

Q&A Report: Stormwater Treatment 101

#	Question	Answer
1	What does EMC mean?	Event Mean Concentration, typically for pollutants such as TSS, TN, TP and hydrocarbons etc
2	Beyond first flush from rain events - how much of a change do you see in macro pollution/debris and dissolved pollution from strong winds?	Good question, quite a lot depending on the site. Both anthropogenic (human made) litter and organic pollution (leaves, grass clippings etc) does increase due to wind. But typically we aim to treat up the 3month rain event, here in Australia at least! There is plenty of anecdotal evidence of increased macro pollution/ debris from strong winds - and, yes, we've seen higher concentrations of pretty much all pollutants in strong winds.
3	Are traps like these compulsory in construction?	Depends on the location, some Councils specify a certain size or type of construction to trigger stormwater treatment, others base it on sensitive downstream environments. So to answer your question, sometimes! We would like to see our Councils and water authorities start prioritising treatment for a wider range of sites No. In Australia, compliance with stormwater pollutant targets is typically only required for developments above a certain size/ threshold (and even then only in some areas).
4	How are these contaminated cartridges disposed?	I can only speak to our process, but we recycle 95% of our product and reuse it, we currently dispose of the contaminated filter media. We are currently working on looking at reuse of this material, so watch this space!
5	How are the used media and filters disposed of?	We recycle and reuse all components except the filter media, that is disposed of but we are looking at recycling and reusing this, watch this space!
6	What do you do with the used filters/filter media?	live answered
7	Are there standards on the stormwater water quality as a effluent?	Each Council/water authority has slightly differing requirements, but all require a reduction in TSS, TN, TP and gross pollutants I see. What about others like pH, Heavy metals, and BOD? In Australia, standards typically relate to pollutant load reduction rates. Effluent targets seem to be only applied for contaminants like PFAS and hydrocarbons.
8	Obviously this is a topic of interest in Australia, thankfully. Do you service customers internationally? If so, what is the appetite for stormwater treatment there?	This is a good question, we do service other regions and the appetite for stormwater treatment is growing rapidly. Treatment asset types available from Ocean Protect, are also available in US, Europe.
9	Is PFAS a stormwater pollutant you look at, and can it be removed from stormwater?	My fave question so far, I'll get Brad to speak to this during the Q&A Yes x 2. It can be removed via ... https://oceanprotect.com.au/radflow-pfas-filter/
10	What are the limitations of phytoremediation work in nutrient control in stormwater?	Excellent question, a little too big to answer here, but we will cover in our course we are running. Stay in touch! There's a few - but, in summary, limited storage/ assimilation capacity, toxicity, and risks to wildlife (e.g. wetlands functioning as 'ecological traps').
11	What does a (typical) maintenance schedule look like on a gully pit? i.e., frequency of cleans.. and what happens to flows/drainage when the are full?	Maintenance schedules will depend on the site, but we recommend inspections quarterly (3 months), and our pit baskets have overflow designed in so if it is 100% blocked, there is minimal hydraulic impact to the system You can check out a typical Operation and Maintenance Guide at https://oceanprotect.com.au/oceanguard/
12	How do we size a GPT for a residential and industrial dev?	Great question, huge question! We will cover this in great detail in the course, please stay in touch
13	How do we consider tailwater effect in selecting GPT?	Each different device reacts to tailwater differently, but all GPTs require a free draining outlet to function optimally. This is a big question, we go over in the course or give me a call!
14	How are aboriginal outcomes, and indigenous values, enhanced via stormwater treatment?	This is a good question, my experience of working with indigenous groups is the outcome is very positive, water is sacred to everyone, something we can all relate to and brings us together. It's an exciting space to be in can you share any examples from Australia? I'd suggest by protecting waterways and oceans (and associated ecology and communities) from pollution.
15	Who handles the maintenance for GPT's?	Cleaning contractors, some asset owners do it themselves (some Councils and water authorities) and other turnkey service providers, like Ocean Protect!
