



Project location



The proposed Hunter Valley Hydrogen Hub will be located at 43 Greenleaf Road in the industrial precinct of Kooragang Island and will be designed to minimise impact on the surrounding community.

The project site is on approximately 4 hectares of reclaimed land in an industrial estate in the Newcastle Local Government Area.

The site is zoned SP1 - Special Activities under State Environmental Planning Policy (Transport and Infrastructure) 2021.

The site is serviced by direct access to Greenleaf Road, which connects to Heron Road via Cormorant Road and Teal Street, and are part of State Road B63. These roads are all Transport NSW heavy vehicle approved routes.





Project overview

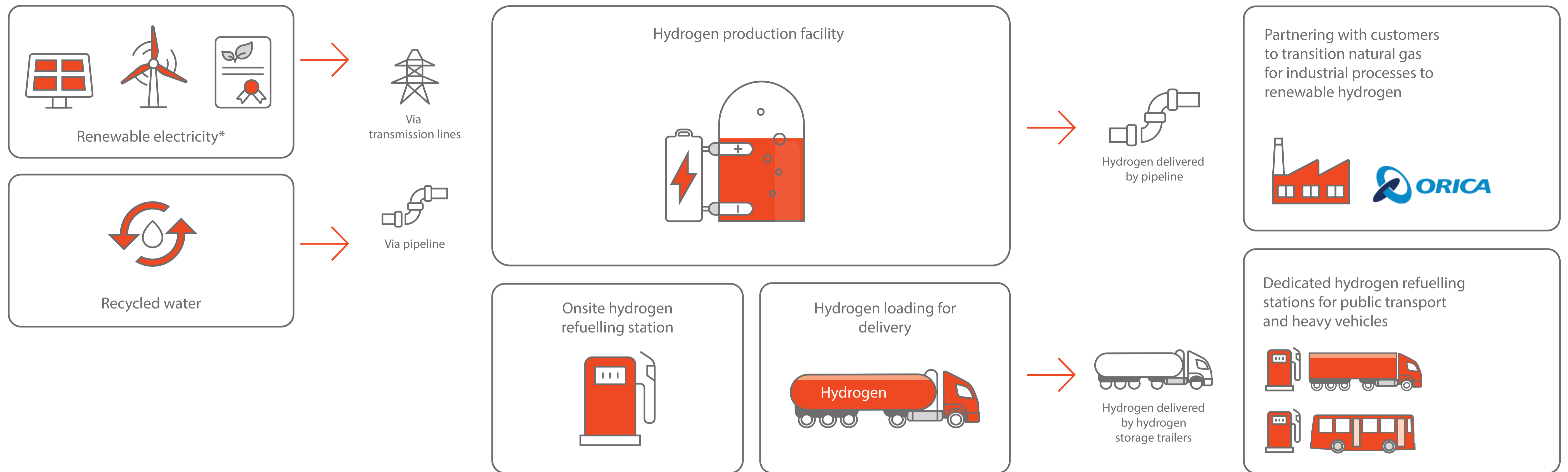


Origin, in partnership with Orica, are proposing to develop the Hunter Valley Hydrogen Hub to deliver a safe, reliable and commercial-scale renewable hydrogen supply chain in the Newcastle industrial and port precinct on Kooragang Island.

- The majority of the hydrogen produced is planned to go to Orica, an ammonia manufacturing business, to help decarbonise their operations. Hydrogen will also be made available to mobility customers, such as bus and heavy vehicle operators through onsite and satellite refuelling stations.
- The facility is designed to be scaled up through subsequent phases offering future expansion, including additional offsite hydrogen refuelling stations.

- Expanded production will help diversify the Hunter Valley’s energy mix, provide employment growth, aid local industry in decarbonising and establish the region as a leader in hydrogen and renewable energy generation.
- Hydrogen is already used in Orica’s manufacturing operations.
- Origin and Orica will ensure the safe production, storage, and transportation of hydrogen as a priority.
- We are targeting first hydrogen production to come online in the mid-2020s.

Project details	Phase 1
Installed electrolyser capacity	Approximately 60MWs
Site footprint	~4 hectares
Trailer loading capacity	2-4 trailer bays
H2 pipeline	720m long
Hydrogen refuelling station (onsite)	400kg/d
Ammonia production facility upgrades	Tie in (Orica)



What is hydrogen and how is it produced?

Hydrogen, which has the chemical symbol of H, is the smallest, and most common element in the universe.

Hydrogen can be burned as a fuel with oxygen to generate heat which in turn is used to generate energy.

Hydrogen is a required feedstock for the production of ammonia.

How is hydrogen produced?

