



Note that minutes are paraphrased to an extent and may not exactly match actual statements.

Project	Gloucester Coal Seam Gas Project	From	Michael Ulph
Subject	Community Consultative Committee	Tel	4910 7788
Venue/Date/Time	Thursday 22 August 2013 AGL Office, Gloucester, 10.15am – 12.30pm	Job No	21/17714
Copies to	All attendees		
Attendees	Ian Shaw – AGL Lands Officer Therese Ryan – AGL Community Relations Manager Toni Laurie – AGL Land and Approvals Manager Ed Robinson – Lower Waukivory Residents Group Dr. Gerald McCalden – The Gloucester Project David Mitchell – Avon Valley Landcare Rod Williams – Community Representative Jerry Germon – Community Representative Anna Kaliska – Mid Coast Water Michael Ulph – GHD (Facilitator) Graham Gardner – Gloucester Shire Council Damon Roddis – Pacific Environment Ltd Brett Hayward – AGL Environmental Advisor Ray Dawes – Barrington Gloucester Stroud Preservation Alliance	Apologies	Clr David West – Mid Coast Water Clr Tony McKenzie – Dungog Shire Council Clr Aled Hogget – Gloucester Shire Council Lee McElroy – Port Stephens Council Lisa Schiff – Great Lakes Council Norma Fisher – Director, Forster LALC Clr Karen Hutchinson – Great Lakes Council Dan Rose – CEO, Forster Local Aboriginal Land Council

1. Introductions

Action

Michael Ulph

Welcome and Acknowledgement of Country

Meeting commenced at 10:15am

2. Meeting agenda

- Welcome and apologies
 - Action items from previous meetings
 - Project Update (Toni Laurie)
 - Community Engagement update (Therese Ryan)
 - Fugitive emissions discussion (Damon Roddis)
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- General business
 - Next meeting & close of formal proceedings
 - Lunch
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3. Action items from the last meeting

Action items from the previous CCC were reviewed. Michael asked the CCC if there were any other questions in relation to the action items or previous meeting minutes.

Action 1- Aaron Clifton (AGL) to present at the next CCC meeting about air monitoring currently happening at the Camden gas site

Action being completed today. Aaron sends his apologies and Damon will present at this meeting in his place.

Action 2 - Toni to ask John Ross for information on when the water study reports will be available for public viewing

Action complete and conceptual model report was released after the last GCCC meeting. Copies circulated to CCC on email list.

Action 3 - Toni to provide a list of the well numbers for the CCC to reference

Action complete. Toni completed a map showing the suspended wells lists and locations. Toni mentioned there are copies available at this meeting.

Action 4 - Toni to find out how much silt was removed from the Tiedman property.

Toni: About 1600 tonnes was taken out of dams. The process involved drill cuttings, added silt dust and polymer used to settle.

CCC: Where was this taken?

Brett: Taken to Summerhill waste depot. Beforehand, the waste material was classified as solid waste.

Action 5 - Toni to find out whether the water balance study report is also available to view online.

Action complete. Copies circulated to CCC on the email list and the project website after the last meeting.

Action 6 - Toni to find out whether the water balance study report covers the entire Gloucester Basin.

Action complete. Yes, it covers the whole geological basin.



Action 7 - Toni to find out if all reports need to be peer reviewed.

Action complete. Both the new conceptual model report and the water balance report have been peer reviewed. The conceptual model peer review is a condition of AGL's Part 3A approval. No formal review is required for the water balance report, however AGL has commissioned a review because of the importance of this study leading into the numerical model.

Action 8 - AGL to consider a response to the CCC's query regarding a health study for the Gloucester project

Action complete. To respond to community concerns around potential human health risks from CSG activities, AGL has commissioned EnRisk to undertake a qualitative human health and risk assessment based on chemicals proposed to be used for Waukivory fracture simulation activity. This document will be publicly available once the REF is lodged. AGL in consultation with NSW Health and Dept. of Planning and Infrastructure has commissioned EnRisk to carry out an environmental health impact assessment for the Camden North project in response to submissions concerning health impacts. This document has been reviewed and commented on by NSW Health and will be released as soon as it's finalised.

Action 9 - Therese to find out what community investment programs exist at Camden.

Action complete. The Camden Gas Project has supported the Camden Show, Campbelltown Show, food donation to Naval care centre, Mater Day School events, volunteering with community events Light Up Camden and Christmas in Narellan.

Action 10 - Therese to find out whether the final flight paths could be uploaded to the website

TR: Flight paths were uploaded on Monday so they should be on the website now.

Action 11 - Michael to contact the CEO of the Forster Aboriginal Land Council and enquire about CCC representation

Action complete. Michael spoke with CEO Dan Rose, who indicated that he'd attend today's meeting but emailed this morning to send apologies.

Questions/comment:

CCC: the health study hardly counts as a study and then we're told AGL is going to look into health impacts of Camden North project which has little to do with us. This is inadequate as there is social wellbeing, health issues, psychological wellbeing and mental health to do with this project and I don't classify that as a complete answer at all. Maybe we should leave this as an ongoing item.

TL- we can defer this issue and look at Camden once it's finalised and can look at options for the Gloucester project down the track.



CCC: This has been through a Chief Scientist review and even though it's preliminary it goes into some detail. AGL needs to be on front foot with these things. The health department carrying out health study in Camden North project will be a significant thing and maybe health department should do study up here too.

TL: We'll take this on board. If it's okay [with the CCC] we can look into Camden results, as Camden is the only active field, and then we can look at how to build on the pilot study with NSW Health Department up here and look at options.

CCC to further discuss health study for this project

CCC: On silt removal, were there tests carried out?

Brett: Yes, we did tests before removal in order to classify and take the waste to a waste facility.

The status of these action items were confirmed for the CCC.

The last minutes were moved by Grahame Gardner and seconded by Jerry Germon as a true and correct record.

4. Project update:

Toni Laurie provided an update of the Gloucester project to the CCC.

- **Water Update for John Ross**

Defer first item (agreements with Gloucester Council) to General Business.

