
CHEMICAL SAFETY REPORT

SECTIONS 9 & 10

Legal name of applicant: **Almetron Ltd**

Use title: The continued use of chromium trioxide for the formulation of surface treatment process solutions- specifically formulating chromic acid based products by the addition of water, wetting agents and acids (no reactive chemistry)

Substance: Chromium trioxide
EC number: 215-607-8
CAS number: 1333-82-0

Submitted by: Almetron Ltd

Submission Date: 04/09/2024

Use 1, this application is for a UKREACH Licence Extension of 12 years to allow Almetron Ltd to continue the formulation of chromium trioxide for sale to downstream users, who are covered by their own authorisation for the applications agreed with UKREACH.

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Abbreviations

AfA	Application for authorisation
BAT	Best Available Techniques
CSR	Chemical Safety Report
DF	Dilution Factor
DNEL	Derived No Effect Level
IBC	Intermediate Bulk Container
LEV	Local Exhaust Ventilation
PPE	Personal Protective Equipment
RMM	Risk Management Measures
TWA	Time-weighted Average
WCS	Worker Contributing Scenario
WIS	Work Instruction Sheet
WEL	Workplace Exposure Limit

Introduction to Almetron Ltd

Almetron Ltd is an established company incorporated on 3rd August 1983, this is our 41st year of trading. Almetron Ltd operates from a single site for this UK-based company registration No: 01744029.

Almetron Ltd supplies bespoke chemical solutions to customers across many platforms including aerospace, defence, automotive, industrial architecture, food industries, hygiene and transportation.

Almetron Ltd are a long-standing supplier into many prestigious companies such as Airbus UK with an – Airbus supplier code of 0034312176,

We have a well-established supply chain and technical representation to support our products and customers.

Almetron Ltd are active members of **Qualicoat**, **Qualanod**, **ESTAL** and **GSB** all global quality labels and organisations committed to maintaining the quality of surface treatment of aluminium and its alloys, a core part of our business. Almetron Ltd is also a member of **Aluminium Federation (ALFED)**, the **Surface Engineering Association (SEA)** along with the **Chemical Business Association (CBA)** in the UK, which includes the **Responsible Care Program** which is the global chemical industry's voluntary initiative to drive continuous improvement in safe chemicals management and achieve excellence in environmental, health, safety, and security.

This is further underpinned by **Lloyds Register Quality Assurance Ltd (LRQA)** membership, which provides a world class assessment and certification service in Quality Management Systems and Environmental Management Systems membership to re-enforce our quality and environmental systems and experience in this field.

Almetron Ltd maintain Lloyds Register Quality Assurance Ltd (LRQA) **ISO9001:2015** and **ISO14001:2015**. With the 2023-2024 external audits successfully completed with zero non-conformances.

Adherence to safety, quality, environmental objectives, and performance are considered high priorities together with valuing innovation and excellence.

- A copy of ISO9001:2015 and ISO14001:2015 certificates are available on request.

Scope of this document

Almetron Ltd will use this report to demonstrate the risks to health and safety from working practices at Almetron formulating chromium trioxide-based products is as low as reasonably practicable (**ALARP**). This report is submitted to address concerns under **UK REACH**. The information provided sets out all of the chromium trioxide process operations that involve this substance of very high concern (**SVHC**) this report will detail all of the control measures in place to for each operation in the formulation process. We demonstrate this by providing the independent on-site testing and evaluation which was completed by RPS Group in 2021-2022-2024 with the next tests planned for November 2024. The testing is based on the requirements of Article 62 (4) (d) of the REACH Regulation. This Chemical Safety Report (CSR) as part of Almetron Ltd Application for authorisation (AfA) covers the risks to our employees human

health and the environment arising from the intrinsic properties of chromium trioxide by disclosing independent tests.

9.0 Exposure assessment (and related risk characterisation)

9.1 Introduction

This exposure assessment is part of our application for authorisation for the continued use of chromium trioxide (CAS 1333-82-0, EC: 215-607-8) – specifically for formulating chromic acid based products by the addition of water, wetting agents and acids (no reactive chemistry). This report has been compiled by the applicant. According to Article 62 (4) (d) of the REACH Regulation, CSR in AfA should cover the risks to human health and / or the environment arising from the intrinsic properties of chromium trioxide detailed in Annex XIV, therefore this Chemical Safety Report (CSR) focuses on carcinogenicity and mutagenicity endpoints.

In particular, the risk assessments performed by SEACTAC took into account the information and the dose-response relationship provided by the risk assessment committee (RAC) in the document "Application for Authorization: Establishing a reference dose response relationship for carcinogenicity of hexavalent chromium" (RAC / 27/2013/06 Rev. 1 Final)¹

In this document, RAC confirmed that it is not possible to determine a "derived no-effect level" for the carcinogenic properties of chromium trioxide and therefore chromium trioxide should be considered as non-threshold substance for the purposes of Article 60 (3) (a) of the REACH Regulation, as a result, according to Article 60 (4) of the REACH Regulation, demonstrating adequate control is not possible and the SEA route is applicable.

This assessment is focused mainly on the Annex XIV properties (Carcinogenic (category 1A) Mutagenic (category 1B)) but mention is made of environmental exposure and consequent assessment of man via the environment has also been carried out to establish any potential exposure levels to the general population.

9.1.1 Overview of uses and exposure scenarios

9.1.1.1 Tonnage information

The total tonnage used by Almetron Ltd. is circa 14 tonnes per annum. Due to the lack of UK formulators this could rise to in the region of 25 tonnes based on our own forecasts.

Almetron Ltd is a small sized business for the purpose of REACH authorisation applications and full details of company size is included with this AFA. Almetron Ltd. is exclusively located in the UK.

9.1.1.2 Overview of exposure scenarios

The following table lists all the exposure scenarios (ES) assessed in this CSR.

Table 1 Overview of Contributing Scenarios presented in the Use

Contributing scenario	Name of the contributing scenario	Size of the exposed population
ECS1:	Use at an industrial site- Use of chromium trioxide for the formulation of surface treatment chemicals namely chromic acid	All Local
WCS 1	Receipt & storage of chromium trioxide	1
WCS 2	Decanting and weighing of solids	1
WCS 3	Transfer to tank– aqueous solution	1
WCS 4	Mixing by dilution	1
WCS 5	Transfer to storage container	1
WCS 6	Transfer to small containers	1
WCS 7	Cleaning of Equipment	1
WCS 8	Maintenance of Equipment	1
WCS 9	Storage of formulation	1
WCS 10	Quality Control – Lab Analysis	1
WCS 11	Waste Management	1

The formulation of the chromium trioxide solution (chromic acid) has been performed at Almetron Ltd for 41 years without any incidents or accidents to date. This does not make us complacent as we continually monitor, maintain and improve the operational processes.

Formulation of the chromium trioxide solution is conducted in a designated area using Tank 3, (see Appendix 1 for site map) which is bunded with no access to none authorised personnel during chromic acid production.

