Selecting Sites and Selecting Devices for Primary Stormwater Treatment and Stormwater Harvesting

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ABSTRACT

Thousands of GPTs and wetlands have been constructed, and some have been appropriately sized, well located and of the right type.   Some haven't.

When Councils are implementing their Stormwater Management Plan, or selecting a site for a stormwater harvesting project there are literally hundreds of things that should be taken into account, and its easy for people to overlook things, or place undue priority on the wrong things. This paper will provide a masterplan or guide for those selecting a Primary Treatment Site or offtake for a stormwater harvesting project.

Sometimes a solution is simple and obvious, but generally this isn't the case. When selecting a car, do you only look at its top speed? The equivalent would be selecting a GPT based only on flowrate, 90% of the time, you will be getting it wrong! Likewise, selecting a car based only on its capital price, without looking at its features, suitability for purpose, and life cycle costs, will also usually lead you to a wrong decision.

There are dozens of considerations when selecting a site and type of primary treatment, and when doing it as part of a stormwater harvesting scheme, the decision becomes 10 times as important. If the primary treatment does not perform as expected, the stormwater harvesting scheme will struggle and costs to operate it will blow out. Worst case is that the primary treatment blocks, and all the flow you were counting on, gets bypassed. An understanding of all the parameters that go into making a successful project are covered in this paper.

This paper is specifically aimed at Council stormwater operators, who need to have a better understanding of how their stormwater solutions work, and why. Allowing them to rely less on consultants, or at least question their designs.

1. INTRODUCTION:

Stormwater treatment is based on multiple objectives, of which some can compete. For example, wanting a large storage volume for low annual maintenance and a small project footprint, or high performance and low capital cost, or high flowrate and high performance. These are all competing objectives.

For elements within a solution, some can be compromised with a lot less impact than others, and some should never be compromised. It is unfortunately common in this industry for designs and solutions to be compromised into a budget, rather than designed to truly achieve the objectives.

The following is a list of things that Councils especially should be aware of when preparing specifications, selecting devices or approving designs.

2. FORECASTING AND BUDGETING

It is very common for Councils to have a set budget to install primary stormwater treatment, but equally common that the budget was a number with minimal costing detail behind it. The first step towards getting a solution the best meets the multiple objectives of stormwater treatment is to have a realistic budget, and realistic expectations of what can be achieved for that budget.

It is also wise to have ALL the possible/proposed stormwater management works in a large "living/adaptable" spreadsheet. This plan or list of works should:

- nominate the project location, catchment name and size
- summarise the water quality objectives (or current problems)
- anticipate the type of treatment (source control, in-line, end-of-line) and type of technology
- estimate the time to do the work (and prioritise the order of the works)
- estimate the cost to do the work

This plan or list needs to be flexible. It can change due to pollution incidents, or political will, funding availability or cuts, experience with existing systems, new technological advances, new policy changes, and with changes in the resources at Council to deliver the works.

It can be equally hard to know what treatment technique or device is best going to meet Council's multiple objectives, and to know what this will cost to have it designed, supplied and installed.

The advice on this is simple. Get someone with the skills and experience to check that the forecasting and budgeting are realistic. Whether this be internal or external, a badly budgeted plan makes everyone look everyone look silly.

3. STORMWATER MANAGEMENT PLANS

Most of the elements discussed in section 2, can be found in a stormwater management plan (SMP).

But also in the SMP are strategies and policies, reference to appropriate standards and design guides, catchment details and municipal boundaries. Hopefully they also contain detail on the ongoing operation and maintenance of existing water quality works.

The SMP should also contain planning and budgeting for asset renewal, flood mitigation works, and approach the management of stormwater on a regional holistic basis.

The SMP is an appropriate place to contain the objectives and strategies to achieve a better stormwater system, less flooding and a cleaner environment, but its not a place to store knowledge of devices and their pros & cons, or the understanding of how all the stakeholders interact. The SMP in its traditional form or a more evolved Integrated Water Cycle Management Plan doesn't do the thinking for you.

4. GENERAL STORMWATER TREATMENT PRIORITIES

There is an order to be followed for stormwater treatment. Most people should know it, but some don't:

1. don't cause any flooding (or an unacceptable hydraulic impact)
2. gross pollutants – primary treatment
3. fine pollutants and some solubles – secondary treatment
4. the remaining solubles, specifically bacteria – tertiary treatment
5. reuse if possible.

