ANALYSIS OF ALTERNATIVES

and

SOCIO-ECONOMIC ANALYSIS

Legal name of applicant(s):	**SCA Ceramic Coatings Ltd**
Submitted by:	**SCA Ceramic Coatings Ltd**
Date:	23rd April 2026
Substance:	Chromium Trioxide EC: 215-607-8 CAS: 1333-82-0
Use title:	Use of chromium trioxide in a binding/sealing process applied to porous/semi-porous coatings to achieve a wear and corrosion resistant technical ceramic surface to meet specific performance characteristics
Use number:	1

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LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
AoA	Analysis of Alternatives
BaU	Business as Usual
EBITDA	Earnings Before Interest, Taxation, Depreciation & Amortisation
ECHA	European Chemicals Agency
FTE	Full Time Equivalent
GDP	Gross Domestic Product
HVOF	High Velocity Oxy-Fuel (Thermal Spray Coating)
ONS	Office of National Statistics
PVD	Physical Vapour Deposition
RAC	Risk Assessment Committee (EU)
SEA	Socio-Economic Analysis or Surface Engineering Association
SEAC	Socio-Economic Assessment Committee (EU)
SEG	Similarly Exposed Group
SLA	Service Level Agreement
SVHC	Substance of Very High Concern

DECLARATION

We, the Applicants, are aware of the fact that further evidence might be requested by HSE / DEFRA to support the information provided in this document.

Also, we request that the information blanked out in the "public version" of the Analysis of Alternatives and Socio-economic Analysis is not disclosed. We hereby declare that, to the best of our knowledge as of today 31st March 2026 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.

Signature: [redacted]

Name. Philip Stewart
Position. Director
Date. 23rd April 2026
Place. SCA Ceramics Ltd

1.SUMMARY

This Analysis of Alternatives and Socio-Economic Analysis relates to the application for authorisation for the continued use of chromium trioxide in ceramic coating and sealing for components with specific technical performance requirements. Typical components are specialist units forming part of Oil & Gas [redacted] equipment and Rolls used in the [redacted] industry.

The function of the chromium trioxide is to provide a ceramic chromium coating, which provides specific characteristics that include corrosion resistance, chemical resistance, wear/abrasion resistance, adhesion and heat resistance. These specialised coating/sealing methods were developed [redacted]. SCA Ceramics Ltd (SCA) [redacted] processes in the UK.

The **end-user #1** for Oil & Gas applications have conducted extensive field tests of alternative coatings offered by various third-party suppliers. Customer 1 is not prepared to divulge information on the various coatings they have trialed stating "those are proprietary…. not sharing results with competitor" but "SCA coating performance established itself…for downhole needs".

End-user #2 (Coated Rolls) states "rolls gain a 150% increase in operational lifetime when your coating is applied" - "we have no other alternative coating available that offers the same operation performance".

SCA provide their coatings based on "built to drawing" i.e. The customer specifies the treatment to be given to their components. A review period of 12 years is therefore requested. As SCA is a "Micro" business it does not have the technical, financial or facility resource to conduct its own R&D. Therefore, any further research and development of potential alternatives and any newly developed coatings identified by the Customers will be regularly monitored to ensure that the reason for rejecting these potential alternatives is still valid.
Much research and development has been undertaken to find alternatives to using chromium trioxide and there are currently five particular technologies that could be considered as potential alternatives for this particular use. Hard chromium electroplating, thermal spraying processes, electroless nickel plating, Physical Vapour Deposition (PVD) and Nitro-Carburising.

As SCA do not have any details about the alternatives subjected to Field testing, the potential alternatives detailed above will be discussed but all with the conclusion that each is considered unsuitable for the end use.

1.1 Continued Use Scenario

The applicant will continue to use chromium trioxide under the ALARP principles and will continue to monitor any R&D activity and development of potential alternatives. The applicant will continue to support UK manufacturing and contribute to the UK Government's Growth Agenda and net-zero targets.

1.2 Most Likely Non-Use Scenario

The most likely scenario if the application for authorisation is not granted is business closure, supply chain disruption and relocation of manufacturing facilities outside of the UK.

1.3 Societal Costs on Non-Use

The societal costs resulting from non-use is £[redacted] over a 12-year period, £[redacted] of that resulting from unemployment and lost wages.