Processing is planned to be performed in single batches and made to the customer's order and requirements. Typically, production is planned in advance and restricted to a single working day whenever possible.

Raw material is received on wrapped pallets of 25kg sealed metal containers and stored in a designated bunded location Bay 13 within the warehouse.

Health, Safety, Environmental and Chemical Safety awareness and refresher training is given to all personnel, this is recorded and retained in their individual training files. All accidents, incidents and near misses are logged and retained for investigation and corrective actions put in place to prevent any reoccurrence. The company has a good safety record, with zero incidents involving chromium trioxide. All PPE is regularly inspected, changed on request and some equipment such as RPE is checked along with user Face Fit Checks to HSE INDG479

REV 1 standard. All staff are offered annual Health Surveillance Checks which include respiratory and skin condition checks.

The production area is bunded in line with Best Practice. The mixing tank (Tank 3) is an enclosed stainless steel tank with a 5,000-litre capacity, with a hot and cold-water blanket system and paddle mixed, which is visually checked pre and post use along with annual inspections by HSB Insurance. Any hazardous waste that is generated which is limited to PPE (disposable protective suits, and gloves) along with washed out 25kg steel drums from the formulation process are segregated and labelled ready for disposal through the use of our registered hazardous waste contractors. Standard Operating Procedures (SOP) exist for the formulation of chromic acid which are maintained in line with ISO14001: 2015 and the products Safety Data Sheet (SDS)

WCS 1- Receipt and storage of chromium trioxide

The chromium trioxide to be used in the formulation process is delivered to the company in hermetically sealed steel drums of 25 kg each, and the chromium trioxide has the appearance of dark red flakes.

On receipt, checks are carried out to ensure the goods are in accordance with the purchase order requirements, the drums are visually inspected for any signs of damage and to confirm the seals are intact. The drums are then stored unopened on a pallet in a bunded location (Bay 13), dedicated for this raw material.

WCS 2 – Decanting and weighing of solids

The dedicated mixing tank 3 has 50 litres of water put into the tank which is used as a particle damping system to prevent particles escaping from the tank on decanting into the tank. Solid chromium trioxide flake 25kg drums (worst case scenario 17 x 25kg drums per mix) are decanted straight into the mixing tank to reduce multiple handling and reduce exposure. The tank has a digital load cell display outside the tank, so the weight of the formulation mixture is automatically displayed, and the additions are made in accordance with the Almetron Work Instruction Sheet for the order. As the lids are removed and the drums emptied they are immediately cleaned at point of use, in a custom-built Chrome Drum Washer then stacked and wrapped ready for disposal, in line with our disposal procedure. The washings from the drum cleaning are then added to the production mix. No liquid or fumes escape from the process (see RPA Reports) The only waste generated are clean steel drums for collection by the licensed waste management company.

This process only takes up to 20 minutes and appropriate and mandatory PPE is worn by the trained and authorised staff.

WCS3 – Transfer to tank – aqueous solution

After washing the chromium trioxide drums, the drum contains a small concentration of chromic acid, instead of going into a waste stream this is added to the mixing tank and appropriate and mandatory PPE would continue to be worn. This is also the process for final tank wash out where the rinsing water goes into the production batch to close the loop on production of chromic acid products.

WCS4 – Mixing by dilution

Clean water is added to the mixing tank, then the chromium trioxide flake is added to the final weight of the mix (Work Instruction Sheet used, example in Appendix 2). The lid for adding the ingredients to the tank is closed and then, only then, mixing takes place for a set period of time. This process results in no particle escapes as this is a closed vessel. Exposure to personnel is annually monitored *. No waste liquids containing chromic acid are produced for disposal.

***External RPS Group, Occupational Exposure Monitoring Reports**

FTOM80421- May 2021

FTOM81927-Nov 2021

FTOM85394-Nov 2022

FTOM87679-Nov 2023

are available on request for review

WCS5 – Transfer to storage container

Once the mixing is complete and the formulation requirements have been satisfied, the chromium trioxide solution is transferred into a new UN Approved IBC, located on a dedicated bund, even though these IBC are new they are inspected prior to use to ensure they are fit for purpose. Standard Operating Procedure are followed.

WCS6 – Transfer to small containers

When Almetron receive orders for 25 litre containers we transfer the chromium trioxide solution from the 1,000 litre IBC's containers into 25 litre containers in Room 7 (suitable PPE is worn and Risk Assessments are available for these processes). The orders are then despatched to the customers in line with the Dangerous Goods Procedures.

Our Dangerous Goods Advisor is:

DG Solutions Europe Ltd – Compliance Certificate

Cover Number: DGSA00382

Annual Audit Date: 26th March 2024

Cover Expiry Date: 31st March 2025 23:59

WCS7 – Cleaning of equipment

Production equipment will be cleaned with 50 litres of water after each production batch mix appropriate PPE is worn, and any waste is collected and added to the production mix to complete the order, and to prevent any hazardous waste liquids being created from the process.

WCS8 – Maintenance of equipment

Following the cleaning of the equipment after a production batch, any required maintenance will be carried out, Daily, Weekly and Monthly Inspection Sheets are used throughout the business along with Maintenance Request forms and a tracking system is in place. External contractors would be expected to sign a permit to work before any work is undertaken once they are fully aware of any risks associated with the process, plant and equipment suitable PPE will be worn a visitor and contractors' induction is given on visiting Almetron Ltd.

WCS9 – Storage of formulation

The formulations are not stored as we make to customer orders. Orders are typically shipped within 3-5 days of order receipt. Orders are shipped same day or next day or as transport can be arranged. The storage vessel(s) temporarily located in the dedicated Room 7 and banded.

WCS10 – Quality control (sampling & lab analysis)

Samples of the chromium trioxide solution taken after formulation are then analysed in the laboratory to ensure compliance with the required specification. Adjustments are made and the taken sample is put back into the mix, the final product solution has a small 100ml retained sample (retained for 13 weeks) Is labelled and stored in designated location in a sealed storage box showing week number, order number and product and safety information along with a density and titration report which is retained indefinitely.

WCS11 – Waste Management

Any single use waste PPE along with any wipes/cloths used to clean the equipment after the production process along with clean and empty 25kg drums are collected and disposed off-site by registered hazardous waste companies.