Groundwater investigation program - ongoing quarterly monitoring across the network. The 2012/13 monitoring report is being prepared to be released in Sept/Oct.

Monitoring bores around Waukivory drilling and pilot testing program, part of quarterly monitor report, with baseline data collection. Maintenance happening on monitoring bore at Waukivory site (WKmb04) in October.

Future drilling program and monitoring network expansion

- Drilling of new monitoring bores adjacent to Faulkland 3 completed a couple of months ago
- New monitoring bores towards east of Gloucester and some down south planned for drilling and completion in October 2013
- New monitoring bore site towards Wards River planned for drilling and completion in October- November 2013

TL to check status of phase 1 desktop assessment

Basin wide studies:

- The water balance study is completed and circulated
 - The updated conceptual model report circulated with peer review
 - Phase 3 numerical groundwater model *has* commenced and the first report is due Oct/Nov
 - Property water surveys tendered but discuss later in meeting
-



(part of Gloucester Shire Council agreement)

- Phase 1 desktop assessment report for areas beyond Stage 1 may be complete but will check.

The irrigation trial first 6 monthly water monitoring program report is nearly completed and will be released in September along with soil monitoring. This is a condition of approval to provide to the Office of Coal Seam Gas. Crops are planted and the irrigation program is underway and we are currently irrigating with the drier weather.

- **Project update**

Similar to last time as not a lot happening. Now entered Front End Engineering Design (FEED) stage of the project. Project works in stages. Will continue to work to meet CoA and commitments in EA will be fed into engineering design process. In early planning stages for conditions. Conditions are at various stages and some haven't commenced. Next CCC meeting opportune time to catch up on program status, schedule and timing proposed. New members in CCC since last workshops and we're probably overdue to catch up to write detailed update. Plan for next meeting.

CCC to catch up on program status, schedule and timing proposed at next meeting.

- **Exploration activities**

Today we have a check shot survey at Waukivory 11 which is part of drilling program. Use a mini vibe to provide more information on the well. Well maintenance on Craven 6 at Stratford mine entrance and Waukivory 3 which is planned to be plugged and abandoned in December not October as stated in last meeting. Workover for water monitoring bore near Waukivory pilot program will occur in October.

IS: landowner seismic meeting are in planning stages and looking at end of September to conduct these. As previously done with 2D seismic survey, we will ask landowners to look at results of survey. Looking at 23, 24 25 September but this is subject to change.

- **Review of Environmental Factors (REF)**

The REF for the Waukivory pilot wells is currently being finalised and will be submitted to the Department in the coming weeks. One of the options is installing a water pipeline connecting the wells to the Tiedman's storage dams to take truck movements off the roads.

- **Core hole on Pontilands**

The core hole is due to be plugged and abandoned around the 29 August and that will take a week or two. We will cement a piezometer permanently for a permanent groundwater monitoring bore.

CCC: If you're talking about putting in the lines to capture water, then you must fairly be well progressed on where wells will be between the Waukivory pilot and Tiedmans?

TL: This is a temporary pipeline only. They are all temporary and it is part of the Waukivory pilot.



CCC: I've noticed there are no pilot wells on the Western limit of the basin. Does AGL plan to put monitoring wells on the Western limit? Secondly there's nothing around Yancoal and it would be interesting to see how AGL's results compare with Yancoal's results because there is a variance of opinion.

TL: On the maps the yellow dots are the wells that are fracture stimulated, not the groundwater monitoring network. These are our pilot wells for the flow testing of gas and with the exception of Waukivory 3 and Craven 6 where work is being done now, the remainder are all shut in. The orange dots are the Waukivory pilot where we're about to submit the REF. We have got a network of groundwater monitoring wells in the area, and have data sharing agreements with the coal companies to feed into our water studies.

CCC: How does Mr Ross' view of Yancoal's data reconcile with his own view of what's happening in terms of groundwater?

TL: All their data is combined into these reports. Yancoal's data has been used in these reports to get the full basin scenario.

CCC: Has Yancoal been free in releasing data?

TL: We have a data sharing agreement with Yancoal in place, which works both ways, we share data with them as well.

CCC: Would it be possible to ask John Ross to critique Yancoal's data?

TL: Will forward the question to John but the data sharing agreement has confidentiality between the companies. Will be a question for Yancoal but will forward to John.

TL to ask whether John can critique Yancoal's data

CCC: Isn't the Yancoal data freely available so not confidential?

TL: Yes, but AGL providing critique on Yancoal's data is different. Haven't seen what data is on their website. A lot is publicly available but I don't think AGL can provide critique on another company's activities.

CCC: These water studies are coming thick and fast and they are getting complex. We need a way to keep up to date with the generalities of what we are talking about. Is there a way we could try to understand the reports as they are very large?

CCC: We'll talk about it later but one of the benefits of the agreement with Council is about putting those capabilities into Council and the role of water scientist is to translate and interpret the information for the community.

CCC: That would be great because people ask me about water study and I'm not sure because it's hard to read.

TL: It is a gap that hopefully this [agreement with Council] will bridge, but we do need to provide technical detail in reports for the Government scientists to analyse.

MU: Anna, when you look at reports and the data comes through does it make more sense to you than the average person?

Anna: Yes.



MU: I suggest that Anna may also be an independent person to talk about these reports.

CCC: The purpose of the scientist to make technical reports legible to community. Clearly a function of position.

IS: Also I think John would be very comfortable to provide a presentation at a CCC meeting to give an update and technical expertise.

MU: Any other questions to Toni?

CCC: Are there any dates set for an Aeromag presentation?

TR: I'm not sure where data interpretation is up to sorry.

TL: I know they are still working on the data, but will I'll let CCC know of timing.

MU: We'll move on to Therese who is going to give us the Community Engagement update.

TL to inform CCC of the Aeromag presentation timing

5. Community Engagement Update – Therese Ryan

Therese provided an update to the CCC on all the recent community engagement events. This included:

- **GCCC Updates**

1 July - Final minutes May meeting

1 July – MU action item re Dan Rose attendance at August meeting

9 July - Emailed Community Update prior to being published in the local paper.

12 July - Draft minutes for review/comment

26 July - Email to CCC to advise of fugitive emissions baseline monitoring and invitation to inspect the equipment. Rod caught up with them in Stroud Road, Ed and Aled popped into the office and chatted to Justine and Aled did the first part of drive on that morning, so thank you for taking up that offer.

