

## Permitting Decisions- Bespoke Permit

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We have decided to grant the permit for Element Six Technologies (Kings Ride Park) operated by Element Six Technologies Limited.

The permit number is EPR/RP3609BU.

The application is to permit Schedule 1 activities associated with the production of synthetic diamonds (see key issues section for further details).

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

### Purpose of this document

This decision document provides a record of the decision-making process. It:

- summarises the decision making process in the [decision considerations](#) section to show how the main relevant factors have been taken into account
- highlights [key issues](#) in the determination
- shows how we have considered the [consultation responses](#)

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit.

### Key issues of the decision

#### Site processes

At the installation, diamonds are produced on a silicon former using Chemical Vapour Deposition (CVD) Diamond synthesis technology. The CVD process uses high purity speciality gases; most of these are purchased in cylinders, while hydrogen is generated on site through the electrolysis of deionized water. Once the diamonds have been produced, laser etching is performed to produce a stiffening structure in the product and the products are cleaned on-site using sulphuric acid. Once cleaned, the products are coated with platinum off-site, by an external coating supplier. With the coating applied, the silicon is then

dissolved on-site using a hydrofluoric acid and nitric acid solution to produce the final product.

## **Activities**

The Schedule 1 activities undertaken at the installation include:

- Section 4.2 Part A(1)(b) – manufacturing activity that is likely to result in the release into air of any hydrogen halide;
  - The hydrofluoric acid and nitric acid cleaning process results in the release of hydrogen fluoride to air. This process is carried out in a ‘wet bench’ unit attached to a wet scrubber extraction system.
- Section 4.2 Part A(1)(a)(i) – producing inorganic chemicals such as – gases (hydrogen).
  - The hydrogen generators typically produce 200 SLM of hydrogen that supplies the site and are used at 80-90% capacity.

The operator has demonstrated that the hydrogen enrichment activity meets the low impact installation criteria (Hydrogen generators low impact assessment, received 03/03/2021). Low impact installation activities cannot be permitted on a non-low impact installation permit. Therefore, the hydrogen enrichment activity is permitted as a Section 4.2 Part A(1)(a)(i) activity within Table S1.1. As specified in table S1.1 of the Environmental Permit, this activity must be operated in accordance with the low impact installation criteria. We are satisfied that the risk associated with the hydrogen enrichment activity is low.

## **Environmental impacts**

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration, accidents, fugitive emissions to air and water, point source releases to air, discharges to ground or groundwater, global warming potential and generation of waste and other environmental impacts. Consideration may also have to be given to the effect of emissions being subsequently deposited onto land (where there are ecological receptors). The key factors considered for this permit application include emissions to air, odour impacts and noise impacts.

## **Air Quality Assessment**

Emissions to air from the installation activities include hydrogen fluoride (HF), nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>).

The applicant submitted an H1 assessment through which emissions to air of SO<sub>2</sub> were screened out as insignificant. Detailed modelling was carried out for HF and NO<sub>2</sub> emissions.

The way in which the Operator used dispersion models, the selection of input data, use of background data and the assumptions made have been reviewed by the Environment Agency to establish the robustness of the Operator's air impact assessment. The output from the Operator's model has been used to inform further assessment of health impacts and impact on habitats and conservation sites. We have assessed the Operator's dispersion model using auditing tools developed by the Environment Agency and based on the US EPA AERMOD air dispersion model. Whilst we do not agree with the absolute numerical predictions, we agree with the overall conclusions that there will not be a significant impact on local air quality. Figures from the Operator's assessment are used in the assessment summary below.

### **Human health assessment**

For human health risk:

- Annual and short-term emissions of nitrogen dioxide screen out as insignificant (PC <1% of ambient air directive limits); and
- Annual and short-term emissions of hydrogen fluoride screen out as insignificant for human health risk (PC <1% of ambient air directive limits).

Having assessed the application we conclude that there will be no significant harm to human health from the operations.

### **Ecological assessment**

The air quality assessment considered

- Englemere Pond SSSI;
- Swinley Park and Brick Pits SSSI;
- Thurley, Ash, Pirbright and Chobham SAC;
- Thames Basin Heaths SPA;
- and Windsor Forest Great Park SAC.

