SOCIO-ECONOMIC ANALYSIS

Public version

Name of applicants:	$CrO_3$4UK Group: Aalberts Integrated Piping Systems Ltd Borough Ltd Quality Plated Products Ltd Samuel Heath and Sons plc
Submitted by:	$CrO_3$4UK Group
Prepared by:	$CrO_3$4UK Group Risk & Policy Analysts Ltd (RPA) Technology Sciences Group Consulting Ltd (TSG Consulting)
Date:	30th June 2022
Substance:	Chromium trioxide (EC no. 215-607-8, CAS no. 1333-82-0)
Use titles:	Use 1: Industrial use of chromium trioxide for the etch pre-treatment step for functional chromium plating with decorative character for automotive, sanitary, heating and other applications
Use number:	1

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Declaration

We, the Applicants (Borough Ltd and Quality Plated Products Ltd), are aware of the fact that further evidence might be requested by the Health and Safety Executive ('the Agency') to support the information provided in this document.

Also, we request that the information blanked out in the "public version" of the Socio-Economic Analysis is not disclosed. We hereby declare that, to the best of our knowledge as of today (30th June 2022), the information is not publicly available, and, in accordance with the due measures of protection that we have implemented, a member of the public should not be able to obtain access to this information without our consent or that of the third party whose commercial interests are at stake.

Signatures: **Date, Place:**

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Aalberts Integrated Piping Systems Ltd

30th June 2022
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30th June 2022
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List of abbreviations

ABS	Acrylonitrile butadiene styrene
AfA	Application for Authorisation
AFUS	Applied-for use scenario
AoA	Analysis of Alternatives
CAGR	Compound annual growth rate
CAS	Chemical Abstracts Service
CLP	Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (Please note that references in this report to CLP should be taken as referring to GB CLP, as retained EU law following Brexit and the end of the Implementation Period on 31 December 2020, unless otherwise specified.)
CMO	Contract manufacturing organisation
CMR	Carcinogenic, mutagenic or toxic to reproduction
COGS	Cost of goods sold
COSHH	Control of Substances Hazardous to Health Regulations 2002
Cr(O)	Metallic chromium
Cr(III)	Trivalent chromium
Cr(VI)	Hexavalent chromium
CrO_3	Chromium trioxide
$CrO_3$4UK	The group of four applicants applying for authorisation (Aalberts Integrated Piping Systems Ltd, Borough Ltd, Quality Plated Products Ltd and Samuel Heath and Sons plc)
CSR	Chemical Safety Report
CTACSub	Chromium Trioxide REACH Authorisation Consortium
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
EC	European Commission
ECHA	European Chemicals Agency
EEA	European Economic Area, i.e. the EU plus Norway, Iceland and Liechtenstein
ERC	Environmental Release Category
ERY	Excess risk per year
ES	Exposure scenario
EU	European Union
EUSES	European Union System for the Evaluation of Substances
FTE	Full-time equivalent
GB	Great Britain
GDP	Gross domestic product
HSE	Health & Safety Executive
IUPAC	International Union of Pure and Applied Chemistry
LCI	Labour cost index

MOQ	Minimum Order Quantity
NPV	Net Present Value
NUS	Non-use scenario
OC	Operational Conditions
OEM	Original Equipment Manufacturer
ONS	Office for National Statistics
PC	Polycarbonate
PEC	Predicted environmental concentration
POP	Plating on plastics
PPM	Parts per million
PROC	Process category
R&D	Research and development
RAC	Risk Assessment Committee
RAR	Risk assessment report
RCR	Risk characterisation ratio
REACH	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (Please note that references in this report to REACH should be taken as referring to UK REACH, as retained EU law following Brexit and the end of the Implementation Period on 31 December 2020, unless otherwise specified.)
RMM	Risk Management Measures
RMOA	Regulatory management options analysis
SAGA	Suitable alternative generally available
SDR	Social discount rate
SEA	Socio-economic analysis
SEAC	Committee for Socio-economic Analysis (ECHA)
SP	Substitution Plan
SU	Sector of use
SVHC	Substance of very high concern
UK	United Kingdom
VCM	Value of cancer morbidity
VSL	Value of a statistical life
WCS	Worker Contributing Scenario
WTP	Willingness to pay

1. Summary

This application for authorisation (AfA) is being made jointly by a group of four companies established in Great Britain (GB) who undertake electroplating using chromium trioxide:

- Aalberts Integrated Piping Systems Ltd (Doncaster, England)
  https://www.pegleryorkshire.co.uk/
- Borough Ltd (Leigh-on-Sea, England)
  https://www.borough.co.uk/
- Quality Plated Products Ltd (Birmingham, England)
  http://www.qppltd.co.uk/
- Samuel Heath and Sons plc (Birmingham England)
  https://www.samuel-heath.com/

The applicants have formed the $CrO_3$4UK group and are submitting a joint AfA under Article 62(2) of REACH. The applicants are successful UK companies producing for a vast national and international market. While the products the applicants manufacture and the sectors they serve differ, each company uses chromium trioxide to electroplate articles (referred to as substrates) made from metals and plastics to create a metallic chrome coating. The outer chrome coating is free of chromium trioxide and provides the coated articles with a resistant, durable and safe finish, normally with a bright or matt silver finish although occasionally other finishes such as black are produced. This is referred to as functional chrome plating with decorative character.

Two of the applicants (Borough Ltd and Quality Plated Products Ltd) also use chromium trioxide for 'etching', which refers to specific type of pre-treatment activity undertaken on plastic substrates. This is an essential step to prepare the substrate for subsequent metal plating and involves roughening the surface of the plastic by removing material from the surface of the substrate. The etching pre-treatment step is generally inter-related in a way that it cannot be separated or individually modified without impairing the overall process or performance of the final product.

The application for authorisation concerns two different but interlinked uses of chromium trioxide:

Use 1: Industrial use of chromium trioxide for the etch pre-treatment step in the electroplating process for functional chromium plating with decorative character for automotive, sanitary, heating and other applications ('etching').
Use 2: Industrial use of chromium trioxide for functional chromium plating with decorative character for automotive, sanitary, heating and other applications ('plating').

Not all applicants undertake etching and so Table 1 below shows which applicants are applying for which uses. Where etching is undertaken, it occurs on the same lines as plating and is part of the overall process of applying metallic chrome coatings to substrates. Amalgamating both etching and plating within one overall use has been considered for the purposes of this AfA. However, it has been ruled out on the basis that the challenges associated with identifying potential alternatives are significantly different between etching and plating, which poses significant implications for the socio-economic analysis (SEA) and substitution plan (SP).

Applicant	Use 1: Etching	Use 2: Plating
Aalberts Integrated Piping Systems Ltd		✓
Borough Ltd	✓	✓
Quality Plated Products Ltd	✓	✓
Samuel Heath and Sons plc		✓

***Table 1**: Applicants and uses applied for*

This Socio-Economic Analysis (SEA) forms part of the AfA for use 1, i.e. the continued use of chromium trioxide for the etching of plastic substrates. The use is required to enable the subsequent electroplating of plastic substrates to achieve functional surfaces with high durability and decorative character (bright or satin appearance) for different applications.

Two separate reports have been prepared to illustrate the SEA for Use 1 and Use 2. This report concerns the use of chromium trioxide for the etch pre-treatment step (Use 1) by two of the $CrO_3$4UK applicants (QPP and Borough). For this Use 1, **the applicants request a review period of 12 years**.

It is important for the applicants to continue using chromium trioxide to manufacture products with the high quality functional and decorative characteristics currently demanded by the market. As described in the Analysis of Alternatives (AoA), at present, the applicants have not yet identified a technically and economically feasible alternative with the same function and similar level of performance to the use of chromium trioxide in the etching step. As a consequence, in the Non-Use Scenario (NUS), the applicants will no longer be able to perform the etching pre-treatment step of components for the subsequent plating step and plate products using chromium trioxide with serious consequences on their businesses and with impacts on UK industry and society.

Following internal discussions, the applicants have assessed the following eight non-use scenarios:

NUS 1: Downgrade of the quality of the final products
NUS 2: Relocation of production outside of the UK
NUS 3: Outsourcing of etching step to either UK or non-UK countries
NUS 4: Subcontracting of etching step outside of the UK to European companies holding a REACH authorisation or to other European companies who do not hold REACH authorisation
NUS 5: Building stocks
NUS 6: Partial closure (only the chrome related operations)
NUS 7: Prolonged downtime until substitution
NUS 8: Shut down of the site and closure of the business, since the companies' revenues rely on chrome that is the core business, and layoff of all staff employed

Based on analysis of all these potential non-use scenarios, the NUS 8, i.e. the complete shutdown of plant and business closure, is considered by QPP and Borough as the only possible scenario in case of a non-granted authorisation to Use 1. This NUS would result in severe socio-economic impacts for the $CrO_3$4UK applicants, their suppliers and customers. The impacts are assessed in this socio-economic analysis over the requested review period of 12 years.

The following costs of the non-use scenario 8 (business closure) are expected for QPP and Borough:

- decommissioning costs less the sale value (for QPP and Borough estimated to be in the range £1M - £3M over the review period).
- foregone profits (estimated to be in the range £7M - £12M over the review period.
- loss of all jobs (social costs monetised at £10M - £30M over the review period).

Other UK actors along the supply chain, mainly suppliers of raw materials (such as CrO_3, plastics, etc.) and services as well as certain customers would face socio-economic impacts:

- economic losses (not monetised).
- jobs at risk (not quantified).

Some socio-economic impacts are quantified/monetised while other are only described qualitatively, as quantitative information is lacking, or the level of uncertainty is too high. Nevertheless the impact at UK suppliers will clearly result in substantial foregone profits and impacts to UK industry including automotive, sanitaryware and other sectors and should not be overlooked.

On the other hand, the risks of continued use of chromium trioxide are the following:

- health impacts on directly exposed workers at the applicants' sites (monetised in the range £169,293 - £192,935 over the period); and
- health impacts on the local population including indirectly exposed workers (monetised at £29,637 - £41,977 over the period).

Appling a highly conservative approach that overestimates health impacts and underestimates economic impacts, the benefits of continued use outweigh the risks of continued use of the substance by a considerable degree (approximately 100 times) and this situation is not likely to change during the 12-year review period requested for Use 1.

2. Introduction

2.1 About this socio-economic analysis

Chromium trioxide is listed in Annex XIV of UK REACH and therefore its use requires authorisation. The applicants currently benefit from transitional measures under Article 127GA of UK REACH. However, should an AfA not be made by the end of the transitional period then their use will become unlawful. The latest application date is 30 June 2022.

This SEA has been undertaken as part of work to demonstrate the case for granting the applicants an authorisation to allow for continued use of chromium trioxide in the etching step during the requested review period of 12 years. The aim of the SEA is to assess and monetise human health and socio-economic impacts of the continues use and under non-use scenarios.

