
01/01/2020
31/12/2021
01/01/2024
Aldon: ALDO/2/04L
Aldon: ALDO/5/01L
Aldon: ALOPS/TANKER

General

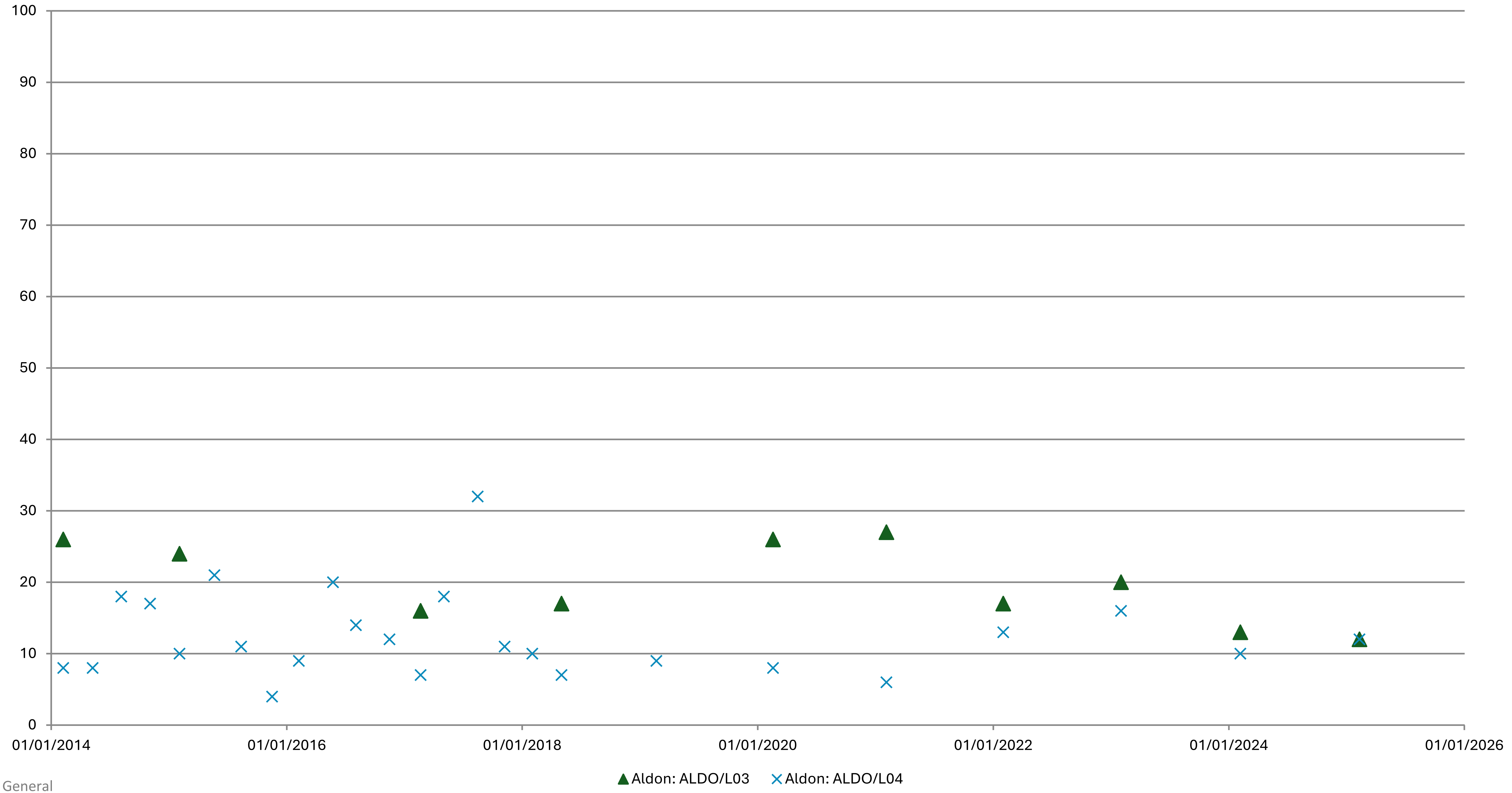
Aldon Landfill Site, Central Area, Leachate Quality: Chloride (mg/l)





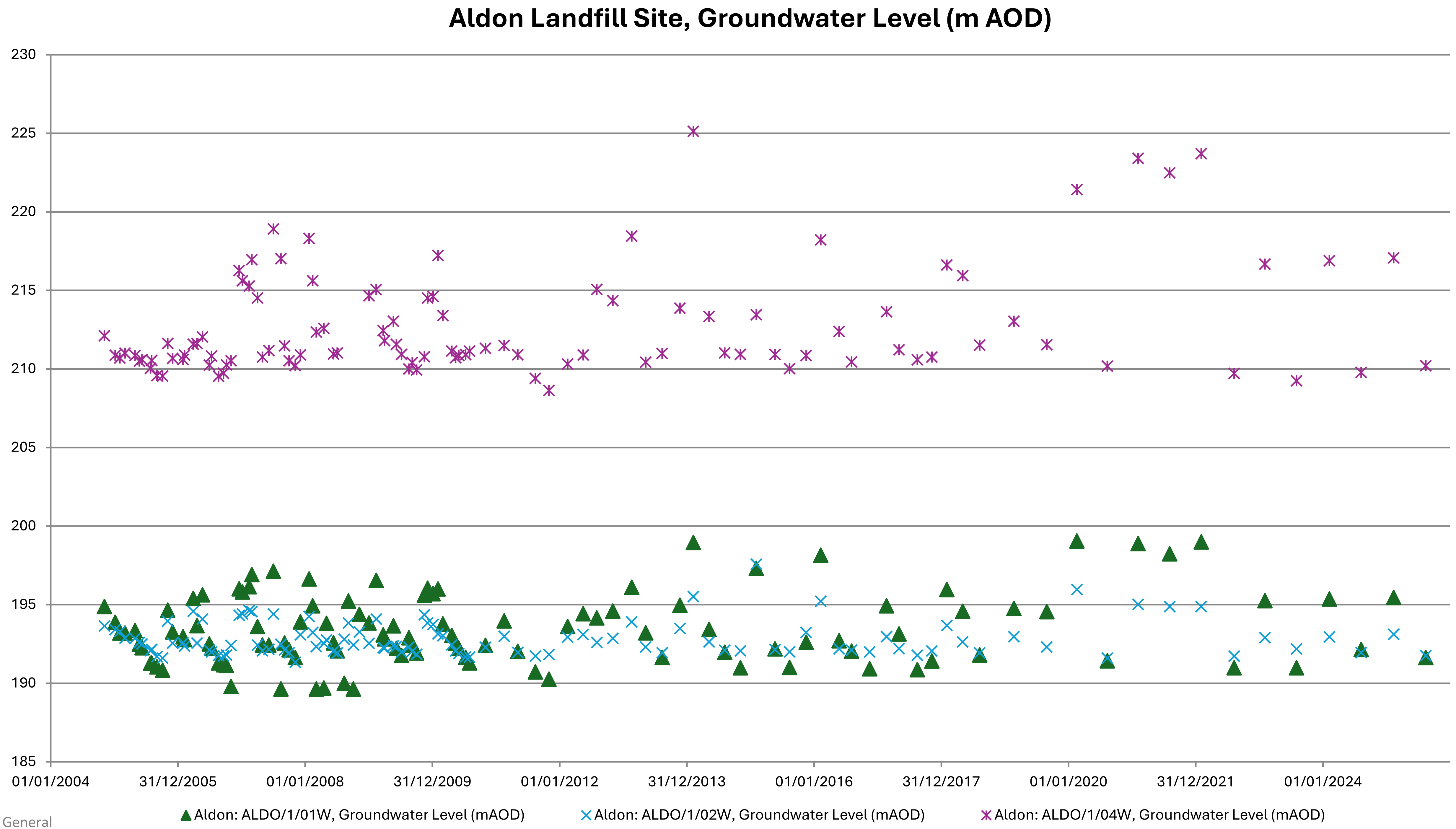
Aldon Landfill Site, Southern Area, Leachate Quality: Ammoniacal Nitrogen (mg/l)
50
45
40
35
30
25
20
15
10
5
0
01/01/2014
01/01/2016
01/01/2018
01/01/2020
01/01/2022
01/01/2024
01/01/2026
Aldon: ALDO/L03
Aldon: ALDO/L04

Aldon Landfill Site, Southern Area, Leachate Quality: Chloride (mg/l)



General

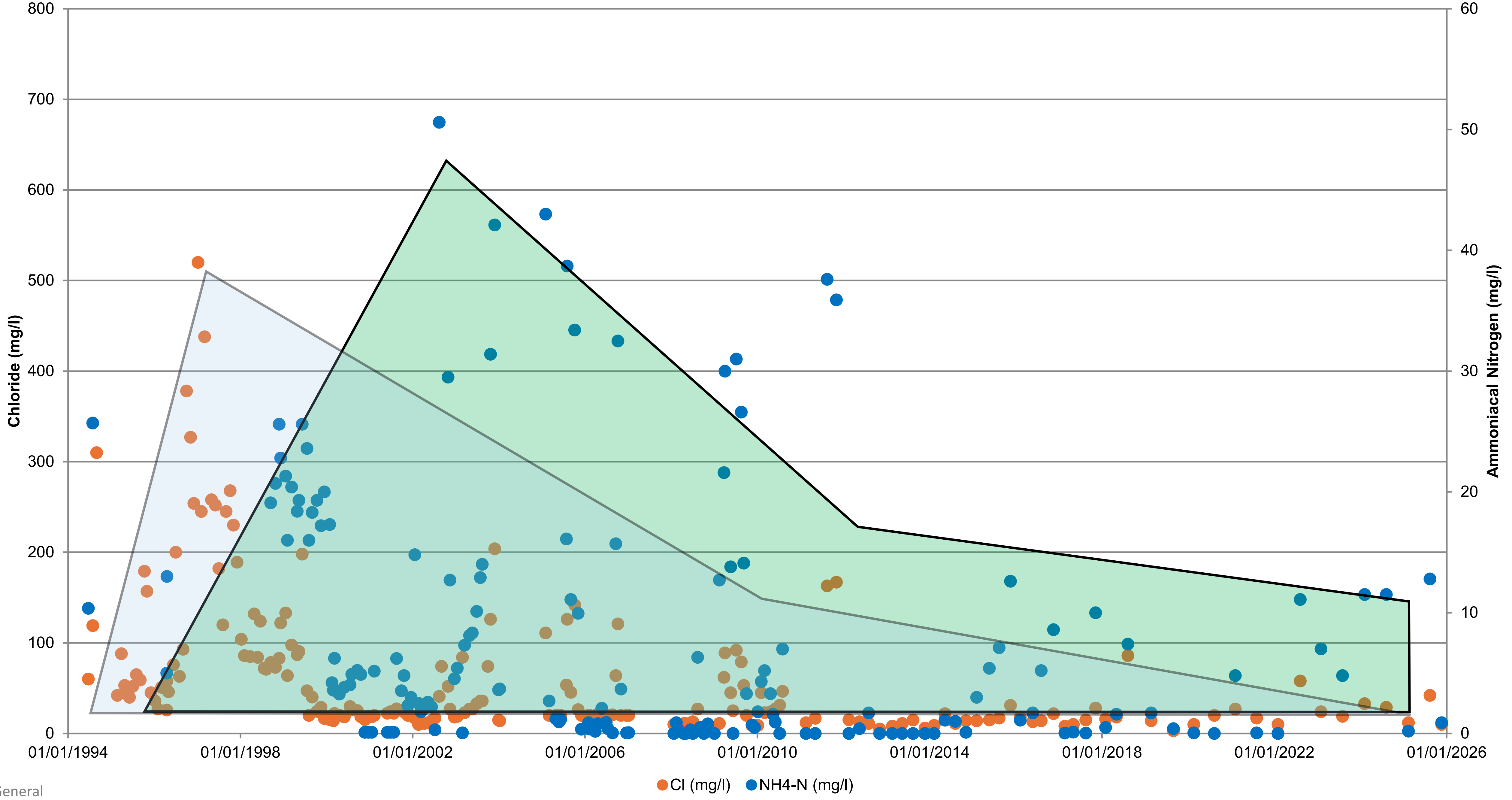
Figure 10. Groundwater Level Graphs

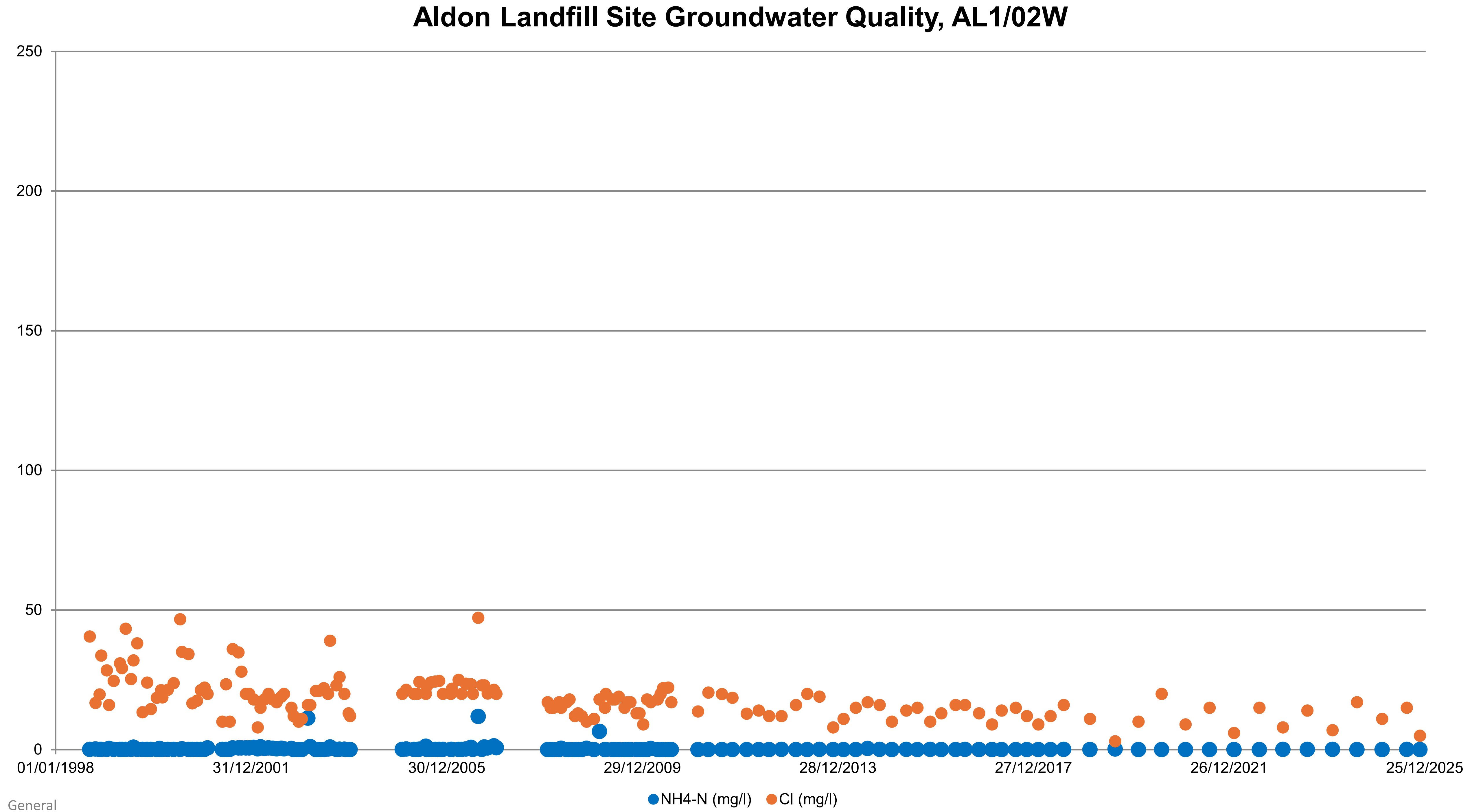


Aldon Landfill Site, Groundwater Level (m AOD)
230
225
220
215
210
205
200
195
190
185
01/01/2004
31/12/2005
01/01/2008
31/12/2009
01/01/2012
31/12/2013
01/01/2016
31/12/2017
01/01/2020
31/12/2021
01/01/2024
Aldon: ALDO/1/01W, Groundwater Level (mAOD)
Aldon: ALDO/1/02W, Groundwater Level (mAOD)
Aldon: ALDO/1/04W, Groundwater Level (mAOD)