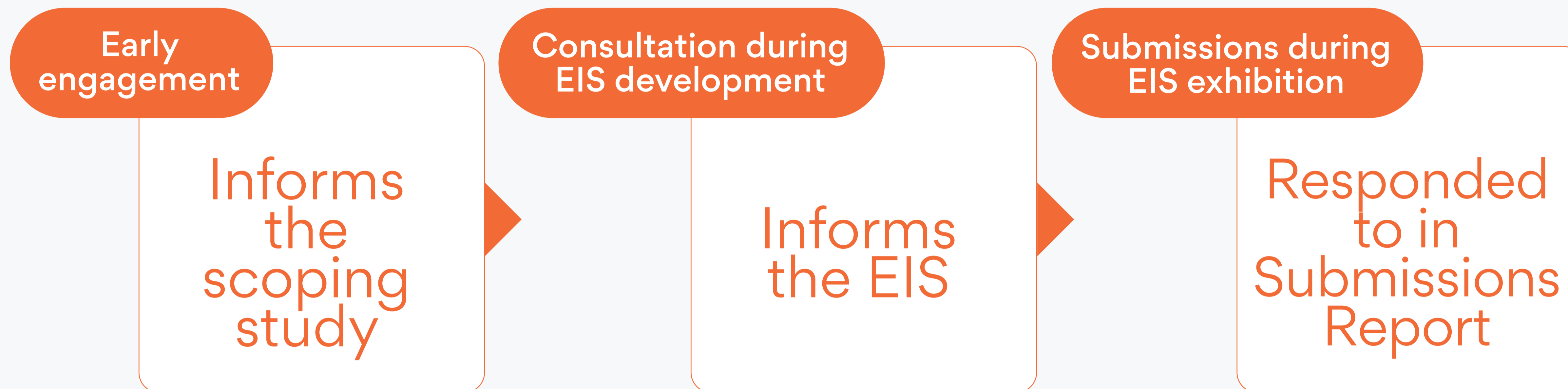
Hydrogen is produced by taking recycled water and splitting the hydrogen and oxygen atoms using a process called electrolysis.

Why hydrogen?

It presents an opportunity to support Australia's transition towards net zero emissions by assisting in meeting decarbonisation targets.

The project intends to match electricity usage during operations with renewable electricity through the purchase and retirement of large-scale generation certificates and / or renewable electricity guarantee of origin certificates.

*Including retirement of large-scale generation certificates and/or renewable electricity guarantee of origin certificates in the future.



Community consultation

Origin and Orica are committed to genuine community and stakeholder engagement and communication. Our approach is built on being proactive, transparent and inclusive.

Prior to the Environmental Impact Statement (EIS) phase of the project we:

- Provided opportunities for early community and stakeholder consultation and feedback including the Stockton, Fern Bay and Fullerton Cove community groups.
- Briefed Newcastle City Council, HunterNet, the Committee for the Hunter, Business Hunter and additional existing community groups.
- Provided a summary of feedback in the scoping report for regulators and to inform the development of the EIS.

During this EIS development phase of the project we:

- Promoted drop-in sessions via the Newcastle Herald and notified over 10,000 homes via letterbox drops.
- Held community drop-in sessions in Warabrook and Fern Bay.
- Met with neighbours across Kooragang Island to provide them with overview of the project.
- Considered all input during the development of the EIS.

During the EIS exhibition phase of the project we:

- Are holding community drop-in sessions in Stockton and Carrington.
- Will continue to maintain a Hunter Valley Hydrogen Hub project website at originhydrogen.com.au
- Will continue to have a direct number and email to contact us on.

Contact us
 contact@ghd.com or
 1800 066 243

Planning details

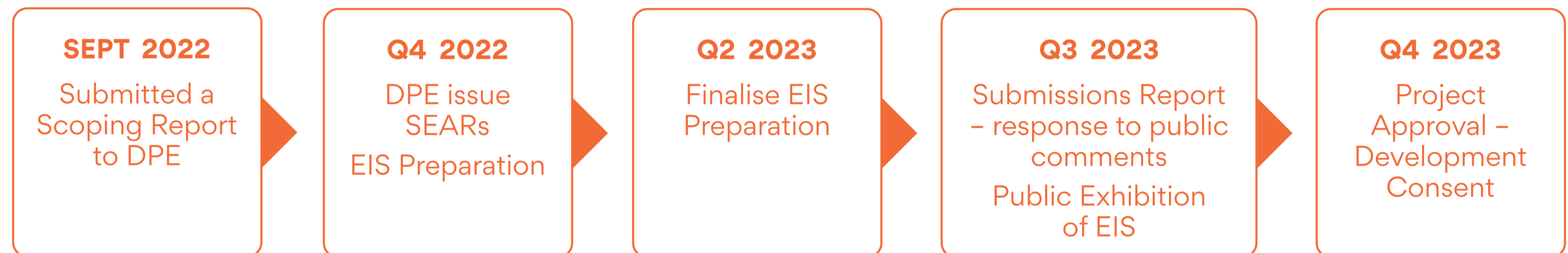


The EIS has been informed by a range of technical impact assessments and studies including, but not limited to:



Origin has lodged a development application for the Hydrogen Hub, as a *State Significant Development under State Environmental Planning Policy (Planning Systems) 2021*.