2.2 Scope of the analysis

Etching of different plastic substrates using chromium trioxide is carried out by the applicants to achieve functional surfaces with decorative character.

Plastic components require etching as a pre-treatment step before the plating step. The etching step is necessary to prepare plastic substrates for the subsequent electroplating process. Without this treatment, electroplating with different metal layers would not be possible as the coating would not adequately adhere to the substrate.

Importantly, etching with a chromium trioxide-based solution only affects the ABS substrate. Considering current advanced manufacturing processes, this is especially important and necessary for the plating of plastic parts made of two or three different types of material (referred to as 2K or 3K parts), for example, parts made from both ABS and PC. For a two- or three-component part, only the ABS is etched and, as a result, plated. Selective etching and plating is essential to achieving the design of these parts; if etching was to affect the non-ABS parts as well, factors such as surface structure, physical fit, electrical properties, and aesthetic appearance of these parts would be ruined. Selective etching and plating allows platers to effectively and efficiently limit use of chromium to those areas in which functionality conferred by chromium plate is needed.

The scope of this assessment is the evaluation of health impacts from exposure to chromium trioxide in the production of different applications at the applicants' sites as well as the socio-economic impacts resulting from the non-use scenario. A detailed description of technical requirements and process can be found in the CSR of this application.

2.3 Geographical scope

The $CrO_3$4UK applicants are located in the UK. Therefore, the UK is the geographical scope for the assessment of socio-economic impacts of not using chromium trioxide as well as the health impacts of the continued use. These impacts are described in the following sections.

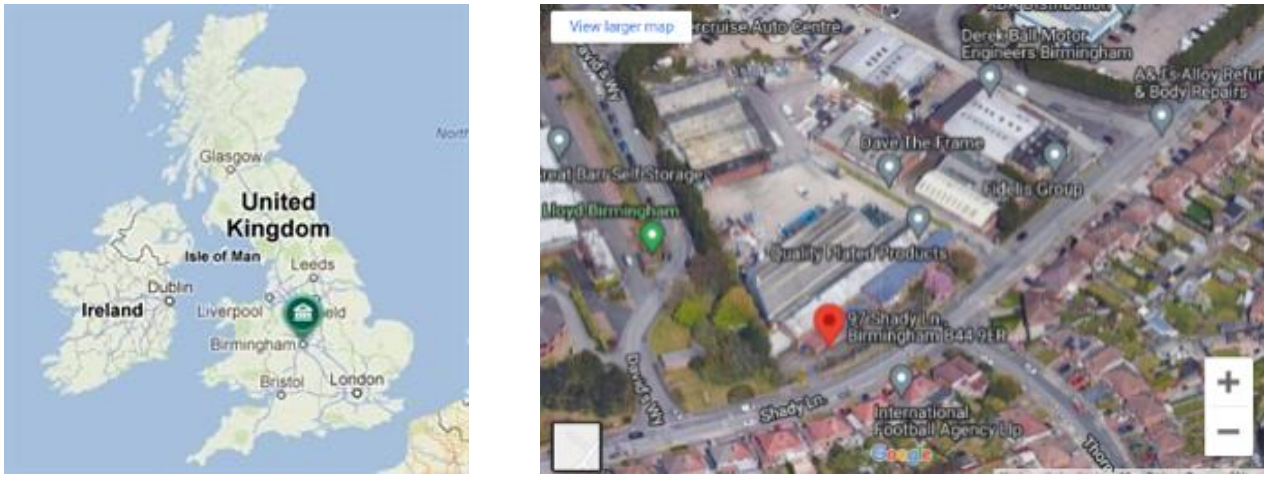

***Figure 1**: QPP's location in Birmingham, West Midlands, UK*

***Figure 2**: Borough's plant and location in Leigh on Sea, Essex, UK*

2.4 Temporal scope

A review period of 12 years is requested for etching (Use 1) as currently no technical and economical feasible alternative is available for the applicants with the same function and similar level of performance as chromium trioxide. Consequently, further R&D, plant adaptation and customers' acceptance will be necessary. Therefore, the temporal scope of socio-economic assessment of this SEA runs from mid-2022 (date of submission of this application) to mid-2034.

Please refer to section 17 for more details of the length of the requested review period.

2.5 Annual quantities for etching

For Use 1, the tonnages of chromium trioxide used annually are estimated based on the average of the tonnages used in 2019-2021 taking into account that, on one hand, the forecasted growth in sales per year over the duration of the review period may increase the tonnage of chromium trioxide used, while on the other hand, the use will start to decrease when substitution to potential alternative etching processes are implemented.

The total annual quantity of chromium trioxide used by the two applicants for etching for automotive, sanitary and other applications is in the range of 9 to 22 tonnes per year (where the lower tonnage [redacted] is that of the year 2020, due to the effects of COVID). This tonnage value for etching is considered conservative and represents an upper bound based on the most optimistic market growth.

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
QPP	[redacted]																
Bor-ough	[redacted]																
Total	[redacted]																
Range	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22	9-22

***Table 2**: Total maximum annual quantities (in tonnes) of CrO_3 for Use 1 by the two applicants over the requested review period*

2.6 The product portfolio of the applicants

Overall, the applicants have a large portfolio of products for sectors as various as the automotive, sanitaryware, heating, domestic appliance, brewery/drink, medical, display electronics and other applications. Following the etching pre-treatment plastic components are plated using chromium or other metals like nickel or brass. The plated components are offered with a variety of finishes, including satin and matt black chrome.

The following table provides an overview of the main plated products of the applicants.

Sector	Products
Sanitary	Shower heads, unit covers, flush handles, buttons, surrounds, washing machine fronts, thermostatic shower valves, thermostatic shower sets, shower flow controls, shower flow diverters, toilet roll holders, toilet brushes, towel rails, towel rings, mirrors, wastes, soap dispensers, soap dishes, baskets, robe hooks,
Automotive	**exterior** parts: number plate surrounds, bumper trims, door handles, light surrounds, brand labels, trim stripes, rims, front skirts, door openers, lamp rings, emblems, chrome bar, etc **interior** parts: Interior door trim, dashboard trim, seat trim plus other decorative parts within the car cabin. **Interior and exterior** trim, badgework, bumper inserts, handles, gear levers, gearstick, decorative frames, switches, knobs, lamp surrounds and grilles to speaker covers, head speakers, interior trims, etc.
Domestic appliances	Cooker knobs, handles, bar fittings, sink waste, TRV valves, cooker knobs, trim
Electrical / Electronics	Coffee machine parts, door lights, electronic shielding boxes, machine trim, buttons, kitchen knobs, measuring tape cases
Point of sale Brewery	Brewery fixtures and fittings, beverage dispensers
Leisure	Pool table feet and corners, caravan door handles gaming machine trim.
Display	Signage, displays (e.g. point of sale)
Medical	Interior parts of life ventilator systems
Drinks	Bar font, drink trays

***Table 3**: Overview of the main products of the applicants*

2.6.1 QPP's products

On average, QPP processes and despatches more than 45,000 plastic parts a day to a multitude of customers in the automotive, sanitaryware, domestic appliance, brewery, display and electronics industries, mainly in the UK. Of QPP's products, close to 100% depends on the use of chromium trioxide for their functional and decorative character. QPP offers durable products with a variety of finishes, including bright chrome and nickel, "noble" chrome, medium and dark satin chrome and nickel, Aztec and antique gold, together with finishes for EMI/RFI shielding. The main products of QPP are summarised in the following table.

Sector	Type of products	Pieces / year	Associated turnover and profit	Main customers (UK and non-UK)	Country
Automotive	Car and van **exterior** parts: Number plate surrounds, bumper trims, door handles, light surrounds and various other trims and parts Car and van **interior** parts: Interior door trim, dashboard trim, seat trim plus other decorative parts within the car cabin. Interior and exterior trim, badgework, bumper inserts, handles, gear shift levers	4.6M	[redacted]	[redacted]	EU [redacted] UK UK UK UK UK UK UK

Sector	Type of products	Pieces / year	Associated turnover and profit	Main customers (UK and non-UK)	Country
				[redacted]	EU [redacted] EU [redacted] UK EU [redacted]
Sanitary ware	Shower heads, unit covers, flush handles, buttons, surrounds, washing machine fronts, shower buttons, trims, sink wastes, bath waste, tap handles, pipe fittings	3M	[redacted]	[redacted]	UK UK UK UK UK UK UK UK UK UK
Domestic appliances	Cooker knobs, sink waste, thermostatic radiator valves (TRV), , handles, trims and fittings	2M	[redacted]	[redacted]	UK EU [redacted] UK UK UK
Display	Components of passive infrared (PIR) alarm sensors, EFI) and RFI shielding for computers and electronics, parts for handheld measuring devices and door switches	0.01M	[redacted]		
Point of sale brewery	Brewery fixtures and fittings, beverage dispensers	0.05M	[redacted]		
Leisure	Pool table feet and corners, caravan door handles, gaming machine trim	0.2M	[redacted]	[redacted]	UK UK UK
Electrical / Electronics	Coffee machine parts, door lights, electronic shielding boxes, machine trim, buttons		[redacted]	[redacted]	

***Table 4**: Product portfolio of QPP*

Below are some examples of the main products of QPP in each sector.

***Figure 3**: QPP's automotive products*

***Figure 4**: QPP's sanitary & heating products*

***Figure 5**: QPP's domestic appliances and other consumer products*

Type of plastic articles	Number of plastic articles of QPP
ABS or blend PC/ABS	1,000
Native PC and ABS or PC/ABS as part of a single article	2,000-3,000 multi-component plastic articles

***Table 5**: Number of plastic articles of QPP (etching and plating)*

2.6.2 Borough's products

The portfolio of Borough's plastic products includes components for the sanitary, automotive, medical, white goods and drink industries. All Borough's products require the etching step and the electroplating with chromium trioxide.

The end products for the sanitary sector are shower, bathroom and kitchen accessories as well as door and window furniture. The sanitary product range includes thermostatic valves, thermostatic sets, taps, taps filters, flow control, diverter, odour closers, toilet rolls, toilet brush, towel racks, plumbing, shower, etc. Such products are offered as a set, hence they require the same appearance as the appliances for water. It is crucial that the aesthetics is the same for all chromium electroplated plastic articles and constant over time. The turnover deriving from the products etched by Borough using chromium trioxide represent approximately [redacted] of the overall annual turnover.

Borough also has turnover associated with products that are etched using chrome but that are not plated with chrome instead copper or nickel is used for the final plating step. The turnover of these non-chrome plated products is valued at approximately [redacted].

The pre-treatment step and the plating with chromium trioxide provide to the plastic components high functionalities such as high durability (for instance when these parts are exposed to aggressive and demanding conditions indoor or outdoor) as well as aesthetic characters such as decorative finishes.