The table below summarises the frequency and duration of each of the contributing scenarios in this particular application for authorisation:

Table 2 – Frequency & duration of tasks, with an average 66 mixes per year

WCS	Task	Duration of task- mins per 8-hour shift	Mixes per year = 66	Activity per year (232 working days)
WCS1 (1 employee)	Receipt and storage of Chromium Trioxide	2 mins	66 x 2 mins	132 mins
WCS2 (1 employee)	Decanting and weighing of solids	20 mins	66 x 20 mins	1320 mins
WCS3 (1 employee)	Transfer to tank – aqueous solution	10 mins	66 x 10 mins	660 mins
WCS4 (1 employee)	Mixing by dilution	10 mins	66 x 10 mins	660 mins
WCS5 (1 employee)	Transfer to storage container	5 mins	66 x 5 mins	330 mins
WCS6 (1 employee)	Transfer to small containers	2 mins	20 x 2 mins	40 mins
WCS7 (1 employee)	Cleaning of equipment	5 mins	66 x 5 mins	330 mins
WCS8 (1 employee)	Maintenance of equipment	5 mins	66 x 5 mins	330 mins
WCS9 (1 employee)	Storage of formulation	3 mins	66 x 3 mins	198 mins
WCS10 (1 employee)	Quality control (sampling & lab analysis)	10 mins	66 x 10 mins	660 mins
WCS11 (1 employee)	Waste Management	5 mins	66 x 5 mins	330 mins
Total TWA Exposure		77 minutes exposure per 8- hour shift when conducting the tasks		5082 mins exposure per year or 84.70 hours of a possible exposure in the 232 days x 8 = 1856 hours.

Total (averaged) hours exposure per 8 hr (TWA) = 1.25

9.1.1.1 Risk Management Measures and Operational Controls

There have been regulations in place in the UK regarding the use of chromium trioxide since 1931. These were amended in 1973 and then revoked by the issue of the Control of Hazardous Substances regulations in 1988. There has also been joint Health & Safety Executive and Industry association guidance on best practice in place for many years.

Many educational events have taken place, again over many years, such as the 2005 National Health Awareness Day for the UK Chromium Plating Industry and the Disease Reduction Programme focussing on workplace cancers which began in 2008. The UK has been at the forefront of the control of the potential risks from the use of chromium trioxide in metal finishing. The UK's approach of risk management rather than complete risk removal (leading to processes being carried in countries with less stringent or even no real controls) means that chromium trioxide can be used safely in metal finishing processes with exposures similar to background levels.

Here is a list of the risk management measures and operational controls that are in operation at the site that is covered by this particular application.

- 1 – Workplace & Employee Occupational Exposure Monitoring
- 2 – Training- Chemical Safety, Spill Management,
- 3 – Suitable PPE
- 4 – Waste disposal
- 5 – Regular maintenance
- 6 – Management Systems

These are all detailed in the RMM document that accompanies this application for authorisation.

9.1.2 Introduction to the assessment

9.1.2.1 Environment

The quantity of chromium trioxide used is circa 14 tonnes per annum. There are no releases to atmosphere from the site and there are no releases to watercourses. All chromium trioxide is utilised in the formulation process.

The only potential exposures to chromium trioxide are within the designated formulation area, and there is no risk to the general public.

9.1.2.1.1 Scope and type of assessment:

As there are no emissions to atmosphere and any waste (cleaned 25kg steel drums and any PPE is treated off-site by registered waste contractors, therefore there is no need for an assessment.

9.1.2.2. Human via environment

There are no quantifiable releases of chromium trioxide to the environment and no Local Exhaust Ventilation (LEV) in use therefore operations involving chromium trioxide make no contribution to this potential route of human exposure.

9.1.2.3 Employees

9.1.2.3.1 Scope and type of assessment

The designated and authorised staff's exposure via inhalation for all Worker contributing scenario (WCS) are assessed using the results of the personal air sampling and biological monitoring of the workers. The air and biological sampling are conducted by RPS Occupational Health Limited.

There is no exposure during the formulation process as it is carried out in an enclosed process tank.

Table 3- Chromium in Workers' Breathing zone (TWA) – "worst case" results

Employee	Sample Type	TWA values corrected for frequency ($\mu\text{g}/\text{m}^3$ 8hr TWA)
Employee 1	Personal Air	0.2
Employee 2	Personal Air	0.3
Employee 3	Personal Air	0.2

Table 4- Biological monitoring (chrome in urine). Results assumed as 100% chromium trioxide

Employee	Sample Type	Chromium in Urine ($\mu\text{mol}/\text{mol}$ creatinine)*
Employee 1	Biological Monitoring	2.4
Employee 2	Biological Monitoring	0.5
Employee 3	Biological Monitoring	0.7

*UK Biological Monitoring Guidance Value (BMGV) is $10\mu\text{mol}/\text{mol}$ (creatinine) with unexposed level being a range of <0.5 to $<1.53\mu\text{mol}/\text{mol}$ (creatinine). All employees had chromium levels below the guidance value.

9.1.2.3.2 Comments on assessment approach related to toxicological hazard

The assessment approach uses measured data from site, the low frequency and low volume of chromium trioxide additions and the relative proximity of the Employee to the formulation process tanks during operation; the only viable data to assess exposure is biological monitoring and personal air sample results.

9.1.2.3.3 Comments on assessment approach related to physicochemical hazard

Chromium trioxide is classified as a Category 1 carcinogen (R45: 'May cause cancer') and, as such, does not have any Derived No Effect Limit (DNEL). Therefore, WEL and BMGV values (where available) are used as benchmarks for controls.

9.1.2.3.4 General information on risk management related to toxicological hazard

The conditions of use detailed within this CSR (sections 9.2.1 to 9.2.11.) specify that all handling of the substance by the Employee should be done while wearing appropriate PPE relative to the task.

9.1.2.3.5 General information on risk management related to physicochemical hazard

The conditions of storage, use & handling of the substance are detailed within this CSR under sections 9.2. and are utilised as the RMM's.

See attached independent reports for personal air monitoring to NIOSH 7600, the reports detail the methods used and the results obtained.

External RPS Group, Occupational Exposure Monitoring Reports

FTOM80421- May 2021

FTOM81927-Nov 2021

FTOM85394-Nov 2022

FTOM87679-Nov 2023

9.1.2.4 Consumers

There is no exposure to consumers who are not themselves registered and authorised to chromium trioxide, in accordance with this application for authorisation.

There are no releases of chromium trioxide to the environment from the site therefore the process operations involving chromium trioxide make no contribution to this potential route of human exposure.