1.4 Residual Risks

When considering the worst-case scenario, the excess lung cancer risk is 0.000215 (due to the number of workers involved and the use of very conservative exposure data) and by the continued use of biological monitoring, all routes of exposure can be assessed and the principles of ALARP – as low as reasonably practicable – will be continued at all sites.

1.5 Conclusion

The societal costs of not granting this authorisation far outweigh the residual risks from the continued use of chromium trioxide by these applicants.

2. AIMS AND SCOPE

This application for authorisation covers the use of chromium trioxide to produce a ceramic chromium coating which provides specific properties and performance characteristics. This AoA/SEA is part of the application for authorisation dossier produced by the applicant.

The aim of the AoA is to demonstrate that no suitable alternatives to the use of chromium trioxide are currently available for this specific use.

The aim of the SEA is to demonstrate that the benefits of the continued use of chromium trioxide, for this specific use, far outweigh any potential risks to human health and/or the environment.

The scope covers the applicant carrying out the chromium trioxide using process and their customers and details the societal implications of a refusal to grant an authorisation for the continued use of chromium trioxide for this specific use.

The applicant is based in the UK, so provide direct employment, generate tax revenues and preserve specialist engineering skills.

3. ANALYSIS OF ALTERNATIVES

3.1. SVHC use applied for

Use of chromium trioxide for the ceramic chromium coating and sealing of various components with technical performance requirements, in specific Downhole equipment used in the Oil & Gas exploration and production environment and, for the [redacted] industry for coated Rolls within strategic parts of the production process - with the purpose of creating a coating to provide specific performance characteristics.

3.1.1. Description of the function(s) of the Annex XIV substance and performance requirements of associated products

Chromium trioxide is used to produce a ceramic chromium coating specifically for engineering / functional purposes:

For this specific use, it is part of an integrated process which consists of a number subsequential process steps as shown below:

A – Pre-treatment processes

These processes clean the surface of the component to ensure that the surface is clean and ready to accept the ceramic processes.

B – Coating/Sealing processes

This is the [redacted] application process

C – Post-treatment processes

These processes will ensure that the surface does not contain any chromium trioxide residue from the coating stage.

It is very important to note that the final coated component does not contain any chromium trioxide, so the only potential exposure to chromium trioxide occurs within the company operating the chromium coating process – the applicant who has submitted this application for authorisation. So, we are primarily concerned with workplace exposures.

The chromium coated components for this specific use require the following performance requirements:

A - corrosion resistance,

B - chemical resistance,

C - wear / abrasion resistance,

D - adhesion,

E – low coefficient of friction

3.1.2. Market analysis of products manufactured with the Annex XIV substance

Components that require ceramic chromium coating/sealing for this use are very specific and have *Technical Performance* as their prime requirement, drive the Market demand and 'failure' of coatings can cause significant supply chain disruption.

3.1.3. Annual volume of the SVHC used

The annual volume of chromium trioxide used in the ceramic chromium coating for this specific use is [redacted] in total.

3.2. Efforts made to identify alternatives

The End-users of the components coated/sealed using the ceramic chromium process have carried out in-house testing of commercially available coatings for their purposes but, to date, nothing has provided the technical performance that can reliably replace this ceramic chromium coating.

3.2.1. Research and development

The applicant relies on the End-users, chemistry suppliers and Universities to conduct research and developments as the costs are prohibitive to a micro-sized business.

3.2.2. Consultations with customers and suppliers of alternatives

The applicant is in regular discussion with their customers to ensure that the coating process specified remains the only viable alternative for their application.

3.2.3. Identification of alternatives

End-User #1 [redacted] (Oil & Gas)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

The End-User will not divulge details of the other treatments/coatings within the testing programme stating "those are proprietary…. not sharing results with competitor." But it can be reasonably assumed that these will be the commonly accepted potential, industrial processes currently available.

[redacted]

End-User #1: test results for Alternative coatings

These are assumed to be:

A) Using hexavalent chromium chemistry
B) Using thermal spraying processes
C) Using electroless nickel
D) Using physical vapour deposition (PVD)
E) Using Nitro-Carburising process

Coating #5 (assumed)

Hard Chromium electroplating, using hexavalent chromium, has been used extensively and successfully for many years in Oil & Gas Drilling equipment.