26 July - Draft June minutes for website

31 July - Forwarded the initial report from Chief Scientist Mary O'Kane

5 August - Copy of Community Update

15 August – A few emails about our draft agenda

19 August – Michael sent out an email in relation to the GCCC action items and the water reports. I did try to shrink the files as much as possible without losing too much image quality. I will get the reports onto the website probably tomorrow.

- **Community updates**

10 July- Gloucester Advocate & Dungog Chronicle - about the partnership with Council and the expansion of the water monitoring network. We flagged trying to get the water monitoring bores in, in



one round but wet weather affected that.

7 August - Gloucester Advocate & Dungog Chronicle - Chief Scientist initial report & irrigation trial and harvest of 177 bales.

- **Letterbox drops**

Monday 19 August - letters to the 12 immediate neighbours to Waukviory pilot wells re: Waukviory REF prepared and will be launched in coming weeks. We've offered that AGL staff would be available Friday August 23 to discuss the REF/work program at the office – or to call us to arrange a time/location to suit.

- **Site tours/project briefings**

22 July - Gloucester Shire councillors and GM visited Tiedman's for irrigation trial and talking about Waukviory pilot.

18 May - Mayor John Rosenbaum, Cr James Hooke & general manager Danny Green attended Camden Open Day

17 July – Ian gave a project briefing for members of the visiting Forestville Men's Probus Club

29-30 July - Three CCC members took up the opportunity to look at the Picarro monitoring equipment on its first visit to Gloucester.

- **Website**

All community updates and media releases have been placed on the project website. The Aeromag flight paths were uploaded also.

The AGL website is in transition – the content from the AGK site has been moved over and redirected to the corporate AGL site. You won't see the weather station there at the moment.

- **Meetings with Gloucester Shire Council**

A number of meetings with Gloucester Shire Council to further the development of the co-operative agreement between AGL and GSC. Considered and adopted at the council meeting yesterday. Ads for the position of water scientist have appeared in SMH and Gloucester Advocate, applications close tomorrow.

- **Information sessions**

Seismic information sessions for landowners – 2D discussed earlier.

- **Going forward**

Next Camden open day Saturday Oct 12.

Graham that might be something to flag in the diary for new water scientist or the new 2IC.

CCC: In regards to the ad for the scientist that Council is employing, are you going back to Hydrogeology Society for peer review?



GG: Not so much the Association, but there is a web based hydrogeology industry journal recommended by Rick Evans as a place to put job ads so it's there as well.

MU: Thanks Therese.

IS: In regard to the water monitoring bores to be drilled, for the ones East of town, we've laid out some new matting so that we don't require a gravel pad. New matting has been developed for different sizes of rigs, so we are going to trial for water monitoring bores to cut down on truck movements and gravel use.

MU: What is it made of, is it plastic?

Ian: A synthetic material that interlocks and can be picked up and moved [a kind of plastic]

MU: Any comments for Therese?

TR: Did anyone want hard copies of water reports?

CCC: Yes (four people)

TR: Ok we will provide those.

CCC: Is it possible to have a summary of Toni and Therese's report distributed in the meeting? The reports are comprehensive and would be nice to have written copy summary of their reports.

MU: Okay and they will be in minutes as well.

TR: Yes we will provide them.

TR to provide four hard copies of water reports to CCC members

TR and TL to provide hard copies of their reports next meeting.

6. Fugitive emissions discussion- Damon Roddis

Damon to give a presentation on fugitive emissions and testing for the project. This included:

DR: I am an environmental scientist working for Pacific Environment. We specialise in air quality and emissions estimation and testing. I usually get asked in forums such as this is whether I'm independent as I'm being paid by AGL. The company works for all sides of the fence working for the EPA, Planning, and the Federal Government so if don't keep a level of impartiality then it affects our business.



AGL Baseline Methane Monitoring Program for Gloucester

DAMON RODDIS
22 AUGUST 2013



This presentation is on the fugitive emissions monitoring that we are doing, it is a screening assessment, based over 4 weeks and concentrating on methane to look at current levels in and around the Gloucester valley to establish a database of baseline data, the methane levels now and subsequent to active CSG project to compare the levels later.

Overview

- Why monitor baseline methane?
- Baseline monitoring in Gloucester
- Equipment
- Initial results
- Conclusion

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Why Methane?

- Constitutes ~97% of NSW CSG (~2% CO₂, ~1% ethane)
- Greenhouse Gas (21 times greater contribution compared to CO₂)
- No significant health criteria in NSW or Internationally:
 - 1,000ppm based on asphyxiation
 - 50,000ppm based on explosivity (LEL)
- Naturally occurring e.g. coal seams, wetlands, permafrost, termite activity
- Man-made e.g. rice paddies, livestock, landfill, biomass burning, waste water treatment, natural gas distribution, coal mining
- Any of these may be expected to yield ambient CH₄ concentrations of >10ppm
- Global background ~1.8ppm (concentrations in City >2ppm)

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- **Why methane?**

CSG contains 97% methane so looking for fugitive air emissions from CSG, looking for methane emissions is a good starting point. There's also about 2% carbon dioxide and 1% ethane. Easy to estimate levels by taking gas bag sample from a CSG well and running through a gas chromatograph or another instrument and seeing the results.

The main reason for the significance of methane is for me because of its propensity as a greenhouse gas. It is 21 times more effective than carbon dioxide as a greenhouse gas, and for that reason alone you want to be controlling and capturing the methane as best you can.

In terms of health impacts of methane it's worth noting that there



are no health criteria currently used for the levels of methane that we would see in the atmosphere as a fugitive release. Yes there are levels there for asphyxiation at 1,000 parts per million which is really a level we'll never see in the ambient environment. There's also what we term the lower explosive limit so when we start dealing with explosivity the level of methane we are talking about is 50,000 parts per million.