	Type of products plastic components	Main customers	Country	Impacts in case of the most likely NUS
Automotive	Exterior automotive parts: brand labels, trim stripes, rims, front skirts, door openers, lamp rings, emblems, chrome bar, etc. Interior automotive parts: gear levers, gearstick, decorative frames, switches, knobs, lamp surrounds and grilles to speaker covers, head speakers, interior trims, etc.	[redacted]	EU [redacted] Asia [redacted] EU [redacted] UK UK Asia [redacted]	Loss of business
Sanitary ware	Valves, heating systems, filters, plumbing, shower products and assemblies, spa fitting, bathroom fitting, sink fittings, etc.	[redacted]	UK UK UK	Quality demands need CrVI Loss of business
Medical	Interior parts of life ventilator systems	[redacted]	EU [redacted]	Medical product certified with chrome part
Drinks	Bar font, drink trays, whiskeys bottle trims, etc.	[redacted]	International UK UK	
Domestic appliance	Kitchen knobs, measuring tape cases	[redacted]	UK UK	

***Table 6**: Product portfolio of Borough*

Below are some examples of the main products of Borough in each sector.

***Figure 6**: Borough's products in the automotive sector*

***Figure 7**: Ventilator for COVID-19 treatment with Borough plated parts*

***Figure 8**: Borough's products for drinks dispensing*

***Figure 9**: Borough display/signage*

***Figure 10**: Borough's products in the sanitary and consumer goods sector (shower heads, sanitary ware components, cooker controls, cistern flush, electric shower box covers)*

2.7 Market and market segments of the applicants

Although there are some specificities, the applicants operate in markets with high competition from other companies inside and outside the UK (in Europe or rest of the world) that produce and sell similar products. If an authorisation is not granted to this application, and the applicants can no longer use chromium trioxide

for etching, their current customers of chrome-plated parts would seek out competitor suppliers who can (still) use chromium trioxide for the pre-treatment step (etching) for then electroplating the components.

2.7.1 QPP's market

In the UK, QPP holds an important market position in the automotive and sanitary sectors. QPP operates in a competitive market in which there is just one UK competitor (Borough Ltd, a co-applicant in this application for authorisation for both Use 1 and Use 2), and many competitors outside the UK that offer similar products pre-treated with chromium trioxide.

While QPP sells to high end/luxury brands, EU suppliers of chrome components prioritise the large volume markets of e.g. [redacted]. The automotive market has seen a fall off over the COVID pandemic period and with a shortfall of raw materials (semi-conductors etc.) and has struggled to grow back to its previous levels.

Prior to the pandemic, in Europe there was a shortage of plating on plastics with growth at very high levels. QPP had planned major investment in plant to grow the business to meet this demand. In 2022, the level of growth is increasing as the market continues to recover. This is expected to increase the turnover and profitability of QPP and therefore increase QPP levels of employment.

As more automotive companies develop their electric vehicles, the demand for plastic as a replacement for metal components will grow with the need for lighter and more efficient cars. To be at the leading edge of this process to provide light weight, high quality components that will fulfil the requirements of its customers, QPP is strengthening its relationship with the major OEMs and Tier I companies.

The following chart shows the different markets in which QPP operates and their relative shares.

***Figure 11**: QPP markets and relative shares*

The automotive sector represents [redacted] of QPP's business. Of the overall production [redacted] is supplied to the UK while [redacted] is exported to the EU.

2.7.2 Borough's market

For different products in the different sectors in which it is operating, Borough is positioned in high end quality markets with high volumes of products and high end in the automotive sector for brands such as [redacted]. For several products, competition is fierce from both EU and the Far East suppliers. Cost is everything to customers at this time.

In terms of markets, the automotive products are sold to UK customers for the worldwide market, products for the sanitary sectors are sold to UK and to the rest of the world and the components of ventilators in the medical sector are sold worldwide. Products for the drink sector are sold to UK and to the rest of the world but Borough does not know exactly where these parts end up.

3. Impact on the environment

The environmental impacts are not included in the impact assessment of the continued use, since in Annex XIV of the REACH Regulation chromium trioxide is not classified for risk to the environment but for human impacts as Carcinogen cat 1A and Mutagen cat 1B (in accordance with Article 57 a and b).

4. Human health impacts of continued use

Chromium trioxide is covered by entry 16 of Annex XIV and only authorised uses are permitted after the sunset date given in the entry, taking into account the UK REACH transitional arrangements, unless an exemption applies. As chromium trioxide is a non-threshold carcinogen, adequate control of risks cannot be demonstrated and therefore applications for authorisation must follow the socio-economic route.

The human health impacts that arise from the remaining risk associated with the exposure of humans to chromium trioxide in the applied for use scenario have been assessed. The excess lifetime risk (ELR) for directly exposed workers and for the general population via the environment for developing lung cancer or small intestine cancer is derived based on the exposure assessment and on the existing reference dose-response function established for carcinogenicity of hexavalent chromium that was published by ECHA's Risk Assessment Committee (RAC)[1].

The main health impact resulting from the intrinsic hazardous properties of chromium trioxide is lung cancer due to inhalation of dust and/or aerosols hence the risk assessment for workers is limited to inhalation of airborne residues of chromium trioxide and the oral route is not taken into account. Therefore, in summary, the main endpoints related to the exposure to chromium trioxide are:

- lung cancer effects by inhalation exposure for directly exposed workers.
- small intestine cancer by oral exposure for local population (including indirectly exposed workers) in 100m around the plants.
- lung cancer by inhalation for local population (including indirectly exposed workers) via the environment in a 100m radius from the industrial plants.

[1] ECHA, 2013 (a).

The monetisation of human health impacts is carried out based on the values of willingness-to-pay (WTP) indicated in the ECHA study for the reduction of cancer risk[2] for fatal and non-fatal cancer cases. To evaluate the fatal cases, a lower and upper Value of Statistical Life (VSL) of £4,146,039 and £5,922,913 respectively is used. To assess the non-fatal cases, a Value of Cancer Morbidity (VCM) of £485,678 is used. These three values are derived by adjusting the values recommended by ECHA (€3.5M - €5M for VSL and €0.41M for VCM base year 2012) to the year 2022 and then by converting them to UK pounds.

4.1 Health impacts on regional population for Use 1 (etching)

Risks to the regional population by inhalation and oral route are considered negligible, hence they have been omitted in the SEA assessment as Cr(VI) will transform in the environment to Cr(III).

4.2 Directly exposed workers

In total, [redacted] workers ([redacted] at QPP's and Borough's sites respectively) face additional risks of lung cancer from direct exposure to airborne residues of chromium trioxide at different tasks[3]. Since this excess lung cancer risk estimate applies to each exposed worker for a total working life of 40 years, to reflect exposures to chromium trioxide over the length of the requested review period, exposures are adjusted over 12 years for Use 1 (etching). Combining these figures with exposure estimates, under the applied for use scenario the annual value of an avoided cancer case would be £169,293 lower bound and £192,935 upper bound for the directly exposed workers over the requested review period of 12-years for Use 1.

4.3 Humans via environment for Use 1

CrO_3 is used in the etching step in processes with a high degree of closure from an environmental point of view. However, to be conservative, risks to the general population are calculated in terms of lung cancer by inhalation and small intestinal cancer by ingestion of drinking water and consumption of fish. Exposure by inhalation is meaningful only at a very local level, in a 100m radius from the point source.

4.3.1 Local population including indirectly exposed workers for Use 1

The production facilities of QPP in Birmingham and Borough in Leigh on Sea are both located in mixed industrial and residential areas.

	Number of current workers	Directly exposed	Indirectly exposed
QPP	[redacted]	[redacted]	[redacted]
Borough	[redacted]	[redacted]	[redacted]
TOTAL	[redacted]	[redacted]	[redacted]
TOTAL (range)	**190-230**	**10-30**	**190-230**

***Table 7**: Directly and indirectly exposed workers*

[2] ECHA, 2016 (a).

[3] [redacted] workers in total are involved in etching and plating at the applicants' sites. While it is not possible to allocate workers to either etching or plating, for the purpose of this application for authorisation, [redacted] workers are allocated to plating and [redacted] to etching.

Using the standard value of the European Union System for the Evaluation of Substances (EUSES) model, for Use 1, 20,000 residents and indirectly exposed workers in nearby companies (10,000 for each site) are assumed to be potentially exposed to chromium trioxide by inhalation and oral route at the local level within a 100m radius. As explained in the CSR, the etching line is in a separate building with barriers in place (either locked doors or cordoned off areas), exposure to indirect workers will not occur. Therefore, the number of workers indirectly exposed at the applicants' sites as well as in other nearby companies (not estimated) has been included in that of the local population.

Considering excess lung cancer risk for a lifetime exposure of 70 years, under the applied for use scenario, there would be 4.10E-2 additional statistical lung cancer cases in the assumed local population. Applying the above-mentioned value of an avoided lung cancer case, the monetised excess risk of lung cancer for the local population amounts to about £2,000 - £2,830 per year, i.e. £23,995 - £33,986 over the review period.

Considering the exposure of humans via the environment, under the applied for use scenario, there would be 9,64E-03 additional statistical intestinal cancer cases (fatal and non-fatal) for the population in the areas of Birmingham and Leigh on Sea.

The lifetime excess intestinal cancer risk is assessed for a lifetime exposure of 70 years. Taking into account the value of an avoided cancer case, the monetised excess risk (fatal and non-fatal) to the local population amounts to about £470 - £666 per year, i.e. £5,642 - £7,991 over the review period (lower and upper bound respectively).

Overall, the estimated monetised excess risk for the local population (via oral intake and inhalation route for fatal and non-fatal cases) amounts to £2,470 - £3,498 per year, i.e. from £29,637 - £41,970 over the 12 years review period.

4.3.2 Health impacts on regional population for Use 1

Risks to the regional population by inhalation and oral route are considered negligible, hence they have been omitted in the SEA assessment as Cr(VI) will be reduced in the environment to Cr(III).

4.4 Total health impacts (directly exposed workers and local population)

Considering altogether directly exposed workers plus local population (including indirectly exposed workers), it can be concluded that the total monetised human health risk value (fatal and non-fatal) from the continued use £16,570 - £19,576 (NPV adjusted in 2022 price level), i.e. £198,913 - £234,912 over the review period (lower and upper bounds respectively).

4.5 Human health impacts on end users

No chromium trioxide residues are present on the chrome plated article and therefore no risk hazard arises from the final product, which guarantees a safe use for final consumers.