9.2 Exposure scenarios for employees

The following contributing scenarios cover the potential exposure during all aspects of the formulation process from receipt of material to despatch

9.2.1 Worker Contributing Scenario- WCS 1

This contributing scenario covers the Receipt & storage of chromium trioxide

9.2.1.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 1	PROC 1	Receipt & storage of chromium trioxide	1
			Method
Product (article) characteristics			
Sealed container of chromium trioxide comprising of >99.8% of dry flake			
Technical and Organisational conditions and measures			
Keep sealed in original container. Transfer to dedicated storage location COSHH and Risk Assessments available			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, coveralls, eye protection, face protection and RPE in case of accidental spillage or contaminants on the surface of the containers			
Other conditions affecting the workers exposure			
Not applicable			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Use mechanical lifting aids for movement and lifting where possible			

9.2.2 Worker Contributing Scenario- WCS 2

This contributing scenario covers the Decanting and weighing of solids

9.2.2.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 2	PROC 2	Decanting and weighing of solids	1
			Method
Product (article) characteristics			
Sealed container of chromium trioxide comprising of >99.8% of dry flake			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> Chromium trioxide flake is added and automatically weighed when decanted into the mixing tank into a blanket of water No partial used or opened kegs containing chromium trioxide will be left for storage after the mix as all formulations are based on 25kg additions. Product order Work instruction sheet (WIS) Standard Operating Procedures Dedicated Mixing Tank Load cell for measuring formulation Mix General Ventilation Bunded and Restricted work area Area closed off to other staff during production activity Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment Decanting is a manual process			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.3 Worker Contributing Scenario- WCS 3

This contributing scenario covers the Transfer to tank– aqueous solution

9.2.3.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 3	PROC 3	Transfer to tank– aqueous solution	1
			Method
Product (article) characteristics			
Washings from drum cleaning process containing <5% chromium trioxide added to formulation mix to prevent going into waste stream.			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Weighed when decanted into the mixing tank into the blanket of water and chrome mix • Product order Work instruction sheet (WIS) • Standard Operating Procedures • Dedicated Mixing Tank • Load cell for measuring formulation Mix • General ventilation • Bunded and restricted work area • Area closed off to other staff during production activity • Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.4 Worker Contributing Scenario- WCS 4

This contributing scenario covers the Mixing by dilution

9.2.4.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 4	PROC 4	Mixing by dilution	1
			Method
Product (article) characteristics			
Mixing by Dilution			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Clean water added • Product order Work instruction sheet (WIS) shows the amount to be added, PPE to be worn and special instructions for the unique order, that has full traceability. • Standard Operating Procedures • Dedicated Mixing Tank • Load cell for measuring formulation Mix • General Ventilation • Bunded and Restricted work area • Area closed off to other staff during production activity • Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.5 Worker Contributing Scenario- WCS 5

This contributing scenario covers the Transfer to storage container.

9.2.5.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 5	PROC 5	Transfer to storage container	1
			Method
Product (article) characteristics			
Transfer to storage container			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Clean new Inspected UN Approved IBC used • The IBC that will be receiving the liquid is put on a portable bund • Product is labelled for shipment • Spill Kit is located in the area • Product order Work instruction sheet (WIS) shows the customer requirements, PPE to be worn and any special instructions for the unique order, that has full traceability. • Standard Operating Procedures • Dedicated Mixing Tank & Equipment • General Ventilation • Bunded and Restricted work area • Area closed off to other staff during production activity • Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment Work movement is kept to a minimum to prevent any potential hazards			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.6 Worker Contributing Scenario- WCS 6

This contributing scenario covers the Transfer to small containers

9.2.6.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 6	PROC 6	Transfer to small containers	1
			Method
Product (article) characteristics			
Transfer formulations to small containers			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> Dedicated transfer pipes, identified with a unique number and a date of manufacture these are colour coded as a blue pipe with a purple sleeve, inspected before each use and on a maintenance schedule for every 3 months. Clean new Inspected 25 litre UN approved clear containers are used The containers that will be receiving the liquid are put on a portable bund Product is labelled for shipment Spill Kit is located in the area Product order Work instruction sheet (WIS) shows the customer requirements, PPE to be worn and any special instructions for the unique order, that has full traceability. Standard Operating Procedures Dedicated Decanting Area -Room 7 used General Ventilation Bunded and Restricted work area Area closed off to other staff during production activity Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Decanted in a controlled environment Work movement is kept to a minimum to prevent any potential hazards			

Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply

Specific training and sign off when handling and formulating chromium trioxide

9.2.7 Worker Contributing Scenario- WCS 7

This contributing scenario covers the Cleaning of Equipment.

9.2.7.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 7	PROC 7	Cleaning of Equipment	1
			Method
Product (article) characteristics			
Cleaning of Equipment			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Dedicated Mixing Tank is washed through until clean with 50 litres of water. • Water (washings) from the cleaning process added to the final mix – See WCS5 • RPE Respiratory equipment and all other PPE is cleaned in line with the training provided. • Disposable protective coveralls are removed, labelled and disposed of in the hazardous waste. • A Spill Kit is located in the area • Standard Operating Procedures • General Ventilation • Bunded and Restricted work area • Area closed off to other staff during production activity • Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment Work movement is kept to a minimum to prevent any potential hazards			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.8 Worker Contributing Scenario- WCS 8

This contributing scenario covers the Maintenance of Equipment

9.2.8.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 8	PROC 8	Maintenance of Equipment	1
			Method
Product (article) characteristics			
Maintenance of Equipment			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Ensure all equipment is clean prior to maintenance work is conducted • Complete Daily, Weekly and Monthly Inspection Sheets • Complete Maintenance Request forms and put on the maintenance tracking system, for any work to be undertaken. • Work will be planned and prioritised based on risk and appropriate contractors, in house or external engineer support. • External contractors would be expected to sign a permit to work before any work is undertaken once they are fully aware of any risks associated with the process, plant and equipment suitable PPE will be worn a visitor and contractors' induction is given on visiting Almetron Ltd. • Standard Operating Procedures • General Ventilation • Bunded and Restricted work area • Area closed off to other staff during production activity • Spill and First Aid Trained staff available. • Sign off in place at the end of the maintenance activity this includes any Repairs, Upgrade, Annual Inspections etcetera 			

Conditions and measures related to personal protection, hygiene and health evaluation	
Wear chemically resistant gloves, disposable coveralls, over company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.	
Other conditions affecting the workers exposure	
Formulated in a controlled environment Work movement is kept to a minimum to prevent any potential hazards	
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply	
Specific training and sign off when handling and formulating chromium trioxide Visitors and contractors engaged in work in the area and around Tank 3 to be made fully aware of the risks before any work is commenced – Risk Assessment and Sign off.	

9.2.9 Worker Contributing Scenario- WCS 9

This contributing scenario covers the Storage of formulation

9.2.9.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 9	PROC 9	Storage of formulation	1
			Method
Product (article) characteristics			
Storage of Formulation			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> The formulations are not stored as we make to customer orders. Orders are typically shipped withing 3-5 days of order receipt The IBC is temporarily stored on a portable bund in Tank 7 Room-Dedicated Area. Spill Kit is located in the area General Ventilation Bunded and Restricted work area Spill and First Aid Trained staff available. 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Wear company workwear, eye protection, face protection and RPE in case of accidental spillage or contaminants.			
Other conditions affecting the workers exposure			
Formulated in a controlled environment Work movement is over a short distance by Forklift Truck and kept to a minimum to prevent any potential increased hazards			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.2.10 Worker Contributing Scenario- WCS 10

This contributing scenario covers the Quality Control – Lab Analysis

9.2.10.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 10	PROC 10	Quality Control – Lab Analysis	1
			Method
Product (article) characteristics			
Quality Control- Lab Analysis			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> • Samples of the chromium trioxide solution are taken after formulation are then analysed in the laboratory to ensure compliance with the required specification. • Clean new sample bottles are used and labelled product name and the batch number. • If not to the requirements adjustments are made and the taken sample is put back into the mix, the sample bottle is cleaned and reused until a satisfactory result is obtained. • The final product has a small 100ml sample retained (retained for 13 weeks) along with titration and density results that are retained indefinitely • A laboratory Spill Kit is located in the area • Product order Work instruction sheet (WIS) shows the customer requirements, PPE to be worn and any special instructions for the unique order, that has full traceability. • Standard Operating Procedures • General Ventilation in the Lab • LEV Fume cabinet in the lab with inspections and annual inspection by HSB Insurers • Spill and First Aid Trained staff available. 			

