



Arrow Energy

Surat development update

December 2017



- Arrow has agreed one of the largest gas supply deals on Australia's east coast:
 - 27-year deal between Arrow and QCLNG to commercialise the majority of Arrow's gas reserves in the Surat Basin
- Collaboration will see use of existing QGC-operated infrastructure to reduce impacts to landholders and communities
 - this includes gas compression, processing and transmission infrastructure and water transport and treatment facilities
 - up to 8 planned central gas processing facilities and 2 water treatment facilities may not be built
 - Arrow Surat Pipeline is no longer required
- Economic benefits
 - project will create 1000 new jobs – around 800 during peak construction and 200 ongoing operational roles
- Development phasing and opportunities to be discussed today

**ARROW
UPDATE**

**SURAT GAS
DEVELOPMENT
UPDATE**

**LOCAL
CONTENT &
EMPLOYMENT**

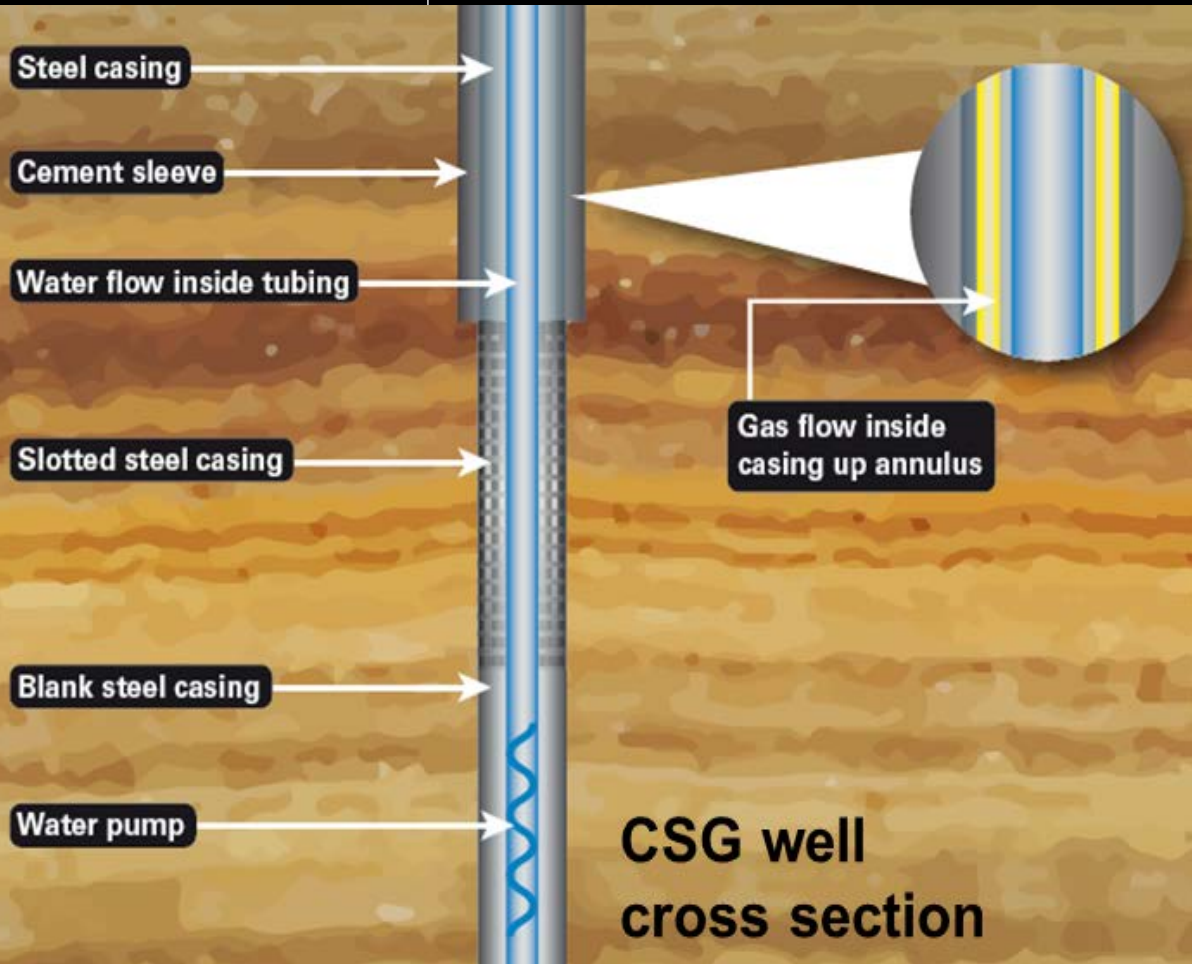
GROUNDWATER

**SOCIAL
INVESTMENT**





- An integrated coal seam gas company owned 50/50 by Shell and PetroChina
- Produces the equivalent of 25% of Queensland's annual gas demand, and provides gas for industrial users and electricity generation
 - tenure over two major production basins - the Surat and Bowen basins
 - about 1,450 gas wells
 - some 17,000km² of production and exploration tenements across Queensland
- Existing domestic gas operations:
 - five gas producing projects in the Surat and Bowen basins - Tipton, Daandine, Kogan, Stratheden (Surat Basin) and Moranbah Gas Project (50/50 AGL - Bowen Basin)
 - supply gas to 4 power stations - Braemar 1, Braemar 2 (100% owned), Yabulu, Daandine, Moranbah, Swanbank
 - capacity to generate electricity supply for 800,000 averaged-sized Queensland homes
- Surat presence:
 - active part of the community for more than a decade, large local employer
 - continued planning to bring significant reserves to market and have continued to invest locally
 - development plans have changed in response to low global oil prices
 - now have a long-awaited path to market for gas through collaboration with QCLNG
 - phased development in the Surat over next 30 years