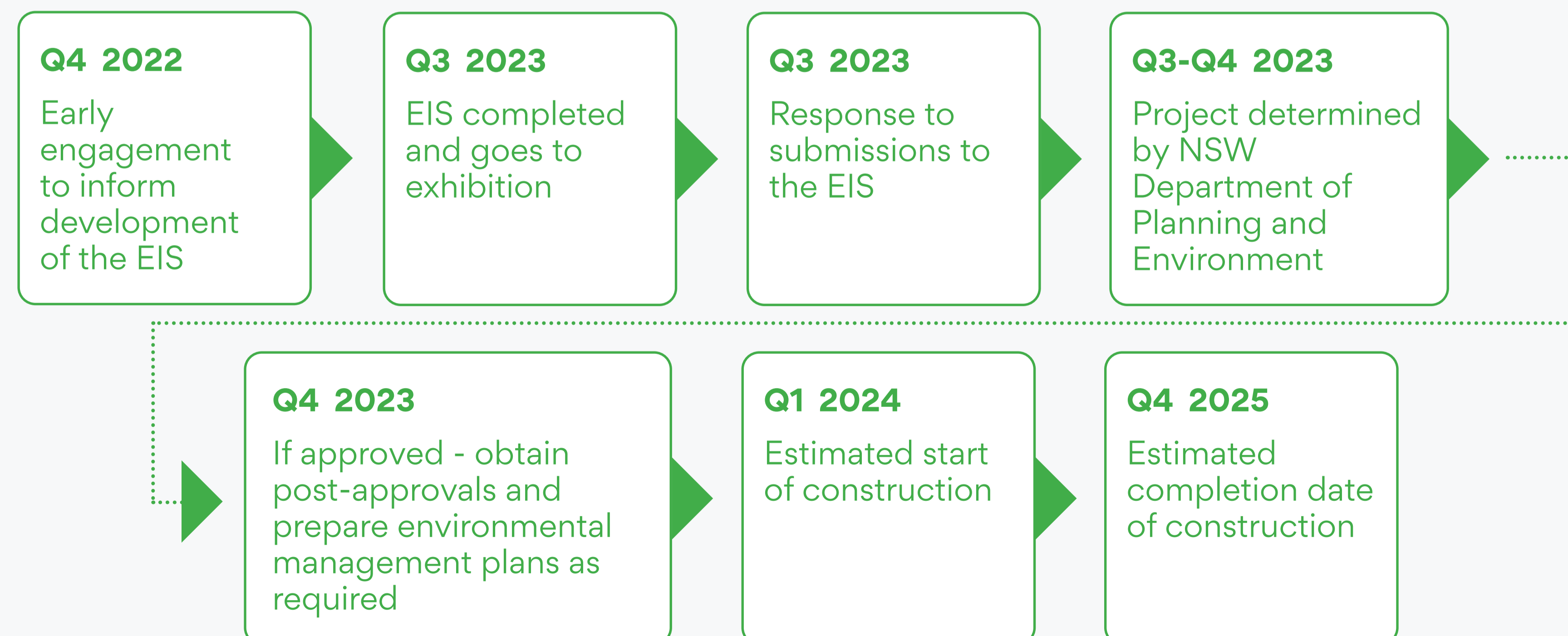
The Secretary's Environmental Assessment Requirements (SEARs) were received from the Department of Planning and Environment (DPE) on 18 October 2022. An Environmental Impact Statement (EIS) has been prepared under these assessment requirements.



Environmental Impact Statement

The Environmental Impact Statement (EIS) assesses all environmental, economic and social impacts for the proposed hydrogen hub. The EIS includes mitigation measures to minimise any significant impacts on the local community or environment.

The Department of Planning and Environment will publicly exhibit the EIS and will consult with City of Newcastle government agencies, other key stakeholders including the community.



Soils and geology



The site and utility connections are located on land which is characterised as disturbed terrain reclaimed prior to 1965. The underlying soils comprise of gravels, sand, silt, clay with components of 'waterloo rock' marine and freshwater deposits and are known to contain residual phosphogypsum from a previous industrial land use.

A full detailed site investigation has been conducted to provide an understanding of the site's potential contamination history and to identify potential impacts. Site investigations have identified that the likelihood of significant contamination is low.

