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Thyspunt Alliance
St Francis Bay Resident's Association
St Francis Kromme Trust

Dear Mr. Thorpe, Thyspunt Alliance and its members, the St. Francis Bay Resident's Association and the St Francis Kromme Trust

RE: ESKOM EIA CONCERNS FOR THE PROPOSED NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE (DEA Ref. No: 12/12/20/944)

Geohydrology Assessment Study 135 Final / March 2011

Quotes from the Geohydrology report surrounded by borders and relevant text highlighted in yellow.

S. Cowling's comments and questions are highlighted in turquoise

Comment 1:

Summary
The obvious bias throughout the report and especially in the conclusions, raises doubts about the integrity of the study. Methods of mitigation are vague. How can the report conclude with such confidence that impacts can be reduced with mitigation, lowering impacts from high to low, yet use language such as "This impact **may** be mitigated..." with dewatering schemes which the report states have "not yet been designed".

Furthermore, the purported methods of mitigation to protect the construction of the infrastructure (not the natural systems) pose a further threat to the natural systems. These cumulative threats are not included in the conclusions.

The report acknowledges severe threats eg depletion of local aquifers, degradation of wetlands, during construction but is unable to provide mitigation details, costs or efficacy, but is confident of success. This is a flaw in this report. Table 4.3 gives data for 7 sites analysed at Thuyspunt, of which 5 indicate scale-forming. However, the conclusion reads =Results indicate that corrosion is unlikely to be a problem at this site. The report fails to include the problems associated with scale forming in the conclusion. This scale forming is likely to cause great problems with infrastructure involving pipes, pumps etc. and cannot be ignored.

*"Quote "**4.4 No Go Option***
*In the event that the sites are not developed for NPSs, Eskom will sell the Bantamsklip and Thyspunt properties and non-essential parts of Duynefontein could also be sold. In this scenario the impact is seen to be of low intensity, neutral consequence and low significance for the Bantamsklip site but of medium intensity, negative consequence and high significance for the Thyspunt and Duynefontein sites as **it is unlikely that a similar level of site control and preservation of aquifers and ecological features could be enforced or afforded by private land owners/developers** as would have been the case with a nuclear site. The main mitigation measure for this scenario would be strict*

enforcement of conditions applicable to any approved future development of the sites, which would presumably cover preservation of these features."

The above text indicates the overwhelmingly strong bias of the specialist in favour of the client. Private owners or developers wishing to develop would have to undergo the stringent requirements of an EIA. Private developers are highly unlikely to propose a development of the same scale or of threat as the building of a nuclear power station. In the event of a No Go, because the land has been purchased with State funds, it could become a state asset such as a sustainably managed natural and cultural heritage site.

Response 1:

Depletion of aquifers is a worst case scenario impact, which assumes that groundwater will be abstracted. However, as indicated in the project description in Chapter 3 of the Revised Draft EIR and in Chapter 5 of the Revised Draft EIR, the project will make exclusive use of desalinated seawater for construction and drinking water during construction and operation.

An extensive programme of wetlands and groundwater monitoring undertaken at the all three alternative sites throughout 2010 (culminating in the Wetlands Monitoring Report – Appendix E12 of the Revised Draft EIR) found that the Langefonteinvlei wetland, the most critical and sensitive wetland on the Thyspunt site, is not geo-hydrologically linked to the footprint of the power station and that dewatering of the power station excavation would therefore not cause impacts on this wetland, particularly if the recommended mitigation of a hydrological cutoff wall around the excavation is implemented. The only wetland impacts that were found could not be mitigated are the impacts on the coastal seep wetlands.

Further a system of cut-off walls, boreholes and wellpoints was successfully used for dewatering/groundwater control for the excavation for the Koeberg Nuclear Power Station. This enabled the bedrock surface exposed in the base of the excavation to be mapped for geotechnical engineering purposes and for the foundations to be laid safely and in dry conditions. The thickness of saturated sands at this site was about 14 m and the base of the excavation was at an average of 10 m below sea level. The dewatering design is shown below figure and an aerial photograph of the excavation, showing the stable side walls and dry floor is also attached. Trucks can be seen on side ramps into the excavation.

A similar system was also successfully used for dewatering/groundwater control for excavations for Coega Harbour north of Port Elizabeth. This site was particularly demanding from a safety/design point of view as excavations took place in the tidal zone and below sea level. Men and machinery were working many metres below sea level with only a cut-off wall and some boreholes/wellpoints stopping the excavation from collapsing, which would have had disastrous consequences. SRK acted as review consultants for the National Ports Authority on this project and can vouch for the effectiveness of this type of integrated groundwater control design.

In the light of the above examples (and many more world-wide), SRK has full confidence in a) the feasibility of such a design and b) the effectiveness in practice of such a design.

Lastly your views regarding the alternative forms of land use being subjected to stringent EIA requirements are noted. However, unfortunately recent history of residential and golf estate developments in the St. Francis region contradict your statement. Even though these developments have been subjected to EIA processes, development of these sites has caused extensive destruction of heritage resources and portions of the mobile dune systems, without sufficient mitigation being undertaken. There is, therefore, reason to believe that other developments having a severe impact would be permitted. It must be borne in mind that developments are not always planned on a large scale. Small developments that individually have insignificant impacts can have highly significant impacts when their cumulative impact over time is considered. This is particularly the case with the development of urban areas along the coastline.

Comment 2:

If the actual mitigatory activities of building cut-off walls also pose a threat to the sensitive wetlands etc, why is this not mentioned in the Conclusions?

