



SUBMISSION TO THE
**SENATE SELECT COMMITTEE ON
UNCONVENTIONAL GAS MINING**

14 MARCH 2016

Foreword

The story of CSG in Australia continues to develop.

And at the heart of this story are our landholders.

Origin's diverse business brings us into contact with a range of people and how we approach and build relationships over time is important. We believe that co-existence can - and already does - happen. The best way for us to demonstrate this is to share the experiences of some of our landholders. These experiences can be found in Section 1 of this submission.

It is also important that our landholders are fairly compensated for our activities that occur on their land. To date, Australia Pacific LNG has committed around \$400 million to our first one hundred landholders over the life of the project. As development progresses over the next 30 years, we will reach agreement with more landholders and they will also receive compensation which adds value to their land.

We strive to ensure that multiple land uses can occur at one time. We consult with our landholders to make sure that our activities complement their existing business and we work with them to achieve their business goals. Of our first 100 landholders for the Australia Pacific LNG project with gas infrastructure on their land, 100% of them are still using their land for farming and grazing purposes. This is another demonstration that co-existence does occur. Also, a recent independent market analysis has shown that the growth in the value of properties in the regional areas where there is gas development has exceeded growth in the surrounding regional areas.

In achieving co-existence, it is also important that Origin seeks to work with the communities in which we operate. Being part of the community as well as supporting long term regional development is needed to achieve this. Origin has implemented a 'Living Local' program which incentivises our employees to live within regional communities. We also source contracts from regional suppliers and to date, Australia Pacific LNG has invested \$46.1 million dollars in the communities in which we operate. As part of the project, we have also upgraded major infrastructure such as roads and airports and established health and education facilities.

The development of gas also provides significant economic benefit to Australia and the communities in which the development occurs. These benefits come in the form of jobs, economic growth, government revenue and lasting infrastructure development. The development of gas increases the available supply to enable the increasing demand for gas in Eastern Australia to be met.

We also support the safe and responsible development of gas and a robust, scientific-based regulatory framework for the industry. Origin has in place systems and procedures to ensure that we meet our legislative requirements in relation to health, safety and the environment. We also strive to adopt innovative processes which reduce our footprint and seek to provide better protection for the environments in which we operate.

So, what is CSG? Coal Seam Gas is simply natural gas taken from the coal seams. For over 20 years, CSG has been an important part of the gas supply for Queensland and electricity generation in Australia. In Australia, CSG is plentiful and CSG has been known about ever since the coal mining industry began in Australia in the early 1900's. Currently, CSG provides 90% of Queensland's gas needs and 15% of the state's electricity generation.

Gas has also become an important part of the energy mix both within Australia and internationally. As countries seek to diversify their energy mix and decarbonise their power supply, gas has the ability to play an increasing role in displacing higher carbon intensity fuels, such as coal. Gas can also play an important role in complementing the development of renewable energy.

Origin has a long history of onshore gas development. For over 20 years, Origin has engaged with communities and landholders and worked in many States and Territories to explore, develop and produce gas. Origin is also the upstream operator of the Australia Pacific LNG project.

We recognise that the development of gas has not been a positive experience for some people. We have examples with some of our own landholders who were initially opposed to gas development and through listening, understanding and co-operation are now supportive. However, we recognise that some people are fundamentally opposed to the development of gas and we respect their opinion.

In all that we do, we seek to continuously improve. We learn from our own work and the research of others. We have implemented innovative processes to work more effectively with our landholders and the community and to reduce our impact.

It is for all of these reasons, that any debate within Australia about the supply and demand of gas must be a fact based discussion which properly considers all aspects of the industry.

At Origin, we believe that energy needs to be provided reliably, at an affordable cost and in an environmentally responsible way. Origin is proud of its operations. We are committed to the communities in which we work as well as the long term sustainability of the Australian gas market and we are on a path to a carbon neutral energy future.

We extend an open invitation for the Senate Committee to see firsthand our operations and speak with our landholder partners.

David Baldwin
CEO, Integrated Gas
Origin

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1. What our landholders say about us

For over 20 years, Origin has worked with landholders and communities to achieve co-existence.

Origin firmly believes that co-existence can - and already does - happen. We seek to ensure that multiple land uses can occur at one time. We also work to complement our landholders' businesses and work with them to achieve their business goals.

The best way for us to demonstrate this is to share the experience of two of our landholders.

Landholder experience

Simon Drury

My name is Simon Drury and along with my wife Kylie, and our four sons, own and operate a 5500 acre property called "Condabri" located on the Condamine River between the towns of Miles and Condamine on Queensland's Western Darling Downs.

We have a family-run business, comprising a 5000-head feedlot and 500 acres of irrigated crops. We supply grain-fed beef to the domestic and international markets under the Condabri Beef label as well as others.

Over the past 20 years "Condabri" has been developed into a highly intensive farming enterprise and now co-exists successfully with the highly intensive Coal Seam Gas industry which is extracting natural gas from beneath our land and exporting it throughout the world.

It has been a most successful partnership which has benefitted all involved including my family, our neighbours, and the surrounding districts and, of course, Origin Energy.

Our four sons, along with other young people in our area, now have a future here without being forced to chase jobs hundreds of kilometres away.

This is a benefit shared by a number of families in our area as well as many more where the landowners have embraced the CSG industry.

Since we were first approached by Origin in 2007 to establish a small pilot project of four test wells aimed at proving the viability of the gas field, we have met and dealt with many changes as we got used to having our land used for a dual purpose and by another company other than ourselves.

Today, we have 50 wells operating on our land.

In the beginning, some people queried my wisdom of embracing CSG on our property but now many questions are raised by landholders enquiring how CSG could benefit them. I can't over emphasise the good that has come

about as a result of the CSG industry in our region.

When Origin first came to us with a plan to establish 50 wells and all the accompanying infrastructure a couple years after the test wells were drilled, we were able to have input into where most of them would be sited.

We put them behind shade lines, and in the corners of paddocks and in previously unproductive areas and in out of way positions.

We found Origin was willing to be flexible in this regard.

Another illustration of Origin's flexibility came after the 2010-2011 floods which caused damage to a lot of the infrastructure, including our family home, on our farm. We decided to build a new house on higher land. There was a well planned on the site we had chosen and after consultation with Origin, it was relocated away from our new home.

When the first wells were drilled, it would take drilling contractors four days to complete the task. Now the process is much faster and much more streamlined and wells can be drilled in a 24 hour period using the new minimal disturbance rigs. The wells on our property are operated on electricity instead of diesel powered gensets therefore causing no noise pollution.

Water taken from the coal seams is a by-product of CSG. It has benefited irrigators, local towns and industries in our region greatly to have access to good quality water since the wells were installed.

Unfortunately much of what is portrayed in the media regarding the opposition to CSG is not entirely accurate. We have experienced no detrimental effects to our land or our business. Upon completion of the development, our property has been restored and improved to a high standard.

We now have passive income which adds to our business and peace of mind. Having CSG on our properties has not only helped us but hundreds of landholders in the Surat Basin. The process of working out a fair conduct and compensation agreement was challenging in the beginning, however, with goodwill this was negotiated to both parties satisfaction.

It is fascinating to see how our gas is being converted and exported to energy hungry countries throughout the world.

I see that the gas industry and farming can co-exist and that the relationships we have formed with Origin will go from strength to strength in the years ahead.

Landholder experience

Brett Griffin

My name is Brett Griffin, a third generation Yuleba grazier.

With my wife Di, I run cattle on our 16,000 acre grazing block 50km north of Yuleba in Queensland's Surat basin. We have two sons Harley, 29 and Hamish 24.

We have 120 CSG wells, with 8 still to complete, on our property and after initially being a reluctant participant I have seen the benefits that have flowed to us and as a result have changed my views.

This was helped by the way Origin has fostered good relations, not only with me, but with other landowners.

I look at it this way. Gas chooses you, you don't choose it. So it's a shock when it comes.

We are all divided into three groups. Active participants, reluctant participants and conscientious objectors.

But the thing about that is you can change camps as time goes by.

I would have kicked off in the reluctant end of reluctant participant but as I saw the benefits of what came on here and what we were able to achieve, we went from being completely at the mercy of the weather and the markets to a more financially secure situation.

Right at the start I made a point of learning as much about the industry as I possibly could so that I was in a position to negotiate with some knowledge.

At first, negotiations were difficult because what was promised or spoken about was not always carried through.

That all changed when Origin appointed a full time company contact which signalled the turning point in my relationship with Origin. I'm told it was the same for other landowners.

It's all mutual respect and cooperation. Origin did their best to minimise disruption.

During construction there were often 250 vehicles a day going through my front gate. Security guards were stationed at the entrance and vehicles had to be signed in and out with only authorised personnel having access.

We sold water and gravel during their construction. But that wasn't all. I was able to negotiate a number of additional things that have been a benefit to our company.

A big positive was being able to set up my sons in a water trucking business supplying the gas industry in the area. It has grown quite amazingly and the boys are flat out and now employ a number of locals.

Another example of cooperation involved 1000 tonne of rubble that Origin had and were faced with dumping it in Roma. We were able to negotiate to use that rubble on our property for erosion control - we were doing each other a favour.

Origin needed to get water to different parts of the property for their development and we worked together on this for our mutual benefit and I was able to get watering points for my cattle at the same time. This was a great positive for me.

A couple of years ago my neighbours and I had a bad bush fire and in the clean up everyone did their part including Origin who supplied equipment and personnel.

My relationship with Origin has developed over the years. We are totally up front with each other. We work, I wouldn't say as partners, but we coexist on a pretty good basis. It's a good relationship.

When I went to Curtis Island last week for celebrations for the first international export for Australian Pacific LNG I was struck by just what a big operation it is. It is quite obvious that it has created a lot of work for a huge number of people.

It's massive and to have got that off the ground is a pretty big thing.



