

Luleå Mini-Mill Project

Site Measurement Report

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1. Executive Summary

This report presents the results of the air quality monitoring programme conducted at the SSAB Luleå Mini-Mill construction site for the reporting period 2026-04-01 to 2026-04-21. The measurement effort commenced on 2026-03-30 following reports of health symptoms among contractor personnel (nausea, dizziness, headache, nosebleeds, vomiting, and in some cases respiratory difficulties with elevated CO levels in blood). The symptoms led to a precautionary work stoppage and an immediate measurement response. The formal reporting window opens on 2026-04-01.

The programme covered four measurement zones within Construction Areas 1, 2 and 3 (CA1, CA2, CA3), Aronstorp, the GIS station, the coke plant pump station, and the East project office area (East Camp):

- Continuous ambient air monitoring for NO₂, SO₂, CO and H₂S using a reference instrument GreyWolf DirectSense XM (GW-A01), together with three portable Blackline G7c units (BL-01, BL-02, BL-03);
- Sampling of gases and particles in machine cabins with chemical analysis at ALS Scandinavia AB and Metlab AB;
- Soil gas (pore gas) measurements in CA2 and Aronstorp, analysed by ALS Scandinavia AB for aliphatics, BTEX, halogenated VOCs and halogenated aliphatics;
- Particulate measurement (PM1, PM2.5, PM10, TSP, metals, PAH and related fractions) using samplers from Vibroakustik AB.

Compliance has been assessed against AFS 2023:14 (Limit Values for Airway Exposure in the Working Environment), applying the Level Limit Value (NGV, 8-hour TWA, time-weighted average) and the Short-term Limit Value (KGV, rolling 15-minute average). The 75 % coverage requirement under AFS 2023:14 §11 has been applied, and Partial Period Measurement (EN 689:2018 §5.3) has been used where coverage was insufficient.

The principal results for the reporting period are:

- No exceedances of NGV or KGV were recorded in the data meeting the coverage requirements of AFS 2023:14 §11 and §12. For portable sensors where continuous coverage was not achievable, supplementary assessment was conducted under EN 689:2018 §5.3 (see section 9.4); no exceedances were identified.
- The highest value against any limit during the period was SO₂ on 2026-04-19: 54.4 % of NGV and 43.0 % of KGV. Together with the values on 2026-04-18 (38.7 % NGV, 39.2 % KGV), this represents a transient two-day elevation in SO₂. A minor concurrent rise in H₂S was noted on 2026-04-19 (2.4 % NGV, 3.4 % KGV) without simultaneous elevation of NO₂ or CO. The event is being followed up through source identification against activity logs and meteorological data.
- NO₂ ranged between 8.9 % and 15.2 % of NGV across the 12 days that met the coverage requirement for GW-A01. Ten days clustered between 11.8 % and 15.2 %; 18 to 19 April fell to 8.9 % to 9.0 %, coinciding with the transient SO₂ elevation and the relocation of GW-A01. The highest 15-minute value was 34.9 % of KGV, recorded by BL-02 on 2026-04-07.
- CO and H₂S remained at low levels throughout the period, with maximum exposure levels equivalent to 1.7 % of NGV for CO (2026-04-10) and 2.4 % of NGV for H₂S (2026-04-19).
- All soil gas samples from CA2 (five locations) showed concentrations below the laboratory reporting limit (<LOR) for aliphatics, BTEX, halogenated VOCs and halogenated aliphatics. Samples from Aronstorp (two locations) have been collected and results are pending.
- Spot samples from machine cabin (crawler tractor 1, 2026-04-01) showed dust, aliphatics and BTEX below the reporting limit, with a minor toluene concentration (0.155 mg/m³) and manganese at 0.0168 µg total (variance <1 % of LOR).
- Particulate sampling carried out by NCC is under revision and will be appended once the underlying data has been received.

Sensor coverage limitations are documented in the data quality observations register (Annex A) and include, among others, recurring downtime for GreyWolf GW-A01; failure of the Blackline G7c units to achieve 75 % coverage for 8-hour TWA on any day during the period (reported via PPM); and a single CO reading of 37.0 ppm on BL-02 on 2026-04-07 which was retained after checks for spikes and artefacts (such as rapid temperature and humidity changes). Subsequent review attributed this reading to the sensor having been positioned directly adjacent to the exhaust pipe of a diesel-powered work machine. The reading is therefore explained as a documented operational point source rather than a change in ambient air concentration.

Based on the measurements conducted, exposure during the reporting period was below the statutory hygienic limit values under AFS 2023:14. The SO₂ elevation on 18 to 19 April is the principal open question for this reporting period and will be investigated further. The monitoring programme will be substantially expanded from May onward through the commissioning of a fixed gas monitoring network of 20 stations (15 primary locations with a 250 m coverage radius plus 5 redundancy units). This will be supplemented by additional soil gas sampling in CA1 and CA3 and measurements in site cabins and machine cabins, in accordance with section 14.

2. Purpose and Scope of Report

This report documents the air quality monitoring and other measurements conducted at the SSAB Luleå Mini-Mill construction site before and after the reporting of health symptoms among contractor personnel, and presents measurement results for the period 2026-03-30 to 2026-04-21 in relation to the statutory framework for hygienic limit values under AFS 2023:14.

The report has been prepared for:

- Arbetsmiljöverket (the Swedish Work Environment Authority), within the framework of ongoing regulatory dialogue and the issued safety representative work stoppage (skyddsombudsstopp).
- Site contractors (NCC, PEAB, Keller, BDX, Nåiden and others, together with their sub-contractors) and their safety representatives.
- SSAB project management, the Transformation Office, and SSAB's crisis management organisation operating under the PSH framework.
- The lender consortium, within the framework of environmental and social reporting linked to SSAB's transformation project.

The scope of the report includes:

- The regulatory framework under which worker exposure is assessed (AFS 2023:14, AFS 2023:10, AFS 2023:15) and the operating permit under chapter 9 of the Environmental Code (Miljöbalken) governing SSAB's existing production facilities in Luleå.
- Site context, including the layout of construction areas CA1 to CA5, the construction activities carried out before and during the reporting period, and a review of any deviations at the adjacent SSAB Luleå coke plant.
- Historical site conditions, with a summary of known soil contamination within the construction area. The construction area derives from staged land reclamation since the 1940s and historical handling of steel production by-products (blast furnace slag, LD slag) and tar sludge handling at the coke plant.
- The symptoms reported by contractor personnel and the resulting prioritisation of gases and particulates for measurement.
- Monitoring methodology for ambient air, soil gas, particulates, and machine cabin sampling, including averaging conventions, instrument specifications, and quality control.
- Measurement locations and sensor deployment, together with the reporting metrics applied.

- Results from the monitoring programme, expressed in relation to NGV and KGV under AFS 2023:14, including daily observations, data quality observations, and assessments of measurement coverage.
- The plan for further measurements, including the planned fixed multi-gas network, reporting frequency, escalation levels, and data quality assurance.

The scope is limited to the assessment of workplace-related exposure on the construction site. Obligations regarding medical examinations in working life under AFS 2023:15 and the management of affected personnel are addressed in a separate incident management report and are referenced here only in connection with the symptom-driven measurement task.

3. Regulatory Framework

3.1 AFS 2023:14 occupational exposure limits (NGV and KGV)

Worker exposure at the construction site is governed by Arbetsmiljöverkets föreskrifter AFS 2023:14 “Hygieniska gränsvärden” (Occupational Exposure Limit Values), which establishes the NGV (Nivågränsvärde, 8-hour TWA) and KGV (Korttidsgränsvärde, 15-minute STEL) for airborne contaminants in the workplace.

Table 1 The NGV and KGV values applied in this report, for each gas and particle and with direct reference to AFS 2023:14:

Gas	CAS number	NGV (8-h TWA)	KGV (15-min)	AFS 2023:14 ref.
Nitrogen dioxide (NO ₂)	10102-44-0	0.5 ppm (0.96 mg/m ³)	1.0 ppm (1.91 mg/m ³)	Bilaga 1, post nr. [ref]
Sulphur dioxide (SO ₂)	7446-09-5	0.5 ppm (1.3 mg/m ³)	1.0 ppm (2.7 mg/m ³)	Bilaga 1, post nr. [ref]
Carbon monoxide (CO)	630-08-0	20 ppm (23 mg/m ³)	100 ppm (117 mg/m ³)	Bilaga 1, post nr. [ref]
Hydrogen sulphide (H ₂ S)	7783-06-4	5 ppm (7 mg/m ³)	10 ppm (14 mg/m ³)	Bilaga 1, post nr. [ref]
Dust – PM2.5 inorganic (Respirable fraction)	-	- (2,5 mg/m ³)	- (-)	Bilaga 1, post nr. [ref]
Dust – PM10 inorganic (Inhalable fraction)	-	- (5 mg/m ³)	- (-)	Bilaga 1, post nr. [ref]
Quarts (Respirable fraction)	14808-60-7	- (0,1 mg/m ³)	- (-)	Bilaga 1, post nr. [ref]

Compliance is assessed using the rolling average values defined in AFS 2023:14 (8-hour average for NGV; 15-minute rolling average for KGV); instantaneous measurements at or above a limit do not in themselves constitute a statutory exceedance. Additional obligations under AFS 2023:10 and AFS 2023:15 are addressed in sections 6.3 and 10.

3.2 Environmental permit framework

The Environmental Court at Umeå District Court issued a permit under chapter 9 of the Environmental Code for SSAB's existing operations through partial judgment of 2010-11-26 in case M 2350-08. An amendment permit and a new permit under the Environmental Code were granted on 19 December 2024 (Umeå District Court, Land and Environment Court partial judgment, case M 340323). The permit covers construction within the Luleå transformation project and the future operation of the upcoming facilities.