The Hard Chromium surface can be machined to very fine tolerances and surface roughness, providing excellent wear resistance and very low friction characteristics.

Chromium develops a passive surface layer that is highly resistant to corrosion however, the coating structure is typically 'cracked' due to internal stress-relieving. These 'cracks'

provide a path for corrosive fluids to penetrate and react between the chromium coating and the substrate material resulting in coating failure.

The chlorides used in the Drilling Fluids will also break through the passive surface layer on the chromium and result in spot corrosion which then accelerates, due to galvanic differentials, resulting in component failure.

Coating #4 (assumed)

Thermal spraying includes several technologies. Materials suggested for the thermal spray technologies include WC-Co, WC-CoCr, Cr3C2-NiCr, Ni5Al and TiN. Thermal spray technologies require extensive training and expertise to master. If done well, a higher quality coating with long service life will be achieved. Thermal spraying is currently applied mainly to rotating cylinder surfaces or coatings of small parts of an object. One of the commonly used spray technologies is the High Velocity Oxy-Fuel (HVOF) spray coating. The principle of the HVOF coating technology is to use a supersonic flame, which accelerates particles of the coating material to high velocity. When the coating material hits the substrate, these high-velocity particles form a very coherent, low porosity coating. Hardness of the coating is in the range of 1100-1400 HV. Its wear resistance and corrosion protection properties can be better than chromium trioxide based hard chromium electroplated coatings. The coating process usually results in rough surfaces, which is why the coating usually requires some post-deposition machining.

A major disadvantage of all thermal spraying processes is that they are a line-of-sight application. Therefore, coating of inner surfaces and complex geometries is very difficult, if not impossible.

So, while the tribological performance of this coating is good, it is not possible to apply to the internal surfaces required for this end-use.

Coating #1, 2, 3 & 6 (assumed)

Electroless nickel is a hard, silver coloured coating comprised of nickel alloyed with between 4 and 14% phosphorus. It can also be alloyed with boron, but phosphorus alloy is the most common. It is deposited by immersion of parts in a solution of nickel salts and reducing agents at a temperature of 90°C. Although it has the appearance of an electroplated coating, the process is purely chemical, so that deposition is evenly distributed over the part, including internal and external corners. Electroless nickel is particularly applicable for plating inside holes with small internal diameters and complex parts.

The hardness of electroless nickel-phosphorous plating is in the range of 500-700 HV, which is less than either Hard Chromium or HVOF coatings and consequently less wear resistant.

The hardness can be increased up to 1100 HV with subsequent heat treatment. The corrosion resistance properties of electroless Ni plating are good, but the heat treatment needed for higher hardness will reduce the corrosion resistance performance.

Use of this coating will not satisfy all the technical requirements of this equipment.

PVD coatings can suffer from pinholes, which then leads to pitting in typical use. Research is still ongoing and combination PVD coatings are now offering enhanced corrosion resistance. This method of coating is also 'line-of-sight' and is not suitable for internal surfaces as required for this end-use.

Currently the PVD coatings do not meet the corrosion resistance requirements for this equipment.

Nitrocarburising is a low-temperature low-distortion "thermochemical" heat treatment carried out to enhance the surface properties of finished or near-finished ferrous components. The resultant compound layer, with good lubricant-retention characteristics, is responsible for the major benefit of high resistance to wear, scuffing, galling and seizure. The diffusion zone contributes improved fatigue resistance if components are quenched after nitrocarburising. An increase in corrosion resistance can be improved upon further by post-oxidation treatment which imparts an aesthetically pleasing black finish; additional polishing and oxidation steps can yield a surface finish rivalling hard chrome plating, in terms of high corrosion resistance combined with low coefficient of friction.

Nitrocarburising is a surface treatment applied to a finished or semi-finished component and does not add material onto a surface. Nitrocarburising can be applied to stainless steels, but very careful selection and control is required.

This process is not suitable for this end-use because of the complex component geometries and the potential negative effect on the material conditions that are the basis of the equipment design function.

3.2.3.1 Conclusion on shortlisted alternatives (End-User #1)

Whilst all the five potential alternative coatings can, and have, been used for specific products with specific technical and performance requirements, none of them are currently considered to be viable alternatives providing the complete technical and performance characteristics for this particular use.

