

**Terms of reference and correspondence with Dr Sebastian Jooste for his review of ecotoxicological aspects of the PCD treatment and performance, and suitability/applicability of the DEEEP freshwater protocols for the UPL spill incident.**

**Email Appointment**

**From:** Sebastian Jooste <[sjooste554@gmail.com](mailto:sjooste554@gmail.com)>  
**Sent:** Tuesday, August 8, 2023 9:30 AM  
**To:** Mark Graham <[mark@groundtruth.co.za](mailto:mark@groundtruth.co.za)>  
**Subject:** Re: Linking up again and report review

Hi Mark

Looks do-able.

Please forward the NDA (which appears to be a standard requirement these days) for signature. As well as the reports for consideration.

I have a more or less standard disclaimer in my report that says (with some case-specific variations):

"Caveat: This report is for the sole and exclusive use of the addressee and represents a scientific opinion based on personal insights and knowledge and experience, based on the specific context and, therefore, subject to specific boundary- and departure conditions that may not have been explicitly stated in the report. None of the implicit or explicit conclusions are to be used for legal- or process design purposes, without prior consultation with the writer to verify the contextual limitations, unless it was expressly stated as the purpose of the report."

The purpose is of course to indemnify myself to a certain extent against some of the legal ramifications that can sometimes follow from, what is essentially, an opinion. I do not carry professional idemnity insurance. So, if that is acceptable to you, we can go ahead. Or you wish to amend the wording, let me know.

As I understand it, my brief is:

"

- **A review of this treatment performance via the PCD treatment plant – as detailed above**
- **Comment on the Class 1 limit (as defined in the DEEEP protocols)"**

I think your assessment of the time requirement is reasonable. I foresee requiring between 4 and 6 hours but with a maximum of 8 hours, depending on the volume of the report(s). My fee is R900/hour. From your message above I suspect this will be one of the easier reports to read. But, I may have to do some extra reading for which I don't expect you or UPL to pay. Should some complication arise that means I cannot complete the task in the allotted time, I will first check with you first on the implication for my output.

Regards

Sebastian

PS: I must say that the Graham and Dickens team in the Umgeni Water days, had always been a beacon of light in what was otherwise a rather dismal landscape. Is Chris still around? I've lost contact with the water environmental field a bit. I seem to have got stuck in the pollution hazard and risk assessment field for a wider user scene. AMD is taking up most of my time.

On Mon, 7 Aug 2023 at 18:19, Mark Graham <[mark@groundtruth.co.za](mailto:mark@groundtruth.co.za)> wrote:

Dear Sebastian

It was very good to chat again at the end of last week and hear more of your news.

Good to hear you are still around and hopefully enjoying your retirement a bit!

As mentioned, Christa kindly forwarded your contact details to me as I'm still in touch with her and Neels on various DWS projects.

Sebastian

As mentioned on the phone, we have been heavily involved in the UPL spill of pesticides which landed up in the water course below a warehouse in Umhlanga. This spill took place during the 2021 KZN riots and looting and when the looters set fire to the warehouse and the local fire brigade had to douse the flames – with water in this case and which went through the local stormwater attenuation dam and into the local river course.

You possibly read about it in the press – quite sensationalised and poorly documented in my opinion but that is the news these days too!

In the initial phases of the project we were dealing with highly contaminated systems and a mixture of pesticides – insecticide, herbicides etc., and which we were able to monitor accurately with detailed organic chemical analyses – undertaken by a specialist forensic and toxicology lab down in George.

<https://www.vm-atls.com/>

They had to gear up with relevant standards etc. to be able to quantify the full spectrum of pesticides and have served us well.

They continue to monitor for us.

During this intervening period we have also undertaken extensive biological sampling.

Primarily focussed on in situ aquatic biomonitoring and aquatic toxicological responses to the residual pesticides.

The initial pesticide concentrations were high, and all life was largely eliminated from the systems but over time, with dilution, flooding, extensive removal/remediation/ treatments etc, as well as in situ bio- and geochemical and photo degradation these concentrations have reduced considerably.

Early on in the incident we researched the landscape and guidance for this work in SA and quickly came across what I consider your seminal work

[https://www.dws.gov.za/iwqs/reports/JoosteS/Complex\\_waste\\_doc\\_Draft\\_5\\_1\\_Jan\\_2004\\_Final\\_for\\_comment.pdf](https://www.dws.gov.za/iwqs/reports/JoosteS/Complex_waste_doc_Draft_5_1_Jan_2004_Final_for_comment.pdf)

There does not appear to be any subsequent guidance from DWS post this document.

Based on the guidance and proposed framework/recommendations therein, we have undertaken regular aquatic tox testing based on the DEEEP protocol and across multiple trophic levels (algae, invertebrates, vertebrates and bacteria) using standardised aquatic toxicity tests.

