



SAPEX Limited PEL 122 & 123 Fracture Stimulation Activities



Michael Malavazos
Director Engineering Operations
Energy Resources Division
March 2018

WHO WE ARE?

The Energy Resources Division (ERD) is part of the Resources and Energy Group (REG) of the Department of the Premier and Cabinet (DPC).

REG reports to the Hon Tom Koutsantonis MP in his capacity as Minister for Mineral Resources and Energy.

The Energy Resources Division is the lead agency in facilitating petroleum and geothermal activities in the state. It has responsibility for facilitating the generation of royalty income, economic development, wealth and jobs, and the minimisation of impacts on the environment and public safety through efficient management of the state's petroleum and geothermal rights on behalf of the people of South Australia.

- Michael Malavazos – Director – Engineering Operations
- Dominic Pepicelli – Principal Reservoir Engineer
- Jarrod Spencer – Senior Environmental Officer

PGE ACT REGULATORY FRAMEWORK

In South Australia

Petroleum Exploration and Production Activities regulated under:

- Petroleum and Geothermal Energy Act 2000 (PGE Act);
- Environment Protection Act 1993;
- Natural Resources Management Act 2004;
- National Parks and Wildlife Act 1972;
- Aboriginal Heritage Act, 1988;
- Development Act, 1993;
- Work Health and Safety Act 2012;
- Public and Environmental Health (Waste Control) Regulations 2010;
- Environment Protection and Biodiversity Conservation Act 1999;
- Commonwealth Native Title Act 1994

Interaction between PGE Act and other South Australian Acts administered through
Administrative Arrangements with respective agencies

DEFINITION OF ENVIRONMENT

Includes:

- Land, air, water, soil
- Plants & animals
- Social, cultural and heritage features
- Visual amenity
- Economic and other land uses

LICENSING AND APPROVALS PROCESS FOR EXPLORATION AND PRODUCTION ACTIVITIES

- Stage 1 – Licensing
- Stage 2 – Environmental Assessment and approval of Environmental Objectives
- Stage 3 – Activity Notification and Approval



STAGE 2 – ENVIRONMENTAL ASSESSMENT AND APPROVAL OF ENVIRONMENTAL OBJECTIVES

Environmental Impact Report (EIR)

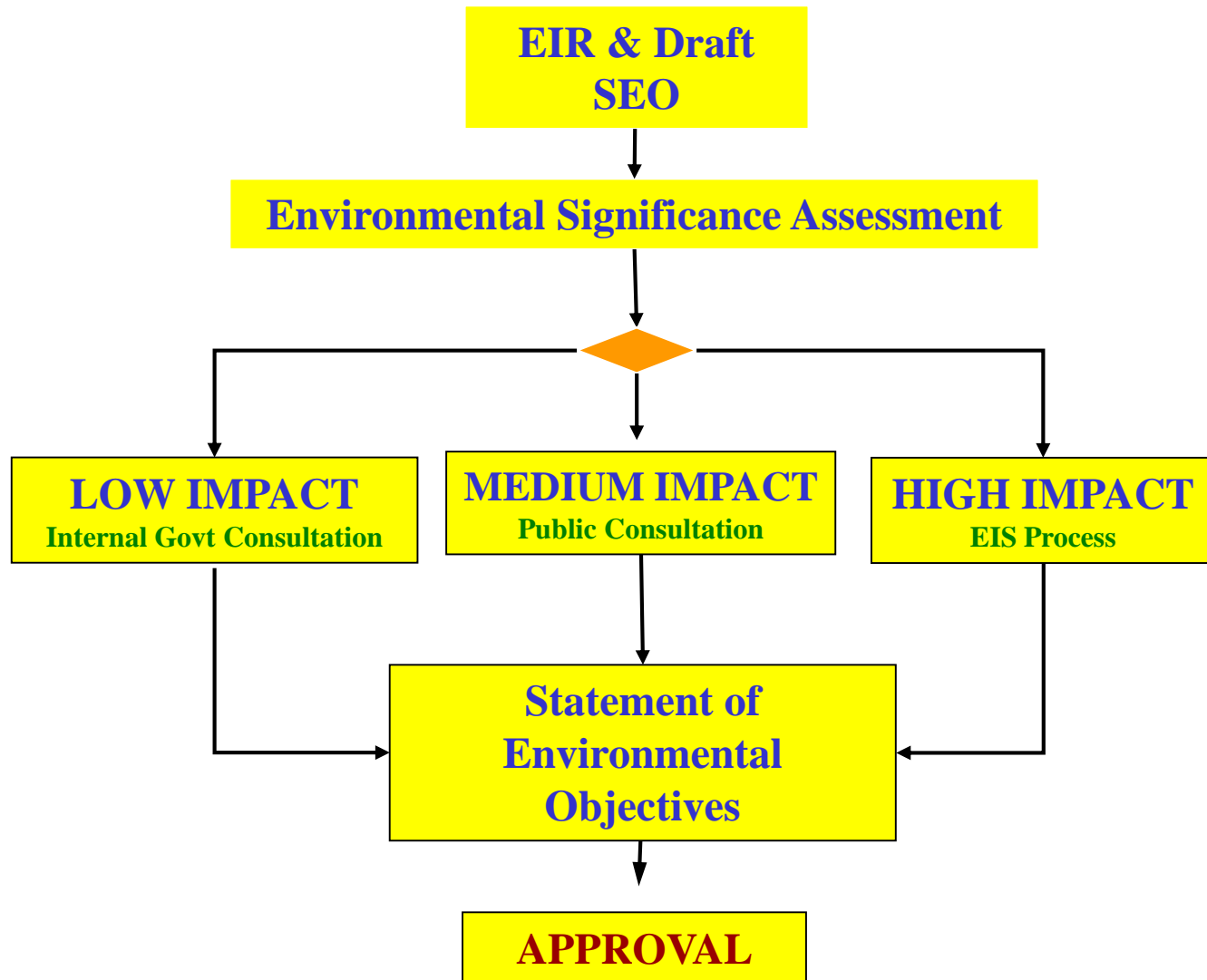
- Needs to consider all risks to the environment (definition provided previously) and how these risks will be managed to sufficiently enable an informed decision to be made on the likely impact the activities will have on the environment.