During the environmental permit process, SSAB has demonstrated that the operations are lawful and meet the requirements under Swedish environmental legislation and applicable EU regulations.

All documents from the permit application process are publicly available and are therefore not described further here.

4. Site Context

4.1 Site overview and layout

Figure 1 illustrates the principal construction areas CA1 through CA4, with CA5 infrastructure distributed across the broader site. Also identified are the East and West Camp office locations, the Aronstorp site and offices, and the GIS site and adjacent offices. The SSAB Coking Plant is situated to the south of the main construction area, and the existing SSAB Steel Mill lies to the west. All locations shown are indicative only; engineering drawings should be consulted for precise area boundaries and dimensions. All locations shown are indicative only; technical drawings should be consulted for precise area references.

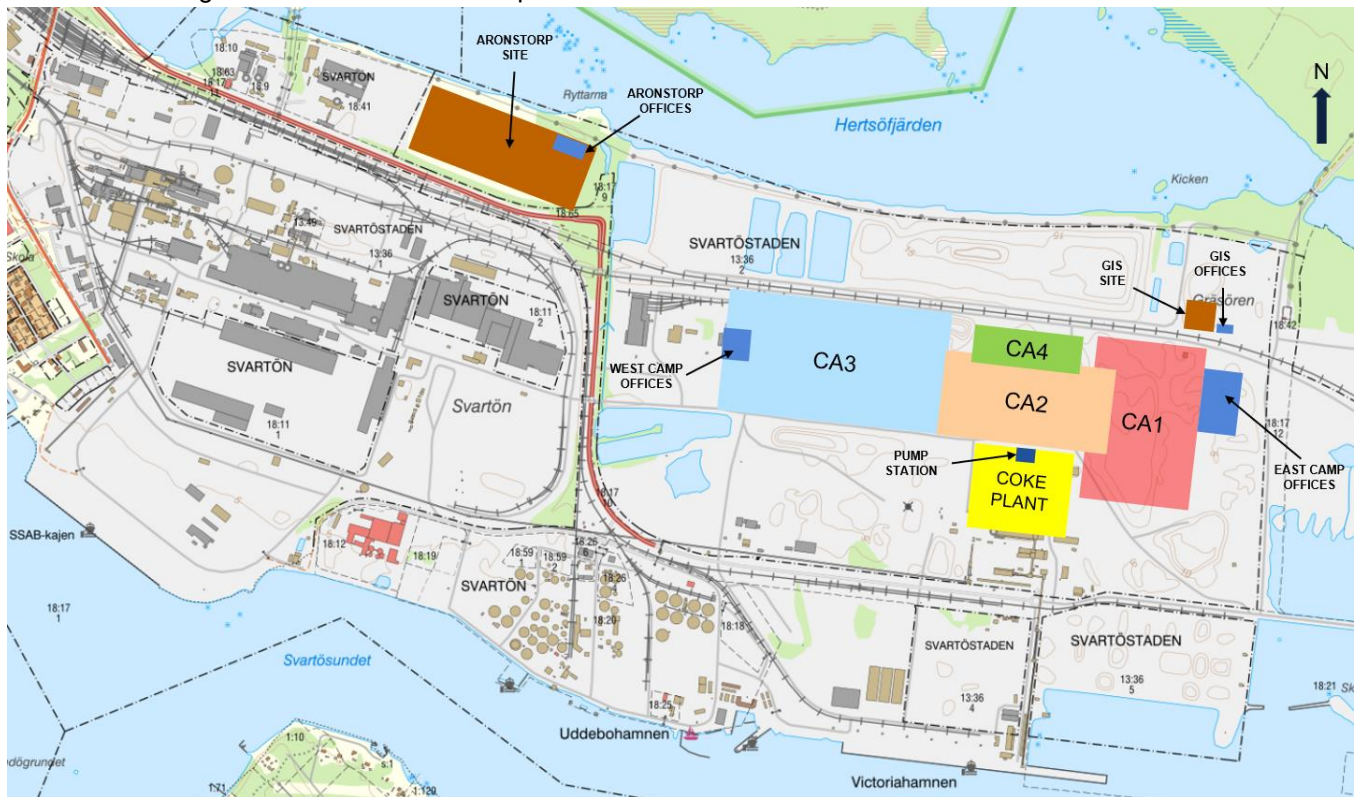


Figure 1 Schematic of Site plan showing CA1 to CA4, site offices, adjacent SSAB production facility and coking plant.

4.2 Coke plant emissions

Emissions from the SSAB Luleå coke plant are monitored in accordance with the facility's environmental permit. No reports have been made of the emissions exceeding the levels permitted under the environmental permit during the reporting period.

5. Historical Site Conditions

5.1 Background

Since the 1940s, the industrial area on Svartön has been progressively expanded through staged land reclamation, both on land and in adjacent water areas. The fill consists of dredged sediments, primarily sorted sand from the bed of the Lule River, overlaid by other fill materials including the by-products 'hyttsten' (granulated blast furnace slag) and 'LD slag' (Linz-Donawitz steelmaking slag), both registered by-products from the blast furnace and steelworks. The area where SSAB is now constructing the new facility was filled in during the 1970s. The surface has been used for processing and temporary storage of various steel production by-products and as a landfill for LD sludge (an inert waste landfill). The landfill has been decommissioned and the waste has been moved to SSAB's active landfill area, located north of the construction area.

Within the construction area there are zones of potential and, in some cases, known soil contamination linked to historical and ongoing SSAB operations. In addition to targeted investigations, in-depth interviews have been conducted with personnel employed at SSAB from the 1970s onward to obtain information on how operations have been carried out, including chemical and waste management practices. The investigations were conducted in accordance with Naturvårdsverket's (the Swedish Environmental Protection Agency) methodology for risk assessment of contaminated sites. SSAB has additionally prepared a baseline status report which also documents the contaminants associated with the operations.

Based on available information, two principal contamination risk types have been identified within the construction area:

- Local contamination (point source), linked to specific parts of the operations such as tar sludge handling.
- Diffuse and potential contamination, related to land reclamation and the handling, processing, and storage of steel production by-products.

5.2 Overview of previously conducted soil investigations

Several targeted soil investigation programmes have been carried out within the construction area to establish the presence of contaminants and to assess environmental risks and plan construction and excavation works. The investigations have been designed on the basis of historical land use analysis (described in the section above) and identified risk areas.

The results confirm that ground conditions are highly variable, reflecting the successive phases of land reclamation with dredged sediments overlaid by varied fill materials including steel production by-products. While large parts of the investigated areas show contamination levels consistent with industrial land use, local exceedances of guideline values do occur. These are typically linked to a specific part of the operations, such as the handling of coal tar, particularly tar sludge.

The investigations provide a sufficient basis for assessing risks to human health and the environment, but also indicate that further sampling and classification may be required in connection with excavation works. Contractors have therefore been instructed to halt work if any anomalies are detected. Excavation within the area is therefore conducted with the awareness that there is a risk of previously undetected contamination.

Table 2 Summary of contaminants at the construction site. The number of samples includes the whole construction site.

Date	Author	Title	Scope	Summary
2023-03-16	AFRY	Environmental geotechnical investigation at property Svartöstaden 13:36, SSAB industrial area, Luleå Municipality	Overview-level soil investigation within the construction area	The investigation confirms heterogeneous ground conditions affected by historical land reclamation and the use of industrial by-products as fill. Although several contaminants were identified, their distribution is generally local and in several cases delineation remains incomplete due to site conditions and sampling limitations.
2024-10-01	AFRY	Notification under §28 of the Ordinance (1998:899) on Environmentally Hazardous Activities and Health Protection at property Svartöstaden 13:36 (2), Luleå municipality	Description of contamination within the new coke plant pump station	Soil investigations (AFRY, 2023; 2024) identified elevated levels of vanadium, chromium, PAH H, and locally barium in soil, while groundwater contained elevated levels of arsenic, PAHs, and vanadium.
2025-06-27	MITTA	Investigation report CA1, 2 and 4	Targeted sampling within CA1, 2, and 4	Heterogeneous ground conditions with local contamination and possible diffuse impact from fill materials. Delineation of contaminated areas.
2025-10-17	MITTA	Risk assessment of contaminated soil within the area for temporary storage of excavated material, transformation project area	Targeted sampling within CA1 for storage of excavated material	Heterogeneous ground conditions with local contamination and possible diffuse impact from fill materials.
2026-04-20	MITTA	Investigation report CA3	Targeted sampling within CA3	Heterogeneous ground conditions with diffuse impact from fill materials.
2026-05-XX	MITTA	Investigation report CA5	Targeted sampling within CA5	Report under review/revision.

5.3 Identified contaminants

The investigations conducted within the construction area have identified metals typically associated with the by-products (slags) derived from steel production, together with organic contaminants associated with tar sludge handling from the coking process. These generally occur in the more superficial parts of the fill materials. Measured concentrations have been assessed against Naturvårdsverket's general guideline values for contaminated soil, primarily MKM (less sensitive land use) depending on current and future land use. Site-specific guideline values (PSRV), calculated in accordance with Naturvårdsverket's methodology, have also been developed based on local conditions. A summary of the contamination situation is presented in Table 3.

Substances assessed as particularly relevant generally reflect:

- Metals originating from steelmaking and bound in slag
- Organic substances linked to tar sludge from the coking process, such as PAH (polycyclic aromatic hydrocarbons)

Table 3: Identified soil contaminants, analysis summary, and assessment basis.

Contaminant	Medium	Typical concentration range	Assessment basis
Metals (Cr, V, Ba, Co, As)	Soil/fill	Varies from background levels to levels above guideline values.	Naturvårdsverket general guideline values (MKM) and site-specific guideline values (PSRV).
Polycyclic aromatic hydrocarbons (PAH)	Soil/fill	Low to high within delineated areas.	Naturvårdsverket general guideline values (MKM) and site-specific guideline values (PSRV).
Petroleum hydrocarbons (aliphatics/aromatics)	Soil/fill	Low to high (aromatic fraction) within delineated areas.	Naturvårdsverket general guideline values (MKM) and site-specific guideline values (PSRV).
Cyanide (CN total)	Soil/fill	Varies from below the laboratory reporting limit to levels below guideline values.	Naturvårdsverket general guideline values (MKM) and site-specific guideline values (PSRV).