By conducting their own Laboratory testing of potential surface treatments, **End-User #1** have determined that the most appropriate coating to provide the required technical performance for their [redacted] is that supplied by SCA.
End-User #1 are the Design Authority for the equipment and specify the treatment required on component drawings and their Approved Suppliers, of which there are two, the Applicant and another company based in [redacted].

3.2.4 Identification of alternatives

End-User #2 [redacted] Steel Processing)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.2.4.1 Process development

The necessity to frequently change the rollers in the process line in order to avoid product quality issues drove the **End-User #2** to research suitable alternative roller coating technologies that would give more consistent and longer operation.

The use of Thermal Spray coatings has been adopted as best practice for these critical parts of the production process.

The exact mixture of the applied Thermal Spray coating is a strictly controlled confidentiality but, it is an accepted fact that the nature of its application results in some inherent porosity.

Because the coating is thermally applied, the carbide particles fuse together, and the molten zinc temperature (>420°C) does not affect the structure. However, the inherent porosity of the coating, if used 'as-is', would result in the same buildup of zinc as experienced with Hard Chromium.

3.2.4.2 Adopted coating technology

End-User #2 [redacted] a Technical Ceramic of chrome oxide/hydroxide that is extremely hard and inert.

By conducting their own development of potential surface treatments, **End-User #2** have determined that the most appropriate treatment to provide the required technical performance for their [redacted] is that supplied [redacted] by SCA.

3.3 Single Use Application

The Technical Ceramic surface is achieved by the application of multi-stage treatments to a porous coating matrix.

In **End Use #1** the porous matrix is produced by the application of a Slurry Mix which is loosely bound by chromium ceramic.

In **End Use #2** the porous matrix is applied by the customer in the form of a thermal spray carbide coating.

[redacted]

This similarity of treatments, using the same chemistry, to achieve the final technical surface, justifies this AfA for a Single Use.

4 SOCIO-ECONOMIC ANALYSIS

4.1 - Continued use scenario

4.1.1 Summary of substitution activities

The applicant holds no design rights to the components treated and supplies its service on a 'build to drawing' basis. The end users have researched the potential alternatives to chromium trioxide and have received sample components from suppliers of the potential alternative process material.

On assessment, none of the alternatives satisfy all the performance criteria required by the end users of the articles being coated. The most important performance criteria being corrosion resistance, wear resistance, hardness and chemical resistance with no alternative able to satisfy all of these criteria.

4.1.2 Conclusion on suitability of available alternatives in general

As a result of the unacceptability of alternatives, to the end users, the conclusion is that the applicant has no available or potential alternative processes likely to be introduced for the foreseeable future.

Therefore, it is not possible to produce a substitution plan.

4.1.3 R&D plan

The Applicant is a Micro-Enterprise, as defined in the EU recommendation 2003/361, and as such do not have access to funds to enable individual R&D activity into surface treatment processes which are not core activities and do not have the floorspace or manpower to accommodate the necessary process facilities.

The applicant must, therefore, rely on R&D carried out by the major process chemistry suppliers and Universities as the costs are prohibitive to micro, small and medium-sized businesses.

4.2 Risks associated with continued use

Given that all the results from the Workers biological monitoring reports are within (or below) the range expected for the unexposed population i.e., <10µmol/mol creatinine and that there are no discharges of chromium trioxide to the environment, there is no excess lifetime risk to individuals (worker or general population) or to the environment. However, as chromium trioxide is classified as a non-threshold carcinogen and using the dose response relationship for exposure to chromium trioxide developed by the Risk Assessment Committee of the European Chemicals Agency, there is an excess lung cancer risk of 2 X 10^{-4} by considering the worst-case scenario.

The worst-case assessment of worker health risks within this socio-economic analysis utilises the results of a study endorsed by ECHA identifying the reference dose response relationship for carcinogenicity of hexavalent chromium. These results are acknowledged to be the preferred approach of the RAC and SEAC and therefore have been used as a methodology for the calculation of work cancer risks in this socio-economic analysis.

