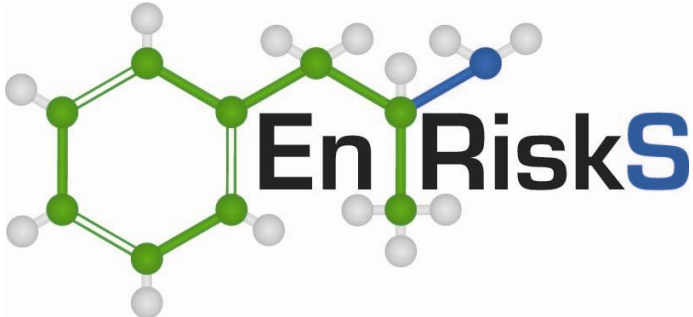


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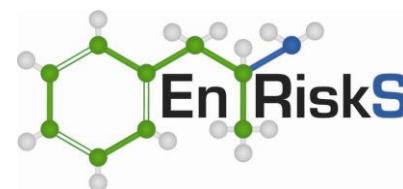
ENVIRONMENTAL HEALTH IMPACT ASSESSMENT – CAMDEN NORTH EXPANSION PROJECT

Jackie Wright



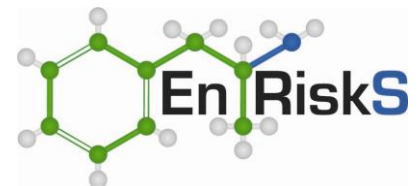
ENVIRONMENTAL HEALTH IMPACT ASSESSMENT

- Health Impact Assessment (HIA) seeks to evaluate the impact of a project on human health
- It aims to facilitate:
 - the reduction or avoidance of negative impacts on human health; and
 - the enhancement of positive impacts
- Undertaken to ensure an explicit and balanced consideration of the human health impacts of a development
- Undertaken for the Northern Expansion Project to address issues raised by NSW Health



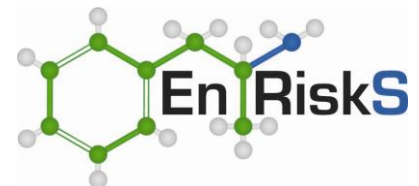
METHODOLOGY

- Main Guidance Documents
 - enHealth – Health Impact Assessment Guidelines (2001)
 - enHealth – Environmental Health Risk Assessment Guidelines (2012)
- Additional Guidance Documents
 - UNSW – Health Impact Assessment – a practical guide (2007)
 - National Water Quality Management Strategy (2000)



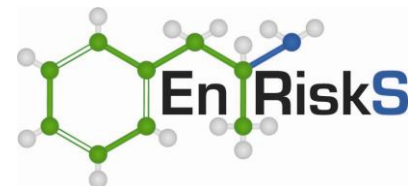
METHODOLOGY

- Screening level HIA undertaken for this project
- Included:
 - Review of all the specialist/technical reports prepared for the EA
 - Obtain additional information where required
 - Development of a community profile for the area from ABS information
 - Identification and assessment of potential impacts
 - Identification of risk mitigation measures
- Attendance at community meeting in Campbelltown
- Meetings (3) with NSW Health



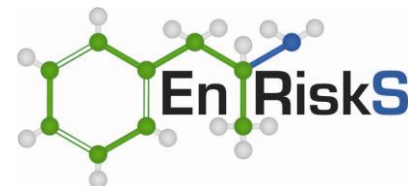
COMMUNITY PROFILE

- Similar population distribution to Greater Sydney
- Range of rural and residential land uses
- Proposals exist for additional areas to be used for residential
- Development plans could bring future houses up to 50 m from proposed well heads (once constructed)
– this was considered in the HIA



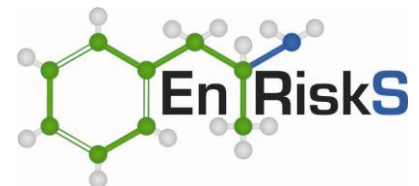
KEY COMMUNITY CONCERNS

- Impacts on groundwater quality, surface water quality and drinking water supply during drilling, hydraulic fracturing and workover activities
- Management of Produced water during production activities.
- Impacts to air – in particular fugitive emissions of gas and hazards
- Noise impacts from all phases of operations