Response 2:

A cut-off wall would pose little or any threat to the wetlands as it is designed specifically with a view to **mitigating** the impacts on wetlands due to groundwater drawdown in the power station excavation. A cut-off wall would be placed parallel and directly adjacent to the power station excavation, as shown in Figure 4.7 of the Freshwater Ecology Assessment (Appendix E12 of the Revised Draft EIR).

Comment 3:

The specialist has referred to interconnectedness in the groundwater systems between the site and the east flowing Sand River. Why is the potential contamination of the latter groundwater (a vital past and potential water source for Greater St Francis Bay) by emissions (of any level) and of bacterial origin not mentioned in the Conclusions?

Response 3:

Interconnectivity is used here in the sense that there are no physical boundaries *per se*, e.g. an impermeable geological formation. However, there could be water divides and the groundwater in the Nuclear Power Station footprint/excavation area is not directly connected to the Sand River System. Liquid emissions will have no impact on the latter. Normal gaseous emissions are postulated to impact on this area but at levels well below any human health or ecological concern.

Comment 4:

How can the report state that the Thyspunt site has a low to medium sensitivity over most of the site in view of the fact that the Thyspunt site has all five criteria for sensitivity listed in the report viz major aquifers; existing supply boreholes/springs; wetlands/seeps; surface water features such as rivers and dams; and 500 m buffer zones around the fore-mentioned?

Response 4:

The Thyspunt site only has two of the above criteria present, i.e. a major aquifer and wetlands/seeps, plus the (arbitrary) 500 m buffer zones. The wetlands are shown as having a high sensitivity and have a 500 m buffer zone of medium sensitivity. In the light of the additional wetlands/ groundwater monitoring work, the high sensitivity of the Langefonteinvlei, or at least the southern parts, may be changed to medium.

Comment 5:

Why the phrase “these (water) bodies may (sic) sustain sensitive ecosystems” when the wetlands expert in the EI Assessment has stated emphatically that these are sensitive ecosystems of global and unique importance?

Response 5:

The wording will be changed, i.e. *may* will be deleted.

Comment 6:

“Quote pg 157 A groundwater monitoring programme is essential, as it will provide:
Baseline information on aquifer behaviour for at least a two-year period before construction commences;”

Why isn’t this vital point of 2 years monitoring included in the report’s conclusions?

Response 6:

An expanded groundwater monitoring programme commenced in early 2010 and the results thereof are documented in the Wetlands Monitoring Report (Appendix E12 of the Revised Draft EIR). This monitoring programme is ongoing and also includes wetlands, meteorology and oceanography. . A comprehensive recommended monitoring programme is recommended in Section 5.4.10 and Table 5.6 of the Freshwater Ecology Assessment (Appendix E12 of the Revised Draft EIR Version 1). The updated EIR (Version 2) will be amended accordingly.

Comment 7:

The report acknowledges severe threats in construction eg depletion of local aquifers, degradation of wetlands, but is unable to provide mitigation details, costs or efficacy, but is confident of success. This is a major flaw in this report.

Response 7:

The Geohydrological Assessment (Appendix E7 of the Revised Draft EIR Version 1) must be read in conjunction with the Freshwater Ecology Assessment (Appendix E12 of the Revised Draft EIR Version

1) as these studies both focus on assessing impacts (from different perspectives) on hydrological resources. As indicated in Response 1, a programme of groundwater and wetland monitoring has confirmed that the proposed mitigation measures are practical.

There are no 'severe threats' only the possibility of depletion of aquifers should inappropriate use of groundwater take place. The additional wetlands/groundwater investigation started in January 2010 has since shown that the wetlands are unlikely to be affected by controlled use of groundwater in the footprint area.

Comment 8:

"Cut off wall and Monitoring to prevent: Degradation of Ecologically Sensitive Wetlands / Seeps / Springs

This impact may be mitigated by constructing a cut-off or diaphragm wall, and by carrying out groundwater level monitoring. Groundwater monitoring is considered an essential mitigation measure so that timeous remediation measures can be taken, if required. The final design of dewatering schemes has not been established. However, based on results from this EIR study, the construction of such a barrier is considered to be an essential mitigation measure at the Duynefontein and Thyspunt sites. The siting of the NPS within the EIA Corridor should also take into account the optimal position from this point of view. Abstraction should preferably not take place from aquifers with direct links to freshwater ecosystems. Roads, cables, foundations and pipelines should all avoid passing through/intruding areas identified as important hydrological corridors and no roads, pipelines, cable routes or other structures should be passed through wetland areas."

Given the content of the box above –the unknowns, the sensitivity of the site, the further threats posed by mitigatory actions - the conclusions of this report should surely recommend this site as unsuitable for an NPS.

Response 8:

As indicated in Response 1, extensive groundwater and wetland monitoring has taken place (Refer Wetlands Monitoring Report, Appendix E12 of the Revised Draft EIR). Monitoring undertaken for this study has reduced the uncertainty sufficiently that geo-hydrological linkages between aquifers are well enough understood to prevent impacts on aquifers and critical wetlands. See also Response 1.

Comment 9:

"Executive summary Pg iv
The impact rating of the potential environmental impacts is summarised as follows for the construction and operational phases:

Flooding by groundwater: Medium at all three sites with out mitigation and Low with mitigation;"

Elaborate on this inexplicable point.

