

TEN THINGS A SQEP WOULD KNOW

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The requirement for suitably qualified and experienced practitioners (SQEPs) under the National Environmental Standard (NES) for Assessing and Managing Contaminants in Soil to Protect Human Health has potential to drive a lift in the standard of work being completed around the country. A group of senior industry practitioners has been pondering the question "what is a SQEP?" and they have concluded a fairly high level of experience is appropriate especially for complex sites.

This paper looks at some of the challenges of contaminated land practice. It is intended to highlight the benefits of adopting a reasonably high threshold to the definition of a SQEP for all levels of work under the NES.

Please note that the views expressed are those of the author and not necessarily representative of the views of Z Energy.

My personal top ten things a SQEP would know how to deal with reflects 22 years in the contaminated land industry and some of the issues that seem to come up over and over again.

1 GRBCA or Gut Reaction Based Corrective Action

We all know about RBCA (pronounced Rebecca) or risk based corrective action. We assess the risk presented by contaminants and then we identify the weakest link in the risk chain. It may be that a layer of contaminated soil is buried a metre deep and presents no risk to a resident living on top of the site. In this case the weakest link in the chain is the potential for future excavations to redistribute contamination to the surface. Our remedy to the situation is to introduce a management plan to control future use of the site.

Any SQEP will understand that this runs counter to the GRBCA technique. A SQEP will have a good knowledge of GRBCA (pronounced grrrrrrrr beca). Gut Reaction Based Corrective action is typically associated with sites where contamination presents no risk and is often seen in the company of "the precautionary principle" (see 2 the Misconceptional model).

Perhaps there is a layer of oil beneath the site but the SQEP says it presents no risk. GRBCA demands it be removed and "remediated" after all in-situ management is a "do nothing option" to the GRBCA advocate. It is really difficult to make the paradigm shift from GRBCA to RBCA – but think about this - if the layer of oil a metre below the site was olive oil we could easily make that shift as we understand the risk associated with olive oil is negligible (although the precautionary principle might dictate a different approach after all you could fall in a hole and drown).

RBCA requires us to take a look at the risk profile and make decisions accordingly. I have often noted that a great deal of my time is spent managing perception of risk – perceptions often founded in GRBCA.

A SQEP should provide truly independent advice based on managing the risk and managing the perception of risk.

2 The Misconceptional Model

GRBCA flows nicely into the misconceptional model. A SQEP will have the ability to develop highly refined site conceptual model to design investigations and ultimately focus remedial work. One skill the SQEP will have developed is the management of the “misconceptional” model. The misconceptional model can be a very advanced and often complicated scenario for how contamination could migrate or change over time or it may be as simple as what contaminants might be present on a site.

When the misconceptional model is fully exposed the “precautionary principle” trump card may be played. Apparently there is no technical argument that cannot be trumped by the precautionary principle.

There is nothing wrong with the precautionary principle in fact I would argue it is well enshrined in every guideline we use. It just tends to get a little overused when there is no logical argument to support a position.