The following steps are therefore necessary to complete the health impact assessment:

1 – Assessment of worker exposure (actual measurements)

2 – Estimation of additional cancer deaths relative to the baseline lifetime risk

3 – Estimation of additional non-fatal cancer based on survival rate statistics

4 – Monetary valuation of fatal and non-fatal cancer risks

Following the worst-case approach, the combined worker (highest) exposure values from the corresponding chemical safety report, section 10, are used to make the assessment of health impacts. Following the ECHA methodology where the applicant only provides data for the exposure to the inhalable particulate fraction, it will be assumed that all particles were in the respirable size range and only lung cancer need be considered.

For the lung cancer calculation, excess lifetime risk (ELR) is defined as the additional risk of dying from cancer due to exposure of toxic substances incurred over the lifetime of an individual. From the ECHA RAC the unit of occupational excess lifetime mortality risk is 4 X 10^{-3} per µg Cr(VI)/m^3

Table 1: Excess lung cancer mortality risk to workers covered by this application

A*	Inhalation exposure weighted average µg/m^3	0.715
B	Excess risk unit coefficient	4 x 10^{-3} per µg/m^3
C	Excess risk for 40 years (A x B)	2.86 x 10^{-3}
D	Excess risk per year (C/40)	7.15 x 10^{-5}
E	Number of workers exposed	[redacted]
F	Total annual excess risk (number of cases)	[redacted]

*Value taken from Table 4 (CSR).

Geometric mean of all results (SEG) = [redacted] (Expostats Tool 1 – 13/4/2026)

The individual development of cancer may be fatal or non-fatal whereas the dose response function considers only fatal cancer. It therefore follows that the excess risk of cancer is higher than the excess risk of fatal cancer.

According to Cancer Research UK the following table can be developed:

Table 2: Age-standardised, five-year survival rates for lung cancer in the UK, 2013-2017

Relative cumulative survival	Non-fatal/ fatal ratio
16.2	0.193

This means that for every fatal case of lung cancer, there is an additional 0.193 non-fatal cases in the UK. This equates to 0.0003 non-fatal cancer cases associated with this application.

Table 3: Values for fatal and non-fatal cancer taken from ECHA Guidance using December 2003 exchange rate of €1.42 / £1

	2003	GDP factor*	2025
Value of statistical life	£740,845	103.33	£1,506,360
Value of statistical life (sensitivity)	£1,590,141		£3,233,234
Value of cancer morbidity	£370,423		£753,181
Value of cancer morbidity (sensitivity)	£795,070		£1,616,616
Value of cancer fatality	£1,111,268		£2,259,541
Value of cancer fatality (sensitivity)	£2,385,211		£4,849,850

*The GDP factor is the change in UK GDP between 2003 and 2025 as per the UK Office for National Statistics and allows for inflationary impacts to be included in the assessment.

Table 4: Estimated monetary value of annual risk of lung cancer from chromium trioxide exposure for this application.

Fatal cancer risk per year	[redacted] <0.001
Annual cost of fatal cancer risk Per case £1,506,360 Sensitivity £3,233,234	 [redacted] <£1000 [redacted] <£2000
Non-fatal proportion Non-fatal cancer risk per year Annual cost of non-fatal cancer risk Per case £753,181 Sensitivity £1,616,616	[redacted] <0.5 [redacted] [redacted] <£500 [redacted]
Total annual cost of cancer Sensitivity	[redacted] <£1000 [redacted] <£2000

These figures used the same methodology as those submitted by The Surface Engineering Association who were granted a 12-year review period for their authorisation.

Given that the results show no significant increased risk over that of the General Population and that there are no emissions to atmosphere, the implications of a non-use scenario will only affect the applicant and their customers.

Similarly, the continued-use scenario does not give rise to any additional economic burden toward health or environment.

4.3 Non-use scenario

If authorisation is refused, there would be an immediate closure of the ceramic chromium treatment facility, and the applicant will be unable to continue trading as a result. This because the ceramic chromium treatment is the only product/process operated by the applicant. This will place the workers at immediate risk of unemployment and the applicant with costs associated with chemical disposals, redundancy, asset disposal and leased property re-instatement.

4.3.1 Summary of the consequences of non-use

In the non-use scenario, the applicant will cease trading, and customers will resort to purchasing the same products and coatings (ceramic chromium) from overseas i.e. from the USA (End User #1) as the drawings detail 2 Approved Suppliers of the process. While non-use in the UK would remove the health risk potential it would do so without removing the substance from Global use.

