26

Records

From: Jan Andrews [murrianda@bigpond.com]
Sent: Thursday, 13 March 2014 12:00 PM
To: Records
Subject: Proposed Allawuna Farm Waste Disposal Facility

RE: PROPOSED WASTE DISPOSAL FACILITY ON LOTS 4869, 5931, 9926, 26934 (2948) (KNOWN AS ALLAWUNA FARM) GREAT SOUTHERN HIGHWAY, ST RONANS

We would like to tender our objection to the above proposed facility on the following grounds:

1. Environmental: We believe no organisation can guarantee that no contamination will ever be emitted from the site by either wind, rain, dust, transport or leaching caused by either normal or abnormal weather, man-made or seismic events. It is really just a question of how bad any contamination will be. Who will accept overall responsibility for any emissions, spillage or leakage from the handling, transport and storage of the waste? Unless the responsible entity can be clearly nominated prior to approval and provide the necessary guarantees to rectify fully each and every spillage event including the repair to as-installed condition and the full clean-up then approval should not be granted.
2. Groundwater contamination; Any leakage of contaminates would threaten ground water supplies which could contaminate drinking water supplies to both human and animal populations.
3. Air contamination; Gaseous emissions could contaminate the atmosphere or the physical relocation of waste by an event such as a willy-willy or the January 2010 storm could contaminate the surrounding countryside.
4. Fire contamination; If a fire event occurred (which is not an unusual occurrence in waste disposal areas) then the potential for major contamination or damage to farm and bushland is very high.
5. Wildlife; The site is close to bushland containing all sorts of native animals and birdlife. Appropriate fencing may keep ground based animals out however birds and some climbing or digging animals could access the site. Wind borne waste could contaminate their bushland habitat.
6. Transport; The transport of waste poses its own contamination risks as well as the risk to other road users especially on The Lakes to York section of road. Is there a guarantee that the number of trucks per hour stated is a maximum number that will never be exceeded over the life of the facility? Will the road be upgrade by the proponent prior to commencement and not at tax or ratepayer expense?

We note that there is a number of trains per week carting mine products to Kwinana from the outer areas around Southern Cross and returning empty. Is there not an opportunity to utilise an existing hole in the ground in a remote area with un-used rail transport facility already provided?

In conclusion this proposal should not proceed if the signatories to the approvals cannot guarantee that the proponents will accept full responsibility for the physical and monetary costs of any clean-up, full restoration of all damage caused by the event and to provide compensation in full to any person or business adversely affected by every contamination event caused during the transport, handling and storage of the waste disposal process. If this condition cannot be accommodated then the facility should **not be approved.**

Yours faithfully
Keith and Jan Andrews
55 Brunswick Road (PO box 439)
York WA 6302
Phone. 08 9641 1867

COPY SENT TO:
1. GORDON
2.
3.

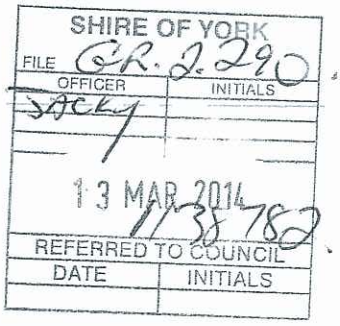
SHIRE OF YORK
FILE GR2.290
OFFICER: DDeley | INITIALS:
13 MAR 2014 1138781
REFERRED TO COUNCIL
DATE | INITIALS

27

Records

From: John Oliver [redacted]
Sent: Thursday, 13 March 2014 12:52 PM
To: Records
Cc: Jan Schekkerman
Subject: Info for Gordon Tester

Can you please forward to Gordon Tester
Gordon
I was informed today that there is a research unit at Murdoch Uni that has good info on reuse and recycling. They have several examples of working models in Perth already doing what we want. The chap that I heard of is a Dr Martin Anda who is in the Environmental Technology section of the Technologies and Policies for Sustainable Development unit.
Needless to say he believes Allawuna is a mistake.
He also stated that there is a State government policy aimed at reducing landfill to zero,, which was documented about 10 years ago, and Allawuna would therefore be directly opposed to this government policy statement.
I was most interested in his organic waste recycling ideas.
Regards
John
--
John Oliver OLIVER Rural IT Solutions Mobile 0427412130 www.OliverRural.com.au



29

Records

From: C & M Chipper [cjmjchipper@bigpond.com]
Sent: Thursday, 13 March 2014 11:36 AM
To: Records
Subject: Fw: SITA LANDFILL YORK

Dear SHIRE COUNCILORS

This is a copy of the letter we sent to DER .
From a York point of view why did this proposal even get this far?
We cannot think of ONE reason that this tip would benefit our community.
Please do your upmost to stop it ever happening.

Chris and Melody Chipper

From: C & M Chipper
Sent: Wednesday, February 26, 2014 2:28 PM
To: Cristina.Angel@DER.wa.gov.au
Subject: SITA LANDFILL YORK

Dear Cristina,

We are writing to strongly object to the Proposed SITA Landfill Tip on Allawuna farm York WA.

IT IS 2014 and SITA is trying to establish a LANDFILL PIT on prime Agricultural land, adjacent to a National Park and Water Catchment area.
And in Western Australia not some third world country.
Who is going to say that they are proud that this happened on their watch?

Ok its the cheapest option for SITA but really-.

Who is going to be responsible for:
-The noxious gases that will escape from the landfill rubbish tip into the atmosphere adding to Climate Change.
-The quality of the air we breath (people do live nearby)
-The wind that will blow contaminated dust into our drinking water (we have to catch our water on our roofs-no scheme water for us)
-The possible contamination of surrounding farm land by polluted dust and water. We are growing your food.
-The discharge of contaminates into the local water course. This tip site is on porous soil on a water course and right next to a
major water catchment area.
-Damage to the pit liner and subsequent contaminate leakage. We live here and know how often there are Earth Tremors.
-The fact that the agricultural Zoning of Allawuna surely meant that this sort of activity should never happen.

We challenge you to swear that this TIP will be completely safe and there will be no pollution issues. Have you checked SITA's
record.

Why dont we find an alternative way of dealing with our rubbish that sets an example to others and that we can be proud of!

Regards

Chris and Melody Chipper
[redacted]
York 6302
ph 0896411292

7997

SHIRE OF YORK
FILE GR2.290
OFFICER Jacky
INITIALS
13 MAR 2014
1138778
REFERRED TO COUNCIL
DATE INITIALS
OVER COUNTER 13/3/14

29

[redacted]
YORK
Western Australia 6302

13th March 2014-03-13

Dear Sir/Madam

My husband and I are forwarding this submission as our objection to the proposed waste disposal site at Allawuna Farm situated 18 kms from York.

1 We came to live in York for the rural lifestyle and farming ambience of the region and placing a waste disposal site on prime agricultural land completely nullifies this aspect and also places in jeopardy the livelihood of the adjacent organic farms on the boundaries of Allawuna. SITA has chosen this site as the cheapest possible option as it is close to the Welshpool transfer station and an access road is already in place. Waste disposal sites should be placed on land that is degraded beyond recall but of course that would entail considerable expense and this company is clearly not prepared to go to the expense of such a development elsewhere.

2 The site at Allawuna is in the water catchment area and should never be placed at risk. With the best will in the world SITA cannot guarantee the safety of the water resource. Leakages will always happen therefore a waste disposal site should always be in places where if leakages of toxic material occur, the damage is minimal and the expense of clean up is also reduced.

3 The site at Allawuna is in an area where seismic disturbance occurs on a regular basis. Surely that should ring warning bells and indicate that the risk of any earth movement is going to create a situation where any toxic materials can escape into the groundwater.

4 We travel the road from York to Midland every week. This road is in a state of disrepair at the moment and is dangerous in parts due to the high number of grain trucks and other traffic. The proposed addition of double bogie trucks carrying waste to and from Perth every 20 minutes is a recipe for disaster. SITA will not go to the expense of maintaining this road and certainly from public forums the company seems quite unconcerned about the potential of death and injury from all the truck traffic. With SITA's proposed truck timetable, there will be a constant line of moving trucks on two thirds of this road. Do local residents have to wait for a horrific accident caused by one of these trucks before common sense prevails ?

5 York is a pretty town and a great drawcard for tourists. The town relies on the extra income generated by tourists but visitors will not want to battle the road buffeted by waste trucks travelling to Allawuna and

consequently will stay away and go somewhere else that is more amenable to access. SITA has now started to dangle a carrot saying that York will benefit from a few more jobs and that some businesses may obtain some input in the construction phase. In our view this will not overcome the negative impact this proposed waste disposal site has on York town site residents and people in the surrounding area. The major benefit will be for the State Government as an easy way to dispose of Perth's mounting waste burden. Why should the residents of York and district have this facility placed in their pristine environment to the detriment of humans, animals and plants ? Once in place this waste dump will continue to grow, place more stress on its surroundings, more traffic than proposed on the road. Invest in the future by reducing metropolitan waste, advise companies like SITA to be proactive and develop waste disposal sites on degraded land even though it will cost more.

Yours sincerely

Jean Durbin

William Lester Durbin

+67

30

PO Box 527
YORK WA 6302

4th March 2014

Manager of Planning Services
Shire of York

Dear Jacky Jurmann

Re: Proposed SITA development near York – we are AGAINST this proposal

We must strongly protest at the siting of a waste site close by our home. Our motivation to move to York was for the peacefulness of the area and cleanliness of the area especially with regards to air quality. To live on a property where we can grow our own vegetables and fruit, raise sheep, beef and chickens as organically as possible for our own consumption in a world of too many harmful chemicals. To look into a night sky and see brilliant stars, to see a clear sky during the day. You cannot see such a sky in Perth or the suburbs. We do not to want see and smell smoke or rubbish.

Below are just some of what will or could happen or why the proposal is not acceptable:

- With regards to air pollution from waste sites which can include methane, carbon dioxide, ammonia, hydrogen sulphide, hydrogen chloride and carbon monoxide to mention a few, which is not conducive to clean air.

- Ground pollution with the replacing of soil/clay/rock layers with layers of medical waste, industrial waste, bedding, squashed containers, diapers/nappies, plastic wrappers, furniture, metal, electrical items, food waste, and other general rubbish which may blow around the countryside as well as leach toxic chemicals (refer to some of the previous point) like heavy metals including mercury, arsenic and lead within the soil. Possibly finding its way through the water chain to far reaching areas.

- Increase in water usage. SITA will require water for damping down the site which may come from dams and presumably bores as dams will not contain sufficient for the purpose. This could also lead to leaks within the water system.

- Population growth. York is close to Perth's metropolitan area which has expanded both north and south to far greater distances than is from CBD to York. York will be an area towards which the population will build out to. They will not come if there is a waste site close by. I believe York could become a satellite town to Perth as it is now closer to the CBD than that of the most southern or northern suburbs for workers to travel to and from work. This will not occur if the time to travel increases as it has from north and south of Perth with the increase in vehicle traffic, especially slower moving trucks in both directions. York wants more residents and visitors in cars and dare I say buses of tourists to visit bringing dollars to our town.

- Increased truck traffic. The horrifying mention of road trains proceeding to and from the site every twenty minutes boggles the thought processes that this is good. Grain carrying trucks are expected to increase with rail problems which are bad enough. To have an even greater number of road trains travelling the Lakes – York Road is even more horrifying. It is not enough to provide overtaking lanes. Accidents will greatly increase – it has to if more vehicles travel a given road. Trucks = even higher number of accidents with more serious consequences. York will require more hospital staff, ambulance staff and equipment to deal with this. Is this where more jobs will be created? Greenmount hill will become even more of a nightmare with more trucks; surely trains would be far better.

- Water Pollution. Like the water system, the waste will flow from outer metropolitan areas to (currently Welshpool) and from there greatly increase traffic along Roe and Great Eastern Highways to mention a few arteries, flowing to Great Southern Highway at the Lakes turn off to the dump site. We don't want to see toxic rubbish filter back the other way into Perth's water supply. Water is a very precious and necessary commodity. The Avon River through York no longer has edible fish and can no longer be swum in due to being 'poisoned'. Rehabitation of riversides and creeks by various groups to clean it up will be again threatened from leakage from a waste site. I am revegetating our section of creek line and have seen the return this year of tadpoles in the water. I haven't seen tadpoles there since moving here in December 2009. I am happy about this as it means the water quality has improved.

- Strong Winds. Living less than five kilometres from the site (as the crow flies) I can say that we experience strong winds for days on end, particularly in spring and summer. These strong winds, including large willy willies, these have the strength to pick up dust and rubbish and will blow it onto nearby productive farm land not just on Allawuna. Although my farm is not certified organic I endeavour to use organic practises on my farm. There is a certified organic olive producer (making olive oil and other products) between my farm and Allawuna. How will their status be affected, they cannot transplant and move their plantation. I don't want to move as I've poured my heart, soul and money into this farm which at the present is valued less than I purchased four years ago – partly due to the threat of a waste site.

- Land Usage. Our agricultural land is under threat from salt, buy outs from overseas countries and the need for housing people. Already much of the agricultural land used for vegetable growing has been over sown by housing on the coastal plains, requiring moving further south. Housing in the 'metropolitan area' has led to water being directed via storm water drains to the ocean by-passing soaking into the land and replenishing underground aquifers. Prime grain growing areas are needed for the food security of our state (if not nationally as well). When some areas are in drought or floods, others are producing our nation's food. To put a toxic dump, which could remain toxic for more than 20 years after being closed (and seeing as the possible site could be used for the next 40 years or more that makes at least 60 years), on any prime agricultural land is inconceivable. A report by Landline, on the 23rd February 2014, from Mr Scott Hansen (I believe his name was) from Meat and Livestock, mentioned that Australia is in a unique and privileged position of being away from the Northern Hemisphere of higher population, and therefore pollution and diseases, for agriculture.

- Food Exportation. It was reported in a previous Landline that the Japanese did not want GM foods and I am sure they would not want 'contaminated' food fed to livestock either or grain for humans. Japan is not the only country to look closely at the farming practises in countries it buys food products from. I'm sure Australians would not want contaminated food either, hence the growing move towards safe food sourcing by consumers from less polluted countries.

- New Farm Opportunity. The West Australian, Saturday 1st March 2014 Business section page 7, had a report that due to a rule change "live sheep and cattle exports are set to increase by millions of head over the next few years on the back of skyrocketing demand and a Federal Government decision to scrap a key condition on opening new markets". **This** is what we need to boost farmers.

- **SITA 120-154-13 AC Report January 2014 A.*** Having read through this report I found on page 15 the following: "The EPA advice from the DER that the Allawuna facility could be seen as a replacement for the proponent's South Cardup landfill which is expected to be full by 2015/16.
  The DER also advised the EPA that there are other landfills, existing and proposed. That could meet the needs of the metropolitan area for the next 10 -1 15 years and the proposal could constitute an oversupply of land fill space."
  Further that: "In relation to planning processes, the EPA advised that these are matters for the relevant planning authorities. The EPA noted that the proposed facility is in a "SA" land use in the Shire of York's planning scheme, which means that the use is not permitted unless the local government has exercised its discretion and has granted planning consent after special notice. The EPA is advised that planning approval has not yet been granted."

- Alternative Solutions. We understand the need for a waste disposal site though if some other countries have done away with infill sites, it bears some study. Surely this could be done to see if these other countries can provide blueprints for such to be done here in Australia – we are not a third world country. Alternatively, surely there is a similar size area which is not in close proximity to water catchment, nature reserves, organic farms, lifestyle land and prime agricultural land on which a waste disposal site can be located. Land which is not suitable for agriculture, possibly that has been mined previously. A site which can be reached by rail maybe, another reason to upgrade rail transport. I am sure there are large (contaminated) rail terminals lying idle or underused which could be adapted to an actual waste sorting facility (similar to SITA's Welshpool site) then loaded onto trains for transfer to an infill site more suitable.

- People of York and Visitors. From the several meetings about SITA's proposal it is very clear that the majority of York residents and visitors do not want this proposal to go ahead.

Being concerned residents of a toxic free area of York and surrounds we sincerely hope the Council members will not allow a change in zoning to allow a waste disposal site on our beautiful land.
Yours sincerely,

Karina Famlonga | Valerie Langlands | Neville Langlands

C.c. Nial Stock, SITA State General Manager – WA, 116 Kurnall Rd, WELSHPOOL WA 6106

* Report to the Minister for Environment

31

SHIRE OF YORK
FILE GR.2.290
OFFICER | INITIALS
JACKY
14 MAR 2014
4138796
REFERRED TO COUNCIL
DATE | INITIALS

OVER COUNTER
14/3/14

12/03/14

Shire of York Planning Dept
1 Joaquin Street
York W.A. 6302

Subject: SITA Landfill proposal at Lot 4869 (PT) 2948 Great Southern Hwy. St Ronans

To whom it may concern,

I strongly oppose the SITA Landfill proposal and have serious concerns about the following:

- Increased truck traffic on The Lakes road
- Air pollution and groundwater contamination
- Loss of amenity of the York area
- Consequences resulting from an earthquake or fire in the landfill area

I drive The Lakes road to and from Perth several times a week and I cannot believe that anyone would entertain the idea of allowing more trucks on that road, especially considering that there is likely to be a significant increase in grain trucks making use of it in the near future. In my opinion this narrow, winding road is dangerous enough to drive along now due to the number of trucks that travel on it and the number of irresponsible drivers who overtake those trucks when it is clearly not safe to do so. Adding waste trucks will only compound the problem.

Sincerely

Kathleen Shannon
10 Buckingham Road
York WA 6302
Phone: 9641-1133

32

12th March 2014
The Shire President and Councillors
York Shire Council
PO Box 22
York 6302.

Dear Sirs and Madam

Re: Allawuna Farm Landfill Works Approval Application

We own 3264 (Lot 5201) Great Southern Highway, St Ronans, York and are writing to object to the SITA application to establish a landfill site on Allawuna, which is only one hobby farm away to the west from our property.

Air Emissions

Our only source of drinking water is from water caught on the roof and stored in rainwater tanks and so we are therefore most concerned about **contaminated dust and other contaminated particles** being carried from the landfill site and the delivery trucks which will be arriving and leaving every few minutes. The **prevailing winds**, which are **strong** and occur almost on a **daily** basis, will easily carry dust and other contaminated particles over **the short distance between the two properties.**

Contaminated dust and other contaminated particles will also land in the **dams** which are the only source of drinking water for livestock. **Salmonella** is already a problem within the cattle industry throughout the world and this problem needs to be controlled, not exacerbated.

Soil Emissions

Surface water, especially flood waters, **leachate leakage** and **seepage through faults,** which will occur in the proposed lining, as it has already occurred at other SITA landfill sites within Australia and elsewhere, are all factors which threaten the quality of farming land and therefore farming produce within the area.

The area is prone to **seismic activity,** which is evidenced by official government records, and so a plastic liner in a diverted river tributary within the Mundaring Water Catchment area poses significant problems for both the community and livestock which depend on potable water from that area as their source of drinking water.

Biosecurity and Agriculture Management Act 2007 (BAMA)

Producers of grain/seed/hay, cattle, sheep and goats are required to pay a **Biosecurity levy** and a landfill site located in the midst of prime agricultural land threatens the quality of produce within that area. Contaminated crops and/or livestock could result in **producers being hit with very heavy fines** in an industry which is already struggling to survive successfully against the natural elements coupled with the excessive costs of farming.

Fire

It is a known fact that fires at landfill sites can burn for long periods of time. A serious fire at Allawuna would present significant problems for the surrounding farms, which nearly all produce crops and do therefore present a huge fire risk, potentially resulting in economic loss, and in turn community health problems, etc. The neighbouring Wambyn Nature Reserve will also be at risk.

There is **limited water to allocate to fire control** within the area and there is also a limited workforce of **volunteers** to assist with the control of fire. **This is a planning matter which must be taken into consideration when addressing the possibility of allowing a major landfill site in the midst of prime agricultural land.**

Signage

An official government sign within a short distance from the Allawuna Farm turn off currently exists and reads "Mundaring Water Catchment Area Please report any signs of pollution". It is incredible that we are having to write submissions of objection to a major landfill site being established within this area.

Alternative Solutions

Other countries, such as Norway, are addressing the matter of waste disposal in **a far more efficient and economically viable manner**. Norway actually buys in waste from other countries, such as Sweden, and has turned waste disposal into a profitable business.

Alternative Sites

We understand that there are other Local Government Authorities which would welcome the possibility of a landfill site being established within their area.

Conclusion

We are strongly opposed to the prospect of a landfill site being established at Allawuna in the midst of agricultural land surrounding the historic town of York and we ask that you, as elected representatives, please acknowledge the local community's strong opposition to this proposal and not grant an approval for a landfill site at this location.

Yours faithfully

Valmai C. Kopke

Peter Kopke

Valmai and Peter Kopke

Email: [redacted]
Postal Address: [redacted]
Telephone: [redacted]
Mobile: [redacted]

1005

33

SHIRE OF YORK
FILE GR2.290
OFFICER | INITIALS
SARK
14 MAR 2014
1738802
REFERRED TO COUNCIL
DATE | INITIALS

Records

From: sue preece [sueyork48@gmail.com]
Sent: Friday, 14 March 2014 5:34 AM
To: Records
Subject: Sita Landfill Proposal at Allawuna Farm in York

DAP Submission.

We would like to give some reasons why we are so against Sita's landfill proposal at Allawuna Farm in York.
1.The leachate seepage from a perforated liner due to York being a high risk earthquake zone would contaminate the water table.
2. When excess leachate occurs within the tip its necessary to pump it in to storage ponds, when the excess leachate evaporates from these ponds due to our long, dry, hot summers the toxic residue will blow who knows how far & wide across the country side & contaminate drinking water from roof catchments.
3. Sita have spoken about recycling at the tip but there is no documentation to confirm this. If recycling doesn't happen it could prove to be extremely detrimental.
4. If a fire should occur within the landfill area its a well known fact that it could burn & smoulder for weeks on end causing air pollution & affect the drinking water we enjoy today not to mention how many other things it would affect.
5. History has proven the landfill process will damage our environment.
6. It is a forgone conclusion that if this proposal goes ahead it will affect the health of the people, livestock, pets & bird life in a big way.

Susan & Stan Preece
3270 Spencersbrook-york Rd
York W.A. 6302

34

River Conservation Society
Incorporated

YORK CONSERVATION RESOURCE CENTRE
YORK REGIONAL HERBARIUM
PO BOX 492 YORK, WA 6302
Telephone 9641 6147
Email: trevormoffat@bordernet.com.au

ABN 88 175 487 401

SHIRE OF YORK
FILE GRD. 290
OFFICER Stacy | INITIALS
14 MAR 2014
1738805
REFERRED TO COUNCIL
DATE | INITIALS

OVER, COUNTER
14/3/14

Proposed Allawuna Landfill

On behalf of the above Society, and as Chairman I wish to OPPOSE this proposal for the following reasons:

- York is in the Centre for earthquakes in the Southwest Seismic Zone. Thus there is a real danger of toxic chemicals polluting the Mundaring water supply if leachate dam liners crack.
  (See Denith & Feathstone, Dept of Geology etc UWA) enclosed copy)

- Allawuna is subject to seasonal flooding and the water table rises as in November 2012. Toxic waste could then run down the slope into 13 Mile Brook, which when flowing runs into Spencers Brook, then on into the Avon, and eventually the Swan Rivers.
  (Refer map of River system)

I am a resident and ratepayer of the Shire of York my home address is:

Trevor A Moffat
7 Penny Street
KAURING, 6302.

Yours faithfully,

Trevor A Moffat
(CHAIRMAN)
14/03/2014

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Tectonophysics 376 (2003) 167–184
TECTONOPHYSICS
www.elsevier.com/locate/tecto

Controls on intra-plate seismicity in southwestern Australia

M.C. Dentith[a,*], W.E. Featherstone[b,1]

[a] *Department of Geology and Geophysics, School of Earth and Geographical Sciences, The University of Western Australia, Crawley, Western Australia 6009, Australia*
[b] *Western Australian Centre for Geodesy, Curtin University of Technology, GPO Box U1987, Perth, Western Australia 6845, Australia*

Received 25 February 2003; accepted 19 September 2003

Abstract

Although the Southwest Seismic Zone (SWSZ), located about 150 km to the east of Perth in southwestern Australia, is one of the most seismically active areas in Australia, there is little understanding as to why the earthquakes are occurring.

An analysis of geophysical, geological and geodetic data from the area suggests that the SWSZ coincides with a Precambrian terrane boundary. Seismic data show that the terrane boundary zone dips at a shallow angle in a northeasterly direction. Reactivation of this 'zone of weakness' in the contemporary stress field (east–west maximum horizontal stress) is interpreted to be the first-order control on seismicity in the region.

Gravity data show that the terrane boundary is offset by near-orthogonal structures, which are interpreted as faults. At least one of these trends corresponds with a linear zone of epicentres. The temporal and spatial distributions of epicentres associated with the 1968 Meckering earthquake (ML 6.9) suggest that the second-order distribution of seismicity in the SWSZ can be explained by the 'intersection model', whereby stresses are amplified by space problems associated with displacements on crosscutting faults.

It is speculated that a zone of high density and high seismic velocity in the lower crust may also be a second-order control on the local seismicity. However, confirmation awaits better delineation of the extent of this zone.

Keywords: Intra-plate; Meckering; Neotectonics; Seismicity; Australia

1. Introduction

One of the most seismically active regions in Australia occurs in the southwest of Western Australia. In common with much of the seismicity in Australia (Denham, 1988), there is little understanding of why earthquakes occur in this particular region, other than an uncontroversial acceptance that some kind of geological structure is being reactivated by the present-day stress field. This is despite the fact that an understanding of the cause of the seismicity is important because of its proximity both to the city of Perth (population 1.4 million) and important regional agricultural and mining centres (Gaull and Michael-Leiba, 1987).

The largest and best-known earthquake that has occurred in the region is the ML 6.9 event that occurred near the town of Meckering in October 1968 (Gordon and Lewis, 1980). Here, the Meckering event is placed

* Corresponding author. Tel.: +61-8-9380-2676; fax: +61-89-380-1037.
E-mail addresses: mdentith@geol.uwa.edu.au (M.C. Dentith), W.Featherstone@curtin.edu.au (W.E. Featherstone).
[1] Tel.: +61-8-9266-2734; fax: +61-8-9266-2703.

0040-1951/$ - see front matter © 2003 Elsevier B.V. All rights reserved.
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in a regional tectonic context, and a possible explanation is proposed for why this part of the Australian continent is seismically active. In a companion paper (Dentith et al., in preparation), the Meckering event and associated seismicity is considered from a more local perspective, specifically the nature of the faulting associated with the earthquake based on an interpretation of high-resolution aeromagnetic data.

2. Seismicity in the southwest of Western Australia

The occurrence of seismic activity in the southwest of Western Australia has been known since at least the time of white settlement (early 19th century), and presumably was noticed long before this by the aboriginal population. However, according to Doyle et al. (1968), from 1901 until 1958 there was only one seismic station in Western Australia and only three accurate epicentres were located in the Western Australian region up to 1958. Additional recording stations were established by Geoscience Australia and its predecessors in the 1950s and 1960s including the Mundaring Geophysical Observatory (established 1959). The 1968 Meckering earthquake caused extensive damage and drew attention to the area, with the number of recording stations increasing significantly (currently there are seven in the region), with a resulting increase in the reliability and volume of seismic data.

Summarised below are some observations that are considered to be significant with respect to the causes of the seismicity in the southwest of Western Australia. Early ideas and observations were based on very limited data and were necessarily speculative. However, more than 30 years of recordings from what is now a reasonable seismic network has created an adequate database to use as a basis for understanding the local seismicity.

- Everingham (1965) noted the linear form of the epicentres known at that time and introduced the term 'Yandanooka-Cape Riche Lineament' (YCRL), based on localities at the ends of the lineament (Fig. 1a). Subsequently, Doyle (1971) called this belt of epicentres the Southwest Seismic Zone (SWSZ), the name that has been generally adopted and is used here. Everingham (1965) noted the epicentres as coinciding with a linear gravity anomaly associated with a decrease of about 600 gu from the region to the southwest of the lineament to that to the northeast. Based on this observation, Everingham (1965) postulated a change in crustal, and possibly mantle, structure across the YCRL (Fig. 1b). The model he proposed was based primarily on gravity observations, with some constraints from the very limited seismic refraction data available at the time.
- The area of the SWSZ is characterised by subdued topographic relief and deep and intense weathering. Consequently, outcrop is very poor and the geology of the region poorly understood, although various correlations with the seismicity have been made. For example, Everingham (1965, 1966) described the seismic zone as coinciding with a change in metamorphic grade, as indicated by the extent of charnockitic rocks (Fig. 1a), and Doyle et al. (1968) noted a parallelism between the YCRL and major fold directions. Wilde et al. (1996) published a major re-interpretation the geology of the region that includes the SWSZ. This geological model provides for the first time a coherent geological framework for the region and it is instructive to consider the seismicity within its context (see below).
- In situ stress data from the southwest of Western Australia come primarily from three sources; the orientation of borehole breakouts in petroleum wells in the Perth Basin to the west of the SWSZ (Reynolds and Hillis, 2000), modelling of focal mechanisms of local earthquakes of sufficient magnitude (Dziewonski et al., 1987; Vogfjörd and Langston, 1987; Fredrich et al., 1988), and in situ measurements of stress from shallow drillholes (Denham et al., 1980, 1987). The regional stress field in the southwest of Western Australia, the Perth stress province of Hillis and Reynolds (2000), is quite well defined and consists of a reverse-faulting regime with an approximately east–west oriented maximum horizontal stress direction (azimuth = 96° ± 26° (1σ)).