For risks to all ecological receptors considered:

- Annual and short term emissions for NO<sub>x</sub> process contributions screen out as insignificant (PC <1% of critical levels);
- Annual nitrogen deposition rates screen out as insignificant (PC <1% of critical loads);
- Annual acid deposition rates screen out as insignificant (PC <1% of critical loads);

- Weekly and daily hydrogen fluoride levels screen out as insignificant (PC <10% of critical level); and
- Daily hydrogen fluoride concentrations screen out as insignificant (PC <10% of critical level).

The modelling supplied did not provide numerical predictions at the Local Wildlife Sites/ Local Nature Reserves. These include:

- Englemere Pond (LNR);
- Allen's Field (LWS);
- Woodland West of Ascot Station (LWS);
- Ascot Heath (LWS);
- and Allsmoor Pond (LWS).

However sufficient information was provided to understand the likely environmental impacts at the sites.

We have assessed the impact and can conclude that the process contribution is not likely to exceed 100% of any critical levels or loads at the Local Wildlife Sites/ Local Nature Reserves. We do not consider that there will be any significant pollution and no further assessment is required.

## **Odour**

The operator submitted a review of odour risk on the site. The potential for odour to arise as a result of the installation activities is limited. All storage and use of raw materials is well controlled and does not produce perceivable external odours. The operator has maintained a record of all complaints regarding its operations, including odour complaints, for the past 10 years. There are no records of any odour complaints. Should odour become an issue in the future, permit condition 3.3.2 enables the Environment Agency to request an odour management plan to identify and minimise the risk of pollution from odour.

## **Noise**

The operator submitted a review of noise and vibration risk on the site. The potential for noise to arise as a result of the installation activities is limited. The principal noise sources at the installation include production buildings, chiller plant, air emission stacks and local exhaust ventilation. The majority of the installation activities take place within the production areas, inside the process building. External noise surveys have been undertaken and no noise issues have been identified. The operator has maintained a record of all complaints regarding

its operations, including noise complaints, for the past 10 years. Two noise complaints, received in the last 2 years, related to plant faults with the HVAC systems (not under regulation); no other noise complaints have been received. Should noise and vibration become an issue in the future, permit condition 3.4.2 enables the Environment Agency to request a noise and vibration management plan to identify and minimise the risk of pollution from noise and vibration.

## **Decision considerations**

### **Confidential information**

A claim for commercial or industrial confidentiality has not been made.

### **Identifying confidential information**

We have not identified information provided as part of the application that we consider to be confidential.

### **Consultation**

The consultation requirements were identified in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement.

We consulted the following organisations:

Public Health England

Director of Public Health

Environmental Health

The comments and our responses are summarised in the [consultation responses](#) section.

### **Operator**

We are satisfied that the applicant (now the operator) is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.

## **The regulated facility**

We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1'.

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

## **The site**

The operator has provided a plan which we consider to be satisfactory.

These show the extent of the site of the facility.

## **Site condition report**

The operator has provided a description of the condition of the site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.

From published British Geological Survey mapping, the Site is indicated as being underlain by superficial deposits of the River Terrace deposit – sand and gravel. The underlying bedrock is mapped as the Bagshot Formation – Sand.

The Environment Agency classifies the superficial deposits (River Terrace) as a Secondary Undifferentiated Aquifer and the bedrock (Bagshot Formation) as a Secondary A Aquifer.

There are no surface water features near the site. The site is not located within or near a Groundwater Source Protection Zone.

There are no records of any previous pollution incidents and none were reported by the applicant to have occurred. The manufacturing process is carried out inside a building with sealed concrete floors.

The application stated that there is no visual or olfactory evidence of contamination and that all bunds are in good condition and are purpose built.

No historical site investigations have been undertaken as no evidence of the likelihood of contamination has been identified and it is not proposed to take any soil and groundwater reference data.

The relevant hazardous substances are always used within buildings in small quantities, transported in a bunded trolley.

## **Nature conservation, landscape, heritage and protected species and habitat designations**

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for these designations.

We have assessed the application and its potential to affect sites of nature conservation, landscape, heritage and protected species and habitat designations identified in the nature conservation screening report as part of the permitting process.

We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified.

**See key issues section.**

We have not consulted Natural England. However a stage 1 Habitats Risk Assessment was undertaken and sent to Natural England for information.

The decision was taken in accordance with our guidance.

## **Environmental risk**

We have reviewed the operator's assessment of the environmental risk from the facility.

The assessment shows that, applying the conservative criteria in our guidance on environmental risk assessment or similar methodology supplied by the operator and reviewed by ourselves, all emissions may be screened out as environmentally insignificant.