16	For small scale reduction in stormwater run-off, e.g. in a house, what is the technical difference between a rain garden and a rubble pit?	Rubble pit is for infiltration typically, and doesn't have planting in it. A raingarden has plants which adsorb through their root systems TN and TP. Both are pretty effective at removal of TSS, but as they fill up with solids, they block, as they are both acting like online blocking filters can we use storm water for MAR and how
17	Is there an in drain catchment option for chemicals?	It is difficult to have a device or system to target all chemicals, non emulsified hydrocarbons can be targeted through some technologies such as booms, and other GPTs, but it is difficult
18	How to distinguish between rain garden and bioretention basin?	Same same. Different name depending on where you are in AU Exactly Steven, thank you. Also footprint, typically raingardens are smaller, and bios can be bigger, but I've seen big raingardens and small bios, so it's a bit all over the shop!
19	Is the potential of accumulation of contaminants into sediment considered in unlined stormwater infrastructure?	Not sure if I understand the question ?
20	Is there a benefit or negatives of having a heavily vegetated sediment basin/wetland?	Good question, I'm going to throw this to Brad during the Q&A. In short, yes, it may affect the hydraulic conductivity due to dropped organics, and makes maintenance difficult. Contentious topic in this space Example benefits - enhanced sedimentation, filtration. Example negatives - restricted access for maintenance.

21	How might bioretention systems/wetlands avoid other consequences such as becoming a breeding ground for mosquitoes or potentially creating odour issues?	Great question. Bio's if they are functioning as designed (which is rare, 80% in the field are typically non operational or working at 20% or less than intended), should drain dry and not have ponding water. Wetlands, different story. This is a common issue with wetlands, but as fish and birds enter the systems, they typically manage a little bit this issue. Wetlands can also become ecological traps, a subject Brad is an expert on. I think i'll throw this to him in the Q&A. Thanks Andre Healthy ecosystems will promote sustainable populations of mosquito predators. Good hydraulic design (e.g. good mixing) will also help by minimising 'dead zones'. So, in general, good design, installation and management.
22	Can we just use GPT without secondary or tertiary treatment?	We can, but depending on your receiving environment, you may be allowing pollution to bypass. A high-performance GPT (when maintained properly!) can remove everything down to 1mm. But medium and fine sediments, Tn, TP will bypass
23	Is there an established certification process for water quality devices on the market in Australia?	Stormwater Australia have developed a program called SQIDEP, which is being adopted by numerous Councils. However, there isn't a defined standard, and as such, this industry is like the roaring 20's, with a lot of devices that don't work. Definitely an exciting and dynamic industry to be in! Stormwater Australia's SQIDEP, although this is not widely used. Some individual councils/regulators operate their own verification process too.
24	Does the paid course in Nov/Dec also touch on MUSIC modelling? E.g. input datasets needed, calibration, etc.	The MUSIC user agreement limits training on MUSIC for groups/ individuals external to eWater.
25	What is the average lifespan of the geofabric/media used in the rain gardens?	live answered
26	How it was designed? based on rainstorm of what ARI?	Stormwater treatment is typically based on the 3 month ARI (4EY), as this will capture 90 - 95% of pollution
27	How is the Bracken Ridge bioretention system functioning today? Has it been monitored? Many instances of these systems not working and ultimately just collecting rubbish.	Couldnt agree more, bio retentions are not set and forget, and are VERY sensitive systems. This combined with lack of maintenance means a majority of these systems are non operational, and are becoming sources of pollution. It can be done better, and it should be done better. Great question I'd suggest by good design, installation, establishment and management. It has been monitored previously (e.g. by Brisbane City Council).
28	Are there any treatment devices that are telemetered? i.e. so when it's full the owner can be notified?	Hi Helen. Great question. Every stormwater conference ive been to for the last 15 years talks about this, and it is definitely the way of the future. Currently however, the technology finds it very difficult to measure the pollution under the water level, can do floatable pollution, but as sediment builds in the sump, it is very difficult without incurring significant costs to do so. Additionally, the monitoring devices are in live stormwater networks which get smashed a lot of the time. That being said, whoever can come up with a system that works and balances capital and ongoing O&M costs, will be very rich. If you got any ideas im keen to be part of it!