The UK customers are Engineering machinists/manufacturers and have the ability to adapt their customer base/product portfolio to other UK markets if this application were to be refused. While they are unlikely to close completely, loss of business from the End-Users is likely to result in some loss of employment. However, End User # 1, being a Global Business, already utilizes international manufacturing capabilities which accounts for c.25% of the applicants' turnover. It is reasonable to assume that the manufacture & machining of components will remain in the UK but, subsequent coatings treatment would be done in the USA – by the secondary Approved Supplier.

The job losses would total [redacted] from the applicant with an added risk within their UK customers employee base of 196 staff.

The short-term effect on the economy would be the loss of approximately £[redacted] GDP (per annum), which includes c.£[redacted] export value, and the contribution to UK Treasury from taxes, etc.

The economic effect on the suppliers, of chromium trioxide, to the applicant will be insignificant given the very small volume used.

4.3.2 Identification of plausible non-use scenarios

Non-use Scenario

Shut down of ceramic chromium coating process, resulting in company closure.

Sections 3.2.3 and 3.2.4 detail the technical performance of each of the potential alternatives and, while some of the requirements are met, there are none that meet the 'basic' criteria of corrosion and wear resistance.

These are critical requirements for these market sectors hence, section 3.2.3.1 and 3.2.4.2 conclude that "none of them are currently considered to be viable alternatives for this particular use."

The customer "demand" is for technical performance.

As there is no alternative process, the existing chromium trioxide facilities will close, and staff will be redundant.

The company must dispose of all materials, using specialist contractors to handle the hazardous waste thereby incurring unrecoverable costs. The process facility is then dismantled and disposed to waste or equipment resellers resulting in little or no value return to the business.

Reinstatement and clean-up costs to the rented property will reduce the company balance sheet value affecting the ability to pay both statutory and commercial creditors and, possibly, staff redundancy payments.

Any Service Level Agreements (SLA) that cannot be satisfied will be subject to contingent cost claims from the customers so reducing the value of the remaining income from invoices issued prior to closure.

Customers source products with technically acceptable coating (chromium trioxide) from available sources (overseas).

4.3.3 Conclusion on the most likely non-use scenario

The most likely NuS is Off shoring of the process and closure of the applicants' business.

Immediate effect on local economy with added potential of larger customers losing business and reducing their employee numbers and so, further, affecting UK GDP.

This market sector is very demanding and concentrates on achieving a long-lasting, technically acceptable product. This fact alone, determines that the customer will demand the chromium trioxide process and this will incur transport costs and delays resulting from extended supply routes – these additional costs and delays will result in significantly inflated costs.

Sourcing this process overseas will have a negative impact environmentally resulting from the emissions from transport and will "export" the chromium trioxide work to potentially less well-regulated areas.

4.4 Societal costs associated with non-use

In the continued use scenario, it is expected that there will be some additional costs associated with testing, reporting and control systems resulting from conditions applied to the authorisation approval. Although this will be contingent cost to the applicant it is very likely to be passed through the supply chain in the form of price increases therefore it would not be additional cost to the applicants.

In the Business as Usual (BaU) case there would be no effect on the economics of the process or product. Employment would continue at the current levels and contributions to the local economy and national GDP would be stable.

As there are no increased health effects to either the workers or the general population, there would be no economic effect on the health or social services.

In the medium to longer term, it is expected that business levels will increase. This will result in additional turnover and employment in the supply chain thereby increasing the economic contribution.

As the share of the customers sales value resulting from ceramic chromium coated parts cannot be quantified, the combined turnover value of the applicant (£[redacted]) is used as the contribution to GDP value.

Thereby: **£[redacted] GDP value.**

In the non-use scenario the sales value (£[redacted] GDP) would be lost to the local economy because of closure of the applicant business. Approximately £[redacted] export value would be lost and the remainder of the estimated £[redacted] GDP value would be offset against the completed component sales value to the customer (manufacturer).

This would effectively more than double the effect on the UK trade balance as there would be transportation and additional inventory costs to be factored into the cost of supply.

As this is a demand-driven product, it is not possible to quantify the financial impact on the customer supply chain.

In this case the cost calculations below take account of the unemployment costs associated with the closure of the applicants' business. Therefore, it is more appropriate to state the short-term effect to be the loss of the applicants' gross profit which is **£[redacted] (EBITDA) for 2025.** (confidential spreadsheet attached detailing 5 years' figures).