This is mentioned here because it is amazing how many times a Gross Pollutant Trap spec calls for removal of suspended solids, nitrogen and phosphorus, but not gross pollutants.

5. SITE SPECIFIC STORMWATER SOLUTIONS

Due to the massive variations in:

- site hydraulics,
- ground conditions,
- pollutant loads,
- performance objectives and
- Life Cycle Costs,

there is no "cook book" of what to do at a given site.

There are several good manuals to refer to, of which *Best Practice Environmental Management Guidelines* by CSIRO (1999), and *Australian Runoff Quality* by IEAust (2006) are the best. But even these are not as comprehensive as they should be, preferring to bundle technologies and devices into a category, and then report on that.

Proposals and solutions can be influenced by a multitude of things, with the most common being proprietors and consultants pushing their own barrow. So Councils need to be aware of whether the solution proposed is best for them or best for the company selling it to them.

The following sections contain a list of issues, and the advice that accompanies them:

6. ISSUES AND ADVICE

6.1 Understanding Technology and what to put in a spec

- A single Star Picket over a pipe outlet can treat the entire capacity flow through that pipe. It won't capture pollution but it will treat flow.
- A Fly Screen mesh over a pipe outlet can catch 100% of pollution down to 1mm!!!, albeit for about 20 seconds until it blocks and rips off. But if 95% to 1mm is the specified performance, this would meet it.
- Given that the definition for Gross Pollutants is items larger than 5mm (plus course sediment), traps with a 50mm bar spacing, do not actually catch Gross Pollutants. Screens, nets, bags, racks and cages that have openings larger than 5mm, don't meet the definition
- Flowrates claimed by big online or off-line direct screens and nets can be as high as the system capacity, but generally their opening are larger than 5mm, and generally they function by blocking. As such, some pollution goes through, then they trap some as they proceed to block and then they bypass most of the remaining pollution. So the large flowrate did not translate into large pollution volumes.

Given that proprietors will always show off their wares in glossy brochures, and discuss all the features of their devices that work well, Councils and consultants need to be equally aware that there is another side they are not being told.

ONLY INDEPENDENT REPORTS, that have no proprietary involvement should be relied upon. In house testing, laboratory testing and proprietary marketing materials are nice to have, but only independent reports can be trusted.

6.2 Different Technologies

- Sediment traps – can offer a guaranteed flowrate, and can't guarantee performance for sediment, but miss the bulk of the typical pollution load.
- Baffles and booms - can offer a guaranteed flowrate, but no guaranteed performance

- Direct Screens - can offer a theoretical performance dependent on where they store their pollution, the type of pollution and cleaning frequency. Whilst the most common, this technology is also the most varied in product diversity and the most unreliable to predict performance
- Vortex and Centrifuges – can offer a guaranteed flow, with a much greater performance than gravity based traps
- Indirect Screens with vortex – can offer a generally non-blocking performance, so they can guarantee both flow and performance. But these can be the most costly to supply and install.

Councils need to match performance claims to an understanding of the technology on which the product works. Claims of 95% treatment through a blocking screen are false. Claims of very high flowrates, almost always relate to very low performance. A degree of understanding and common sense is essential to get a true picture of what a device/technology can do.

6.3 Storage volumes

It is common for most proprietors (but not all) to promote the absolute maximum storage volume in their devices, which would see the device completely full to invert and completely non-operational. Beware proprietors claiming storage volumes on the wrong side of their screens, up to invert in wet sump traps, claiming the same volume twice as oil storage and pollution storage, and claiming areas that hydraulically wont receive pollution.

The forthcoming IPWEA guidelines are expected to nominate that direct filters storing pollution within their screening areas can claim a 100% full volume that relates to 50% of their total physical volume. I.e., clean when pollution is halfway up the screens. This is because the decay in flowrate, and potential for resuspension of previous caught organics, results in a generally unacceptable performance beyond this point.

Councils need to understand the basis of the storage volume claims when making any comparison in this regard.

6.4 Source control vs inline/end of line (catchment coverage)

The philosophy of controlling pollution at source is a good one, until it comes to Life Cycle Costs.