The spatial distribution of seismicity in the SWSZ between 1960 and 1999 is illustrated in the epicentre map comprising Fig. 2. It is obvious that the distribution of seismicity is not uniform and clearly

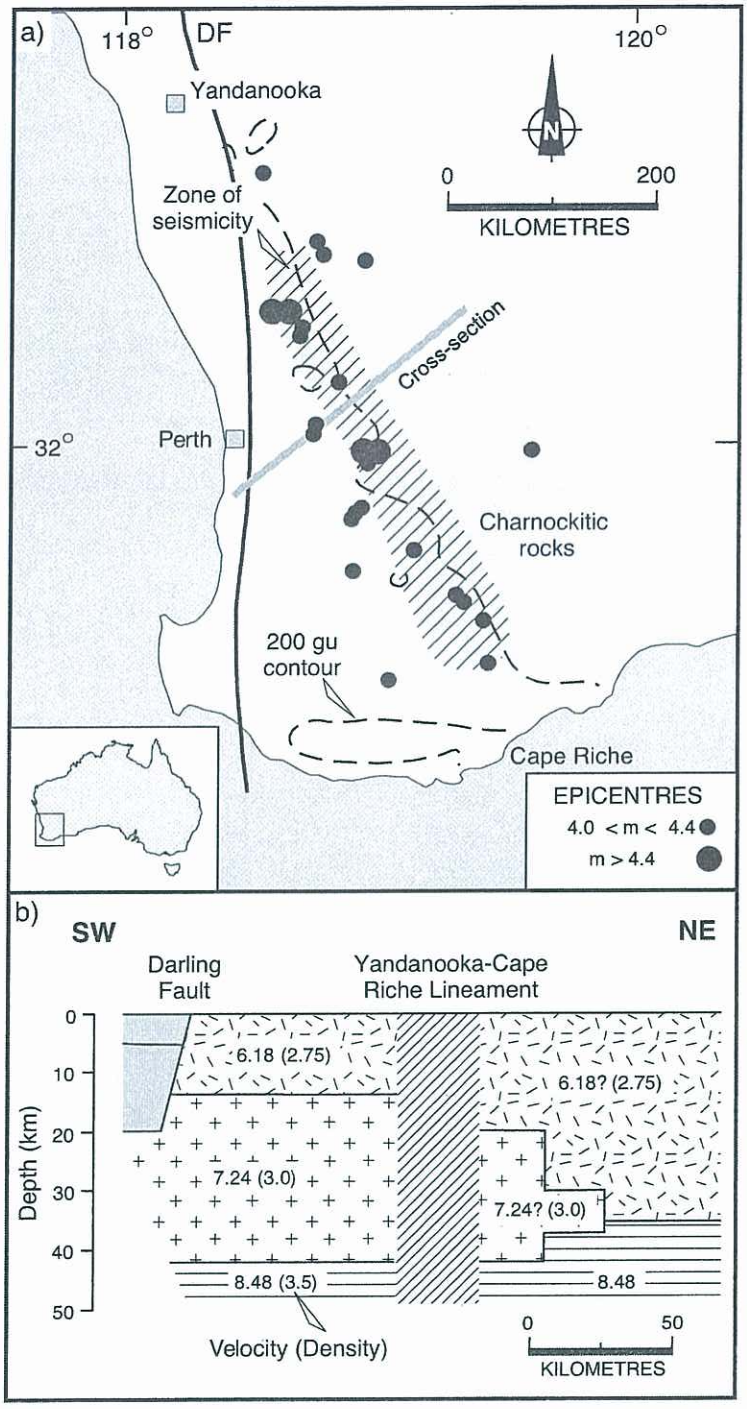


Fig. 1. (a) Map of the southwest of Western Australia showing epicentres known in 1965 and features possibly related to the local seismicity. (b) Cross section across the Yandanooka-Cape Riche Lineament. DF—Darling Fault. Redrawn from Everingham (1965).

more complex than the simple linear zone identified by Everingham (1965) based on the data in Fig. 1a. A northwest–southeast trend to the activity only occurs in the most general sense and there are distinct clusters of increased activity. Also, there is a prominent sub-circular seismic gap, referred to here

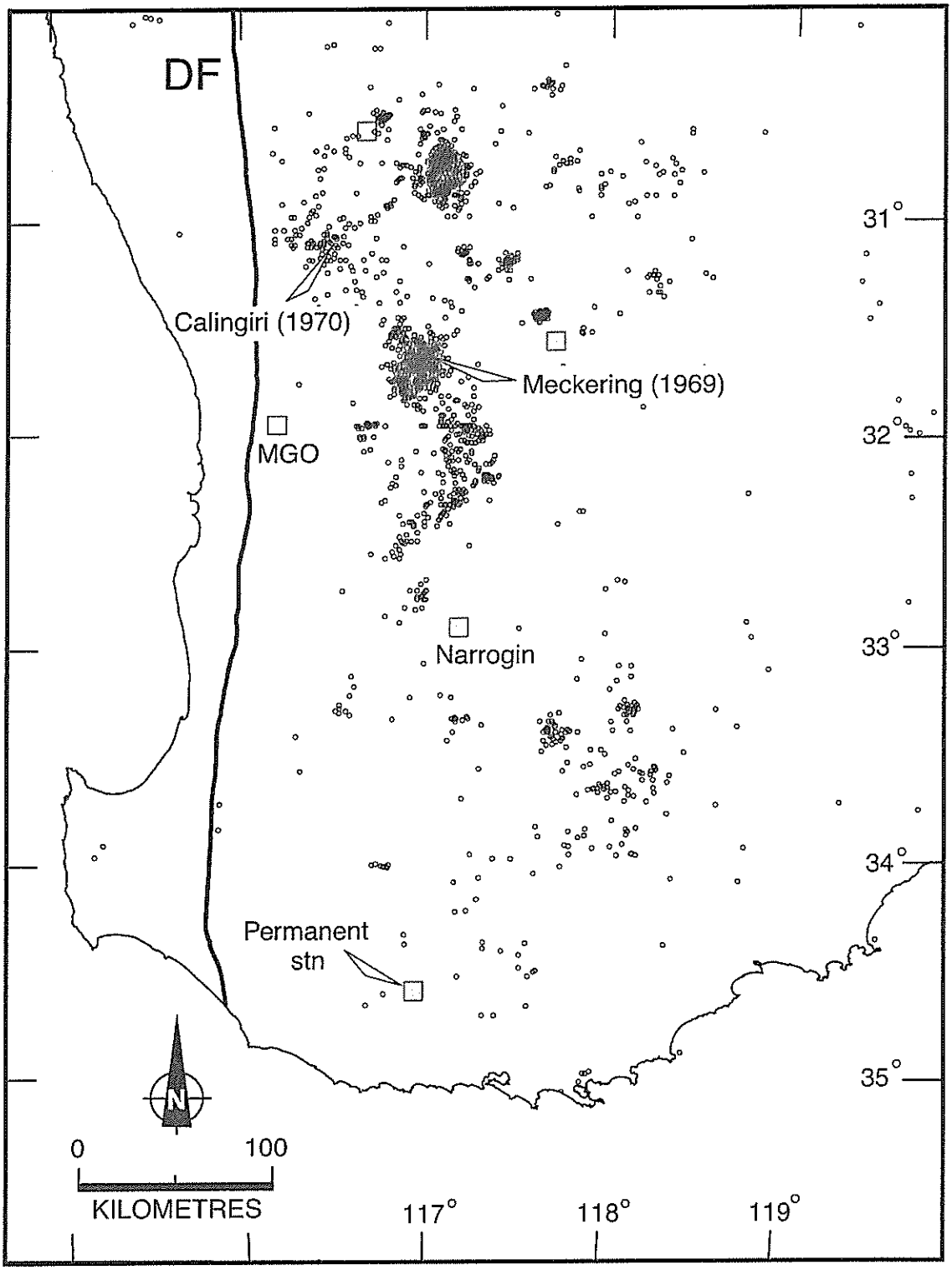


Fig. 2. Distribution of epicentres (ML ≥ 2) in the SWSZ over the 40-year period 1960 to 1999. DF—Darling Fault, MGO—Mundaring Geophysical Observatory. Epicentre locations provided by Geoscience Australia.

as the Narrogin seismic gap (NSG), to the north of which there is a distinct northeast–southwest trending linear zone of epicentres. A case can be made for other similar zones elsewhere in the study area. Clearly, any explanation for the presence of the SWSZ must account for both the first-order northwest–southeast trend and also the more localised variations in epicentre distribution.

3. Regional geology and geophysics

The bedrock geology of the southwest of Western Australia has to be deduced from only meagre data, because of the severe lack of outcrop. The rocks in the region underwent a period of intense weathering in the Tertiary that created a thick regolith and extensive laterites. Lithologies that are more resistant to weathering are exposed in places, but in general the geological information that can be deduced from outcrop is extremely limited. Fortunately geophysical data are available that allow the bedrock geology to be mapped indirectly.

3.1. Regional geology

The main geological entity in the southwest of Western Australia is the Yilgarn Craton, which is composed of predominantly Archaean rocks and extends over most of the southern part of Western Australia. The majority of the Yilgarn Craton comprises granitoid-greenstone rocks, formed between 3.0 and 2.6 Ga. However, large areas of older high-grade gneisses and supra-crustal rocks occur in the southwest and northwest. These rocks are often referred to as the Western Gneiss Terrain (Gee et al., 1981) and the SWSZ lies entirely within the southwestern area. The Western Gneiss Terrain is made up of repeatedly deformed granitoids, gneisses, belts of metasedimentary rocks, small greenstone belts and remnants of layered basic intrusions (Gee et al., 1986). The gneisses have undergone polyphase deformation and metamorphic grade is typically upper-amphibolite or granulite facies. To the west and south of the Yilgarn Craton are Proterozoic mobile belts. Overlying the mobile belt to the west are Phanerozoic rocks of the Perth Basin. At the western edge of the Craton is the Darling Fault (Fig. 2). This fault, or more correctly fault zone, has a complex history of normal and strike-slip movements (Harris, 1994). Its current basin-bounding role represents only the latest movements along what is a major locus of deformation that has probably been active since about 2.5 Ga. Although the Darling Fault is an immense fault structure, being traceable for more than 1500 km along strike with a downthrow of around 10 km in places, it is currently (apparently) aseismic. This is presumably because of its relatively steep dip (Dentith et al., 1993), i.e. it is not favourably oriented for reactivation within the current reverse faulting stress regime.

Wilde et al. (1996) presented a synthesis of various geological data, in particular isotopic dating, from the southwestern Yilgarn Craton and proposed that it consists of three tectono-stratigraphic terranes (Fig. 3a). The terranes are, from west to east, the Balingup Terrane, the Boddington Terrane and the Lake Grace Terrane. To the north is the Murchison Terrane. However, over most of the area the exact locations of the boundaries between each terrane are poorly constrained.

The Balingup Terrane is a narrow north–south trending feature adjacent to the Darling Fault. In the north, the eastern boundary of the Terrane coincides with a 2-km-wide shear zone that separates the Chittering and Jimperding Metamorphic Belts. The adjacent Boddington Terrane is only about 10-km wide near its northern limit, although further south it reaches a width of about 120 km. In the extreme north, its eastern boundary coincides with a change in metamorphic grade and structural style within the Jimperding Metamorphic Belt. However, over most of its length, the boundary has no geological expression, but is correlated with the northeast-trending gravity lineament recognised by Everingham (1965). Like the Boddington Terrane, the Lake Grace Terrane is narrow in the north, but becomes much wider further south. The eastern boundary of the Lake Grace Terrane is loosely defined based on the estimated extent of charnockitic granitoids. The imprecise location of the boundary is a function of poor outcrop and a lack of detailed geological mapping. However, Wilde et al. (1996) are quite specific about the western boundary, stating that "a portion of intermediate crust [the Lake Grace Terrane] was trans-

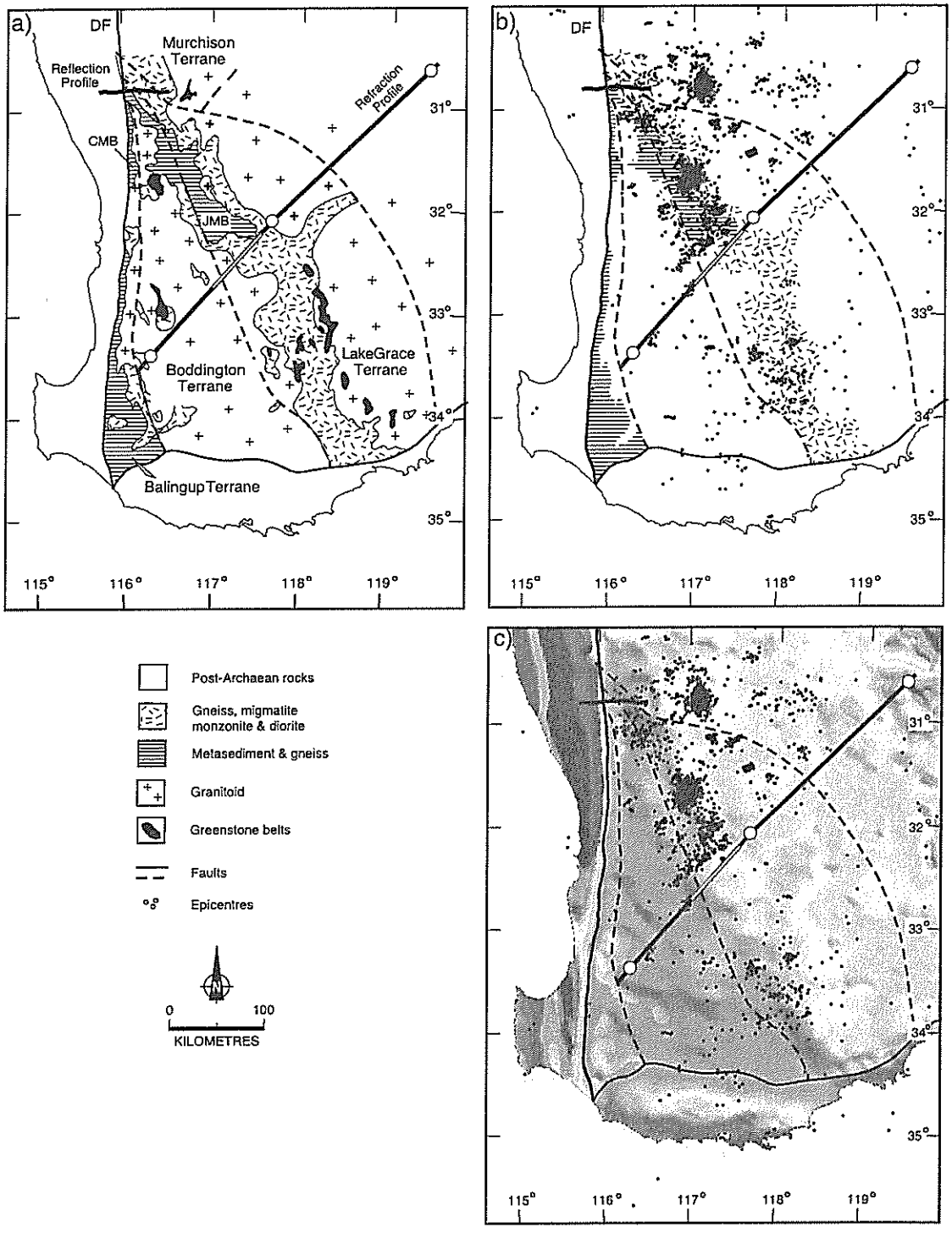


Fig. 3. (a) Simplified geological map of the southwestern Yilgarn Craton. Mainly derived from Wilde et al. (1996). CMB—Chittering Metamorphic Belt, DF—Darling Fault, JMB—Jimperding Metamorphic Belt. (b) Distribution of epicentres (ML ≥ 2, 1960–1999) from the same region. (c) Bouguer gravity. The colours represent a range of approximately 1000 gu, with red high, blue low, etc. Key geological features from (a) are also shown for comparison. The white bar on the seismic refraction profile shows the intersection of an HVZ with the top of the lower crust. Epicentre locations and gravity data supplied by Geoscience Australia.

ported to the surface along a thrust zone, marked by the major change in gravity signature".

Wilde et al.'s (1996) geological model has important implications for the origin of the SWSZ, since the terrane model implies the presence of major faults/suture zones that are likely to be reactivated in subsequent stress regimes. Fig. 3b shows the locations of epicentres relative to the terrane boundaries defined by Wilde et al. (1996), plus key elements of the local geology. The most obvious relation between the epicentres and the geology is the concentration of epicentres around the Jimperding Metamorphic Belt and its surrounding migmatite zone, especially its eastern and southern margin. However, this is not the case with other metamorphic belts in the region. Given that the positions of the terrane boundaries are not well constrained, the suture between the Boddington and Lake Grace Terrane shows a reasonable correlation with seismicity, especially in the northwest of the SWSZ. Since the boundary is inferred to be an east-dipping thrust, it is expected that the epicentres will lie to the east of its intersection with the current ground surface, as is observed. Further to the southeast, there is evidence for the concentration of epicentres in the belt of migmatites that continues southeastwards along strike from the Jimperding Metamorphic Belt. There is some evidence for seismicity associated with the eastern boundary of the Lake Grace and Murchison Terranes, again mainly in the north of the SWSZ.

3.2. Gravity data

The entire area of interest is covered by gravity surveys with a station spacing of approximately 11 km and barometrically determined heights (Fraser et al., 1976). These data have also been supplemented by higher resolution surveys undertaken for mineral exploration and academic reasons. Recall that variations in gravity, albeit deduced from a less extensive dataset, were an important component of the early work on the cause of the SWSZ by Everingham (1965).

A full interpretation of the regional gravity data and its integration with the epicentres comprising the SWSZ is beyond the scope of this paper, although such a study is ongoing. Here the discussion is restricted to general observations about the associations between the potential field data and the epicentres. These data are shown in Fig. 3c and some potentially significant relationships are immediately apparent. For example:

- The gravity data clearly delineate the major geological boundaries in the southwest of Western Australia, notably the Darling Fault/Perth Basin. Of the terrane boundaries defined by Wilde et al. (1996), only that between the Boddington and Lake Grace Terranes is clearly reflected in the gravity data. Thus, at least in terms of density distribution, the gravity data are suggesting this is the most important geological structure in the vicinity of the SWSZ.
- With the benefit of more extensive and higher resolution data, combined with image processing (Fig. 3c), it is clear that the situation is more complicated than the simple near-linear gravity gradient (cf. Fig. 1a) described by Everingham (1965). Well-defined northwest–southeast trending linear segments do occur, but these are offset and interrupted by crosscutting trends and there are also sub-circular negative anomalies. The northeast–southwest trending zone of epicentres at the north of the NSG coincides with one such feature.

3.3. Controlled-source seismic data

The SWSZ has been traversed by crustal-scale seismic reflection and refraction surveys. The locations of the two profiles are shown on Fig. 3. These data, although restricted in spatial extent, provide important constraints on the three-dimensional geometry of key features mapped at the surface.

A normal-incidence seismic reflection profile was recorded across the boundaries between the various terranes at the northern end of the SWSZ, where all three terranes are narrow (Middleton et al., 1993, 1995). It is possible that the boundaries between the terranes in this area are atypical, since the substantial decreases in their outcrop-width might be due to tectonic factors. However, in the absence of data from other areas, these seismic data provide the most detailed picture currently available of the geometry of the sutures separating the terranes. Using surface

geological mapping to constraint their interpretation, Middleton et al. (1993) correlated east-dipping (~ 30°) reflections with outcropping mylonitic shear zones interpreted as the terrane boundaries (Fig. 4). These events appear to sole into a décollement at about 2.5 s two-way time (~ 8-km depth), implying thin-skinned compressional tectonics and the possibility of allochthonous units at the surface. It is significant that seismicity in the SWSZ is thought to occur mainly in the topmost few kilometres and what data are available suggest compressional failure on shallow east-dipping structures (see, for example, Vogfjörd and Langston (1987)).

Dentith et al. (2000) presented a crustal velocity model derived from wide-angle reflection/refraction seismic data, recorded along a northeast-trending profile perpendicular to the principal trend, and crossing the approximate centre, of the SWSZ. Overall, a typical cratonic crustal velocity structure was recognised, comprising a two-layer crust varying in thickness from about 33 to about 38 km (Fig. 5). Compared with the northeastern part of the profile, the southwest part has velocities in the upper crust that are clearly higher, the top of the lower crust is shallower, and the Moho is deeper. Two different crustal blocks are interpreted to explain these differences. Separating the two types of crust is a high-velocity zone (HVZ) in the lower crust that dips to the northeast at about 20° (apparent). Note that the discrete higher velocity core to the zone is a modelling convenience and a gradual change in velocity between core and periphery is more likely to be the case.

The two seismic profiles provide information of considerable importance in explaining the local seismicity. The dip of the HVZ is entirely consistent with the interpretation of the Lake Grace Terrane being thrust into contact with the Boddington Terrane (Wilde et al., 1996). Overall, it is clear that the seismic refraction data strongly support the terrane model of Wilde et al. (1996) for this region of the Yilgarn Craton. Unfortunately, the location of the seismic profile was such that effectively no constraints are placed on the nature of the boundaries between the other terranes proposed for the region. Also, recall that a change in crustal structure in this area was predicted by Everingham (1965). Although his data were insufficient to place much constraint on the nature and geometry of the change in structure itself, the model in Fig. 1 has much in common with that in Fig. 5. Most importantly, there is clear evidence for a major geological structure suitably oriented for reactivation in the

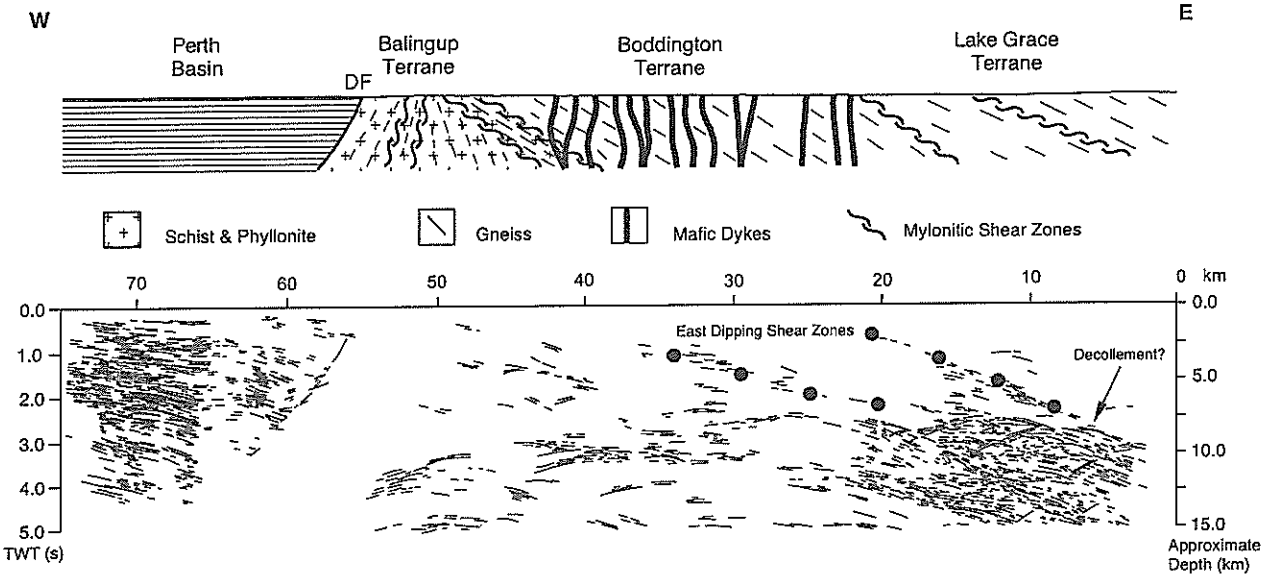


Fig. 4. Line drawing and geological interpretation of a deep seismic reflection profile across the western edge of the Yilgarn Craton. Modified from Middleton et al. (1995).

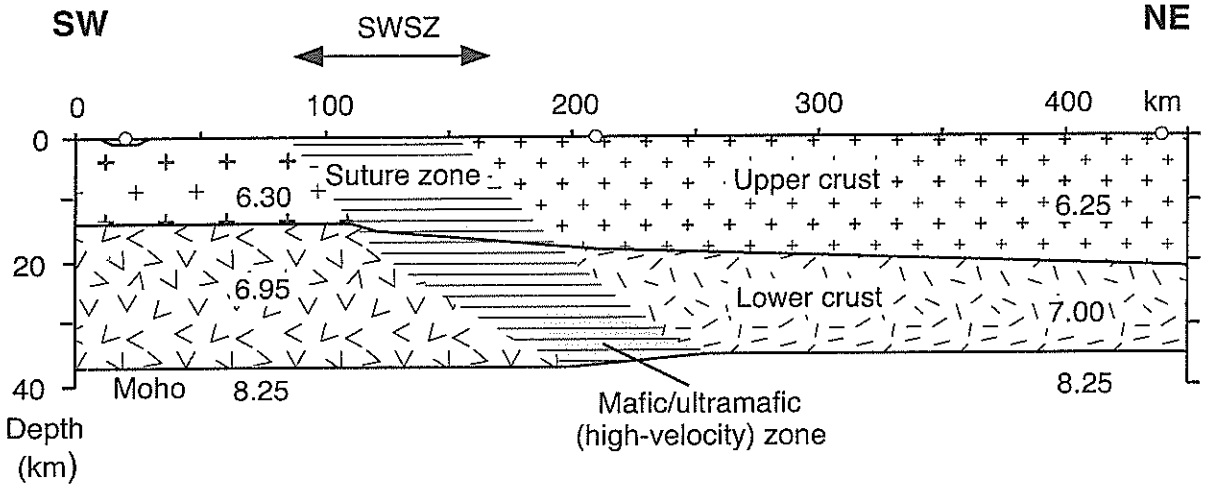


Fig. 5. Velocity cross section across the SWSZ derived from seismic refraction profiling. Based on the data of Dentith et al. (2000). Note the easterly dip and change in crustal structure across the high-velocity zone that coincides with the SWSZ.

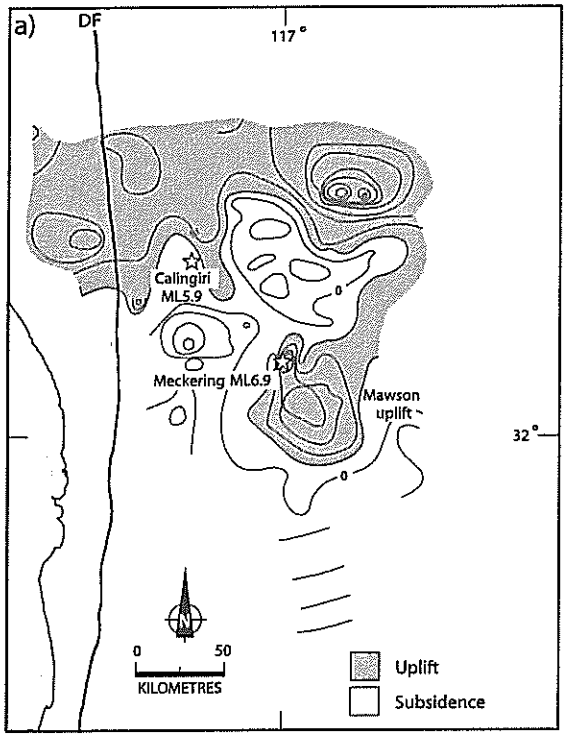
present-day east–west oriented compressional stress field.

The interpretation of the HVZ is potentially a crucial clue to understanding the SWSZ (see below). Its seismic velocity suggests it is mafic/ultramafic in composition. One possibility is that it is a zone of intrusions. These might be associated with underplating during Mesozoic rifting or decompression melting during Archaean orogenesis. Alternatively, the suture zone may have been a convenient conduit for magma during one of the intrusive episodes associated with the numerous dyke swarms in the study area. However, the preferred interpretation of Dentith et al. (2000) was that the zone represented a fault-bounded mega-sliver or terrane of mafic/ultramafic composition, possibly of oceanic affinity, lying within the suture zone separating the Boddington and Lake Grace Terranes.

3.4. Vertical surface deformation

An analysis of apparent vertical ground movement in the SWSZ, based on repeat levelling and gravity measurements, is described by Wellman and Tracey (1987). They concluded that there is apparent vertical motion from the repeat levelling, but no significant changes in gravity. The observed patterns of uplift and subsidence are potentially important constraints on the causes of the local seismicity. Fig. 6a shows a map of heights measured during the 1980s minus those measured in the 1960s. The rate of deformation implied is very large. Unfortunately, the description of the estimation of uncertainties in the observations within the paper is not very detailed and it is not clear how much of the detail in Fig. 6a should be considered significant.

Taking the observations at face value, the 1968 Meckering event occurs at the northern end of a roughly circular region of uplift with a maxima of more than 160 mm. This region encompasses a zone of seismic activity extending southeast from Meckering (Fig. 2). Comparison with the digital terrain data from the region (Fig. 6b) shows the area of uplift coincides with a region of high ground, named here the Mawson uplift. This is an important correlation since its presence implies that the millimetres of displacement detected by Wellman and Tracey (1987) are a component of longer-term uplift that has caused this region to now be more than 100 m higher than its surrounds. This basic pattern of uplift must be a long-term phenomenon because it has clearly influenced the local drainage pattern, specifically the Avon River has been diverted around its southern end (Fig. 6b).



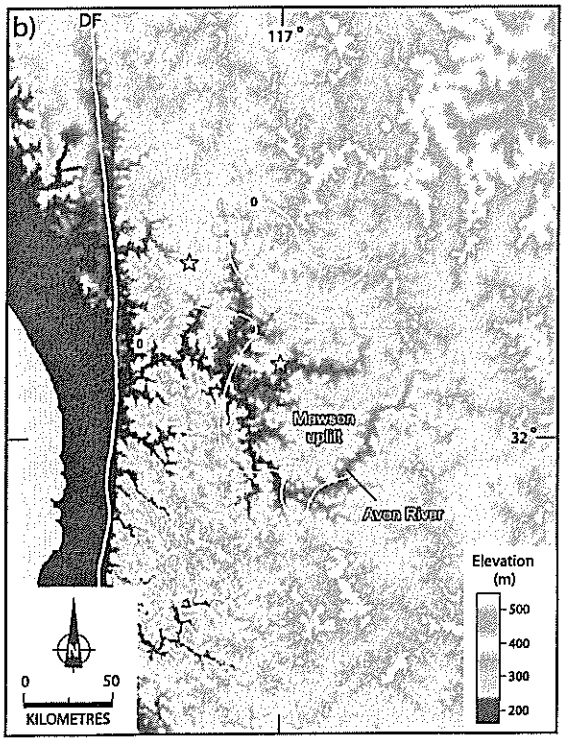


Fig. 6. (a) Contours of uplift/subsidence in the period 1980 to 1960 in the central SWSZ from repeat spirit levelling. Redrawn from Wellman and Tracey (1987). Contour interval is 40 mm. (b) Digital elevation model (9 s cell size) from the same area as (a) showing coincidence of uplifted areas and a topographic high (Mawson uplift). DF—Darling Fault. Data courtesy of National Mapping Council of Geoscience Australia.

4. Geological controls on the seismicity comprising the SWSZ

The SWSZ occurs far from any current plate boundary within an Archaean craton within a stable continental interior. Therefore, this is an area of intra-plate seismicity by all accepted definitions; see for example Johnston (1989) and Talwani and Rajendran (1991).

It is generally accepted that in intra-plate regions the cumulative strength of the lithosphere is such that stress levels are insufficient to cause failure (Hinze et al., 1988). This has led to widespread acceptance that models for intra-plate seismicity must include a reason for the crust to be abnormally weak, and/or the stresses to be locally amplified (Talwani, 1989). The stress amplification may occur through some mechanism that concentrates the effects of the ambient stress field, or may be due to the addition of some local source of stress acting in concert with the ambient field. However, factors that amplify stress tend to operate on a local scale. Thus, it is mainly the presence of weak zones that is most usually invoked to explain intra-plate seismicity occurring on a regional scale.

In most explanations for intra-plate seismicity, weak areas of the crust are envisaged to be preexisting fault structures, which, if favourably oriented relative to the prevailing stress field, can be more easily reactivated than a new structure created (Sbar and Sykes, 1973; Sykes, 1978). In addition to favourable orientation, selective reactivation may be related to variations in pore pressure, fault friction and localised deformation in the lower crust (Zoback, 1992). The reactivation of faults is often referred to as 'resurgent tectonics', or the 'zone of weakness model', and the structures involved range from terrane boundaries through to comparatively minor faults.

Many of the models for intra-plate seismicity have been developed explicitly to explain the seismicity in

the eastern USA, especially the New Madrid Seismic Zone (NMSZ) in the Mississippi Valley. An interesting aspect of reviewing these models is the recognition of apparent similarities between the NMSZ and the SWSZ. In particular, the lower crust beneath the NMSZ is of anomalously high density and seismic velocity (Hildenbrand, 1985). This is usually referred to as 'anomalous crust' or the 'rift pillow', since it is thought to be formed during extensional tectonism. The seismicity in the NMSZ is most intense where the anomalous crust is thickest and its top shallowest, and the two have been linked through various tectonic models, see for example Grana and Richardson (1996). A comprehensive description of the NMSZ is provided by Johnston and Schweig (1996) and references therein.

Below evidence is presented for the operation of the zone of weakness model in the SWSZ. In addition, some speculative observations are made relevant to whether the HVZ in the lower crust defined by the seismic refraction profile is also a significant factor.

4.1. First-order controls on seismicity

The geological model of Wilde et al. (1996), along with the gravity map and seismic sections, convincingly demonstrates that the local seismicity correlates with a major east-dipping fault zone that marks the juxtaposition of different crustal blocks, i.e. the junction of the Boddington and Lake Grace Terranes (Fig. 3). Thus, there is good evidence for a Precambrian terrane boundary acting as a first-order control on the distribution of epicentres in the southwest of Western Australia. Zoback (1992), in studying seismicity, stress magnitudes and orientation and the favourability of faults for reactivation in the eastern United States, comments that fault planes frictionally compatible with a thrust faulting stress regime had strikes between 35° and 50° of the direction of the maximum horizontal stress and dips of between 20° and 50°. If the orientation of the gravity lineament (Fig. 3c) is taken as indicative of the trend of the terrane boundary, and given the evidence for a shallow easterly dip of the suture zone, it is clearly suitably oriented for reactivation in the contemporary east–west oriented compressional stress regime.