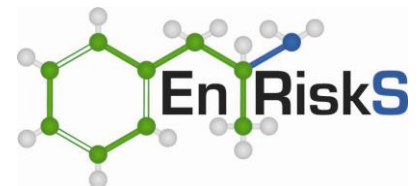
PROJECT ACTIVITIES

- Construction – drilling of the wells (including hydraulic fracturing) and installation of supporting infrastructure
- Production – production and delivery of gas to the existing Camden Gas Project gas gathering line system
- Post Development – maintenance of wells to maintain efficiency
- Closure – decommissioning of all project infrastructure and rehabilitation of affected areas



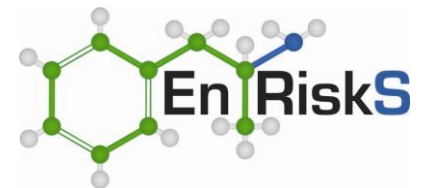
KEY ASPECTS OF ASSESSMENT

- HIA identified and collated the hazards and risk for the proposal
- Considered the site-specific and project-specific information available
- Considered issues of concern raised by community
- Assessed potential impacts to Groundwater, Surface Water, Air Quality, Noise, Vibration, Subsidence, Hazards
- Considered a range of worst-case scenarios for impacts to occur to air, groundwater and surface water



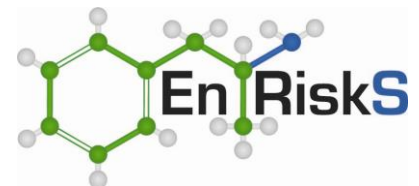
ASSESSMENT OF IMPACTS - GROUNDWATER

- Activities which encounter groundwater
 - Installation and operation of wells
 - Horizontal drilling with the coal seams
 - Hydraulic fracturing within the coal seams
- Given geology/hydrogeology of Camden, codes of practice for well installations and other control measures, it is considered unlikely for there to be adverse impacts on beneficial aquifers
- Past experience in the area with the rest of the Camden Gas Project confirms this conclusion



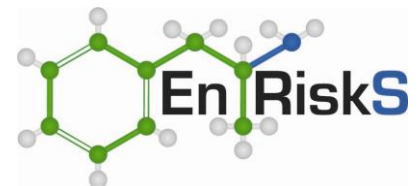
ASSESSMENT OF IMPACTS - GROUNDWATER

- Even though all activities have been designed with significant controls to ensure impacts do not occur, two highly unlikely, worst case scenarios have been assessed to show whether impacts would be acceptable if they did occur:
 - Leak of produced water at well pad into accessible groundwater
 - Connection between coal seam and shallow accessible groundwater



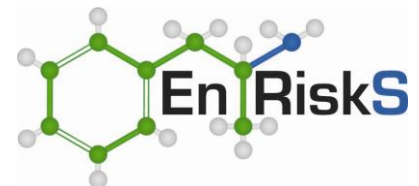
ASSESSMENT OF IMPACTS – GROUNDWATER

- Hypothetical leak of produced water
 - In project area no shallow groundwater (all in deeper rock) but assessment assumes shallow viable groundwater at 10 m depth
 - Leak of 10 000 L per month that is not noticed
 - Maximum concentrations of chemicals
 - Estimated concentrations in shallow groundwater are all more than 100 times less than drinking water guidelines



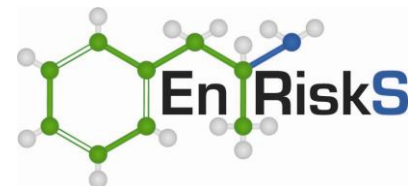
ASSESSMENT OF IMPACTS – GROUNDWATER

- Hypothetical cross connection
 - Assumes 100% of water injected into coal seam (500 kL) will migrate from 700m depth upwards from coal seam to sandstone aquifer that lies between 300m and 40m depth;
 - The water migrates upwards over 1 month through a fracture under enough pressure to reach aquifer and mix in aquifer
 - Maximum concentrations of chemicals
 - Estimated concentrations in shallow groundwater are all more than 20 times less than drinking water guidelines



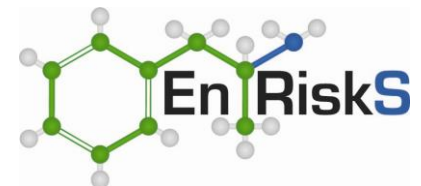
ASSESSMENT OF IMPACTS – SURFACE WATER

- Chemicals used during well construction and produced water will be stored at the surface temporarily
- Surface waters may be affected if a spill occurred
 - into a nearby creek (closest is greater than 100 m)
 - into a local farm dam (closest approximately 100 m) or
 - into the concrete lined supply channel (Upper Canal) for Sydney water (closest well is 170 m from Upper Canal)