You'll see when we get onto the results we are very much, about three orders of magnitude below these levels.

Methane is naturally occurring. The global background is around 1.8 ppm which comes from natural sources such as ruminants (cattle), wetlands, standing water such as ponds, dams etc, termites, melting permafrost. Man-made sources include livestock, rice paddies, landfills and sewage treatment plants and we'll talk about the relevance here - and open cut mining – again that's relevant here. Any of these might yield up close, concentrations of methane levels over and above 10 parts per million in a spike. Is that alarming? I would argue it is not seeing it would not impact health down at that level but it's worth noting.

Purpose of study

- Address community concerns:
 - What are the CH₄ levels in Gloucester area?
 - Are the levels a health issue?
 - Will AGL be a significant source?
 - What other sources of CH₄ are there in the area?
- AGL's social responsibility
- Establish the baseline
- Demonstrate impact of the Project on environment
 - Before vs After
- Other applications: Leak detection and repair

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• Why this study?

This project is an extension of work done in Camden to address community concerns about fugitive releases of methane from CSG projects, and that's a very good reason to be doing it.

We want to establish what the Gloucester methane levels are now, and if there is a health issue. I know the community wants to know about this. This project will help to address that. Will AGL be a significant source? It's important to understand your baseline and then when the operations start up, is there a significant difference, and if so, what is that difference.

And also to look at other methane sources in the area such as the landfill, the sewage treatment plant we've picked up as a source, coal mines, for example at Gloucester.

CCC: To establish the baseline do you pick any particular time of the year, as different things happen? Gloucester is notorious for



burning off in July and August. If you don't take this into account will it skew the results?

Damon: Biomass burning will increase methane. It's my understanding that AGL will be looking to continue this work, and get readings at different times of the year. Good point.

AGL is taking responsibility here which I guess feeds into addressing community concern. The key is for me establishing that baseline. That's the real pertinent reason to be doing this exercise. Many of you will have seen for example the Southern Cross University work that's been done to look at methane around Tara up in Queensland. Now if I had a criticism for that work, and I guess I do, is that they're driving around an active coal seam gas extractive area, they didn't go there before that arrived, and there's various reasons why not, but how can we say what was there was natural seepage which does occur, and what is there as a result of their actions, and right now nobody can tell you that.

Here in Gloucester, we'll be able to answer that question.

CCC: Has this been done anywhere else in Australia, to study methane before a project kicks off?

Damon: This is pretty much the first time. Even in Camden which has been going since 2001, we had to look at sites remote from Camden with similar land uses to say this is how they compare. The instruments that we are using as well, are very new and have only been around for commercial, mobile applications for about 18 months, and this issue is actually very new as well, globally as well as in Australia.

The tools we are using are also useful for AGL's purposes as well, when we have active wells, to establish leak detection, as you can just drive around and establish that a leak is happening and then fix as maintenance - tag and repair.

CCC: how easy would that be just driving around, how would you capture a leak?

Damon: I will show during the presentation. The instrument we used is sensitive and can detect an increase in methane, therefore detecting a potential leak.



Monitoring Program

- 4 week screening monitoring program
 - Commenced 29 July 2013
 - 202 km each day
 - Changing days and times of week (i.e. morning and afternoon)
- Outputs
 - Baseline monitoring report
- Future
 - Data will be used as the basis for further baseline monitoring

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• Monitoring route

A four week program, we wanted to get something for you for today, involving two colleagues, two days a week driving a 202km circuit in and around the Gloucester valley and really in that circuit trying to capture different land uses above and away from the coal mines to look for differences, including the sewage treatment plant.

IS: The two maps on the wall show GPS track where vehicle went in and outside coal basin.

Damon: The other thing to say is that we've been changing the days that we've been going out to get a different snapshot.

CCC: What's the sample rate of your equipment and what is it? Does it use a gas chromatograph?

Damon: No it's a technology called "cavity ring down spectroscopy" the sampling rate is one second. So, every second we will get a measurement.

In terms of that we have a baseline screening level monitoring report. I think, Therese, that will be shared with the CCC at some point will it?

TR: Yes.

CCC: Will the same circuit each day be repeated?

Damon: Right now, what we are doing is the same circuit exactly.

CCC: How many trips?

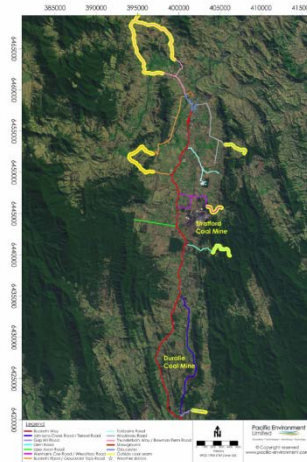
Damon: I'll show you the map shortly.

Over two days, we drove for 4 hours one day in one section and 4 hours on the second day in another section.

Screening assessment - AGL in consultation with the GCCC will design a fugitive monitoring scheme that goes into the active operations.

Monitoring route

- 202 km of mobile monitoring
- 13 routes
- 6 routes extend past the Gloucester coal seam
- Located near other methane sources
 - Landfill
 - Agriculture
 - Coal mining
 - Sewage treatment



• Monitoring route

Damon: So here is the monitoring route. As you can see in the key, the idea was that we would go outside the active coal seam, to see if there is any difference. There are thirteen routes in total and six of those go outside the coal seam. As I said earlier, we have tried to capture other methane resources ie coal mining, sewage, agriculture and cattle which is a significant source of methane and we would expect to see elevated levels around livestock.

Picarro Instrument

- Laboratory Grade Instrumentation
- Can be used for mobile applications
- CH₄ concentration
- 1ppb precision (1.8ppm global background)
- ¹³C Isotopic Analyser
- Determine isotopic signature of CH₄(δ¹³C-CH₄)



• Monitoring instrument

Approximately a year and a half ago I undertook a study for AGL looking at the science and what's available in terms of doing fugitive methane monitoring. It is fairly new as a technique and we've landed upon the Picarro instrument. It is an instrument that Southern Cross University have been using in their investigations of late. Another good reason is that it is highly sensitive and works down to the parts per billion range. As I said, the global background is 1.8 parts per million, so we're a thousand times more accurate than the current global background. Another reason for using it is that it is effectively a laboratory-grade instrument. So, five years ago this would have been

an instrument restricted to the lab. With improvements to technology it has been able to become a portable instrument and I can show you in the break. We can now fit it in a vehicle and use it to drive around and undertake mobile monitoring. Once every second we get a measurement and it is near instantaneous that we can pick it up.