Comparable Precambrian structures have been associated with seismicity in other intra-plate regions around the world. One example is the Great Lakes Tectonic Zone (GLTZ) in central and northern USA (Mooney and Morey, 1981; Chandler and Morey, 1989). A geological map of the region and a seismic reflection section across the GLTZ is shown in Fig. 7. Note the similarity between the line drawings of the seismic datasets in Minnesota and Western Australia (Figs. 4 and 7). Mooney and Morey (1981) associated seismic activity in the area with the reactivation of the GLTZ. However, Chandler and Morey (1989) and Chandler (1995) considered the GLTZ to be of lesser importance, and noted that all the terrains in Minnesota are cut by northwest-trending structures of various age and origin and that there appears to be an spatial association between these and current seismicity. It is possible that the earthquakes are associated with the reactivation of these later crosscutting steeply dipping structures. Nevertheless, the general spatial association with the GLTZ remains, and it may be the intersection of the GLTZ by the later structures that comprise the most favourable sites for reactivation.

Clearly, the GLTZ is less seismically active than the SWSZ, however, it remains an example of an area where major Precambrian structures are apparently influencing modern seismicity. The fact that seismicity is concentrated where a major shallow-dipping structure is crosscut by subsidiary structures is particularly important. As noted above, crosscutting northeast–southwest epicentre trends are evident in the SWSZ, suggesting crosscutting faults may be important in this area too. The possibility of such a second-order controls on seismicity in the Meckering area of the SWSZ is discussed further below.

4.2. Second-order controls on seismicity

Talwani (1988) noted the tendency for intra-plate earthquakes to occur on preexisting faults close to, but not necessarily at, the intersection with another fault. Locations where faults intersect are localised weak spots and also areas of greater fracture density, but it is the concentration of stresses that occurs at the intersections that is most significant. The stress concentration is caused by the space problem associated with accommodating movements on both faults. When failure does occur, it then tends to trigger movements on the adjacent fault. Often the initial failure is

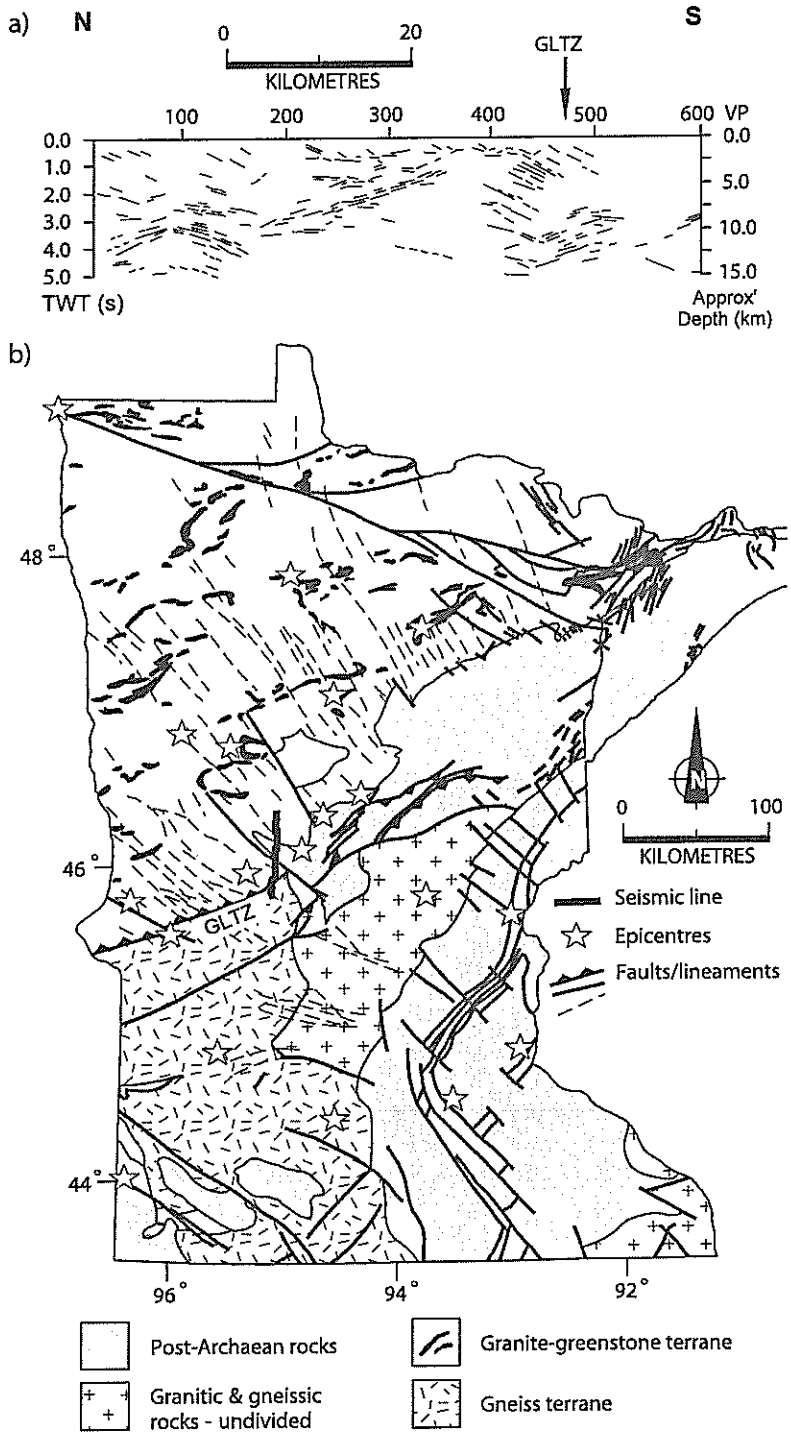


Fig. 7. (a) Line drawing of seismic reflection profile across the Great Lakes Tectonic Zone. Redrawn from Gibbs et al. (1984). (b) Simplified geological map of Minnesota showing locations of known earthquakes. Redrawn from Chandler and Morey (1989).

associated with strike-slip movements. However, the subsequent faulting on the crosscutting fault depends on the local stress field and the space problem that was created. Vertical displacements (normal or reverse) may occur if the offset creates local zones of compression or extension. The fact that the main event often occurs away from intersection itself is because after a few events, the intersection itself will lock up and become a strong barrier to further slip. Thus, the enhanced seismicity at the intersection point is due to the accommodation of deformation due to the large events nearby.

Based on theoretical modelling by Jing and Stephansson (1990), Talwani (1999) presented an example of his 'intersection model' comprising two intersecting faults separating three crustal blocks (Fig. 8). A regional compressional stress field leads to the rotation of the principal stress directions and localised areas of enhanced stress near the intersection, as the regional stress field encourages dextral strike slip on one fault and sinistral movement on the other. Eventually the buildup of stresses and the tendency for rotation lead to a split in one of the blocks and the lateral offset of the fault along its margin. The regional stress encourages dextral movements on the now offset segments of this fault leading to localised compression at the intersection and rotation of one of the offset segments. Talwani (1999) describes three examples that could have developed in the manner described above (Fig. 9a to c). All are from intra-plate settings and all have the characteristic offset of a large fault by a shorter crosscutting fault segment, which intersects the main fault at a comparatively high angle. In all cases the offset is associated with localised compression and hence uplift.

It is interesting to consider the SWSZ in the context of the intersection model and the examples presented by Talwani (1999). Fig. 10a shows epicentres for a 6-year period encompassing the 1968 (ML 6.9) event. In the years of maximum activity (1968 and 1969), two intersecting and roughly orthogonal linear trends are observed. The northwest–

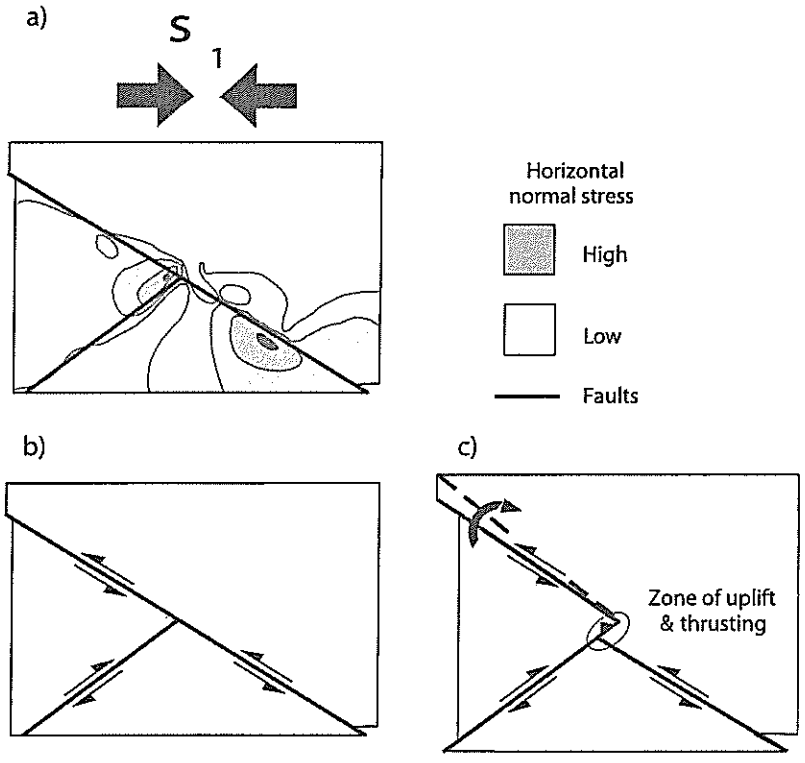


Fig. 8. Block rotations and stress concentration associated with intersecting faults in a compressional stress field. (a) Distribution of horizontal normal stress, (b) initial displacements, (c) final geometry. Redrawn from Talwani (1999).

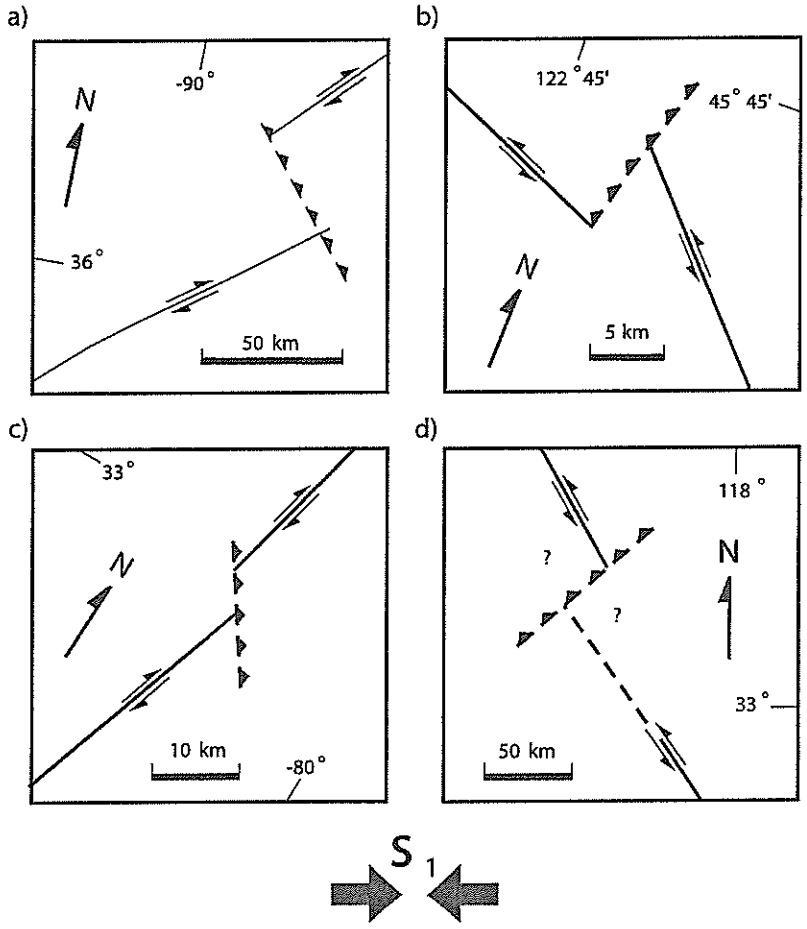


Fig. 9. Schematic illustrations of faulting and surface deformation at three locations of intra-plate earthquakes. (a) New Madrid seismic zone, (b) Haicheng, China, (c) Middleton Place-Somerville seismic zone, Carolina, (d) central SWSZ. The grey areas indicate uplift. Note the different map scales. Parts a, b and c redrawn from Talwani (1999).

southeast trend corresponds with the main trend of the SWSZ. The crosscutting northeast–southwest trend occurs at the northern limit of the NSG. Based on epicentres further to the south beyond the NSG and the presence of the gravity lineament (Fig. 3), a reasonable tectonic scenario essentially identical to those presented by Talwani (1999) can be constructed (Fig. 9d). Thus, in the context of the intersection model, the main Meckering event occurs adjacent to, but not at, the fault intersection. Overall sinistral movement on the main northwest-trending fault zone causes localised compression where it is offset, which is accommodated by activity on the northeasterly trending crosscutting fault. Fig. 10a shows that within about a year, this activity had effectively died out, although after-shock activity continued for longer on the northwest trend, culminating in an ML5.9 event near Calingiri in 1970 (Gordon and Lewis, 1980). Further evidence in support of this mechanism is presented in Fig. 10b. Here, the epicentres of earthquakes in 1968 before and after the main Meckering event are plotted separately. It is clear that the activity on the northeasterly trend only became significant after the main event, strongly suggesting it is associated with accommodating the space problem created by lateral movement on a northwesterly trending structure.

Further evidence for the applicability of the intersection model to the Meckering area is the Mawson uplift (Fig. 6). Uplift occurs in the region

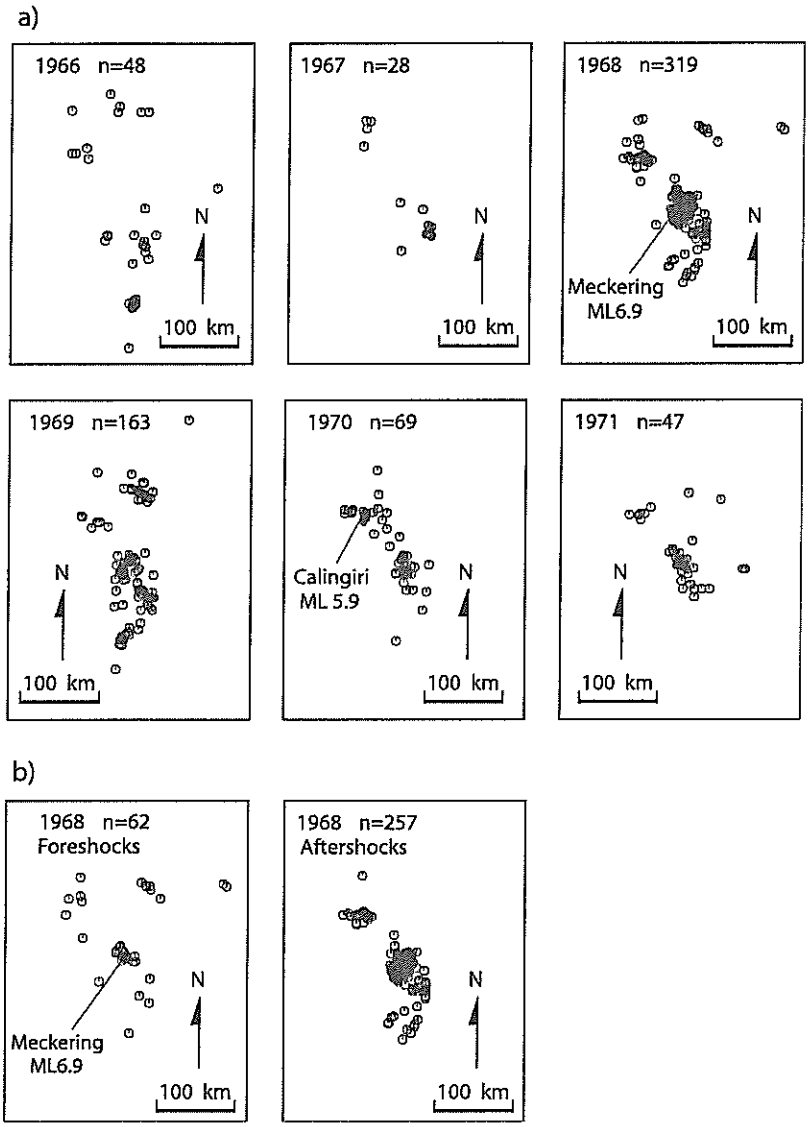


Fig. 10. Distribution of epicentres in the Meckering area before and after the 1968 ML 6.9 event: (a) by year, (b) pre and post the 1968 ML 6.9 event. Epicentres provided by Geoscience Australia.

where the northwesterly and northeasterly epicentre trends meet, c.f. Figs. 9 and 10. Although the geometry of the uplift does not exactly coincide with the extent of the northeasterly epicentre trend, this does not mean the model must be discounted. As demonstrated by Gomberg (1993), the pattern of surface deformation associated with the interaction of adjacent faults is far more complex than implied by Talwani (1989). Surface deformation consists of both uplifted and downwarped areas, with the extent and amount of both depending on the specifics of the nature and geometry of the local faulting. In fact, modelling of the local topography may prove to be an important component in understanding the cause of the SWSZ. The presence of non-vertical faults in the region require the modelling to be three-dimensional, but there is no reason why this cannot be achieved, although it must await a thorough and integrated interpretation of potential field and seismic data from the region to constrain the geometry of the major structural elements. This work is ongoing.

4.3. Role of the high-velocity zone

The zone of weakness mechanism, albeit at two different spatial scales, provides a satisfactory explanation for the observed seismicity in the Meckering area of the SWSZ. However, it is also interesting to speculate on the significance of the HVZ in the lower crust.

Stuart et al. (1997) proposed a model for the NMSZ that involves slip on a sub-horizontal detachment fault in the lower crust, which causes concentration of stresses in the overlying material resulting in slip on steeply dipping faults. The detachment fault is thought to lie at, or near, the domed upper surface of the zone of high velocity and density (rift pillow) that underlies the NMSZ. This model gives rise to a predictable pattern of surface deformation which could be compared with the data from the Meckering region if the geometry of the HVZ was well constrained in three dimensions.

It is also interesting to speculate on the consequences for the local stress regime of the HVZ, which from its seismic velocity must have a mafic to ultramafic composition. The seismic refraction profile crosses the northern part of the NSG (Fig. 3), and it is possible that this gap is related to the change in elastic properties associated with the HVZ. For this to occur, the HVZ would have to be 'stronger' than the surrounding lower crustal material. Note that this requires that its inferred mafic/ultramafic constituents are not serpentinised, and the high seismic velocities suggest this is probably the case. Support for this mechanism would be a demonstrated coincidence of the NSG and the HVZ. If it is assumed that the HVZ is serpentinised, then it would be weak compared with its surrounds, leading to amplification of stresses in the overlying crust (Long and Zelt, 1991). This is in effect the same model as Liu and Zoback (1997), where the stronger regions adjacent to the weak zone act as a stress channel. It is noted that Hildenbrand (1985) suggested the anomalous crust, i.e. the rift pillow, under the NMSZ might be relatively weak, leading to stress concentration in the overlying upper crust. Clearly this is not consistent with the presence of the NSG. In such a scenario, the known HVZ would be expected to represent the end of a more extensive zone extending to the northwest of the refraction profile, beneath the area of most intense seismic activity.

The HVZ may also be influencing the seismicity in the SWSZ through a loading mechanism. The load associated with of the dense material creates compressional stresses in the overlying crust, with the maximum stresses oriented perpendicular to its margins. The observed stress is due to a combination of the regional stress and that due to the load. Zoback and Richardson (1996) and Grana and Richardson (1996) have estimated the magnitude of such stresses and demonstrated that they may have sufficient magnitudes to potentially cause seismicity. These authors described examples based on rift pillows beneath the Amazonas Rift in South America and the Reelfoot Rift, which contains the NMSZ. The amount of stress amplification of the load represented by the pillow, the physical properties of the surrounding lithosphere and the time since the load was applied. The maximum stresses occur above the thickest part of the pillow.

Although probably not caused by rifting, the HVZ beneath the SWSZ could still potentially cause similar effects to rift pillows and hence be responsible for some, or all, of the observed seismicity. Whether the stress amplification is significant awaits determination of the size and geometry of the HVZ and then modelling in the context of the properties of the local lithosphere. In favour of a loading-related mechanism causing the seismicity are the relatively small stress magnitudes predicted in the region by the plate-scale stress modelling of Reynolds et al. (2002). However, a persuasive argument against it being a significant influence is the lack of widespread subsidence in the area, cf. Fig. 6. Also, for the reasons outlined above, the HVZ in the SWSZ is probably of Precambrian age. Maintaining loading stresses within the crust for the required amount of time presents significant difficulties.

5. Conclusions

Everingham's early work describing possible causes of the seismicity in the southwest of Western Australia, based on extremely sparse data, has stood the test of time. There is good evidence that a major change in crustal structure, i.e. a Precambrian terrane

boundary, occurs in the vicinity of the SWSZ and its reactivation in the contemporary stress field is the first-order control on seismicity in the southwest of Western Australia.

The spatial and temporal distribution of seismicity associated with the 1968 Meckering earthquake, the largest event known to have occurred in the area, closely correlates with the predictions of the intersection model proposed by Talwani (1988). This, combined with evidence from gravity data of structures oriented approximately perpendicular to the trend of the terrane boundary, strongly suggests that such structures are a second-order control on the local seismicity.

An HVZ in the lower crust is potentially another significant control on seismicity in the SWSZ. However, this zone is currently only known from a single seismic traverse and establishing its three-dimensional form is essential before its role, if any, can be determined. This is because, depending on its physical properties, the zone could be responsible for either enhancing or suppressing seismicity in the overlying crust.

Acknowledgements

Richard Hillis of the University of Adelaide is thanked for providing in situ stress information. Peter Gregson, formerly of Mundaring Geophysical Observatory, is thanked for supplying the epicentre data. David Denham is thanked for comments on an early version of this paper. Others with whom the authors have exchanged ideas and suggestions about the SWSZ include Dan Clark, Mark Leonard, Hugh Doyle and Vic Dent. The National Mapping division of Geoscience Australia is thanked for providing the 9″ Geodata DEM. Scott Reynolds and David Coblentz are thanked for their positive reviews.

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35

SHIRE OF YORK
FILE CR2.210
OFFICER | INITIALS
14 MAR 2014
1738806
REFERRED TO COUNCIL
DATE | INITIALS

OVER COUNTER 14/3/14

Trevor A Moffat
PO Box 492 YORK 6302
Western Australia
Telephone 08 9641 6147 Mobile 042 799 5879
Home address: 7 Penny Street
KAURING, 6302.

14th March 2014

PROPOSED ALLAWUNA LANDFILL

Opposition to the Proposal:

- My personal opposition is based on the condition and safety record of the road between York and the Lakes (on Great Eastern Highway). See Office of Road Safety web site for indication of statistics.
- My wife and I travel this road, on average, three times per week.
- Frequently other road users take extra –ordinary risks by speeding and overtaking on "blind" bends, or over double lines.
- While I realize authorities cannot legislate or provide for impatience, road conditions should be at their best.
- Already the volume of traffic on this section of roadway is stretching the maximum.
- On Thursday 27th February we counted 13 B Double vehicles between York and the Lakes, it was from 2:00 pm onward. And this is without the three per hour in each direction, which SITA Management mentioned at the first Public Meeting in the York Town Hall.
- In the interests of public safety I believe the road should be upgraded before approval is given to this proposal.

Submitted in good faith,

Trevor A Moffat

YORK SHIRE & COUNCILLORS
LANDFILL PROPOSAL BY SITA ON ALLAWUNA FARM LOTS 9926, 4869, 5931, 26934
GT SOUTHERN HWY ST RONAN'S YORK.

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The above application applies to a neighbouring property to my cattle producing farm, and I oppose any landfill being dumped on Allawuna Farm.

Mt. Observation Allawuna is a large farm situated with it's boundaries along side the Mundaring Water Catchment area and Mt Observation on the Western side. Close by on the Eastern side is Wambyn Reserve with animals and birds moving between the two.

A landfill that involves dumping all the household rubbish, shop and factory refuse and demolition rubble (including asbestos). At present Sita collect waste from **13** councils.
The removal of waste from the Metropolitan area is environmentally essential, but to use Allawuna as a site for this waste is not desirable. Of all the rural land that comes to mind I cannot think of a more unsuitable one.

The small farmers who have settled hoping to have a healthy lifestyle for their children, and older retirees, are to be landed with a toxic pit exuding unhealthy fumes and toxic dust over the larger countryside. Burning the methane will still blow unhealthy fumes into our homes via the prevailing wind. The carbon situation will not be aided by this method of disposal.

Drinking Water No scheme water is available West of York and residents have to collect rainwater from their roofs which will be polluted by wind blown dust and air pollution.

Underground Water The rainfall for this year has not yet significantly wet the top soil, but in exploratory bores put down at the site, they are already full with underground water which has risen to ground level. The plastic film under the landfill is meant to prevent toxic leachate leaking out into the surrounds. It will become a weak point when the underlying clay dissolves away, with time and water movement, leaving a Sinkhole. This may well lead to the plastic film rupturing and leachate seeping out into the surrounding water table and hence into our soaks and bores, for which we will have no knowledge of for some time. In this eventuality the underground polluted water may travel in any direction of the compass; and, in this case it may well flow into the adjoining Mundaring Water Catchment.

Fire With the flame burning continuously all year, little thought has been given to the Fire danger. The flame is only going to be about 6 foot in the air , and in summer wind storms paper and small dry plant material may well blow into the flame setting fire to the entire area. This could have a catastrophic effect including loss of fauna, livestock, erected structures and even loss of human life. Furthermore, if a neighbour noticed the fire and took his fire truck to douse the flames , the security fence around the landfill, with a locked gate, would prevent his quick fire fighting action. SITA'S advice to workers at Allawuna is to evacuate and wait for the Fire brigade. (That is **VOLUNTEERS).**

Earthquake Building regulations required by the Shire of York requires strengthening of supports from each corner of the top of the corner of each room to be anchored to the top of the diagonal corner because we are in an EARTHQUAKE zone. If the Council insists on these requirements for insignificant structures, why did they not put a stop to this landfill being considered in an earthquake zone in the first place?

Traffic The Gt. Eastern and Gt. Southern highways are used by many vehicles now, private and commercial including large trucks with trailers, grain trucks, oversize mining vehicles, house transporters etc, as well as tourists and cyclists.
There are only **Two** passing lanes on GT. Southern Highway for vehicles held up behind the slow moving heavy vehicles, which may well lead to many more accidents with the frequent SITA trucks on the road.

OVER COUNTER
11/3/14

Feral Animals At present **PIGS** are already being shot regularly on Allawunaby by the owners, and ROTTING GARBAGE will only attract more and varied feral animals and birds.

I am opposing the proposed application for a Landfill site on land now owned by Allawuna farm. I **OBJECT** to being put in a situation where I will have to drink polluted water off my roof, breathe Contaminated air from a nearby landfill and flare, and suffer noise dust etc on a daily basis.

14/3/14

Leonard O'Hara [redacted]
York.

or

[redacted]
York. 6302

Please see attached newspaper cutting from SITA'S Byford tip as a reminder of their inefficiency.

Investigation into toxic spill in creek
The West Australian
JANE HAMMOND The West Australian June 12, 2010, 10:00 am

The Department of Environment and Conservation is investigating how more than 100,000 litres of toxic waste spewed out of containment tanks at the South Cardup landfill site, south of Perth, yesterday contaminating a local creek.
The flushing is expected to continue for at least the next few days.
Leachate tanks at the landfill site overflowed on Thursday night sending the waste flowing more than one kilometre through bushland and into Cardup Brook. The spill was not detected until yesterday morning.
The black-coloured leachate is understood to contain a toxic cocktail of heavy metals, pesticides and other poisons.
DEC Environmental Hazards manager Ken Raine said DEC officers had issued an environmental field notice and a clean-up scope of works on the landfill operator to ensure rapid and effective clean up was carried out
"DEC responded immediately and sent officers from the Pollution Response Unit and the Swan Region Industry Regulation Unit to the scene to ensure the spill was quickly and effectively contained, the source of the spill stopped and that the clean up was undertaken thoroughly," Mr Raine said.
"Work is currently underway to determine the extent of soil that may have been affected and a suitable remediation strategy to protect the environment and nearby land use."
Mr Raine said DEC officers had taken samples of the leachate to determine its exact composition and the results were expected this weekend.
He said a full investigation into the incident was already underway under DEC's Enforcement Policy.
The landfill site is licensed to take household, commercial and industrial waste and has been used to dump some of the State's most noxious chemical waste.
Spokesman for the operator of the site, Simon Lee from SITA Environmental Solutions, said the
extent of the spill had been contained and water used in the flushing would be sucked out of the creek and transported back to the waste site.
National Toxics Network secretary Lee Bell said the incident highlighted failures at the Cardup landfill facility and it was time it was closed down.
"This facility is located in the worse possible location for a landfill - on the Darling Scarp, above a rain catchment area with natural creek lines. It was a terrible place to put a landfill and now a lot of the problems are becoming evident," Mr Bell said.
Serpentine Jarrahdale Ratepayers Association president Alan Clarkson said the toxic slick had run through a Bush Forever nature reserve and across South Western Highway.
"The worst fears of the community have been realised," Mr Clarkson said.
"We urge the Government to close this facility."
The Shire of Serpentine-Jarrahdale is notifying nearby landholders of the incident.
The departments of Water and Health have also been notified about the incident.

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ALLAWUNA LANDFILL PROPOSAL

The proposal by SITA Australia Pty Limited to develop Allawuna Landfill, for Class 11 disposal of waste at

Lots 9926, 26934, 4869 and 5931, Volume 285/78A

Great Southern Highway, St Ronans, Shire of York,

should be denied planning approval by the Shire of York. . It is our contention that it is inappropriate to allow a noxious industry of this type in an environmentally sensitive and fragile area. York is a Shire whose main pursuits are agriculture, tourism and recreation and this "development" is the antipathy of these pursuits.

Throughout this submission document, references will be made to

Victorian EPA's *Best Practice Environmental Management* (BEPM*) – Siting, Design, Operation and Rehabilitation of Landfills (SDORL),* September 2010 Version,

Best Practice Environmental Management, Department of Environment, WA, November 2005 (BPEM)

Wheatbelt Regional Plan 2010-13, 2012 Revision (WRP)

Shire of York Town Planning Scheme No 2 (TPS2)

Shire of York Local Planning Strategy (SoY LPS)

Environmental Protection Authority (EPA)

LANDFILL SITE

"The environment of the region [Wheatbelt] needs to be protected from incompatible land use to ensure the protection of extensive biodiversity assets." (p 31, WRP)

Proposed changes to land use should complement the natural and rural environment, not put it in jeopardy. Despite the mandatory buffer zones cited by SITA, the landfill will be very close to conservation reserves and sensitive receptors, such as the Swan-Avon and the Mundaring Catchments.

The *Wheatbelt Regional Plan 2010-13* (2012 Revision), an Australian Government Initiative, describes the Wheatbelt as a "valued natural amenity.' The report urges planning bodies to

- Lead the way in identifying opportunities to improve agricultural productivity consistent with changing environmental and climatic conditions
- Protect and manage the natural environment, particularly our water resources and biodiversity assets

- The protection of areas of high biodiversity in the region is essential and can be achieved
- through increased awareness and better land use planning and management (p 31)

The Shire of York states, "The local environment needs to be valued and sustained during growth to ensure the rural aspect and the farming economy are respected and maintained". (p 5) "Our Shire will be a place of community, where lifestyle choices are important and where community matters". (p 6) And one of the goals of the Shire is to "maintain and preserve the natural environment during growth, enhancing the 'rural' nature of York, and ensuring a sustainable environment for the future.' (p 6) SoY LPS). This proposal is not respecting and maintaining the rural nature of York and it has the potential to destroy the natural environment of adjoining conservation reserves. If a landfill is established on Allawuna farm, residents on adjoining properties will have been disadvantaged with regard to their health, their visible amenity through air and water pollution, odour and noise, and economically for the benefit of a few, and especially for the benefit of a multinational corporation.