	Excess lifetime cancer risk	Number of exposed people	Estimated statistical cancer cases (lifetime)	Monetised excess risk lower bound VSL £4,146,039 VCM £485,678	Monetised excess risk higher bound VSL £5,922,913 VCM £485,678
Directly exposed by inhalation FATAL	7,82E-03	17	1,33E-01	£13,785	£15,755
Directly exposed by inhalation NON-FATAL	7,82E-03	17	1,33E-01	£323	£323
Local inhalation FATAL	2,05E-06	20 000	4,10E-02	£1,943	£2,775
Local inhalation NON-FATAL	2,05E-06	20 000	4,10E-02	£57	£57
Local population oral FATAL	4,82E-07	20 000	9,64E-03	£457	£653
Local population oral NON-FATAL	4,82E-07	20 000	9,64E-03	£13	£13
TOTAL per year	-	-	-	£16,570	£19,576
Total over the period	-	-	-	£198,913	£234,912

***Table 8**: Summary of additional statistical lung and small intestine cancer cases for Use 1*

5. Non-use scenarios

Eight different non-use scenarios (NUS) have been assessed by the applicants for Use 1:

NUS 1: Downgrade of the quality of the final product
NUS 2: Relocation of production outside of the UK
NUS 3: Outsourcing of etching step to either UK or non-UK countries
NUS 4: Subcontracting of etching step production outside of the UK to European companies holding a REACH authorisation or to extra European companies
NUS 5: Building stocks
NUS 6: Partial closure (only the chrome related operations)
NUS 7: Prolonged downtime until substitution
NUS 8: Shut down of the site and closure of the business and layoff of all staff employed

NUS 8 was considered to be the most likely non-use scenario by both applicants, whereas NUS 1-7, were discarded for reasons described below.

NUS 1 - Downgrade of the quality of products (functionality and aesthetics)

The combination of an adequate etching pre-treatment with the subsequent electroplating step guarantees the required key functionalities and aesthetic character of the final product. In terms of functionality, the protective top layer should ensure wear resistance, high corrosion protection, humidity stability, abrasion resistance, thermal resistance, durability (long lasting products and warranties), good adhesion strength, chemical/cleaning agent resistance (easy cleaning), that it's safe to use, hygienic and non-allergenic. In order to be easily cleaned and avoid corrosion all sanitary and automotive parts must ensure chemical resistance to all cleaning products.

The current stages of development of alternatives to chromium trioxide in etching do not allow the applicants to substitute, not even to alternatives with a lower quality. As a consequence, in the absence of the pre-treatment step with chromium trioxide that guarantees the durability of the components, the applicants will not be able to offer sufficiently long warranties on different products and sectors (from 2-3 years in non-automotive sectors to up to 5-10 years for automotive parts). This is not in line with their commitment to deliver the highest quality components. As a consequence of the NUS 1, and applying an inferior alternative resulting in shorter lifespan of the product, the majority of the applicants' customers (at least in the sanitary and automotive sectors) will not be able to guarantee sufficiently long warranties on their products (of minimum 5-years for the automotive sector). In the absence of the etching step, customers (namely in the automotive sector) would not accept the subsequent downgrade of the functionality of final products (series parts or spare parts) that would not comply to their technical requirements and specifications. Therefore, if chromium trioxide was withdrawn from the etching step, in case of failure to offer products with the same durability, warranties and appearance, customers would rather turn to competitors, who are allowed to pre-treat (etch) their products using chromium trioxide, most probably outside of the UK.

In terms of aesthetics, having parts with high quality and durable decorative finishes is essential for the applicants and their customers. For a large variety of applications, the applicants' customers need to mix and match serial production and spare parts, e.g. having identical satins finishes (medium satin chrome and dark satin) or bright finishes (bright dark black and bright blue mirror finish) that are standard in the industry. The smallest change would lead to non-repeatability of colour, poor colour stability or poor appearance of finishes. Additionally, as chrome coated products from different companies are often installed together (for example in bathrooms, automotive interior), the colour harmonization and colour match of these products is crucially important.

As a consequence, and same as for functionality, a degradation of aesthetic will end up in loss of current and future customers who would reject the applicants' products and rather turn to competitors, most probably outside of the UK. For all these reasons, the non-use scenario 1, a downgrade of functional and aesthetic character was considered clearly unfeasible at this time by both the applicants for Use 1.

NUS 2 - Relocation outside of the UK

A relocation of production outside of the UK, is a very complex operation since the $CrO_3$4UK applicants do not have manufacturing facilities outside of the UK. First and foremost, the applicants don't consider it morally acceptable moving potential health risks from the UK (where etching with chromium trioxide take place under regulatory scrutiny) to countries outside of the UK that may not have similar health and safety standards/regulations in place.

Moreover, this non-use scenario will not be feasible on economic, financial and logistical grounds since it would require:

- time (at least 3 years to carry out all required steps before starting the production) to identify a suitable country and location, buy the land, build new facility, acquire new machinery and equipment and hire and train skilled personnel
- huge investment

- financially critical issues to secure the investment in a new facility
- complex logistics for the shipment and additional transportation
- bureaucratic efforts, costs and regulatory constraints to gather all necessary permits, export controls, import licenses technical qualifications and quality approvals
- high risks due to uncertainties
- high environmental impacts in terms of CO2 emissions

The costs and the time needed to relocate outside of the UK cannot be precisely quantified since they very much depend on the selected location and on the regulations of the country.

NUS 3 - Outsourcing the etching step

The non-use scenario of outsourcing the etching step was discarded due to the following considerations:

- it is extremely difficult and time consuming to identify potential contract manufacturing organisation (CMO) companies both inside and outside the UK able to carry out pre-treatment etching step and chrome plating of plastic parts in a reliable way and in the same quantities and quality
- a CMO located in UK that use chromium for the pre-etching step would require authorisation for the same use as sought by the applicants
- shifting the risks related to use of Cr(VI) and the associated human health impacts from the UK where they are very low to countries outside of the UK where risks might be less well managed is not in line with the applicants' ethical values
- it is logistically impractical
- it is financially unfeasible
- environmental impacts for transportation of products back to the UK if CMO located outside of UK

NUS 4 - Subcontracting the etching step outside of the UK to European companies holding a REACH authorisation or to companies in other countries

Subcontracting the etching step is not a viable alternative for the applicants as the components would have to be validated by the end customer on the new site. This creates the risk that the applicants would be cut out of the supply chain as customers might chose to go directly to the subcontractor outside of the UK. In this case, the applicants will not be able to remain on the market. Moreover, it would require time and high costs for the identification of a potential subcontractor, for the adaption and setup of a new additional transportation and logistics and the associated environmental impacts in terms of CO_2 emissions, manufacturing equipment of the production line and export permits and import licenses, as well as for approvals.

NUS 5 - Building stocks

This non-use scenario was ruled out as unfeasible as there would not be enough available space in the current structures to stockpile parts etched (and later plated) with chromium trioxide as the steps are performed in a continuation. Building stocks for the finished plated products for more than maximum of 2 to 3 months is not feasible as the applicants would need to build warehouses to cover any lead times before the acceptance by the market of parts plated using a suitable alternative. For building such warehouses, time (at least 18 months) and huge investment are required. Moreover, building stocks of components pose a high risk as design changes may occur in series production.

NUS 6: Partial closure (only the chrome related operations)

For the use of chromium trioxide for etching the non-use scenario of partial closure was discarded as unrealistic and not feasible given that the profitability of the applicants largely (more than [redacted]) relies on the sales of products that are pre-treated with chromium trioxide. Therefore, a partial closure would basically correspond to a total and immediate closure of the business (see NUS 8). Moreover, even if a temporary closure until substitution was possible, in the highly competitive sectors of Use 1 of this

application (especially the sanitary and automotive sectors), it is unlikely that customers would return to the applicants after a temporary closure. Therefore, QPP and Borough will be forced to completely close.

NUS 7 - Prolonged downtime until substitution

This scenario was ruled out by the applicants as in the highly competitive markets in which the applicants operate (especially the sanitary and automotive sectors), customers will switch providers and purchase from competitors, most likely outside of the UK. When the production could start again, after substitution, it is unlikely that customers, who have gone through the costly and lengthy process of changing supplier, would change again and come back to the applicants. Moreover, there are no guarantees that the existing plants would be fully operational after a prolonged downtime.

NUS 8 - Shutdown of the site and business closure

NUS 8 is the most likely NUS for QPP and Borough. If an authorisation was not granted for the etching use, the two applicants would have to cease their businesses as more than [redacted] of their profits depend on products pre-treated and plated with chromium trioxide. In fact, as Cr(III) as a substitute to chromium trioxide is not yet qualified and accepted by customers, and the two applicants would not gain sufficient profit to continue their businesses. Therefore, in case of a non-granted authorisation for Use 1, the applicants' sites will shut down and their businesses will close.

The main reasons for the closure of the businesses of QPP and Borough can be summarised as follows:

- the production and profits, that depend on the use of using chromium trioxide for the pre-treatment etching step, are essential for the applicants
- parts concerned by Use 1 are crucial for the applicants' main customers
- a downgrade of the functionality of the products is not acceptable by the applicants considering the specific requirements of their customers related to the parts affected by Use 1 hence NUS 1 has been discarded
- the other non-use scenarios assessed (relocation, outsourcing, subcontracting, partial closure and stockpiling) have been discarded for the reasons quoted above

Non-use scenario 8 will entail the following socio-economic impacts for the applicants:

- loss of EBITDA
- market share taken by competitors who have already received favourable opinions
- decommission costs
- low or no sale value of the assets
- additional transport costs in case of outsourcing
- layoff of workers

Additionally, economic loss would prevent continuing the R&D currently focused on Cr(VI) substitution.

In the meantime, the non-use of chromium trioxide by the applicants would entail negative socio-economic impacts along the UK supply chain for suppliers and downstream users in various sectors and industries. The implications would be:

- the need to seek other suppliers outside of the UK with potentially lower quality
- a loss of business (potential plant closures)
- the risk of job losses and the associated social costs

Due to the high level of associated uncertainties, these impacts along the supply chain are only qualitatively described and not included in the socio-economic assessment (more details are provided in the following sections).

5.1 Most likely non-use scenarios for the applicants

5.1.1 Most likely non-use scenario for QPP

QPP would have no option but to implement an immediate site closure (NUS 8). This action would lead to shortages at all customers creating line stoppages in a number of manufacturing sectors. First affected would be the major UK automotive OEM's due to lack of parts. Currently QPP supplies plated components which are specified (either internal or external parts) across their entire vehicle ranges. QPP carries a one week contingency stock of plated product which would be quickly exhausted due to the high volume nature of the automotive sector. Transfer of this product outside of UK/Europe would be extremely complex and time consuming for the OEM's to undertake. Non-build of vehicles would have a knock on effect to every other supplier to the OEM's as their parts would not be required until the new sourcing of chrome was in place which could take months.