The investigations have informed the remediation works being conducted in parallel with the excavation works started for the foundations of the new buildings. During the remediation work, an independent environmental controller has progressively taken samples to verify that the remediation objectives have been achieved. The remediation areas should not be confused with the areas where illness symptoms have been reported.

6. Methodology: measurement and monitoring

6.1 Site Conditions

Gases

The construction site is assessed to lie outside any specific gas risk zone for the adjacent process industry (coke plant).

The following gases are nevertheless considered possible at concentrations below applicable limit values:

- Combustion gases: CO, CO₂, NO₂
- Gases from materials (granulated blast furnace slag) and the industrial process: CO, CO₂, NO₂, H₂S, VOC.

Particulates

The construction site is assessed to have dust present. Principal sources are considered to be:

- Dust from material stockpiles, roads, and ground.
- Particulates from adjacent industries and engines/machines within the construction area.

Measurements have been carried out both in the ambient environment (continuous) and in machine cabins (spot samples).

6.2 Gases: ambient air monitoring

6.2.1 Scope

Following reports of symptoms including nausea, dizziness, headache, nosebleeds, vomiting, and in some cases respiratory difficulties combined with elevated CO levels in blood, an investigation was initiated to identify possible causes. Exposure to gases or particulates could not be excluded. The project compiled a list of relevant gases potentially present in the area and monitored NO₂, SO₂, CO, and H₂S, which are common emissions from adjacent operations. Gases from the blast furnace were considered sufficiently distant that they are unlikely to affect air quality.

Table 4: Scope of gas analysis in air with rationale for measurement.

Gas	Reason for measurement	Source
CO	Elevated CO level in blood (per medical report) of affected personnel	Industrial processes; combustion engines; reduced lung function
H ₂ S	Can irritate mucous membranes and airways	Industrial processes
NO ₂	Can irritate mucous membranes and airways	Industrial processes; combustion engines
SO ₂	Can irritate mucous membranes and airways	Industrial processes; combustion engines

Gas	Reason for measurement	Source
VOC	Not sampled. Higher concentrations than reasonable in the immediate area would be required to cause these symptoms.	Industrial processes
Other gases	Gases emitted in connection with blast furnace operation are assessed to be too distant to affect air quality (the blast furnace is approximately 3 km from the location of the reported incidents).	Industrial processes

As a result of the above, gas measurements were started on the construction site on 2026-04-01. Tests covered:

- Ambient air / outdoor
- Machine cabin (for operator)

6.2.2 Method

Ambient air

Gases were measured in different areas over extended time periods (typically 1 to 3 days). The measurement interval is normally set to 30 seconds.

Machine cabin

Gases are sampled inside the machine cabin and outside the cabin. The measurement interval is normally set to 30 seconds. In some cases longer time intervals were used.

6.2.3 Sensors

Continuous sampling (loggers) (GreyWolf (Norrkompetens AB), Blackline (SSAB)) was used both for ambient air monitoring and for machine cabin measurement. Gas monitors are placed in different areas and measure gas concentration at short intervals. Electrochemical sensors provide a value that is downloaded (or sent to a cloud platform) for collection.

Chemical analysis (Metlab) used only for tests in machine cabin. Gas samplers (adsorbent) with air pump are used to sample gases over a longer time interval, e.g. one day. The adsorbent is then sent to a laboratory for chemical analysis.

See Annex A for details of gas sensor specifications (manufacturer, model, technology, measurement range, detection limit, accuracy).

6.2.4 Quality control

See Annex A for information on calibration.

6.3 Pore gas monitoring

Pore gas sampling has been carried out as an indicative method for assessing the presence of volatile substances in the ground that may give rise to gas formation. The purpose of the sampling is to identify whether the ground contains volatile contaminants that may evaporate and accumulate in soil pores, which in turn may pose a risk of migration to ambient air during excavation work. The results from the pore gas survey are to be used as a screening basis and to support assessment of the need for any further investigations or risk-reducing measures, and not for the assessment of any health risks in connection with excavation work.

Pore gas sampling has been carried out in the unsaturated zone above the groundwater level to indicate the presence of volatile substances in the ground. Air is pumped up from the selected sampling depth and led through an absorbent tube, which is then sent to an external laboratory for analysis. Sampling has been performed in dry weather conditions and at a sufficient distance from the ground surface and groundwater level to avoid the influence of moisture-saturated pores.

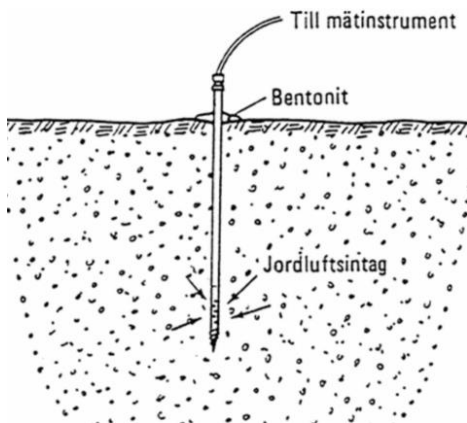


Figure 2 Illustration of pore gas sampling. A lance is inserted into the ground with apertures through which the drawn-up gas can enter. At the ground surface, the lance is sealed with bentonite clay so that air cannot penetrate down to the lance apertures. A suction pump is connected to a hose with a filter (adsorbent tube). When sampling is complete, the filter is sent for analysis. (Not reproduced in translation.)

6.3.1 Equipment

Pore gas lance and Casella Vapex low-flow pump.

6.3.2 Analysis scope

Adsorbent tubes from the sampling have been sent to ALS Global for analysis of:

- **Aliphatic compounds:** Fraction C10-C11, fraction C11-C12, fraction C12-C13, fraction C6-C7, fraction C7-C8, fraction C8-C9, fraction C9-C10, n-decane, n-dodecane, n-heptane, n-hexane, n-nonane, n-octane, n-undecane.
- **BTEX:** Benzene, toluene, ethylbenzene, m,p-xylene, o-xylene, total xylene.
- **Other:** Mercury, cyanide (free), total phenol and cresols, total chlorophenols (mono-penta), total mono- and dichlorobenzene, dichloroethane, dibromochloromethane, bromodichloromethane, trichloromethane, carbon tetrachloride (tetrachloromethane), 1,2-dichloroethane, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, dinitrotoluene (2,4), PAH16, aromatic >C8-C10.

Determination and calculation of volatile organic compounds (VOC) has been carried out in accordance with SS-EN 13649 and NIOSH. Analysis is performed using GC-MS.

Table 5: Sampling locations for pore gas samples and number of samples analysed as of 2026-04-24.

Work area	Contractor	Pore gas samples	Status	Result
CA2	NCC	Five	Analysed	All <LOR
Aronstorp	Keller	Two	Sampled	Pending

6.3.3 Results

All results received as of 2026-04-24 are below the analysis reporting limit or close to the reporting limit. Note that pore gas results can only be used as an indication for further investigation.

6.4 Particulate monitoring

Particles	Purpose of measurement	Possible source
Dust	May be harmful to the respiratory system, depending on size and composition	Material stockpiles, industry, engines, slag products



Figure 3 Overview map and approximate location of the measurement cabin for particle monitoring. Lat 65.5557480; Long 22.2622375

6.4.1 Scope

As a result of the above, particulate measurements were started on the construction site on 2026-03-11. Tests covered:

- Ambient air
- Machine cabin (for operator)

Total dust collection was carried out for the purpose of indicating whether the limits in AFS 2023:14 are exceeded.

6.4.2 Sampling of ambient air within the construction site

Contractor NCC was tasked by SSAB to commence particulate collection. The contractor selected a number of parameters in consultation with their consultant, Ensucon, as set out below. These parameters were included because the contractor had assessed them as potential risks within their work area. They chose to use a particulate sampler for environmental sampling.

Table 6: Dust collection (environmental sampling) parameters.

Dust (parameter)	Description
Size	Fraction size (PM1, PM2.5, PM10, and PM100 ('total dust'))
Chemical analysis	Metals including sulphur and calcium; PAH in both gaseous and particle-bound phases; benzene and other organic compounds in gaseous phase; H ₂ S gas measurement; hydrogen cyanide

6.4.3 Method

Continuous sampling and particulate measurement equipment was installed within the construction site.

Continuous particulate measurement: On-site particulate samplers collect dust/particulates from the air in the construction area (total dust). The particulates are sent to a laboratory for analysis. Logged measurement data and laboratory results are presented as particulate concentrations over a defined period.

6.5 Measurement of dust particles in machine cabin

Spot sampling: Particulate samples were taken in the machine cabin together with the gas tests and sent to a laboratory for analysis. Results are reported in relation to AFS 2023:14.

6.5.1 Equipment

Spot sampling: Dust sampling was performed using IOM filters with an air pump. The filters were then sent to a laboratory for analysis of fraction (size) and composition.

6.5.2 Reference criteria

AFS 2023:14, Limit Values for Airway Exposure in the Working Environment.

6.6 Meteorological data

SSAB continuously log wind direction on Svartön industrial area.