"To ensure the continuation of broad-hectare agriculture as the principal land use in the district encouraging where appropriate the retention and expansion of agricultural pursuits." (4.15.1 (a) TPS2). The site falls within a priority agricultural area worthy of protection based on strategic planning for the locality. This proposal **is not promoting the protection of sustainable agricultural production, farm diversification and the preservation and enhancement of the environment and natural resources.**

"To consider non-rural uses where they can be shown to be of benefit to the district and not detrimental to the natural resources or the environment (4.15.1 (b) TPS2). The landfill is to benefit the Perth Metropolitan area and the site has been chosen in response from a directive of the former Department of Environment and Conservation to locate all new landfill developments off the Swan coastal plain. It is obvious that York Shire will inherit the very same environmental problems that characterised the Swan coastal plain landfills. Any benefits to the district cited by SITA lack clear details. Figures that have been offered by SITA about employment are clearly over stated, including the sub-contractors driving rubbish trucks to the site. They will be located in Perth and not sourced from York.

MATTERS TO BE CONSIDERED BY LOCAL GOVERNMENT

We believe the Shire of York should refuse the planning application on the following grounds:

Part 4.15 GENERAL AGRICULTURAL ZONE:

4.15.1 a) b) c) d), 4.15.2, 4.15.4

In summary of this section, broad acre agriculture should be encouraged, non beneficial and detrimental non rural uses should not be considered, tourists, travellers and recreation should not be discouraged and the interface of Allawuna Landfill with adjoining land (Water Catchment, farming and residential) would bring adverse effects.

Part 5.7 Supply of potable water

Residents in this part of the Shire of York collect water for domestic use from their roofs. We are most concerned that our water will be polluted by micro emissions of a toxic nature. We are reminded of how easily children were contaminated with lead in Esperance through poor cartage and the unloading conditions of lead ore in Esperance Port.

Is it the intention of DER and the Shire of York to conduct baseline testing of our domestic water supplies, and subsequent retesting at regular intervals? Can the Shire of York demand such testing on the part of SITA? This is an issue of public health. How will the Shire of York guarantee our supply of potable water?

Although this section of the Scheme refers to the building code for a single dwelling, by implication, if an adjacent development will potentially contaminate the potable water collection of neighbours, it should be deemed unsuitable and the application refused.

Part 7.5 Matters to be considered by local Government

a) b) i) J) l) m) n) o) q) v) w) x) z) za) zb)

In summary, the Shire of York in considering this proposed noxious industry, should adhere to the aims and provisions of the Scheme, engage in orderly and proper planning, the compatibility of a landfill with its setting, the effect on the amenity of the area, the effect on the natural environment, its detrimental effects on adjoining properties, the amount of traffic to be generated, the landscaping of the land to which the application relates, the degradation and soil erosion to be caused, the loss of community benefit, and the impact of noise, dust and other pollutants on surrounding land uses.

Part 7.6 DETERMINATION OF APPLICATIONS

a) the council refuses to grant its approval.

Part 8.4 COMPENSATION

If the proposal is granted land and property in the area will be injuriously affected and residents on neighbouring properties will be able to seek compensation.

The proposal does not accord with the principles of orderly and proper planning. A consideration of amenity impacts can be demonstrated from the visual, odour, water pollution and traffic related concerns.

Discharge to Water and Land

"Valley fill landfills are to be avoided as they have inherent environmental problems such as unstable slopes, water infiltration and leachate seepage. Due to the open nature of these landfills and shallow placement of waste, they consume a greater amount of soil for cover and

capping than an equivalent volume landfill in a disused quarry." (BPEM) This proposed site is located on the side of the valley, approximately 100metres to the east of Thirteen Mile Brook. The landfill will sit astride one of the tributaries, and deviate the water from two others into dams. It is to be constructed with its western boundary, between four and six metres above the seasonally dry creek bed.

The landfill will be sited on the side of the valley below significant remnant bush on both Allawuna and on the adjacent property, owned by Ian and Jenni McColl. We know that the landfill site will have to pump out water to establish the cells and several of the tributaries will be cut off and realigned. One of those tributaries on Oringa Park, has a channel over 2 metres deep. Where, it enters Allawuna it disappears underground. Residents have witnessed huge volumes of water surging down that gulley. SITA asserts that there will not be any dewatering. A large proportion iof the landfill will be in the landfill and not the obligatory 3 metres above it as stated by SITA. How does the liner work if it is floating? A large portion of the landfill footprint will be in the water table, despite SITA's assertions that it will be 3 metres above the water table. There is huge disquiet about the whole water issues on the site. The attachment with the bore logs reveals that Bore No 6 located at 283AHD has water at the head all through the year, including during dry summers. In typical weather conditions the landfill will have to manage large amounts of water and in atypical conditions it is inevitable that overflows will occur. These will carry toxic materials into Thirteen Mile Creek, and onto surrounding land.

The TPS2 (8.5 (i) addresses "the compatibility of a use or development with its setting". Landfill sites are normally chosen where movements of the water table are well known. Research completed for the Avon Valley Residents Association Inc, has confirmed that the landfill will, in part, sit in the water table, will not be the mandatory 3m above the water table and will be very close to paleo channel that feeds into the Mundaring- Helena Catchment. There are very serious inaccuracies in the hydrological calculations, including the rate of leachate permeation, not the 178 years outlined by SITA, but in fact 13 years, before it reaches the water table. (Refer to the submission from the Avon valley Residents Assoc. Inc and to reports from *Landform Research* and *Rockwater.*)

Residents contend that the water feeding the remnant bush will be significantly altered. Studies of the wandoo have revealed their vulnerability to a lowered watertable and will place this bush in jeopardy. (Wills A. et al, *Crown Decline in Wandoo* 2001, DEC) The remnant bush in the buffer zones is also likely to be affected, thus affecting the visual amenity of the residents and vehicles on Great Southern Highway, Wambyn Road and Catchment Road.

SITA estimates that the landfill will be 30 metres higher than the surrounding natural landscape. Examination of topographical maps shows that the final height will be above 355 AHD metres, (Figure 4: Surface Water Catchments, *Allawuna Farm Landfill, Executive Summary.)* Clearly, the landfill will be visible from adjoining properties and Catchment Road, Great Southern Highway and Wambyn Road. If the vegetation in the buffer zones alongside Great Southern Highway should become compromised (some has recently been cleared) our property including our residence, would also be able to view the site.

We believe the location of the site to be completely unsuitable, but in event that this travesty should go ahead, very high bunds that are well vegetated should be demanded to counteract this visible pollution.

EARTHQUAKE

SITA has significantly downplayed the relevance of the earthquake warnings and over played their hand in the management of this situation.

If an earthquake of similar magnitude as Meckering, took place in York, any landfill site that relies on a high density polyethylene liner to separate the leachate from the water table, is bound to fail.

Information, mainly from the US indicates that this type of liner has failed, on a large number of occasions, under earthquake conditions. No information appears in any report from SITA on pseudo-static or pseudo-dynamic stress test on the liner material. If it did, it would in all likelihood indicate that the landfill structure would fail. Sukhmander Singh, delivered a paper, *Dynamic strength and stability of refuse landfills during earthquakes,* at the Earthquake Engineering Tenth World Conference in 1992 in Rotterdam. Some of his main points follow:

- In an earthquake there is failure of foundation soil and collapse of supported structures,
- The seismic response of medium plasticity clays...amplify the incoming seismic motion and their bearing capacity can be moderately decreased by continuous cyclic loading,
- Seismic loads are never simple
- The application of soil mechanics principles to refuse material strength and stability evaluation should be viewed with caution because of the incomparability of strains that produce a shear failure in soils and those that would produce shear failure in refuse.

The low permeability clay on the Allawuna site is medium plasticity.

Liquefaction, which can follow an earthquake, is also an issue not dealt with, and another potential cause of pit failure. (Geosynthetic Society of US;

http://www.geosyntheticssociety.org/resources/archive/gi/src/V5I1_2/GI-V5-N1&2_Paper9.pdf)

In summary, the following important points should be considered:

Seismicity:

- The Avon-arc lies within the South West Seismic Zone (SWSZ), one of three active seismic zones in Australia (the others being Tennant Creek and SE Australia).
- The SWSZ is the largest of the active zones and is known internationally as the most unpredictable.
- The centre of the SWSZ is now York (Geoscience, 2013) (previously Meckering, then the Burakin locality), it has consistently incorporated Toodyay and York.
- Since 1968 there have been constant movements with 9 shakes greater than Magnitude 5.
-
-

- The Meckering earthquake (Magnitude 6.8) resulted in earth movements that altered the underlying hydrology as far west as Wundowie (55km) and Bindoon Agricultural College (80km).
- Local history from York landowners testify to changes in hydrology- springs disappeared, bores became dry, and water sources appeared in different places.
- This was evident by the emergence of fresh water springs at Wundowie Wetlands & Bindoon College, and altered hydrology in many farm bores.
- Earth movement opens and closes fissures in the underlying geology, as do piezometers, bores and tree roots to create connections between soil, clay and rock layers through which water will travel.
- Paleoliquefaction studies indicated numerous 'sand blows' (liquefaction) occurred following the Meckering earthquake.

LEACHATE

In the documentation from SITA, the leachate ponds are to be established to the north of the landfill and between it and Thirteen Mile Brook. This is the third proposed location of the ponds. Initially, they were to be located to the west of the landfill and close to Thirteen Mile Brook; secondly uphill and to the east of the landfill as described by the CEO on the consultative visits and now to the west of the landfill – how does one read these ad hoc changes? With scepticism and at least with a sense that the leachate is proving to be an issue. "As leachate contains high levels of nutrients and salts it requires treatment before it can discharged to the environment." (p27 EPA Vic) One of the management options for leachate is evaporation. SITA has indicated that this is the option to be used and considering the 2 metre evaporation rate per year in the York area, this seems reasonable.

However, the dried leachate material will be mechanically transported back to the landfill. This is material of high toxicity. The potential for contamination of adjoining property is high. The EPA Vic, also states, "Where leachate is to be evaporated, it should be within a closed system where no leachate is able to escape to the environment." (p27) The accumulation and disposal of leachate is hugely problematic. Sita has indicated that the ponds will be open structures.

In June 2010, 100,000 litres of leachate from a **SITA** landfill site, spilled overnight into the South Cardup Creek and into a nature reserve. This is part of the Serpentine Catchment. After the accident **SITA ENVIRONMENTAL SOLUTIONS** was ordered to clean up the spill site and to test the soil daily. They were also to install a carbon filter. Since then tanks and tankers were introduced to remove leachate from the landfill site. The escaping leachate was described by residents as a black sludge, containing heavy metals, toxins and weedicide. But all this remediation occurred after the accident, as has been the case in all incidents cited from other states in Australia. All the leachate had already escaped.

On January 6th, 2013 the local area of the proposed Allawuna landfill had a rainfall event of around 40mm of rain in 30 minutes. Water accumulated in gullies and water courses to a depth of between 500mm and 1500mm. In fact, in one of the tributaries of Thirteen Mile Brrok that flows from McColls's property the water was over two metres deep. Huge volumes of water swept down all the water courses, causing flooding, washaways and inundation of low lying areas of paddocks. The proposed landfill footprint is 500.000 sq metres, (p 30, SITA referral document).

A 40mm rain event would produce 20.000 cubic metres of water, within that 30 minute period. If only a quarter of this quantity should reach the bottom of the landfill site (5000 cubic metres), this would result in the failure of any infrastructure and a consequent spillage. There are no figures in any reports indicating how this quantity of water would be managed or how high the bund at the bottom of the landfill is going to be. No pumps would be able to cope with these quantities, delivered in such a short time. If the liners, ponds or bunds should fail, the chances of recovering any of the spillage are slim. The hilly, gravely country, in which the landfill is planned, is recharge country. It is only in extreme rainfall events that have happened more and more each summer in the last decade, that substantial run off occurs.

Also, in recent years, a localised thunderstorm caused flooding. Two dams on properties adjacent to Allawuna were breached, fallen trees, rocks and sands and flooding of the Great Southern Highway occurred. Such an event would compromise the leachate ponds and flood the landfill.

It is predicted that such severe weather events will occur more frequently as Climate Change progresses. A landfill, despite the claims of advanced technology to be used, in such extreme weather events will undoubtedly cause significant environmental problems.

In the SITA proposal, acknowledgement is made that the liners will leak, 8.83 litres per hectare per day. Given the size of the landfill a significant volume will leak through the liner. SITA will rely on the low permability clay to contain this leakage. In the SITA report (p 51) it is calculated that it will take 178 years for the leachate to travel 640 metres if the membrane should rupture. Passmore's calculations are that the leachate will take only 13 years to travel that distance. (p 2 Passmore R, *Comments on EPA Statement of Reason,* July 2013)

"I consider that the lack of adequate field-testing – to establish groundwater levels and substrata permeability is valid grounds for the EPA's decision to be appealed. This is reinforced by the calculation herein that the velocity of flow of groundwater beneath and beyond the landfill site is likely to be about fourteen times greater than that calculated by the proponent, raising the possibility of contamination of aquifier beneath Thirteen Mile Brook." (p 2)

Further, HDPE landfill liners area relatively new concept (SITA points out that the liners can leak through inherent flaws, accidents and earth movements). The life of the liner is calculated on modelling, ie theory not practice. SITA hypothesises that the liner will last over a 100years. As these liners have only been in use for a short time, no one has the practical knowledge of how the liner will react to earthquake, the corrosive interaction with the waste, with saline and acidic soils.
Further, an examination of the bore log, shows that the leachate ponds will also be in the water table.

It needs to be emphasised that the whole area has a complicated water system, which has not been properly addressed in the SITA proposal.

AIR EMISSIONS

Our research ascertains that the main sources of emission from this landfill are as follows:

- the waste materials as they are brought onto site,
- from the transport and any heavy plant used on site,
- waste blown by the wind as it is tipped or deposited at the landfill site,
- dust generated from the surface of the landfill when waste is tipped or unloaded,
- the waste materials previously deposited in the landfill,
- gas generated as the waste breaks down,
- and plant used to burn landfill gas, including gas flares or engines,
- leachate produced as waste breaks down,
- the discharges from any waste used to treat the leachate.

How will SITA control these emissions and contain them on site, in both **typical** and **atypical** conditions.

In recent years, York was subjected to a violent tornado type storm, accompanied by massive dust movement, which resulted in windows coated in mud. Severe damage was caused to buildings, fallen trees on roads (in fact the Great Southern Highway was cut off for many hours) and infrastructure, in general. If such an event, or similar were to occur again a large area of the Shire would be covered with toxic dust from the landfill.

During the spring and summer months the site will be exposed to many days of strong winds. For example, in February 2014, 7 days recorded winds of 20 or more kph, in January 2014 10 days recorded winds of 20 or more kph, in December 2013 7 days recorded winds of 20 or kph. This is typical of the wind patterns for the area. (Australian Bureau of Meterology, data from York weather station).

ODOUR EMISSIONS

Odour emissions from landfill are well documented. **Will this site have a robust on –site plan to manage and reduce odours and any emissions, especially considering the potential for gust, windy conditions.**

In 2000, SITA Organics established a bio-solids composting facility at the Kwinana Waste Water Treatment Plant in McLaughlin Road, Postans, in the Kwinana Shire. At that time the maximum waste was 50,000 tonnes per annum. The plant operated without complaint until 2003. In that year DEC issued an approval for the plant to increase the waste to 100,000 tonnes per annum. From this point odour complaints increased and the public expressed concern that the operation was a public nuisance and affected their amenity. The odour was particularly offensive in hot humid environmental conditions. It was resolved by DEC, Kwinana Council, SITA and Biowise, Water Corporation to carry out reviews and specialist odour modelling, with the support of the Department of Health Toxicology Department.

Allawuna will rarely have the humid conditions, **but will** have the hot, windy conditions. The important issue associated with this site was that complaints came from outside the recommended 500m buffer zone (the same buffer zone that is proposed for the Allawuna site) including Medina, Orelia and Parmelia and the Kwinana townsite. Although the setbacks recommended by DEC were considered adequate, public concern escalated in line with the significant increase in the volumes of highly odorous wastes, such as grease trap waste, food wastes and bio-solids. Some minor improvements were made by SITA, but complaints continued. DEC imposed limits and targets. SITA chose to close the site. (*Agenda, Ordinary Council Meeting*, City of Kwinana, February 2013.)

The Kwinana experience shows that the 500metre buffer zone was inadequate, odour from decaying materials in a landfill is so offensive and health hazardous, that the regulatory process is unsatisfactory and that environmental health and social amenity issues are of secondary consideration in such ventures.

Similar complaints are currently being received for a composting plant at Oakford. With all due respect to DER (previously DEC) it appears that the company has violated the licensing codes and that the Government regulatory body has not monitored this site properly. Is the Shire of York prepared for the costly and time consuming role of close monitoring of the site,upon which the neighbours will demand.

Although the above examples were composting plants, landfill sites are notorious for violations associated with foul odour or stench.

In 2010,SITA Australia Pty Ltd was required to front the Sunshine Magistrates' Court in Victoria, on three charges relating to the environment. EPA Victoria brought three pollution charges against the company, relating to odours allegedly discharged from the company's Brooklyn composting facility in September2010.

Similarly, odour from Hallam Road in Hampton Park, Victoria, has been a longstanding issue for the EPA and the community. The landfill's operator, SITA Australia Pty Ltd, informed EPA that 'cell 8' - the major source of odour - will be closed by June 2012. The cell is expected to be completely 'capped' by the end of September and should lead to an immediate reduction in odour. EPA has now finalised a brief of evidence against SITA paving the way for serious enforcement action.

Another important concern is the emission of methane from landfill.

In 2009 residents in Cranbourne (a suburb near a landfill site, which operated between 1996 and 2005), were advised to relocate their homes. The warnings were in response to the detection of methane gas found in concentrations deemed to be dangerous. In September 2008, residents in the area were forced to evacuate their homes, because of danger of explosions.

In South Australia, the EPA tabled a report in Parliament, which listed 20 landfill sites, identified as potentially posing a high risk to human health because of methane gas emissions. These sites were both closed and operational sites. In a region of high bushfire hazard, such as west York, the potential for methane gas fire is high.

Ground Water

"Pollution of groundwater by leachate is very difficult to remediate, and accordingly, landfills should be sited in areas where impacts on beneficial uses of groundwater are minimised. In particular, landfills **should not** be located:

- in areas of potable groundwater, groundwater recharge areas or in areas identified by the
- DoE as a Groundwater Supply Area; or
- below the regional watertable."
  (*Best Practice Environmental Management,* Department of Environment, WA, November, 2005)

It appears there has not been any detailed study undertaken on the underground water systems in the area. The referral document for the Allawuna landfill (Bowman & Associates, 2013) states that the base of the landfill has been designed to maintain a minimum separation of 3 metres from the depth of the "confined groundwater". Precise data for the pit base to groundwater separation has not been presented, and that which has appears to be flawed. Again examination of the bore logs show that much of the proposed landfill will lie in the water table. " Geologically, this location is quite different to other landfill sites and brings with it some potential complications that need investigation...most landfills are located on materials of defined and known characteristics with good knowledge of the geology, ground water patterns and movements." (Stephens, Lindsay, 2013, Comments on the General Geology of Proposed Landfill Site –Allawuna, York, p1). Stephens continues his report with comments about the lack of local geology or regolith, lack of correlation between the bore holes, lack of knowledge of aquifiers, lack of knowledge of granite highs, the possibility of an infilled palaeochannel to the west of Thirteen Mile Brook. He has now the paleochannel and proven that water flows directly to the Helena CatchmentIt is not fully known where the paleochannels run (no mention in any report) and where the aquifers lay, the size of them and how they interact. There is no knowledge of how the surface water and the groundwater interact. The whole notion of interconnectedness of the water systems has been ignored.

A recently published study by the CSIRO titled "South-West Western Australia Sustainable Yields", coordinated by Dr Don McFarlane, came to the conclusion that a far greater interaction takes place between groundwater and surface water, than previously understood. (Radio interview on ABC, Don McFarlane and Geoff Hutchinson). This has significant implications for the hydrology of the proposed landfill site. Any spillage of leachate could well leak into the ground water and consequently into the Mundaring catchment. (CSIRO study tilted: South-West Western Australia Sustainable Yields http://www.csiro.au/en/Organisation-Structure/Flagships/Water-for-a-Healthy-Country-Flagship/Sustainable-Yields-Projects/SWSY.aspx

Even if all this knowledge were at hand, an earthquake would in all likelihood re-arrange these aquifers and the relationship between each other. In time, the pollution of the Mundaring catchment is a real possibility.

INTERGENERATIONAL LEGACY

The Western Australian Government recommended that, "... landfills should not leave an environmental legacy for future generations to address."
Eight years later, York is being asked to accept waste from the Metropolitan area, much of which is a type that should not be disposed to a landfill in 2013, when so much good science is available as to why landfill are an anachronistic way to dispose of waste. It is a landfill that will operate for 37 years, followed by a maintenance program of 40 years. The Department of Environment states,

"Landfills have served a key role in the management of solid wastes and are likely to continue to be an important component of the waste management system for at least the next 10 years. The implementation of the waste management hierarchy of waste avoidance, waste reduction, waste reuse, waste recycling and finally waste disposal has resulted in significant diversion of waste from landfill. This will continue, however, landfills will continue to underpin our waste management strategies until waste disposal is replaced by these measures. In the interest of intergenerational equity, today's landfills should not leave an environmental legacy for future generations to address. Furthermore, for as long as landfilling remains part of our waste management strategy, best practice measures must be adopted to ensure that landfills are managed acceptably. (BPEM, 2005.)

This report was written in 2005 and now in 2013 we are considering the retrograde proposal to establish a landfill in prime agricultural land near sensitive environmental receptors of recognised valued amenity. The proposal to establish this landfill ignores the notion of "intergenerational equity". In fact, it condemns the Shire of York to 37 years of rubbish dumping, and a further 40 years of maintenance of the site.

Peter Green

Helen Green

[redacted]

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Name: Kelvin Davies

Address: [redacted]

Proposal Details:

SITA Allawuna Class 11 Landfill on lots 9926,4869, 5831 and 26934 Great Southern Highway,

York WA 6302

Air Emissions:

I am very concerned about the emission of methane and other gases from the landfill. The distance between the neighbouring residences and the Mt Observation National Park will not be enough in the weather conditions in this part of York to prevent health problems. Toxic gas will be distributed over the area. I have a lot of experience with fire-fighting in the York Shire and fear for fire problems with the emission of methane. The volunteer fire fighting service should not have to fight a landfill fire. If the licence is granted, SITA must be required to have their own fire-fighting equipment and crew at the site.

Dust Emissions:

Landfills emit toxic chemicals. On a typical summer day hot, gusty strong winds are common. Even though SITA maintain that the buffer zones are adequate, small particles will be carried long distances. As our climate conditions change, more windy events will occur, willy-willies, dust storms such as the one in 2010 and stronger winds with storms. People in the west of York collect water for their homes, and as a farmer I am concerned that dams and soaks that water stock will also be affected by this poisonous dust. Domestic and stock water needs to be tested often and paid for by SITA. The Shire of York will have to bear the time consuming and costly task of monitoring wate, soil and air pollution.

Discharge to water:

I know this area very well, having farmed it for 60 years, including the property next door, lot 20621. It is a water recharge area with many springs, soaks and ponds, such as Manyuering Springs. The landfill will located over such an area, very close to Thirteen Mile Brook and sitting on top of a very shallow water table. The liners are not 100% fool-proof and I believe there will be discharge into both the water table, the surface water and the deep aquifiers. As a younger man I helped my father develop our family farm, located nearby and it was often the case that the smallest change to the landscape produces water pouring from the ground. Toxic discharge from the landfill will end up in the networks which connect to both the Swan-Avon and the Mundaring Catchments.

Over the last few years there have been storm events when dam walls have broken, due to the huge volumes of water. In a storm evens, the tributaries from Oringa Park, running into the landfill will carry a lot of water. The pumps will have much difficulty dealing with these situations.

Discharge to land:

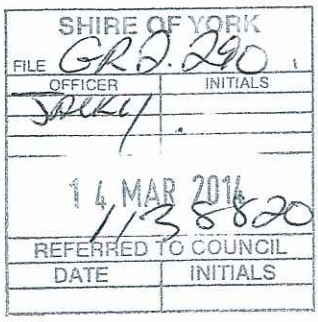
SITA believes that farming will continue on the rest of land. Contamination of crops and stock will occur from vermin and air-borne particles. It is likely the same will happen to products from neighbouring farms, also. Valuable farming land, on Allawuna and neighbouring farms will be lost. The Shire of York states that agricultural pursuits are its valued asset – it is wrong to take them away in this manner.

Solid and Liquid waste Management:

SITA plans to pump leachate to two ponds on the northern side of the landfill, allow the liquid to evaporate and then transfer the remaining solids back to the landfill. There will be discharge of this material to the land and to the air, mainly because of the conditions described above. I find it hard to believe that anyone would consider allowing the future damage of parklands, remnant bush (such as Ralph McColl's property, lot 5931) and farmland with such a toxic development.

Signed.....

Date..... 14 '3 2014



OVER COUNTER 14/3/14.

[redacted]
MIDLAND WA
6056.
16-3-2014.

39

The Shire of YORK.
PO Box 22.
YORK WA 6302.

To whom it may concern.

My name is Colin Luelf and I own a farming property known as "OAKLEIGH" at Talbot Brook just a couple of kilometers south of the proposed "Allawuna" rubbish site.

I am very opposed to this going ahead on the grounds of -

- probable decrease in land values in the area.
- air pollution from dust which will settle on the surrounding forest.
- leakage.
- extra trucks on road.

Please dont allow this to go ahead.

YOURS FAITHFULLY
Colin Luelf.

[redacted]

OC 14/3/14

40.

SHIRE OF YORK
FILE GR2.290
OFFICER Jacky
INITIALS
14 MAR 2014
13882/
REFERRED TO COUNCIL
DATE INITIALS

13th March 2014

[redacted]
York 6302

Mrs Jacky Jurman and Councillors
Shire of York
PO Box 22,
York WA 6302

Dear Jacky,

As a resident of York I object to the proposed landfill at Allawuna Farm as it does not fit with Yorks Community Strategic Plan in particular the objective of protect and enhance our rural land and spaces and ensure rural and farming land is protected.

Also under York's local planning strategy is states; "protection of sustainable agriculture and preserve and enhance the environment and natural resources". I do not believe that the landfill will enhance the environment in particular the area in which this is proposed, next to a water catchment area.

I object to the extra large trucks that will be driving along the Lakes Road which is already a dangerous and very narrow road.

I object as I do not believe it will be of any benefit to the community of York as SITA is a Perth based business that will not take local rubbish and is coming from Perth in trucks from Perth with rubbish from Perth.

Please do not allow this to happen in our historic town.

Yours sincerely

J Blennard (JOHN BARRETT-LENNARD)

44

Shire of York
PO Box 22
York WA 6302

To The York Shire and Councilors,

Re: Landfill Proposal by SITA on Allawuna Farm – Lots 9926, 4869, 5931 and 26934 Great Southern Highway, St. Ronan's, York, WA.

I object to the proposed landfill at Allawuna Farm and feel that the proposal should not be permitted. It does not fit within the Shire of York Town Planning Scheme No.2, which states under the general agriculture zone "to ensure the continuation of broad acre agriculture as the principal land use in the district encouraging where appropriate the retention and expansion of agricultural activities." Landfill is not an agricultural activity.

The proposed landfill is not acceptable with the Shire of York's Local Planning Strategy which states "protection of sustainable agriculture and preserve and enhance the environment and natural resources. It is also against the objectives of York's Community Strategic Plan which has an objective of "Protect and Enhance Our rural Land and Spaces" and a priority to "establish land use strategy to ensure rural and farming land is protected. Landfill does not enhance or preserve but instead destroys our environment for future generations. Landfill should not be placed in our agricultural areas.

The landfill will not benefit York in anyway and I ask that the proposal not be accepted.

Further to these objections is the increase in Volume of heavy vehicles using the Lakes road. The only safe way to navigate this road if the proposal goes ahead would be to make it a dual carriage way. No way will this be done due to the cost involved. I believe this road is already at it's volumes limit and added loads will lead to frustration and catastrophic accidents to ordinary road users and heavy vehicles alike.

Yours sincerely

NAME: Mr & Mrs William Bathwick

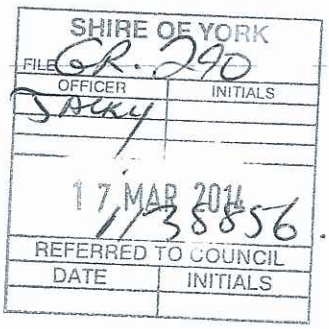
ADDRESS: [redacted]

DATE: 14/3/14

SIGNATURE: Helen Bathwick

42

Records



From: [redacted]
Sent: Saturday, 15 March 2014 10:35 AM
To: Records
Subject: Landfill Proposal by SITA on Allawuna Farm

15 March 2014

The Shire of York

PO Box 22

YORK WA 6302

Via email: records@york.wa.gov.au

Attention: The York Shire and Councillors

Dear Sirs/Madam

LANDFILL PROPOSAL BY SITA ON ALLAWUNA FARM -

LOTS 9926, 4869, 5931 AND 26934 GREAT SOUTHERN HIGHWAY, ST RONAN'S, YORK

I wish to strongly object to the proposed landfill at Allawuna Farm. The development does not fit with the Shire of York's Local Planning Strategy in relation to "protection of sustainable agriculture and preserve and enhance the environment and natural resources".

I am also objecting to the proposal as it is against the objectives of York's Community Strategic Plan which has an objective to "Protect and enhance our rural land and spaces" and a priority to "establish land use strategy to ensure rural and farming land is protected".

I strongly object to the additional traffic that will be driving along the Lakes Road. I have personally witnessed so many near misses on this dangerous and narrow road.

I do not believe the development will have any benefit to the community of York, and in fact will prove to be detrimental to rural activities, tourism and road safety.

Please do not allow this landfill development to proceed. The future is in your hands. Please do not leave a "rubbish" legacy to future generations.

Yours faithfully,

Alison Clements

[redacted]

YORK WA 6302

Records

43

From: Gwyn and Ray [gdean@netcall.com.au]
Sent: Saturday, 15 March 2014 11:15 AM
To: Records
Subject: Objections to SITA landfill site

SHIRE OF YORK
FILE GR2.290
OFFICER | INITIALS
17 MAR 2014
1/38845
REFERRED TO COUNCIL
DATE | INITIALS

The Shire of York
York WA

16th March 2014

To York Shire and Councillors

On behalf of the members of The Mount Helena Residents and Ratepayers Progress Association Inc (MHRRPA) I wish to submit our objections to the proposal to establish a landfill site on Allawuna Farm - lots 9926,4869,5931 and 26934 Great Southern Hwy, York

Name: Gwyneth Dean, President MHRRPA
Address: 24 Alps St, Mount Helena 6082

We object to the proposal on the following grounds:-
Close proximity to water catchment area will compomise the Goldfields water supply

- Contamination of the water course will result from the dried toxic leachate entering the air and the catchment .
- Heavy flooding, a more likely event with climate change, will take contaminated water from leachate ponds into the river, then into the Avon
- Probable rupturing of the sealing membrane (this has alrady occurred to the membrane at the Red Hill) will allow leakage into the river from underground water
- This is an active seismic area and an event can occurr at any time, detroying the

Use of arable land for waste disposal

- Future food supplies depend upon efficient farming, so excising farming land from a reasonably reliable rainfall area will further impact on our food safety.

Incresed heavy traffic movement on Great Eastern Hwy

- The danger to road users from the greatly increased number of trucks using GEH and local roads was not taken into account in the EPA's rejection of the submissions to assess the project. This is of particular importance to Mundaring residents.