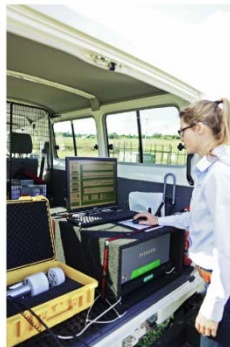
The last advantage of using this instrument is that we can look at the isotopic ratio of methane. Essentially, every source of methane has a different isotopic signature. That is how much carbon-13 is contained in the methane. For various reasons, different sources will have a different amount of carbon-13 in their methane. What that means is that we can look at the methane and say we think that this source is from landfill or from coal seam gas, or cattle. It is useful for everyone to understand where elevated methane is coming from if we find it. This is to my knowledge the only portable instrument that you can take out and establish that.

CCC: You mentioned termites?

Damon: From what I understand it, that is correct; they produce methane as part of their digestive process.

Equipment

- Mobile configuration
 - Toyota Landcruiser
 - Picarro analyser
 - GPS
 - Weather station
- 1 second measurements
 - CH₄ concentration
 - ¹³C Isotopic ratio
 - Wind speed
 - Wind direction
 - Latitude/longitude



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This slide shows my colleague Justine. I can show you the Picarro machine contained in the land cruiser car during the break. It also has a GPS to map where the methane measurements were taken. We also have a weather station so that if we are parked-up, we can put this out. If we get a peak, we can then determine what the wind speed and wind direction were at that location and from that back-calculate where that source may have been.

CCC: What weather conditions affect methane, humidity vs temperature?

Damon: A lot of factors can influence it, but one of main things is day and night. Overnight, when the atmospheric mixing height lowers down, effectively you are squashing and concentrating the methane that's available into a smaller volume of air. We do see a natural night time peak. Also, we measure wind speed and wind direction, and as I said we also get the latitude and longitude from the GPS that is fitted to the equipment.

- **Equipment**

Damon: So a couple of slide of the equipment in action. As you will see, the equipment sucks a lot of power and we have a couple of back-up batteries in the back there. It sucks so much power that we had a bit of trouble starting the machine this morning, so unfortunately I cannot show you the equipment in full use this morning. [this was resolved – the equipment was shown in use].

Equipment



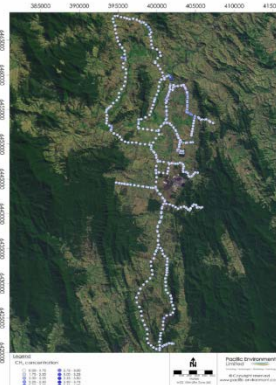
- All equipment power supplied through Landcruiser
- Sample line fixed to bull bar and fed into back of Picarro
- Review of data near real-time

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As you can see, there is a sample line fixed to the bull bar of the vehicle, which feeds back into the equipment as we drive along, and take the sample as we drive through any plumes that we might find. It also means that we can review the data in almost real time, there is a slight delay in taking the sample from the bull bar and sucking it into the instrument. It is a delay of one minute and forty seconds.

Results

- Relatively low CH₄ concentrations have been observed
- CH₄ concentration ranged between 1.7 ppm to 3.9 ppm
- δ¹³C-CH₄ averages range between -38‰ and -45‰
- Sources identified:
 - Livestock
 - Landfill
 - STP



- **Results**

Results are preliminary because we have only measured methane over 4 weeks. Overall, it hasn't been terribly exciting, which is probably a good thing. I have shown you some results from one week when we did get some higher levels. When I say higher, I mean, the baseline is

1.8ppm and we saw up to 3.9ppm; this was the highest recorded. This is really of no concern and typically what we expect to see.

CCC: Would you expect to see it higher in a rural area, or somewhere like Sydney?

Damon: You do expect Sydney to be higher, but that is due to more reticulated gas mains which do have an element of leakage, so around 2.2ppm would be normal for a city like Sydney.

CCC: Where was 3.9ppm recorded?

Damon: I'll show you that. It was actually around the sewage treatment plant. As you can see, we've got the route mapped and captured Stroud Road. We also got peaks from livestock but landfill and sewage treatment plant showed highest levels.

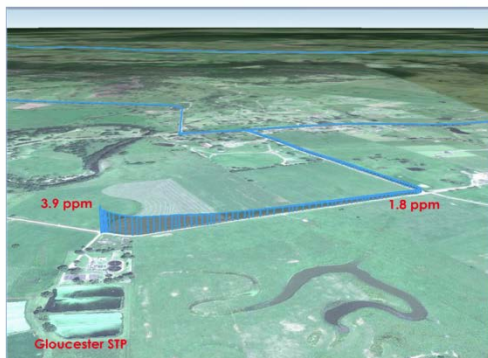
CCC: So, the 3.9ppm, I take it that livestock is getting nowhere near that?

Damon: That's right, but we weren't surrounded by cows, we were on the boundary of a field.

CCC: From what I've read livestock create about 10% of the methane. If livestock were concentrated in an area, you would expect methane levels get up to 3.9ppm?

Damon: Yes probably. As I said, we've only been out for 4 weeks, so in the future we might pick up larger concentrations. On this map, you can see we are trying to separate out the different signatures of C13, where there is a difference between different methane sources. We are seeing some variance, but we always do see some variance.

Results



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CCC: So, you're not seeing any significant increase in methane around the coal mines?

Damon: No, and that is surprising to me. But, right now, no we're not.

CCC: Well, you'd need to be there after a blast I would assume, because that's when the methane would be released.

Damon: Assuming that they are turning over fresh coal, yes.