Especially when dealing with primary treatment, hundreds of pit traps might be a similar capital cost (or less) than one efficient GPT, but when compared on both performance and Life Cycle Costs for the next 50 years, it is common that an in-line or end-of-line trap will come out financially better for Council.

Pit traps have their place, and there are some particularly good ones available these days, but for monitoring and cleaning, a single catchment based device will generally work out more cost effective when the number of pit traps exceeds 6 – 12. (note that this would change if Council has the equipment to clean all the pit traps themselves but would have to contract out the GPT cleaning).

6.5 Structural vs non-structural

Other "softer" source control options don't tend to address Gross Pollutants very well (raingardens, swales, infiltration systems, etc) but rather they are generally designed to handle smaller catchments with diffuse runoff, and smaller loads of pollution.

It's common to use these "softer" solutions to provide secondary treatment. Where it's common for gross pollutants to remain on the surface for manual cleaning.

Structural solutions are better for primary pollutants, non-structural are better for the secondary pollutants.

6.6 WSUD

The concept of Water Sensitive Urban Design has been heavily promoted across the country, and is an excellent strategy/policy. The problem Councils need to be aware of is the idea held by some, that WSUD is the same thing as source control and using non-structural solutions…..it's not.

Designers need to deal with whatever the expected pollutants and loads are. It is rare to find a stormwater system which does not have litter, leaves/grass clippings, and course sediment. As such, addressing the primary treatment requirements is still part of WSUD, and is generally dealt with most cost effectively by structural solutions/devices (for larger catchments at least).

The most "water sensitive" you can be is to capture the water, treat it, store it and reuse it. This is Stormwater Harvesting. Using infiltration techniques, that don't involve the subsequent capture of the water for reuse, could be considered not very "water sensitive" at all. These could include infiltration basins, porous pavers, raingardens etc.

Councils should understand the technologies being proposed, to determine whether they meet their policies, strategies and objectives. Everyone has a different idea of what WSUD is, but primary treatment is definitely part of it.

6.7 Wetlands and GPTs

Some computer modeling tools, note that you can get excellent capture of gross pollutants and course sediment and the organic load in a wetland. Whilst this is true however, it's not desirable.

Almost every wetland needs appropriate pretreatment. This is generally, but not always, with an effective GPT.

GPTs target the litter, organics and course sediments.

Wetlands target the fines, solubles, and allow bacterial die-off.

They are complimentary, and do different jobs.

If a wetland is designed without protection it will generally fill quite swiftly, and the organics will decay in the wetland and release ALL their nutrients, the sediments will smother any benthic flora, and the litter will degrade the site and bring down property values. Then when it comes time to clean it, the bill will be massive, and the process very destructive on the wetland.

Like toast needs butter, and bacon goes well with eggs, wetlands need their GPTs. Each has their role in the treatment train.

6.8 Understanding Flow

Most Councils and even several consultants making decisions on primary treatment don't have formal training in hydraulics. In some cases, this is fine, but in others, the designs MUST be hydraulically checked so (a) they will work as designed and (b) they don't have an unacceptable hydraulic impact.

The biggest problem to date with the design of existing devices has been the lack of attention paid to the grade of the incoming pipe, and the velocity of the water it produces. High velocity water has high energy and produces large headlosses. These have been known to cause flooding and blow lids off.

Get someone involved who can do a hydraulic check, or get the proprietor to sign off on a proposed devices' suitability for the hydraulic situation it is proposed for.

- System Capacity,
- hydraulic jumps
- subcritical vs supercritical
- K factors during treatment or bypass
- Velocity and energy
- Backwater impacts

These all need to be taken into account when selecting a site and designing a primary treatment solution

6.9 Understanding Pollution

As many people will attest, more pollution comes down in the first flush. But what most people don't know is that this may or may not be true depending on the type of pollutants and size of catchment. Just because you are treating the flowrate associated with the first flush, does not mean there are not significant loads of pollution transported during larger events, which there are. Designing for the first flush is NOT wise when dealing with urban stormwater. It is more important to understand how the device handles the not only the first flush, but the second, third, fourth, … twenty seventh, and all other events up until it is cleaned. The first flush is typically the capture of the first 10mm of runoff from a catchment, with bypass of subsequent flow. That 10mm volume is then processed after the event.