Failure to address recycling and waste management

- There is no undertaking by SITA to recycle any of the materials brought to the landfill site. If our state government will not address this matter, then it is up to the local authorities to do so.
- The project is a commercial venture on the part of SITA and attests to a failure of the metroploitan councils to properly deal with their waste problem. For the city councils it is a case of out of sight, out of mind.

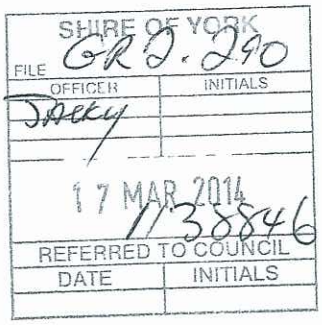
Thank you for considering our submission.

Gwyneth Dean, President
Mount Helena Resodents and Ratepayers Progress Associatin (Inc)
PO Box 156
Mount Helena 6082

44

Records

From: Andrew Theelen [theelean@yahoo.com.au]
Sent: Saturday, 15 March 2014 1:43 PM
To: Records
Subject: Landfill Proposal by SITA on Allawuna Farm



15 March 2014

The Shire of York
PO Box 22
YORK WA 6302

Via email: *records@york.wa.gov.au*

Attention: The York Shire and Councillors

Dear Sirs/Madam

LANDFILL PROPOSAL BY SITA ON ALLAWUNA FARM -
LOTS 9926, 4869, 5931 AND 26934 GREAT SOUTHERN HIGHWAY, ST RONAN'S, YORK

I wish to strongly object to the proposed landfill at Allawuna Farm.

This development does not fit with York's objectives of protecting rural and farming land and ensuring the continuation of broad hectare agriculture.

This development does nothing to enhance York as a tourism destination as WA's oldest inland town.

The additional traffic on Lakes Road will have a negative, and possibly fatal impact.

I see no benefit to the community of York in accepting Perth's rubbish.

Please STOP this landfill development application.

Yours faithfully,

Andrew Theelen
Lot 774 Cubbine Road
YORK WA 6302

45

Records

From: Liz Christmas [lizchristmas@westnet.com.au]
Sent: Sunday, 16 March 2014 4:39 PM
To: Records
Cc: Jacky Jurmann
Subject: Submission to SOY and DAP

Attachments: Submission to SOY re Landfill Proposal.pdf; ATT00002..txt

Submission to SOY re Landfill ... (248 B)

ATT00002..txt

Herewith, my Submission re SITA's proposed Landfill at Allawuna Farm, York.

Please would you acknowledge receipt of this.

Jacky, would you please send the entire PDF untouched to DAP?

Best Regards,

Liz Christmas
[redacted]

SUBMISSION TO Shire of York AND THE D.A.P.
regarding

S.I.T.A.'s ALLAWUNA FARM LANDFILL PROPOSAL
Class II or III putrescible landfill site: SITA Australia Pty Limited (Allawuna Farm Landfill) Great Southern Highway, St Ronans (W5581/2014/1)

by Liz (J. Elisabeth) Christmas, [redacted], York WA 6302

LOCATION: IN THE VICINITY OF GAZETTED NATURE RESERVE, NATIONAL PARK, DRINKING WATER CATCHMENT AND FEEDER STREAMS.

SITA's claim: http://www.sita.com.au/media/about_us/SITA_A4-Booklet_WEB.pdf page 3
"located away from homes, nature reserves and other sensitive areas"
does not ring true.
The proposed landfill site is:

1. On **Arable Land** on a Farm zoned **General Agricultural.**
2. in the vicinity of the **Gazetted Nature Reserve, St. Ronan's (No. 30591)**; and just a little further from **Wambyn Nature Reserve (No. 21981);**
3. in the vicinity of **13 Mile Brook**, followed by **Talbot Brook, St. Ronan's Brook etc..** , and **Wundabiniring Brook,** as one travels towards Perth; and
4. as one travels along the road towards Perth, immediately adjacent to Allawuna Farm is a notice saying **National Forest,** followed by a road to the left (i.e. on the same side) with notices saying **Mount Observation** (land) and **Drinking Water Catchment** (water).

The proponents of the Allawuna Landfill Project want us to understand that the Landfill is 1000 metres from the National Forest. However, driving up that Mount Observation road to the left reveals that the Allawuna property fence in some places is right up to that road, and cut straw, for instance, has blown onto it recently. This indicates that a little wind, a little fire from wind blowing from the East up the hill from the landfill could easily set fire to the National Forest, scatter pollutents from the Landfill etc... **1000 metres or not from the actual Landfill, the Forest is not sufficiently protected from the risks.**

EASTERLY and NORTH-EASTERLEY WINDS ARE COMMON IN THE YORK AREA.

Despite the Land and Water significance of these places, this proposal to bury putrescible waste has been boldy put forward in this, of all places: where National Forest, Nature Reserves, Drinking Water Catchment and Farmland are adjacent to and/or overlap each other.

ALLAWUNA FARM IN GENERAL AGRICULTURAL ZONE

SHIRE OF YORK TOWN PLANNING SCHEME NO. 2 *Updated to include Amd 51 gg 3/09/13*
4.15.1 Objectives:

(a) To ensure the **continuation of broad-hectare agriculture as the principal land use** in the district encouraging where appropriate the **retention and expansion of agricultural activities.**
BUT
(b) To **consider non-rural uses** where they can be shown to be of benefit to the district and **not detrimental to the natural resources or the environment.**

The general principles are:

- retain broad-hectare agriculture, even expanding that use where appropriate;
- only allow a non-rural use where they can be shown to be .....nor detrimental to the natural resources or the environment.

I am arguing:

1. that **the proposed Landfill operation is at serious risk indeed of being detrimental to the natural resources and the environment** — at the very least Water as a natural resource, not only for Drinking Water, but also for the water that nourishes the National Park, Gazetted Nature Reserves, and surrounding farmland; but also to air and land via emissions.

2. The proposal is not consistent with **State Planning Policy 2.5 – Land Use Planning in Rural Areas, Part 4. Objectives of this Policy**

1. To **protect rural land from incompatible uses** by –
   I. Requiring comprehensive planning for rural areas
   II. **Make land use decisions for rural land that support existing and future primary production and protection of priority agricultural lands, particularly for the production of food;** and
   III. Providing **investment security for the existing and future primary production sector**
2. To promote regional development through provision of ongoing economic opportunities on rural land
3. To promote sustainable settlement in, and adjacent to, existing urban areas
4. To **protect and improve environmental and landscape assets**
5. To **minimise use conflicts.**

I believe that clauses 1.II, 2 and 3 must all be subservient to 1.II, 1.III, 4 and 5, and the material presented below will illustrate how I have come to my conclusions.

As one expert said on Landline Sunday 16th March, on average:

• ONE FARMER IN AUSTRALIA FEEDS 150 PEOPLE IN AUSTRALIA,

• and 450 PEOPLE OVERSEAS;

• and that THIS NEED WILL INCREASE OVER TIME.

We don't need less, but more farming.

NATURE RESERVES

The closest Gazetted Nature Reserve, **St. Ronan's, is one of only two gazetted nature reserves in the Darling Range/Western ('Wet Mediterranean') area of York Shire.** From the publication *Nature Reserves of the Shires of York and Northam: Management Plan 1987-1997*, published by C.A.L.M., this nature reserve and the other of the two (Wambyn Reserve, No. 21981, a little to the North-East in this area) are **uniquely different in many respects from the only 2 such Reserves on the Eastern ('Dry Mediterranean') side of York** which is topographically different to the Western side, the topographic divide corresponding roughly with York Town, the Avon River, and Northam-Quairading Road.

Details of e.g. the St. Ronan's Reserve topography, vegetation and fauna, some of which are scarce or even unique in the region, are found in the Chapter on St. Ronan's (in Part 3), and Appendices 1 and 2.

These 4 Gazetted Nature Reserves are the sum total that York and its environs (and hence this part of the state) has. The potential damage to the balance of Indigenous Vegetation and Fauna in close vicinity of the Proposed Landfill site would not and could not be compensated for by the protection of the Eastern side reserves alone, because of the very uniqueness of the biodiversity and ecosystem on Western side as opposed to that on the Eastern — damage dependent on damage to the Land, Air and Water.

STRESS ON THE WILDLIFE AND FLORA IN THE NATURE RESERVES, THE ROAD RESERVES AND FORRESTED PATCHES ON FARMS

Barnaby's Cockatoos have been cited as an example of indigenous wildlife which are threatened by clearing (and other aspects of earth, air and water) if the Landfill Proposal goes ahead. It has been said that SITA arranged for an audit of nesting etc... of Barnaby's Cockatoos on the site and saw no evidence of such. This would be because they were not there when the Barnaby's Cockatoos were. I have visits by Barnaby's Cockatoos to my property in the centre of York, to my pine and giant gum trees, every year. The visits used to begin predictably just before Christmas and occur daily for about 3 weeks before the Corellas replaced them for much longer. However, **the visits are not as predictable or long now** (but **just because they are less predictable does not mean they do not need their trees, and does not mean that because SITA's people didn't see them they weren't there at other times**; they are true fly-in-fly-out creatures) and can sometimes be at unexpected times of the year. No doubt this is due to the weather being less predictable, combined with so much more development having occurred in the corridor from Eastern Central Wheatbelt through across the Hills to the Metropolitan area. The more damage we do here, the less relevant ecosystem there will be for the Barnaby's along with the other wildlife, whether land-living or air-living.

From *Nature Reserves of the Shires of York and Northam: Management Plan 1987-1997*, published by C.A.L.M., there is s **rich range of vegetation,** including Powderbark Wandoo, Jam, Sheoak, Marri, a host of thicket, heath, scrub and woodland plants, among them **some rare finds:** 2 types of *Lomandra* not often found North of Narrogin, and the only known examples of *Darwinia sp. nov.,* and beyond the Darling Scarp, the *Calothumnus* being found only in this reserve and Boyagin Nature Reserve. Similarly, it is not common to see the *Lomandra nutans* anywhere else in the regiou, other than here, Clackline and Wambyn reserves.

There is also a **rich range of fauna,** including: 9 mammal species — the hightest number recorded on any nature reserve in the York-Northam area; 1 monotreme, the Echidna, showed many signs of being there, and one Wambyn resident has recalled seeing some; small native mammals included dunnarts and western pygmy-possum. White-striped mastiff-bats are also in the area.

In the area were found **55 types of birds**, including: the Splendid Fairy-wren, 3 species of thombili, and many species of honeyeater. Among reptiles were 20 species of lizard, 1 of snake as well as 4 of frogs. Skinks, gekhos, legless lizards, bobtails, and bungarra were all widespread, but one type of gekho and the western bearded dragon were only in the wandoo woodland, and the ornate dragon only on granite outcrops.

A glance at the Appendices also indicates that there are **also other species of flora and fauna in St. Ronan's that don't appear to occur in the majority of the York-Northam Reserves. One type of gekho and the common scaly-footed legless lizard had not been found on any other Reserve in the area.**

So, in St. Ronan's Reserve (which has been intensely studied) there are rare species, and species rare to the area. The environment and the state do not need them decimated through dust, fumes, noise, and vibrations etc...

CONSIDERING IMPACTS ON THE INDIGENOUS FLORA AND FAUNA OF THE AREA BY: Emissions of gases, noise, etc... or discharge etc... via land, air and water

1. These flora and fauna comprise a **specific ecosystem inherent in the area,** and diminution or destruction of any native population among them by any impact caused by the operation of the proposed landfill would by virtue of the interplay between each population do harm to or destroy other populations in the ecosystem.

2. By necessity, there is already a certain amount of **traffic emitting noxius gases** toward the forest, reserves, road reserves etc... which are home to **native flora and fauna. Those there at present have adapted to the current moderate to low levels of traffic fumes. If this moderate traffic is increased to heavy levels such as with several trucks per hour per day per week at much closer intervals, then the level of fumes the flora and fauna can cope with could reach doses that some will not be able to cope with, and we will see the death of some.** This applies to the proposed truck traffic on the farm itself as well as that on the road past/through forested areas, whether National Park, Gazetted Reserve or not.

3. There is already a certain amount of **noise caused by** moderate **traffic** on the road, and enough space in time between most of the traffic that e.g. birds can hear each other's sounds, such as warnings of danger; but the vastly increased rate and proportion of heavy trucks will lead to proportionately less and smaller intervals for such signals to be exchanged and heard. This puts these creatures at more risk. **Some sounds they need to be able to detect for their safety may be overridden by more traffic noise.** At the very least they will move away to try and find homes elsewhere, if they can find suitable habitat. The same effects would arise from increased noise from heavy duty machinery. The worst case scenario is loss of rare species.

From *The Effect Of Noise On Wildlife: A Literature Review* http://wfae.proscenia.net/library/articles/radle_effect_noise_wildlife.pdf

> Most researchers agree that noise can effect an animal's physiology and behavior, and if it becomes a chronic stress, noise can be injurious to an animal's energy budget, reproductive success and long-term survival.

From *Annotated Bibliography; Impacts of Noise on Wildlife* http://www.nature.nps.gov/sound/assets/docs/Wildlife_AnnotatedBiblio_Aug2011.pdf

Barber, J.R., Crooks, K. R., & Fristrup, K. M. 2010.The costs of **chronic noise exposure** for terrestrial organisms. *Trends in Ecology and Evolution, 25*(3), 180-189. Abstract:

> **Growth in transportation networks**, resource extraction, motorized recreation and urban development is responsible for chronic noise exposure in most terrestrial areas, including remote wilderness sites. **Increased noise levels reduce the distance and area over which acoustic signals can be perceived by animals.** Here, we review a **broad range of findings that indicate the potential severity of this threat to diverse taxa,** and recent studies that document **substantial changes in foraging and anti-predator behavior, reproductive success, density and community structure in response to noise.**

Stone, Eric, 2000, *Separating the **noise** from the **noise**: a finding in support of the "Niche Hypothesis," that birds are influenced by human-induced noise in natural habitats.*Anthrozoos, 13(4): 225-231. Abstract:

> It was possible to test the hypothesis that ambient noise alone would play a role in structuring bird communities in riparian habitats in Boulder, Colorado, USA. Point counts of birds were conducted in openspace/minimally disturbed, residential, commercial and industrial neighbor -hoods. Within the same disturbance parameters and land use, **species richness and PIF scores (a weighted value based on species importance) consistently and significantly decreased as ambient noise increased.** These results can be viewed as support for the "Niche Hypothesis" (Krause 1987, 1998), that **wildlife species' acoustic niches are adversely affected by human-induced noise pollution**

4. Land creatures such as lizards and dunnarts or similar will be at more risk and discomfort because of the **increased amount of vibrations through the ground as a result of increased average weight and rate of trucks on the roads.** They may have **difficulty interpreting signals, or simply be scared into dangerous situations by e.g. vibrations overriding something else they need to detect by feel.**

5. **Plants** will be affected by **increased dust and fumes coating them**; and **our rainfall much of the year is not sufficient to clear the effects. Plants will also be affected by any lessening in the animal populations that results from the increase in pollution (sound, vibration or chemical emissions) caused by the increased use of heavy vehicles/trucks.**

By contrast to the protective ozone in the upper atmosphere, "**ozone at the surface** is deleterious and is produced primarily from emissions of fossil fuel combusion. (EnviroNews Vol. 6 No.1 - Millenium Issue - January 2000 *Air Pollution, Global Climate Change and Agricultuer: A Vignette of the Last 50 Years of a Millenium;* by Sagar V. Krupa, Prof. at the Department of Plant Pathology, U. of Minnesota. In the same journal, Vol. 8 No. 3 =July 2002, *Air Pollutants, Plants Response, Soil Mimcrobes and Ecosystem Biodiversity,* Dr. J.H.B. Garner (U.S. Environmental Protection Agency) points out:

> "Scientific studies for more than three decades have shown that burning of coal and oil produces emissions that affect the groth and reprocuction of crops, forests and the ecosystems on which life depends.....
>
> **Sulphur dioxide** (SO2), **nitrogen oxides** (NOx) and **ozone** (O3), the most phytotoxic [toxic to plants] pollutants, result from the emissions of .....**automobile exhausts** and **volatile organic compunds** (VOCs) emitted from a number of sources. [In turn]... Acidic rain is formed in the atmosphere [in major part] from emissions of sulfur and nitorgen oxides ...[compounding the effect on crops, forest and total ecosystem]
>
> **Changes in nitrogen supply** ... can alter biodiversity. Atmospherically deposited nitrogen can act as a fertiliser in nitrogen-poor soil. Not all plants ... are capable of utilising extra nitrogen. Most plant species growing in nutrient poor conditionsare adapted to such habitats and can only compete successfully on soild low in nitrogen.
>
> [some effects are:] leaf injury and increased needle... drop off..[and changes in] the fungal microflora involved in leaf decomposition on the forest floor"...
>
> Ozone exposures [from engines/automobiles/the combustion of oils] can result in (1) changes in letter quality and quantity, (2) decreased carbon allocation to roots, (3) alterd root exudation and soil ... CO2 flux, and (4) decrased root growth and possibly increased root mortality...." as well as altering the biochemical and microbial activities in the soil, in a sresultant deteriorating ecological system.
>
> **Severely stressed ecosystems do not recover readily, but may be further degraded.** [Relevant] stresses [include] (1) physical restructuring (e.g. changes resulting from [change of] land use); .....(4) discharge of toxic substances into the atmosphere, onto land, and into water."

ALREADY EXISTING LANDSCAPE STRESS

The Department of Environment and Heritage's *Landscape Health in Australia Report (2001)* which seems to no longer be available on the Net, though it was in 2005, refer to Landscape Stress, and rates subregions of Australia into stress classes, from greatest to least. **In WA, the Avon Wheatbelt is one of the two areas they singled out as 'endangered subregions' in terms of the risks to their ecosystems** (the other was the Dandaragan Plateau).

From eyeballing the series of topographical maps in the article for vegetation for 2001:

i. The Avon Wheatbelt is in the 'intensive landuse zone':
ii. only <10% of its natural vegetation remained in 2001, and there is very little connectibity between patches of natural vegetation;
iii) <2% of the subregion was in conservation reserves;
iv) >90% of the native vegetation that remained was outside of conservation reserves ;
v) 10%-30% of it was in land tenures associated with conservative land use practices;
vi) there was 30% dryland salinity risk or hazard;
vii) more than 10% of the native vegetation was threatened by salinity;
viii) there was moderate-to-major change in hydrological conditions;
ix) **somewhere between 10 and >49 of our native plant species were [already] under threat.**

That was 2001, 13 years ago. This is 2014, and it is most likely that the figures are considerably worse now after decreasing rain, let alone any more clearing that has gone on in the region.

From eyeballing the maps for native fauna — birds, reptiles, mammals and fish:

For the Avon Wheatbelt 5 to 19 species were considered threatened. Again, we cannot expect this to have improved, and it could well be made worse by the issues here raised.

From the same Report: the issue of Dryland Salinity:

"By 2050 the southern subregion of the Avon Wheatbelt [is expected to have] almost 42% of its native vegetation threatened by high dryland salinity risk".

Other factors that will complicate the already stressed land

Add to the **lower rainfall** the following risks to the land:

a) potential leaching of higher-than-safe levels chemicals through water if an **industrial accident** occurs or a **high level earthquake** occurs, or
b) pollution from **heavy doses of dust kicked up by trucks**, and **emissions from truck exhausts** and **that from other heavy machinery involved in processing the proposed rubbish**, for instance.

Under these circumstances:

i) Land normally used for agriculture will be less productive;
ii) Land ditto may be sufficiently contaminated that production on it is unsafe;
ii) Wildlife and native flora will be damaged or destroyed;
iii) The existing ecosystem will be damaged or destroyed.

IT WOULD BE MORALLY WRONG TO INCREASE THE ALREADY MASSIVE STRESS ON THE LANDSCAPE AND ITS NATIVE FLORA AND FAUNA.

STRESS ON AGRICULTURAL ANIMALS AND PLANTS IN THE IMMEDIATE NEIGHBOURHOOD OF THE PROPOSED LANDFILL ACTIVITY LIKELY TO BE SIMILAR TO THAT ON WILDLIFE

1. If there is a fire from combustion within the Landfill (see further on) or a spill of chemicals or an earthquake leading to a spill of Landfill contents whether raw or in the process of rotting down, and then, say, a major windstorm occurs, then farm animals could be at risk of ingesting unsafe fodder or breathing in unsafe air, etc...and the fodder in the fields and water likewise polluted, being unsafe for animals and humans, and also taking away any organic rating that the farmers nearby already have and having been striving to keep.

2. Just as wildlife and native flora are affected by the various disturbances in the noise and emissions environment, we can expect farm animals and crops to be affected. Ditto for vibrations. The various animals rely on messages via sound (e.g. birds), vibrations (e.g. kangaroos, animals that walk on the ground, smell (e.g. certain insects such as beetles) for self-protection etc...

The following ill-effects can occur: hearing loss or threshhold shifts, physiological effects and 'fight or flight' responses, changes in digestive patterns, behavioural effects such as migration, effects interfering with mating messages and reproduction, etc...

http://www.airandnoise.com/Animals.html *Effects of Noise on Animals: Effects of Noise on Wildlife"*;

http://www.nonoise.orf/library/fctsheet/wildlife.htm (U.S. National Park Service 1994 etc... data);

http://wildasia.net/main/article.cfm?articleID=169 *Elephants and Wildlife in Sri Lanka Escape Asian Tsunami: Impact .....*;

www.yptenc.org.uk/docs/factsheets/_env_facts/communication.html;

www.geocities.com/thesciencefiles/cowmusic/page.html.

One of interest in a seismic activity prone area (which York is) is: http://www.fascinatingearth.com/Seismic%20Cows.htm.

SEISMIC RISK FACTORS interacting with existing risk factors, and with a Landfill operation if built. SITA's documentation http://wawaste.com.au/docs/140106b%20AD%20Volume%201%20Allawuna.pdf acknowledges (pp 26, 27):

> **4.10**.....The area around Northam, from the Darling Scarp to Merredin is an area of notable seismic activity...

However, it downplays the significance of seismic activity for the locality of the planned Landfill, saying:

> "the location of the landfill is to the southwestern edge of this zone of activity....."
>
> A search of the Geoscience Australia Earthquake Database (12/12/2012) [— the legend for the map they show says 12/12/2013 —] showed no record of any earthquakes within 4 km of the Site boundary, with the nearest being a magnitude of 2.5 earthquake 4 kilometers to the north east of the site. No earthquakes of magnitude greater than 3.8 have been detected within 20 km of the site.....

They want us to believe (pages 36 and 76) that their modelling showed that their engineering under the conditions described in the Earthquake Data Base is adequate to meet the very small threat that they deem to exist.

While the Perth area and coastal plain are not to date centres of seismic activity (source: *Seismicity of Western Australia* http://www.seismicity.see.uwa.edu.au/welcome/seismicity_of_western_australia) **York is in one of the areas of WA most at risk for earthquake.** Not only have there been 'frequent intense bursts of seismic activity' to the north of Meckering, and other major earthquakes south of York — (Beverley and Brookton being among them), but the **strongest example we know of in the area was the Meckering Earthquake, of 1968.** Its effects were so great that they extended even to the old Royal Hotel in York, about 36 km away, on the corner of South St. and Avon Terrace — sufficient that the hotel had to be demolished, and various verandahs in the main street had to be taken down as they also were affected and had become dangerous. It lasted 40 seconds, and measured 6.9 on the Richter Scale. From the University of Western Australia's summary:

http://www.seismicity.see.uwa.edu.au/welcome/seismicity_of_western_australia/wa_historical/meckering

> "It caused ground rupturing nearly 40 km long, some of which is still to be seen today. The maximum heave was 2.4 m, max vertical displacement was 2.0 m, and the maximum strike slip movement (dextral) was 1.5 m. The maximum felt intensity on the Modified Mercalli scale was 9.....the focus of the earthquake was ..... about 7km deep.....The earthquake and its aftershocks were accompanied by surface faulting extending over an area of 200 km2 and an arcuate dextral thrust fault 37 km long was formed.....The Meckering Earthquake was located in a well-documented zone of seismic activity which is about 60 km wide and extends across the southwest corner of Western Australia."

Seventeen months after the main event at Meckering, at 1.15 a.m. on 11th March 1970, a magnitude 6.0 earthquake occurred at Calingiri, 80 km northwest of Meckering. This earthquake was again shallow, with a focal depth of about 1 km, and was accompanied by surface faulting similar to that at Meckering.

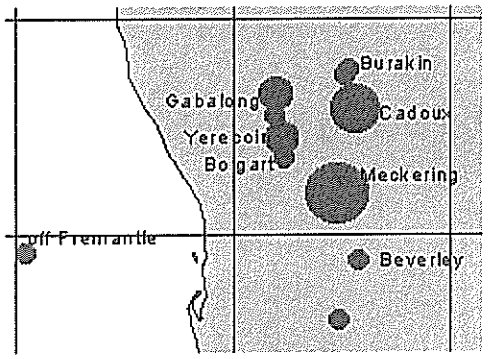
This location of the faulting at Meckering and Calingiri, in an otherwise stable Precambrian Shield, has shown that damaging earthquakes are a potential hazard in Western Australia."

http://www.abs.gov.au/ausstats/abs@.nsf/94713ad445ff1425ca25682000192af2/fecb2ab6de16171eca2570de0005871b!OpenDocument reports that the damage spilled down into the Perth metropolitan area.

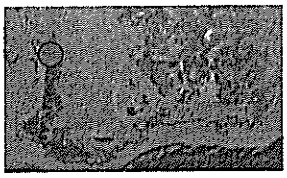
Going back to http://www.seismicity.see.uwa.edu.au/welcome/seismicity_of_western_australia#SW ,

"in the South West Seismic Zone we have had 11 major or strong earthquakes between 4.5 and 5.5 magnitude in 11 years, from 1990 to 2009.. (averaging 1 per year), compared to 18 in the 43 years from 1946 to 1989 (averaging roughly 3 in 7 years, or 1 per 2.3 years). The rate has increased.

Clearly, Meckering's of 1968 is shown as the biggest, furthest-reaching, and at 7km depth, but we have also had two of 5.0 or more in Beverley, not far south of us — 5.4 on 18 Jan. 1963 and 5.0 on 23 Feb. 1966.



We cannot say that there would not be one in York or west of it, because there was one in Mundaring on 6 Feb 2014, measuring 2, at 4 kilometers depth, (http://www.ga.gov.au/earthquakes/getQuakeDetails.do?quakeId=3473567),



and on 9 Dec 1980 there was one measuring 5.2 West of Fremantle (see map, bottom of page 3)

To the North of York, from http://www.ga.gov.au/earthquakes/initRecentQuakes.do we have evidence of very frequent (mostly smaller) earthquakes through the South West. For instance, at Burrakin, at Koorda, at Kellerberin, at Beacon, at Ballidu and one SW of Meckering.

To the South of York, at Beverley, including a significant one, at Brookton, at Wagin, at Dumbleyung, at Narrogin, and at Hyden.

To our North West, at least two at Quairading on in 2013, and one NW of York on 28th May 2013.

Most recently, on 26th Feb. 2014 (while I was writing this Submission) there was a Significant 4.6 one W. of Kalgoorlie on 30 Sept 2013 a 3.7 one nr. Norseman — and a smaller one on 4th Feb.—, various down Katanning way over a period of months, etc... **The 26th Feb 2014 one in Kalgoorlie was felt very long distances away** (http://www.theaustralian.com.au/news/nation/earthquake-rocks-was-goldfields/story-e6frg6nf-1226838104006):

> **A string of phase arrivals, or seismic waves associated with the Kalgoorlie earthquake, was recorded in areas including Kambalda, about 100km away, Mundaring in Perth's Hills region, 500km from the epicentre, and Forrest, 657km away.**

For anyone who has lived in The Hills, as I have, **such as Darlington or Glen Forrest, this extended impact is evident in the cracking of house walls at the very least.**

If an earthquake such as Meckering's of 1968 were to occur anywhere in York — or more critically

so in the close vicinity of Allawuna Farm — then with a 200 km2 area of faulting there would almost certainly be extensive leaching of noxious levels of chemicals and biological agents throughout such an area at the very least. That includes into the Drinking Water Catchment and the National Park and Nature Reserves and Farms. Other strong earthquakes could have similar ripple effects.

Earthquake Swarms in the South West Seismic Zone : http://www.seismicity.see.uwa.edu.au/welcome/seismicity_of_western_australiaearthquake_swarms

There have been swarms of earthquakes in York, Kellerberrin, Burakin and several other places in the SWSZ. E.g.**YORK** Nov 1994 - Jan 1995:

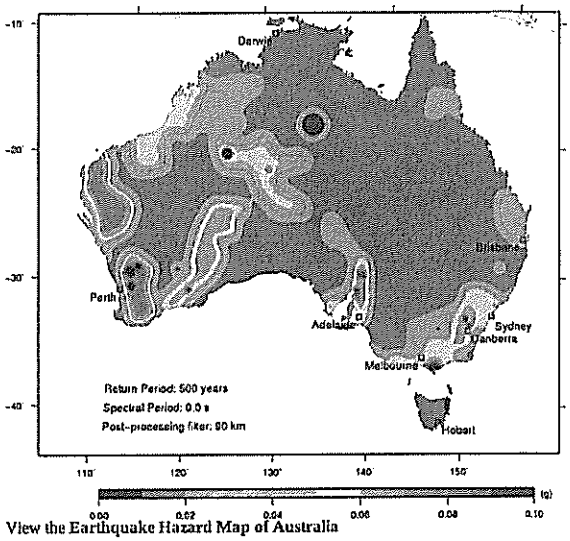
> "A swarm of events occurred about 10 km SE of York, beginning on 26 Nov 1994, and continuing into Jan 1995. The largest event was magnitude 2.6, and occurred on 29 Nov. [Twenty Seven] 27 events were located during the swarm, although there were many other events, too small to be accurately located. Portable instruments were deployed in the area to accurately locate some of the events.

YORK	Nov 1994 - Jan 1995	**2.6**	27 events located

THE EARTHQUAKE HAZARD MAP OF AUSTRALIA 2012

Based on reading of *The Earthquake Hazard Map of Australia 2012,* "a national scale map of earthquake hazard which has been developed by scientists at Geoscience Australia following an assessment of historic and ancient, pre-historic earthquakes in Australia" (http://www.ga.gov.au/ausgeonews/ausgeonews201212/productnews.jsp#product2) a NewsCorp article by Lisa Cornish (Former Manager of data.gov.au and Data Journalist for News Limited) 19 November 2012 reports the then Minister for Resources and Energy, Martin Ferguson, when launching the Map, as reporting, among other things, that **IT IS THE STRONG GROUND SHAKING** FROM EARTHQUAKES, **NOT THE MAGNITUDE** THAT MAKES AN EARTHQUAKE DANGEROUS (whereas SITA seems to think the big issue is the Magnitude):

"the map estimates the likelihood of a particular area experiencing **strong ground shaking from earthquakes** and it is this, rather than the magnitude of an earthquake, that **endangers people, buildings and infrastructure**", and hence "**Although these maps do not enable us to predict earthquakes** [as likely to occur at a specific place on a specific day], **they will allow engineers and planners to design and locate buildings and infrastructure so as to better protect our communities**". The article also reported that Martin Ferguson "also expects the modelling and data, which have been made available to the public, **will be used by emergency managers, researchers and the insurance industry.**"



View the Earthquake Hazard Map of Australia

Analyst Lisa concluded from studying the Map that the following 4 places in Australia have the **highest potential for earthquakes**: Moe (Vic.), **York**, and Kirwan near Burakin & Dalwallinu (WA) and Tenant Creek (NT).

Another time we could not be sure that an earthquake would not happen near or within close range of Allawuna Farm, which could cause trauma to the infill site.. It could (if strong enough, and regardless of what the proponents wish to think is likely chance) rupture the plastic, or shake and dislodge it sufficiently that at least what is near the surface could well spill out over, and leach into the water courses. The collected Landfill bundle/unit could tilt on its axis sufficient to spill out in whole or in part — e.g. if the rupture of the earth's surface was immediately contiguous to the bundle/unit.