I chatted to Hesmari Pearson early on as to good labs who could do this work commercially and she gave us a number of options.

We opted for BioTox labs

<https://www.biotoxsa.co.za/>

Principally based on price, turnaround times, but most critically being SANAS accredited.

They have served us well and we can share their reports.

Now, over 2 years on, we are reaching an organic chemical analysis point in the system where we are on the edge of the analytical performance of the lab instrumentation, as well as reaching a bit of a moot point with the authorities whether or not the low residuals still observed in the system still constitute a risk to the system.

As such we are grappling to convince them as to sensible endpoints for this incident – for example we find Class 2 tox levels (according to the above tests) on routine “control/reference” sites, outside of the spill plume!

This is particularly evident in the stormwater attenuation dam, which early in the incident was repurposed into a Pollution Control Dam (PCD) to hold, contain and allow tankering and disposal of stormwater and to a number of hazardous landfill sites. Due to massive dilution, millions of litres abstracted and removed to landfill, and the above breakdowns of residuals, even the PCD is now at very low residual pesticide levels.

Additionally at this site UPL have also bench tested, undertaken relevant tests, proven the efficacy of and then built a state of the art tertiary advanced water treatment plant to further treat this PCD stormwater.

It flocculates, clarifies, and then treats with UV and ozone to smash any residual organic pesticide compounds. There is a final activated carbon treatment to this water prior to discharge to the local stream.

These results are summarised, and that report and subsequent analyses were submitted to DWS as part of an authorisation application process to request treated water discharge from the PCD. Those respective reports will be made available to you. For context to [this request](#), brevity, and completeness however, the results may be summarised as follows:

- PCD water, treated using advanced water treatment processes, including flocculation, UV and Ozonation (O3), and activated carbon were able to achieve:
  - highly significant reductions in the residual pesticide concentrations (of the order of 99 to 100% reductions post treatment)
  - A Class 1 toxicity hazard classification – based on standardised SANAS accredited testing laboratory tests and across multiple aquatic trophic levels was achievable for the treated PCD water.

Our interpretation of this Class 1 is the following (and largely based on the reports from BioTox who are now routinely providing this service for a wide range of industries in SA and as per DWS licensing requirements):

- This Class 1 may be translated as **No Toxicity** – i.e., no lethal/sub-lethal hazard (or statistically interpreted as **None of the tests (at a range of trophic levels) show a toxic effect i.e., an effect value (growth, mortality, or biological activity) that is significantly higher than that noted in the controls).**

We have now run several trials on this PCD treated water and consistently achieve the Class 1.

It is now based on this information, and recognising the limitations of the substance-specific approaches (and hence integral to dealing with these potentially complex industrial/pollution wastes) that we are seeking and would like to engage with you for:

- A review of this treatment performance via the PCD treatment plant – as detailed above
- Comment on the Class 1 limit (as defined in the DEEEP protocols)

Ideally so that we can engage with senior DWS staff on this matter, and with your report as a support to our way forward.

It would appear that since your departure/retirement, we are struggling to find and connect with senior DWS colleagues who have an adequately skilled appreciation of this landscape and the approaches we are trying to pursue to prove that there is no longer any residual toxicity involved in this discharge.

To the point you raise in your 2004 document, in Appendix 1, around typically requiring a license for such a discharge, UPL are still operating and under the direction of a NEMA Section 30 compliance Directive and which was issued after the pollution spill.

Senior legal council (2 advocates) have advised that as UPL are still under this Directive, UPL would not need to be motivating or undertaking a full WULA.

That would have applied if on first principles they were applying for a discharge, and licensing thereof, rather than responding to an emergency situation and now dealing with the pollution therefrom in accordance with the NWA and NEMA.

To practical matters.

I suspect this is an approximately 2-3 day review and short report that we would be requesting to address above, and then a provision (probably on an hourly and adhoc basis) for some time to engage as UPLs expert on this, should the need arise.

We will provide all the background documents on the PCD treatment plant performance, as well as a short report we did on testing in the system during an emergency release Directive that DWS issued during the most recent heavy rains, and which allowed for in-situ river etc. testing to see the impacts, if any of the discharge from the PCD via the treatment plant.

There were no impacts - biologically, toxicologically or chemically – but that is in the above reports

Please could you let me know if this is acceptable to yourself and the budget and timeframes to assist us accordingly.

UPL would also request that at this stage you sign an NDA for this phase.

Please let me know and if you have any questions or clarification needed on above.

If you could let me know ASAP and on your availability for this assignment, I would be very appreciative.

Warm regards

Mark

---

**Dr Mark Graham**

**Pr. Sci. Nat., FWISA**

University of KwaZuluNatal Research Fellow

<https://cwrr.ukzn.ac.za/centre-staff/associates/>

United Nations University - Regional Centre of Expertise

<https://www.rcenetwork.org/portal/rce-profile-detail/922>

Director