**CSG well
cross section**

- CSG is natural gas trapped in underground coal beds by water and pressure
- To extract CSG a 300-750m deep well is drilled
- Water is pumped from the coal seams to release gas
- Gas and water flow up the well to the surface separately
- Wells are constructed to isolate coal seams from groundwater aquifers

ARROW
UPDATE

**SURAT GAS
DEVELOPMENT
UPDATE**

LOCAL
CONTENT &
EMPLOYMENT

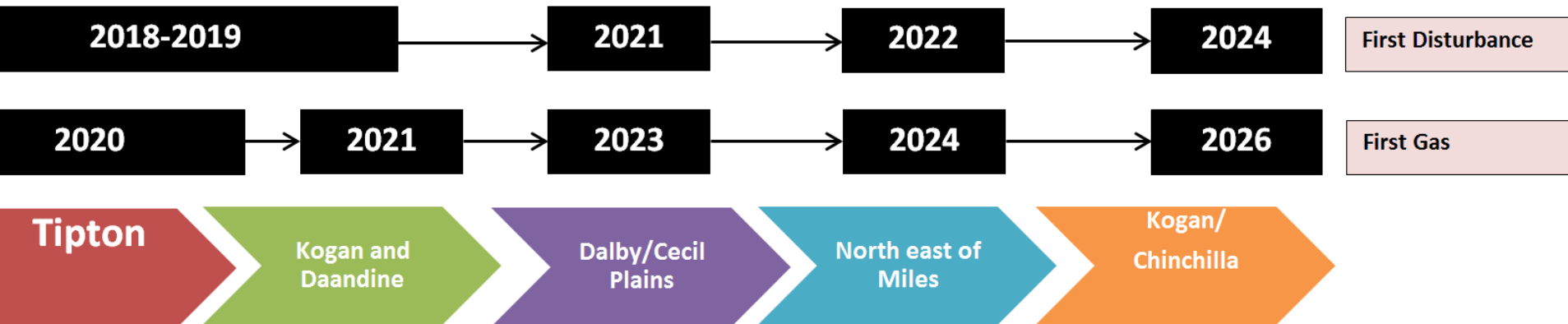
GROUNDWATER

SOCIAL
INVESTMENT



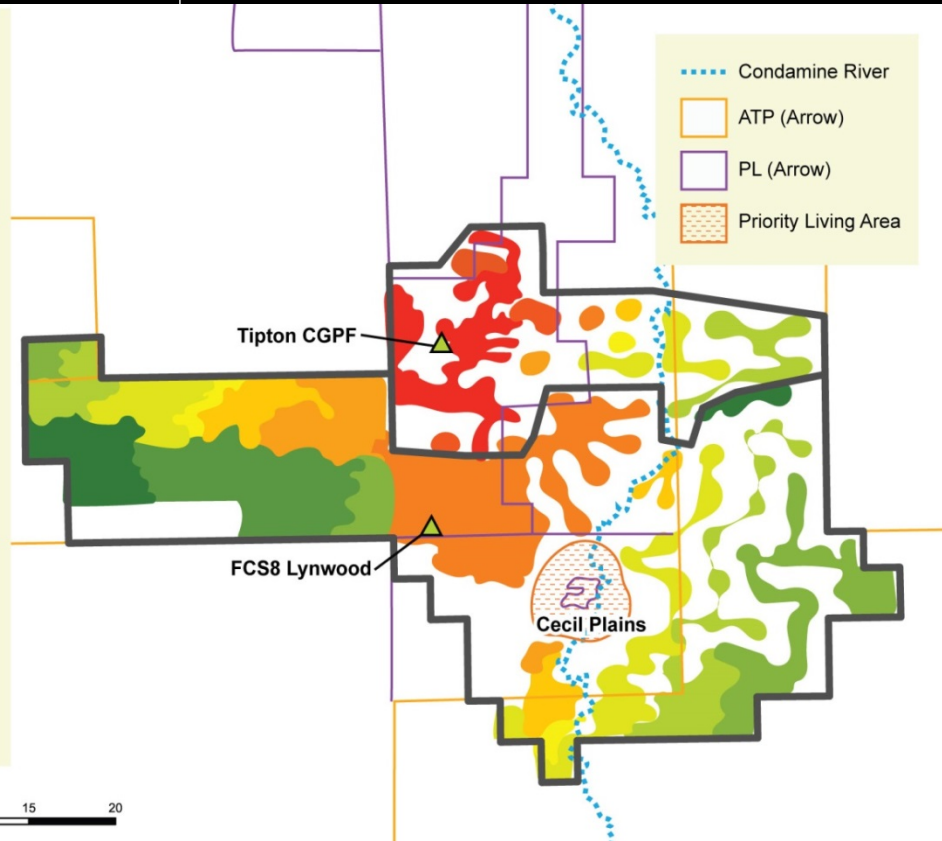


- Arrow will no longer deliver gas direct to an LNG plant
- The proposed Arrow Surat Pipeline will no longer be required
- Only 2 new Gas Facilities are required- previously 8
- No new water treatment facilities
- Reduced number of accommodation villages
- 60% reduction in the number of wells required - 2500
- Phased development to start with expansion of existing domestic gas assets, and then will move south to north
- Execution is phased over a longer duration