## **Climate change adaptation**

We have assessed the climate change adaptation risk assessment.

We consider the climate change adaptation risk assessment is satisfactory.

We have decided to include a condition in the permit requiring the operator to review and update their climate change risk assessment over the life of the permit.

## **General operating techniques**

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.

The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.

## **Operating techniques for emissions that screen out as insignificant**

Emissions of SO<sub>2</sub>, NO<sub>2</sub> and HF have been screened out as insignificant, and so we agree that the applicant's proposed techniques are Best Available Techniques (BAT) for the installation.

We consider that the emission limits included in the installation permit reflect the BAT for the sector.

The applicant should keep the plans under constant review and revise them annually or if necessary sooner if there have been complaints arising from operations on site or if circumstances change. This is in accordance with our guidance 'Control and monitor emissions for your environmental permit'.

## **Improvement programme**

Based on the information on the application, we consider that we need to include an improvement programme.

We have included an improvement programme to assess the feasibility of installing real-time emissions monitoring for hydrogen fluoride.

## **Emission Limits**

Emission Limit Values (ELVs) based on Best Available Techniques (BAT) have been added for the following substances:

Oxides of Nitrogen (NO and NO<sub>2</sub> expressed as NO<sub>2</sub>) - 10 mg/m<sup>3</sup>

Hydrogen fluoride - 15 mg/m<sup>3</sup>

We have included these limits based on the air quality impact assessment. There are no significant impacts at these levels.



## **Monitoring**

We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified.

These monitoring requirements have been imposed in order to ensure the emissions from the process are in accordance with the ELVs assigned to protect the environment.

Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.

## **Reporting**

We have specified reporting in the permit for the following parameters:

- Releases of oxides of nitrogen and hydrogen fluoride to air from A1
- Energy usage

## **Management System**

We are not aware of any reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.

## **Financial competence**

There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.

## **Growth duty**

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or

growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

# Consultation Responses

## Responses from organisations listed in the consultation section:

Response received from Public Health England 21/04/2021

Brief summary of issues raised:

Based on the information that has been supplied, the main emissions of potential concern are from the point source emissions, including hydrogen fluoride, nitrogen dioxide, sulphuric acid and argon; as well as the public health impacts of accidents and incidents, particularly resulting from the chemicals stored and used at the site.

In general, it is considered that the application lacks detail and clarity and in particular there are limited details provided regarding the processes undertaken at the site and the resulting pollutants and emissions of concern. An Environmental Risk Assessment Report has not been submitted with the application and the resolution quality of the floor plans is poor. Overall, there is insufficient information contained within the permit application to be able to fully assess the impact of the installation on public health and specific points are detailed below in the recommendations.

### Recommendations:

We request that the Environment Agency takes account of the following concerns when considering appropriate permit conditions:

Air

- There is a lack of consistency across documentation regarding the pollutants in the point source emissions from the site. For example, the *Air Quality Assessment* report identifies hydrofluoric acid, sulphuric acid and nitrogen dioxide. However, the *SPD Process Overview* report additionally identifies hydrogen, methane and argon. It is recommended that this be accurately characterised across documentation and where necessarily, further detailed assessment undertaken.
- The *Air Quality Assessment* does not clearly explain why sulphuric acid emissions have not been modelled, we therefore, are unable to comment on the potential impact on public health from these emissions.
- Limited details have been provided regarding emission limits values and the best available technique (BAT) and in the *Emissions Monitoring Document*, it is unclear what improvement actions have been identified as stated in Section B3.4a-b.6. It is recommended that further information be provided, and the Regulator is satisfied with the approaches and justifications provided.

- Reducing public exposures to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards has potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants and address inequalities (in exposure) and encourage their consideration during site design, operational management, and regulation.

## Water

The *Hydrogen Generators Low Impact Assessment* report advises that there are process emissions to the sewer from the installation. This is in contrast to what is stated in the *Emissions Monitoring* document. The applicant should provide clarification in relation to this and the Regulator should be satisfied that the point has been addressed.