Response 9:

This has been addressed previously and was a typing error. The correct wording is as shown as below:

Flooding by groundwater: Medium at all three sites ***without*** *mitigation and Low with mitigation;"*

Comment 10:

"*Depletion of local aquifers: Medium at Thyspunt and Low-Medium at Bantamsklip and Duynefontein without mitigation and Low at all three sites with mitigation;"*

Provide details on mitigation and explain how intensity becomes low – Has this been assessed in the light of recent rainfall events, especially over the medium term (and not just after the recent events). Mention threat by mitigatory cut-walls.

Response 10:

Dewatering the construction area will result in lowering of the water table, which could deplete the local primary aquifer system. Potential impacts relating to a declining water table include the threat of decreased yields of existing production boreholes / wellpoints and drying up of wetlands/seeps. Without mitigation the intensity is assessed to be low as the natural processes (i.e. depth to groundwater, sustainable borehole yields, etc.) would be negligibly altered. The duration of this potential impact is assessed to be short-term, as once the excavation works have been completed, the water table will soon attain its pre-construction natural depth below ground level. Mitigation measures could include managed artificial recharge of the primary aquifer with pumped groundwater near to sensitive features and installing cut-off walls around the dewatered excavation areas. With mitigation, the intensity is assessed to be low.

The extent of the influence of dewatering on groundwater levels was determined by numerical modelling and shown to be of limited extent, especially with the installation of cut-off walls.

At the Thyspunt site there are no cumulative impacts relating to depletion of the aquifer systems as there are no other significant developments and / or large-scale groundwater abstraction areas within the indicated area of influence of dewatering/groundwater control.

Groundwater could be used for start-up water supply at the Thyspunt site based on aquifer potential and assessment of impacts on the aquifer/wetlands/seeps.

Comment 11:

"Degradation of wetlands / seeps / springs: Medium at Thyspunt and Duynefontein and Low-Medium at Bantamsklip without mitigation and Low at all three sites with mitigation."

3. Provide details on mitigation and explain how intensity becomes low and what the confidence limits are.

Response 11:

Potential impacts relating to a declining water table may include the drying up/degradation of coastal springs, seeps and / or wetlands in close proximity to the sites. These bodies sustain sensitive ecosystems and are mostly fed and sustained by groundwater from the primary aquifers. The survival of such ecosystems may be threatened due to dewatering activities and/or foundations or cut-off walls. The intensity is assessed to be medium, as the functioning of such coastal springs, seeps may be temporarily modified. The duration will be short-term during construction but could be long-term during operation. With mitigation, the intensity is assessed to be low. The additional wetlands/groundwater monitoring work has also shown that the Langefonteinvlei at Thyspunt is perched above the water table in its southern and western parts.

An assessment of impacts to these surface freshwater ecosystems has been carried out and includes identification and mapping of the wetlands in the vicinity of the sites, classification of the wetlands and an assessment of wetland sensitivity and importance. Modelling has shown that it will be possible to site the NPS within the EIA Corridor so that these impacts will be minimal to absent. Ongoing monitoring is taking place and additional modelling will be carried out if measured parameters exceed established trends.

Confidence levels are high in the light of the additional monitoring being carried out.

Comment 12:

Quote pg 9 from report Modelling scenarios: Alternative scenarios for a given area are then assessed. In order to develop a model of an aquifer system, certain assumptions have to be made, including the following

- *The system is initially in equilibrium and therefore in steady state.*
- *The available information on the geology and field tests is considered as acceptable and representative.*

Models done by Dr Ingrid Dennis and reviewed by Professor Gerrit van Tonder of UOFS who has a BSc Hons in geohydrology and MSc and PhD in geohydrological statistics and data analysis. The modelling was also reviewed by Peter Rosewarne and Richard Connelly."

Can we have written statements from these experts confirming that this system is in equilibrium and therefore in steady state. If they are unable to confirm this, how do the models hold up?

Response 12:

In all numerical flow modeling simulations, the accepted protocol is to first construct a steady state model. This is essential and unavoidable in order to first calibrate the model. Models are simplifications of the real world situation and certain assumptions have to be made in order for them to run properly. To reiterate this important point, this is the standard international procedure for constructing and running numerical groundwater flow models.

Comment 13:

"Quote pg 11 : The best way to improve the confidence in a groundwater model is to collect time series data. An extended groundwater/wetlands monitoring programme was thus initiated by Eskom at the site in February 2010, scheduled to run for at least one year. Additional boreholes/piezometers have been established and continuous data loggers installed."

Have these data been analysed and do they support or negate the earlier assumptions and findings.

Response 13:

Results of the groundwater / wetlands monitoring programme were analysed and the outcomes are documented in the Wetlands Monitoring Report (Appendix E12 of the revised Draft EIR). These outcomes support the finding that mitigation of wetland impacts is possible, as it was found that aquifers feeding critical wetlands such as the Langefonteinvlei wetland are not geohydrologically linked to the aquifer at the proposed power station position.

Comment 14:

"Quote pg 12: Thyspunt …. The nuclear footprint is likely to be located very close to the coastline."

How close is "very close" and how does this align with distances from the shoreline given in the other specialist reports.

Response 14:

A strip of 200 m will be kept clear of any development at all three alternative sites. Thus the power station will not be constructed less than 200 m from the coastline. All specialist reports were prepared on the assumption that there would be no development within this 200 m coastal strip.

Comment 15:

"Quote pg 94 The prevailing wind direction is south-westerly to north-easterly."

Why does this differ from the emissions report which states that the northwesterly is a prevailing wind."