Even multiple smaller earthquakes in the vicinity could cause serious destabilisation of the Landfill

storage and operations.

THE ISSUE OF SAFE DRINKING WATER

http://www.sita.com.au/media/about_us/SITA_A4-Booklet_WEB.pdf
Page 1 of this article states:

> In 2006, the WA Department of Environment and Conservation directed that all new landfill developments must be located off the Swan Coastal Plain.
>
> The direction to locate landfills off the Swan Coastal Plain serves **to improve the security of Perth's drinking water.**

The reasons stated for choosing the Allawuna Farm site for the proposed Landfill site include:

> "a more sustainable, **environmentally safe** and cost effective solution than existing arrangements" and...**large buffers** can be maintained between the landfill and other potentially sensitive land uses, including water catchments, homes and existing agricultural activities"

There is **no certainty** that either the claim of increased security of Perth's drinking water or the claim of improved environmental safety are true or justifiable.

Likewise, there is **no large buffer** in the case of:

(a) leachate due to a rupture in the shell of the dump (either top surface or plastic lining) by something cataclysmic such as a large earthquake, nor

(b) in the case of a combustion fire affecting the lining and the clay below (see page 18 below)

(c) in the case of runoff or seepage if a major major storm dumps unforseen sudden extreme rain thus massively increasing water flow on the land in the vicinity, nor

(d) in the case of a major wind storm such as the one York and other towns in the Avon Valley suffered on 29 January 2011.

THE DRINKING WATER CATCHMENT AREA, AND OTHER CATCHMENT AREA

From the article *Mundaring Weir Catchment Area Drinking Water Source Protection Plan: Goldfields and Agricultural Water Supply [and] Perth Integrated Water Supply System*;
REPORT NO. 69, June 2007. http://www.water.wa.gov.au/PublicationStore/first/72102.pdf
From page 2:

> "Over its history, the Mundaring catchment has been modified from its original native forest condition through human use. Land use has also resulted in **significant degradation in some sections of the catchment**, particularly in areas of steeper slopes and adjacent to major stream and riparian zones."

Add to that (p. 2) rainfall has decreased since the 1970s and:

> "For most of the catchment, the **monthly pan evaporation is in excess of the rainfall for seven or eight months of the year**.....[because we have] a Mediterranean-type climate with warm, dry summers and cool, wet, winters."

and there is a **net loss of water from the catchment**:

> "due to the prolonged period of low rainfall in recent years, the mean annual stream flow has significantly reduced to 17.2 GL. The long-term average annual draw from the Mundaring Weir catchment is 22.3 GL. The total annual draw from the Mundaring reservoir, including pumpback from the Lower Helena Pipehead Dam, is 31.3 GL

This all makes the catchment so much more vulnerable if its water intended for drinking safety gets polluted. Not only is there a net loss of water, but **if leachate etc... makes its way into the water it will be less diluted because the net water is less, and so the intensity of the pollution is greater than it would be if previous greater water amounts such as pre-2007 were in the catchment.**

The water in the catchment is coming from close-ish to the surface (page 3):

> The major source of stream flow in the catchment is generated by **lateral flow through the upper soil layer over the winter months.** The catchment hydrology also includes the presence of **permanent shallow groundwater in the soil profile, which may discharge to streams in the valley floors.**

By virtue of these factors, Perth's drinking water is already not secure — but adding the risks from pollution via the dump, such as by a split in the seal of the dumped waste by an earthquake, or the spreading of pollution from dried up powdery rubbish dust near the surface of the dumped waste makes it even less secure. **The damage doesn't have to come from deep down. If there is an upheaval of some kind, what is near the surface will also be leaching into the upper soil or, say, add a wind/dust storm or such and it will enter the catchment water intended for drinking via close-to-surface seepage, or flow in the case of heavier rains when they next occur.** But then see also the reference to **paleochannels** on page 11 below.

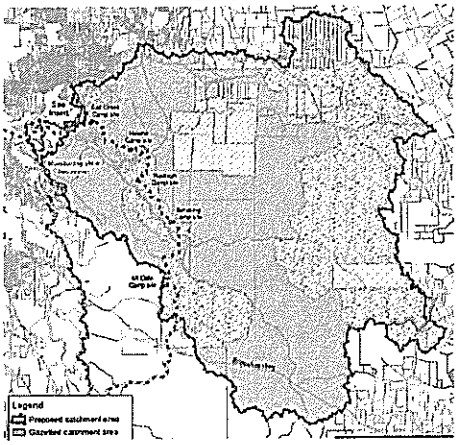
Page 4:The Mundaring Weir Catchment Area was proclaimed under the *Country Areas Water Supply (CAWS) Act 1947* in 1972 **to ensure protection of the water source from potential contamination.**

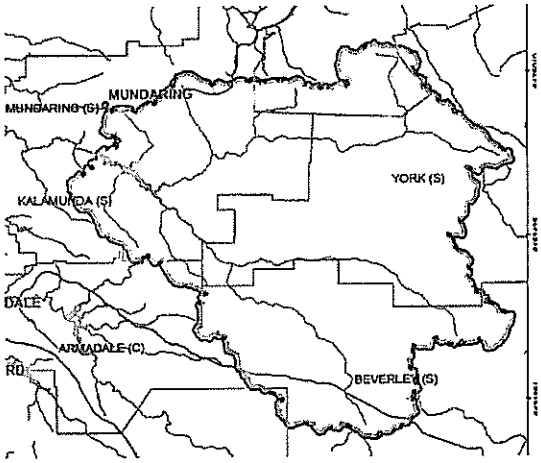
From the maps supplied in the article, it appears that virtually the whole of the Western side of York (i.e. West of the Avon River, both East and West of Allawuna Farm) is part of the Mundaring Catchment Area, even if some of it is not strictly in the gazetted catchment area [as in 2007], so we can expect that what happens in the vicinity will affect not only the area towards Mundaring Weir, but also towards York, in terms of impact on rivers and land by way of runoff and seepage.

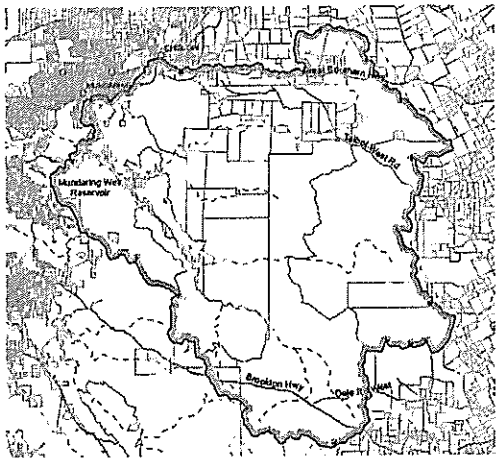
Dark edge indicates Proposed [official] Catchment Area, and the solid grey indicates the Gazetted Catchment Area as at 2007. In fact, on page 56 it was recommended that the boundaries be widened to encompass this full area, as I understand it.

The maps here identify York in the Catchment, and e.g. Talbot West Road, for orientation to location.

2007





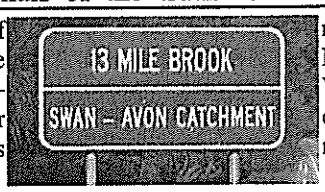


The boundary of the Mundaring Weir **Catchment Area** is also the boundary of the Mundaring Weir **Surface Water Area**, proclaimed under the *RIWI Act 1914*.

Additional land use controls were enacted over the Mundaring Weir catchment in December 1978 when the catchment was proclaimed under Part IIA of the CAWS Act to restrict the clearing of native vegetation that would cause salinisation of water resources.

SITA proponents want to think of only the plain grey area of the top map (or less?) as being the Drinking Water Catchment Area, but that only represents half of the truth as acknowleged in the

REPORT NO. 69, June 2007. http://www.water.wa.gov.au/PublicationStore/first/72102.pdf. Moreover, before you reach Allawuna Farm, on the left is the notice here shown: 13 Mile Brook flows into Catchment, even if not directly flowing into the Mundaring Weir Catchment — Whether drinking water catchment or not. It also does not need polluting.



— though it is referred to as Spencers Brook Water Catchment in SITA's Works Approval Application.

WATER QUALITY PROTECTION MATTERS AND ONUS ON LANDOWNERS: a matter of DUTY OF CARE.

> (Page 11) The Mundaring Weir catchment is a **gazetted clearing control catchment,** which provides a mechanism for Government purchase of clearing rights. It also **assists with offsetting the impacts of water quality protection strategies on landowners. The former Water Authority purchased clearing rights or compensated those [landowners] who did not gain approval to clear on several properties in the north-east of the catchment.**

Here, the principal was made clear that the landowner has a duty of care to protect water quality insofar as what he/she does (or causes to be done) could indeed have impacts on the water quality. This I feel is a solid legal argument that **Duty of Care on the part of the Landowner (in this case the owners of Allawuna Farm) constitutes an obligation they would be breaching if the proposed landfill at any time leached into the catchment, or its dried surface dust at any time blew onto the land and into surface- and near-surface- water in the catchment.** Likewise, if any activity on the part of the company running the Landfill operation (whom they have agreed on being on their property) caused any damage to the environment.

PROPOSED LAND USES IN THE CATCHMENT AREA, as per the DEPARTMENT OF WATER

(Page 14)

> 3.2 Proposed land uses:
> It is anticipated that **private land within the catchment will continue to be used for low intensity agriculture or other low intensity use**, and further fragmentation should not be permitted. This activity is compatible with the **priority 2 source protection classification [i.e. risk minimisation]** proposed.

It seems to me that **a Putrescible Waste Dump does not meet the criterion of 'low intensity use'.** The **Risk would be increased** by such a dump:

* it disturbs the land and air;
* it creates noise: frequent intermittent noise, with some noise going on for some time;
* it introduces a wide range of 'foreign substances' into a concentrated space; etc....

(Page 16)

> The overall source protection objective for the catchment is to **maintain existing water quality and** initiate measures to **improve water quality** where possible.

So not only is the goal to **maintain** but to **improve** the water quality — an even greater argument for not introducing counterproductive chemical elements. Here it is stated quite clearly by the Department of Water (p. 16):

> All public land in the Mundaring Weir catchment should be managed for Priority 1 (P1) source protection. The objective of this priority classification is to protect water quality according to the **principle of risk avoidance.**
> A P1 source protection classification is appropriate as:
> • The Mundaring reservoir is the **primary source of public drinking water** for the G&AWS (Goldfields and Agricultural Water Supply), without which supply to this region can not be maintained, and **should be afforded the highest level of protection**; and
> • Most existing land use practices are compatible with P1 source protection, or can be managed for P1 source protection with the use of best management practices.

The Department of Water recognizes the following **hazards which are not dissimilar to those of a Landfill operation**; for instance:

(p. 26) Risk from activities involved in Gravel Pits: e.g." turbidity from extraction". This could apply particularly when the Landfill pit is being dug; we can add turbidity (and dust polluting the air) from when the rubbish is being deposited in the pit; possible spills from trucks or machinery (one could say if something accidental happened, such as a rollover or breakdown of some unloading mechanism)

(p. 30) Roads and tracks: "Turbidity from erosion of unsealed roads and tracks; fuel and chemical spills from vehicles and machinery";.....

(p. 32) Major Roads (Shire roads and Main roads): "The potential risks to

water quality include: Fuel and chemical spills from vehicles and their loads;.....

(p. 35) Rubbish Dumping: "Pathogen contamination from domestic rubbish; nutrient, chemical, heavy metal and fuel contamination from domestic or industrial waste;....

(p. 54) DEC activities such as Fire management and feral animal control.

SURFACE WATER, GROUNDWATER AND CATCHMENT

SITA does pay attention to this (Works Application, p 17):

> "The landfill is located in the upper reaches of the **Spencers Brook water catchment**.....Both surface water and groundwater from the site flows away from the Mundaring Weir PDWSA."

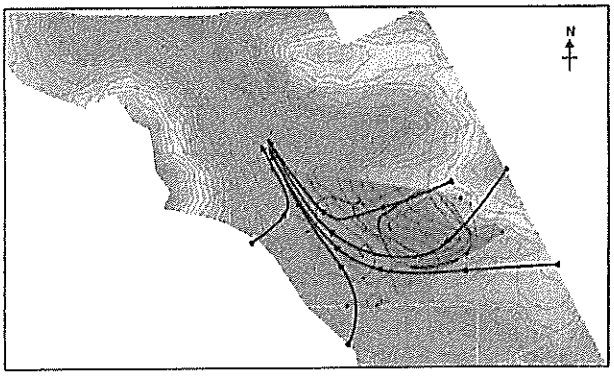
But then on p.27:

> "The groundwater under the site flows along under the valleys and turns northward along 13 Mile Brook".

But on P 29, "Figure 3 shows the hydraulic eqipotentials and groundwater flow directions beneath the site.....Flow beyond the bore field boundaries has been inferred based on comparison between the measured bore heads and the surrounding topography....."

Maybe so, but wait till you get a Major Earthquake or series of lesser magnitude but frequent shaking...

And if not, **it is still flowing towards a catchment.**



They also say:

> "The surface water and groundwater systems in the vicinity of the proposed lanfill footprint are disconnected by the thick layer of surface [which is not surface] clay that covers the area....."

Again: **With a Major Earthquake or an Earthquake Swarm, or with clay dessication due to internal combustion in the landfill, the situation might change with dangerous results in pollution.**

WHAT THE PROPOSED WORKS INVOLVES and claims

1. Landfill
2. Evaporations dams
3. A Stormwater dam
4. Office
5. Storage facility
6. Truck weighbridge

Sources of the waste:

- Residential wheelie bins
- Construction sites, with any asbestos sealed in a double layer of plastic and buried deep in the landfill
- Shops, restaurants and other businesses.

Containment of the waste:

- Plastic and clay on the bottom
- Some kind of covering on top as it fills

SOME OF THE CLAIMS THAT CAN BE DISPUTED

Question: Since material from construction sites will be included, with **asbestos** specifically mentioned, how can the asbestos brought in later be 'buried deep in the landfill'? **Surely, the later it comes in, the higher in the landfill it would be?**

Leachate:

> "Water that comes into contact with the waste – known as leachate – would be captured, pumped out from the bottom of the landfill and into evaporation dams."

Leachate Dams: Map shows them **awfully close to 13 Mile Brook!**

Stormwater Dam: Further away, but towards someone else's Property, and I think still in a slope that runs in the direction of 13 Mile Brook.

Buffers:

SITA claims (page 4) that buffers are **adequate. They are not in the event of certain major disasters,**

including Earthquake and Duststorms of the magnitude of that which hit York on 29 January 2011.

Claim (p. 6) they will capture gas (for Power) from the Landfill: dealing with gas is another potential hazard, both for escape into the environment, and for explosion or fire.

Claim there will be no disturbance to 13 Mile Brook: doesn't take other risk factors for that into consideration. Everything is multifactorial, and they are treating each factor as standing on its own causativeness.

Claim the will salvage recyclables at the tip face (and other resource recovery perhaps): another point of risk of spills, scatter, etc.....

Environmental Requirements?

Page 7: SITA claim they have met all the environmental requirements, ensured compliance with all standards, etc... Unless and until they build and operate the facility, this is not proven.

Their Works Application claims (p. 18), by interpreting in the way that suits them, that because the EPA

> "determined the proposal as 'not assessed' as the potential environmental impact of the proposal is not so significant to warrant the EPA's assessment"

that this shows that :

> "From an environmental perspective, the Allawuna Farm site is an ideal location for a putrescible landfill."

Such a conclusion is a **step too far in logic**. It does not follow that because something is "'not assessed' as the potential environmental impact ....is not so significant as to warrant the EPA's assessment" equates to "it is ideal". The true algebra is (where $\neq$ means 'is not equal'):

potential environmental impact not so significant $\neq$ potential environment makes the site ideal

Minister Jacobs' early February to those who appealed the EPA decision makes it absolutely explicit that the site is not necessarily ideal:

> My decision should not, however, be taken to infer that the proposal is environmentally acceptable. Rather, my decision acknowledges that concerns with respect to water quality, air quality, vegetation clearing and potential environmental impacts will be considered by the DER for applications made under Part V of the EP Act. If the DER's assessment of an application indicates that the environmental risks posed are unacceptable, the DER can refuse to issue a works approval, licence or clearing permit.

reflecting the fact that following the appeal to the EPA against their decision the Appeals Convenor concluded:

> Allawuna Class II Landfill Facility, Shire of York — Appeals Convenor's Report
> SITA Australia Pty Ltd — January 2014
>
> **CONCLUSION AND RECOMMENDATION**
>
> For the reasons outlined in this report, it is concluded that the EPA decision not to assess this proposal was justified, noting that risks associated with the interaction between the proposal and ground and surface water, air quality and related matters are within the scope of matters the DER is able to consider as part of applications received under Part V of the EP Act.
>
> It is further concluded that a decision not to assess the proposal is not intended by the EPA to be a determination that the proposal is environmentally acceptable and will necessarily be approved by other decision making authorities. Rather, the decision acknowledges that concerns with respect to water quality, air quality and related matters will be considered by the DER for applications made under Part V of the EP Act, and if the DER's assessment of applications received indicate that the environmental risks posed are unacceptable, the DER can refuse to issue the relevant instrument (such as a works approval, clearing permit or licence), or can ensure conditions are attached to the instrument to mitigate identified environmental impacts.

Claim that the low permeability clay between 6.5 metres to 9.5 metres thick: where?

Question: Since the pit is intended to go as deep as 25 metres, at what depth does that clay begin and end? They cannot surely say that it encases the whole intended pit, because the pit is to be 25 metres deep, and the clay (wherever it begins and ends) anything from 6.5 to 9.5 metres thick!

Existing Agriculture can continue on the rest of the site that is not taken up by the operation: well, minus the road and its immediate surrounds, minus the narrow sectors between the operation and 13

Mile Brook at a certain point, minus the potential side-effects of potential noise, air pollution etc....., minus the 350 hectares of bushland.

Claim that SITA will maintain about 350 hectares of bushland on the Allawuna Farm site: Actively? How? And how if a Natural Disaster occurs?

Claim (p. 9) of 'only a small increase in traffic': One truck each way every 20 minutes (6 per hour all up) X 8 hours X 5.5 days = 264 per week, or 48 per full day. That is **quite an increase in pollution** to what the environment already receives.

Claim (p.10)

> "The landfill is located away from key groundwater and drinking water sources and would have no impact on their flow paths; .....
> Beyond the protected Mundaring Weir water catchment area;
> Set back from 13 Mile Brook, to ensure no impact on its flow."

These things they cannot guarantee.

Note the word "protected" for Mundaring Weir Catchment Area. It is playing with words, because "protected" is being applied to a certain section, while ignoring what could happen to the actual, factual area with potential runoff into the Catchment. (See maps on page 6)

Claims about the low-permeability clay and the rate of the groundwater movement in metres per year, and that 'any water that comes into contact with waste in the landfill....[being] carefully collected and treated', there are no guarantees if there is an industrial accident to the operations, or in the case of a big enough and close enough Earthquake.

Works Approval Application Executive Summary claims that the very low permeability of the clay **would limit the flow of surface water into the groundwater beneath the site**; but:

1. Even the proponents use the word 'limits', which admits that there is some possible, if minor or slow, leakage possible;
2. Is only referring to areas as low as where the clay starts; i.e. it does not prevent leakage at levels above the clay, if the plastice gets pierced by something cataclysmic or above where the plastic is, at the level of loading at the time something occurs to start unintended leakage.

Plans for a series of Cells, beginning with 1 & 2, moving on to 3 and more:

Logically, the more Cells that there are, and the longer adding Cells goes on, the more risk there is of some kind of unintended accident causing environmental damage. A lot can go wrong in the intended 37 years, and the long Post-Closure Management phase of another 43 years — particularly the 37 Waste Placement years.

Types of Waste to be included in the *Landfill Waste Classification .....1996(As amended December 2009....* for a Class II landfill.*)*

The very fact that the first type is called Clean Fill marks out the rest as being varying types and levels of waste which each has some element of risk if not handled correctly or in large enough proportions. So
(a) how they are handled,
(b) how they are treated, and
(c) whether or not there is some accident or catastrophic event
all affect how harmless or dangerous the operation is.

<u>NEAREST PUBLIC DRINKING WATER SOURCE AREA</u> (Works Application point 4.5) Claims

To quote:

> "The nearest Public Drinking Water Source Area .. is the Mundaring Weir catchment, the boundary of which is located 1,000m west of the proposed landfill development."

This applies to the 2007 Protected Catchment Area, but does not apply to the real area which impacts it via runoff, close to surface seepage, and groundwater — particularly if a major storm and flood, or a major Windstorm causes overflows of the intended dams, or piercing of the protective layers by flying debris or debris or materials dislodged by flood, or some other unexptected cataclysmic event.

Again to quote:

> "Comprehensive site hydrogeological investigations have found no evidence of connection between the proposed landfill design and location and the Mundaring Weir PDWSA."

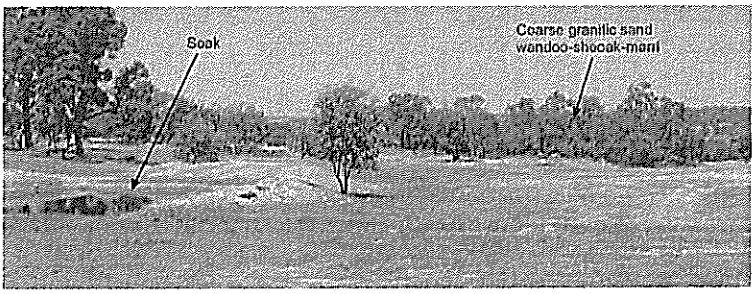
This does not entirely make sense, because the whole landscape and hydrogeology is interconnected, and anything cataclysmic is bound to have ripple effects to the whole.

Importantly, it appears that there are **paleochannels** in the area, some covered and some open as soaks, and that these run into the Helena River System which in turn joins into the officially protected Mundaring Water Catchment Area. So pollution that finds its way into these paleochannels will eventually find its way into the drinking water catchment. The worse the accident or catastrophe that occurs to affect the system, and the more frequently these things occur (as they are indeed doing) the greater the risk through the Landfill operation would be.

http://archive.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/bn_landscapes_soils_northam.pdf

This study informs us (in the section on the Darling Range south west of York, which refers to the area of Talbot Brook Road etc...) describes and illustrates waterlogging that goes with paleochannels as often occurring in winter, and wet drainage lines. The illustrations show the same kind of soil (basically greyish) that can be seen in a dam hump as one looks out to the left when passing Allawuna Farm, just before the National Park and Water Catchment Area notices.

This is one of the illustrations from that section of the article:



Another aspect of the "Drinking Water Source" issue is the fact that homes in the area are not linked up with mains water, and have to collect water from their roofs in tanks. In the scenario that we have a major summer windstorm such as is described and illustrated in 3. below, the leachate (with all its toxic substances) which has dried up in summer could blow onto the roofs (as dusts and pollens do even in the lesser yet still violent summer winds in York) and could find its way into the residents' water tanks and hence drinking water.

HISTORIC NATURAL DISASTERS I know of IN YORK OTHER THAN EARTHQUAKE

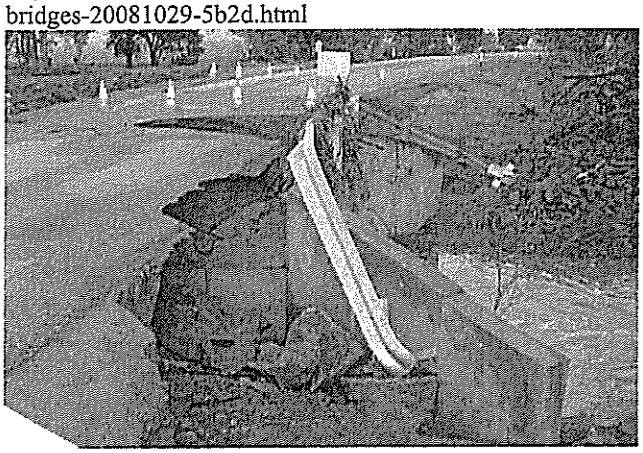
1. **SEVERE STORM THAT SWATHED THROUGH THE AREA WEST OF YORK NEAR OR IN THE ST. RONAN'S AREA AND WHERE SOME OF THE RIVERS IN THE VICINITY RUN, CAUSING FLOODING AND SERIOUS DAMAGE**

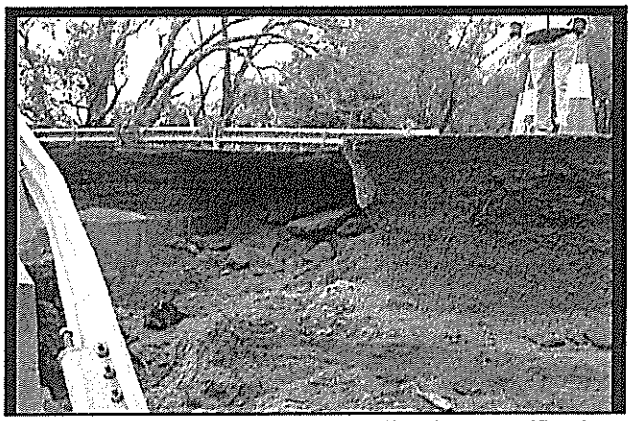
On 29 October 2008, without warning, there was a sudden storm, with about 100ml of rain falling in about 20 minutes. It was localised in an arc or path to the South West of York, in the general vicinity of St Ronan's, passing up throught the Wambyn/Mokine area to the South West of Northam. It "washed away everything in its path" as one of the people living in the area described it. Roads had to be closed, and even several days later when I was able to pass through there was clear evidence of erosion beside the Great Southern Highway, fallen branches and uprooted trees.

On the **night** it occurred, the flash flooding washed away the stone and concrete foundations of bridges, undermining and breaking up road, and scattering debris. Four intersecting roads were impassable for some time. These 4 photos were taken on Mokine Road.

This rain event differed markedly from what the Eastern side of York got; the Eastern side only got 11.5mm.

http://www.watoday.com.au/wa-news/storms-wash-out-york-bridges-20081029-5b2d.html





http://www.watoday.com.au/photogallery/wa-news/flood-damage-at-york-20081029-5b2h.html

A storm of that suddenness, magnitude and ferocity in the area of Allawuna Farm could well cause undesirable leachate into the water catchment rivers and subsoil.....

2. 27th JANUARY 2009 SEVERE STORM AND FLASH FLOODING IN YORK AND QUAIRADING

http://www.bom.gov.au/cyclone/history/wa/2009.shtml

Tropical Cyclone *Dominic*, 22 - 27 January 2009

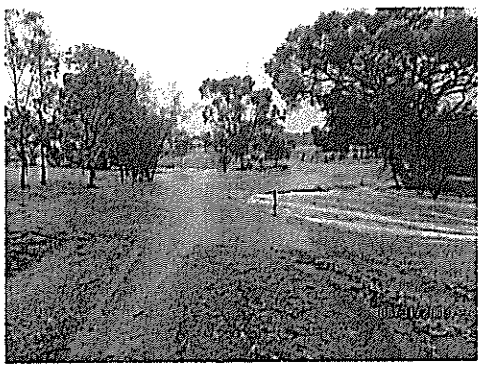
A low moved off the Kimberley coast during 24 January. This system moved steadily west and intensified into Tropical Cyclone *Dominic* by 0900 WDT 26 January. *Dominic* turned southwest and reached category 2 intensity before crossing the west Pilbara coast near Onslow at 0600 WDT 27 January. Wind gusts to 133 km/h (72 knots) were recorded at Onslow Airport and there was some minor structural damage and power lines brought down. *Dominic* weakened quickly over land although the remains of the system caused heavy rainfall and flooding in many parts of southern Western Australia. The Gascoyne River inundated many parts of Carnarvon. A train was derailed east of Kalgoorlie on 30 January apparently because of flowing water. **Flash flooding was also reported in the wheatbelt including York and Quairading.**

Just east of Mount Bakewell in York, a friend measured the rainfall as 57mm on 27th January 2009.

3. 6TH JANUARY 2013 SEVERE RAINFALL EVENT IN THE AREA

I am informed by a resident of that area that on January 6th 2013, coming from the North West in a band about 5km wide 40mm of rain fell there in a half hour. It affected properties in the vicinity of Allawuna Farm.

Some landowners there have photos of the event. The photo here, taken by Jenni McColl on that day, represents some of the flash flooding at 13 Mile Brook.



I am also informed that the leachate ponds are located uphill from the landfill site, and that leachate will therefore be being pumped uphill from the landfill site to the evaporation dams. Obviously, if there are heavy rains or storms like those of 6/1/13 and 29/10/08, then leachate will will flow back downhill and contaminate whatever is below it, including 13 Mile Brook, the landfill pit and around it, etc... This will:

(a) require a massive cleanup and decontamination;
(b) potentially damage the surface water which feeds the catchment via one route or another, not to mention other watercourses in the area. Apparently the soil is a of a porous, gravely type and will absorb liquid rapidly.
(c) the barely porous clay at the bottom will not release the added water, and pumping out massive amounts of water would be an enormous challenge. The pit could fill and a mix of water and rubbish would overflow.

4. 29 JANUARY 2011 UNFORESEEN SUDDEN MASSIVE DUSTSTORM WITH THE FEROCITY OF A TORNADO HIT YORK -NORTHAM REGION

This duststorm travelled in a very short space of time, arising from erosion in Dalwallinu, with dusts travelling and accumulating and depositing their contents from Dalwallinu to Northam and York — a distance of about 203.7 km (Department of Agriculture and Food,Wind Erosion Roadside Survey Report No. 2 May 2011 http://archive.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/erosion/rss2.pdf — see the top right hand 2 pictures and captions below).

The winds in this storm were sufficient to structurally damage approx. 30 houses in York alone, several losing their roofs. Numerous fences and trees fell, including giant branches. Roofing, fences and all sorts of objects were blown into other people's properties.

If such a storm occurred again, including over the area of the proposed Landfill and surrounds, a serious accident could occur to any aspect of the Landfill via flying debris. Further, the storm arrived so suddenly that there was no forewarning to anyone not outside and looking in the right direction. Even then there was only a short space of time. For people out in it, it became impossible to see ahead of oneself. On impact it whirled around in all directions, so that even shut indoors one felt that it was battering from all sides.