Figure 11. Groundwater Quality Graphs

Aldon Landfill Site Groundwater Quality, AL1/01W with Shaded Substance Fronts

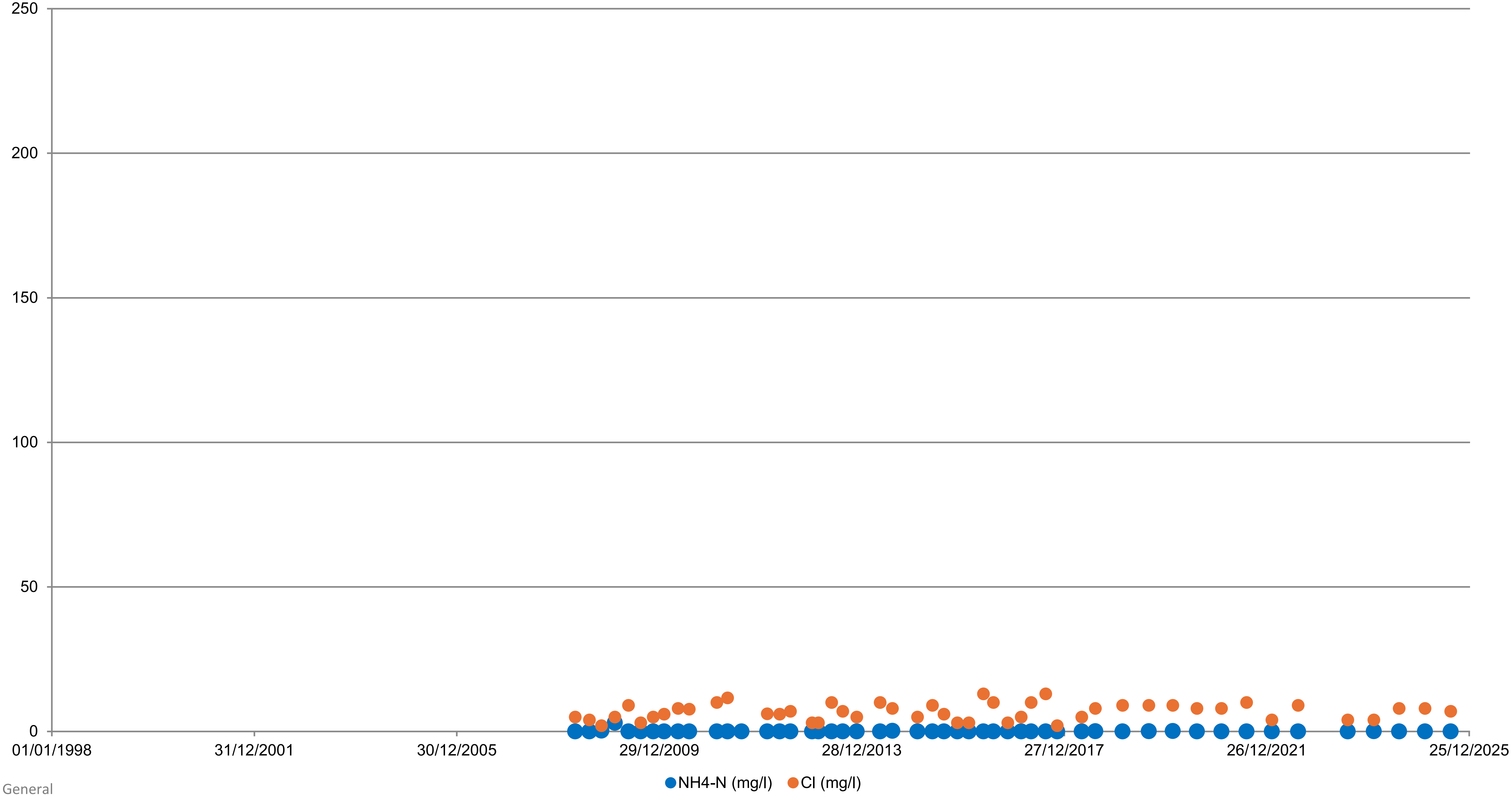




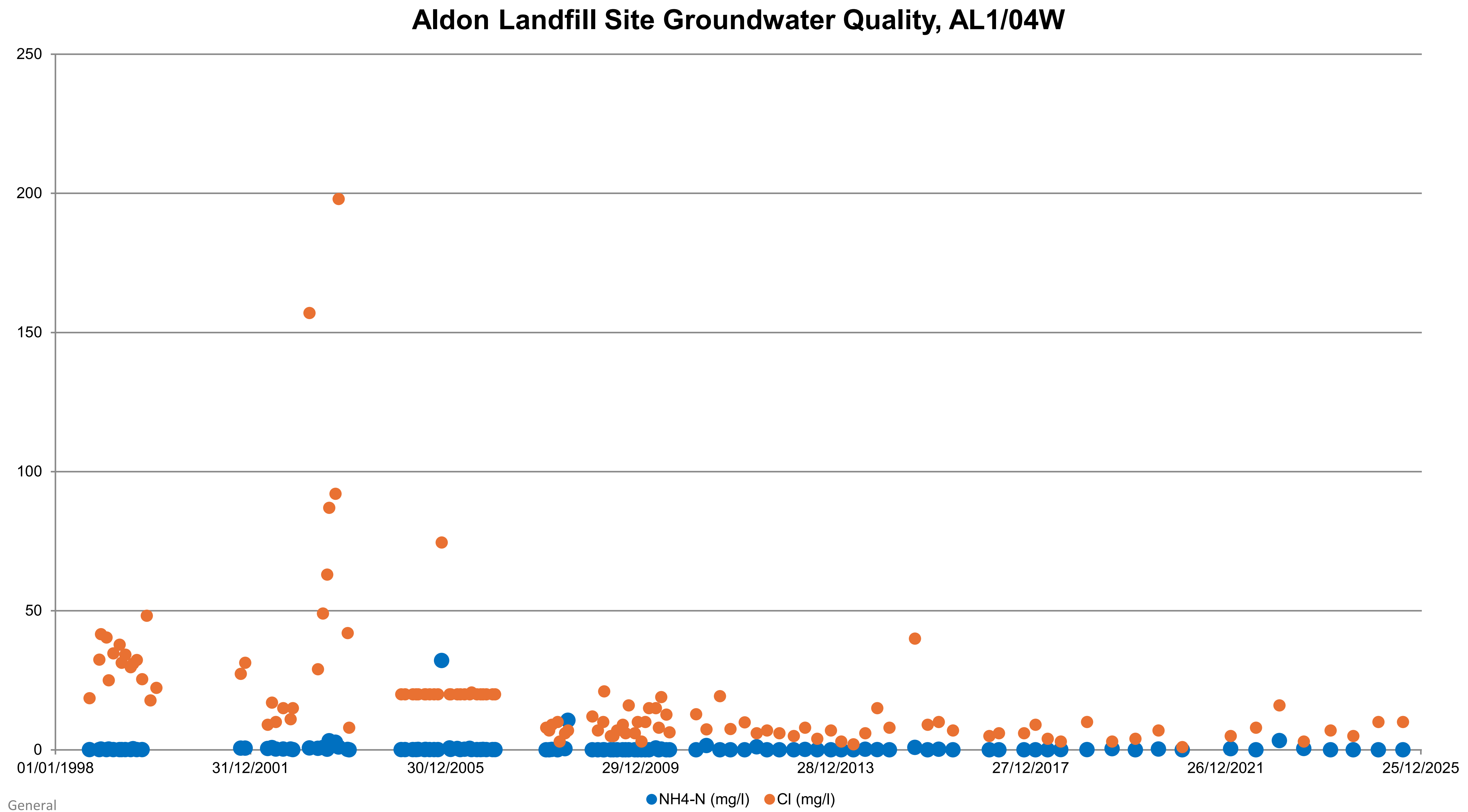
Aldon Landfill Site Groundwater Quality, AL1/02W
250
200
150
100
50
0
01/01/1998
31/12/2001
30/12/2005
29/12/2009
28/12/2013
27/12/2017
26/12/2021
25/12/2025
NH4-N (mg/l)
Cl (mg/l)

General

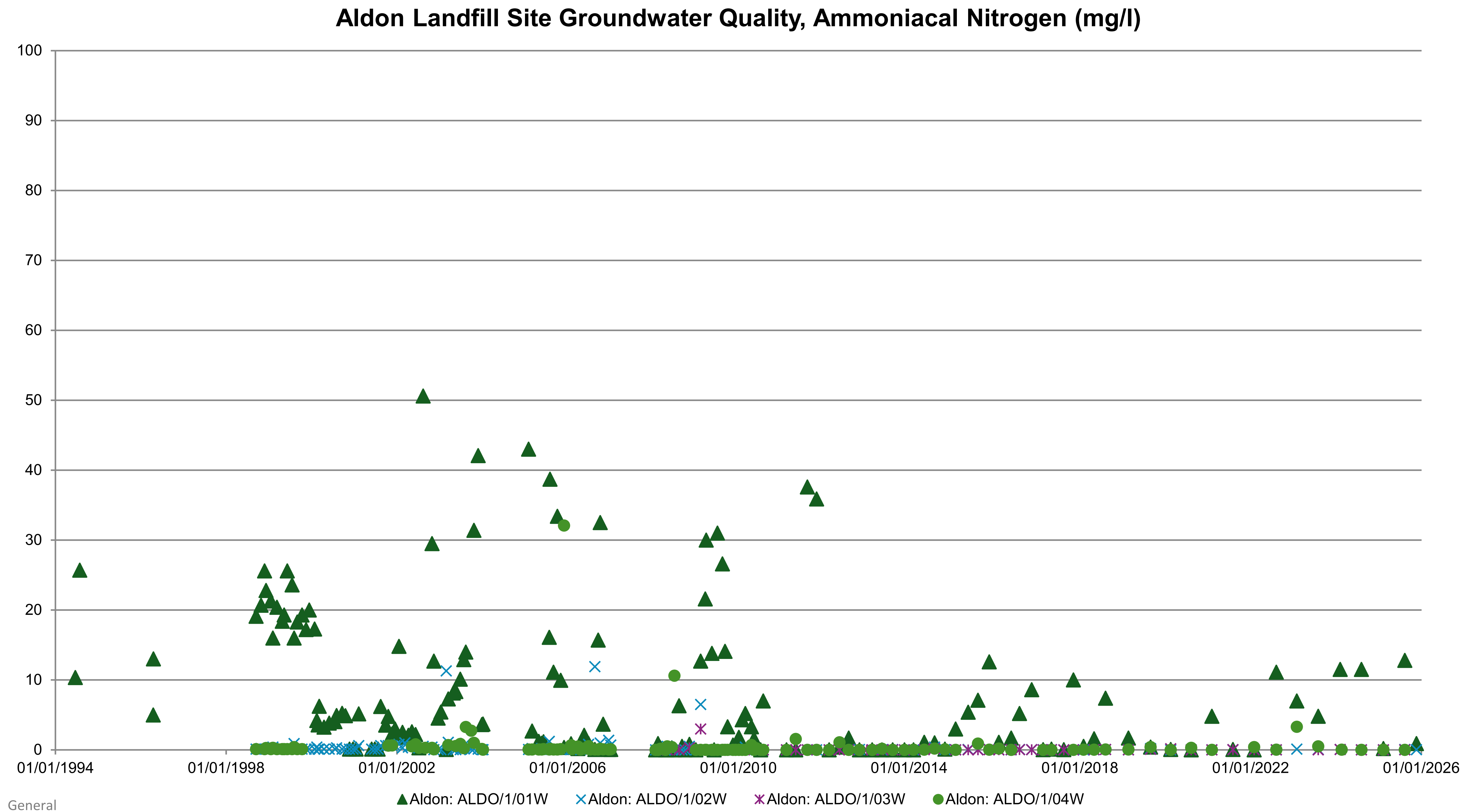
Aldon Landfill Site Groundwater Quality, AL1/03W



General



Aldon Landfill Site Groundwater Quality, AL1/04W
250
200
150
100
50
0
01/01/1998
31/12/2001
30/12/2005
29/12/2009
28/12/2013
27/12/2017
26/12/2021
25/12/2025
NH4-N (mg/l)
Cl (mg/l)



Aldon Landfill Site Groundwater Quality, Ammoniacal Nitrogen (mg/l)
100
90
80
70
60
50
40
30
20
10
0
01/01/1994
01/01/1998
01/01/2002
01/01/2006
01/01/2010
01/01/2014
01/01/2018
01/01/2022
01/01/2026
Aldon: ALDO/1/01W
Aldon: ALDO/1/02W
Aldon: ALDO/1/03W
Aldon: ALDO/1/04W

General

Aldon Landfill Site Groundwater Quality, Chloride (mg/l)