CO-EXISTENCE ON THE LAND

AROUND \$400M
in committed
compensation value to
100 LANDHOLDERS
– with more value for
others to come



of our
FARMERS
and **GRAZERS** with
gas infrastructure **STILL**
FARM AND GRAZE
THEIR LAND

WELL SITE
is half the size of a
TENNIS COURT



Plain English
agreements



OVER 900 agreements
reached with landholders
across **700 PROPERTIES**



Continuously
LEARNING and
IMPROVING

I can't over emphasise the good that has come
about as a result of the CSG industry up here,
Simon Drury - Landholder, Condabri



2. Achieving Co-existence

On the land

As the two stories above demonstrate, co-existence with our landholders is not only possible, but can be welcome. We focus on ensuring the sustainability and co-existence of our landholders' businesses and our operations.

a) Accessing the land

In Australia, the rights to minerals and resources below the land's surface, including natural gas, are held by the state and territory governments. As the natural gas resource is located under the surface of the land, where we do not own the land, we need to be able to negotiate access to that resource. How we approach and build relationships over time is important to our business and our ongoing relationship with landholders - and most relationships start with land access.

Overwhelmingly, Origin has found that we are able to work constructively with landholders to ensure that access to land is on agreed terms. Overall, we have signed more than 900 agreements over 700 properties with over 400 landholders as part of the Australia Pacific LNG project. During the 2015 financial year, we signed 59 Conduct and Compensation Agreements (CCAs).

Our strong preference is that we do not enter private land for exploration or development activities without prior consent.

b) Negotiating with our landholders

Under Queensland legislation, generally, before development work can begin, a petroleum authority holder must negotiate a CCA with the landholder and land occupier. This is an important process because it establishes not only the short term access arrangements but also conduct during the ongoing relationship.

Origin has developed our own process to engage with landholders during negotiations. This process is designed to foster ongoing co-existence. An outline of our typical process can be found at Annexure 1. However, in every negotiation individual circumstances are taken into account and therefore timeframes may vary.

Negotiations with landholders start well in advance of when access is required, usually more than 12 months prior to the proposed start date of activities. During the negotiation process, Origin consults with landholders about their business activities and requirements and, as far as practicable, attempts to locate infrastructure and to schedule activities to minimise disturbance to landholders.

Our negotiations typically allow for time well in excess of those periods set or required under legislation.

During negotiations, landholders give input into the terms of access and obtain legal and other expert advice. Origin's land access agreements are drafted in plain English, and

adjusted to meet the needs of landholders. They outline when, where and how we will access land, carry out our activities and rehabilitation work, as well as the compensation payable.

Origin also consults with landholders about the design and location of infrastructure on their land and provides landholders with time to consider our development plans. For example, actual well locations are decided in consultation with landholders to ensure minimal impact.

The process that we follow in designing well layouts takes account of landholder constraints, environmental approval conditions and environmental constraints on the land, and sub-surface design factors. The design process typically involves a desktop assessment followed by 'ground-truthing', and then further consultation with landholders. Through the consultation process, we have been able to shift the location of wells for a number of landholders where it has become clear that different siting of one or more wells can have a less significant impact on agricultural operations on the land.

A CSG well-head and associated infrastructure is smaller than an average water tank and the fenced off area around the well is typically about half the size of a tennis court. An example of a fully rehabilitated well site in an agricultural land use setting can be seen in Figure 1.



Figure 1

Also, as technology continues to evolve, so too does the way that industry designs and constructs a well site. For example, a well site that is constructed today is about a quarter of the size of what it has been previously and as technology continues to improve, we anticipate that the footprint of a well site will continue to reduce.

c) Compensation

We pay compensation to landholders for a range of activities associated with gas development and production.

Compensation is ordinarily paid annually to landholders to recognise the long-term nature of Origin's relationship with its landholders. Compensation payments in the first few years are usually greater, given that construction activities and associated rehabilitation occur during this period.

Out of respect for our landholders and our duty of confidentiality, Origin does not disclose the details of negotiations with specific landholders.

However, Origin can confirm that we have approximately \$400 million in committed compensation payments to our first 100 landholders over the life of the Australia Pacific LNG project. As development progresses over the next 30 years, we will reach agreement with more landholders and they will receive compensation which adds value to their land.

Compensation to landholders with development CCAs up until 31 December 2015¹

Type of property	No. of properties	Range of total contract values ²	Average contract value ³
Grazing and Cultivation Combination	16	\$600,000 - \$28 million	\$8 million
Lifestyle and Grazing Combination	13	\$300,000 - \$3 million	\$1 million
Lifestyle	27	\$70,000 - \$1 million	\$400,000
Grazing	31	\$65,000 - \$50 million	\$7 million

¹ Excluding one landholder with only cultivated land to avoid compromising anonymity

² Per property over the 30 year contract life, assuming 2.5% CPI

³ Per property

The 87 properties described in the case study above represent our longest landholder relationships.

In terms of compensation payments to date, Australia Pacific LNG has paid between \$80 million and \$100 million in landholder compensation between FY11 and FY15 (5 years).

Our landholders often tell us the compensation we pay provides overall value to their property and businesses.

d) Conduct on private land

In Queensland, the Land Access Code¹ has applied to the gas industry since November 2010. Legislation requires gas companies to comply with the Code, which contains a number of 'Mandatory Conditions' that must be adhered to.

The 'Mandatory Conditions' in the Land Access Code require Origin (and all gas companies) to take in account many behavioural and conduct aspects, and these range from ensuring employees are trained, maintaining good repair of roads, ensuring the speed of vehicles is appropriate, ensuring all gates are closed, and removing waste from private property.

Origin's Landholder Charter outlines Origin's vision and the commitments that Origin expects its staff and contractors to comply with, including our conduct on private land. This document is contained in Annexure 2.

In addition, Origin also agrees with each landholder any specific terms of access relevant to that landholder's property or business operations.

e) Positive impacts on property values and agricultural businesses

Independent market analysis

A recent independent detailed market analysis has shown that properties in the regional areas where gas is being developed, have increased in value compared to properties in surrounding regional areas where gas is not being developed.

This analysis, undertaken by Taylor Byrne Property Valuers, shows that gas development has a positive impact on property values. In particular, the report found that:

"rural property values in the Surat Basin have increased from 2005 to 2015 and more specifically... rural values have increased in the Surat Basin from 2010 to 2015."

Furthermore, the report found that in other similar regional areas without gas development, property values have decreased:

"the market in [the Goondiwindi Region] has been volatile with a series of rises and falls between 2005 to 2015 and between 2010 and 2015. Since 2010 the values have actually decreased, meaning this market has not performed as well as the Surat

¹ Department of Natural Resources and Mines (formerly Department of Employment, Economic Development and Innovation), November 2010

Basin over the period 2010 - 2015.”

“...the [North and South Burnett Region] market has also been more volatile than the Surat Basin market since 2010, and in fact the values over the period 2010 - 2015 have fallen.”

The findings of the analysis are summarised in below:

Findings of detailed market analysis

Sale research region	Median value starting point 2010	Median value finishing point 2015	Difference	% change
Surat Basin	\$1,438/ha	\$1,684/ha	\$246/ha	17.1% growth
North and South Burnett Regions ¹	\$2,322/ha	\$1,799/ha	-\$524/ha	-22.0% drop
Goondiwindi Region ²	\$1,505/ha	\$1,193/ha	-\$312/ha	-20.7% drop

¹ North and South Burnett Regional Council areas

² Goondiwindi Regional Council area

GISERA Research

Gas Industry Social and Environmental Research Alliance (GISERA) research² has also indicated that compensation payments for the development of gas infrastructure on land can also benefit landholders' businesses, being described as *“a valuable addition to farm income”*.

Commonwealth Department of Industry, Innovation and Science

A report prepared by the Commonwealth Department of Industry, Innovation and Science into the Socioeconomic Impacts of Coal Seam Gas in Queensland supports this finding, noting that compensation payments provide some buffer against the variable nature of the agricultural incomes (which are subject to weather conditions and agricultural commodity

“Compensation payments negotiated as part of land access arrangements, including both up-front and ongoing components, can be an important income source for farmers. They can not only buffer against the variable nature of agriculture income, including through periods of drought, but also provide greater certainty in financing agricultural businesses.”

Department of Industry's Report into the Socioeconomic Impacts of Coal Seam Gas in Queensland, 2015

²Neil I. Huth, Brett Cocks, Neal Dalgliesh, Perry L. Poulton, Oswald Marinoni, and Javier Navarro Garcia (GISERA), 'Farmer's perceptions of coexistence between agriculture and large scale coal seam gas development', 2014.

price cycles).

Indeed, several of our landholders have used their compensation payments to acquire additional neighbouring land, or to make upgrades to their properties to increase the productivity of their crops or cattle.

f) Retaining agricultural land

Origin seeks to achieve co-existence - that is enabling agricultural and gas activities to operate harmoniously side-by-side.

Consequently, Origin strongly supports the retention of agricultural land uses.

As stated above, the area of a fenced well site is typically about half the size of a tennis court. This means that gas infrastructure and farming can co-exist on the same land.

To date, 100% of the first 87 properties developed within the Australia Pacific LNG project are still being used for the same purpose as they were prior to Origin's development on the land - grazing, cultivation, and/or lifestyle.

Origin's approach to soil management is another way that we seek to retain and support ongoing agricultural production. The construction of gas infrastructure often requires land disturbance. It is important that soils are managed effectively and that reinstatement restores the productive capability of agricultural land. Landowner knowledge is critical to ensure that areas with high soil value are protected and restoration is as effective as possible.

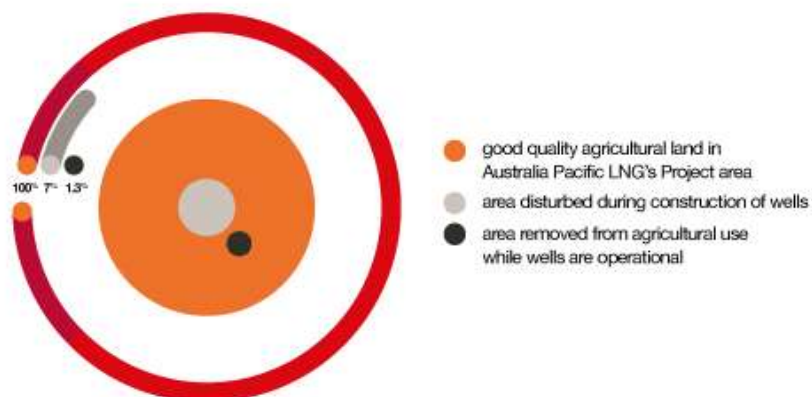
With the objective of restoring land to the greatest extent possible to pre-development condition, some of the strategies that Origin has implemented include:

- working with landowners to avoid developing on areas with high soil value and avoiding access to properties for construction during rain events;
- using appropriate technology to identify high-risk soil areas at risk of soil subsidence and erosion and, subsequently, avoiding the installation of infrastructure in high risk areas;
- 'ground-truthing' all planned disturbance by conducting scouting assessments and soil investigations at every property to verify the likely effectiveness of proposed soil retention controls; and
- minimising off-site soil losses by erosion prevention and sediment controls during construction activities.