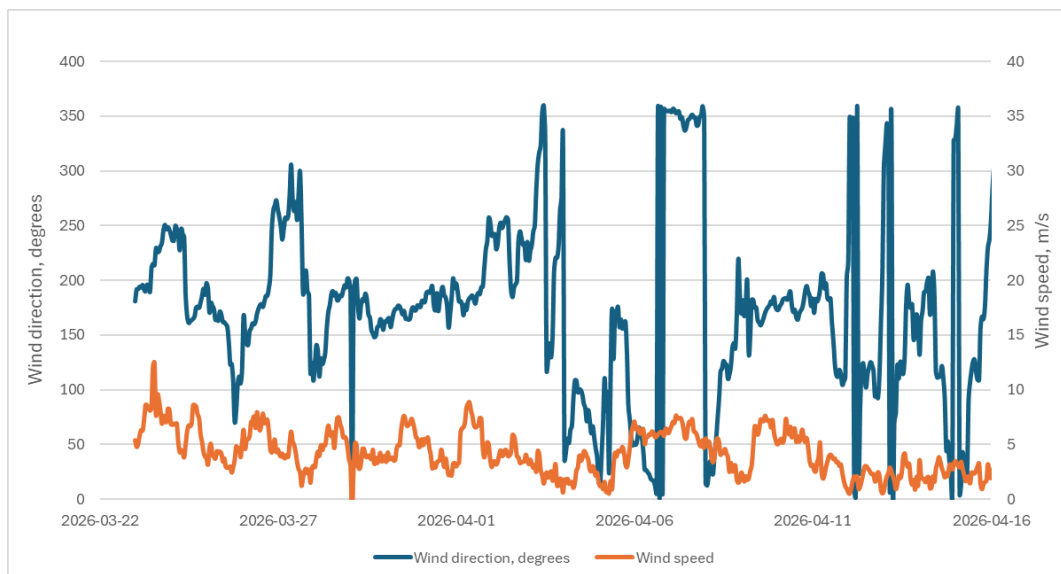


Figure 4 Wind directions 2026-03-22 to 2026-04-16

6.6.1 Correlation to measured results

No correlation has been found between wind direction and results measured across the site. Direct correlations are not possible as the measurement locations varied across the site and across the reporting period.

The implementation of the site wide monitoring with fixed locations (refer to Section 14) will allow for more reliable wind date correlation.

Gas	Wind direction at peak (measured)	NGV (8-h TWA)	KGV (15-min)	Comments
Carbon monoxide (CO)	W (7.0 ppm)	20.0 ppm	100.0 ppm	32 of 6,507 readings (0.49 %) within 20 % of the peak, recorded over 32.3 minutes on 2026-04-16 (single event). A higher single reading of 37.0 ppm was recorded on BL-02 on 2026-04-07; the reading is explained by the sensor having been positioned directly in the exhaust stream from diesel-powered work equipment, and is classified as a documented operational point source rather than an ambient air concentration. The reading is therefore not included in the ambient air peak reported here.
Nitrogen dioxide (NO ₂)	NE (0.9 ppm)	0.5 ppm	1.0 ppm	3 of 6,434 readings (0.05 %) within 20 % of peak, distributed over 8.2 days and 2 different dates (sustained pattern).
Sulphur dioxide (SO ₂)	NW (0.9 ppm)	0.5 ppm	1.0 ppm	28 of 6,244 readings (0.45 %) within 20 % of peak, distributed over 2.9 hours on 2026-04-16 (recurring pattern same day).
Hydrogen sulphide (H ₂ S)	NW (1.6 ppm)	5.0 ppm	10.0 ppm	7 of 6,597 readings (0.11 %) within 20 % of peak, recorded over 4.3 minutes on 2026-04-16 (single event).

6.7 Averaging conventions and reporting metrics

Three metrics are used consistently throughout this report, each applied to the same raw sensor data at different time resolutions:

- Rolling 8-hour time-weighted average (TWA), compared against the Level Limit Value (NGV) under AFS 2023:14 §11.

- Rolling 15-minute average, compared against the Short-term Limit Value (KGV) under AFS 2023:14 §12.
- Instantaneous value at the sensor's native sampling frequency (nominally 30 seconds), reported only for short-duration source identification and diagnostic purposes.

The rolling 8-hour TWA is the primary metric for the exposure that a person may be subjected to during a work shift. It is calculated continuously over each 8-hour window during the day, and the daily peak value is reported. NGV reference values for the gases concerned are NO₂ 0.5 ppm, SO₂ 0.5 ppm, CO 20 ppm, and H₂S 5 ppm.

The rolling 15-minute average captures short-duration exposure peaks that are not necessarily visible against an 8-hour average. It is calculated continuously over each 15-minute window, and the daily peak value is reported. KGV reference values are NO₂ 1.0 ppm, SO₂ 1.0 ppm, CO 100 ppm, and H₂S 10 ppm. The NGV and KGV assessments are applied independently of one another; a day is compliant only if both the §11 TWA and §12 STEL lie within their respective limits.

Instantaneous values at 30 seconds are retained in the dataset and used operationally to identify the onset, duration, and temporal pattern of concentration changes, and to correlate events against activity logs, meteorological data, and sensor diagnostics. They do not constitute a compliance metric; that is, an individual 30-second value cannot be compared against NGV or KGV because neither limit is defined at instantaneous resolution. Statutory compliance is assessed only against metrics (i) and (ii), as defined in AFS 2023:14.

7. Measurement Locations

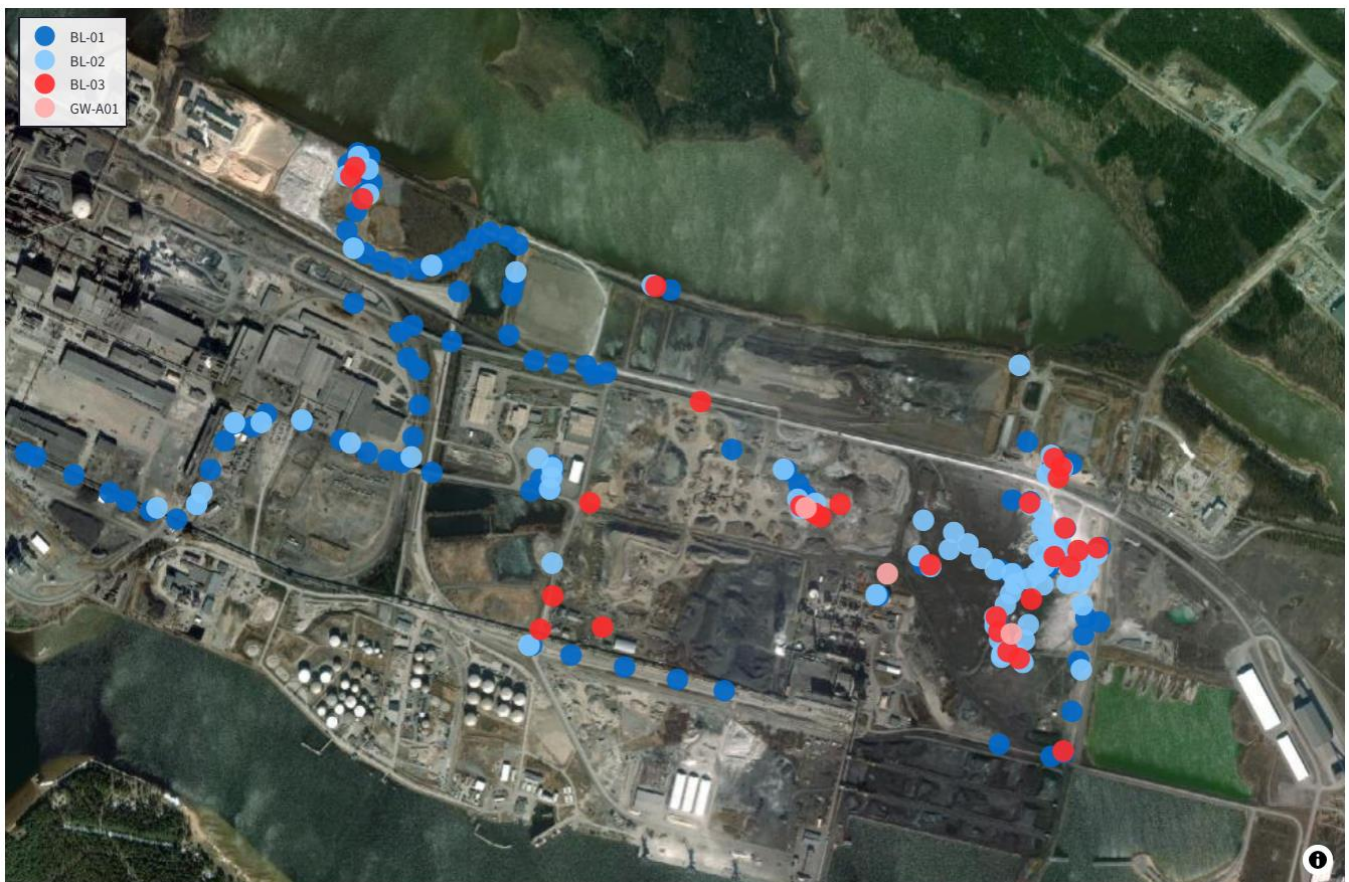


Figure 5 Sampling locations

Table 3 Measurement locations

Location / Measurement	East Camp	GIS station	CA1	CA2 ambient gas	CA2 ambient particulate	CA 3	West Camp	Aronstor p	Coke plant pump station
Gases	Outdoor	Outdoor	Outdoor	Outdoor			Outdoor	Outdoor	Outdoor
Machine cabin			Cabin	Cabin				Cabin	
Pore gas		X		X		TBD		X	
Particulates	Building East 2				X				

8. Results: Ambient Gas Monitoring

This section presents the results from ambient gas monitoring for the period 2026-04-01 to 2026-04-21. Limit utilisation is expressed as the highest daily value of the rolling 8-hour time-weighted average (TWA) in relation to the Level Limit Value (NGV), and the highest daily value of the rolling 15-minute average in relation to the Short-term Limit Value (KGV), under AFS 2023:14 §11 and §12. Only sensor-days meeting the 75 % coverage requirement are presented as compliance assessments; Blackline G7c coverage falling below the threshold is handled via Partial Period Measurement (PPM) under EN 689:2018 §5.3 and is summarised separately. No exceedances of NGV or KGV were recorded during the period.