- Development is generally within existing approved EIS footprint
- Some off tenure pipeline scope required in order to connect to existing QGC and Arrow infrastructure
- Ecology assessments for off tenure work will commence in December 2017



Year Online Phasing

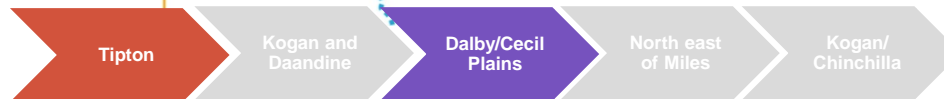
- 2017 - 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027 - 2029
- 2030 - 2032
- 2033 - 2035
- 2036 - 2037
- 2038 - 2040
- 2041 - 2043



Tipton area development

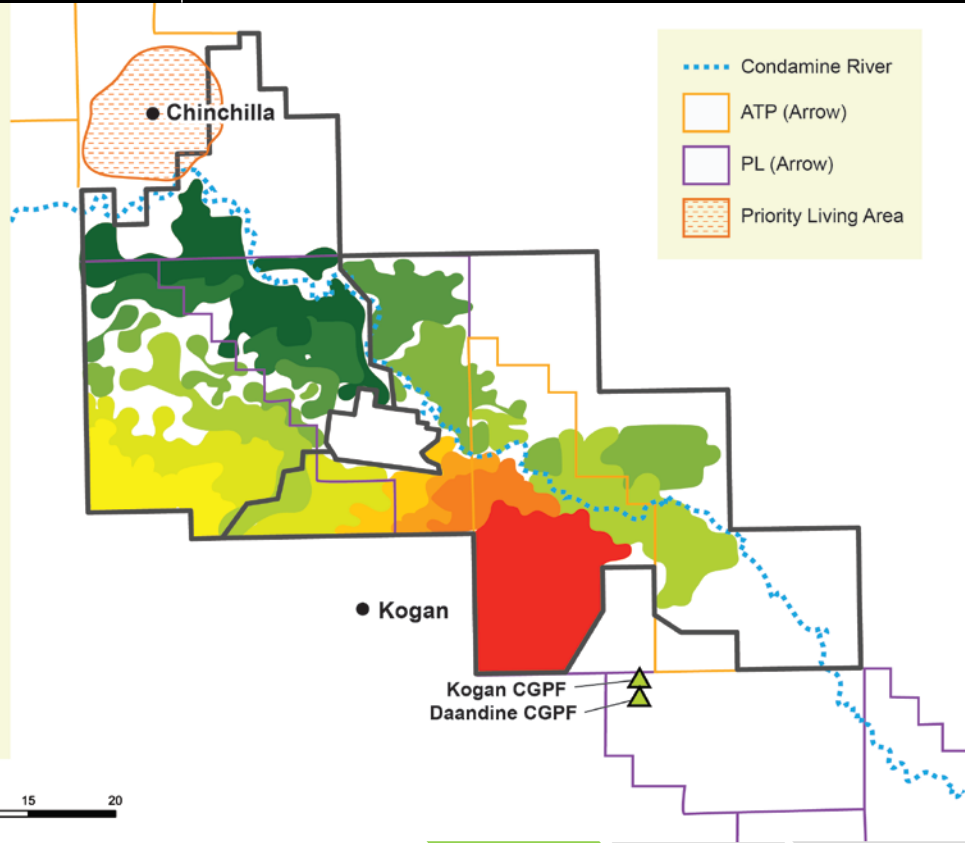
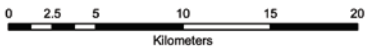
- ~955 new wells
- Gathering and minor works at existing facilities
- 1 new compression station
- 2019 first disturbance
- 2020 first well production
- 2023 compressor online

**Colours on map indicate timing of development. Landholders could expect to be contacted 2–3 years prior to these dates.*



Year Online Phasing

- 2017 - 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027 - 2029
- 2030 - 2032
- 2033 - 2035
- 2036 - 2037
- 2038 - 2040
- 2041 - 2043