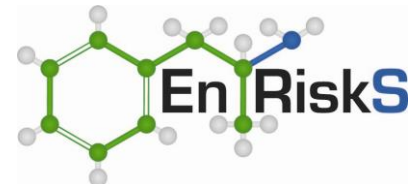
ASSESSMENT OF IMPACTS – SURFACE WATERS

- Assessment of a spill into a farm dam or into Upper Canal has been undertaken, that assumes:
 - people will drink and touch the water
 - 75 000 L will spill into bunded area which then fails completely
 - 10% of fluids reach the closest surface water body at one time
 - Chemicals do not degrade or sorb onto particles
 - Sydney Water Treatment System does not remove any of the chemicals



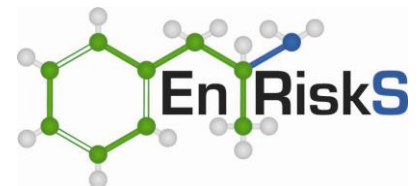
ASSESSMENT OF IMPACTS – SURFACE WATERS

- Assessment shows that
 - For a spill into Upper Canal all chemicals are below drinking water guidelines
 - For a spill into a farm dam most chemicals are below drinking water guidelines but all chemicals are below recreational water guidelines
 - It is considered acceptable as farm dams are not used for drinking and the chemicals readily breakdown



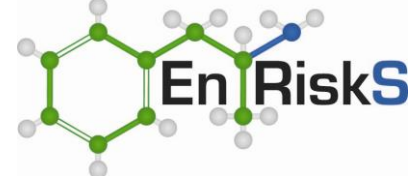
ASSESSMENT OF IMPACTS – SURFACE WATERS

- Risk control measures will be in place at all sites
 - Fully bunded areas installed prior to any fluids being brought onto site
 - Water management system to ensure minimal chance of spills
 - Routine inspection of all water management infrastructure with additional inspections after storms, floods etc
 - Wells installed at least 100 m from any surface water bodies



ASSESSMENT OF IMPACTS - AIR

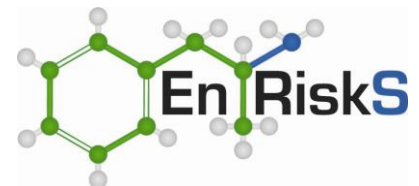
- EPA monitoring station in the area - indicates criteria pollutants all within national guidelines
- Combustion of diesel in engines and particulates from earthworks – main sources of air pollution from this project
- Generators (dual gas/diesel) at well pads also assessed in HIA (assumed to run 24 hours per day – worst case scenario)
- Such sources are not likely to generate sufficient of these pollutants to be measurable (above existing levels) in the area (50m from well pads)
- Management plans for the work include control measures to further reduce such pollutants



ASSESSMENT OF IMPACTS - AIR

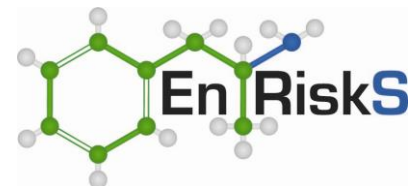
- Coal seam gas from Camden is primarily made up of methane (90%-95%) nitrogen (3%-5%), oxygen (0.7%-1.5%), carbon dioxide (2.6%-3.2%), ethane (<0.2%), propane (<0.01%) and low levels of other aliphatic hydrocarbons (0.001%)

COOP



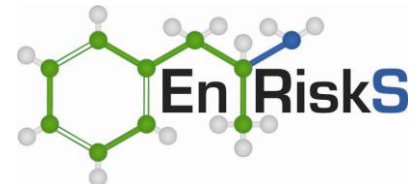
ASSESSMENT OF IMPACTS - AIR

- Methane is most significant hazard present in CSG. Under the right conditions/concentrations it has the potential to form explosive mixtures and is a simple asphyxiant
- Hazards associated with all detected compounds in CSG (major and minor) evaluated in HIA
- Evaluation included modelling fugitive releases of CSG from the wells and assessing impacts on neighbouring residential areas