Statement of Environmental Objectives (SEO)

- Be prepared on the basis of the EIR and include:
 - Environmental objectives to be achieved
 - Guide on how objectives will be achieved
 - Assessment criteria to measure objectives

EIR AND SEO

- Developed in consultation with relevant stakeholders – e.g. landholders/ native title claimants and government agencies (DEWNR/ EPA/ AAR/ DPTI/ DOH/ SWSA)
- If approved the documents will be published on DPC website
- Reviewed every 5 years or as required by Minister



PUBLIC CONSULTATION



PEL122 & PEL123 Fracture Stimulation Activities

Environmental Impact Report

December 2017



PEL122 & PEL123 Fracture Stimulation Activities

Statement of Environmental Objectives

December 2017

The Minister for Mineral Resources and Energy is seeking public comment, under provisions of the PGE Act

Written submissions must be addressed to:

Attention: Jarrod Spencer
Department of the Premier and Cabinet
Energy Resources Division
GPO Box 320, Adelaide 5001
Or via email
to DPC.Engineering@sa.gov.au

**Submissions close COB 22
March 2018**

SAPEX DRAFT SEO – ENVIRONMENTAL OBJECTIVES

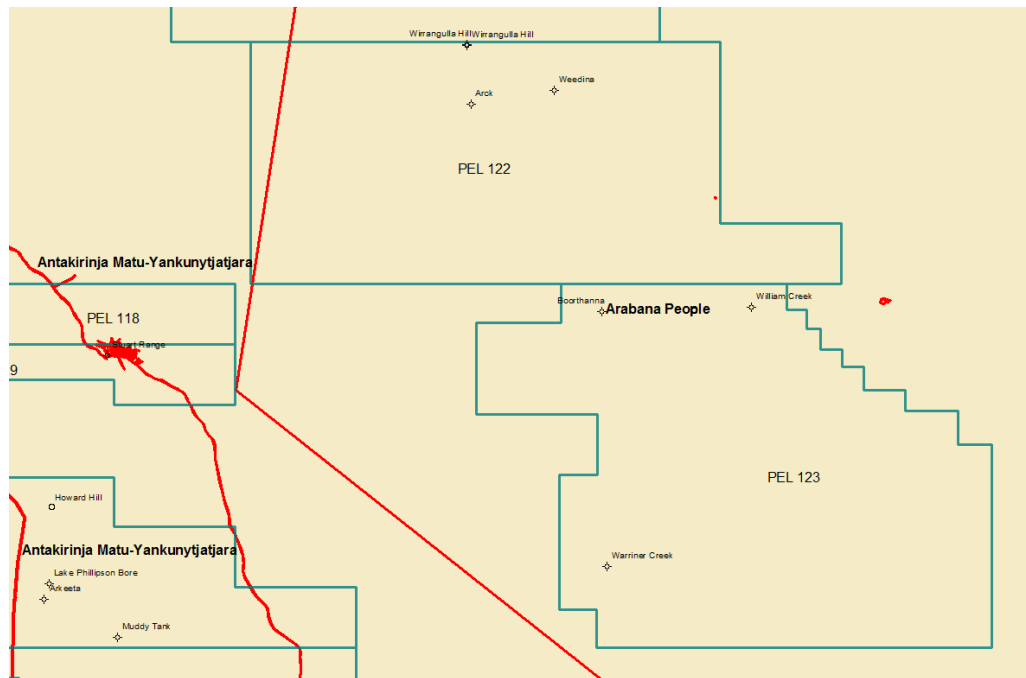
1. Minimise loss of aquifer pressure and avoid aquifer contamination.
2. No impacts on groundwater dependant ecosystems | No significant impacts on existing groundwater users
3. Avoid contamination of surface water | No disruption to natural drainage paths or alteration to flow distribution
4. Minimise disturbance and avoid contamination to soil.
5. Minimise disturbance to native vegetation and native fauna.
6. Avoid the introduction or spread of weeds, pest animals and pathogens as a consequence of regulated activities and implement control measures as necessary.
7. Avoid disturbance to Aboriginal and non-Aboriginal heritage sites, objects, remains and place unless prior approval under relevant legislation obtained.
8. Air pollution and greenhouse gas emissions reduced to as low as reasonably practical.
9. Protect the public and third parties from risks inherent in regulated activities.
10. Avoid or minimise disturbance to stakeholders and / or associated infrastructure.
11. Optimise waste avoidance, reduction, reuse, recycling, treatment and disposal.
12. Remediate and rehabilitate operational areas to agreed standards.