Response 15:

The wind direction stated in the Geohydrological Assessment (Appendix E7 of the Revised Draft EIR) is incorrect and will be corrected to be consistent with the Air Quality Assessment (Appendix E10 of the Revised Draft EIR).

Comment 16:

"Quote pg 96 Groundwater flow direction is to the south / east with discharge along the beaches and rocky outcrop into the ocean, and to the south-east into the Sand River aquifer. Local groundwater flow also occurs in westerly and eastern directions, possibly along channels between the dunes and then enters streams or rivers with subsequent southerly flow towards the ocean; Also A high yielding significant intergranular aquifer occurs to the east of Thyspunt at Mostert's Hoek and St. Francis Bay, where a spring with an artesian yield of 8 L/s occurs."

Why does the report ignore the tremendous water resources of the Sand River system which has in the past, and potentially be a future source if sustainably managed?

Response 16:

It is not clear what is meant here by 'ignore', i.e. ignore these resources from a possible supply source point of view or from a possible impact point of view? In terms of the former, this system was not considered because of sensitivities regarding previous/existing/future use by St. Francis Bay, environmental concerns and accessibility. In terms of the latter, there will be no impacts from the nuclear power station excavation/dewatering/groundwater control. The only potential 'impact' is from gaseous emissions during normal operation of the nuclear power station.

Comment 17:

The intergranular aquifer is currently classified as a Major Aquifer system (Parsons 1995 and Parsons and Conrad 1998), as this aquifer produces high yielding boreholes with good water quality. The site is classified as being highly vulnerable to anthropogenic impacts.

Why if, as the report states, the groundwater flows into the Sand River aquifer, and this system with good quality water is highly vulnerable to human impacts, why is this not mentioned in the conclusions – or for that matter, more detailed in any of the impact analyses?

Table Mountain Group Aquifer
The TMG Aquifer is classified as a major aquifer system. The aquifer is classified as having a moderate vulnerability to anthropogenic impacts.

Response 17:

It is stated in the Revised Draft EIR Version 1 that, on a regional scale, groundwater flow is to the south and east and to the southeast, into the adjacent Sand River Aquifer system. It should not be inferred from this statement that groundwater generally flows from the site into the Sand River Aquifer. This could possibly apply to groundwater in the northeast parts of the site, away fro the potential Nuclear Power Station footprint. Groundwater in the vicinity of the proposed nuclear power station footprint flows into Thysbaai.

Comment 18:

10. Earlier, the report states that groundwater systems are interconnected and flows eastwards. Where is the detailed assessment of risk to the water system of the Sand River? The interconnectedness implies that activities at Thyspunt will affect the artesian well of St Francis Bay. Given the scarcity of water in the greater St Francis Bay and NMMetro region, no threat to artesian wells should be tolerated. (These wells have supported Greater St Francis Bay for many years).

Response 18:

Activities at Thyspunt, e.g. nuclear power station excavation dewatering or use of groundwater in the footprint area (which will all be associated with the Algoa Aquifer), will have no effect on the Sand River or wells/boreholes in the St. Francis Bay area.

Comment 19:

Hydraulic heads
The hydraulic head values as calculated during the steady simulations were specified in the model.

Scenario using regional model: Potential groundwater contamination due to air pollution from site –

Scenario 1: Deposition of tritium
In this scenario the movement of tritium is simulated from the deposition thereof on the ground, to the movement of it in the groundwater system. Tritium is modelled as though it is conservative. It is once again important to note that the nature of the subsurface (vegetation and soil types present) will also play a role in their movement. Therefore, this scenario can only serve as an indication of what can occur and must be seen as qualitative and not quantitative. Using average annual emissions assuming two EPR and three AP1000 units (to make up the 4 000 MWe) it is clear that most of the wetlands and the St. Francis Bay boreholes will be affected by emissions, but by low concentrations of ~2.5 TU. This is for a 20 year indicative simulation period.

All potential NPS contaminants of the groundwater system would migrate towards the sea and as such very little groundwater contamination is expected. This does not include potential contamination of groundwater due to air emissions. Why is the potential contamination of wetlands and groundwater by emissions (of any level) not mentioned in the Conclusions?

Response 19:

The Geohydrological Assessment is being updated and any pertinent omissions as pointed out will be addressed in the new version.

Comment 20:

"Quote from Report 2.4Site Sensitivity
Site sensitivity has been assessed according to the categories listed below. Category Description

High sensitivity
These are no go areas or severely prohibited areas for development; they may be protected by legislation

Medium sensitivity
These are areas that may have the potential for development, if adequate mitigation measures are prescribed Low sensitivity. These areas have no sensitivity to development.

The sensitivity of each of the sites is shown in Figure 2.67 (Duynefontein), Figure 2.68 (Bantamsklip) and Figure 2.69 (Thyspunt) for the defined site areas. Criteria used for defining site sensitivity were the presence of any of the following:

- *Major aquifers;*
- *Existing supply boreholes/springs;*
- *Wetlands/seeps;*
- *Surface water features such as rivers and dams; and*
- *500 m buffer zones around the above.*

Thyspunt Site sensitivity analysis indicates a low to medium sensitivity over most of the site with a high sensitivity for the wetland areas."

How can the report state that the Thyspunt site has a low to medium sensitivity over most of the site in view of the fact that the Thyspunt site has all five criteria for sensitivity listed above?