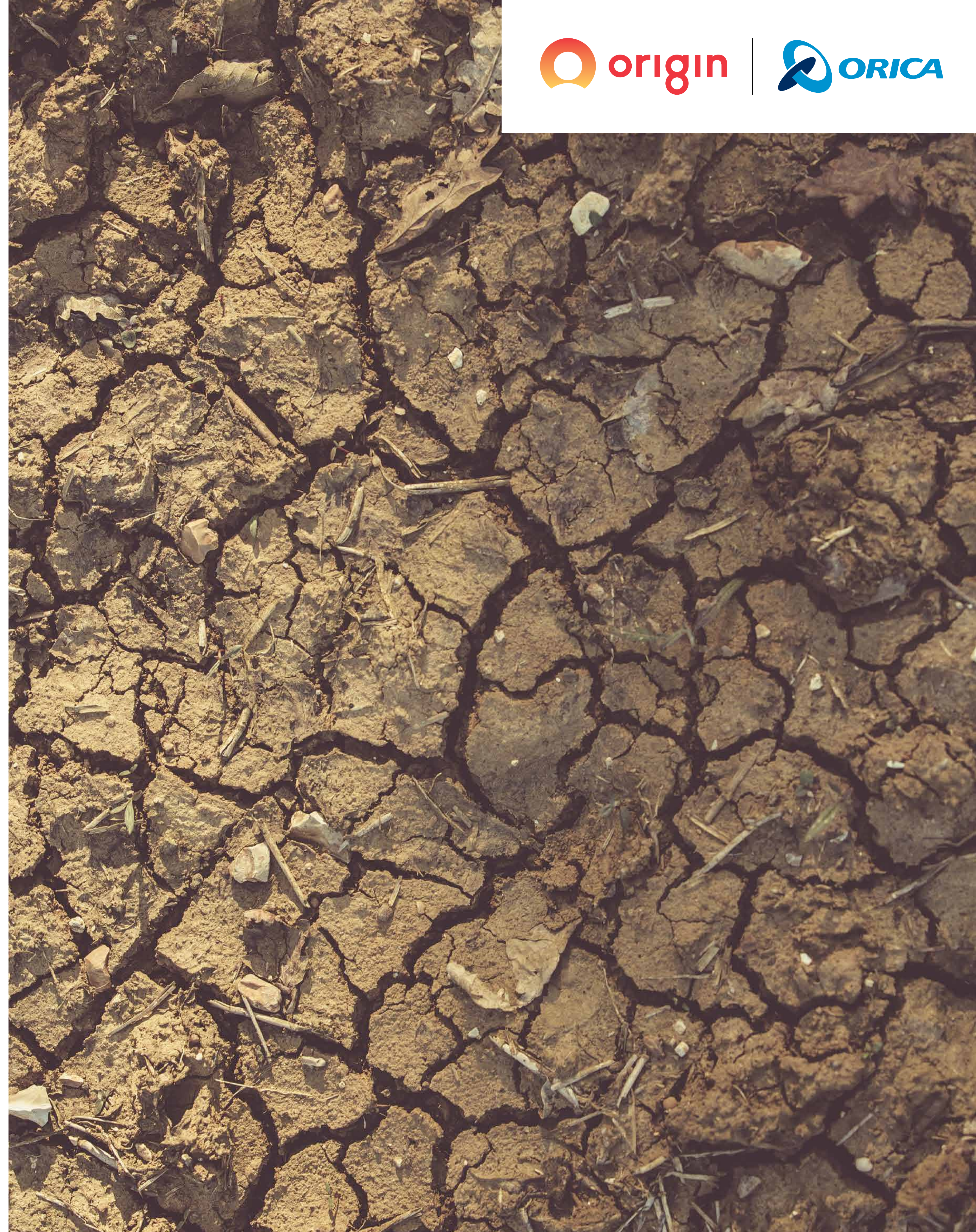
Construction

Due to the previous land use, contaminated soils may be encountered during construction. The movement of plant equipment and machinery over exposed surfaces may lead to erosion and compaction of fill. Any soil stockpiled or exposed would also be prone to wind and water erosion. Management plans will be developed to ensure this is mitigated during the construction period.

Our assessment approach

The Environmental Impact Statement has assessed any impacts to soils by:

- Assessment of the existing soils by utilising available regional mapping including underlying geology.
- Review of available site-specific contamination reporting and publicly available data on the EPA's contaminated lands database.
- Assessment of potential erosion and sedimentation impacts from the project.
- Identification of proposed sediment and erosion controls for the project.
- Identification of any other necessary mitigation measures.





Landscape and visual impact



The Hydrogen Hub will be set back from Greenleaf Road. Features of the site will be generally low lying, with cooling towers, tanks and sheds being the largest significant structures. Distribution lines will be required to power the site. Our intent proposal is for these to be underground similar to the Ausgrid distribution lines in the area to minimise visual impact.

The project team is working with various landowners to make sure access would be available for the distribution lines to connect the hub to the Ausgrid sub-station.

The site is on a large, cleared block in the industrial precinct of Kooragang Island surrounded by similar industrial sites. Vegetated areas are located north of the site, with the north arm of the Hunter River east of the site between the Kooragang Island and the Stockton Peninsula.

Construction

During construction, views of the site will be temporarily altered by construction plant equipment and associated

facilities. Given the surrounding industrial area, this will have a negligible impact on the visual amenity of the site.