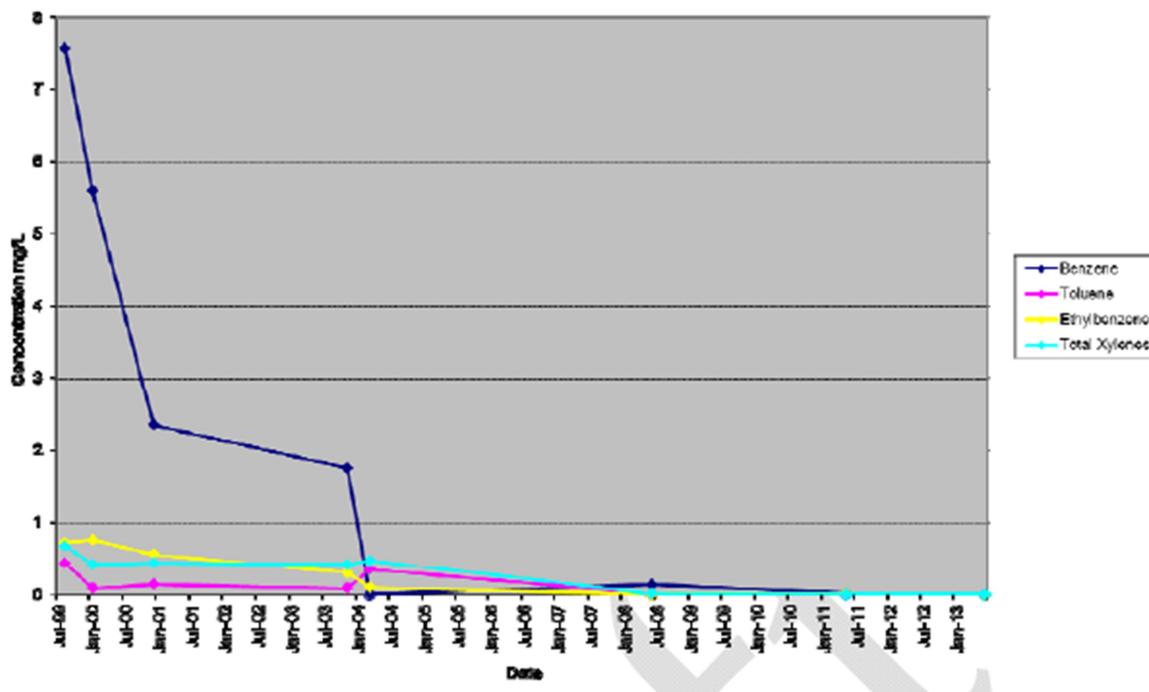
The petroleum guidelines themselves suffer from a misconceptional model (though they contain text that clarifies what is appropriate use of the guideline criteria and no SQEP would be confused by this context).

For example all too often it is assumed that a contaminant source is infinite and that an exceedance of protection of inhalation criteria for groundwater represents an immediate risk. However the actual model is based on risk associated with long term exposure. The misconception applied to the model is that the concentrations detected when investigating a problem will persist for 20 or even 70 years.

Here is a typical graph of long term monitoring (12 years) adjacent to a petroleum impacted site. Time weighted average data for these scenarios would suggest a very low level of risk. However there is often a panic reaction to a guideline exceedance and concern about acute (short term) risks. Risks that don't exist at these typical hydrocarbon plume concentrations.

A SQEP should build a robust site conceptual model and communicate risk in the context of that model. The model should dispel misconceptions where appropriate.

BTEX Concentrations in Monitoring Well MW8



3 I'm Not a Chemist/Hydrogeologist/Statistician

Contaminated land is a broad field, in my time in consulting I noted that the New Zealand industry typically provides a wide range of experience. Colleagues from overseas related spending years purging and sampling wells and never getting near a report. Big industry and large projects seemed to lead to narrow specialisation.

The SQEPS that I recognise have a firm grasp of all of the disciplines that make up contaminated land. They are jacks of all trades and masters of a good few. I believe a broad knowledge is required to be a SQEP and a narrow focus can be a handicap if it is not recognised. A SQEP will have a grasp of all of the critical disciplines and have a working knowledge of subjects beyond their core expertise. Personally I would not expect to hear a SQEP defer to another expert because "I'm not a hydrogeologist" or "I'm not a chemist". I would expect the SQEP to have obtained an expert second opinion and be able to relate it. They may not have been able to come up with an explanation but they would be more than capable of conveying one.

A SQEP doesn't have to know everything but will have a good grounding in all disciplines and will have developed the skill of knowing when it is time to pull in specialist expertise.

A SQEP should have a fundamental understanding of all of the key disciplines but they will know when specialist expertise is required and won't step outside their expertise.