We are also able to demonstrate that the development of gas infrastructure does not have a significant impact on the use of good quality agricultural land. Of the 335,000 hectares of good quality agricultural land within the Australia Pacific LNG project area (as defined by the Queensland Government), 7% (23,726 hectares) is expected to be disturbed during

construction. Due to progressive rehabilitation of disturbed areas, it is estimated only 1.3% (4,319 hectares) will be removed from agricultural production for the life of the project.

The diagram below demonstrates the proportional area of agricultural land use that will be displaced for the life of the project.



Finally, at the end of its economic life, a gas well is decommissioned - that is, the well is plugged with cement, the surface equipment is removed and the remaining lease area is rehabilitated. This ensures that the small area of land used for a well can ultimately be returned to agricultural purposes.

g) Make Good Agreements

The Queensland Water Commission's report into Underground Water Impact found that 97 per cent of the 21,000 bores in the Surat Basin would not see any impact arising from gas extraction activity.³ Underground water sources used by landowners, graziers and farmers are typically separated from the coal seams by hundreds of metres of low permeability rock.

However, in a small number of cases, gas activity could affect bore water levels in specific locations, especially where landholders have been using water from a coal seam. Where reduced groundwater availability is predicted to occur as a result of gas production, we are required to make good any predicted impacts.

Under the *Water Act 2000*, tenement owners are required to use best endeavours to negotiate agreements with landholders, called make good agreements. These agreements set out make good measures to address the predicted impacts on bores identified in the Surat Underground Water Impact Report as being likely to suffer short term impacts from gas activities. Make good measures are to be commensurate with the likely impacts.

Examples of make good measures agreed with landholders include:

- increasing the depth of landholder bores or sinking new bores for the impacted landholder;

³ Queensland Water Commission, 'Underground Water Impact Report for the Surat Cumulative Management Area', July 2012.

- lowering, modifying or replacing pumping equipment;
- supplying treated produced water to supplement landholder supplies; or
- providing alternate compensation.

Origin has been able to reach agreement with a majority of its landholders with whom we are legally required to negotiate a make good agreement. We now have agreements for 35 of the 42 bores that require a make good agreement and are working towards the completion of the remaining five lawfully required agreements relating to seven bores.

We also acknowledge and recognise that reaching agreement around make good requirements has been a challenging process for both landholders and industry. We are conscious that some negotiations have taken longer than our landholders and we would have liked. As a result, in recent months, Origin has made changes to the way we undertake make good negotiations.

There have also been some circumstances where landholders have sought make good measures for bores which have collapsed, are damaged or no longer in use (some for more than a decade). In these circumstances, Origin has no legal liability to make good these bores. When this has occurred, Origin has taken the time to engage with these landholders to understand their concerns. In some circumstances, even where there was no legal obligation to make good, Origin has provided compensation to enable a landholder to improve water infrastructure on the land or expand surface dam capacity in alignment with that landholder's current water management strategy.

h) Continuously improving

Origin is working with other gas companies to develop a standard CCA to make negotiations simpler, more transparent, and less time-consuming for landholders.

Across Origin, we monitor feedback from the community and provide formal mechanisms for recording and responding to complaints. Our Landholder Relations Advisors manage and address complaints promptly and comprehensively in accordance with our Complaints Management Plan. We use this feedback to better improve our processes.

i) Working with landholders in the Northern Territory

Origin, and its joint venture partners Sasol Petroleum and Falcon Oil & Gas, are exploring for unconventional gas in the Beetaloo Basin in the Northern Territory (Beetaloo project). Origin is the operator of three exploration permits that cover approximately 18,500 square kilometres between Daly Waters, Elliot and Borroloola (see Figure 2).

The volume of gas estimated to be in the basin could transform the Australian domestic gas industry and provide the Northern Territory with a multi-decade project.

In carrying out our exploratory activities for the project, Origin has engaged with our landholders and put land access agreements in place before commencing any work on private land.

Origin has worked with the Traditional Owners of the land through the Northern Land Council to obtain approval for the exploration activities.

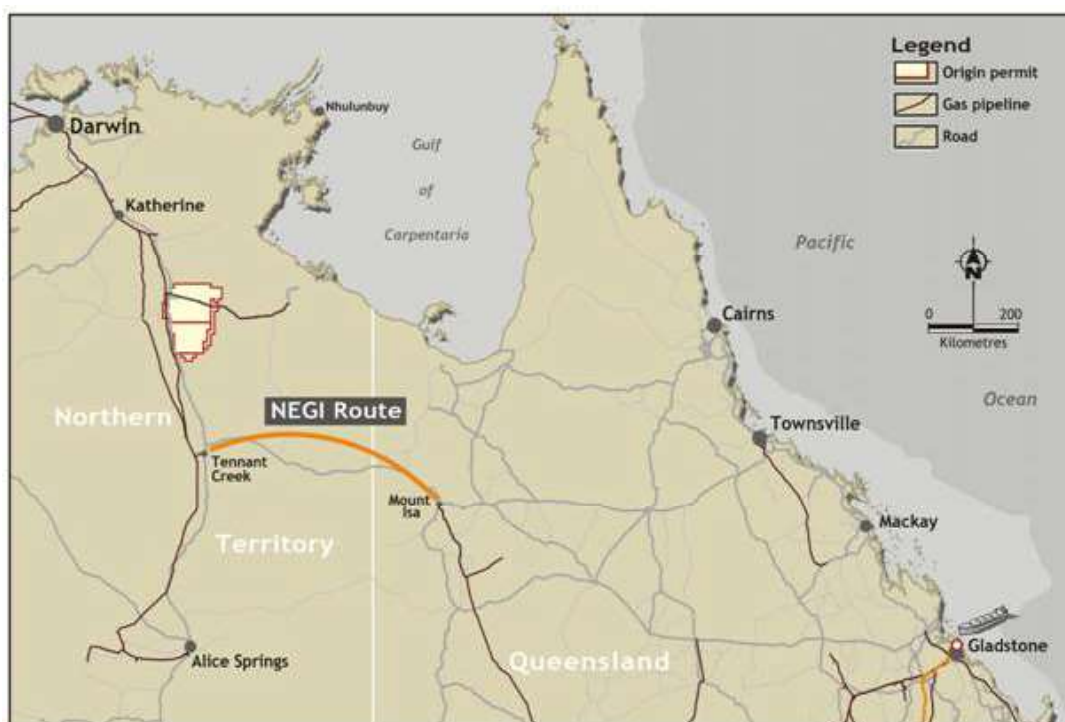


Figure 2

CO-EXISTENCE IN THE COMMUNITY



**\$46.1
MILLION**

IN COMMUNITY
INVESTMENT



**\$10
MILLION**

invested in
regional housing

**\$130
MILLION**

INVESTED IN
REGIONAL ROADS



\$27.5 MILLION
IN REGIONAL AIRPORT
UPGRADES

15,000 JOBS
created during
construction **2,500**
in ongoing operations

AROUND 78%
of all construction
expenditure sourced
through **Australian
providers**

**IMPROVED
COMMUNITY
ACCESS**

to emergency
medical services



What the CSG industry and the energy sector has done with Western Downs is we've actually upgraded our infrastructure that should have been done over the last 50 years, we've done it in two years,
Cr Ray Brown - Mayor Western Downs Regional Council

In the community

Over time, we have seen the communities in which we operate develop and benefit from the gas industry.

The Australia Pacific LNG project was subject to an environmental impact assessment process. This process involved consultation with more than 6,000 stakeholders including landholders and non-government organisations over an 18 month period.

Although only in the exploration phase, Origin has begun engaging with communities in the Northern Territory about the Beetaloo project. We have provided information about the project through briefings, where stakeholders may also raise their concerns or ask questions about the project or the industry in general.

a) Community benefit

Recently on Landline, Cr Ray Brown, Western Downs Regional Council Mayor, stated that⁴:

“What the CSG industry and the energy sector has done with Western Downs is we’ve actually upgraded all our infrastructure that should have been done over the last 50 years, we’ve done it in two years.

So the last time we had major upgrades to our water and sewerage was actually after the Second World War. So we’ve renewed everything. So for the next 50 years, we’ve got a very good legacy ahead of us.”

A study undertaken by the Commonwealth Department of Industry, Innovation and Science also found that⁵:

“Headline economic impacts of CSG development in Queensland to date are found to be net positive, and are attributable to increases in employment, income, output, consumption and government revenue. These changes are broadly consistent with changes experienced as a result of a typical natural resource development.

Since commencement, Australia Pacific LNG’s shareholders have invested, through Origin as upstream operator, more than \$23 million in regional communities in the gas fields. A total of \$46 million has been invested in communities across the total project. Approximately 15,000 employees and contractors worked on the project during the peak construction phase. We anticipate that between 2,000 and 2,500 people will be employed in ongoing operations.

CSIRO research about resilience in changing community landscapes indicated the important role that community organisations play in assisting the community to build resilience to periods of change, such as that during the peak phase of construction work. In recognition of this, Australia Pacific LNG contributed funding to community groups located in Miles, Chinchilla, Tara and Dalby to enable them to continue their work in the region.

⁴ ABC Landline, Reporter: Caitlyn Gribbin, 27 June 2015.

⁵ Commonwealth Department of Industry, Innovation and Science, ‘Review of the socioeconomic impacts of coal seam gas in Queensland’, 2015, page 1.

b) Road upgrades and road safety

Australia Pacific LNG has invested more than \$130 million to upgrade and maintain roads in the area of our activities. Most of this spend (approximately \$97 million) has occurred with local councils.