QPP's other customers, such as shower manufacturers would lose a key supplier who would be very difficult to replace in short time. The shower manufacturers would struggle to resource their components as showers tend to be produced by large numbers of mould tools producing many variants of parts. If all chrome plating activities leave the UK not only will they struggle to find alternative plater/moulders they will struggle to compete in a chrome plating market where there is suddenly limited capacity where the plating companies still operating, will give priority to high volume jobs where premium prices can be charged.

5.1.2 Most likely non-use scenario for Borough

The chrome plating activities are crucial for Borough's products lines. Borough's business in supplying plated parts (which need etching and final plating) supports other manufacturing processes on site. Borough has an injection mould shop which supplies the mouldings that are processed (etched and plated). Without the plated plastic moulding business there would be no need for a mould shop set up. Borough's location is too far from automotive assembly plants to be competitive in the supply of 'mould only' parts. Borough's USP is the supply of plated mouldings, so without the ability to plate Borough would have no business for neither plating or mouldings operations. In case an authorisation is not granted Borough would have to implement immediate site closure (NUS 8) and lay off its staff.

Borough's customers would be put in a position that would threaten their supply chain due to Borough's inability to supply parts in the NUS. Without the capability to supply, customers would need to resource in Europe or further afield (China) parts to meet their criteria, and possible uneconomical and implementation of retrograde designs. This would give added problems to customers, as Borough is currently able to deal with quick changes in the market and respond to with new designs in weeks. For the customers, dealing with suppliers further afield in the world, would mean longer leads times, stock builds, longer response times to market conditions. The non-use scenario would mean OEMs buying complete assemblies from e.g. Far East, cutting out Boroughs immediate customers and in so give potential risk to their businesses.

6. Impacts on the applicants' suppliers

The applicants purchase raw materials such as chemicals, plastics, metals, packaging, engineered jigs, machinery spares, consumables, heating, energy, as well as logistics, maintenance, external security and other services from several suppliers. Most of these materials and services that are needed to manufacture the applicants' products are purchased within the UK from a multitude of (local) companies.

The most significant socio-economic impacts from a non-granted authorisation for the use of chromium trioxide for etching will be suffered by those small and medium size UK companies that currently supply large amounts of raw materials or services exclusively or mainly to the applicants. For these suppliers, at a minimum, some downsizing or, in the worst cases, closure can be expected. As a consequence, there will be significant impacts on many of the clients' suppliers leading to additional profit and job losses in their supply chain. Some other UK suppliers, even if they do not rely just on the applicants' purchases, might potentially face reduced sales, profit losses and negative social impacts in terms of job losses. For companies for which the applicants' businesses represent a minimal part of their revenues would only be temporally impacted until they find other customers.

All applicants buy chromium trioxide from the same UK supplier of chemicals [redacted]. It is expected that this supplier will be significantly affected by a non-granted authorisation to the applicants. If this supplier of chemicals were to reduce their UK operation, there will be consequences for UK hard chrome platers and functional platers who have a licence to trade but will lose their main source of chemistry in the UK leading to higher import costs, loss of sales, loss of jobs and potential product shortages to UK manufacturers in different industries.

As shown in the following two tables, the vast majority of the applicants' suppliers are UK companies. The tables also describe the main impacts on the suppliers of QPP and Borough.

	Type of material and service	Supplier	Country	Impacts on suppliers associated with the NUS for ETCHING USE
Raw materials	CrO_3 and other chemicals	[redacted]	UK UK	Loss of business in some UK Plating on plastic industries
	Plastic	[redacted]	EU[redacted]	Loss of business in some UK Plating on plastic industries
	Energy	[redacted]	UK UK	Loss of business in some UK Plating on plastic industries
	Metals	[redacted]	UK EU[redacted]	Lower demand in some UK Plating on plastic industries
	Water	[redacted]	UK	
Services	Logistics	[redacted]	UK	Loss of parts delivery and supply business in some UK Plating on plastic industries
	Packaging	[redacted]	UK UK UK UK	Loss of business in some UK Plating on plastic industries
	Labour	[redacted]	UK UK	

***Table 9**: Main impacts on the suppliers of QPP in the case of NUS 8*

	Type of material and service	Suppliers	Country	Impacts in the event of the most likely non-use scenario
Raw materials	CrO_3 and other chemicals	[redacted]	UK UK UK UK	The NUS would kill the demand for etching in UK, resulting in loss to UK suppliers Reduction in trade, loss of [redacted] direct business and possible jobs
	Plastic polymer	[redacted]	UK EU[redacted] UK	Loss of [redacted] t/y of polymer to UK suppliers Reduction in sales
	Engineered jigs	[redacted]	UK UK	Reduction in sales of UK suppliers of jigs and loss of profits
	Metals	[redacted]	EU[redacted] UK	Reduction in sales of UK suppliers of metals and loss of profits
Services	Logistics	[redacted]	UK	Transport company would cut driver jobs at company that distributes products to customers (loss of jobs x 2)
	Packaging	[redacted]	UK	Loss of sales
	Electricity provider	[redacted]	UK	Loss of electricity demand [redacted] per month
	Cleaners	[redacted]	UK	Loss of work
	Electrician	[redacted]	UK	x 2 contractors employed on maintaining facilities
	Landlords	[redacted]	UK	Loss of tenant
	Tooling engineers	[redacted]	UK	Loss of tooling maintenance

***Table 10**: Main impacts on the suppliers of Borough in the case of NUS 8*

Due to the high level of uncertainty, impacts on UK suppliers of raw material and services within the UK are described but not quantified. Therefore, these (not monetised) impacts are not included in the applicant's assessment of the socio-economic impacts of the NUS.

7. Economic impacts of a non-granted authorisation

The socio-economic assessment includes the impacts on the applicants in terms of turnover and EBITDA losses, decommissioning costs, as well as social costs of unemployment.

7.1 Loss of turnover and EBITDA in case of NUS 8

Foregone profits in terms of loss of turnover and EBITDA are relevant in case of NUS 8. The reference turnover taken into account in this assessment is the annual turnover based on 2019 and 2021 data. The data of 2020 were not used for the assessment considering that the applicants' sales fell due to the COVID

19 pandemic. The turnover associated to the products related to the use of chromium trioxide is provided in the following table. For Use 1, in line with the non-use scenario, in the socio-economic assessment, profit losses are calculated and presented over the requested 12-years review period.

Turn-over £million	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
QPP	[redacted]															
Borough	[redacted]															
TOTAL	[redacted]															
TOTAL (range)	8-20	8-20	4-20	8-20	8-20	8-20	8-20	8-20	8-20	8-25	8-25	8-25	8-25	8-25	8-25	8-25

***Table 11**: Turnover associated with products related to the use of chromium trioxide for etching*

EBITDA (Earnings before Interest, Taxes, Depreciation, and Amortisation) is used as a financial indicator for foregone profit in case of closure of the businesses. The foregone EBITDA for the two applicants is provided in the following table.

EBITDA (£ k)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
QPP	[redacted]															
Borough	[redacted]															
TOTAL	[redacted]															
TOTAL (range)	100-900	100-900	100-900	200-900	500-900	500-900	400-900	700-1000	700-1000	800-1200	800-1200	800-1200	800-1200	800-1200	800-1200	800-1200

***Table 12**: Foregone EBITDA of the etching use (Use 1) for the applicants*

The total EBITDA losses of the two applicants over the requested review period of 12 years amount to approximately [redacted] (public range £7-12 million) with annual values of approximately [redacted] (public range of £0.1 million - £1.2 million).

7.2 Decommissioning costs and sale value of the plant in case of NUS 8

If the authorisation is not granted to the applicants, there would be high decommissioning costs associated to end the production of chrome plated components. These costs include the cost to dismantle the production facility, decommissioning specific equipment for the manufacturing of chrome plated components, cost of building refurbishment, chemical clearance and land clean-up.

It is expected that, in a sale, the plants and its inventory would only generate a low or no sale value, as the plants were designed for specific needs of the applicants (uses, buildings and volume of parts to be produced). However, some machines (e.g. injection moulding machines) can be resold and will have a certain market value. The expected resale value will be subtracted from decommissioning costs associated to the closure of the plant. In all cases, it would cost more to dismantle the existing plants that what would be generated from the sale of equipment.

The annualised value of decommissioning costs is equal to approximately [redacted] (public range £1M - £3M) over the 12 years review period. This corresponds to an annual value of approximately [redacted] (public range £0.1M - £0.2M per year over the assessed period of 12 years.

The following table summarises the decommissioning costs and sale value associated to the closure of the applicants' plants.

Applicants	Total decommissioning costs	Expected resale value	Total net costs
QPP	[redacted]	[redacted]	[redacted]
Borough	[redacted]	[redacted]	[redacted]
TOTAL	[redacted]	[redacted]	[redacted]

***Table 13**: Summary of decommissioning costs over the review period*

7.3 Economic impacts for QPP

In case of continued use of chromium trioxide for etching, QPP expects a growth of its business through the next three years from large contracts on the [redacted] models that started production in [redacted].

During the last three years (2019-2021), the average annual turnover of QPP has been approximately [redacted]. In case an authorisation was not granted, the loss in yearly turnover forecasted for the years 2022-2024 is expected to be [redacted]. Therefore, the non-granted authorisation would entail the immediate shutdown of the business.

7.4 Economic impacts for Borough

Borough uses chromium trioxide for etching in approximately [redacted] of business turnover, while the remaining [redacted] is dependent upon Borough's plating business. In case an authorisation was not granted to the applicants for the use of chromium trioxide in etching, the annual loss of turnover for Borough is expected to be [redacted]. Borough's business related to Use 1 represents about [redacted] of the products sold to EU, while [redacted] to UK.

8. Social impacts for the workers of the applicants (Use 1)

The closure of businesses of at least two applicants (QPP and Borough), whose profit highly depends on the use of chromium trioxide in etching, will entail the dismissal of all [redacted] employees, who are currently working in moulding, production, inspection and administration at the applicants' sites.

Following the ECHA methodology[4], the social costs of unemployment are monetised taking into consideration the value of lost output/wages during the period of unemployment, the cost of acquiring a new job, recruitment costs, the scarring costs and the positive value of leisure time during the period of unemployment.

[4] ECHA, 2016 (b), and Dubourg, 2016.

The guidance provided by ECHA notes that tax rate of the country, average salary and default value for job lost should be taken into account when calculating the social impacts. Because of the 'scarring' effect, the default value for one job lost needs to be included in the calculations. The social impacts would be felt locally in the nearby areas of the facilities. The total costs of social impacts are calculated with the formula provided by ECHA:

Social impact = jobs lost x average annual salary x (1 – employer tax rate) x default value for one job loss

	Number of current workers	Number of workers who would be dismissed
QPP	[redacted]	[redacted]
Borough	[redacted]	[redacted]
TOTAL	[redacted] 210-230	[redacted] 210-230

***Table 14**: Current number of workers and number of workers who would lose their jobs*

The monetised social impacts related to the loss of employment of its workers would amount to [redacted] (public range £10 million - £30 million) over the review period, i.e. approximately [redacted] (public range £1 million - £3 million per year).