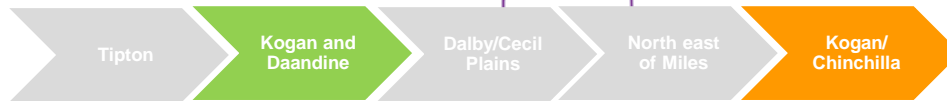


- Condamine River
- ATP (Arrow)
- PL (Arrow)
- ▨ Priority Living Area

Kogan area development

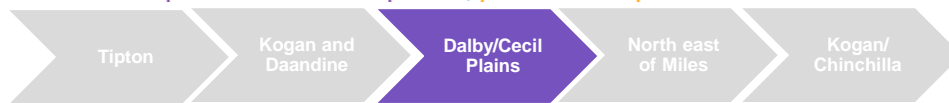
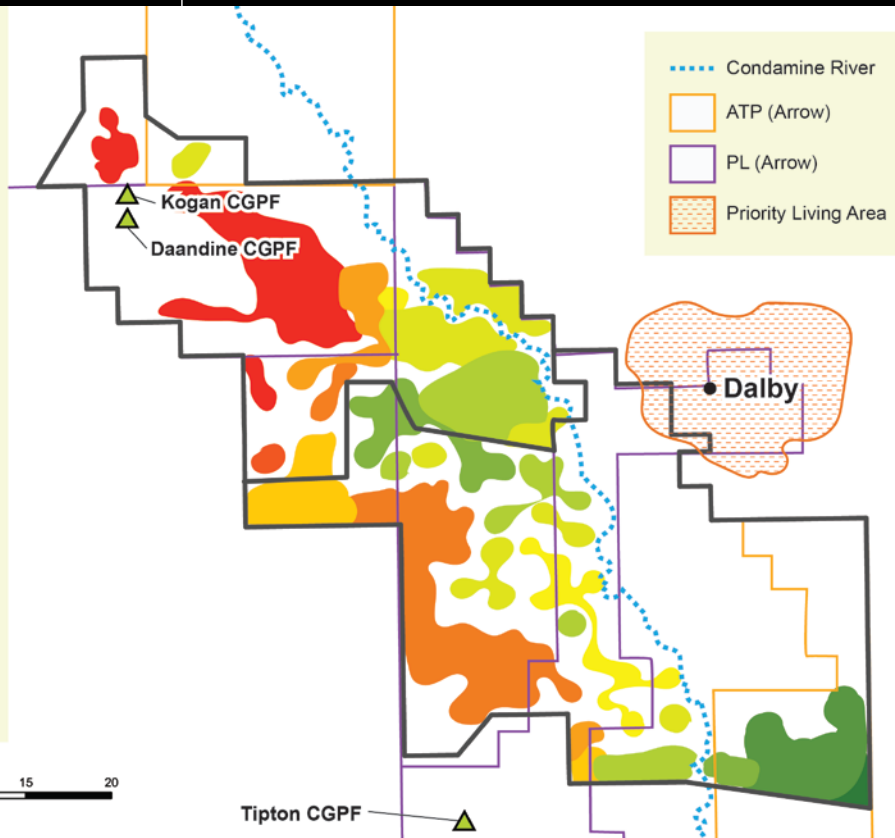
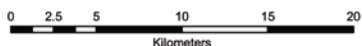
- 630 new wells
- Gathering and minor works at existing facilities
- 2019 first disturbance
- 2021 first production

**Colours on map indicate timing of development. Landholders could expect to be contacted 2–3 years prior to these dates.*



Year Online Phasing

- 2017 - 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027 - 2029
- 2030 - 2032
- 2033 - 2035
- 2036 - 2037
- 2038 - 2040
- 2041 - 2043



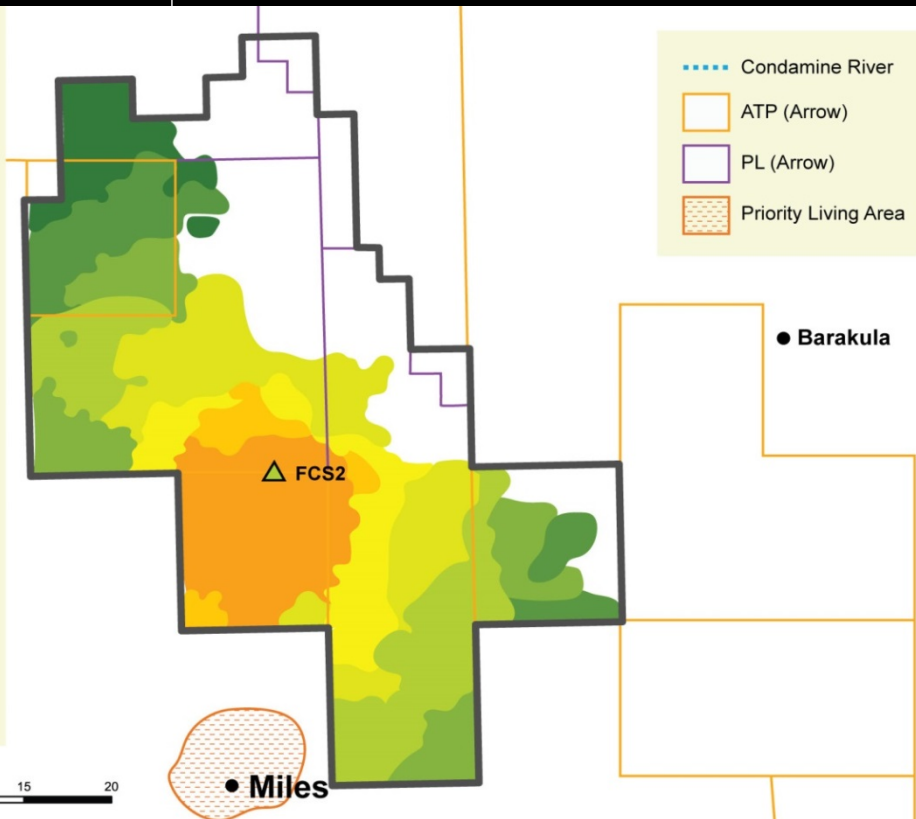
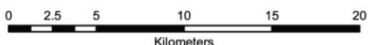
Dalby area development