This investment has been used across the region to improve road infrastructure and safety. For example, Australia Pacific LNG's \$36 million funding commitment to Western Downs Regional Council supported the improvement and upgrade of more than 500 kilometres of roads in the Western Downs Regional Council area.

To support efforts to improve road safety, Origin, on behalf of Australia Pacific LNG, developed the 'Caring About Road Safety' program (**CARS Program**). Run in conjunction with RACQ, the CARS Program included annual school presentations by Queensland Fire and Emergency Services, e-learning facilities and driver training provided by RACQ.

c) Airport upgrades

As part of the Environmental Impact Statement (EIS), Australia Pacific LNG committed to minimising private vehicle use including through use of local airports to transport workers to and from construction worksites during the peak of the construction phase. To achieve this, Australia Pacific LNG worked with the federal, state and local governments and other gas companies to improve the capacity of local infrastructure, including airports.

To date, Australia Pacific LNG has contributed \$1 million to the total \$14 million Roma Airport upgrade and has funded the Miles Aerodrome upgrade in two stages, totalling \$25 million. The upgrade to these facilities provides the local community with considerably improved access to air travel and associated business opportunities.

In relation to the upgraded Roma Airport, the Maranoa Regional Council's Mayor, Rob Loughnan, stated that⁶:

"The construction phase of LNG projects might be over, but the net gains that we have achieved for this community at large, have been very pleasing... the [new Roma Airport Industrial Precinct] will allow industrial and commercial ventures to capitalise on airport operations and vehicle accessibility on the Carnarvon Highway, which is the main thoroughfare between Roma and the north."

⁶ Toowoomba Surat Basin Enterprise event, 18 August 2015.

Miles Aerodrome upgrade

The \$25 million upgrade to the Miles Aerodrome, funded by Australia Pacific LNG, was completed in February 2016. Commissioned by Origin on behalf of Australia Pacific LNG, the upgrade was carried out in two stages. The first stage of the upgrade, which included construction of the runway, taxiway and parking apron, was finished in 2013 and the second stage, completed early in 2016, involved construction of the terminal building and car park.

The air-conditioned terminal has three check-in desks, seating for 70 passengers and a covered arrival baggage area. The upgraded facility now has capacity to transport 100,000 passengers a year.

In addition to accepting 74-seat airplanes such as the Dash 8-400, the Miles Aerodrome is now an all-weather facility for the Royal Australia Flying Doctor Service. The facility will now be operated by Western Downs Regional Council.

The upgraded facility is described by Councillor Andrew Smith as:

“...a valuable asset for the Western Downs and ... an integral transport hub for private and commercial charter flights, as well as vital community services such as the Royal Flying Doctor Service...the upgraded aerodrome will provide the local community with valuable, high quality infrastructure that will support regional economic development well into the future.

I'd like to take this opportunity to thank Origin for funding and managing this project on behalf of Australia Pacific LNG; they along with Hutchinson Builders were most professional and efficient, delivering the project on time to the highest standard”

There is now also the possibility of regular commercial airline services in and out of the Miles Aerodrome.



d) Health benefits for the community

The operation of the gas industry in regional areas in Queensland has improved community access to medical care and emergency services.

As part of the broader safety strategy for the Australia Pacific LNG project, Origin (along with other gas proponents) partnered with CareFlight Group Queensland to obtain aeromedical retrieval services across the Surat and Bowen Basins to provide injured personnel with access to a range of hospitals and medical facilities.

These services were also made available to the community. In 2015, CareFlight missions were used almost equally by the industry and the community.

Through working with Queensland Health, community and industry patients can be transferred to larger tertiary hospitals where needed for the best possible treatment and demand on local health resources can be more effectively managed.



Aero medical evacuation service

This has meant that the communities in which we operate now have better access to medical services.

e) Working Together program

Our Working Together program provides landholders with an opportunity to carry out basic maintenance around gas infrastructure on their properties. Certified *Working Together* participants are now equipped to undertake future project-related maintenance on their own properties and to earn additional on-farm income as the program matures.

f) Training and Education

As part of the Coordinator-General's approval of the Australia Pacific LNG EIS, Australia Pacific LNG was required to develop a strategy in relation to workforce and training in its Social Impact Management Plan (SIMP). The SIMP set out a broad range of education and training initiatives to provide greater capacity within the regions.

One of the initiatives introduced by Origin, on behalf of Australia Pacific LNG, was the Community Skills Scholarships, which was a partnership with local businesses to enable apprentices in the region to receive a cash grant to support them completing their apprenticeship. The program has supported over 150 apprentices, including school-based and mature applicants, females in non-traditional roles and an Indigenous apprentice. Scholarship recipients have worked in industries such as electrical trades, welding, hairdressing, butchery, childcare and automotive mechanics.

Australia Pacific LNG has also contributed to education and training facilities within schools in the region.

Miles Training Facility

In 2013, a new training centre at Miles High School was opened with the aim to prepare local students for trade careers, while addressing regional skills shortages. Through the training centre, students have access to a full range of tools for woodwork and metalwork and once safety trained, they will help build furniture and structures for use by the local business and Miles community, including park benches for new housing developments.

The centre also has a conference room and facilities available for hire by the local community and businesses.

Australia Pacific LNG provided part funding for the Training Centre along with other businesses and community organisations in the region. This contribution supplied the trade equipment, tools and for final fit out of the facility.



g) Affordable housing

As part of the EIS, Australia Pacific LNG was required to develop a strategy in relation to affordable housing in its SIMP. Australia Pacific LNG committed \$10 million to an integrated housing strategy, developed to address accommodation impacts associated with the construction phase of the project.

Australia Pacific LNG worked with local government and community partners to assist locals facing short term accommodation cost pressures and with community housing partners to develop three affordable housing developments - in Miles, Roma and Gladstone - where other solutions could not address the shortage.

Delivered with Horizon Housing, a not-for-profit housing developer, Australia Pacific LNG contributed \$1.75 million to a 10-dwelling development in Roma and \$2.05 million to a nine-dwelling development in Miles.

In Gladstone, Australia Pacific LNG partnered with the other LNG proponents to contribute \$19.8 million jointly to deliver affordable housing with the not-for-profit company, Gladstone Affordable Housing.

These initiatives contributed to addressing the short term housing pressures experienced by local people associated with the construction phase of the Australia Pacific LNG project. Housing market impacts are complex to manage - Origin's approach demonstrated a willingness to take action to address key concerns raised by the community, in partnership with community and not-for-profit groups.

Maranoa Regional Council Mayor, Rob Loughnan stated: ⁷

"This project will help us to put local people into new homes without the stress that many of them have been facing. It's a win for the community, so we're happy to be involved."

⁷ Media Release, Horizon Housing and Australia Pacific LNG, 22 May 2013.

HEALTH AND THE ENVIRONMENT



1500 STATE AND FEDERAL APPROVALS

provide confidence
in **operating**
environmental
standards



MULTI-MILLION \$ PARTNERSHIPS

and studies with leading
national science
bodies and
institutions



Priority on
**BENEFICIAL
USE** of
associated water



INNOVATIVE
**AUSTRALIA
PACIFIC LNG
PROGRAM**
PROVIDING
WATER TO
LANDOWNERS



of regulated waste
recycled **minimising**
our footprint

"...the Queensland approach seems to embody many features of regulatory best practice, with cumulative, regional assessments revised regulatory, purpose built institutions and strong focus on water issues." **IEA 2015 World Energy Outlook**

3. Health and the Environment

Origin's HSE Policy sets out how Origin thinks about, plans and manages health, safety and environmental aspects of its operations.

The Australia Pacific LNG project is subject to over 1,500 conditions. As required by many of these conditions, management plans have been prepared that set out how Origin will achieve compliance with the relevant conditions.

a) Health

Based on the research and data that is currently available, Origin is confident that there is no evidence of adverse public health impacts from the development or production of natural gas.

As set out below, Origin has implemented air and water quality monitoring programs, which have demonstrated that there has been no material change to either air or water quality since operations commenced.

A Queensland Health study undertaken in 2013⁸ found that:

"The available evidence does not support the concern among some residents that excessive exposure to emissions from the CSG activities is the cause of the symptoms they have reported."

In addition, the Australian Institute of Petroleum's 2013 Health Watch Report prepared by Monash University,⁹ which follows the long term health of 20,000 employees in the petroleum industry employees, shows that they have better health than the general Australian community and are less likely to die of diseases commonly causing death - such as cancer, heart disease and respiratory conditions. For men and women in this industry, the chance of contracting cancer is similar to that for all Australians. This study has been running since 1980 and the 2013 report is the 14th report in the study. This is evidence that people who spend a substantial amount of time in gas fields are in good health.

"Overall, the Study clearly shows that petroleum industry employees have better health than the general Australian community and are less likely to die of the diseases commonly causing death - including cancer, heart disease and respiratory conditions."

Monash University, 2013

⁸ Queensland Health, 'Coal seam gas in the Tara region: Summary risk assessment of health complaints and environmental monitoring data', March 2013.

⁹ Monash University, '2013 Health Watch - The Australian Institute of Petroleum Health Surveillance Program', 2013.

Dispelling the “Black Rain” myth

In 2013, rural residents near Tara in Queensland, raised concerns in the media and with Origin about the presence of a black sticky residue falling on cars and buildings. Dubbed ‘Black Rain’ the claim was that nearby CSG pilot well activity was the cause and that it was contributing to alleged health impacts.

Origin responded directly to those who raised concerns, engaging a third party environmental specialist to take samples of the residue and surrounding soil, and put collection equipment in place to detect the presence of any airborne residue.

Origin also conducted its own thorough and detailed inspection of nearby facilities finding no residue on the pilot wells or surrounding infrastructure that was in any way consistent with what was being claimed.

Subsequent laboratory testing found that soil elements were normal for the region and met the national environmental guidelines applied to soils used for activities with high human contact, such as growing vegetables for food, or outdoor playing areas in child care centres or kindergartens.

Testing to determine the source of the residue material identified that the black sticky material was a sugar and amino excretion produced by nymphs of psyllids insects, known as lerps.