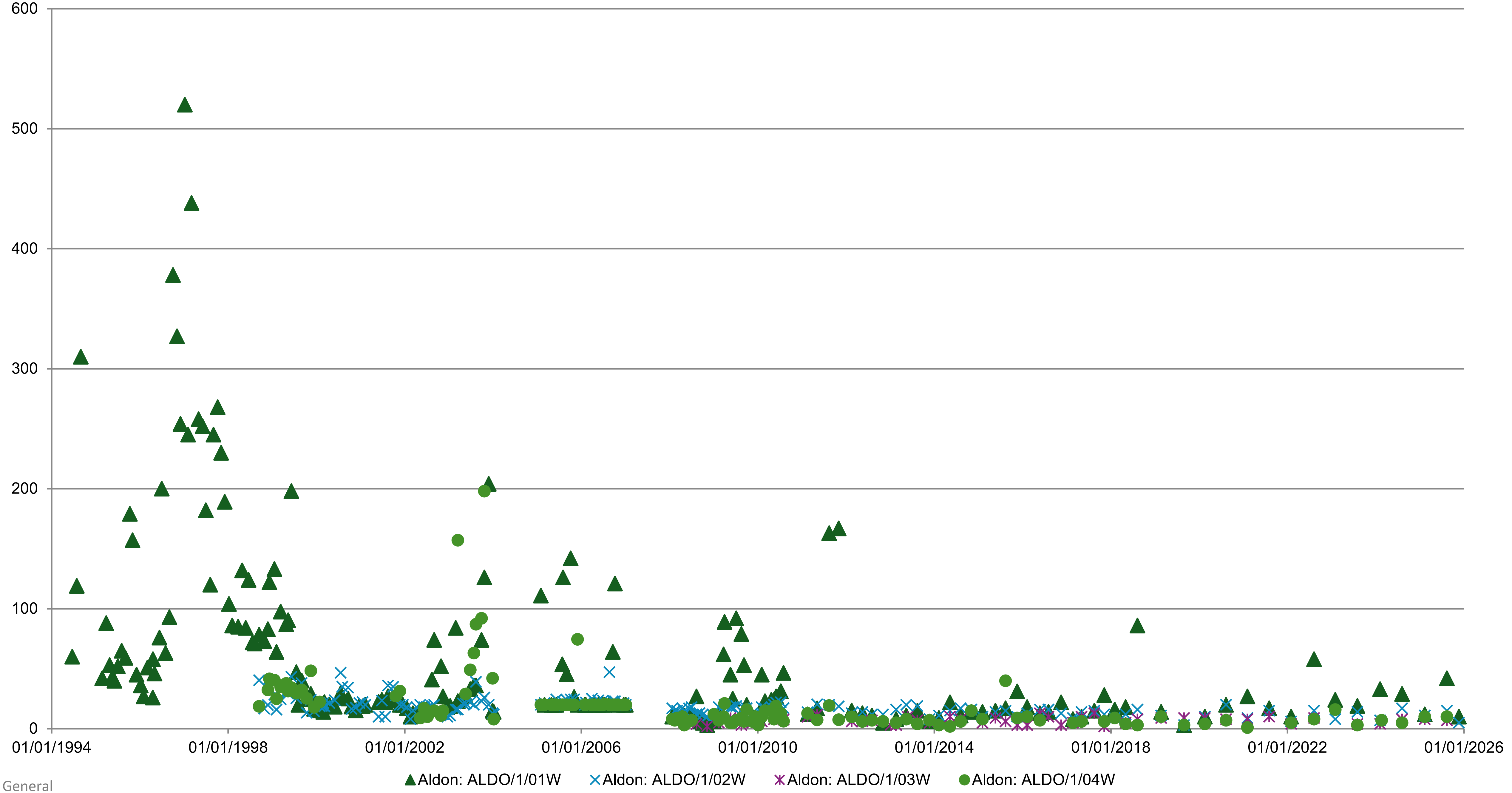
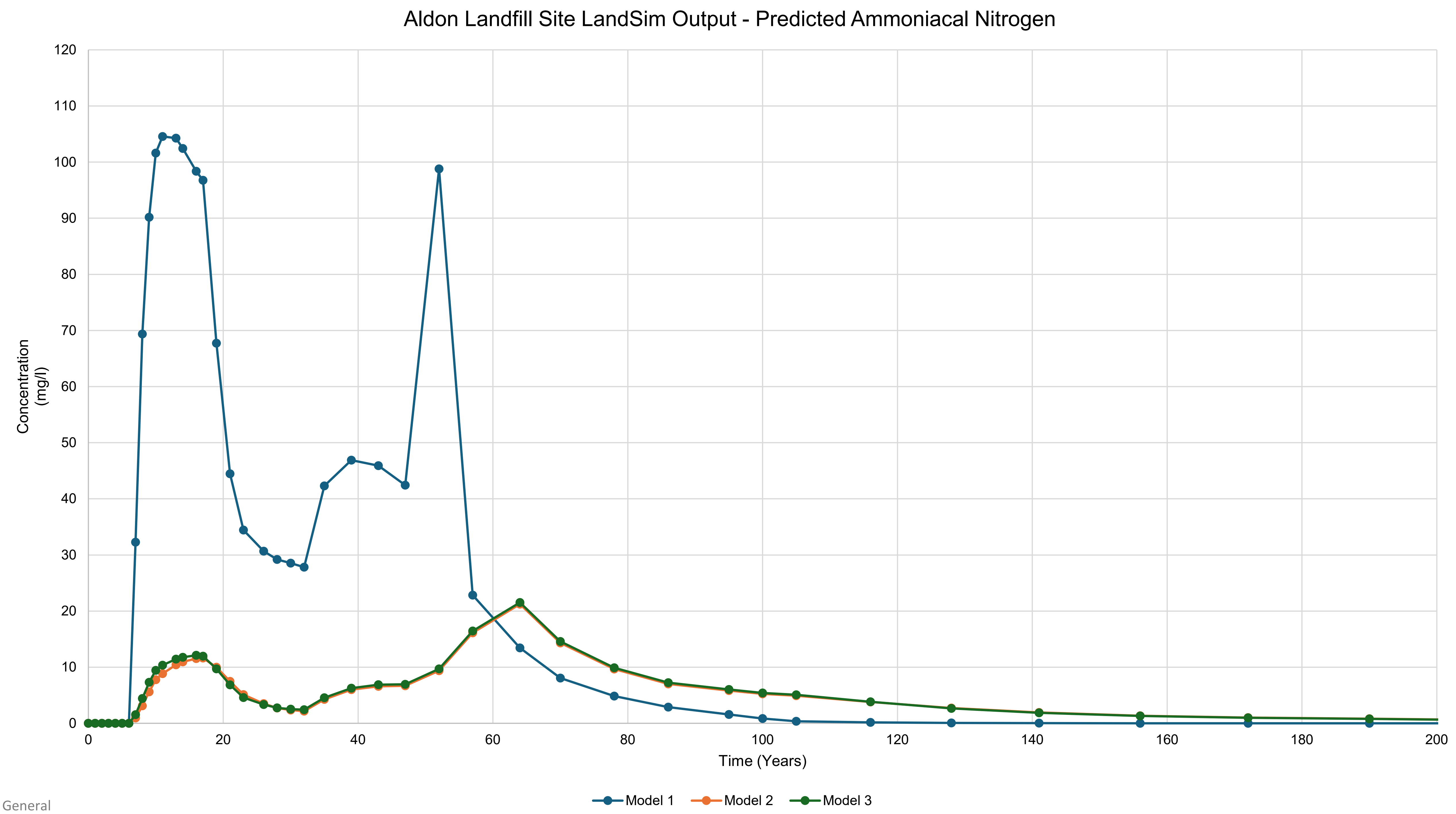
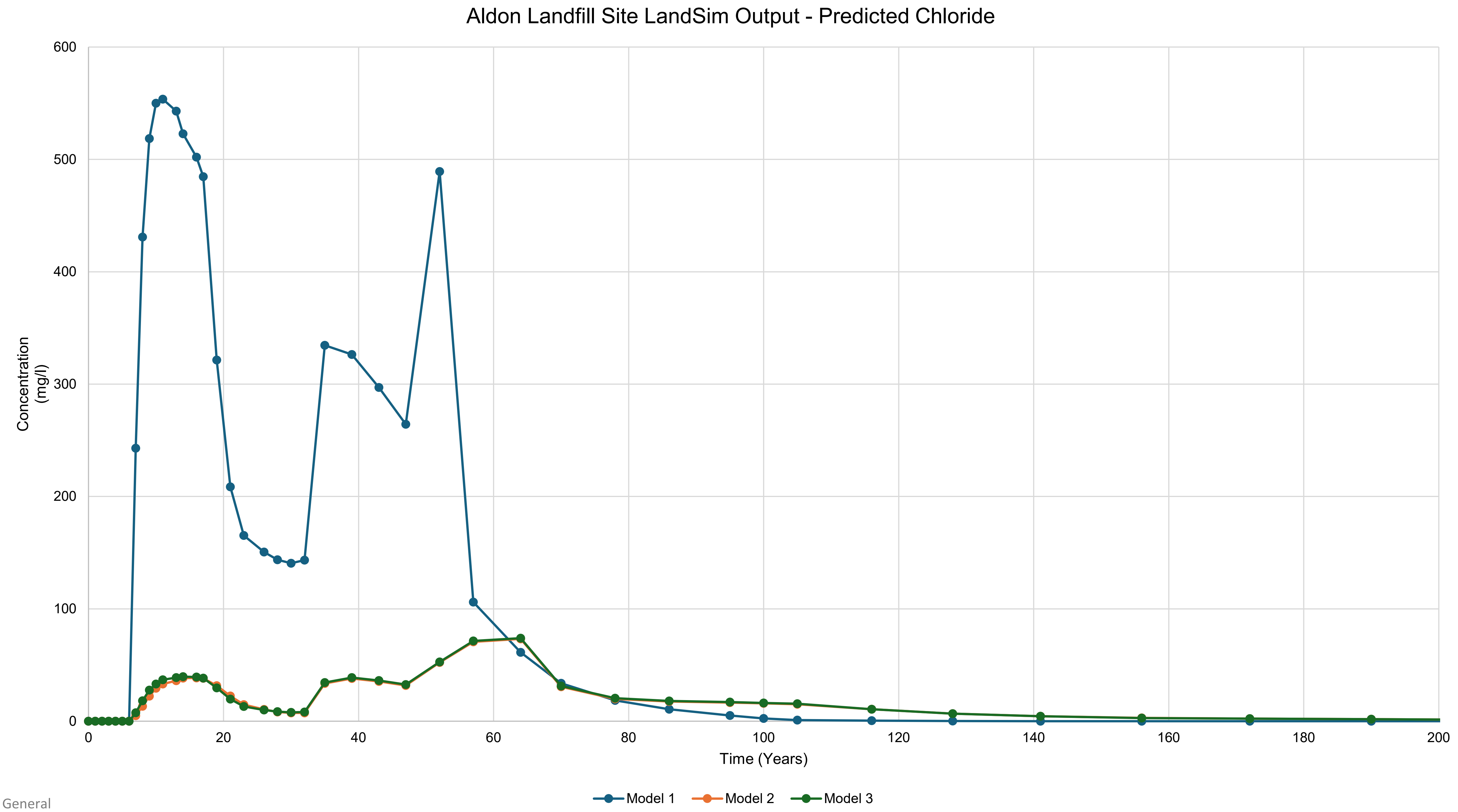


Figure 12. LandSim Output Graphs

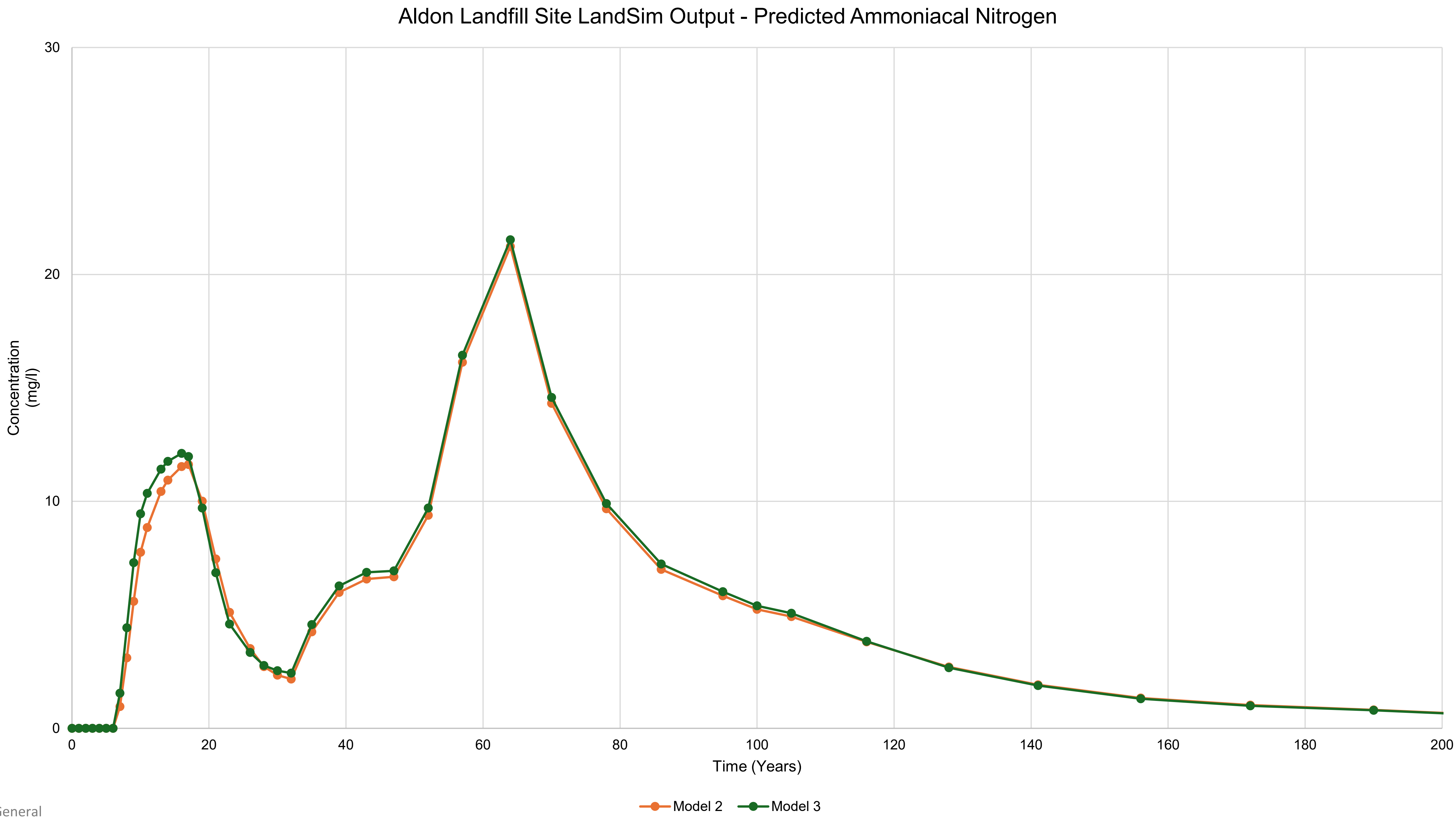


Aldon Landfill Site LandSim Output - Predicted Ammoniacal Nitrogen
Concentration (mg/l)
Time (Years)
Model 1
Model 2
Model 3