In terms of the results, you can see we've got the 1.8ppm, then as we

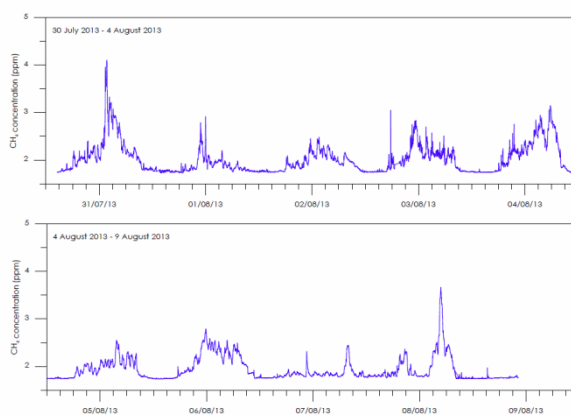
turn and head past the sewage plant, we have the increase to 3.9ppm.

We also have two Picarro instruments here in Gloucester, one of which is mobile. Another one is a static location.

IS: It is in the pump shed at Tiedman dams. It required power availability and also is close to the weather station that Damon was talking about before, so that they can use that data to assist with the analysis.

CCC: Can you explain the axis please?

Results



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Damon: Sure. You can see that on the x-axis is a new day and on the y-axis is the methane concentrations, going up to 3.5-4ppm.

CCC: So this is from the fixed machine at Tiedmans?

Yes. You can see from this the variance due to time of day. As we approach midnight, you can see the peak, followed by a trough in the day. As I said, as the mixing height increases you can see the concentrations decrease during the day.

CCC: What is the first day there, where there is a really high concentration?

Damon: That's on the 31st July. Although it appears really high, that is only in comparison to the other levels.

CCC: What would be the affect be of sampling at intervals of 500m or 100m?

Damon: As you get above the mixing layer, it gets lower.

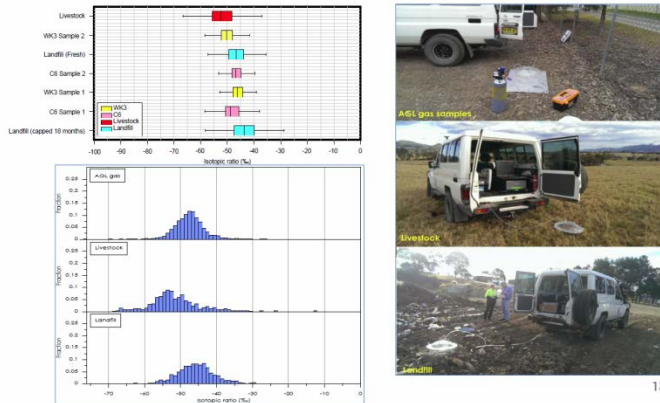
MU: Isn't methane lighter than air though? Does it rise up?

Damon: Only marginally.

CCC: So it will still layer and concentrate?

Damon: Yes

Results



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- **Results**

So now I just wanted to talk to you about the isotopic signature of methane. What we do to get that fingerprint is take a bag sample of coal seam gas.

As you can see, this is us measuring coal seam gas from a well in Gloucester, and also gas from the local landfill and livestock, here we are getting a reading from a cow pat, and from the local landfill.

What we wanted to establish is if there are different signatures to those methane sources. The graph [above] shows this the clearest. At the top the AGL gas, then landfill and livestock, with different carbon thirteen levels. All I would say is that as this becomes more negative, you would expect it to be more biogenic. Landfill again is going to be rotting vegetable or animal waste.

Interestingly, in Camden there was a more noticeable difference in signatures between the CSG and the other sources.

If you see these three here and pick them up as a peak, it can be hard to differentiate them. What I recommend is that we take more samples of the local coal seam gas to see if this result was an anomaly or if it's real.

CCC: Why do you think the coal seam gas here is way down the scale?

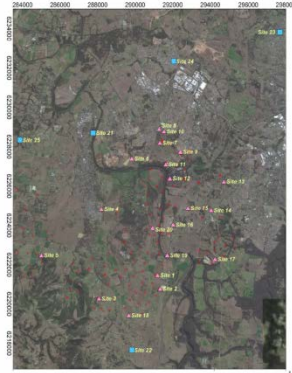
Damon: I am not sure as I would typically expect to see a difference between coal seam and other, more biogenic sources. All three sources right now are looking fairly similar. That's just something we will have to work out in the future, and it's relatively easy to work out just by getting more samples of the coal seam gas.

CCC: Would each coal seam gas monitoring well have different methane levels?

Damon: No, the gas should be the same because the same gas is taken up but from different areas.

Camden Campaign

- 3 month campaign in vicinity of Camden Gas Project
- 25 monitoring locations
 - 20 selected sites in proximity to AGL wells
 - 5 background sites >2km from a well
 - 15 minutes monitoring at each site
- Located near other methane sources
 - Land fill
 - Soil mix
 - Agriculture
 - Coal washery



• Camden

Now, a bit of a quick overview of the Camden work. The Camden work is much more well established than around here. We did a 3 month campaign in the vicinity of the Camden gas project, driving the vehicle 2 days, analysing data on the third day, we did that for three months.

We had 25 sites. Twenty of the sites were within an active CSG area. 5 sites were outside the area with similar land use; so still a coal seam beneath, but with no active extraction. Again, we were trying to look at other sources as well; coal washery, soil mix, agriculture.

Camden Campaign

- Meteorology has an influence on CH₄ concentrations
- Temperature inversions can lead to elevated measurements
- Lower levels measured in afternoon or on windy days
- Agriculture has small influence on CH₄ concentrations
- Higher CH₄ concentrations measured in urban areas



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As well as driving around like we have been doing here in Gloucester, we can also park-up and monitor there for a period of time. In Camden we would park-up and take a 15-minute reading, then move on.

The other advantage is that you can monitor the weather station set-up for wind speed etc. What we found was that temperature inversions can have an effect on the data. In the afternoon and on windy days we found lower levels. Agriculture seems to only have a small influence on the methane concentrations. We also noted that higher levels were



measured in urban areas, related to gas mains in the vicinity.