These results were then reviewed by a nationally recognised, independent scientific expert who confirmed the residue was related to organic material from insects and was not connected to the CSG industry.

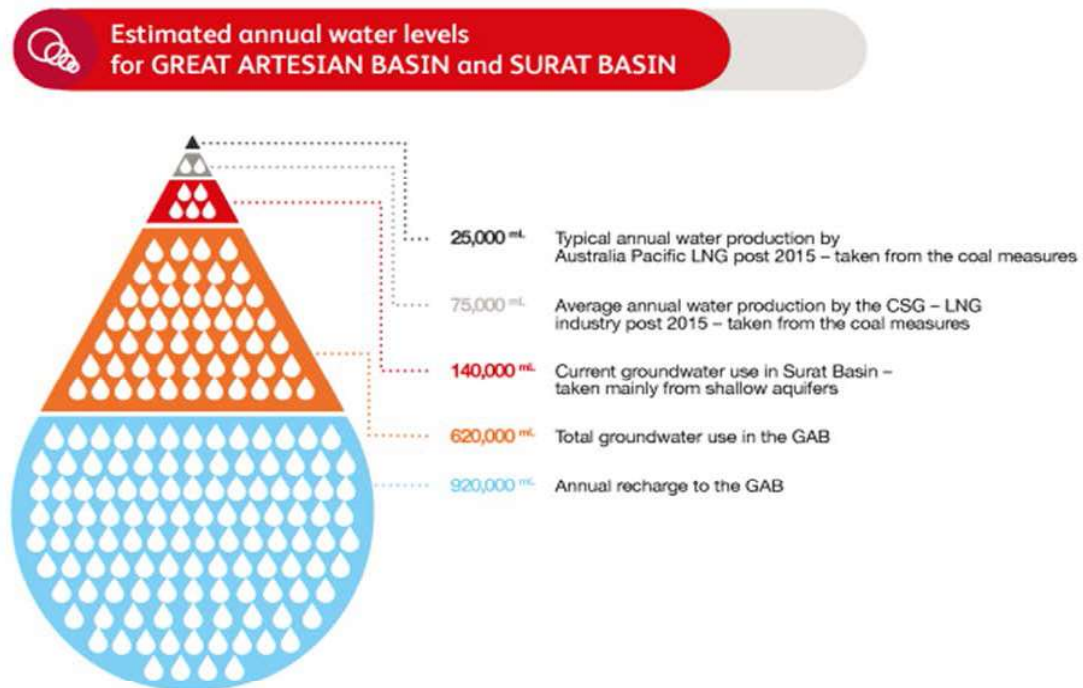
b) Water

Origin’s objective is to ensure water security for our business and other water users. Water management is primarily regulated by State laws and regulations, including the *Water Act 2000* (Qld) and Queensland’s CSG Water Management Policy. The EPBC Act also regulates aspects of water management.

Our management program for water includes commitments that exceed the strict conditions imposed by law.

Groundwater

Origin recognises the importance of groundwater to agriculture and other industrial users. The 2012 Surat Underground Water Impact Report projected that the CSG industry would extract 75,000 mL per annum, compared to 620,000 mL extracted by other users, including agriculture (see Figure 3). This impact report is compiled by the Office of Groundwater Impact Assessment (OGIA), an independent body for Queensland created under the *Water Act 2000* to understand and monitor cross-industry and cross-basin impacts on groundwater across the state and to ensure responsible development.



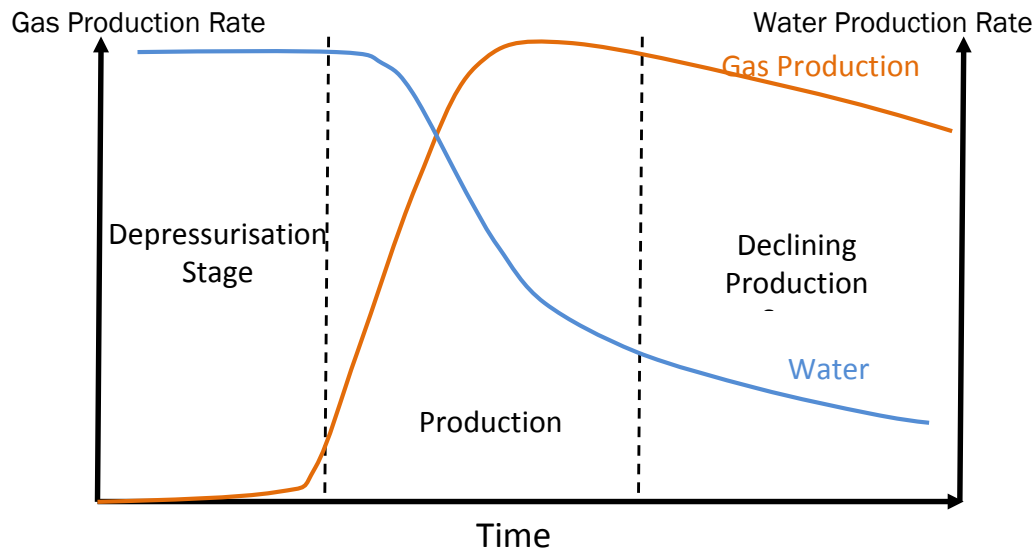
[Source of figures: Great Artesian Basin Coordinating Committee and industry estimates]

Figure 3

In accordance with regulatory requirements, Origin monitors, protects and sustains groundwater resources. We carry out baseline assessments and bore assessments of landholder bores and have established a vast groundwater monitoring network. This information also enables us to respond to landholder and community questions.

Government authorisation, either through water licences or within legislation, is required to remove water from the Great Artesian Basin. This is the case for all industries. The gas industry is entitled, under legislation, to extract water from coal seams as part of the gas extraction process. Gas extraction necessarily produces water as it is essential to reduce the water pressure within the seam to allow the gas to desorb and flow from the well. Origin always prefers to obtain water for construction activities from sources other than groundwater.

The following graph depicts the rate of water and gas extraction over the life of a well:



© Copyright, Queensland Water Commission 2012

Where multiple developments occur, such as in the Surat Basin, OGIA is responsible for considering cumulative impacts of underground water extraction which occurs as part of gas production, and for carrying out research activities related to underground water resources.

Origin, on behalf of Australia Pacific LNG, provides to OGIA monitoring data to support OGIA's groundwater flow modelling for the Surat Cumulative Management Area, which forms the basis of the impact assessment and management activities. Origin operates a groundwater monitoring bore network of over 150 dedicated monitoring bores and landholder bores. The monitoring network exceeds the requirements of our environmental approvals and those in the Surat Underground Water Impact Report. The bores monitor aquifers above and below the coal seam, and are used to assess changes to water level and water quality. The data is provided to OGIA for improving the regional groundwater flow model.

The Surat Underground Water Impact Report confirms that the gas industry will have minimal impacts on users of the recognised aquifers of the Great Artesian Basin. Of the approximately 21,200 landholder groundwater bores in the Surat Cumulative Management Area, 528 bores were predicted in the 2012 Surat Underground Water Impact Report to experience a decline in groundwater level of five metres or more as a result of the combined impacts of all gas producers in the basin. Only 85 bores, or 0.4% of the total, were forecast to be impacted by 2015. The process for assessing these bores and coming to arrangements to make good any impacts on those bores is outlined in Annexure 3.

The Surat Underground Water Impact Report is undergoing its first three-yearly revision (as required by law) and a draft is expected to be released in March 2016 for consultation. We also regularly provide data to the Department of Natural Resources and Mines for presentation to landholders and for assessment of potential impacts. For those landholder bores that form part of the monitoring network, we provide the monitoring data directly to the landholder. Australia Pacific LNG is the only gas company that prepares and publishes (on its website) an annual report on groundwater monitoring data.

Produced water management

Historically, farmers have used untreated groundwater from a variety of aquifers (including coal seams) for agricultural activities. The same water is known in the natural gas industry as ‘produced water’.

Produced water is necessarily extracted as part of gas production. In the Australia Pacific LNG project, four water treatment facilities use filtration and reverse osmosis processes to treat produced water to meet the standards set out in our Environmental Authorities. Australia Pacific LNG’s produced water is treated above requirements to meet the quality parameters for drinking water, as demonstrated in analysis of over 1,700 samples by third party laboratories (see Figure 4). Origin was the first gas company in Queensland to use reverse osmosis plants to treat produced water.

<i>Water quality parameter</i>	<i>Australian Drinking Water Quality Health Guideline (ADWG, 2011) (mg/L)</i>	<i>APLNG End-Use Average Concentration (mg/L)</i>
Benzene	0.001	0.00052
Ethylbenzene	0.3	0.00073
Toluene	0.8	0.00073
Xylene Total	0.6	0.002
Cyanide Total	0.08	0.0035
Fluoride	1.5	0.14
Iodide	0.5	0.027
Nitrate (as NO ₃)	50	0.17
Nitrite (as NO ₂)	3	0.3
Antimony	0.003	0.00063
Arsenic	0.01	0.00045
Barium	2	0.045
Beryllium	0.06	0.0004
Boron	4	0.41
Cadmium	0.002	0.000084
Chromium (Hexavalent)	0.05	0.002
Copper	2	0.0012
Lead	0.01	0.00053
Manganese	0.5	0.0012
Mercury	0.001	0.000054
Molybdenum	0.05	0.00058
Nickel	0.02	0.00099
Selenium	0.01	0.0014
Silver	0.1	0.00063
Uranium	0.017	0.0013
Zinc	3	0.0046
N-Nitrosodimethylamine (NDMA)	0.0001	0.0000025

Figure 4

The majority of our produced water is directed to a beneficial use. Origin predominantly uses produced water for either irrigation or aquifer injection programs.

Injection

Injection is currently being used at two of Australia Pacific LNG's gas fields. The process involves injecting treated produced water into the Precipice Sandstone aquifer of the Great Artesian Basin. The water is treated to a salinity set at a lower level than the current groundwater. The quality of the treated water is continuously monitored by the treatment plants, and injection stops if the water quality starts to approach the limits set in the Environmental Authority.