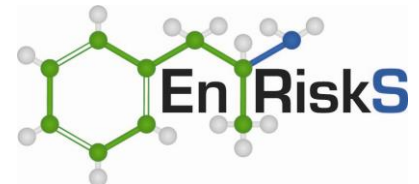
ASSESSMENT OF IMPACTS - AIR

- Fugitive losses of coal seam gas from the wells is estimated to be 0.1-1% - based on:
 - Estimates made using the National Greenhouse and Energy Reporting System guidelines: for gas production and processing it estimates 0.12%
 - Estimates of losses from whole gas distribution network of 1.3%
 - Monitoring of well heads from CSG operators in Queensland (monitored by the Qld government) provides methane concentrations adjacent to the well heads: these were consistent with predicted concentrations in the HIA



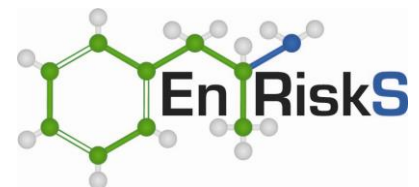
ASSESSMENT OF IMPACTS - AIR

- Screening assessment was undertaken to evaluate if fugitive emissions would be of concern:
 - Modelled all gases detected as fugitive emissions
 - Predicted worst-case air concentrations 50m from well and compared with air guidelines (based on protection of health and explosive limits)
 - All concentrations were well below (more than 1000 times) the relevant air guidelines



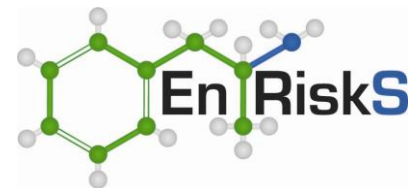
ASSESSMENT OF IMPACTS - NOISE

- Noise study was undertaken
- Existing ambient noise in the area ranges from 33 dBA at night to 49 dBA during the day
- Noise goals were identified in line with state guidance that are protective of health and wellbeing
- Noise modelling focused on the worst-case conditions for noise during drilling, operations (with generators and pumps going) and workover activities
- Where noise impacts were identified – noise walls were included in the modelling to demonstrate compliance with the noise goals



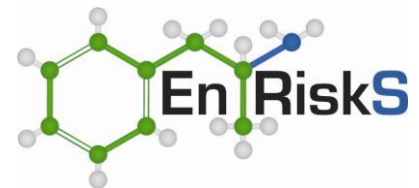
ASSESSMENT OF IMPACTS - NOISE

- Noise assessment considered the future residential developments in relation to proximity to the wells
- Noise management plan requires a range of control measures to be used
- Where these controls are implemented the predicted noise levels during all phases of the project are below goals



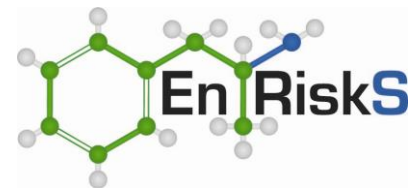
ASSESSMENT OF IMPACTS – VIBRATION AND SUBSIDENCE

- No vibration expected that would affect local residents
- When working within 3 m of the Upper Canal vibration needs to be considered (critical infrastructure and fragile heritage structure)
- No subsidence expected for this project as no large voids will be created by any of the proposed activities
- Target coal measures are at considerable depth with consolidated rock in overlying profile



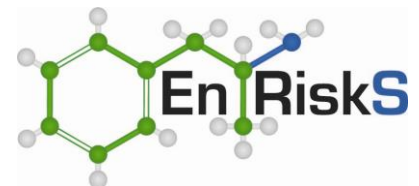
ASSESSMENT OF IMPACTS - HAZARDS

- A preliminary hazard analysis was undertaken for the project
- The main acute risk that could be possible for the project is an explosion or flash fire resulted from the accumulation of coal seam gas within an enclosed area and the introduction of an ignition source
- For this project an acute risk is only possible if some equipment fails, it goes unnoticed for long enough to release sufficient gas, there is an ignition source and people present
- Control measures will be in place



OUTCOMES

- HIA identified and collated the hazards and risk issues of concern for the proposal
- Considered the site-specific and project-specific information available
- Considered issues of concern raised by community
- Considered a range of worst-case scenarios for impacts to occur to air, groundwater and surface water



OUTCOMES

“Assuming that the Northern Expansion Project is carried out in accordance with best practice, as well as the current policies and codes of practice, the risks posed to the health of the community and to air, noise, groundwater and surface water by all aspects of the project have been found to be low and acceptable.”