It is assumed that all those workers, made redundant as a result of the non-use scenario and closure of the applicants' business, would experience a period of temporary unemployment. This assumption is based on the understanding that the workers are generally semi-skilled and therefore likely to regain employment within a relatively short period.

Using a conservative approach, the estimated unemployment periods and resultant costs will be calculated using data published by the Office for National Statistics (ONS) March 2026. These data show a 'total' unemployment rate of 5.2% but a rate of 24.9% for those aged 16-64.

The 'total' figure is used so that there is no bias to the resultant costs even though workers in this business are predominantly male. Further, it is assumed that re-employment within the first year will be within 3 months and that the rate of re-employment is constant year-on-year and that re-employment is achieved at the midpoint of the second and subsequent years i.e. 6 months unemployed in that year.

It can be seen from table 5 (below) that it is expected that all workers will be re-employed 3 years after redundancy. (calculations detailed in attached spreadsheet).

Table 5: Annual unemployed by year following closure

FTE Workers		Social cost (£92/week – 2026)	Lost Earnings (net avg salary)
[redacted]	2026	[redacted]	[redacted]
[redacted]	2027	[redacted]	[redacted]
[redacted]	2028	[redacted]	[redacted]
TOTALS		[redacted]	[redacted]

Average salary cost = £32871 (ref. ONS April 2025)

Conservative estimations and assumptions have been used to ensure that the socio-economic impacts of the non-use scenario have not been overestimated. Further, there are likely to be a number of additional negative effects which have not been quantified or monetised due to a lack of suitable data and/or information. These include temporary reductions in output and employment in the applicants' supply chain and in the local economy surrounding the affected manufacturing site.

4.4.1 Economic impacts on applicants

In the non-use scenario, the applicants' business will close resulting in total loss of profit but will remove cost of manufacturing i.e., raw material, utilities, payroll, etc.

However, there will be costs incurred because of redundancy payments (unquantifiable. Values subject to workers age, service, etc.), disposal of residual stock and process chemicals (unquantifiable. Subject to analysis and volumes).

Also, disposal of fixed assets (process equipment, etc.) is likely to be for 'scrap' value only as there will be no market in the UK for this equipment. Financial value of this scrap will result in a reduction in balance sheet values for fixed assets.

Once chemical disposal, clean-up and asset disposal are complete, the property will need to be "made good" (reinstated) before hand over to the Landlord.

Again, for the purposes of this assessment, the costs are assumed to equal the reduction in manufacturing costs, the balance sheet value and potential return on asset sale.

As the applicant will need to finance the disposals and clean-up costs, the probability is that they will enter Administration or Liquidation putting the immediate burden of redundancy cost on to the Public Purse.

4.4.2 Economic impacts on the supply chain

In the non-use scenario there will be an immediate effect on the customer base in that the only option will be to purchase the same goods and services from outside the UK/EU.

This will increase lead-time, costs, and reduced service levels.

Cost increases will be passed on to their customers who will already be suffering delayed supply and possibly result in cancellation of supply contracts and what are currently exports of goods and services will probably be lost to the overseas suppliers who will deal directly with the export customers.

4.4.3 Economic impacts on competitors

While there is some use of alternative processes within the UK these have been dismissed by this market sector as being unacceptable.

This means there would be no economic advantage achieved by any UK-based competitor who is using an alternative. The entire value of the customer base will be lost to foreign suppliers.

4.4.4 Wider socio-economic impacts

In addition to the socio-economic impacts described in the previous sections, the non-use scenarios might be associated with wider economic impacts. These include possible impacts on government tax receipts. These are transfers from workers, consumers, and capital owners to taxpayers, and are effectively included in the figures presented above, which are defined in terms of total economic value. Taxes are a transfer of a portion of that value between parties — the distributional aspects (the extent to which part of these values are transferred to taxpayers) are not considered in detail.

There might also be impacts on local economic activity and development because of the non-use scenario, but these impacts are expected to be limited.

There will clearly be an impact on international trade, with UK-based production being replaced partly or wholly by output produced outside the UK/EU. This is detailed in the previous sections and would be a combination of the lost output value from the applicants plus additional freight costs and the lost export values of goods and services from the customers trading values.