29	The sludge removed from retention basins is then treated or how it is disposed?	live answered
30	Are there specific plants that are most effective in bioretention systems, or are plants used to mirror the local vegetation community?	live answered
31	Have you considered including Constructed Floating Wetlands as part of your treatment. It is a nature based treatment solution	live answered
32	Any comments on maintenance for stormwater systems? Particularly the "squid" storm filters? Are most municipalities willing to accept the maintenance of "squid" stormfilter systems in Australia? How do they go about ensuring sufficient staffing to maintain those assets?	Love this question. Ill throw to brad during the Q&A There are several councils that allow StormFilters to be used on public sites (i.e. handed over to Council). Like anything, it's a matter of ensuring suitable resources to manage these assets - although it's worth noting that these assets are highly resilient (based on over 20 years of R&D).
33	What flood event does the bio-retention basins need to be clear of or above to ensure that the first flush is not impacted where located near waterways/wetlands? Do Bio basins need to be above the Q100 flood?	Different councils have different rules. I'd suggest it should also be dependent on flood velocities. For Filterra bioscape, we commonly integrate these into detention basins - but (as a rule of thumb) don't want Q100 inundation to be more than about 1 metre above the filter media.
34	For open channels with large discharges, are there equivalent systems to indirect screens (vortex)?	I don't think so.
35	to close the circle - where does the pollution/sediment go after it has been collected from traps? Is it going to landfill or does it go to wastewater treatment plants? What do you do with highly concentrated bioproduct?	As per above, typically to landfill.
36	Can you use the phytoremediatory properties of street trees and integrated this with the storm filters	No. StormFilters utilise filter media 'housed' in a cartridge. If there's a preference for trees/vegetation, we recommend Filterra bioretention.
37	We, at Stonnington Council initiated by our Smart City program are building powered IoT monitoring stations along the Gardiner Creek as part of the bike path upgrade project. Bordering Monash Fwy, Gardiner Creek is one of the main water inlets to Yarra River. What type of water quality sensing technologies would you suggest we should consider along the way to monitor the pollution? Happy to even try some new approaches. Goran	Probably best to contact me directly to discuss.
38	Do you have any recent (last 2 years) research resources you can share on stormwater pollutants in Australia?	Plenty. Best to contact me directly.

39	Is there a way to minimise the need to undertake weed maintenance in bioretention basins? (e.g., variety of vegetation used, anti-weed matting, etc)	Absolutely - e.g. utilising a suitable mulch, appropriate vegetation coverage.
40	Does rain gardens require maintenance as well? If so, how often?	Very much so, these/all devices are designed to "capture" pollution and they have a max storage capacity, it therefore means the collected pollution must be removed and disposed of. live answered
41	Sorry, typo above - Is there a way to minimise the need to undertake WEED maintenance in bioretention basins? (e.g., variety of vegetation used, anti-weed matting, etc)	As per above.
42	We have seen several studies showing the benefits of rainwater tanks at the building or lot level, which reduce the volume of stormwater and also nitrogen. Do you see any best-practice councils combining rainwater tanks on planning codes with bioretention? How should we encourage the combined system?	live answered
43	What can be done with the sediment 'gunk' from bioretention basins? Is it possible to remediate it, or is it disposed of in landfill or treated as toxic waste?	Typically landfill, although (if contamination above guideline levels) it may need to be disposed to a contaminated waste facility.
44	How do you clean a vegetated basin of accumulated sediment? Would the vegetation need to be ripped up and replanted?	Often with great difficulty given the high planting densities applied in conventional bio. For Filterra, we apply much lower planting densities - which (amongst other advantages) allows for access between plants for maintenance.
45	Is SQIDEP the only way to verify the claims of a manufacturer are true about device performance?	No. As per above, some Councils/ regulators (e.g. Water NSW, Blacktown CC) have their own review process. Also, you can always ask for an independent expert to review. I'll do it for free ;)
46	Any advice for small regional councils who don't have enough maintenance budget for multiple SQIDs? Tend to find that for each new development results in another SQID of some sort?	live answered
47	a presentation at the recent conference identified that street sweeping was significantly less in \$/kg of phosphorous reduction compared to maintaining existing assets.	I think I was at the same conference - FRANC Hunter Valley ? This might be true for some assets (e.g. if they don't remove much P).