General

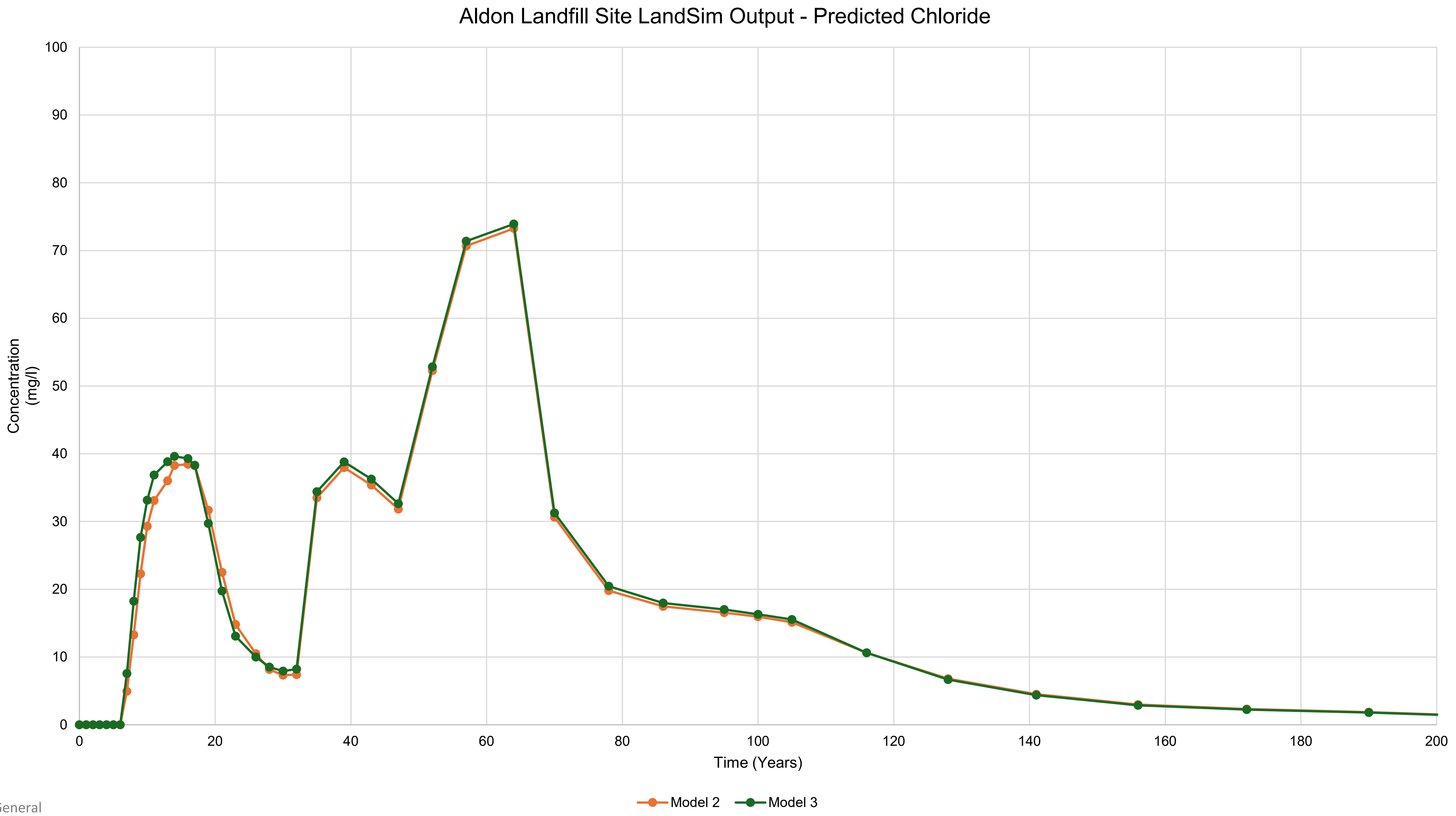


Aldon Landfill Site LandSim Output - Predicted Chloride
Concentration (mg/l)
0
100
200
300
400
500
600
Time (Years)
0
20
40
60
80
100
120
140
160
180
200
Model 1
Model 2
Model 3



Aldon Landfill Site LandSim Output - Predicted Ammoniacal Nitrogen
Concentration (mg/l)
Time (Years)
0
10
20
30
0
20
40
60
80
100
120
140
160
180
200
Model 2
Model 3

General


Aldon Landfill Site LandSim Output - Predicted Chloride
Concentration (mg/l)
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
200
Time (Years)
Model 2
Model 3

Appendices

Appendix A. Aldon Landfill: Site Photographs 19th and 20th June 2025

Aldon Landfill: Site Photographs 19th and 20th June 2025

Photograph 1. Central Compound (facing west)

Location: www///encoding.engaging.fizzy

Time: 09:13hrs (19/06/2025)

Photograph 2. Central Compound Leachate Tank (facing west)

Location: www ///engraving.glue.capacity

Time: 09:13hrs (19/06/2025)

Photograph 3. South Area (facing south)

Location: www ///producing.balancing.weeps

Time: 16:11hrs (19/06/2025)

Photograph 4. Central Area (facing west)

Location: www ///cashiers.tapes.stag

Time: 12:57hrs (19/06/2025)

Photograph 5. Central Area (facing west)

Location: www ///amplifier.trackers.tumblers

Time: 08:16hrs (20/06/2025)

Photograph 6. Central Area (facing south)

Location: www ///empty.composers.honeybees

Time: 10:10hrs (20/06/2025)

Photograph 7. North Area (facing south east)

Location: www ///though.solo.strapped

Time: 14:38hrs (19/06/2025)

Photograph 8. North Area (facing north west)

Location: www ///though.solo.strapped

Time: 14:38hrs (19/06/2025)

Photograph 9. North Area (facing east)

Location: www ///cocktail.poorly.purely

Time: 11:43hrs (20/06/2025)

Photograph 10. Springhead Gutter (facing north west)

Location: www ///formless.broadens.appetite

Time: 15:58hrs (19/06/2025)

Photograph 11. Surface Water monitoring point AL7/01W (facing north east)

Location: www ///limit.translated.unhelpful

Time: 16.00hrs (19/06/2025)

Appendix B. Aldon Landfill Site Leachate Management Plan

Recycling and recovery UK

Environmental Permit EPR/QP3999CD

Aldon Landfill Site

Leachate Management Plan

Report Issue Form

Issue History

Issue	Description	Originated	Checked	Approved	Date
1	ISSUE	Katharine Alexander *Technical Analyst - Leachate*	Thomas Willetts *Hydrogeologist* Richard Watkins *EIR Manager* Ken Yarrow *Energy Operations Manager – Central West*	Chris Dussek *National Hydrogeology Manager*	April 2026

Report Distribution

Distribution	No. of Copies
SUEZ - EIR Department	1
SUEZ - Site Management	1
Environment Agency	1

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1 Introduction

1.1 Purpose

This plan has been prepared by SUEZ Recycling and Recovery UK Ltd ('SUEZ') to present an updated Leachate Management Plan (LMP) for Aldon Landfill Site ('the Site') to set out how leachate continues to be managed and monitored at the Site through its extended period of aftercare.

This document should be read in conjunction with the updated and contemporary Hydrogeological Risk Assessment prepared for the site by Suez in March 2026.

1.2 Background

Aldon Landfill Site is located north west of Aldon Village, approximately 10km north west of Ludlow, Shropshire.

The site was developed as a landfill within a steep sided valley, in a rural area dominated by rough grazing and arable land, with the valley floor falling steadily to the south east.

Aldon Landfill accepted a range of inert, non-hazardous, and putrescible wastes from the mid-1960s through to August 1998 and has subsequently been fully restored for grassland grazing and continues to be managed by SUEZ through its extended aftercare period.

The Site has continued to be operated in line with the following environmental obligations, set either in the Site's license and/or the site's approved Monitoring and Management Plan (MMP) last updated in August 2018.

1.3 Leachate Management Philosophy

As one of the leading waste management companies in the UK, SUEZ is dedicated to ensuring that leachate is managed, collected and disposed of safely and effectively at all of its landfill sites.

This is achieved through the implementation of leachate management systems, which are designed to minimise the production of leachate and, where appropriate, to extract and treat leachate that is generated at a site. These measures aim to prevent pollution to the environment, harm to human health or detriment to the local community.

All leachate management infrastructure and leachate management practices are designed to comply with all relevant Health and Safety legislation.

SUEZ is committed to supporting the development of new landfill leachate management technologies and will continue to operate in accordance with relevant regulations and codes, while looking to develop within the current and emerging regulatory environments, the most sustainable approaches for effective and risk based solutions to the extended requirements of leachate management across its portfolio of sites within the UK.

1.4 Report Context

This Management Plan has been prepared by SUEZ based on all data and historical records retained by SUEZ to the date of issue of this plan.

At Aldon Landfill Site it is recognised that the site was developed prior to the contemporary permitting regime, with all phases of the site built under the principles of passive management of leachate and gas with no engineered basal engineering or engineered basal drainage blankets/pipework constructed beneath the waste mass.

The requirement for active leachate management in the final area of tipping was introduced in 1994 in the transition of the regulatory regime from Waste Disposal Licensing to Waste Management Licensing era.

2 Mechanisms for Leachate Production and Associated Risk Assessment

This section provides a summary of the core elements of leachate production at Aldon Landfill Site based on the management and monitoring data retained at the site to 2026.

2.1 Hydrogeological Risk Assessment

A detailed and updated hydrogeological risk assessment (HRA) of the site has been prepared in 2026.

With the site approaching the mid-point of its formal period of aftercare, SUEZ has taken the opportunity to review and - as required - redefine the site's Conceptual Site Model to quantify the relationship between the residual leachate source term and the receiving water environment.

The 2026 HRA has been extended to assess the potential impact that would arise from ending active leachate extraction from the two extraction points present within the 10.1 Ha landfill footprint.

The HRA report concludes that with leachate in the Site being now an aged source term as the 30th anniversary of the end of active waste placement approaches, few hazardous substances remain in leachate at the Site. Ending active leachate management will not result in any discernible and unacceptable increase from the risk of either non hazardous or hazardous substances entering the wider water environment.

2.2 Current and Future Rates of Leachate Production

The Site comprises of four unlined/non-engineered Phases with a capped area of 10.1Ha.

Phases 1 to 3 are located in the 'Northern' area and composed of the oldest waste. It is presumed that this area was filled between the late 1960s and the mid 1980s before filling moved into Phase 4. Filling of Phase 4 occurred in four Cells (or stages). Cells 1 and 2 from the southern most area of the site and were filled before the final area of filling in Cells 3 and 4 – referred to as the 'Central Area' of the site.

As the waste mass infilled a moderately steep valley feature in the landscape, the waste thickness and base varies, with the greatest thickness along the central spine, thinning to the peripheral edges. Nominally, the waste mass thickness varies from at least 10m in the northern and southern areas, and up to 20m in the central area.

In line with the standards for waste disposal in the 1960s to 1990s, all four phases were built under the principles of passive management of leachate and gas with no engineered basal engineering or engineered basal drainage blankets/pipework constructed beneath the waste mass.

All phases have been capped to a range of engineering standards that were applicable at the time of site restoration. Capping in the northern (Phases 1 to 3) and southern (Cells 1 and 2 of Phase 4) areas of the Site consists of semi-engineered clay overlain by approximately 1.0m of restoration soils Capping of the Central Area between 1998 and 2000 consists of a Bentomat liner, overlain by between 0.5m and 1.0m of clays and restored using approximately 0.5m of restoration soils.

With Aldon Landfill Site being situated entirely above the local water table with a permanent unsaturated zone, long term leachate production is derived from with residual infiltration through the cap with secondary, (now in 2026) very small inputs from the release of moisture from any residual degradation of organic material within the site.

With no basal containment beneath the waste mass at the site, it is not possible to define the exact rates of leachate production at the site. The 2026 HRA has defined the site's leachate / water balance as follows:

Rate of Leachate Production in Aftercare: ~ 6,900m^3/year

Rate of Leachate Removal by Pumping: ~ 600m^3/year since 2020

A plot of the rates of leachate removal by month from the site since 2020 is included as Figure 1.

The rate of long term change in leachate quality in the site is summarised (for key parameters) in Figure 2 highlighting the evolution of a weak residual leachate in the site to 2026.

3 Leachate Management Systems and Infrastructure

This section provides a summary of the core elements of the leachate collection and management system installed within the landfill site.

3.1 Current Leachate Management System

In line with the standards for waste disposal in the 1960s to 1990s, all four phases at Aldon Landfill Site were built under the principles of passive management of leachate and gas with no engineered basal engineering or engineered basal drainage blankets/pipework constructed beneath the waste mass.

There are two chambers currently used to extract leachate from the waste mass that were installed in the central area of the site within the final phase of filling on-going in 1994 and after the (non-engineered) base of the site was covered with waste. These are identified as AL2/04L and AL5/01L. Leachate is pumped from these wells via pneumatic pumps to a leachate storage tank where it is routinely removed by road tanker to an appropriate facility for disposal.

Leachate monitoring wells AL/03L and AL/04L are located in the Southern area of Phase 4 and were retrospectively drilled in 1997.

In reflecting the age of the site, there are no leachate monitoring wells in the oldest area of the Site (Phases 1 to 3).

3.2 Leachate Infrastructure

The key leachate infrastructure currently in place at Aldon Landfill Site in 2026, summarised in Appendix A includes:

- Two chambers use to extract leachate from the waste mass that were installed in the central area of the site within the final phase of filling on-going in 1994.
- Two leachate monitoring points retrospectively drilled in 1997.
- Leachate storage tank.
- Compressor and ancillary control equipment for the two air pumps installed in the Central Area chambers.

3.3 Future Management Technique

In light of the re-development of the Conceptual Site Model for leachate storage and management within the site, SUEZ has proposed an updated approach to leachate management, monitoring and maintenance as detailed below (subject to approval by the Environment Agency).

Leachate management at the site will be moved into a passive management phase with leachate extraction and collection being ceased from chambers AL2/04L and AL5/01L.

The pneumatic pumps will be removed from the wells and the headworks on the chambers will be retained to enable the re-installation of pumps should they be required in future.

The pneumatic pumps, leachate storage tank and compressor will be retained and kept in a serviceable condition so that the system can be re-commissioned if required.

All buried pipework associated with the leachate collection system will be retained.

SUEZ has proposed a detailed and extended programme of leachate, groundwater and surface water monitoring at the site and, while unlikely to occur, appropriate assessment of any risk of leachate breakout at the site surface has been addressed by SUEZ by the retention of an appropriate Leachate Action Level in the Central area of the Site as detailed in Section 4.3.

4 Monitoring Programme

In continuing with the established environmental monitoring programme at Aldon Landfill Site, SUEZ will continue to undertake leachate monitoring as follows:

4.1 Quantitative Monitoring

Leachate levels and leachate quality monitoring with be carried out in accordance with:

- the schedules for testing set in this Management Plan supported by
- any internal schedules for monitoring retained by SUEZ to support a wider understanding of leachate management / risk at the site.

The schedule for monitoring of the site's leachate level and quality is included at Appendix B.

Internal assessment limits are set by SUEZ to provide information on unexpected changes in leachate quality from sample data obtained at the site.

4.2 Monitoring Techniques and Quality Assurance

Manual leachate level and quality measurements are obtained by SUEZ in accordance with the company's monitoring procedures "S01: Procedure to Sample Raw Waters and Leachate" and "L01 Procedure to Measure Groundwater and Leachate levels", which draw on established company and industry best practice for the monitoring of landfill sites.

Analysis is obtained via spot samples sent to an accredited third-party laboratory with results automatically returned, imported, stored and assessed against Action or Compliance limits, as appropriate.

4.3 Site Compliance

Leachate level is monitored on a quarterly basis, with quality monitoring carried out annually.

In line with the findings of 2026 HRA, the current and unachievable leachate compliance levels will be replaced with a single Action Level of 245mAOD at leachate chambers AL2/04L and AL5/01L.

Leachate Action Levels

	Leachate Level – Compliance Schedule	
Monitoring Points	**Monitoring Frequency**	**Action Level**
AL2/04L, AL5/01L	Quarterly	245m AOD
AL/03L, AL/04L		N/A

Contingency actions associated with the exceedance of the leachate action in the leachate chambers are presented in Appendix C.

4.4 Internal and External Reporting

SUEZ continues to capture all key data required for site compliance within the company's Monitor Pro database, with data forwarded on to the Environment Agency at quarterly intervals.

The Monitor Pro database continues to be the single point of reference for assessing compliance with respect to leachate level calculation and then reporting within SUEZ.

4.5 Update of Key Survey Data

In recognising the need for accurate data sets for assessing leachate level compliance, SUEZ will obtain topographic survey updates in the event of changes to leachate well levels (as a result of extension or lowering of a leachate well or chamber) and update the cover level stored in Monitor Pro.