Conditions and measures related to personal protection, hygiene and health evaluation	
Wear chemically resistant gloves, company workwear (lab coats), eye protection, face protection and RPE in case of accidental spillage or contaminants.	
Other conditions affecting the workers exposure	
Analysed indoors LEV used in the area to prevent any potential hazards	
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply	
Specific training and sign off when handling and formulating chromium trioxide	

9.2.11 Worker Contributing Scenario- WCS 11

This contributing scenario covers the Quality Control – Waste Management

9.2.11.1 Conditions of use

Contributing scenario	ERC / PROC	Name of the contributing scenario	Size of the exposed population
WCS 11	PROC 11	Waste Management	1
			Method
Product (article) characteristics			
Waste Management			
Technical and Organisational conditions and measures			
<ul style="list-style-type: none"> Any single use waste PPE along with any wipes/cloths used to clean the equipment after the production process along with clean and empty 25kg drums are collected and disposed off-site by registered hazardous waste companies. Containers with lids are used to collect any PPE and contaminated cleaning products from the process Containers are labelled for disposal Standard Operating Procedures General Ventilation Contractors are aware of the risks and correct disposal requirements of this hazardous waste. Waste Licenses checked and records retained for inspection 			
Conditions and measures related to personal protection, hygiene and health evaluation			
Other conditions affecting the workers exposure			
Waste stored in sealed containers indoors in dedicated Room 7 for collection Work movement is kept to a minimum to prevent any potential hazards			
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply			
Specific training and sign off when handling and formulating chromium trioxide			

9.3 Combined exposure for all WCS

From the WCS, (Worker Contributing Scenarios) shown in this document there is a potential for exposure to chromium trioxide to two workers, as the process is conducted by two trained workers, but only one worker will do the process in any one day. With the Health, Safety and Environmental monitoring in place, external occupational monitoring of inhalation and biological monitoring of the workers conducted by RPS Group as well as Almetron implemented Risk Management Measures (RMMs) and Operational Conditions (OCs), we consider these risks are ALARP. We continue to both respect this SVHC and continue to manage the risks and work with this substance safely without incidents or accidents over the last 41 years.

Chromium trioxide is bio-accumulative, and exposure potential is via inhalation, ingestion and/or dermal absorption. Results from the regulated monitoring methods of mist testing and personal air sampling all show that the RMM's are effective in maintaining exposures to levels below the WEL for chromium trioxide from TWA measures.

Biological monitoring results also demonstrate that the RMM's are effective and are being improving as the results are below the guidance level of 10 µmol/mol (creatinine) at 2.9 µmol/mol (creatinine) in 2021, with results improving since.

10 Risk characterisation related to combined exposure

10.1 Human health (related to combined, shift-long exposure)

10.1.1. Workers

Table 5 Combined exposure and risk characterisation

Contributing scenario	Route of exposure	4-year average 8hr TWA from occupational exposure monitoring value	WEL (EH40/2005-4 th edition 2020) (8-hr TWA reference period)	Excess risk factor (from CSR)
WCS 1-11	Combined (Inhalation, dermal, ingestion)	0.0002 mg.m ⁻³	0.01 mg.m ⁻³	0.002

* WCSs that may be performed by the same worker/s within one shift

10.1.2 Consumers exposure and risk characterisation

There is no exposure to consumers from the use of chromium trioxide in accordance with this application for authorisation.

There are no releases of chromium trioxide to the environment from the site therefore the process operations involving chromium trioxide make no contribution to this potential route of human exposure.

10.2 Environment (combined for all emission sources)

There are no emissions to air as the site does not use LEV on their formulation tank as it is a closed vessel.

There are no emissions to ground as this single site has integrated bunds which are maintained and inspected, this forms part of our requirements to maintain our operator's license issued by Natural Resources Wales, Permit: YP3736UX, last inspection 9th January 2024, Compliance Assessment Report CAR_NRW0043134. There are no emissions to surface water.

Any waste solutions made during the process are reused in the formulation process making this a closed loop system.

There are no liquid discharges to the foul sewer.

10.3 Employee 1 summary for all WCS Tasks

Occupational Exposure Monitoring Results				Personal Workplace Monitoring Results		
WCS	Task	Duration of task-mins per 8-hour shift	Location	8-Hour TWA Concentration (mg.m-3)	WEL (mg.m-3)	
WCS1 (1 employee)	Receipt and storage of Chromium Trioxide	2 mins	Bay 13	<0.0002	0.01	
WCS2 (1 employee)	Decanting and weighing of solids	20 mins	Tank 3	<0.0003	0.01	
WCS3 (1 employee)	Transfer to vessel- aqueous solution	10 mins	Drum Washer	<0.0002	0.01	
WCS4 (1 employee)	Mixing by dilution	10 mins	Tank 7 Area	<0.0002	0.01	
WCS5 (1 employee)	Transfer to storage container	5 mins	IBC under Tank 3	0.0001	0.01	
WCS6 (1 employee)	Transfer to small containers	2 mins	Room 7	<0.0002	0.01	
WCS7 (1 employee)	Cleaning of equipment	5 mins	Tank 3 Area	<0.0002	0.01	
WCS8 (1 employee)	Maintenance of Equipment	5 mins	Tank 3 Area	Not recorded	0.01	
WCS9 (1 employee)	Storage of formulation	3 mins	Room 7	<0.0002	0.01	
WCS10(1 employee)	Quality Control (sampling & lab analysis)	10 mins	Lab	<0.0002	0.01	
WCS11 (1 employee)	Waste Management	5 mins	Sealed drums located in Room 7	Not recorded	0.01	