- 440 new wells
- Gathering and minor works at existing facilities
- 2019 first disturbance
- 2021 first production

**Colours on map indicate timing of development. Landholders could expect to be contacted 2–3 years prior to these dates.*

Year Online Phasing

- 2017 - 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027 - 2029
- 2030 - 2032
- 2033 - 2035
- 2036 - 2037
- 2038 - 2040
- 2041 - 2043

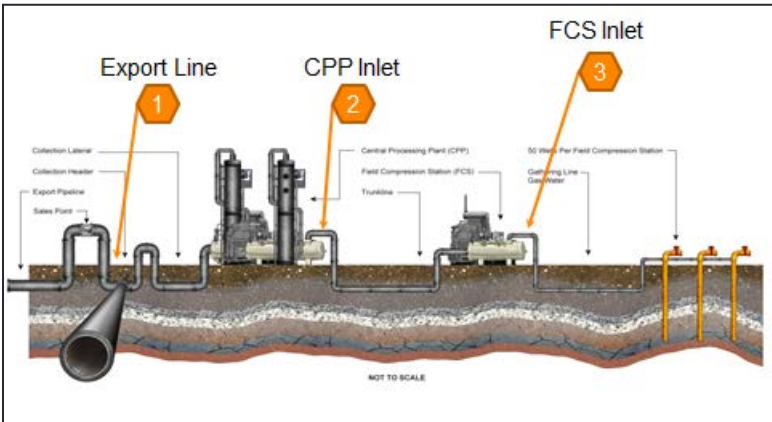


Miles area development

- ~590 new wells
- Gathering
- 1 new compression station
- 2022 first disturbance
- 2024 first well production
- 2024 compressor online

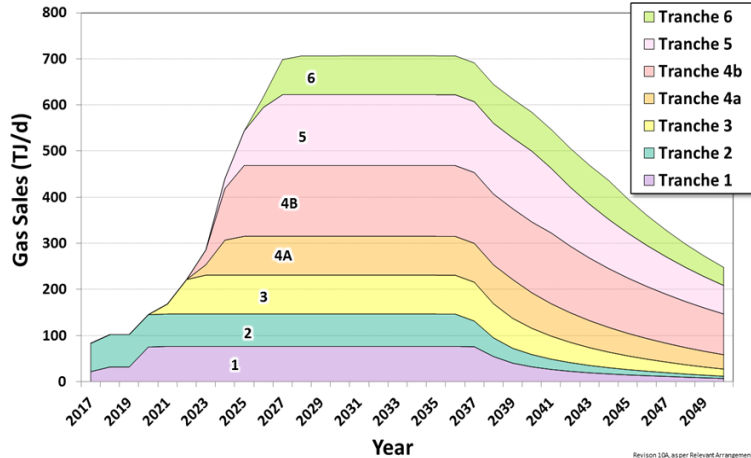
**Colours on map indicate timing of development. Landholders could expect to be contacted 2–3 years prior to these dates.*





- The deal will monetise the majority of Arrow's Surat gas.
 - Detailed development planning is underway
 - Areas north of Wandoan, to south of Cecil Plains are being assessed
- Area Wide Planning will be undertaken on a landholder to landholder basis
- Community engagement will be ongoing
- Overarching Surat Gas Project principles remain unchanged, including Arrow's coexistence commitments
- Arrow to remain upstream operator and will develop and construct Surat Gas Project

Surat SGP project - Sales Gas rate per Tranche





Gathering

- Gathering lines will be underground, buried to a depth that will cater for future land use
- Low Point Drains and High Point Vents plus some water pumping equipment will have a small surface area along the gathering lines

Power

- Arrow's preferred method for power supply for its proposed compression facilities is from the transmission grid by a Network Service Provider via overhead transmission lines
- On IFL, Arrow's Surat Gas Project plans that power will be reticulated underground to well sites and water pumping stations, unless otherwise agreed with the landholder