8.1 Site-wide 8-hour NGV utilisation

The highest rolling 8-hour TWA recorded each day is expressed as a percentage of the AFS 2023:14 NGV. Site-wide 8-hour TWA assessments were produced exclusively by the GreyWolf ambient sensor (GW-A01); the Blackline G7c units did not reach the 75 % coverage threshold on any day (reported via PPM), and GW-A01-Cabin did not reach 75 % coverage on either of its two active days.

During the reporting period, the highest 8-hour TWA utilisation for any gas was 54.4 % of NGV for SO₂ (0.272 ppm, GW-A01) on 2026-04-19. The second-highest daily TWA utilisation was 38.7 % for SO₂ on 2026-04-18; both days lie well within the NGV limit. NO₂ TWA varied between 8.9 % and 15.2 % of NGV across GW-A01's 12 valid days, with ten days clustered between 11.8 % and 15.2 % and a fall to 8.9 % to 9.0 % on 18 to 19 April coinciding with the SO₂ event and the relocation of GW-A01. CO peaked at 1.7 % of NGV on 2026-04-10; H₂S peaked at 2.4 % of NGV on 2026-04-19. No NGV exceedance occurred.

Table 1: Daily 8-hour TWA peak, as % of AFS 2023:14 NGV (site-wide peak across sensors). Amber shading indicates the greater-than-50% NGV warning threshold.

Date	NO2	SO2	CO	H2S
2026-04-04	12.0%	0.0%	0.9%	0.2%
2026-04-05	12.5%	0.0%	1.1%	0.2%
2026-04-06	12.1%	0.0%	0.5%	0.0%
2026-04-07	12.1%	0.0%	0.0%	0.0%
2026-04-10	12.2%	0.1%	1.7%	0.2%
2026-04-11	11.8%	0.0%	1.1%	0.4%
2026-04-12	12.3%	0.0%	0.9%	0.4%
2026-04-13	13.6%	0.0%	0.8%	0.3%
2026-04-14	14.7%	0.0%	0.9%	0.1%
2026-04-15	15.2%	0.0%	0.8%	0.1%
2026-04-18	8.9%	38.7%	0.4%	1.5%
2026-04-19	9.0%	54.4%	0.5%	2.4%

NGV reference values: NO2 0.5 ppm; SO2 0.5 ppm; CO 20 ppm; H2S 5 ppm. Days with no sensor meeting the 75% coverage threshold are omitted from the table (see Section 9.3 for day-by-day coverage commentary).

8.2 Site-wide 15-minute KGV utilisation

The highest rolling 15-minute average recorded each day is expressed as a percentage of the KGV under AFS 2023:14. Compliance assessments for the 15-minute KGV were produced by GW-A01 across 12 days, by GW-A01-Cabin across 2 days (2026-04-01 and 2026-04-16), and by Blackline G7c units across four days (2026-04-07 BL-02; 2026-04-08 BL-01; 2026-04-09 BL-01 and BL-03; 2026-04-15 BL-02).

The highest 15-minute KGV utilisation during the period was 43.0 % for SO₂ (0.430 ppm, GW-A01) on 2026-04-19, consistent with the concurrent SO₂ TWA peak. Second-highest daily STEL values were 39.2 % for SO₂ on 2026-04-18 (GW-A01) and 34.9 % for NO₂ on 2026-04-07 (BL-02 at its working position). CO and H₂S remained below 4 % of KGV during the period. No KGV exceedances occurred.

Table 2: Daily 15-minute STEL peak, as % of AFS 2023:14 KGV (site-wide peak across sensors).

Date	NO2	SO2	CO	H2S
2026-04-01	10.2%	22.3%	0.5%	0.3%
2026-04-04	6.9%	0.0%	0.3%	0.3%
2026-04-05	7.0%	0.0%	0.4%	0.3%
2026-04-06	6.0%	0.0%	0.1%	0.1%
2026-04-07	34.9%	0.0%	0.1%	0.0%
2026-04-08	n/a	0.0%	0.0%	0.0%
2026-04-09	n/a	0.0%	0.0%	0.0%
2026-04-10	7.4%	0.7%	0.5%	0.3%
2026-04-11	6.6%	0.0%	0.5%	1.0%
2026-04-12	8.9%	0.0%	0.2%	0.8%
2026-04-13	10.4%	0.0%	0.3%	0.3%
2026-04-14	11.6%	0.2%	0.8%	0.4%
2026-04-15	20.0%	0.1%	0.2%	0.1%
2026-04-16	6.6%	19.2%	0.4%	0.0%
2026-04-18	6.0%	39.2%	0.2%	1.4%
2026-04-19	4.6%	43.0%	0.1%	3.4%

KGV reference values: NO2 1.0 ppm; SO2 1.0 ppm; CO 100 ppm; H2S 10 ppm. Table updated from prior revision: 2026-04-01 SO2 STEL corrected to 22.3% (Cas-Cabin, 0.223 ppm); 2026-04-16 SO2 STEL corrected to 19.2% (Cas-Cabin, 0.192 ppm).

8.3 Daily summary

The following day-by-day narrative records the essential features of the monitoring programme for each day during the period: sensor coverage, stepwise changes in concentrations, and coverage gaps. The narrative is fact-based and derived from the raw data file, the sensor adequacy register, the daily compliance summary, and the PPM detail records in the underlying Python report. Wind direction is referenced only where meteorological data is appended to the record; in other cases the narrative is limited to sensor observations.

Table 3: Daily observations log, 2026-04-01 to 2026-04-21.

Date	Observation
01 Apr 2026	GW-A01-Cabin active for 5.8 hours (KGV assessment within limit; highest 15-minute values: NO ₂ 0.102 ppm / 10.2 % of KGV, SO ₂ 0.223 ppm / 22.3 % of KGV, CO 0.517 ppm / 0.5 % of KGV, H ₂ S 0.030 ppm / 0.3 % of KGV). No ambient data from GW-A01, hence no site-wide 8-hour TWA for this day. BL-02 and BL-03 recorded partial data (reported via PPM). The GW-A01-Cabin internal temperature log shows wide fluctuations correlating with the elevated SO ₂ readings on individual 15-minute intervals; this GW-A01-Cabin SO ₂ signal is flagged as a possible thermal artefact in the data quality observations register and is under investigation.
02 Apr 2026	BL-02 active for only 3.3 hours. No compliant TWA or STEL. BL-02 H ₂ S WPA 0.521 ppm over 3.3 hours (informational, PPM).
03 Apr 2026	BL-02 active for 0.6 hours. No compliant TWA or STEL.
04 Apr 2026	GW-A01 ambient sensor online from 11:00 (13.0 hours). First AFS-compliant 8-hour TWA (140 valid points) and 15-minute STEL (255 valid points). TVOC TWA 6.5 % of NGV (GW-A01; the period TVOC peak of 1.628 ppm occurs this day during initial sensor stabilisation and should be reviewed against sensor start-up characteristics).
05 Apr 2026	Full 24-hour coverage for GW-A01 (480/480 TWA/STEL points). All gases at low baseline; NO ₂ TWA 12.5 % of NGV (GW-A01 peak); other gases below 1.6 % of NGV.
06 Apr 2026	Full 24-hour coverage for GW-A01. Stable baseline: NO ₂ TWA 12.1 % of NGV; other gases below 0.5 % of NGV.
07 Apr 2026	GW-A01 partial coverage (13.5 hours over 2 contiguous periods). BL-02 recorded a single CO peak of 37.0 ppm during a 10.7-hour shift; the shift WPA was 0.831 ppm and no CO STEL window was generated due to non-compliant coverage. Subsequent review of sensor positioning shows that BL-02 had been moved during this shift and positioned directly in the exhaust stream from diesel-powered work equipment, identifying the isolated 37.0 ppm reading as a documented operational point source rather than an ambient concentration change or sensor artefact. The event has been logged in the data quality observations register with sensor positioning as the root cause, and corrective action regarding sensor placement relative to heavy vehicles is under development. BL-02 also produced the period site-wide peak for NO ₂ STEL: 0.349 ppm (34.9 % of KGV); TWA assessment was not generated for BL-02 at this coverage.
08 Apr 2026	GW-A01 in downtime. BL-01 active for 23.9 hours with 6 valid STEL points (CO, SO ₂ , H ₂ S all at 0 %). No NO ₂ measurement from BL-01 this day; NO ₂ STEL not site-wide assessable.