Response 20:

Your comment is noted however please read the text again. It states that criteria used for defining site sensitivity were the presence **of any** of the following The Thyspunt site only has **two** of the above criteria present, a major aquifer and wetlands/seeps, plus the 500 m buffer zones around these features.

Comment 21:

"Report states the following:
It is recommended that the system be further monitored and the model re-calibrated as further monitoring data are collected, especially in terms of groundwater/wetlands interactions. However, it is considered unlikely that widely differing results will be obtained."

On what basis it is it considered that widely differing results will be obtained?

Response 21:

The statement is that '...it is considered *unlikely* that widely differing results will be obtained.'

Comment 22:

Will the next final report describe the impacts – not only immediate but also the longer term records - of the July rainfall events, and what are the conclusions?

Response 22:

The Revised Draft EIR Version 2 will reflect the latest monitoring data and the implications thereof.

Comment 23:

"ENVIRONMENTAL ASSESSMENT
4.1 Construction Phase
Flooding by Groundwater – Direct Impact
As the natural groundwater levels at the sites are shallow, flooding will occur immediately when excavations extend below the water table. This potential impact refers to the natural effect of the environment on the construction works, whereby groundwater inflow into excavations will hinder and be a danger to construction activities. Without mitigation the *intensity* (i.e. the management of the impact in relation to the sensitivity of the receiving environment) is assessed to be *medium* because the natural geohydrological processes (i.e. movement of groundwater) will continue, albeit in a modified way. Localised flow directions may be altered as a result of the change in hydraulic gradient. However, the *duration* of this potential impact is assessed to be *short-term*, as once the excavation works have been completed, the environment will mostly recover to equilibrium with groundwater levels and flow directions achieving pre-construction conditions. With mitigation, the *intensity* is assessed to be *low*."

15. Describe mitigation in detail and also costs and explain how intensity becomes low – also explain the assumption with recovery to equilibrium. Explain how the redirected "modified" water flows will achieve re-construction conditions when a massive infrastructure has been built in the original path?

Response 23:

The costs associated with mitigation, such as a cut-off wall, pumping and return of pumped water to the upper aquifer, are likely to be significant on their own but not in relation to the overall site development/installation cost.. Such costs are impossible to estimate with any accuracy at this stage as site specific design details are not known to the specialist.

Comment 24:

"Degradation of Ecologically Sensitive Wetlands / Phreatophytes / Seeps / Springs – Indirect Impact

Potential impacts relating to a declining water table may also include the drying up/degradation of any coastal springs, seeps, phreatophytes and / or wetlands in close proximity to the sites. These bodies may sustain sensitive ecosystems and are mostly fed and sustained by groundwater from the primary aquifers. The survival of such ecosystems may be threatened due to dewatering activities and/or foundations or cut-off walls. The intensity is assessed to be medium, as the functioning of such coastal springs, seeps and / or wetlands may be temporarily modified. The duration will be short-term during construction but could be long-term during operation. With mitigation, the intensity is assessed to be low."

16. Why the phrase "these (water) bodies may sustain sensitive ecosystems" when the wetlands expert in the EI Assessment has stated these as being of global and unique importance"?

Response 24:

The wording will be changed.

Comment 25:

17. If the mitigatory activities of building cut-off walls also pose a threat to the sensitive wetlands etc, why is this not mentioned in the Conclusions?

Response 25:

A cut-off wall would pose no threat to the wetlands. This will be explained in the Revised Draft EIR Version 2.

Comment 26:

18. Why is there no proper justification for the confidence (or not) in low impacts?

We need more information that (sic) just an opinion. The EIA specialist reports state that this is a unique system in the world. Therefore there is a need for proper justification that these activities will have low impacts. Why is there no proper assessment of the impacts of the mitigation?

Response 26:

As indicated in several responses above, confidence in the assessment of impacts has been drastically improved through analysis of the data from a wetland and groundwater monitoring programme, as documented in the Wetlands Monitoring Report (Appendix E12 of the Revised Draft EIR).

Comment 27:

"An assessment of impacts to these surface freshwater ecosystems has been carried out and includes identification and mapping of the wetlands in the vicinity of the sites, classification of the wetlands and an assessment of wetland sensitivity and importance (Day, 2007a and Day, 2007b). Modelling has shown that it will be possible to site the NPS within the EIA Corridor so that these impacts will be minimal to absent. However, further investigation, monitoring and modelling is planned for these areas to firm-up predictions and mitigation measures."

19. The conclusions need to include the fact that the mitigation methods in themselves pose threats to the wetland, seep etc systems. Mitigation must be more fully described and report must explain how intensity becomes low.

Response 27:

The mitigation measures could have an impact on coastal seeps but not on the other wetlands. This will be addressed in the updated specialist study..

Comment 28:

"Quote from report pg150 Degradation of Infrastructure – Direct Impact
In scale forming water, a precipitate or coating of calcium or magnesium carbonate can form on the inside of the piping. This coating can inhibit the corrosion of the pipe, because it acts as a barrier, but it can also cause the pipe to clog. Water with high levels of sodium, chloride, or other ions will increase the conductivity of the water and promote corrosion.

Corrosion can also be accelerated by:

- *・low pH (acidic water) and high pH (alkaline water),*
- *・high flow rate within the piping,*
- *・high water temperature,*
- *・oxygen and dissolved CO2*
- *・high dissolved solids, such as: salts, sulphates,*
- *corrosion related bacteria and electrochemical corrosion, and*
- *presence of suspended solids, such as sand, sediment, corrosion by-products, and rust.*

The Langelier index indicates the corrosivity of water (Langelier Saturation index). If its value is lower than - 0.5, then water is corrosive, if it is higher than + 0.5 then the water has a high scaling potential, and it can form deposits in piping.