Operation

The main visual elements of the project is proposed to include:

- Electrolyser modules and associated plant infrastructure.
- Water treatment and cooling system.
- An onsite hydrogen vehicle refuelling station.
- Hydrogen storage trailer filling bays to supply hydrogen to satellite hydrogen refuelling stations.
- Heavy vehicle parking for hydrogen storage trailers.
- Workshop, storeroom, switch rooms, communications and safety control and site office.
- Internal roads, car park for employees and truck parking.
- Fencing, landscaping and business identification signage.

Our assessment approach

- A high-level assessment was completed to identify the potential visual impacts of the project on the nearest sensitive receivers such as public roads, residences, work and recreation areas.
- The assessment evaluated 5 viewpoints and 3 landscape character zones.
- The assessment concluded that the proposal is consistent with the existing visual character and would have low to negligible impact on visual amenity.



Managing hazard and risk



Hydrogen, like many other gases, is highly flammable and can be dangerous if handled incorrectly. Origin and Orica bring extensive experience to handling gases and safely operating major hazard facilities. Origin has extensive experience in generating, storing and transporting a range of gases such as LNG and LPG, following and often exceeding all Australian and state legislated regulations around safety and the environment.

Risk controls

Origin and Orica use well recognised techniques to identify and manage risks. While we prioritise removal of risks, some risks need to be managed and mitigated. The facility will be designed to minimise risks beyond the site boundary.

We continue to work to reduce the hydrogen inventory on the site, which will further reduce out on and offsite risk.

These risks may include:

- Spills associated with chemicals used for water treatment.
- Fires within the facility infrastructure.
- Fires on the hydrogen supply pipeline to Orica.
- Incidents related to the offsite transportation of hydrogen.
- Ignition of hydrogen gas leaks from storage tanks and pipelines.
- Equipment failure.
- Hydrogen refuelling station user accidents.
- Onsite storage of dangerous goods.
- Operational truck movements can generate hazards and risks such as vehicle collisions.

Our assessment approach

- A risk screening confirmed that the project is classified as Potentially Hazardous (per the NSW regulation).
- The results of Preliminary Hazard Analysis indicated that the project complies with Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning (HIPAP 4) risk criteria.
- Modelling indicated the risk of a single fatality is one in 16,500 years.
- The incorporation of hydrogen specific Australian design and codes of practices will be incorporated into the final design to further mitigate and minimise hazard and risk.

Noise and vibration



A noise and vibration impact assessment has been completed to ensure the project is designed and constructed in accordance with the relevant Environment Protection Authority noise guidelines and Australian Standards.

The area has typical ambient noise levels from industrial land uses and the use of large-scale plant and machinery. Noise from local road traffic, rail transportation and port operations are also present.

Construction

During construction, the project has the potential to generate noise from a variety of sources, including:

- Site establishment and earthworks.
- Installation of equipment.
- Loading and storage of materials on site.
- Movement of heavy vehicles to and from the site.

Construction noise and vibration impacts would be short-term.

There is also potential for some traffic noise from the delivery of materials to site during the day, typically between 7:00 am to 6:00 pm Monday to Friday. Traffic movements may also occur outside of these hours.

Operation

The project would operate 24 hours a day 7 days a week. The operation of plant and equipment including compressors, pumps and generators would generate noise, as would the small number of hydrogen storage trailers taking hydrogen offsite.