For those very interested in this, more research should be done into typical pollutographs from urban catchments, to get some field validation on what level of rainfall creates enough water, and velocity, and energy, to move various sized pollutants (based on size and mass).

I expect it will show that in a larger event, more water has more energy, thus moving the larger sands and grits and sticks and car parts. All of these will run along the bottom of a piped system, hit the bottom of the weir, and be caught. But cigarette butts are completely different, take time to slowly waterlog, and go from being easy to mobilize and capture, to being neutrally buoyant, to being negatively buoyant and sinking.

In essence, pollution comes as either:

1 Floating
2 Neutrally buoyant
3 Sinking
4 Soluble

Depending on the technology used different types of pollutants can be captured (and/or retained).

7.0 SELECTING SITES

Selecting Sites

- Pollution problem (type of problem, real or fake, pollutants of concern?)
- Community/resident/political pressure
- Catchment area
- Treatable flowrate
- Hydraulics
- Budgets
- Experience of selection personnel

All these things commonly come into play, but some are more important than others.

7.1 Hydraulics

The device has to work, given the site grade, velocity, bypass capacity, and volumetric efficiency. It also has to not cause flooding.

In some cases an acceptable hydraulic impact or surcharge arrangements can be designed in, but generally, it must not put the hydraulic grade line above the ground for the system capacity event.

The most commonly overlooked thing is backwater either from a tidal situation or due to creek levels downstream of devices rising over time, causing a backwater on the devices.

If backwater is present, then most devices will need an easy method to isolate the device so it can at least be sucked down and emptied once a year. This might be via sandbags, but sometime more elaborate and expensive penstocks are required.

7.2 Access for Cleaning

This is a very basic requirement, but its apparent simplicity sees it commonly overlooked.

Devices should ideally be sited so a maintenance vehicle can park on the road or just off the road, and clean it. Whilst it might cost a little more to build it for ease of future cleaning, its ongoing maintenance will depend on that maintenance being as fast and easy (therefore cheap) as possible.

If lifting baskets or nets are involved, vehicle access is even more critical.

7.3 Downstream Environment

Generally, you want to be treating the catchment as cost effectively as possible. This will commonly result in a device being located at the end of the line. Whilst sometimes an upstream option is better for access, it might miss a critical pipe, so it has to be located with non-optimal access. But devices should rarely be located on creeks themselves (since this is the environment we wish to be protecting)(the exception to this is the last resort – a boom).

Treatment should occur before flow leaves a pipe and enters a “natural” system. This includes man made “natural” systems such as bio-retention or wetlands.

7.4 Drops, Bends, depth to invert, multiple pipes, land ownership

Some devices are best suited to a single straight piece of pipe, whereas others have the flexibility to take drops, bends and multiple pipes.

It is crucial to always assess the depth to invert, so devices aren’t left sticking out of the ground. Deeper systems are not so much of a problem with the main proprietary devices, as they can all handle the structural loading of the soil around them, and commercial suction trucks can easily suck to 10m or 20m.

Land ownership and easements, can commonly complicate the locating process. Councils should be aware though that some private land owners will allow devices to be located on their lands, especially when they will benefit from the cleaner water. This especially applies to golf courses.

It is worth noting that some Councils have DA conditions that note all stormwater must be treated on private lands, before it enters their system. This tends to end up with lots of small and varied devices, that are generally poorly maintained. Whilst it doesn't cost Council to clean a single more regionally located GPT, Council typically pays for this policy with poor water quality due to poor maintenance by land owners.

There are pros and cons to the private land vs public land debate, but that could be a paper by itself.

7.5 Pretreatment for Stormwater Harvesting

When selecting an off-take location for stormwater harvesting it might be better to tap into the line further upstream if this would allow a gravity fall to the storage. But if a pumpwell and pump are envisaged, this would not affect the siting, other than knowing you will need more room, plus a source of power.

It is becoming common for consultants to see stormwater harvesting as only about water supply, and either proposing to bypass the pollution or proposing pretreatment GPTs, that are ok based on flowrate, but massively inappropriate based on the pollutant load.