Table 4.3: Langelier Indices for the Thyspunt site with degradation indication (corrosion or scaling)'

This table gives data for 7 sites analysed at Thuyspunt (sic) , of which 5 indicate scale-forming. However, the conclusion reads = Results indicate that corrosion is unlikely to be a problem at this site. Explain why the conclusion makes no mention of the earlier problems associated with scale forming. This scale forming is likely to cause great problems with infrastructure involving pipes, pumps etc. and cannot be ignored.

Response 28:

Scaling will be addressed in the Revised Draft EIR Version 2 and the need for this possible effect to be taken into account in plant design and maintenance.

Comment 29:

"Table 4.6: Impact assessment table for the Thyspunt site during the construction phase

Fig 2.69 Sensitivity zones.
The well point area as well as western access roads are shown very close to these highly sensitive zones."

Given the high sensitivity of the zones of Fig 2.69, justify the close positioning of the well points as well as the western access road to these sensitive sites. Why does this proposal ignore the precautionary principle?

Response 29:

It is unclear to which 'well point area' you refer.

Comment 30:

Refer to Tables.

22. Provide details on how Impact 1 will be mitigated and explain how this mitigation can justify the significance from medium to low, given the high probability.

Response 30:

The impact will be mitigated by installation of a cut-off wall, boreholes, well points and sumps for groundwater control/dewatering. These methods are tried and tested for this type of application and are known to be effective in creating dry, stable excavations.

Comment 31:

Refer to tables.

23. Explain how the consequences of Impact 3 will only be medium, given the national legislation regarding the shoreline and wetlands. Provide details on how will this be mitigated and explain how this mitigation can justify the significance from medium to low, given the high probability.

Response 31:

Your reference to national legislation regarding the shoreline and wetlands is presumably a reference to the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008). It is furthermore assumed that your reference to Impact 3 refers to Impact 3 for the construction phase (Drying up of coastal springs) and not to Impact 3 for the operational phase (Organic and bacteriological contamination of groundwater).

In this regard, please refer to Tables 9-8 to 9-13 in Chapter 9 of the Revised Draft EIR. Although the impact on coastal seeps has been assessed in the Geohydrological Assessment (Appendix E7 of the Revised Draft EIR), this impact has been assessed in more detail in the Freshwater Ecology Report (Appendix E12 of the Revised Draft EIR) from the perspective of the affected resource. Section 9.12 of the EIR has, therefore, referred to the findings of the latter specialist study.

The Freshwater Ecology Report assesses the impacts on coastal seep wetlands to be high without mitigation and medium with mitigation. The significance of these impacts is reflected as such in Table 9-32 of the Revised Draft EIR. The potential loss of these coastal seep wetlands cannot be avoided, and the recommended mitigation is therefore the extension of the conserved area of wetlands, thereby creating a potential net positive impact for wetlands.

Comment 32:

Refer to tables.

24. Explain how the consequences of Impact 4 will only be medium, particularly given that the wetlands expert in this EIReport has identified the wetlands of being unique and of global importance.

Provide details on how this will be mitigated and explain how this mitigation can justify the significance of the impact from medium to low, given the high probability.

Response 32:

It is assumed that your reference to Impact 4 refers to Impact 4 for the construction phase (Degradation of wetlands) and not to Impact 4 for the operational phase (Decreased yields of existing production boreholes).

In this regard, please refer to Table 9-8 in Chapter 9 of the Revised Draft EIR. Although the impact of wetland degradation has been assessed in the Geohydrological Assessment (Appendix E7 of the Revised Draft EIR), this impact has been assessed in more detail in the Freshwater Ecology Report (Appendix E12 of the Revised Draft EIR) from the perspective of the affected resource. Section 9.12 of the EIR has, therefore, referred to the findings of the latter specialist study.

In this regard, please refer to Tables 9-8 to 9-13 in Chapter 9 of the Revised Draft EIR. Although the degradation impact on wetlands has been assessed in the Geohydrological Assessment (Appendix E7 of the Revised Draft EIR Version 1), this impact has been assessed in more detail in the Freshwater Ecology Report (Appendix E12 of the Revised Draft EIR Version 1) from the perspective of the affected resource. Section 9.12 of the EIR has, therefore, referred to the findings of the latter specialist study.

The Freshwater Ecology Report assesses the degradation impacts of a number of different types of wetland. With the exception of the degradation of coastal seep wetlands (see Response 36), the degradation impacts on wetlands are generally assessed to be medium without mitigation and low with mitigation and in some cases low-medium without mitigation and low with mitigation. The significance of these impacts is reflected as such in Table 9-32 of the Revised Draft EIR. In general the probability of these impacts reduces to low after mitigation and hence the significance also reduces.

Comment 33:

"*Quote from report Pg 150 "Leaks of any radioactivity into the subsurface and ultimately into the Underlying aquifers (both the primary and secondary aquifers) will not directly affect existing groundwater users (but will affect the receiving environment), but air emissions from the sites could be transported inland by prevailing winds and contaminate groundwater by being incorporated into rainfall recharge."*

25. In view of the problems of reliable water supply for the greater St. Francis area (the recent drought conditions led to water restrictions for 18 months which raised the prospect of the towns once again relying on groundwater supplies from local boreholes) the above comment is of great concern.