GROUNDWATER AND GROUNDWATER DEPENDENT ECOSYSTEMS PROTECTION

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved
1. Minimise loss of aquifer pressure and avoid aquifer contamination.	<p>Compliance with assessment criteria relating to well integrity in the Drilling Activities SEO</p> <p>No loss of aquifer pressure or contamination of aquifers as a result of fracture stimulation operations.</p>	<p><u>Well Integrity</u></p> <p>Casing and wellhead designed to meet pressure, temperature, operational stresses and loads.</p> <p>Well pressure tested prior to commencing fracture stimulation.</p> <p>Monitoring programs implemented (e.g. through well logs, pressure measurements, casing integrity measurements and corrosion monitoring programs) to assess condition of casing and cross-flow behind casing.</p> <p>Trip systems installed to shut off stimulation pumping units if pre-set operational maximum pressure is reached.</p> <p>Note: well integrity issues are subject to requirements of the Exploration Drilling Activities SEO (Sapex 2013)</p> <p><u>Fracture Stimulation Planning and Monitoring</u></p> <p>Assessment of geological and geomechanical settings undertaken during design of fracture stimulation treatments to avoid growth into undesired strata.</p> <p>Fracture design (including pressures, injection rate, fluid makeup and proppant concentration) undertaken to provide confidence that the fracture treatment does not extend into overlying aquifers</p> <p>Fracture stimulation treatment modelled prior to all operations</p> <p>Injection pressures monitored and compared to expected fracture initiation pressure.</p> <p>Investigation undertaken if unexpected water flows occur during production testing, to determine source (e.g. may indicate communication with aquifer).</p> <p>Hydraulic fracturing diagnostics used to assess fracture height growth where appropriate. Specific diagnostic tools (e.g proppant tracers, chemical tracers etc) will be selected based on parameter of interest</p>
<p>2. No impacts on groundwater dependant ecosystems</p> <p>No significant impacts on existing groundwater users</p>	<p>Landholder complaints regarding impact on groundwater users are documented and reasonable steps taken to resolve them can be demonstrated</p> <p>No impact on groundwater dependent ecosystems resulting from extraction of groundwater.</p> <p>No change in the capacity of third party groundwater users to undertake their respective activities</p>	<p>Water extraction, if required, will be in compliance with licensing and water allocations where applicable. Liaise with DEWNR to ensure appropriate authorisations are in place</p> <p>Landowners consulted regarding water well locations and water use</p> <p>Water extraction for fracture stimulation in accordance with licensing and water allocation plan where applicable.</p> <p>Monitoring of water extraction volumes and pressures</p> <p>Options for alternative water supplies investigated / used where feasible (e.g. produced formation water, recycling, reuse).</p> <p>Avoid extracting groundwater where there is potential for impacts to groundwater dependent ecosystems. Where it is not possible to avoid extracting groundwater from these aquifers and there is potential for impact a monitoring plan will be implemented</p>

ABORIGINAL HERITAGE PROTECTION

- DPC-ERD and all South Australian State Government agencies continue to recognise and respect the sensitivities of all Aboriginal heritage matters in the State and the importance that these are appropriately addressed through the regulatory process, both during the approval stage and the compliance monitoring and enforcement stages.
- PEL 122 & 123 in most parts overlies the Arabana People's Native Title area as determined in 1998. A small section to the west of PEL 122 overlies the Antakirinja Matu – Yankunytjatjara (AMYAC) Peoples Native Title area.
- If this project goes ahead, it will have to comply with the South Australian Aboriginal Heritage Act 1988 which includes measures for the protection and preservation of Aboriginal sites, objects and remains.



ABORIGINAL HERITAGE PROTECTION

- The requirement for proponents to secure a native title land access agreements preceding issue of Petroleum Tenements in this State continues to be governed by the federal RTN or Indigenous Land Use Agreement (ILUA) procedure
- As recommended under the AH Act, and required under the PGE Act (SEO), proponents attain Work Area Clearances (WAC) from the prescribed Native Title group as a precedent to commencing any on ground operations. These WACs are the standard assurance that reasonable steps have been taken to avoid damaging, disturbing or interfering with Aboriginal sites and objects protected under the AH Act.

Aboriginal Heritage Issues

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved
7. Avoid disturbance to Aboriginal and non-Aboriginal heritage sites, objects, remains and place unless prior approval under relevant legislation obtained.	<p>Areas of proposed land disturbance have been surveyed and any identified sites, objects, remains and places of Aboriginal and non-Aboriginal heritage have been avoided.</p> <p>Any Aboriginal and non-Aboriginal heritage sites, objects, and remains discovered during operations have been appropriately reported and responded to.</p> <p>If disturbance occurs outside of an approved work area an assessment to evaluate the impacts has been carried out and if required rehabilitation is undertaken in accordance with legislation and/or consultation with Native Title Claimant groups and other Aboriginal people or heritage groups who may have an interest.</p>	<p>Activities confined to cleared areas (e.g. access roads, prepared well lease) within area subject to Work Area Clearance for cultural heritage.</p> <p>Training and induction for all personnel to educate them on the importance of remaining within designated / approved areas.</p> <p>Approved work areas and restricted areas clearly delineated on site</p> <p>Where necessary, cultural heritage sites or exclusion zones in the vicinity of the well site flagged and / or fenced off to prevent disturbance.</p> <p>A mechanism is in place to appropriately report and respond to any sites discovered during operations</p>

REPORTING UNDER THE PGE ACT

Serious Incidents	Reportable Incidents
<ol style="list-style-type: none"> 1. A person is seriously injured² or killed. 2. An imminent risk to public health or safety arises. 3. Serious environmental damage occurs or an imminent risk of serious environmental damage arises. For example: <ul style="list-style-type: none"> • Damage, disturbance or interference to Aboriginal or non-indigenous sites of cultural and / or heritage significance without appropriate permits and approvals³. • An escape of petroleum, process substance, fracturing fluid, a chemical or a fuel to a water body, or to land in a place where it is reasonably likely to enter a water body by seepage or infiltration, or onto land that affects the health of native flora and fauna species. • Identification of cross flows in aquifers in natural hydraulic isolation, or uncontrolled flows to the surface. • Any well incident or failure that threatens or poses an imminent risk to safety or a risk of serious damage to environmental values. • Detection of a declared weed, animal / plant pathogen or plant pest species that has been introduced or spread as a direct result of activities. • Any removal of rare, vulnerable or endangered flora and fauna without appropriate permits and approvals⁴. 4. An event that results in a rupture of a pressure containing asset or facility. 5. A regulated activity⁵ being undertaken in manner that involved or will involve a serious risk to the health or safety of a person emanating from an immediate or imminent exposure to a hazard.⁶ 6. An uncontrolled release resulting in the activation of emergency response and / or evacuation procedures of an area in or adjacent to the release, and / or fire or explosion. 	<ol style="list-style-type: none"> 1. An escape of petroleum⁷, oil, chemicals or fracturing fluid that affects an area that has not been specifically designed to contain such an escape (other than a serious incident). 2. An event that has the potential to compromise the physical integrity of an asset or facility. For example: <ul style="list-style-type: none"> • An unapproved excursion outside of critical design or operating conditions / parameters. • Failure of a critical procedural control in place to reduce a credible threat to low or as low as reasonably practicable (ALARP)⁸. 3. Malfunction or failure of critical plant or equipment that had (or still has) potential to cause a serious incident. 5. An excursion (disturbance) outside a culturally cleared area has occurred but not impacted on any site of significance as determined by relevant authority or Native Title Claimant (must be treated as serious until no impact determined). 6. Any detected unauthorised third-party access to facilities and associated infrastructure.