If such a storm occurs around Allawuna, any rubbish in the process of being unloaded, or not yet covered, would be blown wherever the wind sent it, as would the material intended to cover it, thereby polluting the land around for some distance, and the next time rain fell it would enter the water system by absorption or by runoff. Hence, it would blow unhealthy chemical and biochemical elements (including asbestos dust if present):

- into houses and airconditioners;
- into the streams ground surface and drinking water catchment;
- onto normally productive farmland;
- onto normally healthy national park and its ecosystems, and ditto for the gazetted nature reserve nearby.

http://www.redbubble.com/explore/2011+29+jan+storm+york

http://archive.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/erosion/rss2.pdf

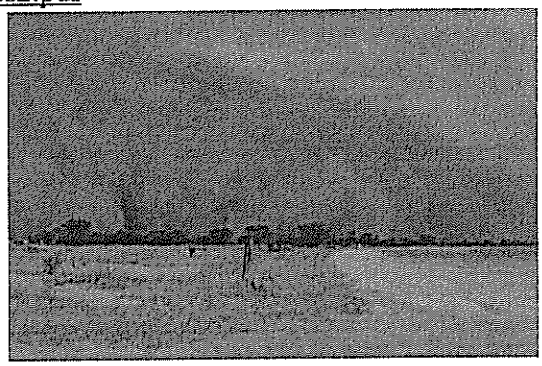
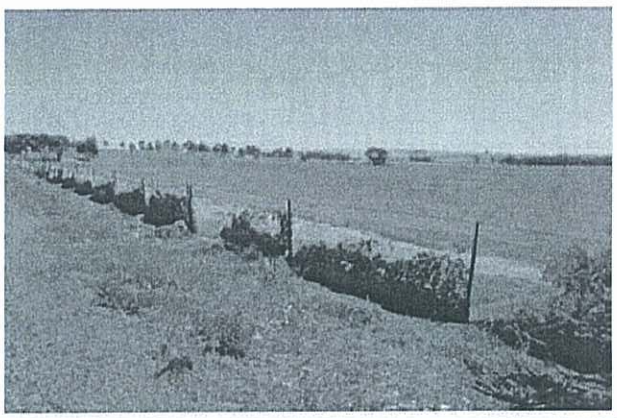


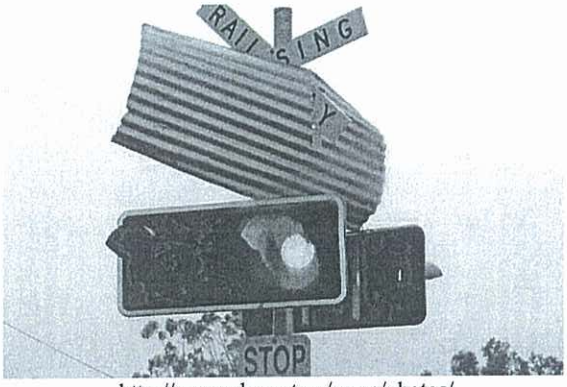
Figure 1. Dust Cloud caused by wind erosion near Dalwallinu (29 January 2011) (Photo courtesy of Rebecca Butcher)

http://archive.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/erosion/rss2.pdf

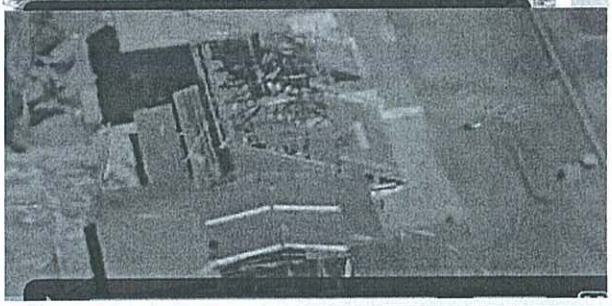
The summer period between the pre-harvest survey (Oct/Nov 2010) and the pre-seeding (April/May 2011) was marked by strong localised storms causing wind and water erosion in some areas, and other areas remaining hot and dry. Prefrontal winds produced dust clouds in parts of the wheatbelt (Dalwallinu on several occasions, Northam and York), indicating that some ground was vulnerable to wind erosion.

Right side Caption:
Wind debris on the fenceline of a paddock in the York district after the storms in Jan 2011, the result of high winds and detachment by stock.

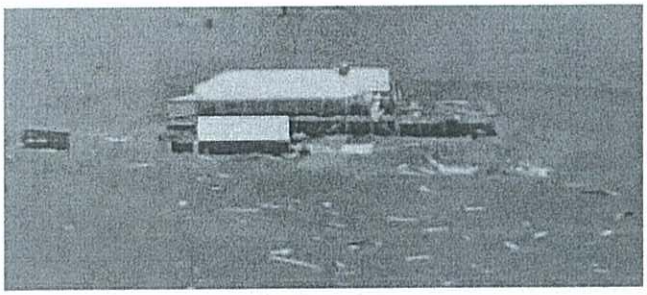




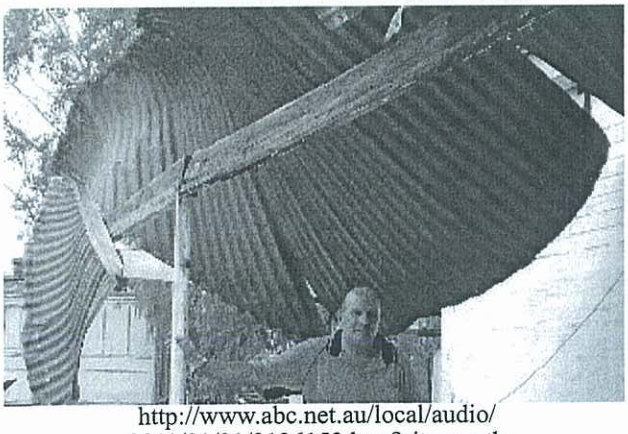
http://www.abc.net.au/news/photos/2011/02/01/3126605.htm?site=perth



Right and below left:



Source (this and above Right): http://www.abc.net.au/news/video/2011/01/30/3125231.htm?site=perth



http://www.abc.net.au/local/audio/2011/01/31/3126152.htm?site=perth
ditto above Right

Caption: Anyone seen a shed? (Shed had flown)
Source: http://www.abc.net.au/local/photos/2011/01/31/3126094.htm?site=perth

POLLUTION FROM TRUCK EXHAUST ON THE HIGHWAY AND ON THE PROPERTY

Ref: blumberg-lab.bio.uci.edu/past%20teaching/bio2B.../airpollution.ppt

A conference on "Air Pollution: Impacts on Body Organs and Systems" was held in Washington D.C. by the National Association of Physicians for the Environment on November 18, 1994.

Air pollution can enter the human bloodstream through the nose, mouth, skin, and the digestive tract.

Include harmful chemicals such as benzene, lead, carbon monoxide, volatile nitrites, pesticides and herbicides.

Pathogens in car exhaust include: (above article plus http://www.dieselnet.com/tech/env_top.php)

1.-Carbon Monoxide (danger to humans and animals)
2.-Nitrogen Dioxide (produces nitric acid & ozone; contributes to acid rain; a respiratory irritant)
3.-Sulphur Dioxide (produces sulphuric acid; contributes to acid rain; a respiratory irritant)
4.-Particles such as PM-10 — Particulate Matter (into the lungs; a mix of solids, organics, and sulfates) which is still a relative 'unknown quantity' regarding its effects, but considered a major health concern.)
5.-Benzene (see below)
6.-Formaldehyde (ozone precurser and carcinogenic)
7.-Polycyclic hydrocarbons (see below)
8.-Carbon Dioxide (global warming)

and a range of other harmful more complex versions of some of the above, as well as

It stands to reason that **the more heavy vehicles there are on the road, the more pollution will occur from these sources.**

5.- Some information on **Benzene**:

- Benzene has been found in 337 of 1177 National Priorities List **hazardous waste sites** [in the US].
- used as materials to produce industrial products and pesticides
- environmental sources of benzene: found in gasoline, ...**vehicle exhaust fumes, underground storage that leaks**, wastewater from industries that use benzene, **chemical spills, groundwater next to landfills containing benzene**, and food products that contain benzene naturally.

7. Some information on **Polycyclic hydrocarbons:**

- PAHs are a group of chemicals formed during the incomplete burning of coal, **oil and gas, garbage**, or other organic substances.
- used in medicines, and to make dyes, **plastics**, and **pesticides**
- **found in the air, water and soil**
- **occur in air attached to dust particles, or in soil or sediment as solids**
- **PAHs attached to dust and other particles in the air originate from vehicle exhausts**, asphalt roads, coal, coal tar, **wildfires**, agricultural burning and **hazardous waste sites**.
- can be ... in soil near where coal, wood, gasoline have been burned, or from **soil near waste sites** such as former manufactured gas sites and wood-preserving facilities.
- enter the body through the lungs

Solution

Air pollution prevention is the best solution for immediate reduction of harmful effects of environmental toxins. Public support is necessary to reduce environmental air pollution.

Governments can encourage the reduction of vehicular use ....with a variety of transportation options.

One suggestion in the case of this project is **The Avon Proposition** (http://wawaste.com.au/proposition.html). This includes:

> a single landfill site to cater for all metropolitan waste that needs to go to landfill, subject to the following conditions:
>
> 1. The site should be in a low rainfall area. [Western York is "Wet Mediterranean Climate"]
> 2. It should be away from a population centre.
> 3. It should be on land already cleared.
> 4. Choice of a site must take into account local seismic activity.
> 5. The site should be large enough to provide sufficient waste disposal facilities for the next three generations.
> 6. All organic waste should be processed and used as a soil improver.
> 7. **Metropolitan waste should be transported to the site exclusively by rail."**

This does not, however, deal with the likely effects of spread of organisms and dust pollutents in the

case of very major storms or duststorms.

DUST, PATHOGENS AND OTHER POLLUTANT TRANSFER POSSIBLE WITH MOVEMENT

- of soil when it is being removed to dig the pit
- from any accidental spill of rubbish when loading it into the pit
- if blown by heavy wind when transfer is occurring (as with the 29 Jan 2011 windstorm, it might creep up enexpected)
- if washed into the surrounding surface ground, waterway, leachate evaporation dams, or stormwater dam.
- of dust at any stage: tipping, construction of cells, from excavation material stockpiles, etc..
- of dust due to truck movements on the unsealed road at the site.

These and other such things are acknowledged by SITA (e.g.11.2 http://wawaste.com.au/docs/140106b%20AD%20Volume%201%20Allawuna.pdf), and they suggest how they will deal with it, but even when they say:

> "If dust inspections indicate that dust is being generated from the site, and is crossing the Site bondary, then additional dust management techniques may be adopted such as mulching, hydro seeding, chemical crusting agents or additional use of water trucks or sprays"

That is not foolproof; mulch, chemical crusting agents, sprayed water inmixed with the dust or chemicals or mulch dust, can still blow around, even across Site boundary, towards the landowners' or neighbour's homes, the treed areas, the National Park, etc.... **especially in the case of a major windstorm.**

RISKS FROM FIRE

Fire could occur in the Landfill, due to **industrial accident** or **bushfire** or fire started by **lightning**. Fires are often started by lightning in York's rural area. Even though they are often put out quickly, such a fire could still impact on the Landfill.

On page 74 of the SITA document, they acknowledge that **flammable materials** will be onsite, and state:

> "Fire can also originate from the surrounding bushland and farming areas, particularly during dry and hot weather conditions either naturally or due to deliberate lighting."

They believe they have put in place adequate management strategies. However:

1. this site is with in close contact of bushland,
2. in **one of the hottest areas out of Perth in Summer** (e.g. Jan-Feb 2013 there were about 10 days of over 40° temperatures, with nights barely cooling;
3. where **very strong winds occur** even in Summer (not to mention the extreme example we had on 29 Jan 2011 with the wind/dust storm), and:
4. **lightning frequently starts fires**, even on farms (common knowledge around here),

seems to suggest that this area could be volatile for fire-weather, and mitigate against easy extinguishment.

Then also:

5. there always being the possibility of an **industrial accident** causing fire (an employee could light a cigarette inappropriately, or fail to follow safety guidelines, for instance),
6. the relevant department might start a **hazard reduction fire which gets out of control and drops embers** on the landfill.

http://en.wikipedia.org/wiki/Bushfires_in_Australia (quoting a range of Research Documents)

> **"Australia's climate has been trending toward more bushfire weather over the last 30 years.**
>
> In 2007, a study by the CSIRO ... found evidence that climate change will lead to increases in very high and extreme fire danger rating days and earlier onset of the fire season. Other studies investigating the historical record identify significant changes in Australia's bushfire season as a result of human activity.

The article charts "some of the most severe" Bushfires in all States from 1851 to 2014. The earliest and most frequent were and are in Victoria, and 1851 to 1961 (110 years) none of them in WA. However, there is an increase in the number/frequency in WA, over time.

The locus of proneness to bushfire seems to have shifted to include Western Australia more frequently.

These are the large WA fires in Perth Hills and Avon Valley areas referred to in the article:

1961, Jan-March, [Dwellingup etc..,] Darling Scarp & Mundaring); CAUSE: hot NE winds & high temperatures following Pilbara cyclones.

1997, [3-]8 Jan, 10,5000 hectares burnt out in Wooroloo, 16 homes destroyed; [also damage to Wooroloo Prison Farm —http://www.ga.gov.au/webtemp/image_cache/GA6524.pdfCAUSE: ?

2009, 29 Dec, Toodyay, 3,000+ hectares, 38 homes destroyed; CAUSE: heat >45°; power line fault may or may not have been involved (http://en.wikipedia.org/wiki/2009–10_Australian_bushfire_season)

2011, 6-8 Feb, Roleystone-Kelmscott, (72 homes destroyed, 32 damaged, Buckingham Bridge on Brookton Highway collapsed and closed for 3 weeks whilst a temporary bridge was constructed and opened a month after the fires); CAUSE: High temperatures, sparks from angle grinder use igniting grass, as per news coverage.

2014, 12 Jan, Parkerville, 386 ha, 1 dead, 56 homes lost. CAUSE: temperatures >40°, and fallen power line on one property, according to news at the time.

Other close to York

http://en.wikipedia.org/wiki/2010–11_Australian_bushfire_season

2011, 5 Feb, Swan Valley, (CAUSE: tree falling on electrical transmission tower)

http://en.wikipedia.org/wiki/2011–12_Australian_bushfire_season

2012, January, Wooroloo and Chittering and 6 Feb. Chittering Estate, also small one in Toodyay (http://www.perthnow.com.au/news/western-australia/homes-destroyed-as-fires-rage-down-south/story-e6frg13u-1226256900590)

http://en.wikipedia.org/wiki/2013–14_Australian_bushfire_season

2013, 14 Dec, Toodyay, > 50 hectares; CAUSE: powerlines?

The severity and frequency have been increasing.

http://www.ga.gov.au/webtemp/image_cache/GA6524.pdf

2005, 15 Jan: Largest bushfire in Perth Hills in 40 years. The fire was believed deliberately lit and burnt 27,000 ha of state forest, national park and bushland in Mundaring, Pickering Brook, Karagullen and Barton's Mill.

So if, despite all SITA's efforts and engineering technology, a moderate of catastrophic fire occurred, starting in the landfill (e.g. through explosion, which SITA documentation indicates is potentially possible http://wawaste.com.au/docs/Appendix%20G%20-%20EPG%20&%20Contingen.pdf) or spread to it through an external source, such that they were ubable to bring to an end quickly, what would be the likely impacts on the water, land and air in the environment of the area?

http://www.waste-management-world.com/articles/print/volume-11/issue-4/Features/understanding-landfill-fires.html

A serious landfill fire results in the downgrading of a 'controlled' landfill to 'uncontrolled' status, or in practical terms the waste mass becomes inadvertently reconnected to the environment. All the costs and effort of engineering a perfect containment system are wasted if fugitive emissions, often including dioxin and untreated leachate, are released through a perforated cap or liner.

Landfill fires occur frequently. In the USA there are around 8300 fires a year (US Fire Administration, 2001) and in the United Kingdom around 280 to 300 a year.

Landfill fires vary in scale from minor outbreaks on the surface, to massive tyre conflagrations with the potential to cause environmental incidents exceeding for instance, the impact of the Exxon Valdez oil spill in 1989. In human terms, the uncontrolled atmospheric emissions arising from these fires, which often continue for years, are potentially lethal with well-proven acute and chronic health impacts.

Recent landfills are very largely comprised of combustibles such as plastic and textiles, which maintain their fuel value into virtual perpetuity.

How do landfill fires start?

For surface fires the reasons are obvious – a heat source of some type has contacted the surface, for instance deposits of hot wastes, lightning, or arson. For deep-seated fires (below 4.5 metres) the initiation mechanisms are quite different. Accidentally initiated fires normally start for one of three reasons:

- **Spontaneous Combustion**: where a buried heat source, resulting from biological decomposition

or chemical oxidation, produces a rise in temperature if the waste mass cannot dissipate the heat faster than it is being produced – a process known as 'thermal runaway'.....

• **Spontaneous landfill combustion** has been traced to a batch of mercury cell batteries which short-circuited during the final settlement of a landfill, and to cotton rags soaked in aluminum paint. Combustion accelerants can also help to make the party go with a zing, the dregs of distilled alcoholic drinks bottles are an example....

• **Legacy Heat: the inadvertent burial of a heat source.....**

• **Piloted Ignition:** from a point heat source, happens when ignited waste is buried in the landfill.

SITA's documentation http://wawaste.com.au/docs/Appendix%20G%20-%20EPG%20&%20Contingen.pdf **acknowleges that there could be smouldering waste taken to the site** (p.17). Returning to the above article:

Deep-seated landfill fires do not 'burn' in the accepted sense. These fires are a form of combustion, known as **pyrolysis**, where the thermal reaction takes place in an oxygen-starved environment. The combusting material is consumed very slowly and at low temperature. As the waste is heated it begins to devolatalize .....

The **volatiles** are either incompletely combusted into other species for example carbon monoxide, dioxin from PVC, hydrogen sulfide from gypsum drywall board, or re-deposited on the surface of cold wastes lying in front of the advancing temperature front. Once devolatalization is complete the remaining fuel, in the form of fixed carbon (visualize this as the charred wick on a candle after it is blown out) can remain hot, under starved oxygen conditions, for years.

Atmospheric emissions

Atmospheric emissions from landfill fires are often dismissed as a nuisance. The following are two examples of just how serious the 'nuisance' is:

• **Dioxin emissions:**.....

• **Gases and Vapors**: landfill fires emit a toxic cocktail of 'Most Wanted' fugitive gases including formaldehyde, hydrogen cyanide, hydrogen sulfide, nitrogen oxides and many others (OEPA, 2006). Visible smoke might not be visible since compacted waste acts as a good particulate filter, but fugitive gases are able to percolate towards the surface. Emitted smoke is a hazard ..... A particular problem with smoke, which is largely unburned carbon, is particles that have become activated, in the form of an adsorbent, with a huge appetite for mopping-up 'most wanted' contaminants. Very small particles, known as Sub PM2.5s (smaller than 2.5 millionths of a meter in diameter) are capable of remaining airborne for days, and together with adsorbed contaminants will pass directly into the bloodstream once inhaled.

• **Groundwater emissions**: This is an interesting issue. An uncontrolled release of leachate can occur, even to an otherwise dry site, if groundwater is admitted through a perforated basal liner. Manufacturers of HDPE / LLDPE liners recommend an upper temperature limit of between 60°C and 71°C. Exceeding these temperatures, for even a short time, causes a depletion in the membrane antioxidants and a spectacular loss of service life. At 10°C the service life of a liner might be 375 years; at 60°C the service life will have decreased to around 20 years.

This being the case, SITA's plan to use HDPE geomembrane (http://wawaste.com.au/docs/Appendix%20F%20-%20Construction%20Sp.pdf page 36, section 14) **is subject to this risk.**

I think this establishes the case regarding both

(a) **external source fire risk** and

(b) **internal source fire/combustion risk** and

(c) the **unwanted side-effects that are seriously dangerous to the environment.**

But there is also this from the same paper:

.... you might say, 'thank goodness for our **clay/Bentonite (CLPS) secondary membrane protection layer'** - but the effects of **heat dessication on clays** is even more spectacular and **results in the formation of very large fissures which can be visualized as sort of 'self-excavating' leachate drains.**

Geotechnical engineers will tell you that a perforated basal containment system cannot be repaired at any reasonable cost.

So, in case of e.g. internal combustion in the Landfill, **EVEN WITH BOTH** THE **MEMBRANE** AND THE **CLAY LINER, LEACHATE CAN ESCAPE** INTO THE GROUND and so potentially POLLUTE THE UNDERGROUND WATER CHANNELS (THE PALEOCHANNELS) that eventually find their way into the **Drinking Water Catchment.**

The above article was written by Patrick Foss-Smith who is a a British environmental consulting engineer specializing in landfill and underground fires.)

NOISE POLLUTION

While the Noise Levels during both Construction and Operation were measured http://wawaste.com.au/docs/Appendix%20M%20-%20Noise%20Investiga.pdf (page 14) as falling within ghe EPNR 1997 criteria, I believe that for the people living at 3462 Great Southern Highway, St. Ronan's, the fact that it will be ongoing is a danger.

The EPA's ***GUIDELINES FOR THE USE OF THE ENVIRONMENT PROTECTION (NOISE) POLICY 2007*** http://www.epa.sa.gov.au/xstd_files/Noise/Guideline/guidelines_noise_epp.pdf acknowleges (p1) that there is a range of factors that influence how a person responds to the noise, including:

> loudness; duration; predictability; certain characteristics, such as a tone (ringing or humming), impulse ('bangs' or impacts), a modulation (where the noise level changes in its loudness, tone or character) or low frequency (base noise which has the ability to travel and penetrate or bend around structures) noise; time of day; activities of the person affected; relationship between the person affected and the noise; familiarity with the noise and its purpose; area in which the person is affected and the noise is located, and how loud or quiet that area is expected to be; history of the area in which the person is affected and the noise is located; .....
>
> [and so] the Noise Policy balances the interests of those whose legitimate activities cause noise, and the rights of those who are exposed to and potentially affected by the noise."

They express the need (p.5) to

> "balance social, economic and environmental considerations in the management of noise issues [by] ensuring that protection from excess noise is in accordance with World Health Organization guidelines

They offer guidance (p. 13-14) on the factors that may be relevant in subjectively deciding whether a noise is unreasonable in the circumstances: e.g.

- Is the noise **loud** either in an absolute sense, or relative to other noise that might be present or expected in the area?
- Is the activity of a **duration**, volume or **characteristic** that is significantly different to that expected or typical in the area?
- **Could a reasonable person tolerate the noise** given the time of day and the duration of the emission and/or the fact it is not typical of activities conducted in the area?

"Not all of the factors need to be present for an opinion to be formed that the noise is causing an unreasonable interference. Ultimately, the level, nature and/or extent of a noise are important criteria"

I believe these are serious questions when considering the Landfill Construction and Operation in the vicinity of not only the farm operated by the owners of the land on which it is proposed to set up the works, but also the farm nearest to it, and possibly at least the one nearest to it across the road (when the wind is blowing a certain way, at least). I would expect The Construction Phase to be the worst from the noise point of view, with varying levels, some sounds of longer duration than others, etc..... Sudden noises and whining noises could be the most irritating; that does not mean that the Operational Phase would not have health/environmental implications, though.

The World Health Organisation has been studying Community/Environmnetal Noise since 1980 http://whqlibdoc.who.int/hq/1999/a68672.pdf page v, Community/Environmental noise including (p.vii)

> "noise from road, rail and air traffic, industries, construction and public work, and the neighbourhood."

Adverse Health Effects they refer to include:

- Cardiovascular and Physiological Effects (pp. 29-30)

> "The overall conclusion ... cardiovasclar effects are associated with lon-term exposure to LAeq,24h values in the range of 65-70dB or more, for both air- and road-traffic noise"

- Mental Health Effects (pp. 30-31)

"Environmental Noise is not believed to be a direct cause of mental illness, but it is assumed that it accelerates and intensifies the development of latentmentl disorder. Studies ... cover a variety of symptoms including anxiety; emotional stress; nervous complaints; nausea; headaches.....increase in social conflicts, as well as general psychiatric disorders .....

Despite the weaknesses of the various studies, the possibility that community noise has

adverse effects on mental health is suggested by studies on the use of medical drugs, such as tranquilizers and sleeping pills, on psychiatric symptoms and on mental hospital admission rates."

- Effects on Performance;
- Effects on Behaviour and Annoyance;
- Effects of Combined Noise Sources..... Etc....

The Precautionary Principle is invoked by the WHO, ibid. page 48, thus:

> **"In all cases, noise should be reduced to the lowest achieveable in a particular situation. Where there is reasonable possibility that public health will be damages, action should be taken to protect public health without awaiting full scientific proof."**

The Landfill's proponents have given the noise levels for the varying aspects of the transport, construction and operation aspects of the Project. However:

1. their figures do not take into full consideration the **possible effects of ongoing noise phases.**
2. They focus on higher-range noise figures which may not have long-term effects if not long-term in themselves; but
3. They have not paid adequate heed to the long-term effects of lower-decibal long-term noise which may well reach the neighbour farmers, and will certainly reach the owners of Allawuna Farm unless they sell up and move out.

As a retired Psychologist, with a Master's Degree in Psychology, the potential for serious effects of noise on the nearest neighbours (whoever lives there now or later) concerns me greatly.

I have refrained from reference to effects on Fauna, however, noise does have impacts on their survival and welbeing, too. (e.g. *Annotated Bibliography; Impacts of Noise on Wildlife — National Park Service* — http://www.nature.nps.gov/sound/assets/docs/Wildlife_AnnotatedBiblio_Aug2011.pdf and *Effects of Noise on Animals; Effects of Noise on Wildlife* http://www.airandnoise.com/Animals.html)

I would say the same for vibrations, for both humans and animals.

ODOUR EMISSIONS — THE ASPECT SITA ADMITS TO MOST UNCERTAINTY ABOUT
http://wawaste.com.au/docs/Appendix%20L%20-%20Odour%20Investiga.pdf

- If odorous loads are received, these are buried amongst existing waste as soon as possible.
- Waste will be covered at the end of every day to a minimum cover thickness of 225 mm
- Covering will be sand, earth, etc... (see **RISKS THROUGH FAILURES ..... section below)**

In my view, if contaminated coverings are scraped off as suggested would happen under certain circumstances, they can spread contamination, but moving on...

4.3 ODOUR SOURCES (p.9)

The key odour-emitting sources are considered to be:

- the working tip face; and
- the leachate dam, used primarily for the collection of sub-surface leachate from the working area.

The stormwater dam used for the collection of stormwater runoff from outside the working area, was considered to be a negligible odour source based on observations of the equivalent facilities at the Henderson Landfill in Perth.

(p. 100)

> "the odour emissions ..... were primarily obtained from a sampling program of odours from the City of Cockburn's Henderson Landfill which is considered comparable in terms of capacity, waste and management practices to the Allawuna proposal site."

In my view, it is risky to judge one setting by another; the topography of the two places, Henderson and Allawuna over the Hills, is quite different, and different factors will come into play in affecting outcomes.

SO THE CONCLUSIONS THAT CAN BE DRAWN ARE ALL PRETTY HYPOTHETICAL, as SITA admits in the following (p.17; 8.2)

QUALIFICATIONS AND UNCERTAINTIES

> "The largest uncertainty is considered to be the odour emission rates. These were determined from odour emissions at the Henderson landfill, which is similar in capacity to the final capacity at Allawuna and in terms of waste being received.

It is considered that the odour emissions rates used for modelling odour impacts from the proposed Allawuna Landfill should be conservative because:
• the odour emissions sampled from Henderson were after a prolonged period of hot weather in Perth, therefore the putrescible waste being received was in a more advanced state of decomposition – and more odorous, than for average temperatures. The use of a "summer-time" odour emissions rate year-round at Allawuna should be an over-estimate;
• comparisons with the odour emission rates derived with those from other sites in Perth and from values derived overseas indicates that the odour emission rate used for Allawuna is at the high end of these values; and
• the modelling includes what should be an over-estimate of odour emissions from the leachate dam since the emission rate is based on continuous maximum capacity of the dam.
Uncertainties that could result in the criterion odour contour being larger than predicted include:
• management practices deteriorating from those assumed; and
• poor integrity of the landfill gas capture system to be installed.
These matters are, however, subject to regulatory controls.
Given there is a wide margin between the most stringent of the predicted extent of the unacceptable odour impacts and the location of odour-sensitive premises (i.e. nearly 2 kms), there should be considerable confidence that the proposed Allawuna Landfill, if operated according to the assumed management practices, will not cause unacceptable odour impacts."

We must remember, however, that not all dangerous gases give off odour.

RISKS THROUGH FAILURES IN SOLID & LIQUID WASTE MANAGEMENT

Cover material http://wawaste.com.au/docs/Appendix%20L%20-%20Odour%20Investiga.pdf
(page 8)

Cover material
• The cover material will typically be sand, soil or biodegradable sheeting.
• The choice of material used as daily cover will be an important management consideration at the landfill as it could potentially limit gas and leachate movement, thereby stratifying the waste.
• At least two weeks cover material will be available at the waste facility under all weather conditions. This material can either be obtained on-site, or alternatively delivered to the site.

Cover stockpile
• A cover stockpile will be maintained adjacent to the tip face at all times.
• There will be enough cover material in the stockpile to cover waste in accordance with the above

(page 9)
The daily cover may be scraped back before additional waste is placed on top and if this occurs, the daily cover will then be stored for reuse.

In my view, there are risks in wind/dust storm, flooding rains, and simply moving materials leading to contamination of the environment.

CHEMICAL STORAGE

This speaks for itself as a risk in the case of a Seismic disaster or a fire or explosion, or if a wind/dust storm of major force causes some object to fly into the storage area.

INCREASED RISK OF DEATHS AND INJURY TO PEOPLE THROUGH INCREASED NUMBERS OF LARGE TRUCKS ON OUR NARROW ROAD TO THE LAKES

Six double-trucks X 8 hours p.d. X 5 days p.w = 48 X 5 = 240. Then there is the trucking in of sand to cover the rubbish, and other ancillary vehicles for operators of machinery etc... Someone estimated up to 108 movements per day, which would be (for 5 days) 540 pw. If there is another half-day Saturday, that is even more. That is a lot of extra vehicular movement from SITA alone.

The cartoon inserted opposite from Facebook (hence the public domain) applies to the other extra trucks we will get if grain does not end up being rail-freighted due to rail closures. The road widths may be just a little greater between Allawuna Farm and The Lakes

(but not much more in most parts). The principle is the same.

I illustrate with my own personal example below:

My experience late October 2013, illustrating how unsafe this road is even without the extra trucks SITA would be putting on the York—Lakes road.

I had the experience of nearly being pushed off the road between here and The Lakes by a very long double truck. I had to focus on the narrow path it left me to negotiate through.

I was returning to York late afternoon still in full daylight, somewhere the Perth side of 13 Mile Brook, Allawuna Farm, Mount Observation and so on, and as soon as the truck became visible (only maybe 100 meters away, because trees were blocking the view to that point) coming round a long bend towards me, it was already my side of the double white lines and did not shift back off that trajectory. Once that far over from its side of the road it probably couldn't because of its size and steady speed.

Since my vehicle is narrow (the narrowest in town) and the road had a one-foot approx bitumen apron the other side of the rough white line that marks the official edge, I was able to steer between the truck and the gravel. **Had my car been a larger, more average-sized or large one**, it would have been forced onto the gravel, and could quite probably have skidded into a tree and/or turned over. I, or anyone else in a similar situation, could have been **dead or maimed. IT COULD HAVE BEEN ME; IT COULD HAVE BEEN YOU.** IT COULD HAVE BEEN OUR BEST FRIEND, OR OUR SON OR DAUGHTER OR MOTHER OR FATHER OR BROTHER OR SISTER.

It is another timely warning about the risks on that road and the likely accidents from a vast increase in large trucks if the SITA dump were allowed.

GREATER DETERIORATION OF THE ALREADY POOR YORK-LAKES ROAD FROM THE EXTRA HEAVY VEHICULAR TRAFFIC

This is undebatable. It speaks for itself.

A VERY DANGEROUS PLACE TO HAVE A TRUCK ENTRY TO ALLAWUNA FARM:

I drive out that way pretty often, and it seems to me that that area is a very dangerous place to have trucks etc... entering Allawuna Farm. Coming from Perth it is downhill, just round a bend on the main road, with a Right Hand Turn into the property. **Even with a wide entry area built and a widening of the road at that point, I believe it would be quite dangerous — particularly for the other traffic on the road at the same time.**

DAMAGE TO YORK'S TOURISM INDUSTRY, PEOPLE'S ENJOYMENT OF ECO-TOURISM, ETC..

If native flora (the wildflowers, for instance, that draw people to York annually) which are particularly visitable in the very area of forest and reserves in the area, end up decimated by fire and emissions emanating from the pit, or caused by lightning strike or windstorm or earthquake, then:

- Eco-Tourism will be seriously depleted;
- The Town of York will have less visitors and trade that comes from eco-tourists.

Further:

- People already tell us they find the Lakes-York road inadequate;
- If it deteriorates because of the extra traffic they will not wish to travel on it;
- They will fear travelling it if there are too many long and wide trucks are on it (yes, they will still be plying the road week-days during holidays);
- If they have an accident or near-accident due to truck widths or trucks coming over the white lines, they will be discouraged from coming back.