Occupational Exposure Monitoring Results				Urine Monitoring Results		
WCS	Task	Duration of task-mins per 8-hour shift	Location	Contaminants	Concentration (mg.m-3)	BMGV (mol/mol creatinine)
WCS1 (1 employee)	Receipt and storage of Chromium Trioxide	2 mins	Bay 13	Chrome and Nickel	Chrome 2.2 / Nickel 2.9	Chrome 10 / Nickel 24
WCS2 (1 employee)	Decanting and weighing of solids	20 mins	Tank 3	Chrome and Nickel	Chrome 2.4 / Nickel 5.0	Chrome 10 / Nickel 24
WCS3 (1 employee)	Transfer to vessel- aqueous solution	10 mins	Drum Washer	Chrome and Nickel	Chrome 0.6/ Nickel 0.9	Chrome 10 / Nickel 24
WCS4 (1 employee)	Mixing by dilution	10 mins	Tank 7 Area	Chrome and Nickel	Chrome 1.53/ Nickel1.35	Chrome 10 / Nickel 24
WCS5 (1 employee)	Transfer to storage container	5 mins	IBC under Tank 3	Chrome and Nickel	Chrome 0.72/ Nickel 1.39	Chrome 10 / Nickel 24
WCS6 (1 employee)	Transfer to small containers	2 mins	Room 7	Chrome and Nickel	Chrome 2.2 / Nickel 2.9	Chrome 10 / Nickel 24
WCS7 (1 employee)	Cleaning of equipment	5 mins	Tank 3 Area	Chrome and Nickel	Chrome 2.2 / Nickel 2.10	Chrome 10 / Nickel 24
WCS8 (1 employee)	Maintenance of Equipment	5 mins	Tank 3 Area	Chrome and Nickel	Not recorded	Chrome 10 / Nickel 24
WCS9 (1 employee)	Storage of formulation	3 mins	Room 7	Chrome and Nickel	Chrome 0.5 / Nickel 2.10	Chrome 10 / Nickel 24
WCS10(1 employee)	Quality Control (sampling & lab analysis)	10 mins	Lab	Chrome and Nickel	Chrome 0.6 / Nickel 0.9	Chrome 10 / Nickel 24
WCS11 (1 employee)	Waste Management	5 mins	Sealed drums located in Room 7	Chrome and Nickel	Not recorded	Chrome 10 / Nickel 24

10.4 Personal Protective Equipment Summary

Type	Make	Model	Protection Afforded
Full face RPE with Scott CF32A2B2E2K2HgP3 R D canister filter	Arco	GX01	APF x40
Disposable coveralls	Arco	18b2700	-
Gloves	Ansell	Alphatec nitrile	-
Gauntlets	Polyco	Polysol P73 PVC	-

10.5 Occupational exposure limits legislation and calculations

The Health and Safety Executive (HSE) publish a list of Occupational Exposure Limits (OELs) in their publication EH40 (EH40/2005 Workplace exposure limits (Fourth edition 2020)), which form part of the requirements of the Control of Substances Hazardous to Health Regulations 2002 (COSHH) 6th Edition, Published 2013.

Workplace Exposure Limits (WELs) are OELs set under COSHH, in order to help protect the health of workers. WELs are concentrations of hazardous substances in air, averaged over a specified period of time referred to as a time-weighted average (TWA). Two time periods are used: long term (8-hour TWA) and short term (15 minutes). Long-term exposure limits are intended to control the health effects associated with prolonged or accumulated exposure. Short-term exposure limits (STELs) are set to prevent acute health effects even from brief exposure.

WELs are derived by the following criteria:

1. The WEL value would be set at a level at which no adverse effects on human health would be expected to occur based on the known and/or predicted effects of the substance. However, if such a level cannot be identified with reasonable confidence, or if this level is not reasonably achievable, then:
2. The WEL value would be based at a level corresponding to what is considered to represent good control, taking into account the severity of the likely health hazards and the costs and efficacy of control solutions. Wherever possible, the WEL would not be set at a level at which there is evidence of adverse effects on human health.

Adequate control of exposure will require employers to:

- a) Apply the eight principles of good practice for the control of substances hazardous to health;
 - Design and operate processes and activities to minimise emission, release and spread of substances hazardous to health
 - Take into account all relevant routes of exposure - inhalation, skin absorption and ingestion - when developing control measures
 - Control exposure by measures that are proportionate to the health risk
 - Choose the most effective and reliable control options which minimise the escape and spread of substances hazardous to health
 - Where adequate control of exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment
 - Check and review regularly all elements of control measures for their continuing effectiveness
 - Inform and train all employees on the hazards and risks from the substances with which they work and the use of control measures developed to minimise the risks
 - Ensure that the introduction of control measures does not increase the overall risk to health and safety
- b) Ensure that the WEL is not exceeded; and
- c) Ensure that exposure to substances that can cause occupational asthma, cancer, or damage to genes that can be passed from one generation to another, is reduced as low as is reasonably practicable.

The absence of a substance from the list of WELs does not indicate that it is safe. For these substances, exposure should be controlled to a level to which nearly all the working population could be exposed, day after day, without adverse effects on health. As part of the risk assessment required under Regulation 6 of COSHH, employers should determine their own working practices and in-house standards for control. Further advice can be found in on the HSE Web Site.

The limits relevant to this survey are as follows:

Substance	Type of Limit	8-Hr TWA Limit (mg.m ⁻³)	Notation
Chromium (VI) compounds (as Cr)	WEL	0.01 ⁽¹⁾	Carc, Sen

Key:

8-hr TWA	8-hour Time Weighted Average
WEL	Workplace Exposure Limit
mg.m ⁻³	Milligrams per cubic metre

Notations:

Carc	Capable of causing cancer and/or heritable genetic damage.
Sen	Capable of causing occupational asthma.

(1) This is the limit for non-process generated CrVI, The limit for process-generated CrVI, i.e. exposures generated as a result of a work process, such as fumes from welding, is 0.025 mg.m⁻³

10.5.1 Occupational exposure calculations

Exposure concentrations are calculated by accounting for the mass of the substance captured divided by the volume of air sampled. This is expressed mathematically as:

$$AC = \frac{M}{V}$$

Where AC is the Airborne Concentration (mg.m⁻³); M is the mass of the substance collected (µg) and V is the volume of air sampled in the monitoring period.

10.5.2 Personal exposure calculations – 8-hour Time Weighted Average (TWA)

The 8-hour Time Weighted Average (TWA) exposures are calculated using the approved HSE method listed in EH40 Workplace Exposure Limits (2005).

The 8-hour TWA is expressed mathematically as:

$$\frac{C_1T_1 + C_2T_2 + \dots + C_nT_n}{8}$$

Where C_1 is the occupational exposure and T_1 is the associated time in hours in any 24-hour period.

This takes into account the fact that the normal working shift may be longer or shorter than the normal 8 hours thus increasing or decreasing the exposure to the substance concerned.

The results given are therefore the actual time weighted average exposure over the period monitored and the 8-hour time-weighted average (TWA) exposure, the latter being the one which is compared to the Workplace Exposure Limit given in EH40.

10.5.3 Urine samples

Substance	Type of Limit	Limit
Chromium	BMGV	10 µmol Chromium/mol creatinine
Nickel	90th percentile of data where good controls exist	24 µmol Nickel/mol creatinine

Key:

BMGV Biological Monitoring Guidance Value (published by UK HSE)
 µmol micromole
 mol mole

Biological monitoring (BM) is a technique which can be used to estimate the uptake of substances by workers from all routes of exposure. BM involves measuring the substance in workers' body fluids (e.g. urine or blood) or breath. The BM technique for nickel usually involves measuring the substance in workers' urine.