8.1 Social impacts for the workers of QPP

QPP is a small employer in Birmingham but has many employees who have worked in the company for more than 10 years, some their whole working life. Currently [redacted] people work at the QPP's site in Birmingham. This number reflects the current situation, however, based on expected future growth QPP will require more workers in the coming years.

8.2 Social impacts for the workers of Borough

Since the core business of the company relies on etching, if an authorisation is not granted, due to the closure of the business, all [redacted] (range 80-100) employees, who are currently working in moulding, production, inspection and administration, will lose their jobs.

9. Impacts on distributors

Borough's chromed and non-chromed products are distributed to the end user in the UK and in other countries via either UK distributors who sell to local merchants or directly to the customers while QPP distributes its products directly to its customers.

In the non-use scenario, due to shutdown of production sites, the products' distribution will be stopped and Borough's UK distributors will have to find an alternative supplier. The applicant's UK distributors will no longer be able to fulfil their orders, potentially damaging the relationship with their customers. To avoid a loss of business, UK distributors will look elsewhere to find a supplier that can supply similar products to be distributed. However, it can be expected that, in the short run, given the time needed as well as the

difficulties to rapidly find alternative supplies of chrome-plated goods with similar prices, availability or quality, UK distributors might suffer temporarily supply shortages with the associated loss of business and revenues.

Due to the high level of uncertainty, impacts on Borough's distributors have not been monetised nor included in the assessment of the socio-economic impacts of the NUS.

10. Impacts on customers

The applicants supply chrome plated plastics and metal components in the UK to a range of customers in the automotive, sanitaryware, medical, domestic appliance, brewery, drinks, display and electronics sectors.

In general, if an authorisation is not granted, UK customers that integrate the applicants' components into their products, would be more or less affected with supply gaps before identifying replacement products by other suppliers outside of the UK, thus entailing profit and job losses. Due to the high level of uncertainty, such impacts on customers are not monetised.

The following sub-sections describe the impacts of the non-use scenario on the applicants' customers in various sectors. Finally, the last paragraph summarises in a table the impacts of the non-use scenario for each sector.

10.1 Automotive sector

Automotive plastic parts must deliver technical functionalities e.g. easy cleaning, durability, light weight, etc. Using weight-saving automotive components manufactured from plastic instead of metal entails several environmental and sustainability benefits such as a reduction of fuel consumption and the vehicles' carbon footprint. With the move to electric vehicles the weight reduction from metal to plastic will be a driver for further increase in demand for all vehicles, including premium vehicles.

Pre-treating plastic components with chromium trioxide allows for the consecutive plating of the plastic parts with a metallic surface providing the durability required by automotive manufacturers. In the automotive sector, warranty periods are generally around 10 years. In fact, products have to go through product testing that represents 10 years of use.

The electroplating process (that follows the etching step) provides high-quality performance and aesthetic characteristics that are expected by the vehicle buyers. Different finishes (i.e. shiny, semi-shiny, hard-wearing bright, matt or matt silvery black or gold appearance) embellish interior and exterior design elements of modern cars.

If the desired standards in terms of functionalities and aesthetics cannot be achieved, UK automotive Tier 1 suppliers and OEMs that rely on parts supplied by the applicants, will face short to medium-term supply bottlenecks. OEM approvals require a close collaboration between the applicants and their customers, including activities such as audits, trials with different parts and evaluation of the results. Validation by OEMs qualifies chrome coatings for their implementation into specific OEM vehicle programs.

Given the very complex and highly integrated automotive sector, many UK actors along the whole automotive supply chain (Tier 1 suppliers, sub-contractors, OEMs, etc) will have to coordinate to ensure that they use plating systems that achieve the same or similar colour to ensure harmonisation across the

whole product range. Some of these UK actors might face serious impacts potentially with plant closures and possible major losses of jobs if the plating step is moved out of the UK. As the level of impacts is very uncertain, such impacts have not been quantified.

If authorisation is not granted for the etching uses to the two applicants (QPP and Borough) that work for the automotive sector, the applicants will be unable to satisfy the customers' high functional and aesthetic requirements. This will mean closure of businesses according to NUS 8. Aside the applicants, there are no other significant players in the UK using etching of plastics in the automotive sector. Therefore, in case an authorisation was not granted, the applicants etching services will be moved away by affected OEMs and by their sub tier suppliers to qualified plastic platers (outside of the UK) that can still ensure the current production requirements and specification. These suppliers could be either European companies that have already been granted a REACH authorisation or other competitors most likely in Far East countries that may not be as regulated. This defeats the object of Brexit, i.e. making the UK more self-sufficient and encouraging growth in the UK manufacturing sector, as well as the UK Government's levelling up agenda.

Before COVID, there was a shortage of capacity for POP in the marketplace leading to growth and a healthy prospect for companies to invest. When the market post COVID returns to normality with supply of components not being as restricted as it is today (e.g. semi-conductors, raw materials such as certain types of plastics), it is likely to be a shortage of suppliers leading to price increases, product shortages and loss of output from the OEMs' in the UK.

The UK Automotive Trade Report (2021)[5] for the Society of Motor Manufacturers and Traders (SMMT) indicates that the UK automotive volumes are forecasted to increase by 37% to 2025. In case an authorisation was granted, this expected growth will likely increase the applicants' sales of automotive parts.

The following sub-sections provide a specific description of the automotive customers and, for each applicant, the impacts of the non-use scenario on these customers are described.

10.1.1 Automotive sector for QPP

For more than five decades, QPP has chrome-plated plastic components for many of the world's leading automotive marques. The main automotive customers of QPP are [redacted]. For instance, QPP's parts are on every vehicle of [redacted]. The total sales of QPP to the UK automotive segment is [redacted]. Automotive sales in [redacted] is expected grow with the launch of new vehicles that will push volumes up by [redacted].

As multiple QPP's parts are on every vehicle of [redacted], in the short term, these companies will face major difficulties to avoid production line stoppages and keep production going. Production interruptions would lead to millions of pounds of lost revenue and possible temporary closing or capacity reduction of plants throughout the UK for a short period of time (estimated minimally 1-3 months). This is due to extended times for moving to other suppliers of chromium plated parts around the world, requiring testing and approval on parts, some of which are safety critical such as, for instance, alarm reflectors, TRV control valves, door handles for cars. Without the turnover from the automotive sector, QPP will be unable to reduce its fixed cost base to a low enough level to remain in business for any extended length of time. Moreover, not being able to meet supply contracts, would mean potential lawsuits against QPP from OEMs, with associated costs and likely drive closure of the business. QPP will be liable for production downtime at the OEM's. Costs vary from [redacted] which would close the company financially in a short space of time.

[5] SMMT, 2021.

10.1.2 Automotive sector for Borough

Borough is a Tier II supplier of chrome-plated plastic components for Tier I and OEM customers for many of the world's leading automotive brands. To ensure that pre-treated components designed for plating achieve the highest quality possible, Borough has developed its own injection-moulding capability with a range of different equipment in its facility. Selective plating is now possible thanks to investments in two-shot moulding machines, which ensure only the component that need chroming receive the plating, thus reducing the volumes of chromium needed. The un-plated plastic remains free to flex as required.

Borough supplies [redacted] with moulded and chrome plated plastic parts for the manufacture of [redacted] in [redacted] [redacted] is the biggest customer of Borough and its loss would lead to financial distress that would have a fatal impact on Borough's business. Failure to supply [redacted] would cause [redacted] production line stoppage and potentially to halt half of [redacted] vehicle production (with economic losses and jobs lost). [redacted] will have to find and qualify alternative supply of chrome plated parts from competitors outside of the UK, most likely from a European supplier holding a REACH authorisation or from countries that are less regulated. As a consequence, there would be losses of jobs in the UK, as jobs will be transferred to the EU [redacted].

Securing supplies from outside of the UK would add to [redacted] logistics, transport and permits costs and would increase the carbon footprint of the final products. It has to be noted that the contract with [redacted] foresees that Borough would have to maintain a supply to [redacted], even if unable to do so. Therefore, to fulfil the contract, Borough will have to arrange for another supplier and will have to bear the cost associated to the change.

When an alternative will be qualified for the etching step, OEMs will have to start the approval process of the different (interior and exterior) coated components. The quality approvals by customers take months (up to 1 year) during which Borough will be highly impacted in economic terms.

The total sale of Borough to the UK automotive segment is [redacted] and the UK automotive volumes are expected to increase by [redacted] to 2025.

10.2 Sanitaryware products (QPP)

The hard chrome of sanitary products provides functional benefits in terms of health and safety and aesthetic character related to the different colours of the finishes. QPP has around [redacted] of the UK sanitaryware market of plated parts (bathroom, shower components, sanitary ware, water conservation). The sanitary segment represents [redacted] of total QPP sales to the UK.

The main QPP customers in the sanitary sector are two shower manufacturers, [redacted]. QPP is a key supplier of these two main customers offering them specialised work that cannot be easily replaced by other suppliers. If they would lose QPP as supplier, with very few companies being able to offer the same services, in the short to medium term, [redacted] will face major shortages and will soon run out of parts. As a consequence, they will be unable to supply their own main customer base, house builders and do it yourself (DIY) outlets. All work for both industries would leave the UK and, as a result, the end users will buy alternative products from outside of the UK putting additional manufacturing jobs as risk in the UK as well as their associated supply base.

Aside the two major customers, in the sanitary market, QPP provides shower and sanitaryware products as well as moulding. plating, painting and assembly work to a number of other UK customers. In case of a non-granted authorisation, many of these smaller UK customers of are likely to close due to their inability to resource from outside of the UK and their size and volume of work that might be insufficient to be of interest for other platers on plastics.

10.3 Sanitaryware (Borough)

Currently, Borough's customers in the sanitaryware sector supply the whole UK with products that comply with hygienic standards by the use of Cr(VI) plating in environments that are wet atmosphere and vigorous cleaning with cleaning agents. Borough is able to respond to customers' functional requirements and design, promptly.

Without Borough's current capability, to meet their criteria, customers would need to resource parts in Europe or further afield (China). This would add problems to Borough's customers in terms of lead time, stock building and time needed to respond to market changes. In fact, most likely, other suppliers will not be able to deal with rapid changes on the market and respond to these in time as Borough currently does. Therefore, in conclusion, in case an authorisation was not granted, Borough's customers would be put in a position that would threaten their supply chain.