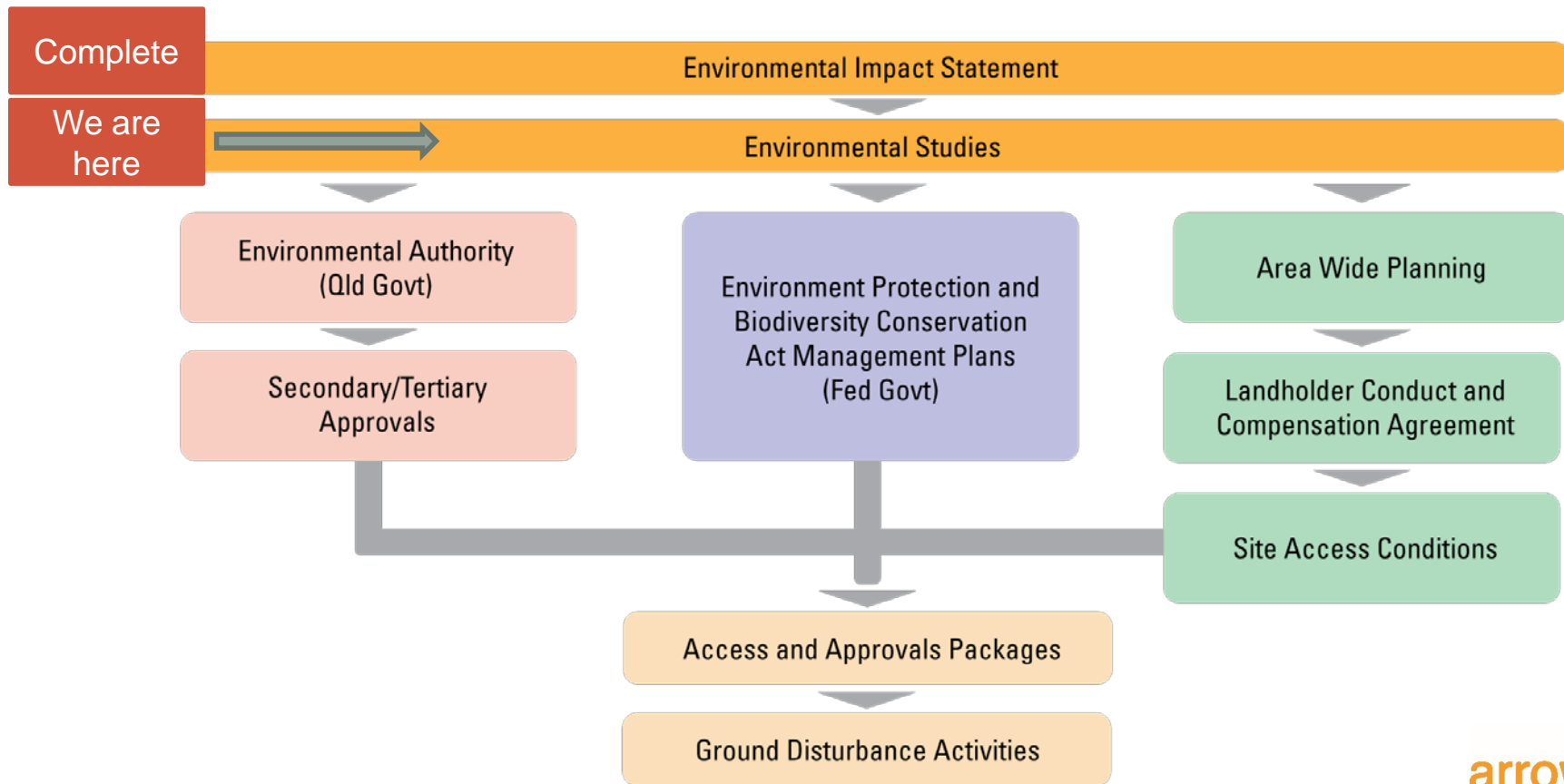
Water

- Arrow will offset any impact it has on the Condamine Alluvium and will maximise beneficial use of its treated CSG water



Wells and wellpads

- Approximately 2500 wells within the development area (60% reduction from SGP EIS, supplementary report)
- The type of wells will depend on coal properties; depth, gas content and permeability
- Average surface spacing of well sites will on average not be less than 800m on Intensively Farmed Land
- Multi-Well Pads:
 - Standard on Intensively Farmed Land, unless negotiated
 - For deeper coals (approx 400m and below) with an average surface spacing of some 2 km
- Vertical wells in shallower coals (<400m), with surface spacing's ranging from 0.8 to 1.5 km (or greater)
- Expected life of a well pad from 'on pump date' to final abandonment is approximately 20 years.



Arrow produces a conceptual field development plan

Arrow and landholder discuss:

- Arrow project layout objectives
- Landholder constraints

Jointly identify potential layout solution

Arrow submits a land access request – Arrow can then commence field surveys, which help to verify the layout solution

Arrow confirms design and engineering of layout solution

Arrow and landholder agrees to a Conduct and Compensation Agreement

Arrow begins construction activities and prepares for field operations

- Early engagement on the existing and proposed development
- Collaborative planning process confirming operational constraints and opportunities
- Identifies & considers all other constraints including Approvals, Ecology, Cultural Heritage and third party interactions
- Small group or one-on-one or planning sessions dependant on landholder preference
- Landholders could expect to be contacted 2–3 years prior to development

ARROW
UPDATE

SURAT GAS
DEVELOPMENT
UPDATE

LOCAL
CONTENT &
EMPLOYMENT

GROUNDWATER

SOCIAL
INVESTMENT





gateway.icn.org.au

ICN helps bring Australian suppliers and project owners together by giving exclusive access to our powerful online database and our extensive network of Business Growth consultants. The result: more work for Australian businesses.