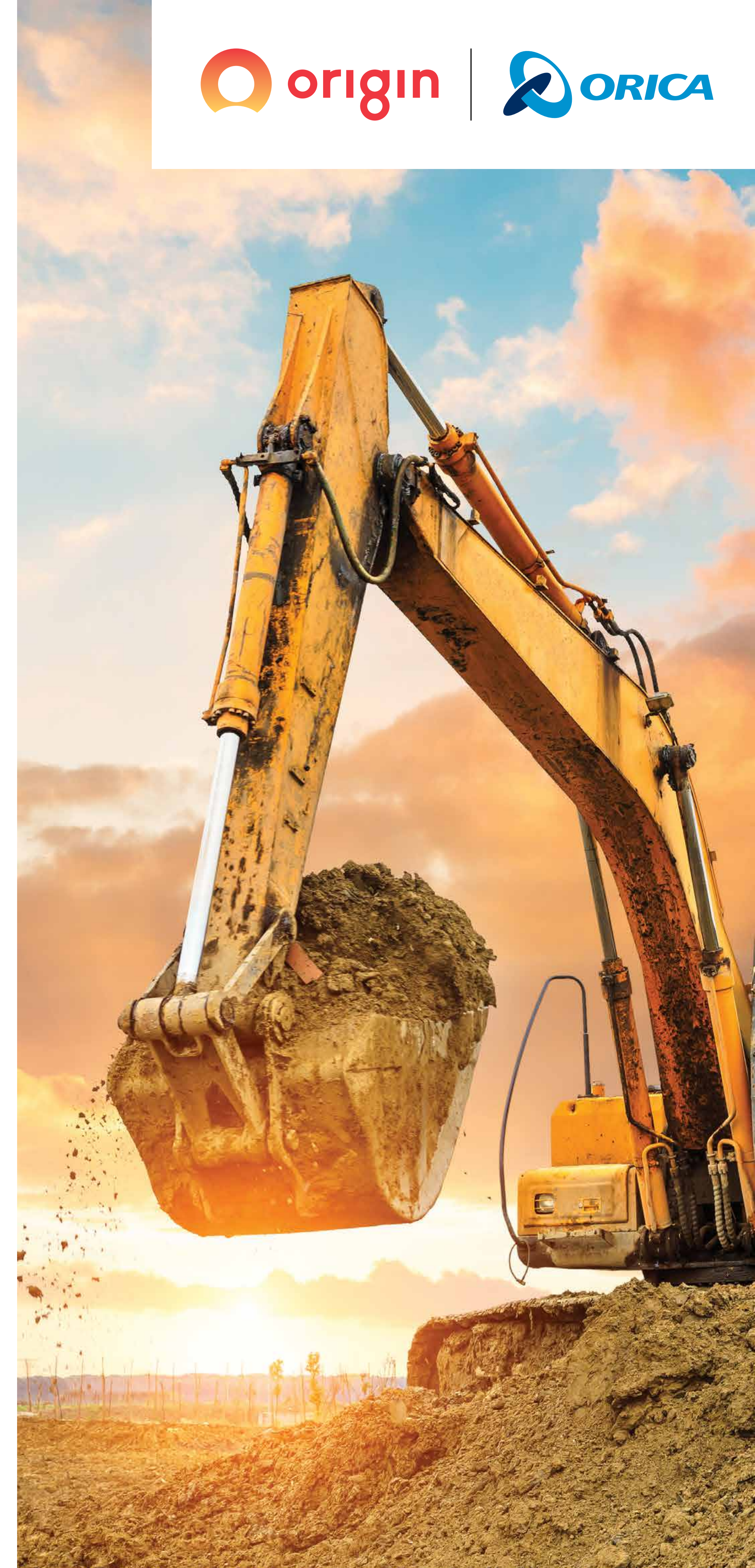
Predicted operation noise simulations indicate the following:

- Noise levels at residential receivers are predicted to comply with the residential project specific noise criteria during the day, evening and night-time periods at all receivers.
- Noise levels for industrial receivers adjacent to the project site as well as active and passive recreation areas in Stockton are predicted to comply with the project specific noise criteria at all receivers during the day, evening, and night periods.
- Operation of the project would not result in sleep disturbance.

Our assessment approach

Noise and vibration impacts were assessed by:

- Reviewing background information including meteorological data.
- Establishing background noise levels.
- Development of a noise model including identification of noise sources.
- Identification of noise trigger levels and criteria for assessment.
- Identification of the likely noise and vibration impacts from construction and operational activities.
- Undertaking an assessment of traffic noise impacts with consideration to the relevant guidelines.



Air



Air Quality

One of the advantages of producing hydrogen is that the only by-products of electrolysis are oxygen and water.

Construction

During construction, dust from materials handling, machinery and truck movements may impact air quality, noting the site is located in an industrial precinct where dust is present. Construction traffic and machinery will also generate exhaust emissions.

Operations

During operation, additional truck movements transporting hydrogen will generate exhaust emissions.

Our assessment approach

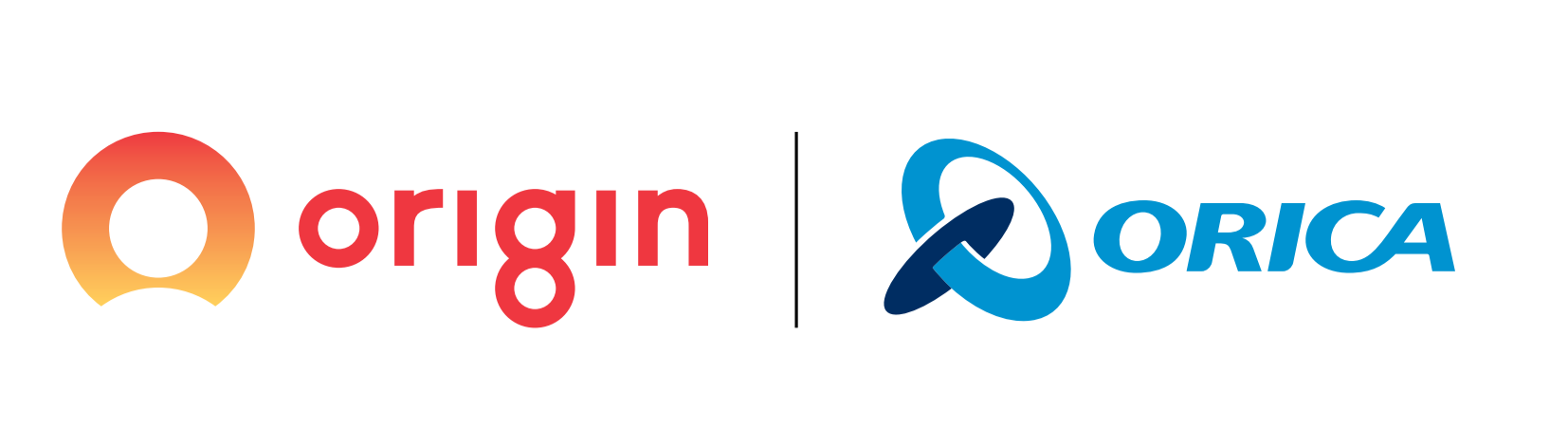
An Air Quality Impact Assessment was undertaken to determine the potential impacts on nearby sensitive receptors. The assessment included:

- Reviewing project information on sources of air emissions.
- Defining the existing air quality environment.
- Identifying all likely sources of air pollution.
- Quantifying potential impacts.

The assessment concluded:

- All residential receptors are located outside the 350m buffer and impacts are considered negligible.
- Receptors within the buffer are industrial and classified as low sensitivity.
- During operation, no odour impacts are anticipated at sensitive receptors.
- Operational air quality emissions impacts are minimal to negligible.
- In context of the existing industrial environment, offsite impacts at the nearest sensitive receptors are considered to be negligible.





Water



Recycled water will be sourced from the Kooragang Industrial Water Scheme (KIWS) with wastewater treated on site and discharged back to Hunter Water via an underground pipeline.

The site is relatively flat and has no formal flood structures. The Newcastle flood map identifies it as having a very low flooding risk.

Construction

During construction, erosion and sediment control would be applied to manage any potential impact to waterways due to soil erosion or flows from stormwater runoff.

Operations

During operations, the Kooragang Industrial Water Scheme will supply process water for hydrogen production and plant cooling. Wastewater from the process will go into the Hunter Water sewerage network.

Our assessment approach

The Environmental Impact Statement included a Water Impact Assessment of surface and groundwater.

This assessment included:

- Review of topographic information, site features, along with potential sensitive receiving environments downstream of the project, including the approved subdivision infrastructure for the site.
- Review of proposed construction methodologies, potential impacts and identification of appropriate measures to manage these impacts in accordance with the relevant legislation and guidelines.
- Review of proposed operational parameters, potential impacts and identification of appropriate measures to manage these impacts in accordance with the relevant legislation and guidelines.
- Review of site flooding information as available from City of Newcastle Council (Council) and identification of appropriate flood management measures commensurate with the identified flood inundation risk and flood hazard.
- Review of water supply arrangements and demands.
- Characterisation of the existing groundwater conditions, including groundwater level, and identification of potential groundwater receptors.
- Identification of locations where groundwater may be intercepted by the project.

A water source assessment has also been developed for the project that considers water supply, demand and discharge to the wastewater system.

The assessment concluded:

- The assessment indicates that the construction and operation of the project is unlikely to result in impacts to local surface water quality and quantity, including receiving environments such as the Hunter River.
- The assessment concluded that the site would not experience inundation (1% AEP event) and the risk of flood is very low.
- The potential impacts to water quality during construction are limited and will be mitigated through implementing appropriate environmental management measures. The project design has included sediment basins to detain water and reduce stormwater runoff.
- The project will require a new pipeline to connect the facility to the existing Kooragang Industrial Water Scheme. The process water demand will average up to 0.7 to 1 ML per day of recycled water for hydrogen production and cooling.



Traffic and transport



The site is currently accessed via Greenleaf Road, from Teal Street and then either Nelson Bay Road heading north or Cormorant Road to head west towards Mayfield via the Tourle Street bridge.

Construction

Construction will require up to 20 heavy vehicle movements and approximately 90 light vehicle movements per day. Impacts will be greatest during morning and afternoon peak times. It is not expected that traffic volumes will be in excess of the capacity of the existing road network.

The hydrogen supply pipeline and utilities will be installed along the road reserve at various locations along Greenleaf Road. Construction activities will require partial short-term road closures.

Operation

During normal operations, it is expected that the project would generate between six and 10 personal vehicles per day. Once the project matures during operation, the daily number of heavy vehicles associated with the project will be approximately:

- 15 heavy vehicles (exporting hydrogen from the project site via hydrogen storage trailer).
- 30 heavy vehicles accessing the project site for refuelling.
- Swept path analysis has demonstrated that heavy vehicles can safely manoeuvre into, through and out of the site.

Our assessment concluded

- Construction traffic is expected to have a negligible impact on intersection performance, road safety and limited additional delays.
- Given that operational traffic is significantly less than during construction, negligible impacts on road and intersection performance are anticipated.



Biodiversity



The Environmental Impact Statement (EIS) included a Biodiversity Development Assessment Report (BDAR). This identified 2.05 hectares of heavily disturbed native vegetation within the site, none of which are in a natural state.