4 Dreaded Industry Standards

Industry standards, and indeed guidelines, are rules of thumb that have been developed to prevent obvious mistakes when collecting or assessing data. Just because an approach is “industry standard” it’s not necessarily the only approach in every case.

So what is a “dreaded industry standard”. My personal number one “dreaded standard” (this week anyway) is “do not sample a well with product” – this “rule” only exists because it’s too much to say take the sample carefully, consider that it’s likely a worst case result, every time you reproduce the data put a footnote that sets out all the limitations and the fact that it’s a semi quantitative piece of data.

In our quest for perfect data we often ignore imperfect data that is actually conclusive in its own right but doesn’t meet the “dreaded industry standard”. If that sample with product floating on it complied with guidelines it’s actually telling us something that not sampling the well wouldn’t have revealed.

Similarly a well doesn’t have to recover to 90 % in a permeability test and a drawdown response doesn’t have to be measured for me to know that is, respectively low hydraulic conductivity and high conductivity. Don’t leave data out because it’s imperfect – use it and qualify it.

A SQEP will follow industry standards but should also be capable of stepping outside the guidelines or adopting scientifically defensible alternative approaches to obtain information that can add to a conceptual model.

5 No Contamination was Detected

Two things a SQEP is likely to have experienced – the sneaky plume and the background well request. The sneaky plume (see 2 The Misconceptional Model) is a slinky plume of highly contaminated water that sneaks, as narrow as a snake, between monitoring wells in a network, ironically the sneaky plume can be assisted by the requirement to have a background well (that’s another “industry standard” we must have one!).

A SQEP will have seen some sneaky plumes but seldom will they be the narrow undetectable “stealth plumes” that are more easily conceived without a troublesome knowledge of hydrogeology.

For example sometimes groundwater gradient may be to the east but the plume may have chosen a less steep and, on plan at least, less direct path to the SSE due to the presence of a permeable lens.

Personally I’ve never ever wished I had just one more (or even one solitary) background well. On the other hand I have remobilised many times to catch that plume that’s not doing what it should. The learning that comes from these experiences makes it likely that a SQEP will get a good handle on groundwater close to the source and then move out to delineate

the plume. I have one site with more than twenty wells and a background well is still a long way down my list of data needs for the project.

But what about assessment of monitored natural attenuation? Surely you need a background well to assess indicators of natural attenuation (see dreaded industry standard)? The answer is no. I still don't need a background well because amongst my twenty plus wells I have enough that missed the plume to have a very good understanding of what the local groundwater quality is like.

The carefully worded disclaimer is a much more likely explanation for the "no contamination detected" challenge. Sometimes you will read a conclusion in a report that says there was no evidence of any significant contamination in the wells sampled. You may have to dig a little deeper in the report to find, for example, that the wells were not down gradient of the source area.

As a client I am looking for answers, I have received reports six months after field work was completed that have been written up about investigations that failed to meet their objectives. Perhaps groundwater flow was in an unexpected direction, or a well could not be installed at a preferred location. The worst reports of this type will not reveal the deficiencies of the investigation. This is a warning sign of a task focus where those doing the work are too far removed from the conceptual model to recognise the need to evolve the investigation scope. And now would I like to pay for another report to be written!

A SQEP won't be going out to site to drill six wells and sample soil and groundwater. They will be going out to collect data to meet an objective – perhaps delineate the plume or define indoor air risk. Managing so called scope creep is a skill a SQEP must possess. The ostrich technique doesn't work.

A SQEP should have the ability to develop a robust groundwater conceptual model and evolve that model to adapt to findings as an investigation progresses. They should have a solution focus and be quick to refine scope to adapt to investigation findings.

6 Guidelines as De Facto Standards

Guidelines are for guidance. They are not standards. Guidelines permit SQEPs to determine their relevance to a particular conceptual model and if appropriate the guidelines will assist the SQEP in assessing risk.

A classic example is the criteria for protection of groundwater in the petroleum guidelines.