Response 33:

Your comment is noted. The Air Quality Assessment (Appendix E10 of the Revised Draft EIR) concluded that normal operational releases of radionuclides and Design Basis Accidents (DBA) would be of low significance, as these releases would not exceed the acceptable limit. Even the highest whole body dose (1 km downwind from the nuclear power station) during a DBA would be 49 mSv, which remains below the maximum legally acceptable limit of 50 mSv for a single event.

Comment 34:

How does this report justify any threat of contamination of groundwater local water supply in the regions which is notorious for droughts and floods?

Response 34:

The report is does not attempt to justify contamination of local groundwater supplies, it merely assesses the likelihood and severity of any such effect. It should also be borne in mind that contamination does not necessarily imply that groundwater (or any water) supplies would not still be fit for purpose/beneficial use. According to the Department of Water Affairs', contamination is defined as:

'*The introduction of any substance into groundwater systems by the action of man.'*

Comment 35:

Refer to tables.

26. Provide details on how Impact 1 will be mitigated and explain how this mitigation can justify the significance from medium to low.

Response 35:

Please refer to Response 30.

Comment 36:

Refer to tables.

27. Provide details on how Impact 2 will be mitigated and explain how this mitigation can reduce the HIGH probability to low.

Response 36:

Mitigation measures are listed in the report and include good housekeeping, bunding/control of storage areas and immediate clean-up of any leaks/spills. Monitoring will detect any unobserved emissions to the groundwater.

Comment 37:

Refer to tables.

28. Provide details on how Impact 3 will be mitigated and explain how this mitigation can reduce the HIGH probability to low.

Response 37:

Impact 3 will be mitigated by the provision of proper on-site sanitation, lining of waste water ponds, monitoring and immediate remedial action if signs of unacceptable contamination are found.

Comment 38:

Refer to tables.

29. Provide details on how Impact 4 will be mitigated and explain how this mitigation can change the duration from HIGH to low.

Response 38:

Impact 4 is Low both without and with mitigation. This is because there are no existing boreholes whose yield could be affected by the mitigation measures.

Comment 39:

Refer to tables.

30. What is the justification for classifying the impact on the irreplaceable resources of wetlands of global significance as low?

Response 40:

The justification is that mitigating measures will ensure that impacts will be minimal. The additional wetlands/groundwater monitoring has provided further assurance in this respect.

Comment 41:

31. Question: It is requested that each of the cells in these tables be re-analysed in collaboration with the following critical people:

1) The wetlands expert
2) Dr Fred Ellery
3) An expert in local St Francis water supplies who will confirm that the Greater St Francis Area will need to become reliant on its water supplies from groundwater boreholes, just as it was in the past. The current supply from the Churchill Dam has been in operation for only a few years. This supply is in the form of a pipeline from the Churchill Dam to the Nelson Mandela Metro whose water demand is

becoming untenable. Furthermore, the water supply pipeline to St Francis is currently out of commission owing to the fall of the Sand River bridge. Until this bridge is properly rebuilt, this pipeline is under threat. The town is in the process of re-commissioning its groundwater boreholes.

Response 41:

As indicated in several of the above responses, in cases where the wetlands specialist has assessed similar or the same impacts to the geo-hydrological specialist, the wetland specialist's assessment has been carried forward into the Revised Draft EIR, as the wetland specialist's knowledge of the affected wetland resources is more detail than that of the geo-hydrological specialists.

The specialists for the Nuclear-1 EIA are qualified and experienced to assess the potential impacts of the proposed nuclear power station. In terms of the EIA legislation (The National Environmental Management Act, 1998 and the EIA regulations in Government Notices no. R 543 to 546 of 2010), the Environmental Assessment Practitioner may appoint particular specialists. It is only the relevant specialists who can, in terms of legislation, assess the impacts. GIBB, as the Environmental Assessment Practitioner, cannot agree to requests from individual interested and affected parties (of whom there are several thousand) to have an input into the assessment of impact significance. This responsibility lies with a single specialist or team of specialists.

Dr Ellery has taken part and submitted numerous comments on the Draft and Revised Draft Nuclear-1 EIRs and has also taken part in public meetings. In addition, he participated in a Key Stakeholder Workshop with relevant specialists in St. Francis on 25 May 2010, where he and other stakeholders had the opportunity to comment with and interact with both the Nuclear-1 geo-hydrological specialist and the freshwater ecology specialist. As such, Dr. Ellery has had ample opportunity to provide his opinion to the EIA Team. Therefore, GIBB cannot accede to a request for additional participation in the EIA by individuals such as Dr. Ellery. The final decision on assessment of the significance of potential environmental impacts remains with the relevant specialists.

Your comment on St. Francis having to become reliant on groundwater is noted. It is unclear how this relates to Nuclear-1, since it is proposed that Nuclear-1 will be entirely dependent on desalinated seawater during construction and operation. Nuclear-1 would therefore not affect groundwater volumes potentially used by St. Francis. Furthermore, should any potential pollution from Nuclear-1 enter the groundwater table, it will not enter St. Francis's water supply, since the proposed position of Nuclear-1 is 11km west of St. Francis and at the end of the groundwater flow pathway (i.e. virtually at sea level).