- **Serious Incidents** must be reported to the Minister as soon as practicable after the occurrence, as per Section 85 of the Petroleum and Geothermal Energy Act 2000 and Regulation 32.
- **Reportable Incidents** must be reported to DPC on a quarterly basis within 1 month of the end of the quarter, as per Regulation 32.

NEXT STEPS

- Public submissions on EIR and draft SEO close on 22 March
- DPC-ERD encourage stakeholders to make submissions
- DPC-ERD will review and collectively respond to all submissions
- DPC-ERD will forward submissions and its own comments to SAPEX
- SAPEX to submit its responses and revised EIR/SEO if necessary
- DPC-ERD will assess and decide on approval or otherwise of SEO
- If substantial changes made, revised EIR and SEO re-consulted on
- If decision is made to approve SEO it will be gazetted
- SAPEX will then proceed to Stage 3 of approval process

STAGE 3 – ACTIVITY NOTIFICATION AND APPROVAL

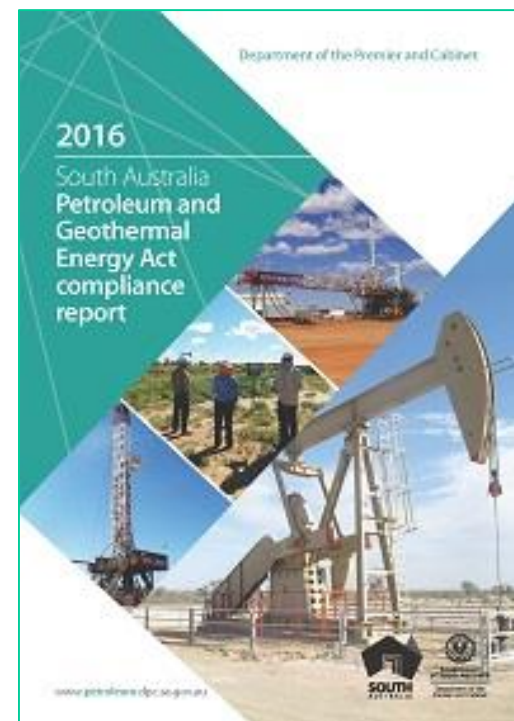
Activity Notification includes:

- Detailed activity information
- Site Specific Environmental Assessment against the objectives of a relevant SEO
- Landholder information (Notice of Entry)
- Fitness for purpose assessments
- Risk assessment documentation
- Work Area Clearance
- Any other material required by DPC to ensure it has comprehensive information on the proposed activities.

PUBLIC INFORMATION

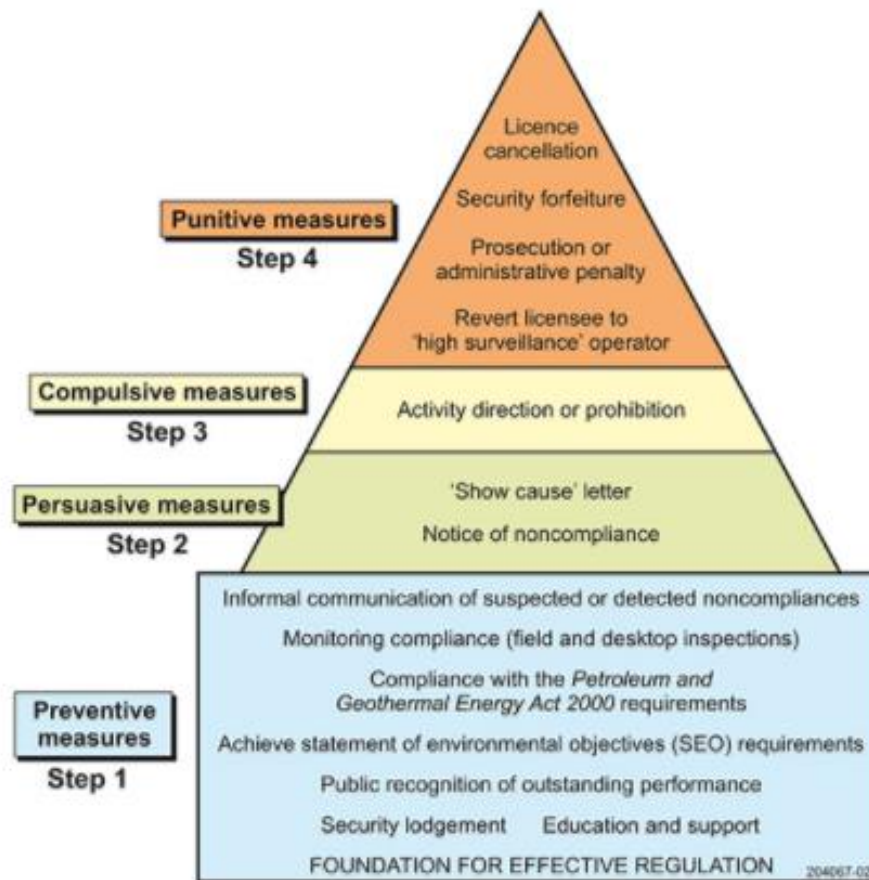
DPC - ERD welcomes people accessing regulatory decision making and industry performance information. The following regulatory documents are freely available to all via the website:

- PGE Act compliance policy,
- Regulatory approval and enforcement actions,
- Surveillance information – SEO compliance,
- Annual compliance report,
- All EIRs and SEOs – including SEOs for fracture stimulation.
- Tenement documents,



<http://petroleum.statedevelopment.sa.gov.au/>

DPC-ERD Compliance Policy



1: Department of the Premier and Cabinet Energy Resources Division compliance and enforcement pyramid

For more information contact:

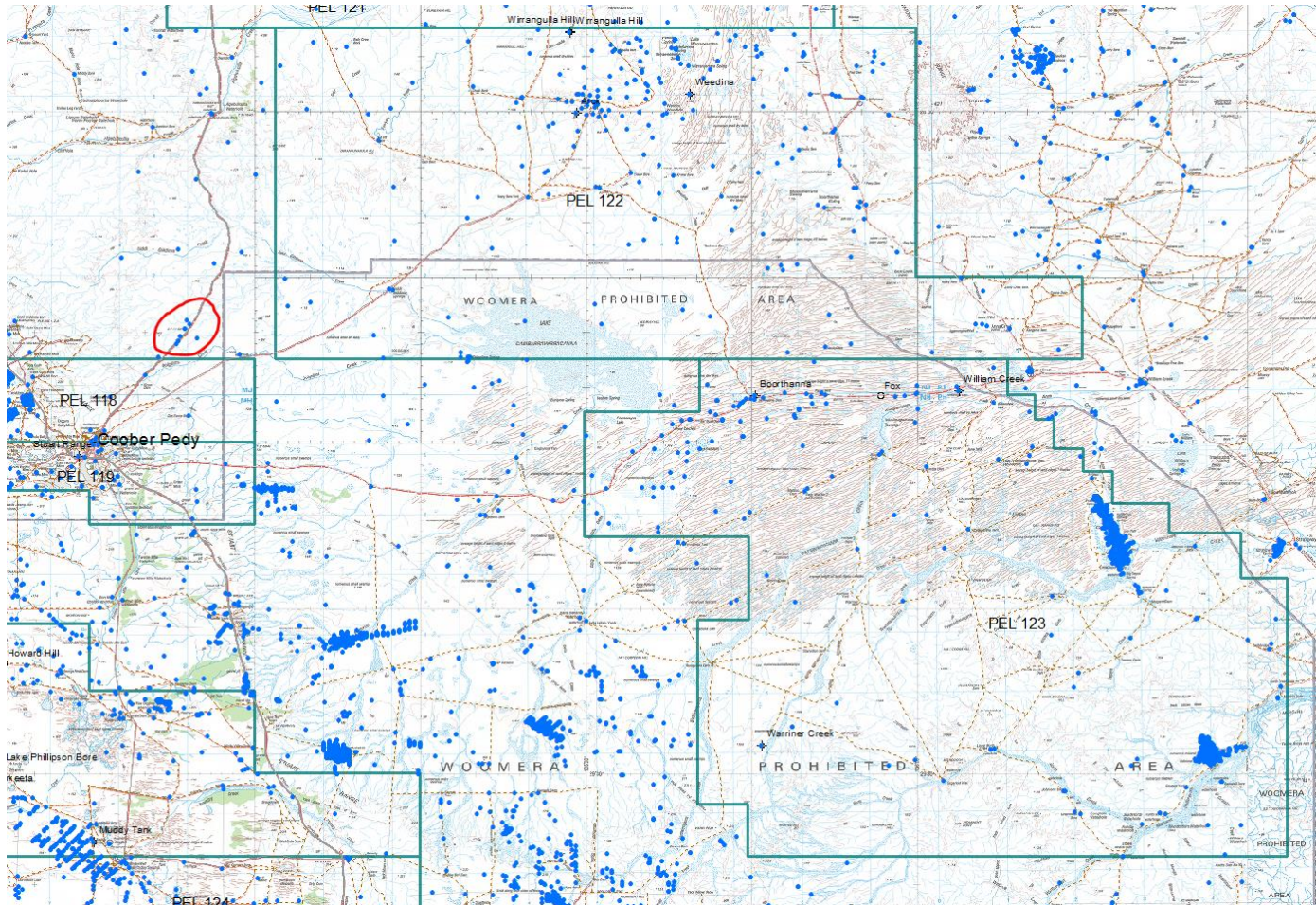
Michael Malavazos: 0401 121 666; or
michael.malavazos@sa.gov.au

Written submissions must be
addressed to:

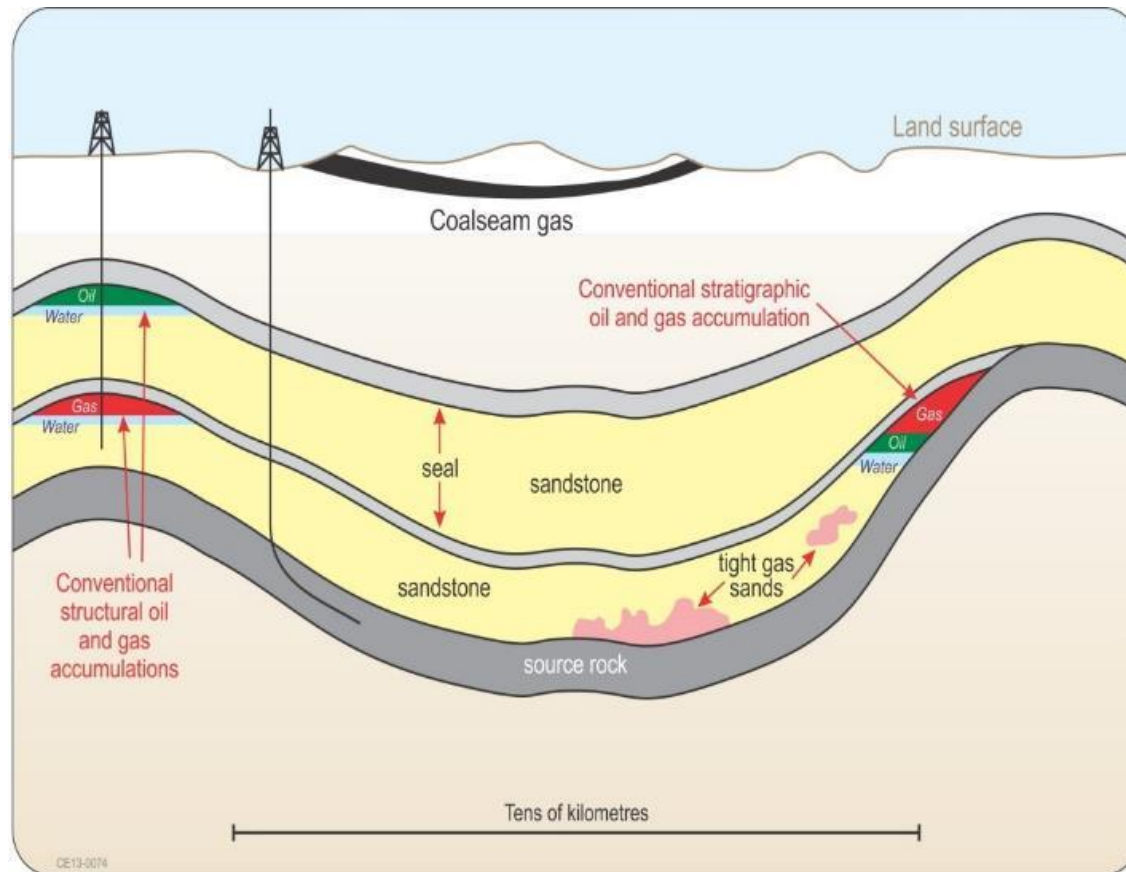
Attention: Jarrod Spencer
Department of the Premier and Cabinet
Energy Resources Division
GPO Box 320, Adelaide 5001
Or via email
to DPC.Engineering@sa.gov.au