Areas without hardstand are dominated by exotic species with minimal environmental value.

- No threatened ecological communities or flora species are present at the project site.
- No loss of hollow-bearing trees and all woody native vegetation will be avoided by alignment options or by using trenchless construction methods.

- The Green and Golden Bell Frog is present on Kooragang Island, with most records located to the west in better quality habitat. Green and Golden Bell Frogs were not observed (visually or aurally) during field surveys.
- The waterways surrounding the site are mapped as key fish habitat. The project would not involve removal of marine vegetation with no impacts on fish passage.
- Listed threatened or migratory bird species have been recorded nearby, however any such species are not expected to be impacted by the project due to the lack of suitable habitat or foraging opportunities on the site.

Our assessment concluded

- Construction activities will be contained within defined boundaries and trenchless construction methods employed, where applicable, to minimise disturbance.
- Due to the heavily modified and disturbed state of the identified vegetation, impacts are anticipated to be low to negligible.
- The project is not anticipated to contaminate or degrade water that may interact with surrounding areas.
- Operational impacts on native flora and fauna and other biodiversity values will be negligible.

Heritage



Historic heritage

- A desktop search of the relevant databases and the Newcastle Local Environmental Plan 2012 (LEP) and State Heritage Register was undertaken for items of historic (non-Aboriginal) heritage significance within close proximity to the project site.
- There are no items identified on the project site and a search area of 500m of the project site identified no local, State or national historic heritage items.
- Neither construction nor operation would result in impacts to any known items of significance.

Aboriginal heritage

- The site is located on heavily disturbed reclaimed land.
- A search of the Aboriginal Heritage Information System showed no listed Aboriginal heritage items within the project footprint.
- The project site is reclaimed land with a history of being highly disturbed. While the likelihood of any impact is considered low, we engaged with the Awabakal and Worimi people and completed an inspection of the site.

An Aboriginal Cultural Heritage Assessment (ACHA) was completed, including:

- Identifying Aboriginal cultural heritage sites.
- Undertaking consultation with Register Aboriginal Parties (RAPs).
- Identifying any cultural values connected with the site.

The ACHA concluded:

- Of the 12 RAPs identified all individuals and organisations supported the project to move forward.
- Social significance to the Aboriginal community due to connection with Country and Dreamtime stories. This has been noted and incorporated into management measures.
- No Native Title Claim cover over the site is evident.
- Overall, no Aboriginal objects/sites and/or places are anticipated to be impacted during construction or operation.





Greenhouse Gas Emissions



Greenhouse gas (GHG) emissions have been estimated for both the construction and operational phases of the project.

The project is expected to have low net emissions associated with energy use due to the proposed matching of electricity supply with renewable electricity through the purchase of large-scale generation certificates (LGCs). Diesel consumption from vehicles, equipment and other project operations is expected to account for approximately 97-100 per cent of the project's construction and operational emissions.

Key areas of energy use or emission sources for the project include:

- Construction of the hydrogen production facility.
- Construction of a new pipeline easement and connection to the Kooragang Industrial Water Scheme (KIWS) and other support infrastructure.
- Operation of a hydrogen production facility, resulting in electricity demand supplied by the national electricity market (NEM).
- Transportation of hydrogen, major equipment or materials via hybrid fuel trucks.

Our assessment concluded

The majority of construction emissions stem from diesel consumption for vehicles and equipment. Emissions totalling 3,188 tonnes of carbon dioxide equivalent (t CO₂-e) are estimated for the 25-month construction period, equating to on average 1,531 t CO₂-e per annum. This is 0.0006 percent and 0.002 percent of Australia and NSW's annual total emissions (2020) respectively.

Due to the purchase of offsets (LGCs) and/or Renewable Electricity Guarantee of Origin (REGO) certificates, there will be no net operational Scope 2 GHG emissions associated with hydrogen production. Offsets required for operation of the project are estimated at approximately 133,900 t CO₂-e / annum.

The transportation of hydrogen to offsite refuellers is estimated to generate 438 t CO₂-e per annum. The project is exploring the opportunity to lower these through the use of hydrogen-fuelled trucks or lower emission fuels, such as biodiesel.

During operational phase, the project will support the decarbonisation of customer operations.

The major GHG emissions benefit will be seen downstream using the renewable hydrogen to displace carbon intensive fuels at Orica and also in customer heavy vehicle transportation. Projections estimate that this project could result in total downstream GHG emissions (Scope 3) reduction by 68,000 tCO₂-e per year at peak production.

The total downstream GHG emissions reduction over the first 10 years of operation (2026 to 2036) is estimated at approximately 680,000 t CO₂-e for our customers' operations. Overall, the project is expected to have a net positive GHG benefit in offsetting GHG emissions through the displacement of the use of fossil fuels. This is predicted to result in a net reduction in GHG emission across the Hunter.