The guidelines assess the likelihood that a particular soil concentration would result in a risk to a groundwater resource. In actual fact the guidelines derive criteria for soils with hydraulic conductivities so low that they could not be expected to support a viable groundwater resource. A SQEP will make this assessment and determine that those

‘guidance criteria’ are not relevant to the site they are assessing. This is a valid use of a guideline.

Unfortunately a SQEP will be faced with requirements to assess against these standards in situations where they are clearly not applicable. Most commonly this is when the guideline criteria values are picked up and enshrined in planning documents without the benefit of the context from the guidelines.

A SQEP should be capable of developing a defensible site assessment that is in “general accordance” with guidance but shouldn’t need to blindly follow it to be accepted by a regulator.

6 Lies, Damn Lies and Statistics

Guidelines are about average exposure. If a single sample on a site exceeds a guideline a SQEP will compare their conceptual model to the conceptual model used in the formulation of the guidelines. They might then conclude that the single exceedance does not meet the assumption of a “uniformly contaminated area the size of a typical service station forecourt” (as used to derive some petroleum guideline numbers).

If a report mentions the exceedance of a guideline in a soil sample it should then present the significance of that in the context of the conceptual model in the guidelines.

A SQEP should know the guidelines inside out and should present results in the context of the guidelines.

7 It’s Not Remediation if you Don’t Actively Treat the Source

There are tables available (from the US EPA) to assist with assessment of remedial options. You don’t even need to be a contaminated land practitioner to use some of these remedial option assessment systems. Unfortunately these models tend to push consultants to devise “remedial options to treat contaminant sources” rather than more sustainable approaches to remedy contamination problems.

The RBCA approach pushes us to assess risk and look at how we can achieve the best outcomes. Often this will involve treating the source area. Just as often it will not. And most often a combination of techniques will be required to achieve a satisfactory outcome.

A SQEP might ask ‘what does successful remediation look like’ and keep that perspective. This contrasts to the alternative approach of asking “how can I treat the source” and delving into smart technology without an understanding of a likely end point.

I once inherited responsibility for a multi-million dollar project that set out to treat the source and, whilst achieving what were perceived to be great outcomes, did not actually

change the risk profile of the site. Ultimately when the site is redeveloped there is over a million dollars of “remediation” spend at that site that did not remedy anything. It will be no cheaper to redevelop the site than if that, partially effective, remediation had been completed.

A SQEP will know that no one method, short of relocating the problem via dig and dump, is likely to remedy a contamination problem. Managing risk will require a combination of methods and will very likely include Monitored Natural Attenuation for the residual.

A SQEP should be focussed on reducing the risk profile of the site and not just the contaminant levels.

8 Council Won't Accept That

One of the challenges I perceive with the Australian contaminated land auditor system is the fact that the auditors are appointed by the Regulators. One could speculate that staying on side with regulators might be a critical aspect to consider for the aspiring auditor.

In New Zealand it has become quite common in some jurisdictions for consultants to adopt variations to the guidelines. A classic example is the concept of a sensitive aquifer.

The guidelines define a sensitive aquifer with consideration to the conceptual model used to derive the guideline criteria. If an aquifer is sensitive according to this definition then the monitoring results should be assessed against the guideline criteria for protection of groundwater.

However if the local Council has a different definition of “sensitive” or defines aquifer protection zones that does not automatically mean that the guideline criteria apply to this different set of assumptions.

A SQEP should still report that the site is not sensitive according to the definition in the guidelines.

Sometimes the science of contaminated land produces an answer that is so far outside the expectations of the industry (see 1 GRBCA) that selective blindness can develop.

It is common to hear statements to the effect that the petroleum guidelines do not apply when product is present and that a special consideration is required. The guidelines actually say *“Use of the model when a residual phase is present, results in an **overprediction** of the soil vapor concentration and subsequently the building vapor concentration”*.