Submissions close COB 22 March

LOCATION - PEL 122 & 123

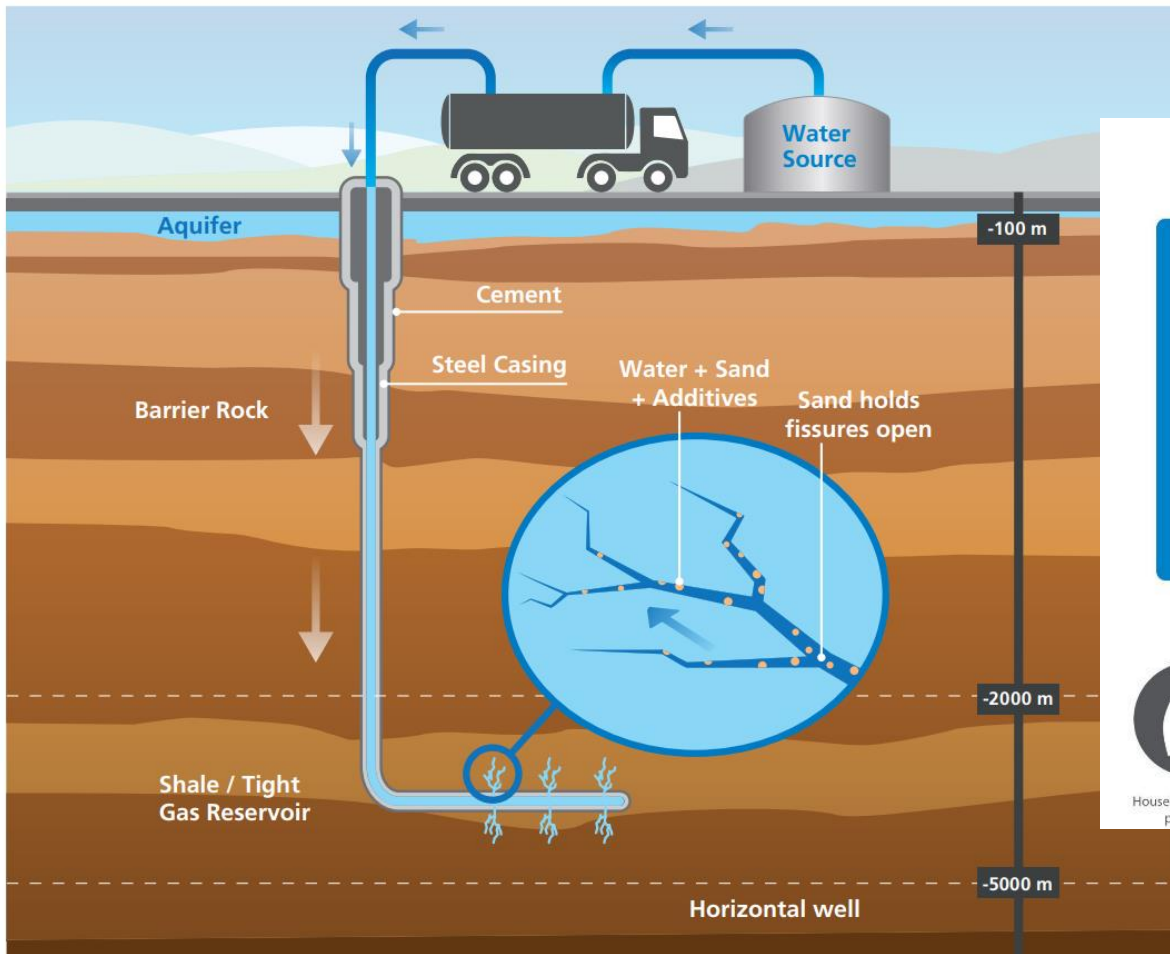


CONVENTIONAL vs UNCONVENTIONAL

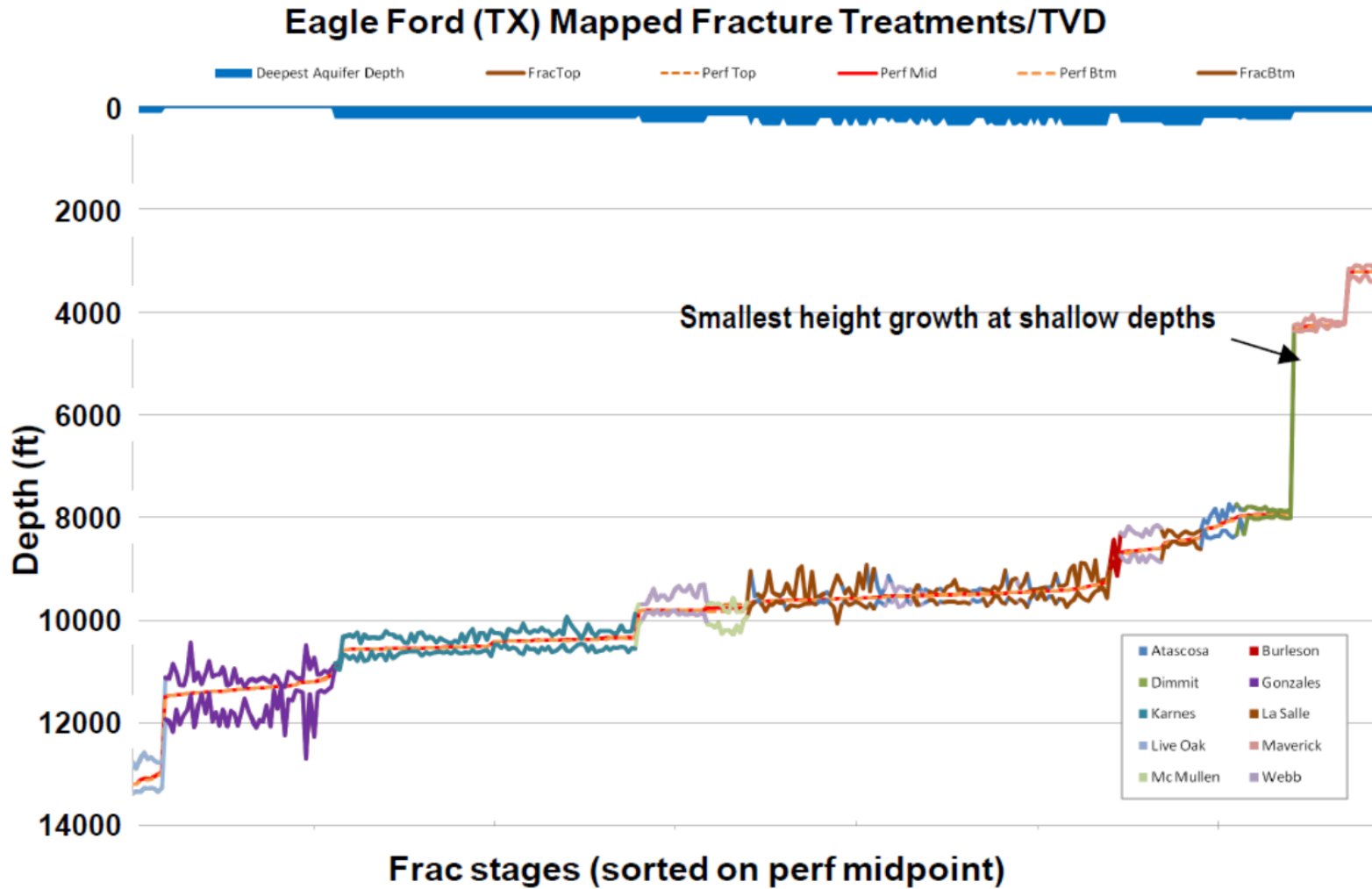


A petroleum well can target both conventional & unconventional reservoirs. Unconventional reservoir horizons may be fracture stimulated but only if approvals are in place. All petroleum wells are drilled under stringent regulations in SA.