Date	Observation
09 Apr 2026	GW-A01 in downtime. BL-01 active for 23.7 hours (3 valid STEL points; all gases 0 %); BL-03 active for 14.8 hours (3 valid STEL points; CO, H ₂ S, TVOC all 0 %). No NO ₂ measurement from these sensors this day; no site-wide TWA.
10 Apr 2026	GW-A01 returned to operation (15.6 hours, 190 TWA points, 305 STEL points). The period peak for CO TWA recorded this day: 0.346 ppm (1.7 % of NGV). NO ₂ TWA 12.2 % of NGV; other gases below 1 % of NGV.
11 Apr 2026	Full 24-hour coverage for GW-A01 (480/455 TWA/STEL points). Stable baseline; NO ₂ TWA 11.8 % of NGV, the lowest NO ₂ day within the GW-A01 compliant dataset.
12 Apr 2026	Full 24-hour coverage for GW-A01. Stable baseline; NO ₂ TWA 12.3 % of NGV; H ₂ S STEL 0.8 % of KGV (a small increase over the previous day's baseline, still clearly within margin).
13 Apr 2026	Full 24-hour coverage for GW-A01. NO ₂ TWA rose to 13.6 % of NGV; NO ₂ STEL 10.4 % of KGV. Other gases unchanged at baseline.
14 Apr 2026	Full 24-hour coverage for GW-A01. NO ₂ TWA 14.7 % of NGV and NO ₂ STEL 11.6 % of KGV, continuing the gradual NO ₂ rise from 12 to 14 Apr. First non-zero SO ₂ STEL (0.2 % of KGV) appears this day.
15 Apr 2026	GW-A01 partial coverage 5.0 hours (140/105 TWA/STEL points); NO ₂ TWA 15.2 % of NGV (period peak for NO ₂ TWA) and CO TWA 0.8 % of NGV. BL-02 recorded NO ₂ STEL 0.200 ppm (20.0 % of KGV) this day; site-wide NO ₂ STEL peak for this day is therefore 20.0 % from BL-02. BL-01 H ₂ S WPA 0.663 ppm over a 5.0-hour interval.
16 Apr 2026	GW-A01 in downtime. GW-A01-Cabin active for 3.0 hours (55 valid STEL points; NO ₂ 6.6 %, SO ₂ 19.2 %, CO 0.4 %, H ₂ S 0.0 % of KGV). BL-03 CO WPA 4.906 ppm over 8.3 hours of monitoring, the highest CO WPA recorded during the period; worst-case shift equivalent is 4.906 ppm, clearly below the NGV of 20 ppm. BL-01 H ₂ S WPA 0.807 ppm (period WPA peak for H ₂ S).
17 Apr 2026	BL-01, BL-02, and BL-03 active over short intervals. No compliant site-wide TWA or STEL. No exceedances.
18 Apr 2026	GW-A01 returned to operation (16.6 hours, 210/325 TWA/STEL points). Onset of the SO ₂ event: SO ₂ TWA 0.194 ppm (38.7 % of NGV) and SO ₂ STEL 0.392 ppm (39.2 % of KGV), both stepwise changes from the period baseline of 0 %. NO ₂ , CO, and H ₂ S remain at baseline. To be correlated against activity logs and meteorological observations from Luleå to identify the source.
19 Apr 2026	GW-A01 active for 7.3 hours (150/150 TWA/STEL points, partial). Period peaks recorded: SO ₂ TWA 0.272 ppm (54.4 % of NGV; warning status >50 %), SO ₂ STEL 0.430 ppm (43.0 % of KGV), H ₂ S TWA 0.119 ppm (2.4 % of NGV) and H ₂ S STEL 0.340 ppm (3.4 % of KGV). No NGV or KGV exceedances.

Date	Observation
	Confirm that the SO ₂ event and the concurrent H ₂ S rise trigger the agreed investigation workflow.
20 Apr 2026	GW-A01 in downtime. BL-01, BL-02, and BL-03 active with partial coverage. No compliant site-wide TWA or STEL.
21 Apr 2026	No sensor activity recorded up to the report generation timestamp of 22:05 on 2026-04-22. Coverage gap at end of period.

8.4 Data Quality and Compliance

This section sets out the regulations applied to the results in sections 8.1 to 8.3, the data coverage and quality filter rules used, the inclusion criteria applied for this reporting period, and the terminology convention adopted throughout the report. The aim is to make every figure in section 8 reproducible from the raw dataset and to provide the reader with an unambiguous basis for distinguishing regulatory exceedances from investigation triggers.

8.4.1 Regulatory and methodological framework

The primary assessment is compliance with AFS 2023:14 (occupational hygiene limit values). The Level Limit Value (NGV) is assessed as an 8-hour time-weighted average under §11, and the Short-term Limit Value (KGV) is assessed as a rolling 15-minute average under §12. Both assessments are applied independently: a day is compliant only if both the §11 TWA and §12 STEL lie within the limit values. Measurement methodology, instrument calibration, and data handling follow AFS 2023:14 §15, with EN 689:2018 as the harmonised European reference for workplace exposure assessment, and ISO 9612:2009 for quality assurance principles. Where continuous coverage over a full 8-hour reference shift is not available, EN 689:2018 §5.3 Partial Period Measurement is applied as a secondary screening tool.

8.4.2 Coverage and data adequacy

The 75 % coverage convention is applied both to the 8-hour TWA window (minimum 360 valid minutes) and to the 15-minute STEL window (minimum 11.25 valid minutes). Only sensor-days meeting this threshold are presented as AFS-compliant primary assessments in sections 8.1 to 8.3. During the reporting period, the GreyWolf reference instrument GW-A01 produced 12 days of AFS-compliant TWA and STEL assessments. GW-A01-Cabin produced AFS-compliant STEL on two deployment days (2026-04-01 and 2026-04-16) but no AFS-compliant 8-hour TWA on either day, since each deployment was shorter than 6 hours. The Blackline G7c units did not meet the 75 % coverage threshold for 8-hour TWA on any day, which is expected for portable units in intermittent use, and these sensors are therefore assessed via the EN 689:2018 §5.3 screening tool for the days they were active.

8.4.3 Quality filter layers

Raw sensor data passes through four documented quality filters before aggregation. Layer 1 is physical range validation: values outside the instrument's specified calibration range are flagged OUT_OF_RANGE and excluded, while slightly negative values arising from zero drift are clamped to zero and retained, preserving time-series continuity. Layer 2 is physics-based plausibility assessment: values above site-specific ceilings (for example, NO₂ above 3 ppm or H₂S above 20 ppm in ambient air) are flagged IMPLAUSIBLE and treated as sensor artefacts. Layer 3 is short-spike detection: bursts of one to six consecutive values exceeding a trailing 30-value baseline by a factor of ten and by at least 0.3 ppm in absolute magnitude are flagged as spikes; longer bursts are retained as candidates for sustained exposure events. Layer 4 is thermal correlation: spikes coinciding

with a temperature change of 2 °C or more within a five-minute window are classified as thermal artefacts. All flagged values remain in the raw dataset and are auditable; the filter is applied at aggregation time, not at storage.

8.4.4 Inclusion settings applied to this report

For this reporting period, Layer 1 (out-of-range) and Layer 2 (implausible) are applied per the default; Layers 3 and 4 (short-burst spikes and thermal artefacts) are INCLUDED, which is a non-default inclusion setting. The total reading volume is 153,561 raw points; 1,455 negatives have been clamped to zero, 172 points meet the Layer 3 spike criterion, and 80 points meet the Layer 4 thermal artefact criterion. No readings were flagged by Layer 2 in the period.

The effect on the headline compliance result is immaterial. The period peak TWA and STEL values, which drive the Section 9.1 and 9.2 tables, are recorded on GW-A01 on 2026-04-18 and 2026-04-19 and are not flagged by either Layer 3 or Layer 4. The site-wide NO₂ STEL peak of 34.9% on BL-02 on 2026-04-07 is similarly not flagged. The non-default inclusion setting is material, however, for some Cas-Cabin readings on 2026-04-01, where a Layer 4 temperature correlation is present on several 15-minute intervals. These readings have been retained for transparency and are tagged in the Data Quality Observations Register as a candidate thermal artefact event requiring investigation. A default-filter re-run of the period dataset is available on request and is stored as a parallel pipeline output for audit.

8.4.5 Terminology: exceedance versus screening flag

For this reporting period, Layer 1 (out-of-range) and Layer 2 (implausible values) are applied by default; Layer 3 and Layer 4 (short spikes and thermal artefacts) are included, which is a non-default inclusion criterion. The total dataset comprises 153,561 raw data points; 1,455 negative values have been clamped to zero, 172 values meet the Layer 3 spike criterion, and 80 values meet the Layer 4 thermal artefact criterion. No values were flagged by Layer 2 during the period.

The impact on the principal compliance result is immaterial. The period peak TWA and STEL values, which drive the tables in sections 8.1 and 8.2, are recorded on GW-A01 on 2026-04-18 and 2026-04-19 and are not flagged by either Layer 3 or Layer 4. The site-wide NO₂ STEL peak of 34.9 % on BL-02 on 2026-04-07 is also not flagged. The non-default inclusion criteria are, however, material for certain GW-A01-Cabin readings on 2026-04-01, where a Layer 4 temperature correlation is present on several 15-minute intervals. These values have been retained for transparency and are flagged in the data quality observations register as a candidate thermal artefact event requiring investigation. A run of the period dataset with default filters is available on request and is stored as a parallel pipeline output for review.

8.4.6 Compliance statement for the reporting period

On the basis of the primary assessment methodology set out above, no exceedances of NGV or KGV were recorded during the reporting period 2026-04-01 to 2026-04-21 for any combination of sensor, day, and gas. The highest primary-assessment utilisation of a statutory limit was 54.4 % of SO₂ NGV on GW-A01 on 2026-04-19, which triggered the internal 50 % warning threshold and is the subject of the source identification workflow described in section 8.3. A screening flag was recorded in the EN 689:2018 PPM detail table (BL-02 NO₂ on 2026-04-08, worst-case shift equivalent 122.8 % of NGV) deriving from 2.2 hours of monitoring with a peak instantaneous value of 0.8 ppm. The representative TWA on the same sensor-day was 27.7 % of NGV. This screening flag is logged as an 'investigation trigger' and does not constitute an exceedance under AFS 2023:14 §11. The SO₂ TWA event at 54.4 % remains the only entry flagged against internal warning thresholds during the period and is carried forward to the action register as open item AQM-2026-W16-01.