10.4 White goods (QPP)

QPP supplies several Tier I companies that then supply the major cooker and domestic appliance manufacturers in the UK. The chrome plated components are included in various types of cooker knobs, buttons and rings as well as parts that fit onto washing machines, coffee machines and other household products.

Many domestic appliances' customers are small niche suppliers of cooker handles, bar fittings, sink assemblies and other products. It is likely that many of these small companies will be unable to source products from outside of the UK as they would either not have the expertise to know how to import and export their products or would not have a sufficient demand to interest the large POP manufacturers from outside of the UK. In some cases, the cost of transport would make the product uneconomical and would lead to many of them closing.

10.5 Domestic appliances (Borough)

Customers in the market of domestic appliances rely on Borough's processing of parts for cooker controls, radiators, where aesthetic designs. These parts are created in plastic mouldings and consequently plated for hygienic reasons. The non-use scenario would mean OEMs buying from Far East, cutting out Borough's immediate customers and potentially putting their businesses at risk.

10.6 Brewery (QPP)

QPP supplies parts that are fitted to beer fonts and taps to many major beer manufacturers. Non-use of chrome will have a less of an immediate impact upon customers as they will simply make do for longer with the taps and pumps already in place. However, at some point replacements will be required and sourcing from a non UK/European supplier will be problematic due to the reduced supplier options, not to mention components will be significantly more expensive in a sector where many pubs are already closing weekly due to demand/competition from supermarkets etc. Many of the pumps and taps contain systems to produce condensation and the "cold effect" without chrome this will not work on a moulded or painted part so there will be significant cost for replacement pump units as well as chrome.

10.7 Display (QPP)

Chromed parts are supplied to display/signage companies that provide services for many UK and international brands. These include badges for car show rooms both internally and externally, cosmetics displays for retail outlets, major international awards trophies such as for MTV awards, and other branded point of sale displays and dispensers. Electroplated chrome gives durability, scratch resistance and the "cold touch" effect of metal at a cost (which could not be achieved by a metal part either due excessive cost or weight constraints). For outside applications, in particular chrome plated parts provide a resistance to the elements, acid rain, temperature fluctuation and discolouration that cannot be matched by plastics/paint/vacuum metallised components. Customers would be facing the challenge of unplanned replacement costs, restricted supply lines and increased component costs supplied at longer timescales – all of which would have an impact on their competitiveness and long-term future of their business.

10.8 Electronics industries (QPP)

QPP supplies to house security companies high volumes of components that are used within Passive InfraRed sensor (PIR) alarm sensors. Moreover, QPP supplies to commercial and retail markets chrome-plated EFI and RFI shielding for computer and electronic devices as well as parts for installation into handheld measuring devices and l door switches. In all these components, the plating with chromium trioxide is used to provide functional characteristics which would become unavailable in the short term. Assuming a supplier could be found outside of Europe/UK this would be at increased cost, longer supply times and uncertain quality on a functional item where there is no ready alternative, other than a chrome plated part for their product to function

10.9 Medical sector (Borough)

In April 2020, during due to COVID 19 pandemic, Borough was contacted by [redacted] company to urgently produce components for lifesaving ventilators vital for patients affected by COVID. Therefore, during the first COVID lockdown, to participate to the common effort to save lives, Borough partially reopened its plant and started this production. Functionally, pre-treatment and electroplating with chromium trioxide of mouldings components assembled inside ventilators is crucial to ensure hygiene and high resistance to guarantee the air flow required to help patients breathing.

The production has continued since then and the ventilators are now also used to treat Chronic obstructive pulmonary disease (COPD). The medical customer manufacturing these lifesaving ventilators would likely be the most affected downstream user of Borough as these ventilators are designed and certified with Borough's chrome plated parts and supplied with warranties for 10 years that required extensive testing.

If Borough stopped to supply these components, this ventilator manufacturer would have to find another supplier and to change regulatory required certifications that were granted with Borough's chrome-plated components. Therefore, to stop Borough's production would jeopardise and compromise the approvals and supply of these lifesaving medical products. At least temporary, this would raise serious health concerns for patients in the UK and worldwide. The medical device customer has communicated and underlined 'the criticality of this component for the assembly of life saving ventilators.

10.10 Drinks sector (Borough)

Borough chrome-plates parts that are supplied to the drinks industry for the dispensing equipment for soft drink producers and alcoholic drinks such as beers, ciders and whiskies for premium drink brands.

The pre-treatment step (etching) ensures that the components can be efficiently electroplated that allow to gather the required functional and aesthetic characteristics. Drinks dispensers need to be easily cleaned to ensure the highest possible hygiene. Therefore, dispenser systems are internally plated with chromium trioxide and, in case of substitution with a lower quality alternative, cleaning products, even sweat, can deteriorate the surface and reduce hygiene over time. Moreover, internal plating with chromium trioxide preserves the drinks from degradation and guarantees over time the taste and olfactory experience of the drink.

In addition, pre-treatment (etching) and following on plating with chromium trioxide on the external side (for instance of whiskey bottle trims) enhance the aesthetics of dispensing systems and contributes to attract buyers, as well as facilitates cleaning and hygiene. The closure of Borough's business will entail impacts on customers purchasing chrome-plated dispenser equipment of soft and alcoholic drinks.

10.11 Summary of the impacts on the various sectors

The following table summarises the most likely non-use scenarios and the potential socio-economic impacts for different sectors for Use 1.

	Most likely non-use scenario for customers	Potential socio-economic impacts
Automotive	Supply issue solutions sought outside UK/EU	• Non-availability of parts for planned production. • Redesign issues, inability for long term testing on alternatives. • Warranty claims • Increased cost. • Short and medium-term supply bottlenecks due to the time needed to approve parts for production. • Loss of work within their organisations due to assembly or production of parts being moved closer to the main source of chrome plating. • Production plant closure • Some closings • Ultimately (extended) job losses on their sites
Sanitary ware	Part sources sought outside UK/EU	Increased cost
Domestic appliances	Part sources sought outside UK/EU	Increased cost
Display	Part sources sought outside UK/EU	Increased cost
Brewery /drinks	Part sources sought outside UK/EU	Increased cost and likely loss of business.
Electronic equipment	Part sources sought outside UK/EU	Increased cost and likely loss of business.
Medical	Part sources sought outside UK/EU	Increased cost and likely loss of business.

***Table 15**: Most likely non-use scenario for customers - Use 1 (etching)*

11. Impacts on final consumers

Final consumers of the different products pre-treated and plated with chromium trioxide could be impacted in terms of higher prices, inferior quality, reduced availability deriving from closure of the applicants UK businesses.

The increase of costs due to supplying from outside of the UK will trickle down along the supply chain to the final consumers in terms of higher prices. However, this consumer's surplus loss (i.e. the benefits for the consumers in terms of prices but also availability and quality) has not been included in the SEA assessment as there is a potential risk of double counting the negative impacts of the non-use scenario. This risk might come from the fact that, for instance, the increase of the final prices has already been included in the losses for the producers in terms of foregone EBITDA (for NUS 8) that are finally suffered by the end users who will probably find a supplier offering lower quality or more expensive products.

In addition, the final consumers may be affected in several other ways, e.g. in terms of lower or more difficult availability, by lower durability, lower quality or non-uniform finishes of the final products. These losses of consumer's surplus have not been included in the SEA assessment of the non-use scenarios.

12. Impacts on competitors

The applicants have competitors in the UK, as well as in the EU and in the rest of the world. If an authorisation is not granted, due to closure of the businesses of Borough and QPP, the customers of these two companies will have to turn to competitors either in the EU (in case they hold a REACH authorisation for the same use) or in other countries with often lower regulatory requirements If competitors outside UK gain the applicants' market shares, there will be net societal losses for the UK in terms of foregone profit/EBITDA in favour of non-UK companies and social costs associated to the loss of employment as UK workers would lose jobs in favour of other workers who would be employed elsewhere.

The following table shows the main competitors of each applicant. It can be noticed that almost all of them are non-UK companies.

	Competitors	Country
QPP	[redacted] [redacted] [redacted]	UK EU Far East
Borough	[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]	UK EU [redacted] EU [redacted] EU [redacted] EU [redacted] EU [redacted] EU [redacted] Far East

***Table 16**: Main competitors of the applicants*

13. Wider economic impacts

Major macro-economic impacts on the UK are not expected, hence such impacts have not been assessed.

14. Societal impacts

For Use 1, the UK societal costs of non-use resulting from the applicants' assessment are summarised in the table below.

Description of major impacts	Monetised/quantitatively assessed/qualitatively assessed impacts
Monetised impacts	**£ over 12 years**
Economic impacts due to investment and/or additional production costs related to the adoption of an alternative	Not applicable
Producer surplus loss due to ceasing the use applied for	£7M - £12M
Decommission costs	£1M - £3M
Loss of residual value of capital	Not applicable
Other costs (e.g. additional costs for transportation or quality testing)	Not applicable
Social cost of unemployment	For the applicants, £10M - £30M Additional social impacts along the supply chain
Spill-over impact on surplus of alternative producers	Not applicable
Other monetised impacts (please specify)	Not applicable
Sum of monetised impacts	£18M - £45M
Additional quantitatively assessed impacts	**Over 12 years**
Avoided CO2 emissions	Not quantified
Other quantitatively assessed impacts	Not applicable
Additional qualitatively assessed impacts	**Over 12 years**
Consumer surplus loss (e.g. because of inferior quality, higher price, reduced quantity)	Not applicable
Other qualitatively assessed impacts	Potential socio-economic impacts on the UK suppliers of chromium trioxide, raw materials, energy, logistic and other services: Potential socio-economic impacts downstream on UK OEMs customers and final consumers Environmental impacts

***Table 17**: Societal costs of non-use of chromium trioxide in Use 1*

Societal costs of non-use £ over 12 years		Risks of continued use £ over 12 years	
Monetised impacts	For the applicants: EBITDA loss: £7-12 million) over the period Decommissioning costs: £1M - £3M over the period Social cost of unemployment £10M - £30M over the period	**Monetised excess risks to directly exposed workers**	£169,293 - £192,935
Additional quantitatively assessed impacts	Number of workers at the applicants' sites	**Monetised excess risks (inhalation + oral) to the general population (including indirectly exposed workers)**	£29,637 - £41,977
Additional qualitatively assessed impacts	Foregone profits along the upstream and downstream supply chain of the applicants	**Additional qualitatively assessed risks (per year)**	Not available
Summary of societal costs of non-use	EBITDA loss, decommission costs and social costs: £18M - £45M	**Summary of risks of continued use**	£198,913 - £234,912 lower and higher bounds over the 12-year review period

***Table 18**: Combined societal costs of non-use and risks of continued use for Use 1*

15. Benefit-Cost ratio

The aggregated societal benefits of the continued use of chromium trioxide for etching including profit loss, decommissioning costs and social costs are expected to be £18M - £45M over the 12 years review period, while aggregated monetised health impacts of the use applied for are £198,930 - £234,912 over the requested review period. Therefore, over the 12 years, the benefits outweigh the risks by a factor of approximately 100 (which is itself a very conservative estimation taking into account the lower values for the negative impacts and the higher bound for the human health impacts).