Conclusion

- 4 week (screening) baseline monitoring for Gloucester area
- Results are provided in report for CCC review
- High end, laboratory grade instrumentation to measure CH₄ and δ¹³C-CH₄
- Isotopic analysis allows for the source of methane to be identified
- Mobile equipment configuration allows measurements to be made almost anywhere
- Initial results identify several influences of methane concentrations in the study area

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- **Conclusion**

We have finished four weeks of a screening assessment to look at background methane levels. There will be a report provided to you for review by the CCC.

As far as I am concerned, the equipment that we have got is as good as we can get, for the purpose that we have in terms of its resolution and fit-for-purpose.

I don't know if I should mention or not, but each of these units is approximately \$50,000 so it is not an insignificant investment on behalf of AGL. The isotopic analysis might be a bit trickier in Gloucester than it has been in Camden, but I think with some time and effort we can look at that a bit more.

CCC: Did you actively try and find problems with the AGL Camden project? Did you target pipelines and well heads etc., along the production line to get reliability of process?

Damon: Yes we were monitoring in the vicinity of active gas wells, at the closest around 60m from a well. But it is not like we parked-up adjacent to the gas well for leak detection. It was more about assessing community exposure, so the sites that we identified with the community were sites that people were concerned about. Such as residential care homes, houses, businesses etc.

CCC: Where are the preliminary results from Camden published?

Damon: They are about to be released on the website, I believe.

TR: I am not sure on timing of reports. I know they are being prepared.

Damon: Aaron would be able to answer that with a specific date. The reports will come out soon as we have a commitment to the Camden community.

Aaron to inform CCC about the Camden preliminary methane monitoring report status.



The mobile configuration allows us to monitor just about anywhere. If there are areas where the community has a concern, as long as we can drive a vehicle there we can monitor there, and that's an advantage of the technology that we are using.

Initial results show that there are some signals from different sources around, but nothing too exciting and that's probably a good thing.

CCC: Is there a significant amount of methane coming from existing coal mines? The answer is obviously no?

Damon: I don't think we can say no yet. There is methane locked up in coal seams and that should be off-gassing, so there should be but we aren't seeing this at the moment. There is a professional relationship that AGL have with the coal mines, whereby we don't want to be driving right up to their gate and checking their methane levels.

CCC: Wouldn't Gloucester Coal know their emissions levels?

Damon: They do report on these emissions themselves, as part of the National Greenhouse and Energy Reporting Scheme. They have a good understanding as they report annually but the idea of fugitive emissions is probably not on their radar.

CCC: It would be quite a different kettle-of-fish though wouldn't it, because CSG is held in-situ by water, whereas coal mining is often only a couple hundred metres below.

Damon: There is significant methane associated with coal mines, for sure.

CCC: Does wind create a difference in methane from coal mines?

Damon: Yes. All it takes is for the wind to be blowing away from you and you may not pick anything up.

IS: The design of the monitoring trips went down Wenham Cox Rd, down past Bowens Rd north pit and then down Wheatley's Lane close to Rosewood pit. Further south, coming up Johnsons Creek Rd which is not far from Duralie mine.

CCC: Would wind blow towards testing?

IS: I can't answer that. The idea of setting up was to get the edges of the basin where there is outcropping and also around existing potential sources.

MU: Any further questions?

CCC: What is next? Will there be more monitoring?

Damon: Yes that is the plan. Next stage is for AGL and yourselves to establish what you would like the monitoring program to look like.

TR: It's certainly time to look and learn from what happened at Camden. We should look at what monitoring locations we want to look



at; perhaps have a community workshop to decide on monitoring locations within Gloucester to go forward. We need to do work prior to the Waukivory pilot so we have data going forward. Then we will develop a program to look at permanent monitoring stations which we can monitor at, and (GCCC) have some involvement in picking those sites.

CCC: I would like to see the company sit them on the gas lines, right next to the well heads and publicise those results

TR: We want to involve the CCC in determining the sites. We will run a similar workshop to Camden with government agencies, AGL and the community to determine those locations. That's the sort of feedback we can use to help all of us to design the program going forward.

MU: What will be the timing of the workshop?

TR: We need to plan internally to decide so not sure yet. We've only just got this baseline data, as the last trip up here [to take readings] was Tuesday. We also need get this up and running before the Waukivory pilot, so we have a nice robust system in place.

CCC: I would like to see sample time one day or one week to monitor what's happening at well pit.

TR: We will use this info in the workshop when we develop the program.

CCC: I would like to see more baseline sample in different months to see variations for summer, autumn, spring to see the differences.

IS: That may be restricted in terms of the lodgement of the REF. The approval for the pilot testing and we don't know that. Given this is quite soon after the new rules came in, we can't say for sure if we'll be able to do that.

CCC: Even another one round in summer would be good.

TR: We've received a lot of information today so don't want to rush any decisions on dates and times today. We all need to digest all this information.

CCC: To establish baseline data, you need to sample to take into account weather changes, so you need to do more to get baseline data.

MU: We will work out some dates?

TR: We will keep the CCC informed. Also Damon can show you the vehicle outside and the equipment at lunchtime.

MU: Any more questions? Are we able to get a copy of the presentation for the minutes?

Damon: Yes.

AGL to keep CCC informed about a workshop to discuss methane monitoring locations and conducting further baseline monitoring



MU: Thanks Damon.

7. General Business

Graham Gardner – Gloucester Shire Council

Council has an agreement with AGL to provide Council and the public with resources to examine water issues comprehensively and in addition to other issues in the Gloucester valley. I think it is important to understand the context - there is a strong community expectation or demand for AGL and Council to look at water issues comprehensively and cumulatively, there has been concern that we just get these little 'bitsy' studies and pieces of information from individual projects.

Earlier in the year Council wrote a brief for a comprehensive Gloucester Basin water study project. Council identified partners including the Federal and State governments, extractive industry, Mid Coast Water, and the community. We thought we should look to get some funding and get this thing happening. After Council had resolved that the issue of the Federal government bioregional assessment came back onto the agenda, but after the first government visit, Council understood that it was a very broad study over long period and was not expecting much.