The injection process has been evaluated and approved by government. The injection sites were selected based on geological and scientific data. Origin, on behalf of Australia Pacific LNG, undertook a series of trials, with the assistance of CSIRO, to prove the technical feasibility of the method and consider the environmental aspects of aquifer injection.

Australia Pacific LNG injected over 5,000ML into the Precipice Sandstone during 2015. Injection of this volume equates to recharging the aquifer with approximately half the annual usage volume taken from the Precipice Sandstone by agricultural and other users.

Water quality and pressure is monitored in more than 15 Precipice Sandstone bores across the region. The monitoring data has shown water level increases of over 1m in the aquifer as far away as 70km from the injection point. This demonstrates that the injection program is reversing some of the historical water level declines experienced by the Precipice Sandstone, which had caused some artesian bores to cease flowing.

Irrigation

In 2014, Origin launched the *Water to Landholders* program. This program provides beneficial use of treated produced water to increase productivity and provide economic certainty through drought for participating landholders.

As part of the program, the Fairymeadow Road Irrigation Pipeline (FRIP) began delivering treated water to 13 properties across an estimated 3,500 hectares of land. The purpose-built 22km pipeline can deliver up to 15 gigalitres of water per year during the peak production period.

The scheme enables landholders to supplement their current cropping programs with new irrigation. Each participating landholder has an off-take point on their property. The water is delivered via the pipeline, either from the water treatment facilities at Talinga or Condabri, or from Monreagh Dam, which was built to store the treated water for the scheme.

"Drought has always been our biggest risk - a risk we essentially had no way to mitigate.

The irrigation scheme created an opportunity to diversify [our] crops - wheat, barley, cotton, sorghum, pulses and sunflowers - and hopefully win long-term supply agreements with international buyers."

A landholder participating in the Water to Landholders program, 2014

The FRIP program is a practical example of how Origin has applied the Queensland Government's Coal Seam Gas Water Management Policy.



c) Shallow Gas and the Condamine River

Methane seeps have been present in the region for more than a century. There is well-documented evidence of shallow gas that predates gas development in the region, and there is historical evidence of seeps and gassy bores as early as 1889.

How exactly seeps occur is unknown, although there is a chance that natural gas extraction in the region is affecting their occurrence. Shallow gas occurs due to the unique geology of the region, which comprises coal seams and other potentially gas-bearing formations at very shallow depths. These formations exhibit natural fault and fracture networks which increase the mobility of any gas and water present. The Condamine River itself has, over time, eroded a channel through the surface layers into these shallow formations, providing a possible pathway to surface.

Origin has designed and is executing a program to better understand the source and impacts of these seeps, particularly the river seeps that reappeared in the Condamine River after heavy flooding in the region in early 2012.

This program has shown that the seeps do not present a public health or safety risk.

The ongoing program includes:

- Data acquisition and studies (2D seismic program recently completed);
- Local and regional mitigation, informed by an increasingly comprehensive data set; and
- Groundwater bore decommissioning.

We are continuing to deepen our understanding of the geology and reservoir characteristics of the area, and continue to invest in infrastructure to support data acquisition.

Since 2012, we have worked with the Queensland Government in relation to shallow gas monitoring and research activity. We have also engaged with local landholders about the seeps. We are now seeking to engage more broadly with the local community to share the information that we are gathering.

d) Air quality

Australia Pacific LNG's voluntary regional air quality monitoring program, which is supervised by CSIRO, has found no ambient air parameters above environmental or health guidelines to date. Impacts on air quality were assessed through the EIS process and are a key component of ongoing government reporting mechanisms. Air quality conditions also form part of all EAs related to the project.

Given the project conditions about air quality, Australia Pacific LNG voluntarily established and implemented a regional air quality monitoring program in 2014, the 'Surat Basin Ambient Air Quality Monitoring Program' (**Surat Air Quality Monitoring Program**).

Australia Pacific LNG's Surat Basin Ambient Air Quality Monitoring Program

In 2014, Australia Pacific LNG developed the Surat Basin Ambient Air Quality Monitoring Program. This voluntary program collects ambient air quality data from multiple sites within the region of Miles, Chinchilla, Condamine and Tara.

The core objective of the program is to assess whether there have been material changes to the ambient air quality values in the region.

The design of the program was underpinned by a detailed risk assessment of potential emissions sources from gas activities.

To ensure the transparency and independence of the program, the design, implementation and ongoing management of the program has been supervised by CSIRO. CSIRO is also responsible for interpreting, reporting and validating data produced from the program.

The program consists of 10 ambient air monitoring points that collect a specific range of data and five online ambient air quality monitoring stations that monitor a broader range of air quality parameters in real time (see Figure 5). Three of these real-time monitoring stations are directly funded by Australia Pacific LNG, with the remaining two owned and operated by CSIRO.

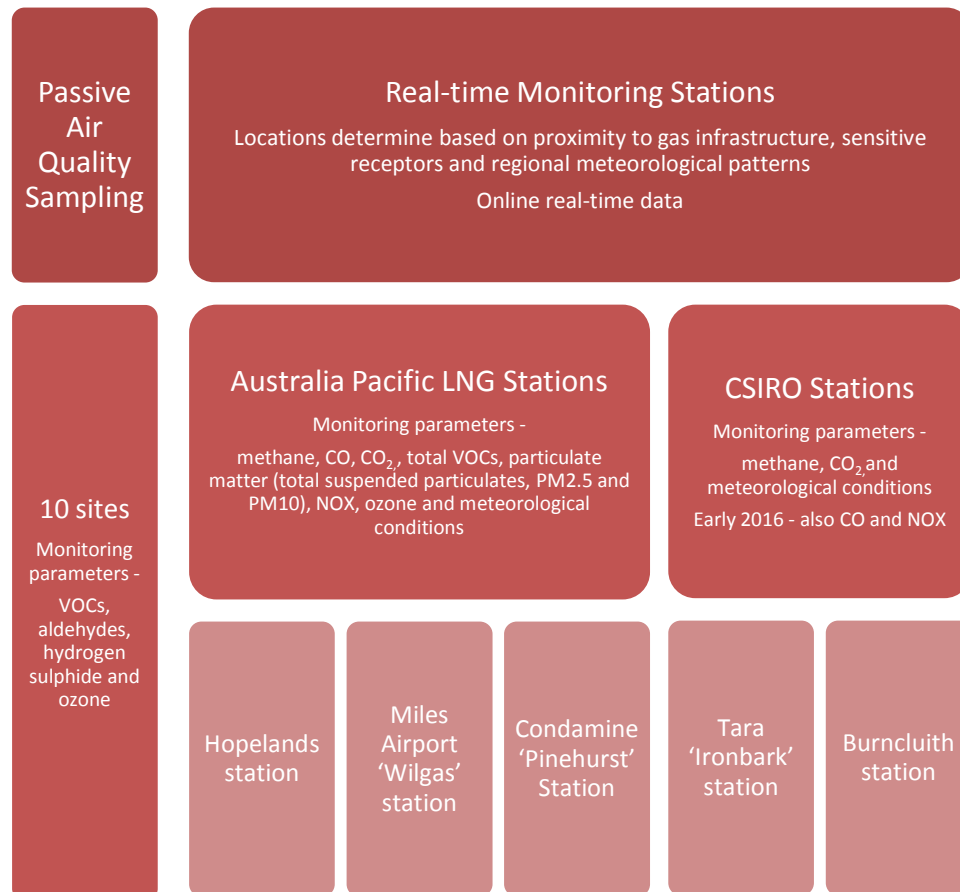


Figure 5

Origin has also consulted with Queensland Government departments about the program, including the Department of Environment and Heritage Protection, the Department of Natural Resources and Mines, Queensland Health and the Department of Science Innovation, Information Technology and Innovation.

The program was transformed into a GISERA project in early 2016. The transition into a GISERA project now means that live access to monitoring data will be provided via the live air quality data portal available on the Department of Environment and Heritage Protection website.

e) Fugitive emissions

Origin, as the upstream operator for Australia Pacific LNG, supported a joint Australian gas fugitive emissions study undertaken by the CSIRO to conduct research specific to a gas development. As part of this study, the CSIRO surveyed 43 wells - six in NSW and 37 in Queensland - operated by a range of gas companies.

The work focused on gas wells to better understand how asset integrity or activities through the gas process influence emission volumes. This is the first study of its kind on emission rates from Australian gas production.

The results of the study were released on 31 July 2014 by the Commonwealth Department of the Environment.

The study confirmed that the emissions range is consistent with the current emission estimates for general equipment leaks, and confirms that equipment leaks comprise only a very small portion of greenhouse gas (GHG) emissions from natural gas production. The evidence suggests GHG emissions from a gas producing well are broadly in line with previous estimates.

f) Waste management

We are continually improving our waste management solutions to handle general, regulated, liquid, construction, food, and green waste. For the Australia Pacific LNG project, general waste volume is down by 83% since 2013. In addition to this, 98% of regulated waste was recycled.

Origin developed a Waste Management Plan for upstream activities. It is the key document guiding the waste management approach and outlines the legislative requirements, sources and volumes of wastes, processing, tracking and storage, recycling and incident management.

Origin has adopted the 'Waste Management Hierarchy', which is nationally and internationally recognised as the most effective way to achieve optimal environmental outcomes. It ranks waste management practices to firstly avoid waste and then to reduce, reuse, recycle, treat and, if no other option is available, dispose of waste.

Some examples of the way that Australia Pacific LNG has actively sought to manage waste according to the waste management hierarchy principles include:

- reuse of produced water in construction materials and dust suppression;
- reuse of drilling fluids, solids and muds;
- recycling of a wide range of waste products including aluminium cans, cardboard, batteries, concrete, scrap metals and plastic drums;
- recycling of oily wastes, oily filters, coolant, rubbers, tyres, residual chemicals and septic waste;
- treatment of produced water and the use of treated water for irrigation (e.g. Fairymeadow Road Irrigation Pipeline Scheme).

g) Rehabilitation and monitoring

A component of Origin's work as upstream operator of the Australia Pacific LNG project is to ensure that areas that are disturbed during the construction phase are rehabilitated. Origin also undertakes ongoing and progressive rehabilitation monitoring.