There is no statutory UK Biological Monitoring Guidance Value (BMGV) for nickel. The 90th percentile of urinary nickel exposure data measured in HSE research (RR963) indicates that with good control, exposures can be reduced to a level of 24 µmol/mol creatinine.

10.6 Results

Supplementary results from occupational exposure monitoring over the previous 4 years.

10.6.1 Summary table of personal monitoring results May 2021

Operator Name/ Sample Location	Contaminants	8-Hour TWA Concentration (mg.m ⁻³)	WEL (mg.m ⁻³)
Employee 1	Chromium VI	0.0002	0.01
Employee 2	Chromium VI	<0.0002	0.01

Key:

mg.m⁻³ = Milligrams per cubic metre

TWA = Time Weighted Average

< = Less than

10.6.2 Urine results May 2021

Operator Name/ Sample Location	Contaminants	Concentration (mg.m ⁻³)	BMGV (µmol /mol creatinine)
Employee 1	Chromium	2.4	10
	Nickel	5.0	24 *
Employee 2	Chromium	0.6	10
	Nickel	0.9	24 *

* There is no statutory UK Biological Monitoring Guidance Value (BMGV) for nickel. The 90th percentile of urinary nickel exposure data measured in HSE research, where good control existed, is used.

10.6.3 Summary table of personal monitoring results November 2021

Operator Name/ Sample Location	Contaminants	8-Hour TWA Concentration (mg.m ⁻³)	WEL (mg.m ⁻³)
Employee 1	Chromium VI	<0.0002	0.01
Employee 2	Chromium VI	<0.0002	0.01

10.6.4 Urine results November 2021

Operator Name/ Sample Location	Contaminants	Concentration (mg.m ⁻³)	BMGV (µmol /mol creatinine)
Employee 1	Chromium	2.2	10
	Nickel	2.9	24 *
Employee 2	Chromium	<0.5	10
	Nickel	2.1	24 *

10.6.5 Summary table of personal monitoring results November 2022

Operator Name/ Sample Location	Contaminants	8-Hour TWA Concentration (mg.m ⁻³)	WEL (mg.m ⁻³)
Employee 2	Chromium VI	0.0003*	0.01
Employee 1	Chromium VI	0.0001*	0.01

10.6.6 Urine results November 2022

Operator Name/ Sample Location	Contaminants	Concentration (mg.m ⁻³)	BMG/P90 (µmol /mol creatinine)
Employee 2	Chromium	<0.72	10
	Nickel	1.39	24*
Employee 1	Chromium	<1.53	10
	Nickel	<1.35	24*

10.6.7 Summary table of personal monitoring results November 2023

Operator Name/ Sample Location	Contaminants	8-Hour TWA Concentration (mg.m ⁻³)	WEL (mg.m ⁻³)
Employee 3	Chromium VI	0.0002*	0.01
Employee 2	Chromium VI	0.0001*	0.01

10.6.8 Urine results November 2023

Operator Name/ Sample Location	Contaminants	Concentration (mg.m ⁻³)	BMG/P90 (µmol /mol creatinine)
Employee 3	Chromium	<0.5	10
	Nickel	1.0	24*
Employee 2	Chromium	<0.5	10
	Nickel	1.3	24*

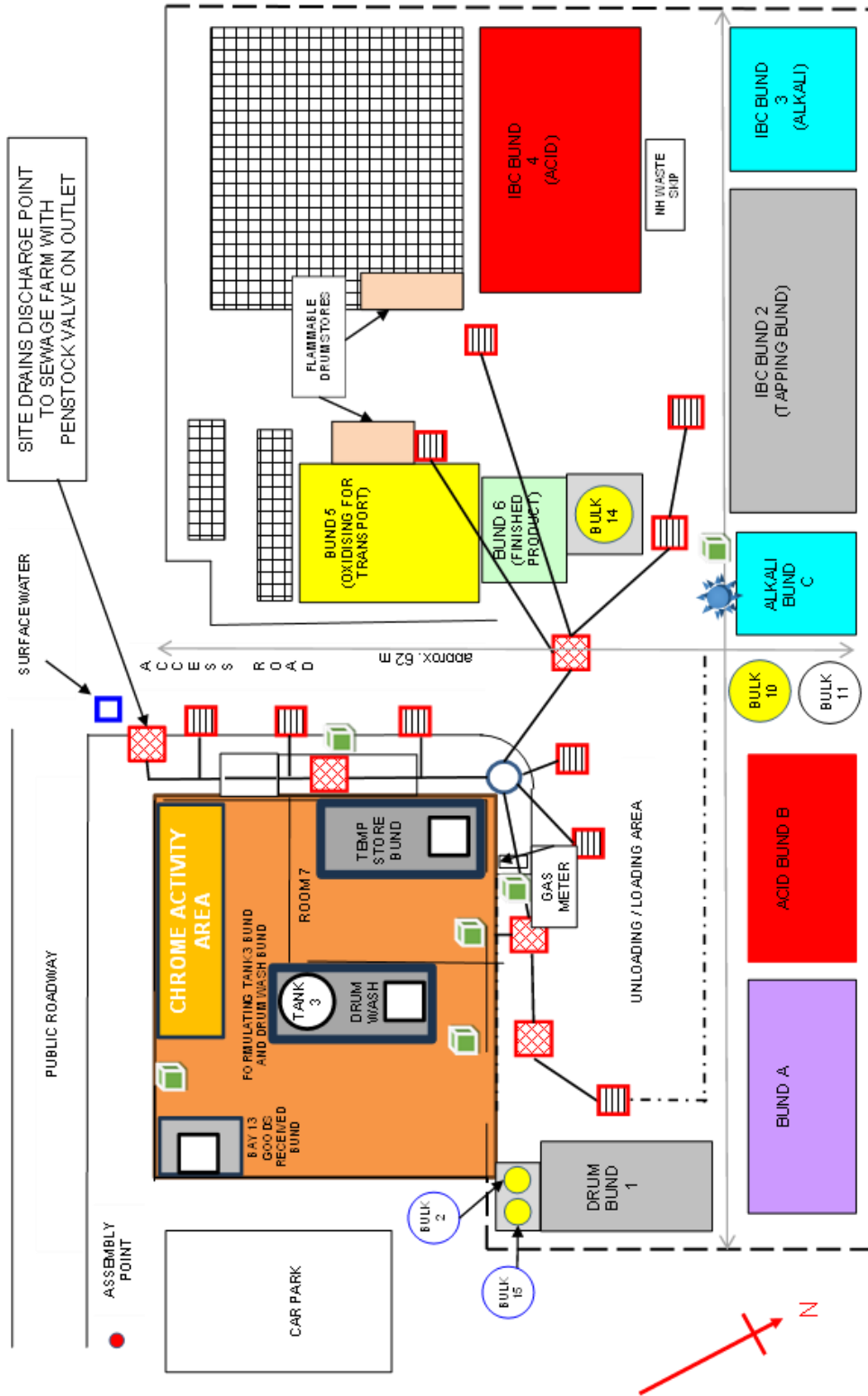
10.7 Summary of workers occupational monitoring results by WCS