Comment 42:

"Quote "4.4 No Go Option
In the event that the sites are not developed for NPSs, Eskom will sell the Bantamsklip and Thyspunt properties and non-essential parts of Duynefontein could also be sold. In this scenario the impact is seen to be of low intensity, neutral consequence and low significance for the Bantamsklip site but of medium intensity, negative consequence and high significance for the Thyspunt and Duynefontein sites as it is unlikely that a similar level of site control and preservation of aquifers and ecological features could be enforced or afforded by private land owners/developers as would have been the case with a nuclear site. The main mitigation measure for this scenario would be strict enforcement of conditions applicable to any approved future development of the sites, which would presumably cover preservation of these features."

32. The above text indicates the overwhelmingly strong bias of the specialist in favour of the client. Private owners or developers wishing to develop would have to undergo the same stringent requirements for an EIA as this proposal. Furthermore, private developers are highly unlikely to have the funds to propose a development of the same scale, or size or hazardous threat as a nuclear power station. On the grounds of this opinion, this comment clearly indicates a serious bias. The land has been purchased with State funds and could become a state asset of a well managed water catchment which could provide a sustainable water supply to local communities, in such a way that the area becomes a natural and cultural heritage site.

Response 42:

Your views regarding the alternative forms of land use not being authorised are noted. However, unfortunately recent history of residential and golf estate developments in the St. Francis region contradict your statement. Even though these developments have been subjected to EIA processes, development of these sites has caused extensive destruction of heritage resources, without sufficient mitigation having been undertaken. There is, therefore, reason to believe that other developments having a severe impact would be permitted. It must be borne in mind that developments are not always planned on a large scale. Small developments that individually have insignificant impacts can eventually have highly significant impacts when their cumulative impact is considered. This is especially the case with the development of urban areas, particularly along the coastline.

Comment 43:

"Quote 155 All industrial wastewater that will be generated at the sites from various operations must be safely and effectively processed and disposed of (essential mitigation measure)."

33. Report must provide details on such a facility, its siting and how it will function.

Response 43:

There is no information yet as to the likely position, design or operation of a wastewater treatment plant. However, the waste water treatment will be designed and constructed to meet legal requirements. Such technology is available and is used in various applications. It will also be sited in ensuring that all the requirements the EMP and conditions of authorisation - if received.

The Revised Draft EIR 9Version 2), which will be provided for public comment, will include conceptual layout plans to show the sizes of all infrastructure elements like the waste water treatment plant that form part of the power station footprint.

Comment 44:

"Quote pg 157 A groundwater monitoring programme is essential, as it will provide: Baseline information on aquifer behaviour for at least a two-year period before construction commences;"

34. Why isn't this vital point included in the Report's conclusions?

Response 44:

The specialist report will be updated accordingly as part of the Revised Draft EIR Version 2.

Comment 45:

"Mitigation measures / management actions are recommended in order to aid with the following:

- *Minimising or eliminating negative impacts;*
- *Enhancing beneficial impacts; and*
- *For assistance with the project design to prevent or minimise negative impacts.*

5.2 Recommended Mitigation Measures
Dewatering to prevent: Flooding by Groundwater
To mitigate this, the construction area and subsequent excavated areas must be dewatered by constructing a cut-off / diaphragm wall and installing a series of wellpoints and boreholes. The design of a dewatering scheme is beyond the scope of this specialist study, but the dewatering activity and associated groundwater monitoring programme are considered essential mitigation measures. A form of cutoff wall is considered to be the most suitable and reliable design to minimise the extent of drawdown. The siting of the NPS within the EIA Corridor should take this aspect / impact into account.

Mitigation Hierarchy: Avoidance"

35. This impact of flooding by groundwater is a threat to the construction of the infrastructure

But according to the report, the design of the mitigatory method is unknown. Furthermore, the mitigation poses another threat of its own. This further threat should be noted in the conclusions.

Response 45:

The specific design has still to be determined but the conceptual methodology is well documented and has been successfully employed for similar applications worldwide. Local applications include the construction of Koeberg Nuclear Power Station and Coega Harbour.

Comment 46:

"Cut off Wall and Monitoring to prevent: Depletion of Local Aquifers
This impact may be mitigated by constructing a cut-off or diaphragm wall, and by carrying out groundwater level monitoring to assess the efficiency of such a design. Monitoring is considered an essential mitigation measure so that remedial actions can be carried out timeously, if required. The final design of dewatering schemes has not been established. However, based on results from this EIR study, the construction of such a barrier is considered to be an essential mitigation measure at the Duynefontein and Thyspunt sites. The siting of the NPS within the EIA Corridor should take this aspect/impact into account. Mitigation Hierarchy: Avoidance"

36. How can the report conclude with such confidence that impacts can be reduced with mitigation, lowering impacts from high to low, yet use language such as "This impact **may** be mitigated…"

Response 47:

Your comment is noted. The wording will be changed to *can* in the Revised Draft EIR Version 2

Comment 48:

37. Given the last paragraph of the box above, the conclusions of this report should surely recommend this site as unsuitable.

Response 48:

The Revised EIR Version 2 will take all the revisions and new data into account and the conclusions will be adjusted as/if necessary. For example, the additional wetlands/groundwater monitoring has shown that the risk of impact on the wetlands is lower than previously attributed. Furthermore the revision to the report has positive implications such as:

- Additional investigation/monitoring of the Langefonteinvlei
- The better understanding of groundwater/wetlands processes so obtained
- Willingness to take cognisance of the numerous questions that have been raised by IAPs, which have added value to the report; and
- The time-span from first submission to this revision and the quest for continual improvement

Yours faithfully

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For GIBB (Pty) Ltd
The Nuclear-1 EIA Team