The guidelines present soil concentrations at which building vapour would exceed the guideline risk. However if the number is in brackets then residual phase (product) is likely to be present and the guidelines will overestimate risk. Now when the guidelines came out there was an element of “council won't accept that” because the threshold for brackets is so

low that its significance was probably inadvertently underplayed by the consulting industry in early days.

Council may wish to adopt a different use of a guideline but that should not colour the SQEP's interpretation of the guidelines.

9 The General (Engineering / Planning / Environmental) Practitioner

An assessment completed by a proficient civil engineer (who would almost certainly consider himself to be a SQEP) included an assessment of groundwater quality from a bore that was screened below the water table. For assessment of a soluble groundwater contaminant plume this is not ideal but still provides useful data – i.e. at this depth interval there is a certain level of contamination. However there was light non aqueous phase liquid present at the site and the assessment did not detect it. Had the well been screened across the water table (in the industry standard manner!) the response might have been quite different.

Another “practitioner” presumably looking to become a SQEP felt the continuing professional development requirement suggested for a SQEP was too great. After all they had to attend a fresh water ecology conference to stay up to date on their core expertise.

A SQEP should recognise the limits of their expertise and consult specialist expertise where necessary. A generalist should review just how far they should dabble outside their field of expertise and should commit to professional development if they want to extend their expertise.

10 Complexity

“Complexity creates confusion, simplicity focus” (Edward de Bono).

Albert Einstein is attributed with the saying *“Everything should be made as simple as possible, but not simpler”*.

Perhaps ironically it appears he actually said.

“It can scarcely be denied that the supreme goal of all theory is to make the irreducible basic elements as simple and as few as possible without having to surrender the adequate representation of a single datum of experience.”

The benefit of hind sight allows us to look back at a mass of data and focus on the seemingly obvious connections that weave a simple story through the initial complexity. To me it feels almost embarrassingly simple when the penny drops and the complexity falls away. Why didn't I see that earlier. It also leaves me feeling that anyone who describes something as too complex to explain may not yet understand it themselves.

Malcolm Gladwell talks about this in his book Blink. A SQEP will have the ability to “Blink” i.e. the ability to look at a situation and sift through the noise around the issue and understand what the answer is very likely to be. As each piece of information is added to the puzzle a SQEP will evolve their understanding and adapt their understanding all the time keeping the client and regulator up to date on the progress of the investigation. In engaging a SQEP a client benefits from this focused approach. It should lead to more cost effective investigations and quicker results

A SQEP should have the ability to simplify a conceptual model and generate clarity for stakeholders. The complexity should fall away and focus should be brought to bear on the core of the issue.

In Conclusion: What Does this Mean for the Industry?

I have highlighted a range of challenges in the day to day dealings of a contaminated land practitioner. The examples I have chosen are intended to highlight that this is a specialist professional niche and that the most effective outcomes come from using experienced practitioners who are immersed in contaminated land assessment for a good part of their working day.

When I look back to the introduction of the MfE 1998 Guidelines for Assessment and Management of Petroleum Contaminated Sites, there was no-one to tell us what the guidelines meant we had to read them ourselves cover to cover. We had teams of consultants going through enormous learning curves at four or five major consultancies. It took a lot of effort to come up to speed and peer reviews and staff movements ensured cross pollination of ideas and concepts. Thankfully the understanding has been passed on through mentoring and staff succession over the last fifteen years.

It's very rare to see a level of familiarity with these guidelines to the level of a SQEP outside of the major firms and I struggle to see how any individual practitioner could adequately cover that same ground without that mentoring and guidance that the major firms provide.

The challenge for sole practitioner will be in forming mentoring or peer review relationships with established SQEPs to ensure that they can have a viable path to becoming a SQEP under the NES.

Continuing professional development will also be critical and I see a huge role for WMINZ in this area. The annual conference has always provided an opportunity to share learnings and learn about advances in the industry. SQEPs will need to support professional development through mentoring and presenting at conferences. The last thing anyone wants to see is the SQEP concept become an exclusive club of practitioners protecting an enshrined position.

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