This particular area is designated for EcoTourism, in particular tosee native vegetation, wildflowers and birds. In our own Visitors' Centre, we have pamphlets about these things, so we clearly are promoting EcoTourism.

www.yorktouristbureau.com.au/Flowersandbirds.shtml (and its related print pamphlet)

http://members.ozemail.com.au/~wildflowers/oneday.html (*One-day trips from Perth* — Wildflower Society of WA (Inc) section on 'East'

birdswa.linet.net.au/guides/pdf/17a_northam.pdf

http://yorktouristbureau.com.au/Birds%20of%20York.pdf (and its print pamphlet *A selection of the more common Bush Birds of the Shire of York*)

Do we want to promote developments which undo EcoTourism? It is counter-productive to do so.

tourism.murdoch.edu.au/reports/YorkReport.pdf is a **Murdoch University study done in 2004**, under the leadership of then Tourism Management Lecturer Jim Macbeth. It acknowledges the part of the York CEO Ray Hooper and his then Secretarial Assistant, Natasha Brennan. The study made a series of 12 recommendations regarding Tourism in York in its Report titled *Shire of York Destination Management Strategic Plan.* **Of the 12 issues and recommendations:**

- **the first was funding for the then Tourist Bureau, and**
- **the 2nd was Nature-Based Tourism in York.**

Clearly they saw this as a high priority for York's tourism.

http://www.deh.gov.au/biodiversity/publications/series/paper5/twoch4.html

This report by DEH cires the following from a 1994 Newspoll surve, for the Commonwealth Dept. of Tourism, of 1200 Australians:

> "53 per cent of Australians planned to visit national parks of natural attractions in the next 12 months. Of those surveyed, 54 per cent rated 'getting close to nature' as very important, and 46 per cent rated 'learning about nature' as very important in choosing a nature-based holiday. Of particular note, say the surveyors, is that the single most emphatic demand was for *'activities which don't damage the environment'*. Seventy percent [70%] of respondents felt strongly enough to rate this as very important."

We all have friends and relations (whether from WA, Interstate or Overseas) who come to the South West (including York) specifically because they are drawn by hearing of our Wildflowers.

DAMAGE TO FARMS, LOSS OF RURAL INDUSTRIES, etc.. due to LOSS OF ORGANIC STATUS, DAMAGE TO SOIL AND CROPS, and LOSS OF MORALE, PEOPLE HAVING TO RE-SETTLE etc....

- I am informed that already, seeing this coming, an Egg Production business has already closed;
- Neighbouring farmers already see themselves **losing Organic status** for their produce;
- Soil and crops are bound to be affected if **pollution leaks** from the Landfill due to any Accident or Natural Disaster.
- Neighbouring farmers are already undergoing a great amount of **Psychological Stress and Distress**, and this will increase if Noise, Pollution, Vibration from the extra traffic on the road and in the Allawuna property, any of the Natural Disasters referred to above interact with the Landfill structures and processes.
- **Some farming may cease, depleting income to the area** and causing **owners to sell, move away,** try and **find work or build up another farm elsewhere** etc.... with all the trauma that goes with having to start again from scratch.

A lot of disruption altogether.

POTENTIAL DISILLUSIONMENT WITH THE SHIRE OF YORK IF THE PROPOSED LANDFILL IS ALLOWED

This **may not be thought by some to be the most rational reason for rejecting the proposed Landfill development.** But if it is allowed, THERE WILL DEFINITELY BE DISILLUSIONMENT AND DISTRUST OF YORK SHIRE OFFICERS AND COUNCILLORS.

How do we know? **For instance:**

- **The large number of Submissions sent to D.E.R. and the large number we know have already been done for SOY and DAP.**

- **The number and proportion of hands raised when a participant asked for a show of hands of those AGAINST the proposed Landfill: about 220 out of the 240 persons in attendance. The only people who did not raise their hands against it were the Shire Councillors and Officers present, the representatives of SITA present, and the couple who own Allawuna Farm.**
- **The rounds of clapping at this meeting and others when questions or comments were made which indicated a desire for the Landfill to not go ahead.**

****

SOLUTION

1. RECYCLE EVERYTHING THAT CAN BE RECYCLED

SITA says (p. 5 of their Booklet) they already have **composting facilities, resource recovery facilities and materials recycling facilities.** Instead of this proposed facility, they should build more of those facilities in Industrial Areas of Perth and the Coastal Plane, and **manufacture new and useful things from whatever can be recycled that way**

This will lead to new avenues to employ people.

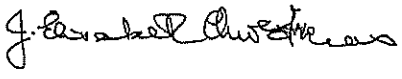
2. IF A LANDFILL SITE MUST BE BUILT, BUILD IT IN AN AREA:

- Already totally devastated by drought and salinity that cannot be productive farm land;
- Further away from town or farming;
- Further away from National Parks, Water Catchment and Gazetted N;ture Reserves;
- In an area where earthquakes have not been known to occur (and where no faults can be found) at least within 500 km radius;
- Where it can be transported by rail. (The company could consider building a rail line or maintaining a 3-Tier rail line if one exists that goes to such a vicinity.)

3. THE PRECAUTIONARY PRINCIPLE SHOULD BE APPLIED: Roughly translated as "where there is any doubt at all, First Do No Harm to humans or the environment". If the action would cause harm to human life or health, is seriously and effectively irreversible, or is inequitable to present or future generations, or is imposed without adequate consideration of the human rights of those affected, then it should be avoided. The onus to Do No Harm is on the Proponent of the Project. (Rio Conference 1992, for instance), and whatever is done should be done with a reasonable margin of safety.

As stated by Sagar V Krupa, Professor of the Department of Plant Pathology, University of Minnesota, in *Air Pollution, Global Climate Change and Agriculture*.....EnviroNews Vol. 6 No. 1 — Millenium Issue — January 2000:

> **"Prevention is better than cure — the post-mortem problem is harder and much more economically draining to fix."**

SIGNED: **Liz Christmas**  BA Hons.(Sydney), BA Hons.(Murdoch), Dip. Ed. (UWA), M.Psych. (Curtin), etc..

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Records

From: Kerryn Oliver [Kerryn@oliverrural.com.au]
Sent: Sunday, 16 March 2014 2:24 PM
To: Records
Subject: Landfill objection

To all members of the Shire Council and Shire Administration

I write to submit my total opposition to the suggested landfill and waste management site proposed at Allawuna Farm. The grounds for my objection are several and include

1. Lack of careful consideration of environmental issues. While the risk of contamination of water, air etc. is claimed to be relatively low there is no justification for taking any risk when it is a known seismic area and so close to one of our state's major water catchment areas. Once pollution occurs it is costly and often difficult, if not impossible, to reverse – not risk worth taking.
2. I regularly travel the road to Perth and am already anxious about the increased use of the road by heavy haulage – any addition to this is risking a serious accident – again not a risk worth taking.
3. The farming community near the proposed site will be compromised – this is an agricultural region and should be maintained as such especially as climatic conditions mean prime agricultural land is increasingly endangered.
4. An unsightly rubbish tip is not conducive to increasing York's attractiveness as a tourist attraction.
5. Any supposed economic benefit to York is likely to be minimal or non-existent and is far outweighed by the potential harm.

I appreciate the need to find sites for rubbish disposal and landfill in general and would support research to find more viable and less harmful sites including places within our shire boundaries should they be identified. Proper and long term planning by an independent agency with a mandate to consult widely is what is required. Finally I have attended all the public events and seen the opposition to this proposal and consider councillors are duty bound to heed the will of the people who elected them. I urge you to do all that is within your power to stop this proposal

Yours sincerely
Kerryn Oliver

Kerryn Oliver
Oliver Rural IT Solutions & Oliver Rural Management Solutions
P.O. Box 447 (43 Grey St)
York
WA 6302
Mobile 0427412120

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Records

From: Jean Wykes [[redacted]]
Sent: Sunday, 16 March 2014 10:11 AM
To: Records
Subject: SITA

Jean Wykes
[redacted]
York 6302

Phone [redacted]

These are just a few of the issues I have concerns about.

- Unhappy about the extra road trucks between York and The Lakes
- Our waters ways including the Mundaring run off
- Our Flora and Fauna
- Surrounding Farms losing their livelihood especially Registered Organic Farms
- High risk if we have an Earthquake

Thank you

Jean Wykes

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Records

From: Alisdair Dougall [alisdaird@bigpond.com.au]
Sent: Sunday, 16 March 2014 6:08 PM
To: Records
Subject: Re: Landfill Proposal by SITA on Allawuna Farm

Alisdair Dougall
65 Waterway Crescent Ascot 6104

16/03/2014

The Shire of York
P O. Box 22
York. W.A. 6302

To The York Shire and Councilors,

Re: Landfill Proposal by SITA on Allawuna Farm – Lots 9926, 4869, 5931 and 26934 Great Southern Highway, St. Ronan's, York.

As a land owner in York and soon to be resident of York I object to the proposed landfill at Allawuna Farm as it does not fit with York's Community Strategic Plan in particular the objective of "Protect and enhance our rural land and spaces" and the priority to "establish land use strategy to ensure rural and farming land is protected". Clearly landfill is not consistent with this and in fact is contrary to this objective and priority.

I object to the increase in the number of large trucks that will be driving along Great Southern Highway which is already a dangerous and very narrow road.

I object to the odour, dust and rubbish that will emanate from the landfill and I object to the detrimental impact on the amenity of York this will have.

York's tourism industry will suffer as a result of the landfill because of the increased number of trucks, the odour, dust and the litter that will be present on Great Southern Highway. What an entrance to York this will be.

As far as I can see there will be no economic benefit to York from the landfill. So as tourism income drops off there will be no income from the landfill to offset this.

I am concerned about the effect of seismic activity on the landfill. In particular the potential for leachate to contaminate ground water.

Furthermore siting a landfill on a farm bordering a drinking water catchment area, thus polluting food producing land and potentially polluting a drinking water supply, is what one would expect in a third world country not in Western Australia.

Regards,

Alisdair Dougall

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Records

From: Andrew Rowland [andrewr68@gmail.com]
Sent: Sunday, 16 March 2014 6:24 PM
To: Records
Subject: Allawauna Landifll Comments- printed
Attachments: Allwauna__Rowland-Rae.pdf

Please find attached our submission in regard to the SITA landfill proposal.

Kind regrds

Andrew Rowland

[redacted]
York
WA 6302

13th March 2014

Re: SITA Landfill Proposal – Allawuna Farm

Dear Sir/Madam,

We own a small farm (16Ha) at 9 Morris Edwards Drive, 10km east of Allawuna. This is both a private residence and a commercial farm. We feel the proposal will adversely impact both our lifestyle and business and we ask you to consider our concerns which we detail below.

Airborne Emissions

York is subject to extreme temperatures during summer with many days over 40C. Annual evaporation rates are around 2000mm which is a potential danger for leachate ponds which run the risk of drying out. Both Tornados[11] and large dust storms have occurred in the area in the past few years with one very destructive storm[12] registering wind speeds of over 120km/h for a sustained period. As such these ponds pose a significant risk to local residents who rely on rainfall for their drinking water which is captured via their roof. Any release of leachate particles to the air would constitute an unacceptable hazard to people in the area as well as the many farmers and horticulturalists – ourselves included – who rely on the unpolluted land in the Avon Valley as a means of making a living.

Fire Risk

All landfills produce gas, predominantly methane, the same gas present in domestic *Natural Gas* used for cooking and home heating.

The release of gas from landfills is not constant.[13] Instead it builds up until the pressure is great enough to force its way through the layers of rubbish blocking its way.

Sudden surges of highly flammable gas in an area bordered by state forest and national park poses an extreme risk of fire especially where heavy machinery is operating at all hours of the day. York's hot dry summers and tinder dry bushland would provide ideal conditions for a catastrophic bushfire to break out, as has happened elewhere[7]. All it would take is one electrical storm in summer and we would have one huge bushfire which would be both extremely hard to fight due to very limited access as well as blocking the only route in and out of York – Great Southern Highway.

This issue requires serious consideration, yet SITA's proposal has virtually no mention of the risk of fire other than to say that it will be addressed at a later stage. They go as far as to state that they will rely on the local (volunteer) fire brigade to fight any fire that occurs. Ironically the same people who are writing to oppose this application.

Earthquake Risk

Whilst the High Density Polyethylene (HDPE) and Geotextile Clay liners used in landfills have been used for many years, their use in seismic areas is unproven. HDPE is a brittle material that can easily crack when subjected to tensile loading or any bending / folding of the liner[14]. The many large sheets are also joined via a plastic "weld" which is also a weak point for the liner. Landfill cells are 3 dimensional structures and joins will not always be in the most favourable orientation making them at a greater risk of failure. Changes in temperature also cause materials to shrink and expand and York experiences some of the states highest and also lowest tempertures at different times of the year making this effect more marked.

From the SITA application:

> *A search of the Geoscience Australia Earthquake Database (5/12/2012) showed no record of any earthquakes within 4 km of the site boundary, with the nearest being a magnitude 2.5 earthquake 4 km to the north east of the property. No earthquakes of magnitude greater than 3.8 have been detected within 20 km of the Allawuna site.*

Whilst the above statement is broadly true, it is very dismissive of the Seismic risk and is notable by its omissions. Here are some facts that are not present in the submission:

- York has been cited by Geoscience Australia as one of the most likely areas in Australia to experience a significant earthquake in the near term[9,1]
- The second largest earthquake in Australian history[8] (Magnitude 6.9) occurred in Meckering less than 36km away which caused an enormous amount of damage[4], far exceeding any assumptions made in the proposal
- There is insufficient evidence of the safety of landfills in seismic areas. The experience of one such landfill from North America is detailed below[2]
- The figure used in calculations on HDPE liner suitability using *"half the 1:500 year peak period ground acceleration (0.07646g)"* is completely arbitrary and also too low according to the statistics from Geoscience Australia which suggests a value in excess of 0.1g [15]
- Calculations also only consider secondary damage from horizontal loading and assume a perfectly plastic soil. Neither of which are realistic in a true earthquake scenario.

Below are excerpts from a publication by the *US Environmental Protection Authority*[2] who have first-hand experience of Landfills in earthquake zones.

> *Damage to landfills from earthquake may be due to the primary seismic hazard of fault displacement or to secondary hazards such as slope instability or liquefaction of the foundation induced by*

strong ground motions. Potential modes of damage MSW landfills associated with the primary seismic hazard include:

- *disruption of liner and cover system*
- *disruption of the landfill gas control system; and*
- *disruption of surface water and drainage control systems.*

Secondary modes of damage to the containment systems of MSW landfills that are subject to strong ground motions include:

- *damage due to liquefaction and lateral spreading of the foundation;*
- *damage due to seismically--induced settlement of the foundation; and*
- *damage due to seismically-induced landslides.*

...

However, experience with the performance of modern landfills conforming to Subtitle D requirements is limited. Of the three landfills designed in accordance with Subtitle D standards subject to the strongest shaking in the Northridge earthquake of 17 January 1994, one experienced two tears in the liner, one of which was approximately 75 ft (23 m) in length, along an anchor trench above the waste.

Furthermore, no landfill with a geosynthetic cover is known to have been subjected to strong shaking in an earthquake and no solid waste landfill is known to have experienced fault displacement or liquefaction in the foundation during an earthquake (even though there are solid waste landfills known to be sited on active faults and liquefiable soils).

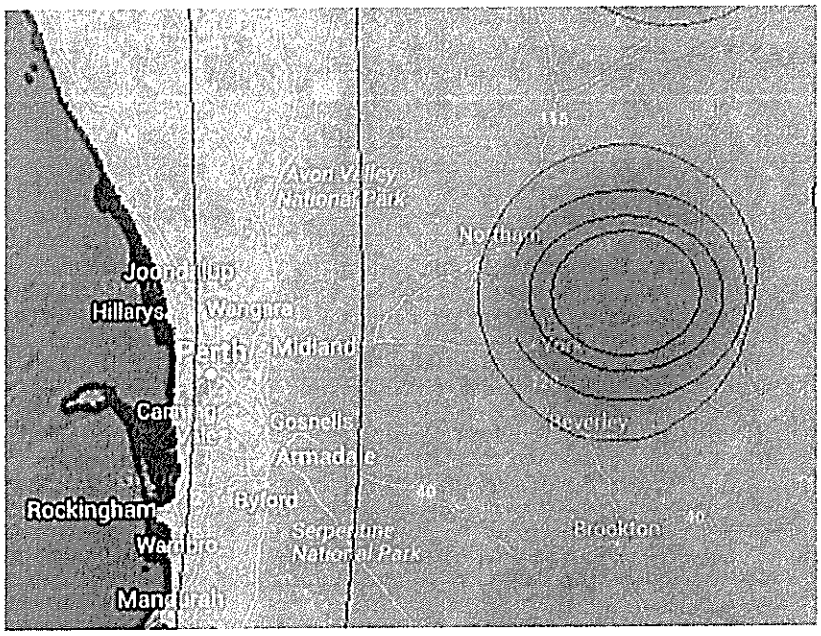
Therefore, caution is warranted in concluding unconditionally that landfills will continue to perform well in earthquakes and investigations and analyses are required to demonstrate that landfills are properly sited to avoid active faults and are properly designed to resist the effects of strong ground motions and liquefaction.

Geoscience Australia also tells us that earthquakes are episodic, so lack of recent activity is **not** an indication of longer term risk. Given that almost 50 years have passed since the large Meckering quake, this may be suggestive of an impending large event.

Models of episodic fault behaviour, with the area surrounding each fault undergoing its own active/quiescent cycles, possibly with subtle stress interactions between neighbouring faults, are emerging in the literature (Toda et al. 1998; Parsons 2002; Stein and Liu 2009; Li et al. 2009; Leonard and

Clark 2011). The occurrence of many of Australia's large (M = 6.0) earthquakes appears to be episodic. Examples include Collier Bay, Tennant Creek, Meckering, Meeberrie, Lake Tobin and Beachport all of which had no significant seismicity in the decades prior to their occurrence. An episodic model of earthquake occurrence implies that a much larger area is involved than is observed from a short-term observation of the seismicity

From Geoscience Australia: Earthquake hazard map. York is situated well within the high risk zone.



The proposed landfill is scheduled to remain active for 37 years. To date, less than 45 years have passed since the last major earthquake in this area which caused major damage to many buildings in York. The chances of another major event not occurring during this time is not to be underestimated and would be catastrophic if it were to happen.

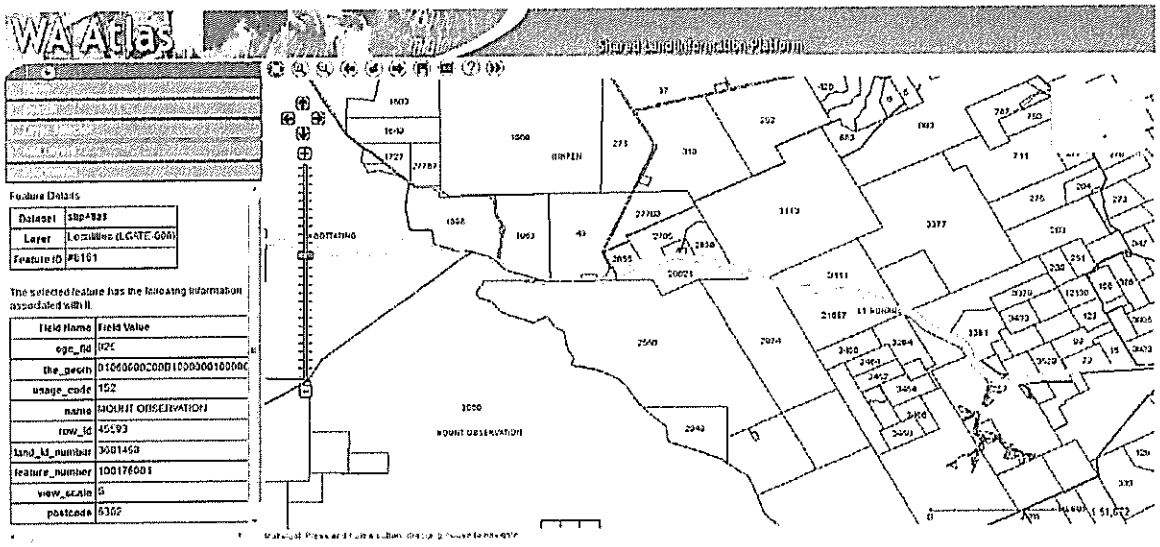
Flood Risk

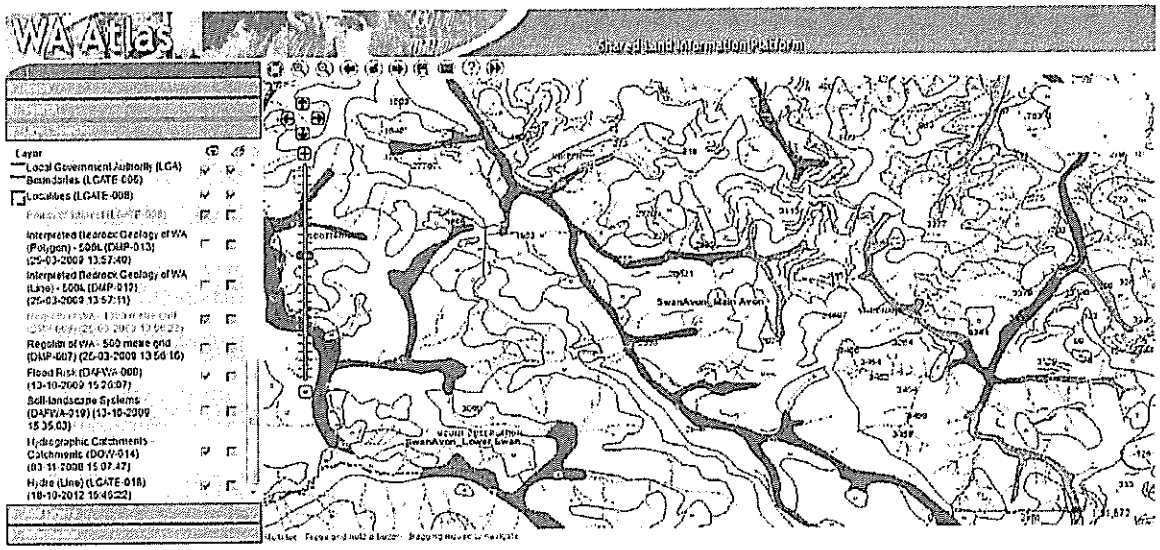
There are also questions with regard to SITA's dismissal of flooding and groundwater risks. The WA Atlas[3] provides the ability to overlay geospatial data in various layers and below are screenshots showing the Cadastre for the Allawuna region and also overlays with:

- DAFWA-019 flood risk (pink)
- Hydrographic Catchments DOW-014 (Blue)

For enlarged versions of these maps, see reference 10 below.

Anyone that has ever been to the area in question will know that there are also signs in this area stating that it is in the Mundaring Catchment and to report any cases involving the dumping of rubbish. It would be the ultimate irony if WA's largest waste dump will be situated only a few hundred metres away as would be the case.





Introduced Horticultural Pests

We grow and sell fruit commercially. Mediterranean fruit fly in our area is relatively rare, allowing us to avoid widespread use of pesticides. Contrastingly, fruit fly in the Metropolitan area is rife and contaminated fruit from domestic waste (even when buried) will allow larvae to hatch and breed. Medfly can cover up to 20km to find food[5] and can also affect Olives and Grapes - both grown

commercially in the York area. This has the potential to decimate not only our business but also that of others. This issue is not addressed in the proposal.

Effects on Wildlife

Allawuna borders national park - predominantly Wandoo and York Gum, preferred sites for Carnaby's Cockatoo[6] a protected species whose distinctive call is familiar to residents of this area. Constant activity and noise are likely to have an adverse affect on the habits of these and other native creatures.

Although SITA supplied a Fauna assessment as part of their application, almost all of this was a "desktop review" with the grand total of *1 day* spent on-site doing a field survey. On this day, 69Ha was covered by which, if we assume a long day and ignore travel time, works out to a minimum of 10Ha/hour. Now, 100,000m^2 is a very large area to cover every hour if you are doing a thorough study so this represents a very speedy assessment. This is clearly little more than a box ticking exercise so that they could say that this particular item had been addressed. We suggest that it hasn't, particularly as most wildlife activity occurs at the very start and end of the day.

Summary

SITA has gone to great effort to commission a large document whose primary purpose seems to be to overwhelm the reader with information and for it to appear to have addressed all the relevant criteria. Whilst the document is intentionally very technical in places, it does not stand up to scrutiny with many inaccuracies, incorrect assumptions and omissions.

We regard this proposal as a series of risks, many of them unacceptable risks. We ask that the Shire of York respect the rights of the York community and **reject** the proposal on the grounds that it poses significant and uncertain dangers to the health and lifestyle of local residents and businesses

Yours faithfully

Andrew Rowland & Glenys Rae

References

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2. US Enivronmental Protection Authority - Seismic Design Guidance for Municipal Solid Waste Landfill Facilities http://nepis.epa.gov/Adobe/PDF/30003BCI.pdf
3. WA Atlas https://www2.landgate.wa.gov.au/bmvf/app/waatlas/
4. Images from Meckering Earthquake http://bit.ly/1lAZ0i3

5. NZ Better Border Biosecurity research programme http://www.b3.net.nz/gerda/refs/24.pdf
6. Carnaby's Cockatoo (Dept of Environment and Conservation, WA) http://www.dec.wa.gov.au/component/docman/doc_download/117-carnaby-s-black-cockatoo.html
7. Williams and Aitkenhead (1991) Lessons from Loscoe: The uncontrolled migration of landfill gas; The Quarterly Journal of Engineering Geology 24 (2), 191-207
8. UWA – Review of the 1968 Meckering Earthquake http://www.seismicity.see.uwa.edu.au/welcome/seismicity_of_western_australia/wa_historical/meckering
9. Geoscience Australia Hazard map : http://www.ga.gov.au/darwin-view/hazards.xhtml
10. Flood risk WA Atlas: http://bit.ly/11fBWGl, Cadastre: http://bit.ly/Z2Z2Uz
11. http://www.abc.net.au/news/2012-06-08/tornado-near-york-in-western-australia/4059442
12. http://www.perthnow.com.au/news/western-australia/storm-worse-than-cyclone-shire-president/story-e6frg14u-1225996973112
13. Wikipedia article on Landfill Gas http://en.wikipedia.org/wiki/Landfill_gas
14. Stress Cracking Behaviour of HDPE Geomembranes and its Prevention, Geotextile Research Institute, Philadelphia., PA
15. AusGeo News, Geoscience Australia http://www.ga.gov.au/ausgeonews/ausgeonews200506/warocked.jsp

Records

From: Karen McRoberts [redacted]
Sent: Sunday, 16 March 2014 7:53 PM
To: Records
Subject: submission on landfill - printed
Importance: High
Attachments: Council submission.doc

Dear Council Officer,

Please find attached our submission on the proposed landfill development.

If there is any problem, please advise ASAP.

Sncerely,

Karen and Bill McRoberts

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March 16th, 2014

Re: SITA Landfill Proposal, York

Submission to The York Shire Council - 2 pages

We oppose the SITA Landfill Development at York for the following reasons:

1. **The construction and siting of this tip are completely untenable from an environmental point of view.**

The risk of ground and surface water pollution, in an earth-quake prone recharge area, next to a national park, is simply not acceptable!

I am particularly wary, as I have conducted much scientific research inclusive of the role environment plays in the ecology of disease. I think you would find it useful to read "Causes of Large-Scale Mortality in Waterbird Populations" Chapter 3, pp 1-48, in my PhD thesis. I reviewed international and Australian situations, and included some information on avian species in general, not just waterbirds as the title implies. Available in the Murdoch University Veterinary School Library. McRoberts, K.M. (2000) Investigation of Large-Scale Mortality in Nestling Straw-Necked Ibis (*Threskiornis spinicollis*) with Emphasis of Giardiasis.

I've had much experience with disease and aquatic environments (this tip will be one, at times), including retrieval of many sick birds from landfill sites in Perth. Registered wildlife carers (and the veterinarians who aid them), I expect contactable through DEC, would be able to comment "first-hand" from similar experiences. The Murdoch Vet Hospital itself would be worth contacting.

Endangered species such as the Carnaby's Cockatoo would be at risk. Migratory species also. As an example, the square-tailed kite hunts in this area; it is a creature requiring a large territory, perhaps up to 100 square kilometres. Apart from the leakage problem, the hot dry windy summers here concentrate migratory waterfowl on the few water bodies available. This weather itself will ensure that much waste is carried elsewhere.

Technology, while it may be so-called "state of the art" is not foolproof. Membranes can tear and degrade. Membranes can overflow. This is especially worrying considering the earthquake history and potential of the area.

People are certainly not foolproof. Accidents happen. Fukushima is a good example; I also cite the frequent sewage spills into the Swan River as a prime local example. Waste can be spilled *enroute* or *in situ*. The "human factor" ensures this will occur. Further, the waste itself will contain all manner of things – things that cannot be completely controlled; even waste purposely included from unethical agents. These will include pathogens and hazardous chemicals. This tip will act as a site for microbial pathogenesis, much of which will not be beneficial. There may well be mosquito eruptions when the tip contains water. Nothing need be said about the disease-carrying potential of mosquitoes.

Finally on this point, as a general comment: Transfer of pathogenesis between animal and human populations has become a serious reality. In light of this sobering fact (think bird flu, SARS, infectious cancer, and the recent polio "revival" initiating from Asian landfill sites) *why* continue to use outdated, dangerous landfill "technology" as a means of waste disposal? ! If we must have it, please put it in areas where risk is minimalised. Certainly not anywhere near seismic activity!

2. Safety for people and animals – more trucks on unsuitable roads mean more accidents. The potential for disaster in terms of human trauma is high.

People will be impatient and try to pass trucks when they should not. People who use the highway may have been travelling for some hours.

The intersection with Wambyn Road is especially dangerous. I have witnessed several accidents in the vicinity, and been involved in some frightening near-misses. I've brought this to the attention of the council; I've never received a reply.

Many tourists use these roads during wildflower season; they are unfortunately not always looking where they're going, crossing the road in anticipation of exciting wildflower discoveries. Many are elderly, so

they will react slowly. Grandparents often bring small children to observe the wonders of nature, who may run across the road in anticipation.

Further, the area is rural; stock on the road is a common occurrence.

3. **Increased traffic noise and noxious smells will negatively impact on the well-being of nearby residents, and the values of their properties. Contamination of ground and surface water will have negative effects on the environmental health of these properties.**

This is totally unfair to those who've bought rural property expecting a rural lifestyle.

4. **More traffic will increase the fire hazard in this area.**

Can drivers be absolutely guaranteed not to throw cigarettes out the window?

5. **The traffic generated by this tip will adversely affect tourism in the area.**

Tourism is very important to York. Many people who would otherwise enjoy a lovely day out in the country will forego the experience if they have to fight this kind of traffic on a road that will not be able to handle it. And who wants to get stuck behind smelly rubbish trucks? This road has very few safe passing places.

6. **The proposal is an insult to the people of York; it is damaging to the Community Spirit of our town.**

A final point, we are repeatedly told that the council will do "what is best for the community." This is an insulting, patronising attitude.

I put it to you that the community knows what is best for itself - we are not ignorant people! It is not the council's job to decide what is right or wrong. This is NOT democracy - this is more akin to the divine right of kings!

The vast majority - if you consider only 2 in 200 people at the recent meeting stated they were in favour of the proposal (those who stand to profit directly from it) - that means 99 % of the community is opposed to this development! Add to this the petition, submissions to the EPA, and the voice of the people at the community meetings - surely the council can be in no doubt whatsoever that the people of York are overwhelming opposed to this development!

There have also been statements that the council is "here to listen to residents and represent their views." Wehope this is the **true** attitude of the council; it is the correct one.

The argument for job creation does not hold up. Only a few,unskilled,jobs would be available, and there is no guarantee they would go to people from York.

Lastly, it is disheartening to see a model of the "safe, innocuous" landfill in the Councils' offices! When you state you are taking no sides, it's a mockery! When the information came out in an underhanded manner and when a works application goes to the DER *before* the proposal has been considered, what are we supposed to think?

Please *do* listen to the overwhelming majority of York residents and reject this proposal.

Sincerely,

Karen and Bill McRoberts