4.6 Groundwater Monitoring and Surface Water Monitoring

SUEZ has proposed a revised, contemporary monitoring programme in Section 7 of the 2026 HRA, which, if approved by the Environment Agency, will be adopted within an updated Monitoring Management Plan.

5 Asset Maintenance

The leachate wells and site infrastructure will continue to be inspected on a regular basis by the site staff in accordance with the agreed schedules set by the Operations Manager.

As part of the evolution of asset management across the Landfill Energy business, contemporary maintenance schedules at the site are being developed and are now being included within the national asset management programme supported by the Mainsaver Application across SUEZ' UK portfolio of waste management facilities.

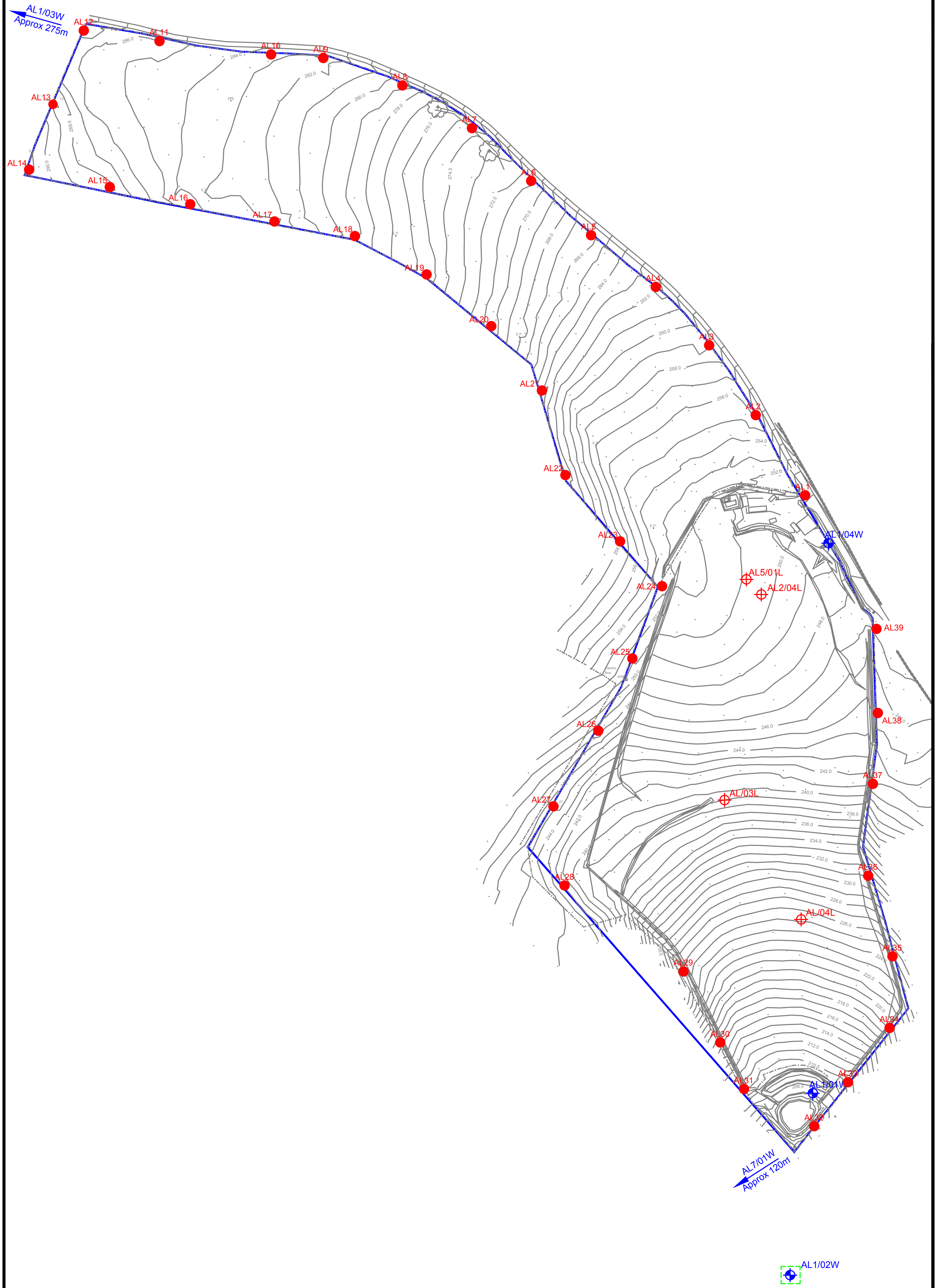
Repairs or replacements are undertaken as necessary to maintain all site infrastructure in a serviceable condition.

The inspections and any actions taken will be recorded on the Site Log held at the Regional Aftercare Offices (in 2026: Betton Abbots Landfill Site).

Any faults identified during the regular inspections will be investigated and repair or replacement of parts undertaken within designated timescales set by SUEZ.

Drawings

Drawing 1 Layout of Site Monitoring Infrastructure



Notes

1. Reproduced from the Ordnance Survey Map with the permission of the Controller of Her Majesty's Stationary Office, Crown Copyright Licence Number 100004910.

PPC Boundary and Licence Boundary WML 479

Groundwater Monitoring Point

Gas Monitoring Point

Leachate Monitoring Point

Surface Water Monitoring Point

Rev	subject	date

suez

Darwen Resource Recovery Park, Lower Eccleshill Road, Darwen, BB3 0RP
Tel:(01254)819700, Fax:(01254)819749, Email: richard.bisset@suez.co.uk

Site	Aldon Landfill Site
Title	Site Monitoring Plan
Scale	1:2500 on A3
Date	June 2018
Drawing Ref	Ald-P4-0618-01
Drawn by	RB
Checked by	EW

Figures

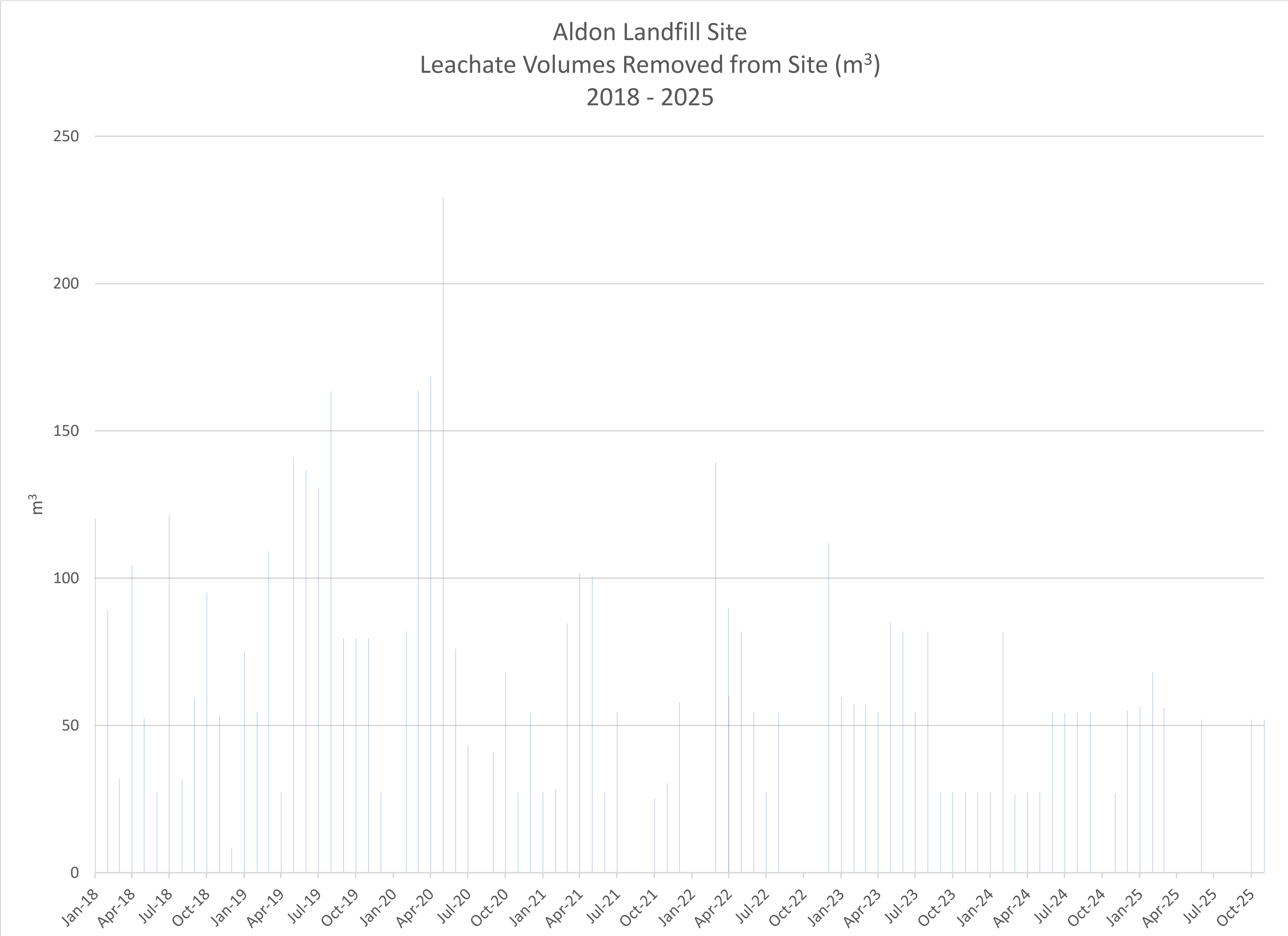
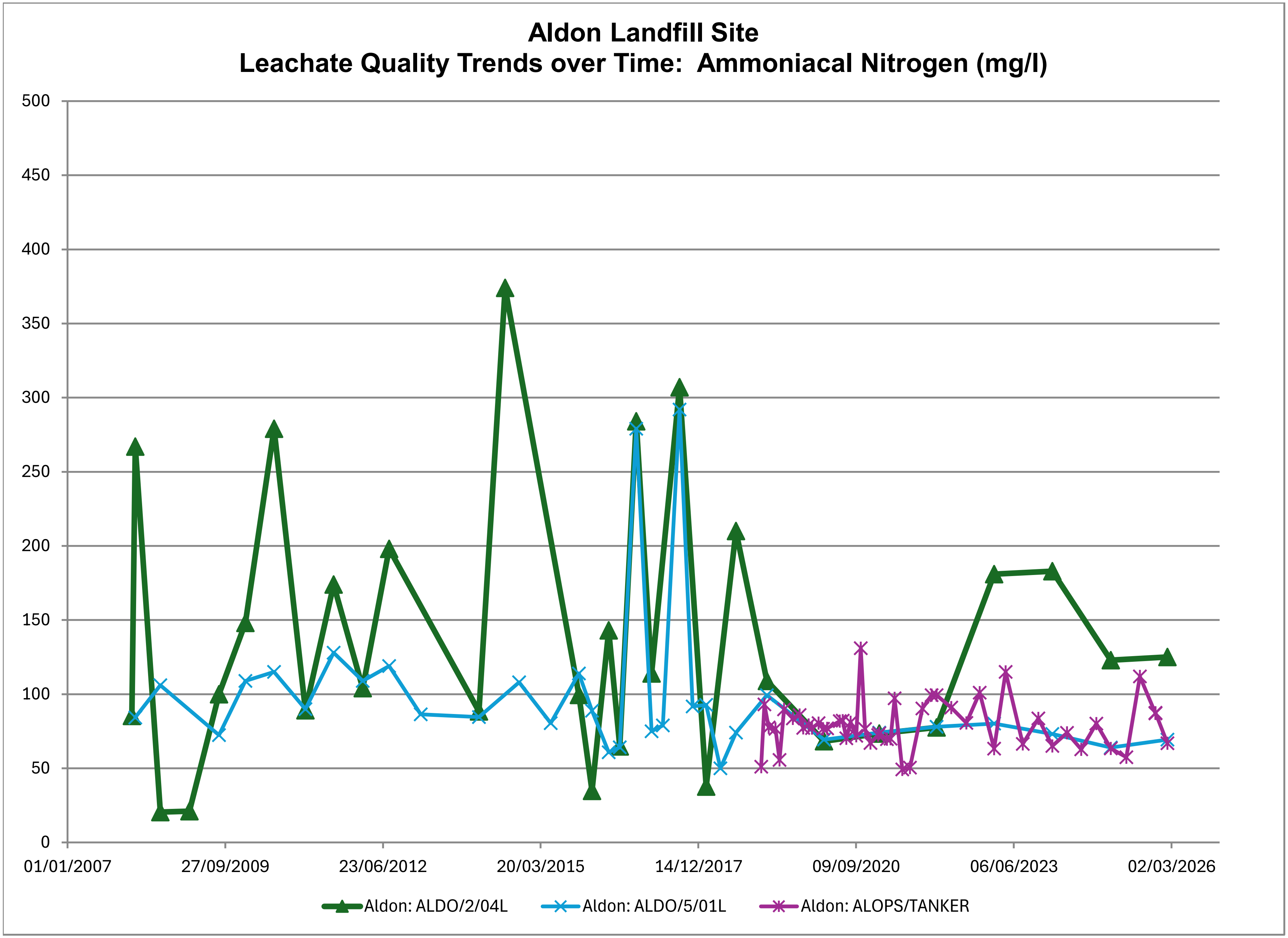

Aldon Landfill Site
Leachate Volumes Removed from Site (m³)
2018 - 2025
250
200
150
100
50
0
m³
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Jul-24
Oct-24
Jan-25
Apr-25
Jul-25
Oct-25

Figure 2 Aldon Landfill Site - Leachate Quality Over Time


Aldon Landfill Site
Leachate Quality Trends over Time: Ammoniacal Nitrogen (mg/l)
500
450
400
350
300
250
200
150
100
50
0
01/01/2007
27/09/2009
23/06/2012
20/03/2015
14/12/2017
09/09/2020
06/06/2023
02/03/2026
Aldon: ALDO/2/04L
Aldon: ALDO/5/01L
Aldon: ALOPS/TANKER

Appendices

Appendix A Leachate Infrastructure Log

Appendix A

Aldon Leachate Infrastructure Log - February 2026

Site	Well ID	Phase/Cell	Original/Retro drilled well	Material	Pump Installed	CQA Report Available	Leachate Well Top (mAOD)	Leachate Well Base (mAOD)	Leachate Well Depth (m)	Hard Dip to Base (m)	Leachate Well Base (using Hard Dip) (mAOD)	Status
Aldon	AL/L03	Southern Area Phase 4	Retrodrill	HDPE	No	No	228.32	217.85	10.47	7.66	220.66	Satisfactory
Aldon	AL/L04	Southern Area Phase 4	Retrodrill	HDPE	No	No	222.26	210.96	11.3	9.09	213.17	Satisfactory
Aldon	AL2/04L	Central Area	Original	Concrete	Yes	No	250.36	231.33	19.03	18.96	231.4	Satisfactory
Aldon	AL5/01L	Central Area	Original	Concrete	Yes	No	251.5	232.31	19.19	19	232.5	Satisfactory

Aldon Landfill Site – Leachate Management Plan

Appendix B – Leachate Monitoring Schedule

Leachate – Monitoring Schedule			
Monitoring Points	**Frequency**	**Determinands**	**Action Level**
AL2/04L, AL5/01L,	Quarterly	Leachate Level	245mAOD
AL/03L, AL/04L			N/A
AL2/04L, AL5/01L, AL/03L, AL/04L	Annually	Dip to Base	N/A
AL5/01L	Annually	Ammoniacal Nitrogen, BOD, Cadmium, Calcium, COD, Chloride, Copper, Chromium, Electrical. Conductivity, Iron, Lead, Magnesium, Manganese, Nickel, pH, Potassium, Sodium, Sulphate, Zinc, BTEX substances	N/A

Aldon Landfill Site – Leachate Management Plan

Appendix C – Leachate Action Level Contingency Action Plan

Purpose and Scope

Routine leachate monitoring of a site is a critical activity to ensure that the leachate levels within the site are known and risks appropriately managed.