## Accidents and Incidents

- Further details should be provided regarding potential accidents and incidents; and mitigation measures. It is noted that an Accident Management and Fire Prevention Plan have not been submitted with this application, it is recommended that the applicant submits these and the Regulator is satisfied with this.
- There is a lack of consistency in the reporting of the quantities of chemicals at the site (please see the *Raw Materials* document and the *Emergency Plan*).
- Due to the lack of clarity around the actual quantities of chemicals stored on site, the EA should clarify this situation with the applicant to ensure this issue is resolved and agreed and it should be confirmed whether or not the site falls under the COMAH regulations.
- The Emergency Plan provides some information regarding actions and mitigation measures for the protection of nearby populations from the release of 'toxic' and 'chemical' gases. It is noted that some details are missing, for example, which residential areas are at risk downwind. PHE would expect the Local Authority to review the emergency plans and comment accordingly.

## Noise

- In view of a number of complaints from residential neighbours over the past two years, it is recommended that the Environmental Health Department at Bracknell Forest Council be consulted regarding measures to reduce any noise impacts resulting from the installation.

Summary of actions taken:

## Air

- There is a lack of consistency across documentation regarding the pollutants in the point source emissions from the site. For example, the *Air Quality Assessment* report identifies hydrofluoric acid, sulphuric acid and nitrogen dioxide. However, the *SPD Process Overview* report additionally identifies hydrogen, methane and argon. It is recommended that this be accurately characterised across documentation and where necessarily, further detailed assessment undertaken.

The releases of hydrogen, argon and methane are from an activity that is not scheduled under EPR and are not considered significant however the activity has been included as a DAA.

- The *Air Quality Assessment* does not clearly explain why sulphuric acid emissions have not been modelled, we therefore, are unable to comment on the potential impact on public health from these emissions.

The emissions of sulphuric acid were assessed using the H1 screening tool and were not significant therefore detailed modelling was not required.

- Limited details have been provided regarding emission limits values and the best available technique (BAT) and in the *Emissions Monitoring Document*, it is unclear what improvement actions have been identified as stated in Section B3.4a-b.6. It is recommended that further information be provided, and the Regulator is satisfied with the approaches and justifications provided.

There are no BAT AELs associated with this activity however ELVs have been set based on protecting human health and the environment.

- Reducing public exposures to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards has potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants and address inequalities (in exposure) and encourage their consideration during site design, operational management, and regulation.

There are no emissions of particulates from the process and emissions of NO<sub>2</sub> are not considered to have the potential to cause a breach of any air quality standard.

## Water

The *Hydrogen Generators Low Impact Assessment* report advises that there are process emissions to the sewer from the installation. This is in contrast to what is stated in the *Emissions Monitoring* document. The applicant should provide

clarification in relation to this and the Regulator should be satisfied that the point has been addressed.

The emissions to sewer from the hydrogen generators are deionised water and a trade effluent consent or discharge limits are not considered necessary. The low impact criteria places a limit on the volume of the discharge.

#### Accidents and Incidents

- Further details should be provided regarding potential accidents and incidents; and mitigation measures. It is noted that an Accident Management and Fire Prevention Plan have not been submitted with this application, it is recommended that the applicant submits these and the Regulator is satisfied with this.

A Fire Prevention Plan is not relevant to this type of activity. Accident management is detailed in document B2.006 Emergency plan.

- There is a lack of consistency in the reporting of the quantities of chemicals at the site (please see the *Raw Materials* document and the *Emergency Plan*).

The version of the Emergency Plan in the application was prepared earlier in the evolution of the production process and it has been confirmed that the maximum quantity stored is as stated in the Raw Materials document. The emergency plan will be updated to reflect this.

- Due to the lack of clarity around the actual quantities of chemicals stored on site, the EA should clarify this situation with the applicant to ensure this issue is resolved and agreed and it should be confirmed whether or not the site falls under the COMAH regulations.

The maximum quantity of materials stored falls well below the relevant COMAH threshold.

- The Emergency Plan provides some information regarding actions and mitigation measures for the protection of nearby populations from the release of 'toxic' and 'chemical' gases. It is noted that some details are missing, for example, which residential areas are at risk downwind. PHE would expect the Local Authority to review the emergency plans and comment accordingly.

This is outside the scope of EPR and is covered under other regulations.

#### Noise

- In view of a number of complaints from residential neighbours over the past two years, it is recommended that the Environmental Health

Department at Bracknell Forest Council be consulted regarding measures to reduce any noise impacts resulting from the installation.

We have carried out an assessment of the impact as detailed in the key issues section and this confirms that there will be no significant impact due to noise associated with normal operation. Standard permit conditions 3.4.1 and 3.4.2 in the permit will ensure there is no significant impact.

No further responses received.