Occupational Exposure Monitoring Results				Personal Workplace Monitoring Results		
WCS	Task	Duration of task-mins per 8-hour shift	Location	8-Hour TWA Concentration (mg.m-3)	WEL (mg.m-3)	
WCS1 (1 employee)	Receipt and storage of Chromium Trioxide	2 mins	Bay 13	<0.0002	0.01	
WCS2 (1 employee)	Decanting and weighing of solids	20 mins	Tank 3	<0.0003	0.01	
WCS3 (1 employee)	Transfer to vessel- aqueous solution	10 mins	Drum Washer	<0.0002	0.01	
WCS4 (1 employee)	Mixing by dilution	10 mins	Tank 7 Area	<0.0002	0.01	
WCS5 (1 employee)	Transfer to storage container	5 mins	IBC under Tank 3	0.0001	0.01	
WCS6 (1 employee)	Transfer to small containers	2 mins	Room 7	<0.0002	0.01	
WCS7 (1 employee)	Cleaning of equipment	5 mins	Tank 3 Area	<0.0002	0.01	
WCS8 (1 employee)	Maintenance of Equipment	5 mins	Tank 3 Area	Not recorded	0.01	
WCS9 (1 employee)	Storage of formulation	3 mins	Room 7	<0.0002	0.01	
WCS10(1 employee)	Quality Control (sampling & lab analysis)	10 mins	Lab	<0.0002	0.01	
WCS11(1 employee)	Waste Management	5 mins	Sealed drums located in Room 7	Not recorded	0.01	
Occupational Exposure Monitoring Results				Urine Monitoring Results		
WCS	Task	Duration of task-mins per 8-hour shift	Location	Contaminants	Concentration (mg.m-3)	BMGV (mol./mol creatinine)
WCS1 (1 employee)	Receipt and storage of Chromium Trioxide	2 mins	Bay 13	Chromium and Nickel	Chromium 2.2 / Nickel 2.9	Chromium 10 / Nickel 24
WCS2 (1 employee)	Decanting and weighing of solids	20 mins	Tank 3	Chromium and Nickel	Chromium 2.4 / Nickel 5.0	Chromium 10 / Nickel 24
WCS3 (1 employee)	Transfer to vessel- aqueous solution	10 mins	Drum Washer	Chromium and Nickel	Chromium 0.6 / Nickel 0.9	Chromium 10 / Nickel 24
WCS4 (1 employee)	Mixing by dilution	10 mins	Tank 7 Area	Chromium and Nickel	Chromium 1.53 / Nickel 1.35	Chromium 10 / Nickel 24
WCS5 (1 employee)	Transfer to storage container	5 mins	IBC under Tank 3	Chromium and Nickel	Chromium 0.72 / Nickel 1.39	Chromium 10 / Nickel 24
WCS6 (1 employee)	Transfer to small containers	2 mins	Room 7	Chromium and Nickel	Chromium 2.2 / Nickel 2.9	Chromium 10 / Nickel 24
WCS7 (1 employee)	Cleaning of equipment	5 mins	Tank 3 Area	Chromium and Nickel	Chromium 2.2 / Nickel 2.10	Chromium 10 / Nickel 24
WCS8 (1 employee)	Maintenance of Equipment	5 mins	Tank 3 Area	Chromium and Nickel	Not recorded	Chromium 10 / Nickel 24
WCS9 (1 employee)	Storage of formulation	3 mins	Room 7	Chromium and Nickel	Chromium 0.5 / Nickel 2.10	Chromium 10 / Nickel 24
WCS10(1 employee)	Quality Control (sampling & lab analysis)	10 mins	Lab	Chromium and Nickel	Chromium 0.6 / Nickel 0.9	Chromium 10 / Nickel 24
WCS11(1 employee)	Waste Management	5 mins	Sealed drums located in Room 7	Chromium and Nickel	Not recorded	Chromium 10 / Nickel 24

11 References

1. Application for Authorisation: Establishing a reference dose response relationship for the carcinogenicity of hexavalent chromium. Published by the Risk Assessment Committee of the European Chemicals Agency – RAC/27/2013/06 Rev. Final
2. MDHS 52/4 – Hexavalent chromium in chromium plating mists. Published by the Health & Safety Executive 11/2014
3. EH40/2005 – Workplace Exposure Limits (Fourth edition). Published by The Stationery Office ISBN 978 0 7176 6733 8

12 Appendix 1



13 Appendix 2

CHROMIUM TRIOXIDE 450					
MIX SIZE:	0 KG/M	MIX TYPE:			
	0 LTR	WASHINGS:			
NO REQUIRED:		CONTAINER:			
		CAP:			
		BUND NUMBER:			
<p>PRODUCTION DATE:</p> <p>BATCH NO:</p> <p>ORDER NO:</p>					
<p>READ THIS BEFORE PROCEEDING</p>					
<p>WEAR FULL FACE REPIRATOR, CHEMICAL PROTECTION SUIT (TYPE 6 LOW LEVEL SPRAY) AND PVC GAUNTLETS, WHEN ADDING CHROMIC FLAKE ANY SPLASH ON SKIN MUST BE WASHED IMMEDIATELY.</p> <p>CHROMIUM TRIOXIDE IS TOXIC, CORROSIVE AND HEALTH HAZARD (MAY CAUSE CANCER).</p> <p>THERE SHOULD BE NO WASHING PRODUCED FROM THIS MIX. WASH THE TANK OUT INTO THE IBC WITH DEDICATED AMOUNT OF WATER.</p>					
MAKING ORDER	UNITS	SUBSTANCES	HAZARDS GHS	WEIGHTS	PURCHASE NUMBER
1		WASH TANK OUT WITH WATER FIRST			
		WATER			
2		CHROMIUM TRIOXIDE ANHYDROUS			
3		← TOP UP WITH WATER TO INDICATED WEIGHT			
		TAKE A SAMPLE FOR LAB			
		TRANSFER THE MIX INTO AN IBC			
4		WASH THE TANK OUT WITH WATER INTO THE IBC			
<p>PRODUCT SPECIFICATIONS: DROP INTO A NEW UN APPROVED IBC ON A BUND</p>					
PRODUCT HAZARD	CORROSIVE TOXIC				
GHS 5 GHS 6 GHS 8 GHS 9	GHS 8 GHS 9				
P		OPERATIVE(S)			
P			TEST	RANGE	RE-TEST
E			SG	1.28 - 1.31	
			QUOTE g/L CHROMIC ACID	425 - 475 g/L	
			COLOUR	DARK RED	
					COMMENT
					PASS FAIL
					LABORATORY SIGNATURE
					PROCESS ADJUSTMENT