This Action Plan has been written to ensure that SUEZ's management and aftercare personnel have clear actions to take on recording a leachate action level exceedance during routine monitoring visits/data analysis at Aldon Landfill Site against the stated management thresholds set out in this Management Plan.

In the event of an exceedance of a Leachate Action Level proposed within the 2026 HRA and Leachate Management Plan, SUEZ will respond by implementation of the following actions as described in the table below.

Leachate Level – Action Level Exceedance		
On exceeding the Leachate Action Level	**Response Time**	**Responsibility**
Notify Site Management, Technical Team and EIR Team.	24 hours	Aftercare Team
Confirm data and trends over time	7 days	Aftercare Team / Site Management
Define the actions required to reinstate active leachate extraction from the Site	28 days	Aftercare Team / Site Management
Complete a preliminary assessment of causes / risk associated with rise in leachate level(s)	28 days	Aftercare Team / Technical Team
Notify the EA of findings and proposed outcomes should active leachate management be required	2 months	Site Management / EIR Team

Appendix C. Aldon Infrastructure Borehole Audit

[Provided as an appended spreadsheet]

Appendix D. Leachate Level Data

[Provided as an appended spreadsheet]

Appendix E. Leachate Drawdown Pumping Tests Worksheets

Aldon Landfill Site			
Test	Recovering Leachate Head Test		
Date	19/06/2025		
By	Thomas Willetts	Borehole Diameter: >300m	
Borehole ID	AL2/04L	Datum: 250.36	
Dip Start	13.93 mbCL	Time Start: 09:42	

Time (mins)	Time (hh/mm/ss	Dip to liquid (m)	Comments
0	09:42:00	13.93	
0.5	09:42:30	13.95	1 pump per 5 seconds
1	09:43:00	13.93	
1.5	09:43:30	13.93	
2	09:44:00	13.94	
3	09:45:00	13.94	
4	09:46:00	13.95	
5	09:47:00	13.96	
6	09:48:00	13.97	
7	09:49:00	13.98	
8	09:50:00	13.99	
9	09:51:00	13.99	
10	09:52:00	14	
12.5	09:54:30	14.03	
15	09:57:00	14.06	
20	10:02:00	14.11	
25	10:07:00	14.16	
30	10:12:00	14.22	
35	10:17:00	14.28	
40	10:22:00	14.31	
45	10:27:00	14.37	
50	10:32:00	14.41	
60	10:42:00	14.51	
90	11:12:00	14.74	
120	11:42:00	15.13	
180	12:42:00	15.61	
240	13:42:00	16.15	
300	14:42:00	16.58	
390	16:12:00	17.2	1 pump per 10 seconds
1341	09:03:00	18.22	
1568	12:10:00	18.2	1 pump per 51 seconds

Aldon Landfill Site		
Test	Leachate Drawdown/Pumping Test	
Date	19/06/2025	
By	Thomas Willetts	Borehole Diameter: >300m
Borehole ID	AL5/01L	Datum: 251.50
Dip Start	15.53 mbCL	Time Start: 10:51

Time (mins)	Time (hh/mm/ss)	Dip to liquid (m)	Comments
0	10:51:00	15.53	
0.5	10:51:30	15.52	1 pump per 10 seconds
1	10:52:00	15.52	
1.5	10:52:30	15.53	
2	10:53:00	15.53	
3	10:54:00	15.53	
4	10:55:00	15.54	
5	10:56:00	15.54	
6	10:57:00	15.54	
7	10:58:00	15.54	
8	10:59:00	15.55	
9	11:00:00	15.56	
10	11:01:00	15.56	
12.5	11:03:30	15.56	
15	11:06:00	15.57	
20	11:11:00	15.58	
25	11:16:00	15.58	
30	11:21:00	15.58	
35	11:26:00	15.58	
40	11:31:00	15.58	
45	11:36:00	15.59	
50	11:41:00	15.65	
55	11:46:00	15.65	
60	11:51:00	15.69	
120	12:51:00	15.69	
180	13:51:00	15.79	
240	14:51:00	15.89	
360	16:51:00	16.05	1 pump per 10 seconds
1335	09:06:00	17.42	
1581	12:12:00	17.65	1 pump per 14 seconds

Appendix F. Leachate Quality Data

[Provided as an appended spreadsheet]

Appendix G. Leachate Hazardous Substances Testing

Hazardous Substance Testing in Leachate Composite Tank: 20th November 2025

Substances above Limit of Detection

Substance	Concentration
Lead, filtered (mg/l)	0.0002

Substances below Limit of Detection

Substance	Concentration
1,1,1,2-Tetrachloroethane (µg/l)	<1
1,1,1-Trichloroethane (µg/l)	<1
1,1,2,2-Tetrachloroethane (µg/l)	<1
1,1,2-Trichloroethane (µg/l)	<1
1,1-Dichloroethane (µg/l)	<1
1,1-Dichloroethene (µg/l)	<1
1,2,3-Trichlorobenzene (VOC) (µg/l)	<5
1,2,3-Trichloropropane (µg/l)	<1
1,2,4-Trichlorobenzene ESG SVOC (mg/l)	<0.025
1,2,4-Trichlorobenzene ESG VOC (µg/l)	<5
1,2,4-Trimethylbenzene (µg/l)	<1
1,2-Dibromo-3-chloropropane (µg/l)	<5
1,2-Dibromoethane (µg/l)	<1
1,2-Dichlorobenzene (VOC) (µg/l)	<5
1,2-Dichlorobenzene ESG SVOC (mg/l)	<0.025
1,2-Dichloroethane (µg/l)	<1
1,2-Dichloropropane (µg/l)	<1
1,3,5-Trimethylbenzene (µg/l)	<0.6
1,3-Dichlorobenzene (VOC) (µg/l)	<1
1,3-Dichlorobenzene ESG SVOC (mg/l)	<0.025
1,3-Dichloropropane (µg/l)	<1
1,4-Dichlorobenzene (SVOC) (mg/l)	<0.025
1,4-Dichlorobenzene (VOC) (µg/l)	<1
1-Methylnaphthalene ESG SVOC (mg/l)	<0.010
2,2-Dichloropropane (µg/l)	<1
2,3,6-TBA (µg/l)	<10.0
2,4,5-T (µg/l)	<15.0
2,4,5-Trichlorophenol ESG SVOC (mg/l)	<0.100
2,4,6-Trichlorophenol ESG SVOC (mg/l)	<0.100
2,4-D (µg/l)	<15.0
2,4-DB (µg/l)	<20.0
2,4-Dichlorophenol ESG SVOC (mg/l)	<0.100
2,4-Dimethylphenol ESG SVOC (mg/l)	<0.100
2,4-Dinitrophenol (µg/l)	<25.0
2,4-Dinitrophenol ESG SVOC (mg/l)	<0.050
2,4-Dinitrotoluene ESG SVOC (mg/l)	<0.025
2,6-Dinitrotoluene ESG SVOC (mg/l)	<0.025
2-Chloronaphthalene ESG SVOC (mg/l)	<0.010

2-Chlorophenol ESG SVOC (mg/l)	<0.100
2-Chlorotoluene (µg/l)	<1
2-Methylnaphthalene ESG SVOC (mg/l)	<0.010
2-Methylphenol ESG SVOC (mg/l)	<0.025
2-Nitroaniline ESG SVOC (mg/l)	<0.025
2-Nitrophenol ESG SVOC (mg/l)	<0.100
3-&4-Methylphenol ESG (mg/l)	<0.100
3-Nitroaniline ESG SVOC (mg/l)	<0.025
4,6-Dinitro-2-methylphenol ESG SVOC (mg/l)	<0.250
4-Bromophenyl-phenylether ESG SVOC (mg/l)	<0.025
4-Chloro-3-methylphenol ESG SVOC (mg/l)	<0.025
4-Chloroaniline ESG SVOC (mg/l)	<0.025
4-Chlorophenol ESG SVOC (mg/l)	<0.100
4-Chlorophenyl-phenylether ESG SVOC (mg/l)	<0.025
4-Chlorotoluene (µg/l)	<1
4-Nitroaniline ESG SVOC (mg/l)	<0.025
4-Nitrophenol ESG SVOC (mg/l)	<0.250
Acenaphthene ESG SVOC (mg/l)	<0.010
Acenaphthylene ESG SVOC (mg/l)	<0.010
Anthracene ESG SVOC (mg/l)	<0.010
Arsenic, filtered (mg/l)	<0.001
Azobenzene (mg/l)	<0.050
Benazolin (µg/l)	<20.0
Bentazone (µg/l)	<10.0
Benzene (µg/l)	<1
Benzo(a)anthracene ESG SVOC (mg/l)	<0.010
Benzo(a)pyrene ESG SVOC (mg/l)	<0.010
Benzo(b)fluoranthene ESG SVOC (mg/l)	<0.010
Benzo(g,h,i)perylene ESG SVOC (mg/l)	<0.010
Benzo(k)fluoranthene ESG SVOC (mg/l)	<0.010
Benzoic Acid ESG SVOC (mg/l)	<0.500
Benzyl alcohol ESG SVOC (mg/l)	<0.025
Biphenyl ESG SVOC (mg/l)	<0.010
bis(2-Chloroethoxy)methane ESG SVOC (mg/l)	<0.025
bis(2-Chloroethyl)ether ESG SVOC (mg/l)	<0.025
bis(2-Chloroisopropyl)ether ESG SVOC (mg/l)	<0.025
Bis(2-ethylhexyl)phthalate... (mg/l)	<0.025
Bromobenzene (µg/l)	<1
Bromochloromethane (µg/l)	<1
Bromodichloromethane (µg/l)	<1
Bromoform (µg/l)	<1
Bromomethane (µg/l)	<5
Bromoxynil (µg/l)	<15.0
Butylbenzylphthalate ESG SVOC (mg/l)	<0.025
Carbazole (mg/l)	<0.050
Carbon Tetrachloride (µg/l)	<1

Chlorobenzene (µg/l)	<1
Chloroethane (µg/l)	<5
Chloroform (µg/l)	<5
Chloromethane (µg/l)	<1
Chromium III as Cr [CALC] mg/l (mg/l)	<0.003
Chromium VI as Cr [KONENS] mg/l (mg/l)	<0.003
Chrysene ESG SVOC (mg/l)	<0.010
cis-1,2-Dichloroethene (µg/l)	<1
Cis-1,3-Dichloropropene (ug/l) (µg/l)	<1
Clopyralid (µg/l)	<10.0
Coronene (mg/l)	<0.250
Dibenzo(a,h)anthracene ESG SVOC (mg/l)	<0.010
Dibenzofuran ESG SVOC (mg/l)	<0.025
Dibromochloromethane (µg/l)	<1
Dibromomethane (µg/l)	<1
Dicamba (µg/l)	<20.0
Dichlorodifluoromethane (µg/l)	<1
Dichloroprop (µg/l)	<10.0
Diethylphthalate ESG SVOC (mg/l)	<0.025
Dimethylphthalate ESG SVOC (mg/l)	<0.025
Di-n-butylphthalate ESG SVOC (mg/l)	<0.025
Di-n-octylphthalate ESG SVOC (mg/l)	<0.010
Diphenyl ether ESG SVOC (mg/l)	<0.010
DNOC (µg/l)	<20.0
Ethyl Benzene (VOC) (µg/l)	<0.5
Fenoprop (µg/l)	<10.0
Fluoranthene ESG SVOC (mg/l)	<0.010
Fluorene ESG SVOC (mg/l)	<0.010
Fluroxypyr (µg/l)	<15.0
Hexachlorobenzene ESG SVOC (mg/l)	<0.025
Hexachlorobutadiene (VOC) (µg/l)	<5
Hexachlorobutadiene ESG SVOC (mg/l)	<0.025
Hexachlorocyclopentadiene ESG SVOC (mg/l)	<0.025
Hexachloroethane ESG SVOC (mg/l)	<0.025
Indeno(1,2,3-cd)pyrene ESG SVOC (mg/l)	<0.010
Ioxynil (µg/l)	<20.0
Isophorone ESG SVOC (mg/l)	<0.025
Iso-Propylbenzene (µg/l)	<1
m,p-Xylene (VOC) (µg/l)	<1
MCPA (µg/l)	<10.0
MCPB (µg/l)	<10.0
Mecoprop (µg/l)	<10.0
Mercury, filtered (mg/l)	<0.00003
MTBE (VOC) (µg/l)	<1
Naphthalene (VOC) (µg/l)	<5
Naphthalene ESG SVOC (mg/l)	<0.010

n-Butylbenzene (µg/l)	<1
Nitrobenzene ESG SVOC (mg/l)	<0.025
N-Nitroso-di-n-propylamine ESG SVOC (mg/l)	<0.025
N-Nitrosodiphenylamine ESG SVOC (mg/l)	<0.025
o-Xylene (VOC) (µg/l)	<1
Pentachlorophenol (µg/l)	<20.0
Pentachlorophenol ESG SVOC (mg/l)	<0.250
Phenanthrene ESG SVOC (mg/l)	<0.010
Phenol ESG SVOC (mg/l)	<0.100
p-Isopropyltoluene (µg/l)	<1
Propylbenzene (µg/l)	<1
Pyrene ESG SVOC (mg/l)	<0.010
sec-Butylbenzene (µg/l)	<1
Settleable Solids (mg/l)	<5
Styrene (µg/l)	<1
Suspended Solids (8 hr Settled) (mg/l)	<5
tert-Butylbenzene (µg/l)	<1
Tetrachloroethene (µg/l)	<5
Toluene (VOC) (µg/l)	<1
trans-1,2-Dichloroethene (µg/l)	<1
trans-1,3-Dichloropropene (µg/l)	<1
Trichloroethene (µg/l)	<5
Trichlorofluoromethane (µg/l)	<1
Triclopyr (µg/l)	<15.0
Vinyl Chloride (µg/l)	<1

Appendix H. Groundwater Level Data

[Provided as an appended spreadsheet]

Appendix I. Groundwater Quality Data

[Provided as an appended spreadsheet]

Appendix J. Groundwater Hazardous Substances Testing

Hazardous Substance Testing in Downgradient Groundwater Network (AL1/01W, AL1/02W): 20th November 2025