48	How to prevent pollutants being carried out by runoff during the large storm events? As the pollutants and chemicals will be concentrated in the treatment devices, will it make the pollution issue worse during the large events?	High flow should typically be diverted around the treatment asset to avoid scour/flush out during high flow events
49	thank you for the presentation. How to convince the government that stormwater treatment is so important to protect the environment?	Get me to do it ;)
50	Which technology do you have for the removal of PFAS?	https://oceanprotect.com.au/radflow-pfas-filter/
51	Current standard in Australia is to use MUSIC for WSUD design. TUFLOW is a key hydrology software and they've developed TUFLOW-Catch which is supposed to address the water quality aspect of catchment water management without the lumping assumption that all stormwater will find its way to a WSUD device. Do you see this software potentially becoming one of the preferred WSUD design softwares?	There are several alternatives to MUSIC currently being developed. Not sure if the preferred software will change though - if it does, it will likely be quite a slow process.
52	https://alga.com.au/wp-content/uploads/2025/04/ALGA-2024-National-State-of-the-Assets-Technical-Report.pdf	
53	How do you bind up and/or destroy PFAS after it has been removed from stormwater	Bound by adsorption. Best to check out https://oceanprotect.com.au/radflow-pfas-filter/
54	https://alga.com.au/wp-content/uploads/2025/04/ALGA-2024-National-State-of-the-Assets-Technical-Report.pdf states: 2023 figures - • Stormwater assets represent 20% or \$130 billion of the total infrastructure replacement cost. \$7.9 billion are in poor condition, \$13.4 billion have poor function and \$15.2 billion have poor capacity. HOW MUCH DO YOU THINK AUSTRALIA NEEDS TO SPEND TO FIX THIS	A tad beyond the scope of an hour webinar ;)
55	what about pesticides	They are a major problem. Definitely a pollutant that doesn't get enough attention.
56	Can you provide a link to the webinar on bioretention media not needing replacement?	November 2023 webinar "How long will my bioretention last?" All recordings and slides for Ocean Protect webinars (like this one) are available at https://oceanprotect.com.au/webinars/ . - Recording: https://www.youtube.com/watch?v=Bzcy1wdUm_Y&t=3s - Slides: https://oceanprotect.com.au/wp-content/uploads/2023/11/Webinar-slides-231122.pdf
57	Does your PFAS removal technology have the ability to remove PFAS in drinking water?	Yep.
58	What does the data say? Is our stormwater entering creeks cleaner than say 10 years ago?	In Australia, some work has been undertaken to assess if stormwater is getting cleaner - which seems to indicate that it might be. However, there are several deficiencies to the methods applied (e.g. sites were not randomly selected, with a strong bias towards monitoring 'new' sites).
59	Do companies like Ocean Protect offer maintenance contracts to complement products/solutions supplied?	Yep.
61	For some developing countries, maybe treating stormwater is still not a focus compared to flowing it out as quickly as possible to the ocean so their area can prevent flooding. What would you think is important to spark change towards increasing the awareness to treat stormwater instead of just flowing it out of the system in the future?	Recognise the link between human health and stormwater.

62	I was told that Perth has little storm water/floodwater to the sea, is this correct as your annual rainfall about 900mm/yr	Certainly, Perth has high infiltration rates - so likely less stormwater discharges. However, groundwater quality still needs protection from pollution.
63	What do you do with the removed pollutants? Where do they go?	
64	How frequently should the performance of a built WSUD system be tested and compared with its MUSIC model predictions? How does MUSIC account for the actual performance of constructed wetlands?	Certainly, performance should be suitably demonstrated through 'real world' performance monitoring of a suitably representative site(s) - and indepently verified. This has been done extensively for Ocean Protect asset types. MUSIC applies the universeral stormater treamtent method to model wetlands - with k-C* method applied to predict pollutant concentration changes across the wetland. Further info in the MUSIC User Guide.