Water Management for Shale and Tight Gas Resources
June 8-9, 2015 – Perth, Western Australia
Co-convened by IAH, SPE and ASEG WA Chapters

TOTAL RISK MANAGEMENT OF SHALE/TIGHT GAS DEVELOPMENT PROJECT IMPLEMENTATION

Author: Joe Collins, Senior Development Engineer

RISC

Introduction

- This presentation will explore the key technological, environmental, financial, regulatory and community issues faced by a typical shale or tight gas development.

- The key issues will be broken down and examined with examples of successful and unsuccessful risk mitigations presented.

Tight/Shale Gas Development

- Difference from other oil and gas developments can be characterized by two things
  - Number of wells
  - Hydraulic fracturing
- Apart from obvious technical challenges three major issues arise from these differences
  - Visible footprint
  - Water management
  - Cost
- These issues have led to major Environmental, Community/Regulatory and Financial risks

Tight/Shale Gas Development

- Involves drilling deep into rock formations with low porosity and permeability, wells are usually drilled with long horizontal section in the shale formation. The rock is then fractured by pumping large volumes of high pressure water into the well.
- Many wells are needed to develop a field as each well has low productivity and can only drain a small area.

Tight/Shale Gas Development Footprint

- The surface (visible) footprint of a Shale/Tight gas development can be extensive
- This can lead to high levels of community opposition
- Large numbers of wellsites and roads can also lead to increased costs
- Use of multi well pads with up to 12 wells drilled from a single location can ameliorate this issue, however community engagement is the best solution

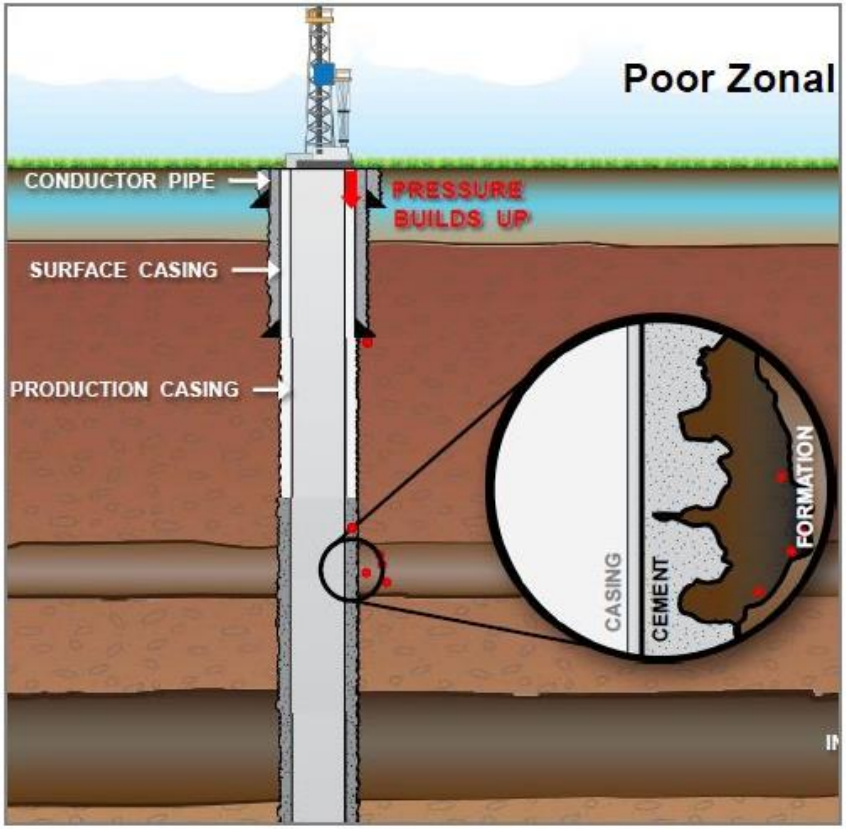
Tight/Shale Gas Development Water Management

- Three main water management issues;
  - Supply of water for fraccing operations,
  - Storage treatment and disposal of produced water (including Frac water flowback),
  - Protection of groundwater from contamination
- These are the highest profile community, environment and regulatory risks with a typical shale/tight gas development
- Best practice in this area involves treating and reusing all produced water in future fracture jobs to reduce water requirements and water discharges. However this can come at a high cost!
- Can you afford not to do it?

- Eastern Star leaked contaminated water from oil an gas operations into groundwater and creeks in 2004-2010 in the Pilliga forest in NSW. This poor practice has arguably lead to the stalling of new unconventional gas development in NSW since 2011

Tight/Shale Gas Development Water Management

- Poor well casing/cement installation can lead to gas or other contaminants migrating from productive zones to aquifers (including groundwater)



Tight/Shale Gas Development Logistics

- Logistics are a major issue with tight/shale gas developments. Each wellsite will require hundreds of truck visits to deliver and remove materials and equipment
- This will create high costs and can cause problems with the local community
- Good logistics planning is crucial to controlling costs and keeping the local community happy
- Some things to consider include;
  - Can each truck be backfilled for the return journey? (halve the number of truck trips required) If not can the trucks be shared with another industry to reduce costs and provide a benefit to the local community?
  - Are the roads suitable for the volume of traffic required?
  - What is the best time too move equipment/materials to and from site? (avoid night time and peak traffic periods in built up areas)
  - Where should supply bases and dumps be located?
  - Avoid double handling of equipment/material.

Tight/Shale Gas Development Cost

- Tight/Shale gas developments will usually have a large cost associated with the drilling and completions for the project
- Fraccing is expensive and drilling long horizontal wells is difficult and costly
- Water management can lead to high costs
- Partnering and risk sharing contracts can be used to reduce costs and control risks but they are not common
- Lengthy, quality, development planning is the best way to ensure costs and risks are well understood and minimized before beginning development
- Recognise that costs will reduce as operators gain experience and understanding. Many operators report cost reduction of between 40% and 60% over the first 5 years of drilling and completions

Tight/Shale Gas Development Risk Management

- Best Practices
  - Geophysical logging to delineate the base of freshwater aquifers
  - Surface casing/cement completed deep enough to protect freshwater aquifers (groundwater)
  - Intermediate and production casing/cement used to further isolate contaminants from aquifers
  - Cement bond logs and pressure testing using to ensure all barriers have a good seal
  - Drilling and Frac fluids stored in tanks and drill cutting recovered for burial offsite
  - Avoid hydraulic fracturing near structures
  - Use microseismic to monitor fracture migration
  - Treat and reuse frac fluids to reduce freshwater resource impact and disposal issues
  - Monitoring bores to regularly sampled before and after drilling/fraccing operations
  - Early and constant honest engagement with the local community
  - Plan well and learn quickly to keep costs as low as possible