9. Results: Pore Gas Monitoring

Measured concentrations by sampling point

Table 4 Pore gas sampling results CA2

Parameter	Unit	PG1 ST2614697-001	PG2 ST2614697-002	PG3 ST2614697-003	PG4 ST2614697-004	PG5 ST2614697-005
Aliphatics	mg/m ³	<LOR	<LOR	<LOR	<LOR	<LOR
BTEX	mg/m ³	<LOR	<LOR	<LOR	<LOR	<LOR
Halogenated VOC	mg/m ³	<LOR	<LOR	<LOR	<LOR	<LOR
Halogenated aliphatics	mg/m ³	<LOR	<LOR	<LOR	<LOR	<LOR

10. Results: Particulate Measurements

Cabon Dozer 1 (bandtraktor) 2026-04-01

Parameter	Result	Unit	Comment
Dust	< LOR	mg/m ³	
Metals	≤ LOR	µg tot	Deviation < 1% of LOR
Mangan	0,0168		LOR(Mn) 0,005 µg
Aliphates	<LOR	mg/m ³	
BTEX	<LOR		
Toluene	0,155	mg/m ³	

10.1 Particulate Monitoring

Particulate sampling was carried out by NCC. Time-based particulate concentrations for total dust are presented in the chart below.

The particulate sampling report is under revision and will be provided once received.

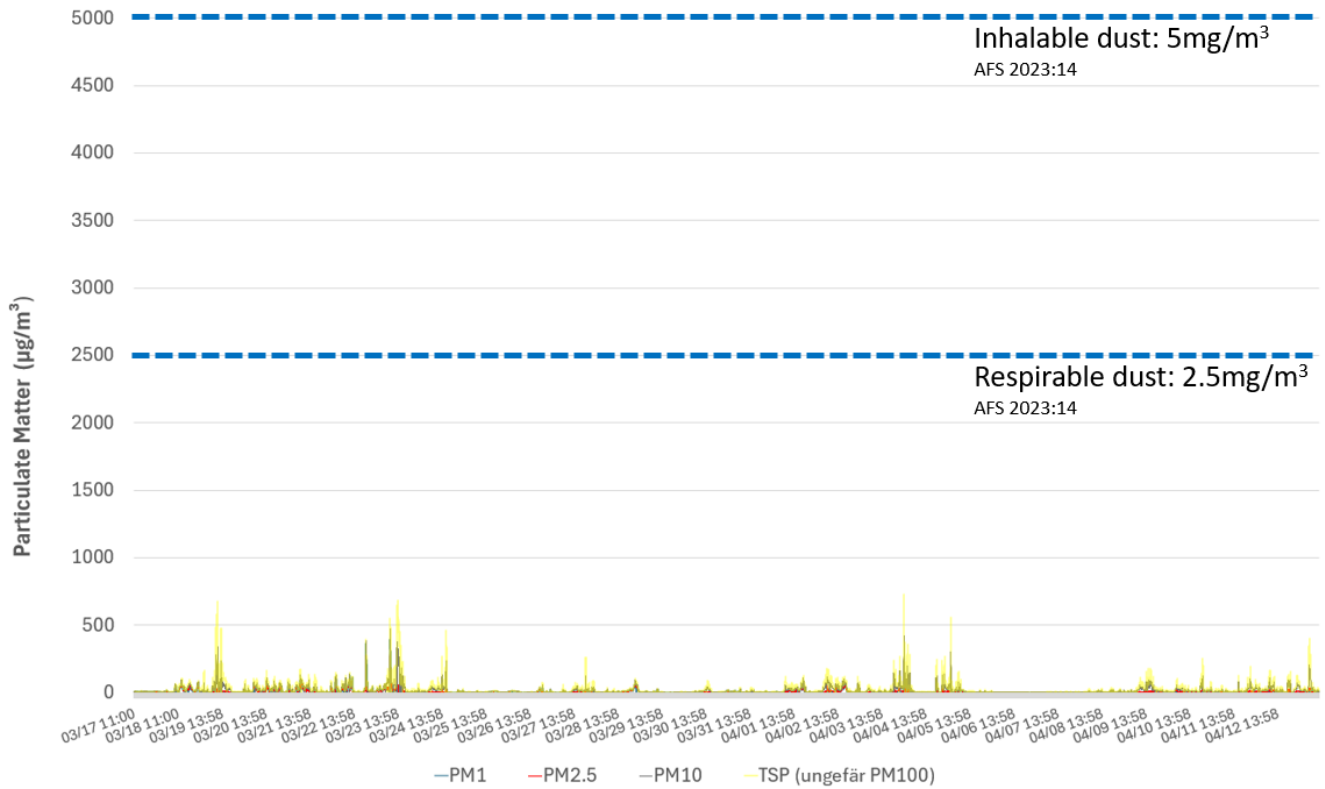


Figure 6: Total dust chart. Limit values for respirable and inhalable inorganic dust are shown for indication. AFS 2023:14 is the regulation in force; AFS 2018:1 is included to show the tightening of limit values decided by Arbetsmiljöverket. (Not reproduced in translation.)

Machine cabin Dozer 1 (crawler tractor), sampling date 2026-04-01.

Table 13: Gases and particulates in machine cabin, 2026-04-01. <LOR indicates that the result is below the analysis reporting limit.

Parameter	Result	Unit	Comment
Dust, respirable	<LOR	mg/m ³	
Metals, manganese	≤ LOR 0.0168	µg total	LOR(Mn) 0.005 µg
Aliphatics	<LOR	mg/m ³	
BTEX, toluene	<LOR 0.155	mg/m ³	

Machine cabin Dozer 1 (crawler tractor), sampling date 2026-04-15.

Gas	ppm	NGV ppm	KGV ppm
NO ₂	<0.1	0.5	1

Gas	ppm	NGV ppm	KGV ppm
CO	<1	20	100

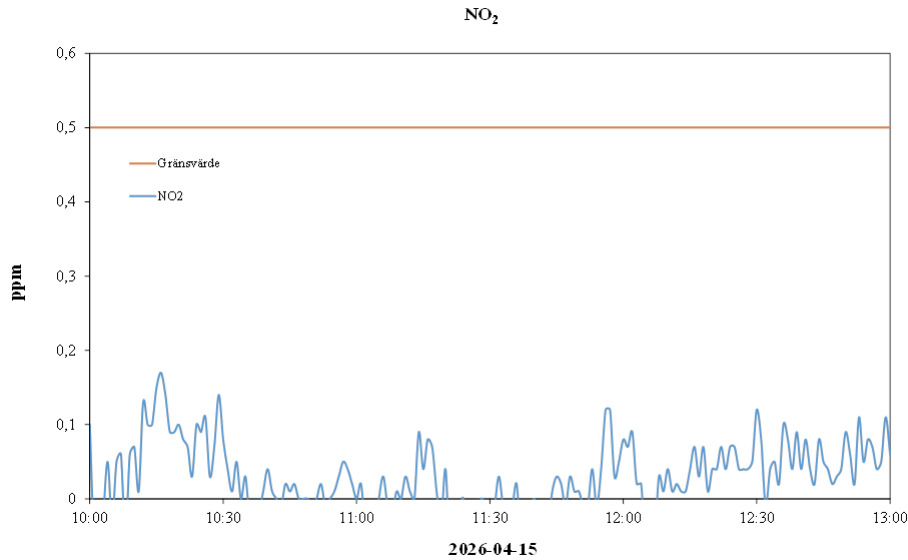


Figure 7: Dozer 1 NO₂ concentration in machine cabin.

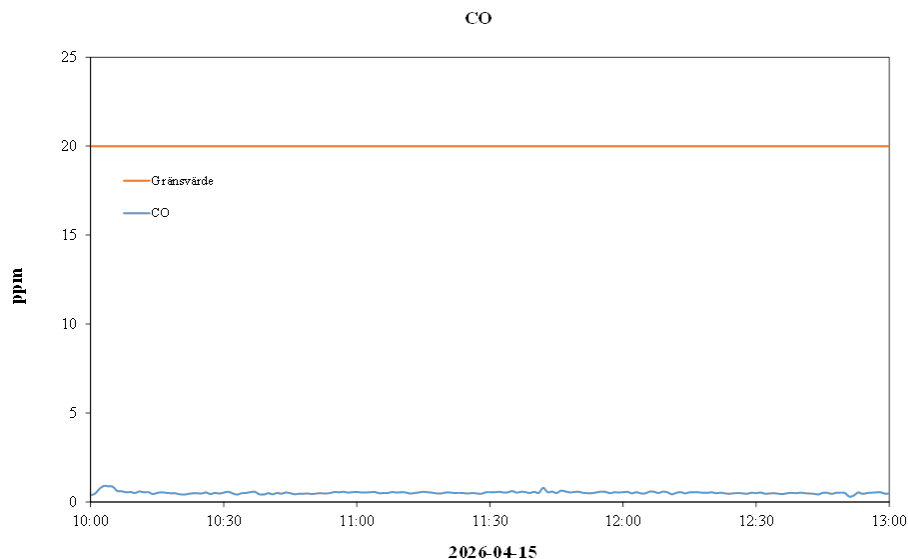


Figure 8: Dozer 1 CO concentration in machine cabin.

11. Plan for Ongoing Measurements

11.1 Scope of planned expansion of measurements

As part of the planned expansion of the measurement programme, SSAB has procured 20 fixed measurement stations for multi-gas measurement. The objective is to complement current portable measurements with continuous monitoring and to enable assessment of the 8-hour TWA under AFS 2023:14 §11 without dependence

on partial coverage. These will be deployed at fixed locations across the area. 15 locations have been identified to provide full coverage across the area with a maximum measurement radius of 250 m. The remaining 5 sensor units will be used for redundancy and for targeted measurements in selected areas. The locations are pre-defined, but actual positions may be adjusted on the basis of planned and ongoing works requiring certain measurement stations to be relocated.

Procurement of dust traps is in progress; these will be deployed to monitor total dust, respirable fractions, and the presence of substances covered by limit values in AFS 2023:14.

Table 14: Planned installations of gas monitoring stations.