Council clarified that the study is very much focused on the Gloucester basin surface and groundwater water conditions in the basin, and the issue of existing and proposed coal and CSG operations on those water resources. A flood study for the Gloucester and Avon Rivers was missing, which we had specified in our brief.

The timeframe was also good and we expect to receive the Gloucester Basin water study before end of this year and updates over the next 2 years. Council said they would put their study aside.

AGL have spoken to Council to provide resources to lift the capability of the organisation, and for specific works not happening elsewhere.

The agreement covers five particular elements, and the first is to lift the capability within Council – through the engagement of a water scientist with relevant skills and capability to drive four major projects. The recruitment has started and applications close tomorrow with the aim of getting this resource in place as soon as possible. This will either be a contractor or Council employee.

The agreement provides for establishment of a technical steering committee with Council staff, a representative from AGL and a representative from Mid Coast Water and a community representative, to assist the water scientist across the 4 projects.

The water scientist will report to Council through me to the GM of Council. Council will also establish a web presence and the information will be made publicly available.

The other thing that Council has been careful to establish is that there is an independence from AGL with the scientist. Whilst AGL are



resourcing it, Council is independently recruiting this person, and the work will be done directed by Council. We are mindful of that because there will be some concerns in the community that we are “in bed with the devil’ dare I say, or there could be all sorts of uncertainties thrown at it.

There are four components to the work:

- 1) Baseline water study within Gloucester Basin to ask landowners of their preparedness to have their water assets examined. The samples will be independently assessed (Anna will be asked) and made available publicly.
- 2) Flood studies of the Gloucester and Avon River will be carried out through NSW floodplain management manual process and in relation with OEH.
- 3) Produced water study. AGL are required to create a wastewater management plan and Council and the community will be consulted. The scientist will then review this plan.
- 4) A peer review process of documents as they become available over a 12-18 month period will be managed by Council. Council's intention is to reengage Rick Evans in peer review given his prior understanding of the area. Parts of this work will be required before the end of this year. Federal government scientific capability is looking at water issues so this is important task. All this information should give Gloucester a clear idea and good evaluation of the water issues. Council's report of the agreement with AGL is on Council website.

These studies are being managed internally by Council to ensure the process is managed properly.

CCC: Does this include the Karuah end of the basin?

Graham: Gloucester Basin baseline water study is the whole basin, flood study is only on the Gloucester River and Avon River, the Karuah River may need to be reviewed in future studies through the Great Lakes Council.

CCC: The concern is that we need a whole picture approach but now the assessment is only concentrating on top half of basin.

Graham: The bioregional assessment is looking at the entire basin, so there are three levels of work going on.

CCC: You said there's a community representative on the committee, when is that advertised?

Graham: We may seek to appoint a representative already working with Council on the mining application working group. This process hasn't been resolved yet but our intention is to find someone who can add technical value to the discussion around the table. The technical steering committee is technical group and information will go into the community. Council would hold public meetings as necessary and use the person to inform the community.

CCC: Are the neighbouring Councils on side with this? i.e. Great Lakes Council?



Great Lakes are on board. We don't necessarily need to engage other councils but we want to as we'll be impacting their rate-payers during testing. AGL will be funding the whole lot. The scope of works hasn't been written to scope budget but this is a serious contribution and I would suggest it will approach \$0.5 million and will give us capability in the water issues, alongside what the Federal Government is doing.

MU: Any further questions for Graham? Thanks.

CCC: There is a new ad that the APPEA is running that claims natural gas will create over 150,000 new jobs in Australia. Are AGL able to give any information on the basis of that claim?

TR: We can ask APPEA how they got this figure.

CCC: Is AGL prepared to ask APPEA where this figure came from? Previously, ads stated that CSG will ensure the creation of 20,000 new jobs in NSW. I wrote to the association on how they got this figure in May. I sent a letter by registered post on 2 May to the Canberra office, it was collected on 7 May by M Cooke, but I have never had a reply.

IS: You should take this up with APPEA as to why they haven't replied. I would take it up with them.

CCC: I'm taking it up with AGL as members and asking AGL to take it up with APPEA.

TL to follow this query up with APPEA

CCC: It's an issue between APPEA and the individual.

CCC: Is AGL part of APPEA? If so as good corporate citizens, couldn't AGL follow this up?

TL: Yes. We can follow it up and ask the question. We can't promise anything. We are members of APPEA, they are the industry body.

Michael: Any other items of general business.

Graham: Council recently recruited Rebecca Connor from Port Stephens Council, a land use planner, Planning Manager with an environmental science background and land use planning history in local government. She starts on Monday 26th August and will sit in my chair and can follow up on questions.

8. Next meeting

MU: At this time of year it is pertinent again to contact Terrence Healy chair of GRLCCC to put forward meeting dates for next year. I suggest the same format of timing being the third Thursday of the month in morning apart from Dec meeting which occurs earlier in month.

Meeting closed: 12.32pm

Next meeting to be held on 24th October from 10am, at the Gloucester Country Club.



Michael Ulph

GHD – Stakeholder Engagement

ACTION ITEMS			
Action	Responsibility	Complete	Outcome
CCC to further discuss health study for this project	CCC		
Toni to check status of phase 1 desktop assessment	Toni Laurie		
CCC to catch up on program status, schedule and timing proposed at next meeting.	CCC		
TL to ask whether John can critique Yancoal's data	Toni Laurie		
TL to inform CCC of the Aeromag presentation timing	Toni Laurie		
TR to provide four hard copies of water reports to CCC	Therese Ryan		
TR and TL to provide hard copies of their reports next meeting	Toni Laurie Therese Ryan		
Aaron Clifton to inform CCC about the Camden preliminary methane monitoring report status	Aaron Clifton		
TL and TR to keep CCC informed about a workshop to discuss methane monitoring locations and conducting further baseline monitoring	Toni Laurie Therese Ryan		
TL to ask APPEA about the advert stating 'CSG will ensure the creation of 150,000 new jobs in Australia'	Toni Laurie		
Michael to liaise with Terrence Healy re: meeting dates for 2014.	Michael Ulph		