Substances above Limit of Detection

Monitoring Point	Substance	Concentration
AL1/01W	Mecoprop (µg/l)	0.15

Substances below Limit of Detection

Monitoring Point	Substance	Concentration
AL1/01W	1,1,1,2-Tetrachloroethane (µg/l)	<1
AL1/01W	1,1,1-Trichloroethane (µg/l)	<1
AL1/01W	1,1,2,2-Tetrachloroethane (µg/l)	<1
AL1/01W	1,1,2-Trichloroethane (µg/l)	<1
AL1/01W	1,1-Dichloroethane (µg/l)	<1
AL1/01W	1,1-Dichloroethene (µg/l)	<1
AL1/01W	1,2,3-Trichlorobenzene (VOC) (µg/l)	<5
AL1/01W	1,2,3-Trichloropropane (µg/l)	<1
AL1/01W	1,2,4-Trichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/01W	1,2,4-Trichlorobenzene ESG VOC (µg/l)	<5
AL1/01W	1,2,4-Trimethylbenzene (µg/l)	<1
AL1/01W	1,2-Dibromo-3-chloropropane (µg/l)	<5
AL1/01W	1,2-Dibromoethane (µg/l)	<1
AL1/01W	1,2-Dichlorobenzene (VOC) (µg/l)	<5
AL1/01W	1,2-Dichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/01W	1,2-Dichloroethane (µg/l)	<1
AL1/01W	1,2-Dichloropropane (µg/l)	<1
AL1/01W	1,3,5-Trimethylbenzene (µg/l)	<0.6
AL1/01W	1,3-Dichlorobenzene (VOC) (µg/l)	<1
AL1/01W	1,3-Dichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/01W	1,3-Dichloropropane (µg/l)	<1
AL1/01W	1,4-Dichlorobenzene (SVOC) (mg/l)	<0.005
AL1/01W	1,4-Dichlorobenzene (VOC) (µg/l)	<1
AL1/01W	1-Methylnaphthalene ESG SVOC (mg/l)	<0.002
AL1/01W	2,2-Dichloropropane (µg/l)	<1
AL1/01W	2,3,6-TBA (µg/l)	<0.02
AL1/01W	2,4,5-T (µg/l)	<0.03
AL1/01W	2,4,5-Trichlorophenol ESG SVOC (mg/l)	<0.020
AL1/01W	2,4,6-Trichlorophenol ESG SVOC (mg/l)	<0.020
AL1/01W	2,4-D (µg/l)	<0.03
AL1/01W	2,4-DB (µg/l)	<0.04
AL1/01W	2,4-Dichlorophenol ESG SVOC (mg/l)	<0.020
AL1/01W	2,4-Dimethylphenol ESG SVOC (mg/l)	<0.020
AL1/01W	2,4-Dinitrophenol (µg/l)	<0.05
AL1/01W	2,4-Dinitrophenol ESG SVOC (mg/l)	<0.010
AL1/01W	2,4-Dinitrotoluene ESG SVOC (mg/l)	<0.005
AL1/01W	2,6-Dinitrotoluene ESG SVOC (mg/l)	<0.005

AL1/01W	2-Chloronaphthalene ESG SVOC (mg/l)	<0.002
AL1/01W	2-Chlorophenol ESG SVOC (mg/l)	<0.020
AL1/01W	2-Chlorotoluene (µg/l)	<1
AL1/01W	2-Methylnaphthalene ESG SVOC (mg/l)	<0.002
AL1/01W	2-Methylphenol ESG SVOC (mg/l)	<0.005
AL1/01W	2-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/01W	2-Nitrophenol ESG SVOC (mg/l)	<0.020
AL1/01W	3-&4-Methylphenol ESG (mg/l)	<0.020
AL1/01W	3-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/01W	4,6-Dinitro-2-methylphenol ESG SVOC (mg/l)	<0.050
AL1/01W	4-Bromophenyl-phenylether ESG SVOC (mg/l)	<0.005
AL1/01W	4-Chloro-3-methylphenol ESG SVOC (mg/l)	<0.005
AL1/01W	4-Chloroaniline ESG SVOC (mg/l)	<0.005
AL1/01W	4-Chlorophenol ESG SVOC (mg/l)	<0.020
AL1/01W	4-Chlorophenyl-phenylether ESG SVOC (mg/l)	<0.005
AL1/01W	4-Chlorotoluene (µg/l)	<1
AL1/01W	4-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/01W	4-Nitrophenol ESG SVOC (mg/l)	<0.050
AL1/01W	Acenaphthene ESG SVOC (mg/l)	<0.002
AL1/01W	Acenaphthylene ESG SVOC (mg/l)	<0.002
AL1/01W	Anthracene ESG SVOC (mg/l)	<0.002
AL1/01W	Arsenic, filtered (mg/l)	<0.001
AL1/01W	Azobenzene (mg/l)	<0.010
AL1/01W	Benazolin (µg/l)	<0.04
AL1/01W	Bentazone (µg/l)	<0.02
AL1/01W	Benzene (µg/l)	<1
AL1/01W	Benzo(a)anthracene ESG SVOC (mg/l)	<0.002
AL1/01W	Benzo(a)pyrene ESG SVOC (mg/l)	<0.002
AL1/01W	Benzo(b)fluoranthene ESG SVOC (mg/l)	<0.002
AL1/01W	Benzo(g,h,i)perylene ESG SVOC (mg/l)	<0.002
AL1/01W	Benzo(k)fluoranthene ESG SVOC (mg/l)	<0.002
AL1/01W	Benzoic Acid ESG SVOC (mg/l)	<0.100
AL1/01W	Benzyl alcohol ESG SVOC (mg/l)	<0.005
AL1/01W	Biphenyl ESG SVOC (mg/l)	<0.002
AL1/01W	bis(2-Chloroethoxy)methane ESG SVOC (mg/l)	<0.005
AL1/01W	bis(2-Chloroethyl)ether ESG SVOC (mg/l)	<0.005
AL1/01W	bis(2-Chloroisopropyl)ether ESG SVOC (mg/l)	<0.005
AL1/01W	Bis(2-ethylhexyl)phthalate... (mg/l)	<0.005
AL1/01W	Bromobenzene (µg/l)	<1
AL1/01W	Bromochloromethane (µg/l)	<1
AL1/01W	Bromodichloromethane (µg/l)	<1
AL1/01W	Bromoform (µg/l)	<1
AL1/01W	Bromomethane (µg/l)	<5
AL1/01W	Bromoxynil (µg/l)	<0.03
AL1/01W	Butylbenzylphthalate ESG SVOC (mg/l)	<0.005
AL1/01W	Carbazole (mg/l)	<0.010

AL1/01W	Carbon Tetrachloride (µg/l)	<1
AL1/01W	Chlorobenzene (µg/l)	<1
AL1/01W	Chloroethane (µg/l)	<5
AL1/01W	Chloroform (µg/l)	<5
AL1/01W	Chloromethane (µg/l)	<1
AL1/01W	Chromium III as Cr [CALC] mg/l (mg/l)	<0.003
AL1/01W	Chromium VI as Cr [KONENS] mg/l (mg/l)	<0.003
AL1/01W	Chrysene ESG SVOC (mg/l)	<0.002
AL1/01W	cis-1,2-Dichloroethene (µg/l)	<1
AL1/01W	Cis-1,3-Dichloropropene (ug/l) (µg/l)	<1
AL1/01W	Clopyralid (µg/l)	<0.02
AL1/01W	Coronene (mg/l)	<0.050
AL1/01W	Dibenzo(a,h)anthracene ESG SVOC (mg/l)	<0.002
AL1/01W	Dibenzofuran ESG SVOC (mg/l)	<0.005
AL1/01W	Dibromochloromethane (µg/l)	<1
AL1/01W	Dibromomethane (µg/l)	<1
AL1/01W	Dicamba (µg/l)	<0.04
AL1/01W	Dichlorodifluoromethane (µg/l)	<1
AL1/01W	Dichloroprop (µg/l)	<0.02
AL1/01W	Diethylphthalate ESG SVOC (mg/l)	<0.005
AL1/01W	Dimethylphthalate ESG SVOC (mg/l)	<0.005
AL1/01W	Di-n-butylphthalate ESG SVOC (mg/l)	<0.005
AL1/01W	Di-n-octylphthalate ESG SVOC (mg/l)	<0.002
AL1/01W	Diphenyl ether ESG SVOC (mg/l)	<0.002
AL1/01W	DNOC (µg/l)	<0.04
AL1/01W	Ethyl Benzene (VOC) (µg/l)	<0.5
AL1/01W	Fenoprop (µg/l)	<0.02
AL1/01W	Fluoranthene ESG SVOC (mg/l)	<0.002
AL1/01W	Fluorene ESG SVOC (mg/l)	<0.002
AL1/01W	Fluroxypyr (µg/l)	<0.03
AL1/01W	Hexachlorobenzene ESG SVOC (mg/l)	<0.005
AL1/01W	Hexachlorobutadiene (VOC) (µg/l)	<5
AL1/01W	Hexachlorobutadiene ESG SVOC (mg/l)	<0.005
AL1/01W	Hexachlorocyclopentadiene ESG SVOC (mg/l)	<0.005
AL1/01W	Hexachloroethane ESG SVOC (mg/l)	<0.005
AL1/01W	Indeno(1,2,3-cd)pyrene ESG SVOC (mg/l)	<0.002
AL1/01W	Ioxynil (µg/l)	<0.04
AL1/01W	Isophorone ESG SVOC (mg/l)	<0.005
AL1/01W	Iso-Propylbenzene (µg/l)	<1
AL1/01W	Lead, filtered (mg/l)	<0.0002
AL1/01W	m,p-Xylene (VOC) (µg/l)	<1
AL1/01W	MCPA (µg/l)	<0.02
AL1/01W	MCPB (µg/l)	<0.02
AL1/01W	Mercury, filtered (mg/l)	<0.00003
AL1/01W	MTBE (VOC) (µg/l)	<1
AL1/01W	Naphthalene (VOC) (µg/l)	<5

AL1/01W	Naphthalene ESG SVOC (mg/l)	<0.002
AL1/01W	n-Butylbenzene (µg/l)	<1
AL1/01W	Nitrobenzene ESG SVOC (mg/l)	<0.005
AL1/01W	N-Nitroso-di-n-propylamine ESG SVOC (mg/l)	<0.005
AL1/01W	N-Nitrosodiphenylamine ESG SVOC (mg/l)	<0.005
AL1/01W	o-Xylene (VOC) (µg/l)	<1
AL1/01W	Pentachlorophenol (µg/l)	<0.04
AL1/01W	Pentachlorophenol ESG SVOC (mg/l)	<0.050
AL1/01W	Phenanthrene ESG SVOC (mg/l)	<0.002
AL1/01W	Phenol ESG SVOC (mg/l)	<0.020
AL1/01W	p-Isopropyltoluene (µg/l)	<1
AL1/01W	Propylbenzene (µg/l)	<1
AL1/01W	Pyrene ESG SVOC (mg/l)	<0.002
AL1/01W	sec-Butylbenzene (µg/l)	<1
AL1/01W	Styrene (µg/l)	<1
AL1/01W	tert-Butylbenzene (µg/l)	<1
AL1/01W	Tetrachloroethene (µg/l)	<5
AL1/01W	Toluene (VOC) (µg/l)	<1
AL1/01W	trans-1,2-Dichloroethene (µg/l)	<1
AL1/01W	trans-1,3-Dichloropropene (µg/l)	<1
AL1/01W	Trichloroethene (µg/l)	<5
AL1/01W	Trichlorofluoromethane (µg/l)	<1
AL1/01W	Triclopyr (µg/l)	<0.03
AL1/01W	Vinyl Chloride (µg/l)	<1
AL1/02W	1,1,1,2-Tetrachloroethane (µg/l)	<1
AL1/02W	1,1,1-Trichloroethane (µg/l)	<1
AL1/02W	1,1,2,2-Tetrachloroethane (µg/l)	<1
AL1/02W	1,1,2-Trichloroethane (µg/l)	<1
AL1/02W	1,1-Dichloroethane (µg/l)	<1
AL1/02W	1,1-Dichloroethene (µg/l)	<1
AL1/02W	1,2,3-Trichlorobenzene (VOC) (µg/l)	<5
AL1/02W	1,2,3-Trichloropropane (µg/l)	<1
AL1/02W	1,2,4-Trichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/02W	1,2,4-Trichlorobenzene ESG VOC (µg/l)	<5
AL1/02W	1,2,4-Trimethylbenzene (µg/l)	<1
AL1/02W	1,2-Dibromo-3-chloropropane (µg/l)	<5
AL1/02W	1,2-Dibromoethane (µg/l)	<1
AL1/02W	1,2-Dichlorobenzene (VOC) (µg/l)	<5
AL1/02W	1,2-Dichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/02W	1,2-Dichloroethane (µg/l)	<1
AL1/02W	1,2-Dichloropropane (µg/l)	<1
AL1/02W	1,3,5-Trimethylbenzene (µg/l)	<0.6
AL1/02W	1,3-Dichlorobenzene (VOC) (µg/l)	<1
AL1/02W	1,3-Dichlorobenzene ESG SVOC (mg/l)	<0.005
AL1/02W	1,3-Dichloropropane (µg/l)	<1
AL1/02W	1,4-Dichlorobenzene (SVOC) (mg/l)	<0.005

AL1/02W	1,4-Dichlorobenzene (VOC) (µg/l)	<1
AL1/02W	1-Methylnaphthalene ESG SVOC (mg/l)	<0.002
AL1/02W	2,2-Dichloropropane (µg/l)	<1
AL1/02W	2,3,6-TBA (µg/l)	<0.02
AL1/02W	2,4,5-T (µg/l)	<0.03
AL1/02W	2,4,5-Trichlorophenol ESG SVOC (mg/l)	<0.020
AL1/02W	2,4,6-Trichlorophenol ESG SVOC (mg/l)	<0.020
AL1/02W	2,4-D (µg/l)	<0.03
AL1/02W	2,4-DB (µg/l)	<0.04
AL1/02W	2,4-Dichlorophenol ESG SVOC (mg/l)	<0.020
AL1/02W	2,4-Dimethylphenol ESG SVOC (mg/l)	<0.020
AL1/02W	2,4-Dinitrophenol (µg/l)	<0.05
AL1/02W	2,4-Dinitrophenol ESG SVOC (mg/l)	<0.010
AL1/02W	2,4-Dinitrotoluene ESG SVOC (mg/l)	<0.005
AL1/02W	2,6-Dinitrotoluene ESG SVOC (mg/l)	<0.005
AL1/02W	2-Chloronaphthalene ESG SVOC (mg/l)	<0.002
AL1/02W	2-Chlorophenol ESG SVOC (mg/l)	<0.020
AL1/02W	2-Chlorotoluene (µg/l)	<1
AL1/02W	2-Methylnaphthalene ESG SVOC (mg/l)	<0.002
AL1/02W	2-Methylphenol ESG SVOC (mg/l)	<0.005
AL1/02W	2-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/02W	2-Nitrophenol ESG SVOC (mg/l)	<0.020
AL1/02W	3-&4-Methylphenol ESG (mg/l)	<0.020
AL1/02W	3-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/02W	4,6-Dinitro-2-methylphenol ESG SVOC (mg/l)	<0.050
AL1/02W	4-Bromophenyl-phenylether ESG SVOC (mg/l)	<0.005
AL1/02W	4-Chloro-3-methylphenol ESG SVOC (mg/l)	<0.005
AL1/02W	4-Chloroaniline ESG SVOC (mg/l)	<0.005
AL1/02W	4-Chlorophenol ESG SVOC (mg/l)	<0.020
AL1/02W	4-Chlorophenyl-phenylether ESG SVOC (mg/l)	<0.005
AL1/02W	4-Chlorotoluene (µg/l)	<1
AL1/02W	4-Nitroaniline ESG SVOC (mg/l)	<0.005
AL1/02W	4-Nitrophenol ESG SVOC (mg/l)	<0.050
AL1/02W	Acenaphthene ESG SVOC (mg/l)	<0.002
AL1/02W	Acenaphthylene ESG SVOC (mg/l)	<0.002
AL1/02W	Anthracene ESG SVOC (mg/l)	<0.002
AL1/02W	Arsenic, filtered (mg/l)	<0.001
AL1/02W	Azobenzene (mg/l)	<0.010
AL1/02W	Benazolin (µg/l)	<0.04
AL1/02W	Bentazone (µg/l)	<0.02
AL1/02W	Benzene (µg/l)	<1
AL1/02W	Benzo(a)anthracene ESG SVOC (mg/l)	<0.002
AL1/02W	Benzo(a)pyrene ESG SVOC (mg/l)	<0.002
AL1/02W	Benzo(b)fluoranthene ESG SVOC (mg/l)	<0.002
AL1/02W	Benzo(g,h,i)perylene ESG SVOC (mg/l)	<0.002
AL1/02W	Benzo(k)fluoranthene ESG SVOC (mg/l)	<0.002