There are two positive outcomes from progressive rehabilitation monitoring - firstly monitoring is taking place to support maintenance response and, secondly, Origin are aware of the locations that pose a risk to land management and, in respect of those, Origin can maintain robust monitoring in a targeted fashion.

It is important that suitable maintenance activities can be carried out for those sites where rehabilitation has not yet achieved the Environmental Authority (EA) criteria, and priority should be given to maintenance activities having regard to property scale and severity of disturbance.

Our operational rehabilitation monitoring program for pipeline and the gathering network is scheduled annually from September to May, which results in approximately 4000 points in the landscape being inspected across the network.

For the Spring Gully gas field,¹⁰ a rehabilitation assessment was carried out evaluating the success rates of rehabilitation works for all new infrastructure developments and older existing infrastructure across 1,245 locations.

The assessment found that for sites requiring rehabilitation, 83 per cent were successfully rehabilitated with ongoing monitoring suggested for 14% of sites to ensure success retention. Only 17% of the sites required some re-work or ongoing maintenance of the rehabilitation works that had been undertaken to ensure successful rehabilitation outcomes in the future. This type of assessment ensures that rehabilitation is carried out in a progressive manner and that rehabilitation is meeting the conditions of Australia Pacific LNG's environmental approvals.

¹⁰ comprising PLs 204, 195, 200 and 203 and ATP592.



h) Reducing our footprint through innovation

Origin is committed to reducing the ways that natural gas activities impact landholders, the surrounding environment and existing land forms.

Noise during construction

Origin recognises that noise impacts landholders, mainly during construction activities. Some of the initiatives we have implemented include:

- a project-wide noise management plan;
- noise modelling and monitoring, to predict where noise impact may be experienced and to monitor noise levels where landholder complaints have been received;
- promptly responding to landowner concerns about noise and relocating them, where possible, until the noise impact recedes;
- selection of low noise emitting equipment and noise attenuation devices for the gas field operations and infrastructure;
- continuous improvement to reduce noise emissions from the project's activities.

Reducing noise from drilling wells

One of the project's primary activities is the development of gas wells using specialised drilling rigs. Through the noise assessment process, Australia Pacific LNG identified a need to reduce noise emissions from drilling rigs so that activities could be conducted with minimal impacts to individual landholders and the community.

The Australia Pacific LNG drilling team worked with the drilling rig contractors, specialist acoustic consultants and product manufacturers to develop a suite of effective noise abatement measures for the drilling rigs, including:

- noise curtains on drilling mud pumps;
- acoustic ventilation louvers for engines;
- roof attenuators for booster compressor trailers;
- acoustic lining for internal surfaces of rig carrier trailer engines;
- acoustic lining for trailer ventilation chutes;
- rubber lining for the internal supports of pipe racking.

These noise abatement measures have reduced total source noise, typically in the range of 3-5 decibels for drilling rigs, and 10 decibels for completions rigs. We have seen a decrease in noise-related complaints from drilling activities since the noise abatement measures have been put in place.

Minimal disturbance approach

Origin has developed a minimal disturbance approach to well lease construction. This approach minimises topsoil stripping, reduces bulk earthworks, and limits the overall disturbance footprint of the well lease.

The approach benefits both Origin and the landowner with accelerated schedules, reduced downtime in wet weather, reduced drilling and construction times for landholders and decreased construction costs.

Origin uses the minimal disturbance approach where possible, although it is not possible in some areas where, for example, sloped land must be graded to a slope of less than 3% to allow access for drilling and completions rigs.

Origin has also reduced the required size of leasepads by redesigning their layouts and removing unnecessary equipment, allowing 10 to 25% less land to be disturbed in the first place.

Origin is working with GISERA and the University of Southern Queensland on research to understand more about soils, rehabilitation and reinstatement, with the potential for such research to allow further improvements to be made to our construction methodologies in the future.

The evolution of well sites

Once construction is finished, well sites are the long-lasting surface infrastructure most visible on the land. Origin's program of continuous improvement has included initiatives to minimise their day-to-day impact on landholders and neighbours.

The noise and emissions of operating wells across much of the field have been reduced by upgrading legacy power generation facilities on each well site to an electrified grid, providing up to a 10dBA noise reduction at the closest sensitive receptor. Origin is implementing further initiatives to reduce the visual impact of well site infrastructure, including smaller facilities with up to a 50% footprint reduction and 75% equipment reduction (see Figure 6).

Comparison of future well site footprints and surface equipment to current designs

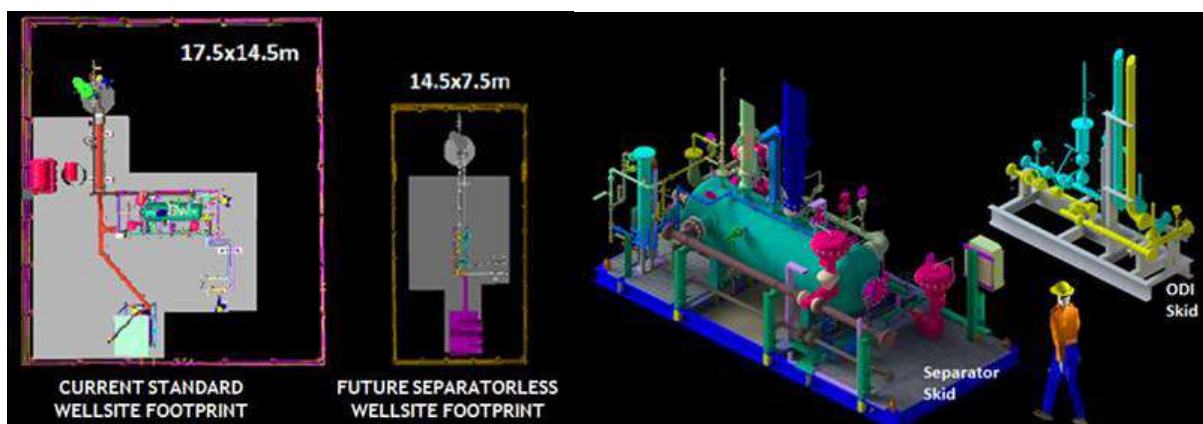


Figure 6

Origin has worked to reduce the frequency that rigs must access well sites to conduct maintenance on a well. To date, 16 initiatives have been implemented to increase well reliability, which means the small rigs that perform well maintenance need to access the property 20% less frequently. Rig design for that maintenance work has also been optimised so that the tasks can be completed quickly and the rig can move off the property again.

4. Regulating the industry

a) Right to extract petroleum

In Australia, the rights to minerals and resources below the land's surface, including natural gas, are held by the State and Territory governments. Companies such as Australia Pacific LNG apply and pay for the rights to explore and ultimately develop these resources across defined geographical tenures. Royalties are also payable to the State on gas extracted when production occurs.

Australia Pacific LNG holds permits granted by the State government to explore for and produce petroleum (which includes gas). The State then uses these royalties as part of their budget process to provide for many facilities and infrastructure such as roads, hospitals and health.

Under law, gas companies cannot undertake any development activity on private land without agreement or where access has been obtained through court proceedings. Queensland legislation provides that CCAs are required to be negotiated between companies and landowners to define how both parties will work together during the development and the quantum of compensation to be paid. These agreements must be in place before any development activity occurs.

b) Regulatory framework

Origin supports sound, stable policy positions that provide a platform for companies to make long term investment decisions. A sound, stable regulatory framework, which is vital in helping to ensure the safe and responsible development of gas resources, is facilitating further investment and participation in the industry in Queensland.

Unfortunately, the regulatory frameworks in other states and territories in Australia are not supporting similar investment in exploration activities - something that has recently been recognised by Rod Sims, Chairman of the ACCC.

"CSG extraction and related technologies are mature and Australia is well equipped to manage their application."

NSW Chief Scientist Final
Report of the Independent
Review of Coal Seam Gas
Activities in NSW, 2014

"...complicating this picture for new entrants and existing players is the spectre of regulatory uncertainty and state and territory-based moratoria which are making new exploration increasingly risky or stopping development."

If the basic exploration and appraisal activity required to bring new gas to the market is significantly reduced for a significant amount of time at some point the market is going to face declining production from mature fields, which will not be replaced in time to meet demand."

Mr Rod Sims, Chairman,
ACCC
Australian Domestic Gas
Outlook Conference,
Sydney
9 March 2016

"Overall, the Queensland approach seems to embody many features of regulatory best practice, with cumulative, regional assessments revised regularly, purpose built institutions and a strong focus on water issues."

International Energy Agency's
2015 World Energy Outlook

The Australia Pacific LNG project operates within Queensland's robust gas regulatory framework¹¹ and was given government sanction under numerous approval processes.

The key legislative and regulatory instruments that govern the activities of the Australia Pacific LNG project include:

- *State Development and Public Works Organisation Act 1971* (Qld)
- *Petroleum & Gas (Production and Safety) Act 2004* (Qld)
- *Environmental Protection Act 1994* (Qld)
- *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (**EBPC Act**)
- *Water Act 2000* (Qld)
- *Nature Conservation Act 1992* (Qld)
- *Aboriginal Cultural Heritage Act 2003* (Qld)
- *Native Title Act 1993* (Cth)
- Land Access Code, November 2010 (Qld)
- CSG Water Management Policy (Qld)

c) Australia Pacific LNG approvals process

The Australia Pacific LNG project was declared a 'significant project'¹² by the Queensland Coordinator-General in April 2009. An Environmental Impact Assessment (using an EIS) was undertaken between August 2009 and November 2010, including public consultation on the EIS Terms of Reference and the completed EIS. The Australia Pacific EIS was approved by the Coordinator-General on 8 November 2010, 10 months after the EIS was first lodged with government.

The Australia Pacific LNG EIS was a whole-of-project assessment of possible impacts on the environment, community, water resources, economy, transport and road network, greenhouse gases, Indigenous cultural heritage, other cultural heritage and land management. It also detailed proposed strategies to mitigate and manage these impacts. At the time of approval, the Coordinator-General imposed a range of conditions relating to the environment, water, traffic, transport, community and the economy.

Concurrent to the EIS assessment process, the Federal Government assessed the project in relation to the identified 'controlled actions'. Approval was provided by the Federal Minister for the Environment on 21 February 2011.