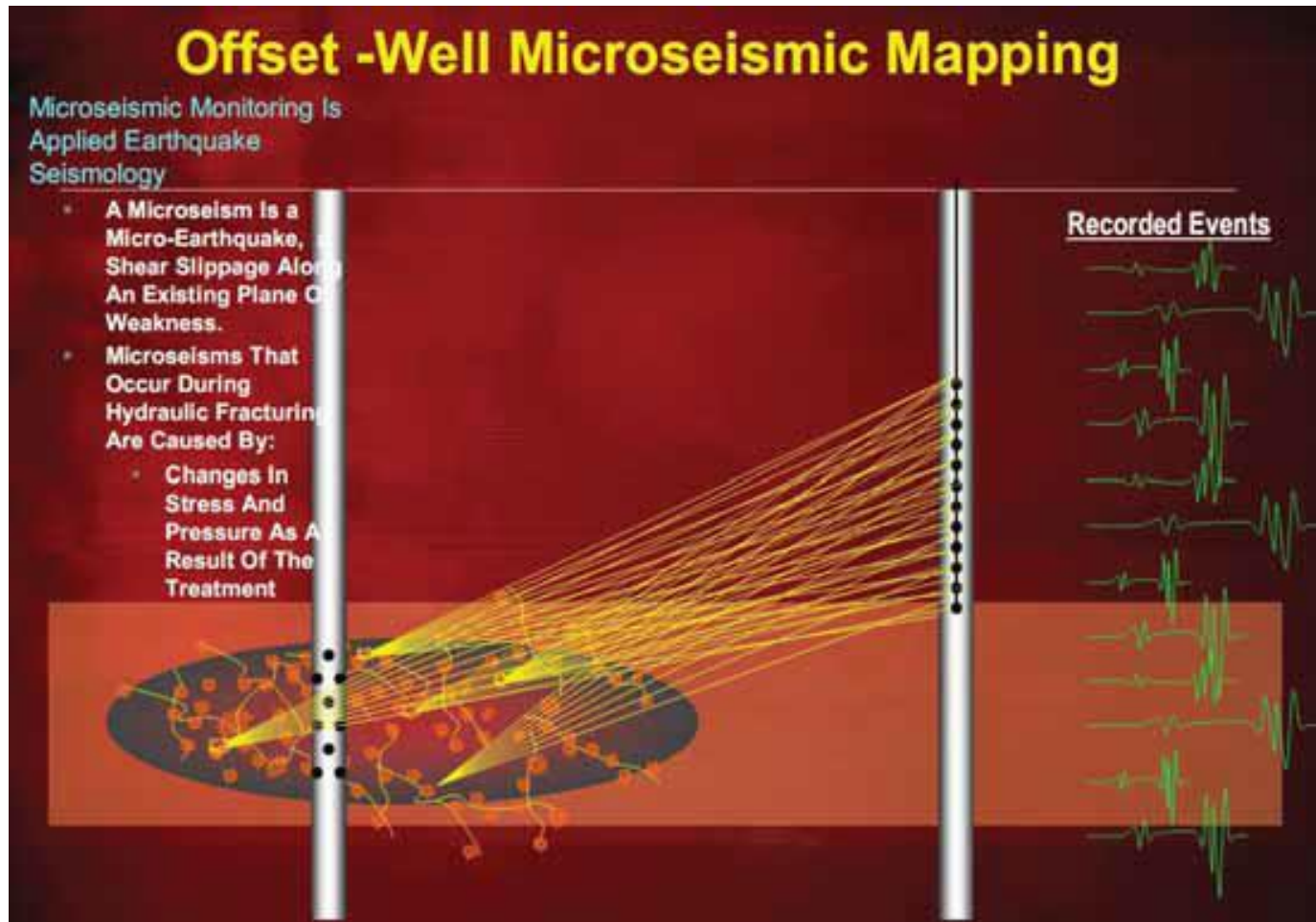
FRACTURE STIMULATION



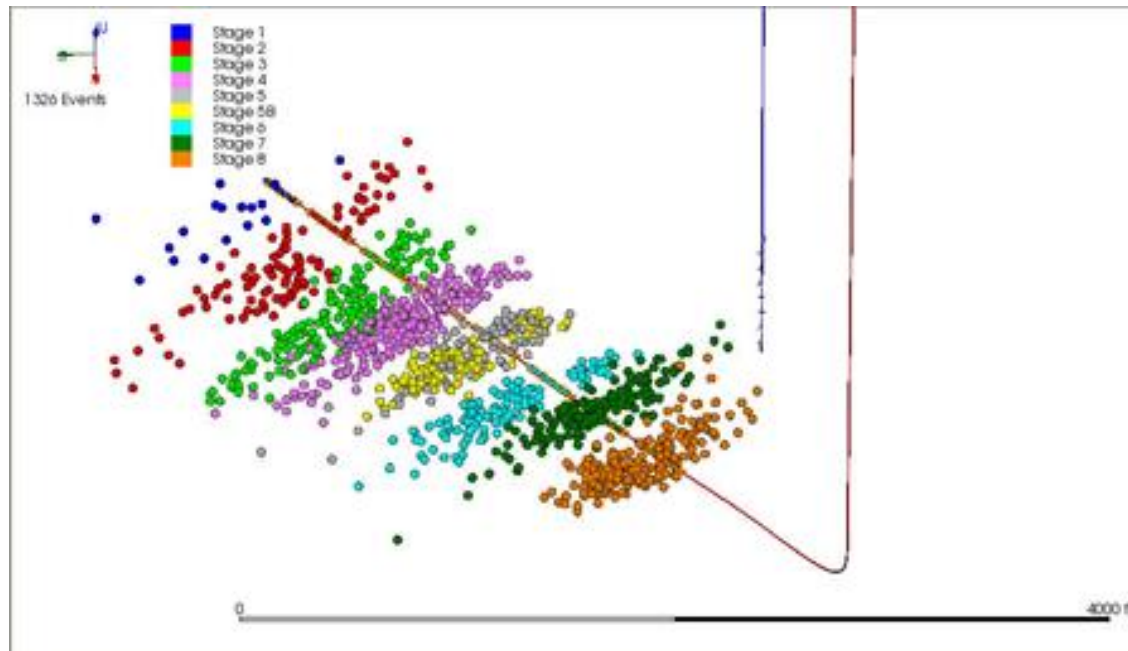
FRACTURE STIMULATION HEIGHT



FRACTURE CONTAINMENT



FRACTURE CONTAINMENT



Fracture is controlled by:

- Frac fluid viscosity (gel vs “slickwater”)
- Pump rate
- Pump pressure
- Proppant “mesh” size
- In situ stresses
- Existing natural fractures
- Natural frac barriers (ductile rocks that don’t break easily)
- Rock brittleness

FRACTURE STIMULATION IN THE ARCKARINGA