AL1/02W	Benzoic Acid ESG SVOC (mg/l)	<0.100
AL1/02W	Benzyl alcohol ESG SVOC (mg/l)	<0.005
AL1/02W	Biphenyl ESG SVOC (mg/l)	<0.002
AL1/02W	bis(2-Chloroethoxy)methane ESG SVOC (mg/l)	<0.005
AL1/02W	bis(2-Chloroethyl)ether ESG SVOC (mg/l)	<0.005
AL1/02W	bis(2-Chloroisopropyl)ether ESG SVOC (mg/l)	<0.005
AL1/02W	Bis(2-ethylhexyl)phthalate... (mg/l)	<0.005
AL1/02W	Bromobenzene (µg/l)	<1
AL1/02W	Bromochloromethane (µg/l)	<1
AL1/02W	Bromodichloromethane (µg/l)	<1
AL1/02W	Bromoform (µg/l)	<1
AL1/02W	Bromomethane (µg/l)	<5
AL1/02W	Bromoxynil (µg/l)	<0.03
AL1/02W	Butylbenzylphthalate ESG SVOC (mg/l)	<0.005
AL1/02W	Carbazole (mg/l)	<0.010
AL1/02W	Carbon Tetrachloride (µg/l)	<1
AL1/02W	Chlorobenzene (µg/l)	<1
AL1/02W	Chloroethane (µg/l)	<5
AL1/02W	Chloroform (µg/l)	<5
AL1/02W	Chloromethane (µg/l)	<1
AL1/02W	Chromium III as Cr [CALC] mg/l (mg/l)	<0.003
AL1/02W	Chromium VI as Cr [KONENS] mg/l (mg/l)	<0.003
AL1/02W	Chrysene ESG SVOC (mg/l)	<0.002
AL1/02W	cis-1,2-Dichloroethene (µg/l)	<1
AL1/02W	Cis-1,3-Dichloropropene (ug/l) (µg/l)	<1
AL1/02W	Clopyralid (µg/l)	<0.02
AL1/02W	Coronene (mg/l)	<0.050
AL1/02W	Dibenzo(a,h)anthracene ESG SVOC (mg/l)	<0.002
AL1/02W	Dibenzofuran ESG SVOC (mg/l)	<0.005
AL1/02W	Dibromochloromethane (µg/l)	<1
AL1/02W	Dibromomethane (µg/l)	<1
AL1/02W	Dicamba (µg/l)	<0.04
AL1/02W	Dichlorodifluoromethane (µg/l)	<1
AL1/02W	Dichloroprop (µg/l)	<0.02
AL1/02W	Diethylphthalate ESG SVOC (mg/l)	<0.005
AL1/02W	Dimethylphthalate ESG SVOC (mg/l)	<0.005
AL1/02W	Di-n-butylphthalate ESG SVOC (mg/l)	<0.005
AL1/02W	Di-n-octylphthalate ESG SVOC (mg/l)	<0.002
AL1/02W	Diphenyl ether ESG SVOC (mg/l)	<0.002
AL1/02W	DNOC (µg/l)	<0.04
AL1/02W	Ethyl Benzene (VOC) (µg/l)	<0.5
AL1/02W	Fenoprop (µg/l)	<0.02
AL1/02W	Fluoranthene ESG SVOC (mg/l)	<0.002
AL1/02W	Fluorene ESG SVOC (mg/l)	<0.002
AL1/02W	Fluroxypyr (µg/l)	<0.03
AL1/02W	Hexachlorobenzene ESG SVOC (mg/l)	<0.005

AL1/02W	Hexachlorobutadiene (VOC) (µg/l)	<5
AL1/02W	Hexachlorobutadiene ESG SVOC (mg/l)	<0.005
AL1/02W	Hexachlorocyclopentadiene ESG SVOC (mg/l)	<0.005
AL1/02W	Hexachloroethane ESG SVOC (mg/l)	<0.005
AL1/02W	Indeno(1,2,3-cd)pyrene ESG SVOC (mg/l)	<0.002
AL1/02W	Ioxynil (µg/l)	<0.04
AL1/02W	Isophorone ESG SVOC (mg/l)	<0.005
AL1/02W	Iso-Propylbenzene (µg/l)	<1
AL1/02W	Lead, filtered (mg/l)	<0.0002
AL1/02W	m,p-Xylene (VOC) (µg/l)	<1
AL1/02W	MCPA (µg/l)	<0.02
AL1/02W	MCPB (µg/l)	<0.02
AL1/02W	Mecoprop (µg/l)	<0.02
AL1/02W	Mercury, filtered (mg/l)	<0.00003
AL1/02W	MTBE (VOC) (µg/l)	<1
AL1/02W	Naphthalene (VOC) (µg/l)	<5
AL1/02W	Naphthalene ESG SVOC (mg/l)	<0.002
AL1/02W	n-Butylbenzene (µg/l)	<1
AL1/02W	Nitrobenzene ESG SVOC (mg/l)	<0.005
AL1/02W	N-Nitroso-di-n-propylamine ESG SVOC (mg/l)	<0.005
AL1/02W	N-Nitrosodiphenylamine ESG SVOC (mg/l)	<0.005
AL1/02W	o-Xylene (VOC) (µg/l)	<1
AL1/02W	Pentachlorophenol (µg/l)	<0.04
AL1/02W	Pentachlorophenol ESG SVOC (mg/l)	<0.050
AL1/02W	Phenanthrene ESG SVOC (mg/l)	<0.002
AL1/02W	Phenol ESG SVOC (mg/l)	<0.020
AL1/02W	p-Isopropyltoluene (µg/l)	<1
AL1/02W	Propylbenzene (µg/l)	<1
AL1/02W	Pyrene ESG SVOC (mg/l)	<0.002
AL1/02W	sec-Butylbenzene (µg/l)	<1
AL1/02W	Styrene (µg/l)	<1
AL1/02W	tert-Butylbenzene (µg/l)	<1
AL1/02W	Tetrachloroethene (µg/l)	<5
AL1/02W	Toluene (VOC) (µg/l)	<1
AL1/02W	trans-1,2-Dichloroethene (µg/l)	<1
AL1/02W	trans-1,3-Dichloropropene (µg/l)	<1
AL1/02W	Trichloroethene (µg/l)	<5
AL1/02W	Trichlorofluoromethane (µg/l)	<1
AL1/02W	Triclopyr (µg/l)	<0.03
AL1/02W	Vinyl Chloride (µg/l)	<1

Appendix K. Surface Water Quality Data

[Provided as an appended spreadsheet]

Appendix L. Qualitative Model

[Provided as an appended spreadsheet]

Appendix M. Model Transcript

Infiltration		
Parameter	**Value / Distribution**	**Derivation**
Phases 1-3		
Infiltration, to open waste (mm/year)	350	Values from Rainfall Records (Aldon Station), estimated cap infiltration, and tipping from 1970 – 1980.
Cap Design Infiltration (mm/year)	69	
End of Infilling (years from start of waste disposal)	10	
Phase 4, Cells 1-2		
Infiltration, to open waste (mm/year)	350	Values from Rainfall Records (Aldon Station), estimated cap infiltration, and tipping from 1980 – 1990.
Cap Design Infiltration (mm/year)	80	
End of Infilling (years from start of waste disposal)	10	
Phase 4, Cells 3-4		
Infiltration, to open waste (mm/year)	350	Values from Rainfall Records (Aldon Station), estimated cap infiltration, and tipping from 1990 – 1998.
Cap Design Infiltration (mm/year)	40	
End of Infilling (years from start of waste disposal)	8	

Cell Geometry		
Parameter	**Value / Distribution**	**Derivation**
Phases 1-3		
No. of Cells	1	Surveying and Historic Mapping.
Cell Length at Base (m)	460	
Cell Width at Base (m)	80	
Basal Area [each cell] (Ha)	3.68	
Top Area [each cell] (Ha)	4.9	
Final Waste Thickness (m)	Min: 10 Max: 15 *Uniform Distribution*	
Phase 4, Cells 1-2		
No. of Cells	1	Surveying and Historic Mapping.
Cell Length at Base (m)	160	
Cell Width at Base (m)	80	
Basal Area [each cell] (Ha)	1.28	
Top Area [each cell] (Ha)	2.2	
Final Waste Thickness (m)	Min: 10 Max: 15 *Uniform Distribution*	
Phase 4, Cells 3-4		
No. of Cells	1	Surveying and Historic Mapping.
Cell Length at Base (m)	150	
Cell Width at Base (m)	120	
Basal Area [each cell] (Ha)	1.8	

Top Area [each cell] (Ha)	2.9	
Final Waste Thickness (m)	Min: 15 Max: 20 *Uniform Distribution*	
Phases 1 - 4		
Waste Porosity (fraction)	Min: 0.1 Max: 0.2 *Uniform Distribution*	LandSim default values and Site geometry
Waste Density (kg/l)	Min: 0.32 Max: 0.72 *Uniform Distribution*	
Waste Field Capacity (fraction)	Min: 0.05 Max: 0.1 *Uniform Distribution*	
Maximum Leachate Head for surface water breakout (m)	10	

Leachate Inventory		
Parameter	**Value / Distribution**	**Derivation**
Phases 1-3		
Ammoniacal Nitrogen (mg/l)	Min: 20 Likely: 25 Max: 30 *Log Triangular Distribution*	Estimated based on Phase 4, Cells 1-2.
Chloride (mg/l)	Min: 50 Likely: 75 Max: 100 *Log Triangular Distribution*	
Phase 4 Cells 1-2		
Ammoniacal Nitrogen (mg/l)	Min: 20 Likely: 25 Max: 30 *Log Triangular Distribution*	Based on leachate quality analysis data
Chloride (mg/l)	Min: 100 Likely: 125 Max: 150 *Log Triangular Distribution*	
Phase 4 Cells 3-4		
Ammoniacal Nitrogen (mg/l)	Min: 75 Likely: 100 Max: 125 *Log Triangular Distribution*	Based on leachate quality analysis data
Chloride (mg/l)	Min: 175 Likely: 200	

	Max: 225 *Log Triangular Distribution*	
Phases 1-4		
Benzene (mg/l)	Min: 0.0005 Likely: 0.001 Max: 0.005 *Log Triangular Distribution*	Based on leachate quality data.
Lead (mg/l)	Min: 0.0005 Likely: 0.01 Max: 0.05 *Log Triangular Distribution*	
Nickel (mg/l)	Min: 0.005 Likely: 0.01 Max: 0.1 *Log Triangular Distribution*	
Source Term Kappa Values		
Ammoniacal-N (kg/l)	M: 0.0000 C: 0.5900	LandSim default values.
Benzene (kg/l)	M: 0.0298 C: 0.2919	
Chloride (kg/l)	M: 0.0298 C: 0.2919	
Lead (kg/l)	M: 0.0443 C: 0.0171	
Nickel (kg/l)	M: 0.0987 C: -0.1479	
Clay Liner Properties		
Clay Liner Half Life (Years)	1×10^9	LandSim default values.
Unsaturated Pathway Half Life (Years) (ammoniacal nitrogen)	Min: 5 Max: 100 *Uniform Distribution*	
Unsaturated Pathway Half Life (Years) (benzene)	100	
Unsaturated Pathway Half Life (Years) (chloride, lead, nickel)	1×10^9	
Aquifer Pathway Half Life (Years)	1×10^9	

Drainage System		
Parameter	**Value / Distribution**	**Derivation**
Head on EBS (m)	Min: 5 Max: 10 *Uniform Distribution*	Variable leachate head due to unlined design and rested leachate levels.

Unsaturated Pathway: Porous Medium		
Parameter	**Value / Distribution**	**Derivation**
Pathway Length (m)	Min: 10 Max: 25 *Uniform Distribution*	Based on landfill geometry and groundwater level monitoring. Hydraulic conductivity and porosity estimated based on a moderately fractured limestone and qualitative model. Longitudinal dispersity assumed 10% of pathway length.
Moisture Content (fraction)	0.3	
Hydraulic Conductivity (m/s)	Min: 1e-05 Max: 2e-05 *Uniform Distribution*	
Longitudinal Dispersivity (m)	Min: 1 Max: 2.5 *Uniform Distribution*	
Retardation (Unsaturated Pathway)		
Retardation Coefficient Ammoniacal-N (K_d) (l/kg)	Min: 0 Max: 0.03 *Uniform Distribution*	LandSim default values
Retardation Coefficient Benzene, Chloride (K_d) (l/kg)	0	
Retardation Coefficient Lead, Nickel (K_d) (l/kg)	Min: 20 Max: 800 *Uniform Distribution*	
Pathway Density (kg/l)	Min: 1.97 Max: 2.1 *Uniform Distribution*	

Aquifer Pathway/Flow		
Phases 1 - 3		
Pathway Width(m)	80	Based on Surveys.
Pathway Length (m)	Min: 370 Max: 840 *Uniform Distribution*	
Phase 4, Cells 1-2		
Pathway Width (m)	80	Based on Surveys.
Pathway Length (m)	Min: 10 Max: 190 *Uniform Distribution*	
Phase 4, Cells 3-4		
Pathway Width (m)	120	Based on Surveys.
Pathway Length (m)	Min: 190 Max: 370 *Uniform Distribution*	

Phases 1 - 4		
Calculate Mixing Zone	No	Based on local hydrogeology and groundwater level monitoring network.
Mixing Zone Thickness (m)	10	
Enter Darcy Flux? (m/s)	*No*	
Conductivity (m/s)	Min: 1e-05 Max: 2e-05 *Uniform Distribution*	
Regional Gradient	0.043	
Pathway Porosity (fraction)	Min: 0.01 Max: 0.02 *Uniform Distribution*	
Dispersion		
Longitudinal Dispersivity	Min: 23 Max: 41 *Uniform Distribution*	Based on Surveys
Transverse Dispersivity	Min: 2.3 Max: 4.1 *Uniform Distribution*	
Retardation		
Retardation Coefficient Ammoniacal-N (K_d) (l/kg)	Min: 0 Max: 0.03 *Uniform Distribution*	Landsim Default values
Retardation Coefficient Benzene, Chloride (K_d) (l/kg)	0	
Retardation Coefficient Lead, Nickel (K_d) (l/kg)	Min: 20 Max: 800 *Uniform Distribution*	
Pathway Density (kg/l)	Min: 1.97 Max: 2.1 *Uniform Distribution*	

Appendix N. LandSim Model Files

[Provided as an appended files]

Appendix O. LandSim Model Results

[Provided as an appended spreadsheet]