¹¹ Australian National Water Commission, 'Position Statement – Coal Seam Gas and Water', 2010.

¹² under the *State Development and Public Organisation Act 1971*.

After obtaining EIS Approval, Australia Pacific LNG obtained EAs for each of the gas fields, as is required for all resource projects (regardless of whether they are declared as significant or not). EAs contain field-specific conditions covering water, soils, air quality, noise, vegetation, contamination, rehabilitation and threatened species.

In addition to these principal environment project approvals, Origin has also obtained, and continues to obtain, other secondary environmental approvals under the following Queensland legislation:

- *Nature Conservation Act 1992*
- *Sustainable Planning Act 2009*
- *Water Act 2000*
- *Forestry Act 1959*
- *Coastal Protection and Management Act 1995*
- *Regional Planning Interests Act 2014*

To date, the Australia Pacific LNG project has obtained 49 principal environment approvals and over 100 secondary approvals. The environment approvals consist of:

- one Coordinator-General report approving a ‘significant project’,
- three EPBC Act approvals for controlled actions,
- 15 environmental authorities,
- 29 strategic cropping land decisions and regional interest development approvals,
- 82 clearing permits or exemptions, and
- 17 development approvals.

GAS AS A TRANSITIONAL FUEL



COAL SEAM GAS
(CSG) IS SIMPLY
NATURAL GAS



**GAS IS THE
PERFECT
PARTNER** 
TO RENEWABLE ENERGY

November 15
Origin becomes
**WORLD'S FIRST
ENERGY COMPANY**
to adopt all seven climate
change commitments
under the **WE MEAN
BUSINESS** coalition

**\$70 BILLION
QLD LNG INDUSTRY**
Exporting energy to Asia
**POWERING A
CLEANER TOMORROW**



LESS

carbon emissions
when natural gas is used
for electricity generation
instead of coal



January 2016
Australia Pacific LNG
first cargo.

5. Gas as a transitional fuel

a) What is CSG?

GISERA (Gas Industry Social and Environmental Research Alliance) explains that unconventional gas is:

“generally produced from complex geological systems that prevent or significantly limit the migration of gas and require innovative technological solutions for extraction. The difference between conventional and unconventional gas is the geology of the reservoirs from which they are produced. There are several types of unconventional gas such as CSG, shale gas and tight gas.”¹³

Natural gas contained within the coal seams, has been described as Coal Seam Gas (CSG). This natural gas collects in underground coal seams and is almost entirely composed of methane¹⁴ – a colourless and odourless gas. CSG is used in the same way as any other form of natural gas for cooking and heating as well as in industrial processes and electricity generation.

In Australia, CSG is plentiful. CSG has been known about ever since the coal mining industry began in Australia in the early 1900's. CSG provides 90% of Queensland's gas needs and 15% of the state's electricity generation.

With advances in technology, gas has developed into a key transition fuel, helping to lower our carbon emissions as we move to a low carbon future. CSG now makes up a significant proportion of Australia's natural gas supply, with the Australia Pacific LNG project providing the largest CSG resources in Australia.

b) The role of gas in the transition to a carbon neutral energy market

Gas is an abundant, affordable, flexible, low carbon fuel that has a critical role to play in Australia and globally in meeting ambitious climate change targets.

Natural gas (including CSG) is also an important transitional energy fuel in the global challenge to reduce carbon emissions. When used for electricity generation, natural gas produces less carbon emissions than coal. Natural gas is a cleaner burning and safely transportable fuel, and it has an important role to play in the response to climate change.

Origin is committed to a carbon neutral energy market in Australia by 2050. In 2015, Origin became the first energy company in the world to commit to all seven of the 'We Mean Business' CDP (Carbon Disclosure Principles).

Origin believes that it has a role to play in the transitioning of the global energy market to a carbon neutral market and that natural gas has a very important role to play in this process.

¹³ GISERA, 'Fact Sheet: What is coal seam gas?', 2014.

¹⁴ GISERA, 'Fact Sheet: What is coal seam gas?', 2014.

6. About Origin

Origin Energy (ASX: ORG) is the leading Australian integrated energy company with market leading positions in energy retailing (approximately 4.3 million customers), power generation (approximately 6,000 MW of capacity owned and contracted) and natural gas production (1,093 PJ of 2P reserves and annual production of 82 PJ). Through Australia Pacific LNG, its incorporated joint venture with ConocoPhillips and Sinopec, Origin is developing one of Australia's largest CSG to LNG projects based on Australia's largest 2P CSG reserves base.

Origin has the longest track record of any major CSG company in Australia, having drilled our first CSG exploration well in Queensland in 1993. For over 20 years we have been working with local communities to gain access to CSG resources. The benefits from CSG development for regional growth and infrastructure development are pronounced.

Origin also aspires to be the number one renewable and low carbon energy company in Australia. Origin is one of the largest installers of solar systems in Australia, having directly installed about 90,000 systems to date. In total, about 400,000 of our retail customers have solar products. This year, Origin launched a new solar leasing product, which allows more customers to access the benefits of solar without having to purchase the system. We are also exploring new opportunities to invest in utility scale solar projects.

a. Australia Pacific LNG

Australia Pacific LNG is the largest producer of natural gas in eastern Australia, delivering a reliable energy source to customers in Australia and Asia.

Australia Pacific LNG is owned by Origin Energy (37.5%), ConocoPhillips (37.5%) and Sinopec (25%). Origin's experience in exploring and producing natural gas is applied with the operation of gas field's production and the gas transmission pipeline. ConocoPhillips brings its proven Optimised Cascade Processing LNG technology to Australia Pacific LNG and is responsible for the operation of the two train LNG facility on Curtis Island.

Some key facts about the Australia Pacific LNG project are as follows:

- \$25.9 billion dollar CSG-LNG project
- Approximately 78% of all construction expenditure was sourced through Australian suppliers
- More than 15,000 direct jobs during the construction period and approximately 2,000-2,500 during operations
- \$41.6 million in community investment
- First cargo in January 2016 with ongoing off take agreements for 20 years

Annexure 1 - Typical landholder engagement process



Annexure 2 - Origin's Landholder Charter

Origin's Landholder Charter



Vision: We are an integral, trusted and valued part of the communities in which we operate. We share value and honour the commitments we agree with our landholders. In doing this, we create value for Origin by protecting the opportunity to access other resources in the future.

Our commitments

Relationships are everyone's job	<ul style="list-style-type: none"> Our actions align with the value of our landholder and community relationships We all know that excellent relationships underpin our license to operate and ability to sustainably develop a gas portfolio We each understand the role we play in building and maintaining those relationships, and we hold ourselves to account for them
Collaborating	<ul style="list-style-type: none"> We share information freely, collaborate and work across Origin as one team We are clear about accountability and responsibility, decision-authority and governance, and we always strive for the best outcomes. We decide and act promptly using our streamlined processes
First contact	<ul style="list-style-type: none"> By the time we seek access, we have already established a relationship with the landholder, regardless of Origin timelines. We know what is important to landholders and how they would like to work with us During that first contact, we share Origin's known and likely long-term activities. Potential impacts of those activities are explained by the appropriate technical experts
Reaching agreement and sharing value	<ul style="list-style-type: none"> We ask landholders about the impacts our activities will have on them and how they think about compensation. We then invite them to articulate the compensation and the ways we can avoid, minimise or mitigate the impacts of our activities that they consider appropriate We explain the reasoning behind our compensation offers We look for other options to share value, such as the Working Together Program or supplier opportunities
Delivering our commitments	<ul style="list-style-type: none"> We collaborate to ensure we only make commitments we can keep, and then we honour them, or give early notice and find another way together We do not always say "yes". We act consistently with our commercial principles, our business practices and our procedures
Planning and managing changes	<ul style="list-style-type: none"> We put ourselves in landholders' shoes in planning to minimise long-term impact on the land and landholder There are no surprises. We collaborate to minimise change, even when Origin needs to be flexible, and engage early on proposed changes and respond to landholders' concerns
Communicating is the key constant	<ul style="list-style-type: none"> We are open and honest. We have difficult conversations when they are needed, and we acknowledge our mistakes and failures Internally, we talk regularly, act promptly, and share openly – both success stories and lessons learned so that we can improve Landholders know who to talk to – they have a single point of contact and an escalation point, and they know when those contacts change Our communication with landholders is planned, purposeful and frequent, and framed within what is important to landholders
Living this charter	<ul style="list-style-type: none"> We measure the quality of our landholder relationships against this Charter, using a reporting and assurance framework Landholders have our commitment to a published Landholder Charter, that we track and share our performance against Periodically, a third party assures us that we have obtained access on an "informed consent" basis and that we have acted ethically – and we fix any practice that falls that test

Annexure 3 - Assessing bores and make good regime

Baseline Assessments

- Origin commenced baseline assessments for all bores in Australia Pacific LNG Tenures before it became a legislated requirement (pre-2012)
- Assessments were shared with OGIA and each landholder

Preparation of Surat Underground Water Impact Report

- OGIA prepared Surat Underground Water Impact Report (released 2012)
- Report identified bores where there was a predicted water level drop meeting the 'trigger threshold', namely, five metres decline in water level in consolidated aquifers and two metres decline in unconsolidated aquifers from production-related activities, excluding bore water level changes due to a range of natural and anthropogenic factors
- Of approximately 21,000 in the Surat Cumulative Management Area, only 85 bores were likely to experience 'trigger threshold' water drop by 2015 - almost all in the coal measures (0.4% of the total)

Bore assessments for short-term impacted bores

- Gas companies were required to carry out bore assessments for each bore predicted to be impacted by 2015
- The purpose of the bore assessment was to further assess the bore and the likelihood of potential impact
- Landholders were provided with a copy of the bore assessment for their bores

Negotiation of make good agreements

- For bores predicted to be impacted in the short term, Origin commenced negotiations for make good agreements to agree measures that were suitable to address predicted impacts for each bore
- The make good measures should be commensurate with the nature of the impact
- Under law, gas companies are required to use best endeavours to reach agreement with landholders

Carrying out the 'make good measures'

- Once each make good agreement is executed, Origin undertakes any works required under the agreement to give effect to the make good measures