ID	Latitude	Longitude
EXO-S-01	65.559001	22.241734
EXO-S-02	65.558418	22.246361
EXO-S-03	65.556113	22.251269
EXO-S-04	65.558145	22.252097
EXO-S-05	65.555225	22.258040
EXO-S-06	65.558034	22.258162
EXO-S-07	65.556698	22.263449
EXO-S-08	65.553987	22.263561
EXO-S-09	65.553465	22.266898
EXO-S-10	65.556135	22.267646
EXO-S-11	65.558320	22.270360
EXO-S-12	65.566460	22.219110
EXO-S-13	65.555210	22.272670
EXO-S-14	65.557470	22.240010
EXO-S-15	65.556720	22.245760

Table 15: Planned gas measurements.

Gases	Location / Measurement point	Equipment	Planned timing
Outdoor	Continuing across the entire construction area	Gas measurement stations	April / May
Pore gas	No further planned	Pore gas sampling tubes	April
Indoor (site cabins)	East Camp, Buildings 2 and 3	Gas monitors / loggers	April / May
Inside machine cabin	Test locations	Gas monitors / loggers	April / May

Table 16: Planned particulate measurements.

Particles	Location / Measurement point	Equipment	Timing
Outdoor	Continuing across the entire construction area	Particulate logger / monitoring station	April / May
Indoor (site cabins)	East Camp, Buildings 2 and 3	Particulate logger / filter	April
Inside machine cabin	Test locations	Particulate logger / filter	April / May
Quartz	Continuing across the entire construction area	Dust traps	April / May

11.2 Reporting frequency

The measurement system will automatically update to a cloud service at regular intervals. Automated email reporting will be configured on a daily or weekly basis.

11.3 Escalation thresholds

Internal action levels for early warning and escalation will be implemented in the gas and particulate monitoring systems, set below the limit values in AFS 2023:14.

Alarms will automatically be sent to the incident organisation and will form part of the emergency response plan (ERP), specifying threshold value, triggering action, notification recipient, and response time.

11.4 Data quality assurance

Calibration intervals, bump tests, and gas cylinder replacement will be included in the maintenance schedule.

Calibration and bump test intervals form part of the system configuration for gases. Particulate loggers shall be calibrated and tested by the respective supplier.

12. Annex A: Instrument specifications and calibration register

Instrument specifications and current calibration status for all sensor platforms in use.

12.1 Instrument specifications

Unit	Manufacturer	Model	Gas / Fraction
Greywolf_1	GrayWolf Sensing Solutions	DirectSense XM (ds2)	NO ₂ , SO ₂ , CO, H ₂ S
3571208838	Blackline Safety	G7c	SO ₂ , CO, H ₂ S
3571217839	Blackline Safety	G7c	NO ₂ , CO
3571219025	Blackline Safety	G7c	CO, H ₂ S
3571243319	Blackline Safety	G7c	NO ₂ , SO ₂

12.2 Sensor specifications

Table 17: Sensor specifications.

Supplier	Gas	Sensor type	Range	Resolution
GrayWolf Sensing Solutions	Carbon monoxide (CO)	Electrochemical	0 to 500 ppm	0.1 ppm
GrayWolf Sensing Solutions	Hydrogen sulphide (H ₂ S)	Electrochemical	0 to 50 ppm	0.01 ppm
GrayWolf Sensing Solutions	Nitrogen dioxide (NO ₂)	Electrochemical	0 to 20 ppm	0.01 ppm
GrayWolf Sensing Solutions	Sulphur dioxide (SO ₂)	Electrochemical	0 to 50 ppm	0.1 ppm
Blackline Safety	Carbon monoxide (CO)	Electrochemical	0 to 500 ppm	1 ppm
Blackline Safety	Hydrogen sulphide (H ₂ S)	Electrochemical	0 to 100 ppm	0.1 ppm
Blackline Safety	Nitrogen dioxide (NO ₂)	Electrochemical	0 to 50 ppm	0.1 ppm

Supplier	Gas	Sensor type	Range	Resolution
Blackline Safety	Sulphur dioxide (SO ₂)	Electrochemical	0 to 100 ppm	0.1 ppm

12.3 Calibration register

Table 18: GreyWolf calibration data.

Sensor	Last bump test	Next bump test	Last calibration	Next calibration	User	Cartridge ID	Unit type
CO	(not set)	(not set)	2026-03-25	(not set)	Sean O'Mara	23804	Grey Wolf
NO ₂	(not set)	(not set)	2026-03-25	(not set)	Sean O'Mara	23703	Grey Wolf

Gray Wolf Sensing Solutions Calibration Certificate

Customer Details

Norrkompetens AB

Invoice # E20330

Lasarettsvagen 35
Skelleftea, 93141
Sweden

Contact: Kennet Tjarnstrom

Sensor Calibration Details

Sensor	Bar Code/ID	Serial No	Set Point	Verified	Error	Uncertainty
Carbon Monoxide	132960014026	23804	0.0ppm	0.3ppm	0.3ppm	0.47%
			95.3ppm	95.0ppm	-0.3ppm	0.69%
Nitrogen Dioxide	212140151026	23703	0.00ppm	0.04ppm	0.04ppm	0.43%
			5.00ppm	4.95ppm	-0.05ppm	2.05%

All test equipment and/or reference materials used in calibration are fully traceable to recognized national standards.
 The uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

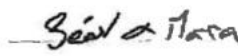
Lab Ambient Conditions

Temperature 20.2°C

Humidity 46.0%RH

Pressure 1,011mbar

Calibrated By: Sean O'Mara



Facility: Annacotty
 GrayWolf Sensing Solutions LTD
 Annacotty Business Park
 Unit 1C
 Annacotty
 Co Limerick
 IRELAND

Date: 25-Mar-26

Figure 9: Calibration certificate for GreyWolf gas sensors. (Not reproduced in translation.)

Table 19: Blackline calibration data.



Unit ID Blackline	Last bump test	Next bump test	Last calibration	Next calibration	Cartridge ID	Sensors	Unit type
3571208838	2026-04-03 04:54	2026-05-03 12:54	2026-04-03 04:54	2026-09-30 12:49	1015752	CO H ₂ S LEL- MPS O ₂ SO ₂	G7c
3571217839	2026-04-03 12:01	2026-05-03 12:01	2026-02-11 14:30	2026-08-10 15:28	1013225	CO LEL-MPS NO ₂ O ₂	G7c
3571219025	2025-04-10 15:10	2026-04-26 17:14	2025-09-02 08:25	2026-09-23 17:14	317394	CO H ₂ S LEL- MPS O ₂ PID	G7c
3571243319	2026-04-16 08:33	2026-05-16 16:33	2026-04-16 08:33	2026-10-13 16:28	243426	NO ₂ SO ₂	G7c

13. Annex B: Glossary and abbreviations

Abbreviations and technical terms used in this report.

Term / abbreviation	Definition
AFS	Arbetsmiljöverkets författningssamling (the Swedish Work Environment Authority's regulatory collection).
AFS 2023:10	Arbetsmiljöverket regulations and general advice (AFS 2023:10) on risks in the working environment.
AFS 2023:14	Arbetsmiljöverket regulations and general advice (AFS 2023:14) on limit values for airway exposure in the working environment.
AFS 2023:15	Arbetsmiljöverket regulations and general advice (AFS 2023:15) on medical examinations in working life.
Arbetsmiljöverket	The Swedish Work Environment Authority, responsible for regulation and inspection of work environment and safety in Sweden.
Blackline	Blackline Safety Corp.; manufacturer of the portable multi-gas sensor units used on site.
Bump test	Functional verification of a gas sensor by exposing it to a known concentration of target gas to confirm that it responds and alarms within specification.
CA / CA1 to CA5	Construction area; the project is divided into five construction areas (CA1 to CA5).
Calibration	Adjustment of a sensor against a certified reference (typically span gas) to ensure measurement accuracy within stated tolerances.
CAS number	Chemical Abstracts Service registration number; a unique numerical identifier for a chemical substance.
CO	Carbon monoxide.
GreyWolf	GreyWolf continuous ambient monitor; the reference air quality instrument on site.
H ₂ S	Hydrogen sulphide.
KGV	Korttidsgränsvärde; the Swedish 15-minute short-term exposure limit defined under AFS 2023:14 Annex 1.

Term / abbreviation	Definition
LOD	Limit of detection; the lowest concentration that can reliably be distinguished from zero by the sensor.
LOR	Limit of reporting; results below this limit are not reported due to laboratory quality standards.
Miljöbalken	The framework legislation regulating environmental protection and permits in Sweden.
Naturvårdsverket	The Swedish Environmental Protection Agency; issuer of guideline values for contaminated soil, soil gas, and ambient air quality.
NGV	Nivågränsvärde; the Swedish 8-hour time-weighted average occupational exposure limit defined under AFS 2023:14 Annex 1.
NO ₂	Nitrogen dioxide.
PAH	Polycyclic aromatic hydrocarbons.
PM2.5	Particulate matter with a diameter of 2.5 micrometres or less. Particles smaller than this can reach the lungs and pass into the bloodstream.
PM10	Particulate matter with a diameter of 10 micrometres or less. Particles smaller than this can reach the upper airways.
Pore gas	Soil gas occurring in the void space between soil particles; measured as an indicator of subsurface contamination and volatile migration potential.
ppm	Parts per million by volume; standard unit for gas concentration at occupational monitoring level.
PPM	Partial Period Measurement (EN 689:2018 §5.3).
SO ₂	Sulphur dioxide.
STEL	Short-term exposure limit; the international equivalent of KGV.
TWA	Time-weighted average; the arithmetic mean concentration weighted over a defined averaging period (typically 8 hours).
Utilisation	Measured value divided by the applicable regulatory limit, expressed as a percentage (e.g. 0.20 ppm / 0.5 ppm NGV = 40 %).

Term / abbreviation	Definition
WGS84	World Geodetic System 1984; the coordinate reference system used for sensor positions in this report.

14. Annex C: Analysis of Gas Measurement Data

“See attached Bilaga C”