4.4.5 Compilation of socio-economic impacts

Table 6: Societal costs associated with non-use.

Description of major impacts	**Monetised/quantitatively assessed/qualitatively assessed impacts**
1. Monetised impacts	**£ [per year[1]] [Over x years]**
Profit (EBITDA) loss due to closure	[redacted]
Potential supply chain impact	£unknown
Social cost of unemployment	[redacted]
Cost of lost wages	[redacted]
Sum of monetised impacts	[redacted]
2. Additional quantitatively assessed impacts	**[Per year] [Over x years]**
	Not applicable
3. Additional qualitatively assessed impacts	
	Not applicable

4.5 Combined impact assessment

Table 7: Societal costs of non-use and risks of continued use.

Societal costs of non-use		Risks of continued use	
Economic impacts (annual) Social impacts (over 3 years – declining value per year) ref table 5	[redacted] + [redacted]	Monetised excess risks to directly and indirectly exposed workers (Annual values)	[redacted] [redacted] (higher bound sensitivity)
Off shoring by supply chain (annual)	£unknown	Monetised excess risks to the general population	No risk to general population
Qualitatively assessed impacts	Not applicable	Qualitatively assessed risks	No direct emissions to the environment

Therefore, the total costs of the non-use scenario are estimated at £[redacted] over the 12-year period from the implementation date. The added value lost, to UK GDP, by the supply chain offshoring manufacture would be significant (unknown value) over the same 12-year period. The total benefit of the non-use scenario i.e., avoiding the direct cost to human health as a result of exposure to Cr(VI) is estimated at £[redacted] over the same period, with a value of £[redacted] as an upper bound sensitivity.

It can be seen, then, that the costs of non-use clearly outweigh the benefits by several orders of magnitude.

Costs of non-use per unit of release.

Not applicable

4.6 Sensitivity analysis

The societal cost of continued use is limited by the small number of workers within the SEG, but the total employed number is more than double when considering the non-use costs.

4.7 Information to support for the review period

This applicant considers a review period of 12 years to be appropriate for the use of Cr(VI) in the coating of their product to create a coating which provides specific performance characteristics

The market for these products is determined by the End-Users of the Cr(VI) ceramic coated products because of their superior performance, in comparison to the available alternatives.

- The available alternatives to Cr(VI)ceramic coated products have critical performance weaknesses which explain why they meet only niche requirements in this sector. While these critical performance weaknesses exist, any future lack of availability of UK-manufactured Cr(VI)ceramic coated products in the UK will be met through imports of Cr(VI) ceramic coated products not through any substitution for non-chrome alternatives;

- As a result, until these critical performance weaknesses have been overcome, it will never be economically viable for the applicants to stop producing Cr(VI) ceramic coated products in favour of these alternatives, and the non-use scenario will continue to be the closure of the applicants ceramic chrome business and with the additional risk of the supply chain (customers) relocating to a country outside of the UK/EU to an available geographic supply-base;

- The costs of these closures and relocation of the supply base are extremely high and will continue to be so;
- In comparison, the risks of the applicants continued use of Cr(VI) are very low and will continue to be so. These risks will not be avoided in the non-use scenario, but simply shifted from the UK to another country outside of the UK/EU;

- Even if a viable alternative of equivalent performance to Cr(VI) was to become available, it would still take several years to develop into a marketable product and to industrialise the production process.

- The conclusion of this assessment is that research and development efforts made in the past and ongoing efforts made by Industry have not led and will not lead to the development of a suitable alternative that could be available within the normal review period. The remaining risks are low, and the socio-economic benefits are high (around 1000 times), both estimated on a highly conservative basis, and there is clear evidence that this balance is not likely to change in the next 12 years. Taking this into consideration, the applicants argue that a `long' review period of twelve (12) years is appropriate.

5 CONCLUSION

Section 4.7 (above) details the reasons why the applicant recommends authorisation for continued use of Cr(VI) [chromium trioxide] and this authorisation to be granted with a review period of 12 years.

6 REFERENCES

1 ALARP – Health & Safety Executive principle – As Low As Reasonably Practicable.

This involves weighing a risk against the trouble, time and money needed to control it. It describes the level to which the Health & Safety Executive expect to see workplace risks controlled.