16. Uncertainty analysis for Use 1

The ECHA guidance on SEA[6] proposes an approach to conduct an uncertainty analysis. This approach provides three levels of assessment of uncertainties: qualitative, deterministic and probabilistic. The ECHA guidance further indicates that the level of detail and dedicated resources to the assessment of uncertainties should be proportionate to the scope of the SEA.

As the socio-economic impacts for Use 1 outweigh the (worst-case) health impacts of the continued use by a factor of approximately 100, performing a systematic (but qualitative) analysis of uncertainties is sufficient. This analysis of the key parameters that might potentially challenge the quantitative results of the SEA and of the human health assessment helps to determine the key uncertainties, their level of

[6] ECHA, 2011.

magnitude (low, medium, high) as well as their direction (under- or over-estimation). In those cases, in which the variability and quality of the available input data, given the associated uncertainties, required to make some assumptions, the applicants have applied a conservative approach by overestimating human health impacts of the continued use scenario and by underestimating the socio-economic impacts of the non-use scenario.

	Details	Level of uncertainty (L/M/H)	Direction of the uncertainties (Underestimation and overestimation)
Human health impacts	Exposure levels	Medium	Potential overestimation since holidays, bank holidays and illnesses are not taken into account
	Number of people exposed at local level	Medium	Potential overestimation for the local population as PEC local (distance only 100 m from the point source) for total local exposure calculation
Socio-economic impacts	Quantities used	Low	The quantities of chromium trioxide indicated in the assessment are based on the best information available on the expected trends 0 of their markets. No major impact on the estimation of the review period
	Market/EBITDA growth	Medium	Underestimation as higher production volume and associated profits might occur if unforeseen contracts will be placed in the future
	Costs of raw materials	high	Conservative estimation of costs is based on previous experience however the war in Ukraine is affecting business as Russia is a key supplier of energy (Oil), palladium and nickel metal
Substitution plan timelines	Phase 1 – identification of potential alternatives	High	No promising alternative has emerged yet, applicants rely on technology providers to identify a promising candidate Conservative estimation of time needed for this phase Potential underestimation of the requested review period
	Phase 2- Process development Phase 3 - Acceptance/ approvals Phase 5 - Transition to alternative	Medium	Once identified, most promising alternative may fail to meet key performance standards on further investigation, i.e. lab tests or pilot plant tests Alternative may not meet customer acceptance requirements following field testing Mostly because of the automotive sector, due to the assumption that OEMs will accept move to alternative during existing contracts rather than just for new contracts Timelines have been based on the best-estimated scenario hence there might be a potential underestimation of the requested review period
	Phase 4 - Scale-up to production	Low	No major impact on the estimation of the review period

***Table 19**: Uncertainties regarding human health impacts and socio-economic impacts*

17. Information for the length of the review period for Use 1

Based on ECHA's guidance for setting a review period[7], the length of the requested review period for the use of chromium trioxide on the pre-treatment step was determined taking into consideration the conclusions reported in the CSR, AoA and Substitution Plan.

For Use 1, a review period of 12 years, until 30 June 2034, is necessary for the two applicants in order to potentially fully substitute chromium trioxide for etching.

As described in the CSR, AoA, SEA and in the Substitution Plan, the following points are to be taken into consideration:

- The two applicants are important UK companies, selling their products in the UK and exporting outside the UK. It is the UK Government's ambition to promote and achieve a competitive advantage on the global stage in UK-made, high-end products and to secure the country's position as one of the highest-productivity major automotive producers in Europe[8].

- The etching step is crucial for the applicants subsequent plating activities to manufacture products of high quality. This pre-treatment step requires the continued use of chromium trioxide. As the applicants operate in a competitive market, any downgrade of the product quality will hamper the current market shares, instigate losses with subsequent likely closure of the applicants' businesses. Non-UK competitors, who are still able to use chromium trioxide, will be able to enter and gain markets.

- The applicants have constantly and actively been working and investing to find suitable alternatives for etching to give customers the highest quality products (see Analysis of Alternatives).

- The applicants will have to perform many complex, resource- and time-consuming tasks in order to successfully substitute the etching step to transition to a Cr(VI)-free process for the electroplating of plastic substrates (see Substitution Plan).

- Any potential alternative to chromium trioxide in etching is required to pass testing and requalification/certification processes in order to comply with high customer specifications, namely in the automotive and sanitary sectors.

- The non-use scenario of the applicants (NUS 8 closure of the businesses) will entail considerable negative socio-economic impacts on the applicants themselves as well as along the supply chains of several UK sectors.

- Health risks for workers from the use of chromium trioxide are kept at a minimum as the production processes at the applicants' sites are highly automated, a range of engineering controls are employed and directly exposed workers wear appropriate PPE (see Chemical Safety Report).

- Modern wastewater treatment, exhaust ventilation and filter systems are able to strongly reduce the amount of Cr(VI) reaching the environment that might represent a potential exposure risk for the general population.

- Finished products do not contain any Cr(VI) and are not harmful to end users nor to the environment.

[7] ECHA, 2013 (b).

[8] HM Government, 2022, at pages 58 and 54 respectively.

In conclusion, for Use 1, the socio-economic benefits of the continued use of chromium trioxide in the pre-treatment step for the applicants outweigh human health risks by factor of approximately 100. For the above-mentioned reasons, for Use 1 a review period until 30 June 2034 is requested for the transition to a Cr(VI)-free alternative for etching plastic substrates mainly for automotive and sanitary applications.

18. SEA Conclusions for Use 1

Chromium trioxide is listed in Annex XIV of REACH and its sunset date has now passed. However, the transitional provisions under Article 127GA of UK REACH have extended the sunset date to 30 June 2022 for the applicants, as a GB-based downstream users covered by an AfA further up their supply chain made under EU REACH.

This Application for Authorisation concerns the use of chromium trioxide by the $CrO_3$4UK applicants at their UK production sites for the etching pre-treatment (Use 1) for the subsequent electroplating step of components for sanitary, automotive and other applications. Etching is an essential step for plastic substrates, to prepare the substrate for subsequent metal plating and application of a durable and protective chrome coating with unmatched aesthetics as a final layer.

If authorisation is not granted for Use 1, QPP and Borough would most likely have to close their businesses. This would entail high socio-economic impacts on the UK applicants and on other UK actors along the supply chains. The following costs of the NUS 8 (closure) are expected for QPP and Borough:

- decommissioning costs less the sale value (estimated to be about £1M - £3M).
- foregone profits (estimated to be £7M - £12 million over the review period).
- loss of all jobs (social costs monetised in the range of £10M - £30M).

Other UK actors along the supply chain, mainly suppliers of raw materials (such as CrO_3, plastics, etc.) and services as well as certain customers would face socio-economic impacts:

- economic losses (not monetised).
- jobs at risk (not quantified).

On the other hand, the risks of continued use of chromium trioxide are the following:

- health impacts on directly exposed workers at the applicants' sites (monetised in the range £169,293 - £192,935 over the period.
- health impacts on the local population including indirectly exposed workers (monetised at £29,637 - £41,977 over the 12 years review period.

The analysis of alternatives, the substitution plan and the socio-economic analysis demonstrate that:

- Only the combination of an adequate etching pre-treatment with the subsequent electroplating steps guarantees the required **key functionalities** of the final product.

- According to the current state of investigations, the full development and implementation of an alternative for chromium trioxide for etching will take **at least until mid-2034**.

- There are **no alternatives available** for the etching pre-treatment with the same function and similar level of performance that are technically and/or economically feasible for the applicants before the end of the requested review period.

- The two applicants have been proactive and started the process to substitute chromium trioxide and are **committed to continue the substitution efforts**.

- The applicants are submitting a **substitution plan** consistent with the analysis of alternatives and the socio-economic analysis and credible for the review period requested.

- The **benefits of continued use outweigh the risks of continued use** of the substance for etching by a considerable degree (approximately 100 times) and this situation is not likely to change during the review period requested.

- The uncertainty analysis shows that the applicants **applied a conservative approach** and that the remaining uncertainties do not challenge the conclusions of the applicants' assessment.

- To complete the proposed substitution, **a review period until 30 June 2034** is required (12 years after the date of the submission of this Application for Authorisation).

References

Dubourg, R., 2016. *Valuing the social costs of job losses in applications for authorisation*. Chester: The Economics Interface Ltd. Available from https://echa.europa.eu/documents/10162/17086/unemployment_report_en.pdf

ECHA (European Chemicals Agency, 2011. *Guidance on the preparation of socio-economic analysis as part of an application for authorisation* [Version 1, Jan 2011]. Available from https://echa.europa.eu/documents/10162/23036412/sea_authorisation_en.pdf/aadf96ec-fbfa-4bc7-9740-a3f6ceb68e6e

ECHA (European Chemicals Agency), 2013 (a). *Risk Assessment Committee (RAC) Application for authorisation: establishing a reference dose response relationship for carcinogenicity of hexavalent chromium (RAC/27/2013/06 Rev.1)*. Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13579/rac_carcinogenicity_dose_response_crvi_en.pdf/facc881f-cf3e-40ac-8339-c9d9c1832c32

ECHA (European Chemicals Agency), 2013 (b*). SEAC/20/2013/03 Setting the review period when RAC and SEAC give opinions on an application for authorisation*. Helsinki: ECHA. Available from: https://echa.europa.eu/documents/10162/13580/seac_rac_review_period_authorisation_en.pdf/c9010a99-0baf-4975-ba41-48c85ae64861

ECHA (European Chemicals Agency), 2016 (a). *Valuing selected health impacts of chemicals: Summary of the Results and a Critical Review of the ECHA study.* Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13630/echa_review_wtp_en.pdf/dfc3f035-7aa8-4c7b-90ad-4f7d01b6e0bc

ECHA (European Chemicals Agency), 2016 (b). *SEAC's approach for valuing job losses in restriction proposals and applications for authorisation SEAC/32/2016/04*. Helsinki: ECHA. Available from https://echa.europa.eu/documents/10162/13555/seac_unemployment_evaluation_en.pdf/af3a487e-65e5-49bb-84a3-2c1bcbc35d25

HM Government, 2022. *The Benefits of Brexit: How the UK is taking advantage of leaving the EU*. London: HMSO. Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1054643/benefits-of-brexit.pdf

SMMT (Society of Motor Manufacturers and Traders), 2021. *UK Automotive Trade Report 2021*. London: SMMT. Available from https://www.smmt.co.uk/reports/uk-automotive-trade-report/

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