JOIN NOW

- Economic benefits through employment, contracting and procurement
- Job opportunities:
 - Arrow strongly supports local employment
 - 800 jobs in construction - peak 2022
 - 200 jobs in on-going operations
 - Vacancies will be advertised
- Local Content:
 - Arrow and its contractors will provide *full, fair and reasonable* opportunities for capable and competitive Local industry to participate in the procurement of goods, equipment and services.
 - Arrow will publish a Supplier Information Guide published on the Arrow Energy website and www.arrow.icn.org.au
 - Work with local supplier advocates, regional development bodies, local Chambers of Commerce and Local Councils to promote supply opportunities
 - Support local suppliers to develop their businesses in prequalifying or tendering

Looking for suppliers?

Search for the right suppliers or project partners here.

Looking for work?

Search for projects and new business opportunities here.

ARROW
UPDATE

SURAT GAS
DEVELOPMENT
UPDATE

LOCAL
CONTENT &
EMPLOYMENT

GROUNDWATER

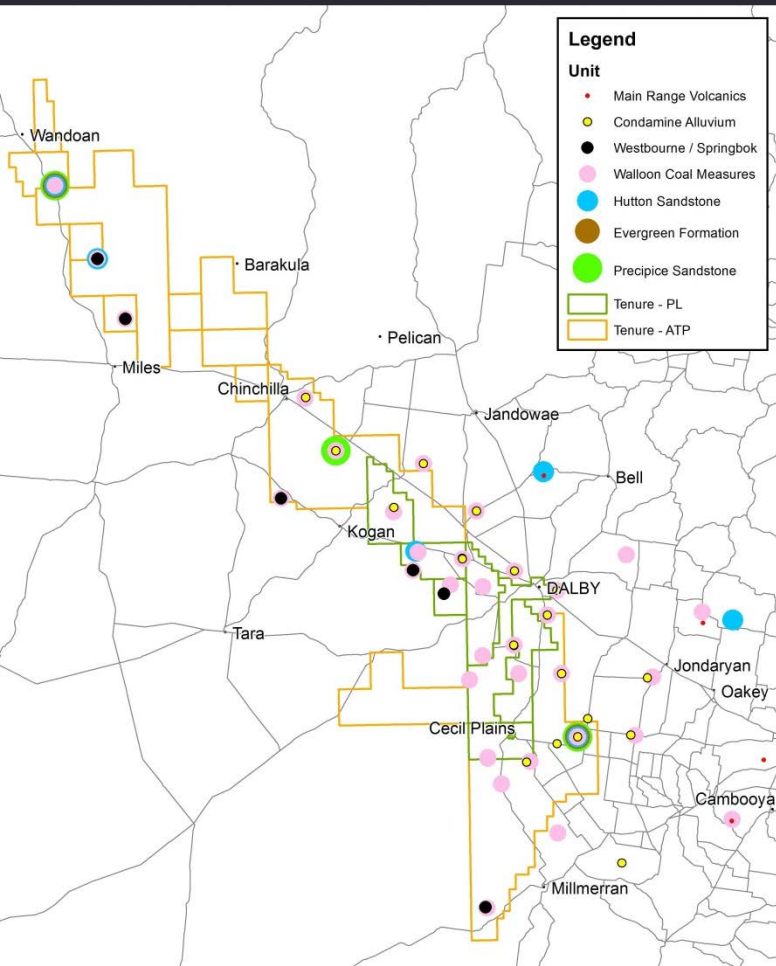
SOCIAL
INVESTMENT



- The removal of groundwater from a coal seam is required to release the gas stored in the seam
- A regulatory framework is in place via the *Water Act 2000* for managing groundwater related impacts, including:
 - Modelling
 - submission of and compliance with Underground Water Impact Reports (UWIR). The Office of Groundwater Impact Assessment (OGIA) prepare and revise the UWIR for the Surat.
 - Arrow's obligations under the Surat UWIR are based on existing operations, as well as proposed future operations
 - Groundwater monitoring
 - Management of affects on groundwater, including:
 - Specific studies to better understand potential impacts to the Condamine Alluvium,
 - Baseline assessments of landholder water bores, and
 - Make good agreements for impacted water bores.



- Arrow remains committed to offsetting its predicted impact to groundwater resources of the Condamine Alluvium aquifer
- Arrow anticipates the drawdown impacts will be less than the prediction in the EIS and SREIS, with further modelling underway
- Arrow will continue to update predictions of drawdown by using the most appropriate groundwater model as developed by the OGIA



- In the 2012 and 2016 UWIRs Arrow were required to commence monitoring at 36 'sites' by end 2017
- These bores monitor formations above, into and below the Walloon Coal Measures
- Arrow has also installed a further 62 bores as part of technical studies
- Another 70 bores have been installed to monitor infrastructure
- Arrow has complied with the requirement to monitor the bores shown

Arrow must also comply with Commonwealth conditions of approval in addition to state-based groundwater obligations.

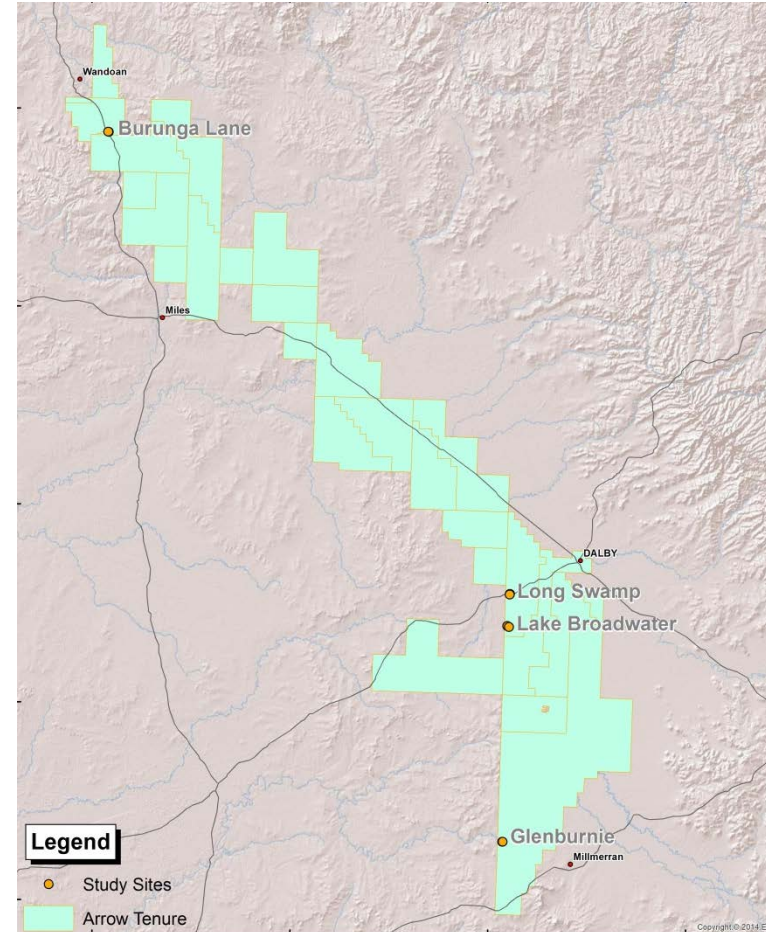
Includes requirement to prepare a Water Monitoring and Management Plan

Stage 1 of this plan will describe additional studies into potential groundwater dependent ecosystems (GDEs) at the following locations:

- Long Swamp
- Lake Broadwater
- Burunga Lane
- Glenburnie

Two drilling programs:

- Shallow core hole drilling program using track mounted sonic rig
- Deep drilling program using truck mounted rotary drilling rig
- December 2017 to March 2018





- Under the *Water Act 2000*, petroleum tenure holders are required to conduct:
 - Baseline assessments of all water bores, and
 - Bore assessments of potentially impaired water bores i.e. those identified in a UWIR or as directed by DEHP.
- Since 2011, Arrow has completed 1,072 baseline assessments of water bores in the Surat Basin
- In 2017, Arrow has conducted baseline assessments of 101 water bores within Dalby
- Arrow has also completed 9 bore assessments in 2017, including some which were undertaken voluntarily
- Make good agreements must then be negotiated for these bores
- Arrow will only make good working bores with capacity

ARROW
UPDATE

SURAT GAS
DEVELOPMENT
UPDATE

LOCAL
CONTENT &
EMPLOYMENT

GROUNDWATER

**SOCIAL
INVESTMENT**



- Heart of Australia is the first mobile heart service to regional Australia. Visits 12 regional towns in North-West and South-West Queensland on a fortnightly basis. Arrow founding partner.
- Arrow's other strategic partners include:
 - LifeFlight – aeromedical medical service. Benefits industry and the community with retrievals
 - Brisbane Broncos – educational and community based partnership.
 - PCYC for driving licenses and disengaged youth
 - Endeavour Foundation provide respite holiday school programs and transition to work for people with a disability
 - Dalby State School agricultural scholarships
 - Indigenous tertiary scholarships with five Queensland universities
 - STEM programs for primary and high schools





- Arrow's Brighter Futures social investment program works with governments, community organisations and local not-for-profit groups.
- Our programs, driven by community needs and priorities, focus on health and safety, education and the environment.
- Our community investment is delivered in three ways: community funding grants, sponsorships and partnerships.
- This approach helps us support diverse initiatives that are tailored to individual community needs.
- The Arrow Brighter Futures program has contributed over \$20M to the communities in which we operate.

© Arrow Energy Pty Ltd December 2017

While Arrow Energy Pty Ltd has endeavoured to ensure that all information provided in this publication is accurate and up to date at the time of publication, it takes no responsibility for any error or omission relating to this information. Furthermore, the information provided shall not constitute financial product advice pursuant to the Australian Financial Services Licence held by Arrow Energy Pty Ltd's related body corporate. To the maximum extent permitted by law, Arrow Energy Pty Ltd will not be liable for any cost, loss or damage (whether caused by negligence or otherwise) suffered by you through your use of this publication.