There is no correct answer here, but it's a little inappropriate to be designing systems, to take the water from the environment, but leave the pollution in it. An appropriate GPT can be around 20% of the project cost, so it's easy to understand why some people want to downsize it, but it is the "engine that drives the treatment train". If the engine is too small, you may not get the solution you had hoped for.

8. SIZING OF PRIMARY TREATMENT GPTs

8.1 Flowrate

It is important to understand that the purpose of a GPT is not to treat flow. It is to capture and retain pollution. A trap that blocks and goes into bypass half an hour into a storm event, might claim 95% removal and deliver only 20%. The flowrate, and the FUNCTIONALITY need to be considered together.

Remembering that generally a high flowrate means low performance.

Ideally to treat 95% of the water by volume, you should be aiming for a 3 month storm event, and the use of non-blocking technology. This would include baffle pits, basins, vortex separators and continuous deflective separators.

Direct screening devices need to be upsized to treat the same volume of water, due to their tendency to block, and typical storage of pollution within the screening chamber. The larger the screen aperture, the more flow it can treat, but the lower the performance, and vice versa. Also, if a device does function by blocking, the time it takes till it blocks (and stops working) is dependent on both the screen area and the screen aperture, (and if pollution is stored in the screening area, this further reduces its functional time).

In some cases a large screen area, and large storage volume can give you an acceptable performance, but in general, small direct screening devices tend to be VERY high maintenance to get any sort of performance out of them.

Hence flowrate and functionality together give you performance, and flowrate alone can be misleading in this regard

8.2 Catchment area

This can be a generally good basis to size GPTs on. Noting however that steep impervious catchments, provide a lot more pollution than flat pervious ones, and with all the following parameters also playing a role in the decision. Most proprietors have sizing request forms, so filling these in and getting their recommendations is a good first step.

8.3 Catchment Imperviousness

For small impervious industrial sites, you might use the same size of GPT as for 5 times the area in a cleaner residential area, due to better infiltration and less pollution. But be wary, grass and trees produce pollution, concrete doesn't, so again, other things come into play.

Impervious areas might just give you more water, but lower pollution loads, because the site is clean. Remember, the job of a GPT is to trap pollution, not treat water.

8.4 Pollution loads

The sump storage, or in-screening area storage, for most GPTs is set. For a given model of GPT, it has a given storage volume. Only one proprietor has variable sump sizing to lower Life Cycle Costs if desired.

IPWEA guidelines to come out shortly will note typical loading rates for pollution from urban areas ranging from 0.5te/ha/yr to 1.5te/ha/yr. Its up to the designer to anticipate the pollution load, and size the storage accordingly. After all, over its life, the cleaning of a GPT will typically cost more than twice what it costs to actually install. Hence the more important cost for Council's to consider is the maintenance cost, not the capital cost. And maintenance costs are based on volume and frequency.

So to get a desired quarterly cleaning frequency, a certain volume of storage should be selected, and by default this would select the model for most GPT companies, irrespective of flowrate.

8.5 Target Pollutants

If a GPT is to be used as a stand alone treatment device, it is recommended to go for the best that can be afforded that traps the widest range of pollutants.

If it's to be part of a treatment train with secondary treatment via a wetland or similar afterwards, a lower level of performance might be acceptable.

It should be noted that lots of GPTs claim TSS, TP and TN reductions. Field validation of this performance should be requested, because laboratory tests don't very well replicate the forces and eddy currents that can cause resuspension in some of the main proprietary GPTs.

It goes without saying that off-line GPTs with high flow bypass away from the treatment zone, and away from the storage zone, will suffer lower resuspension, and have much higher capture and retention rates than anything else.

Hydrocarbons are often also required to be captured in a GPT. It should be noted that this only applies to free floating hydrocarbons. It is also worth the time to understand how the hydrocarbons are captured and where they are stored, because depending on the type of device, it's very hard to trap hydrocarbons if the screens are blocked and the system is in bypass.

8.6 Capacity flowrate or Bypass capacity

Some GPTs only have a certain internal bypass capacity, so be wary of putting large pipes into small GPTs. Every diversion chamber or GPT will have a bypass capacity, and needless to say it must exceed the pipe full capacity.

8.7 Pipe size

GPTs are designed to treat flow and remove pollution, it generally doesn't matter what size pipe brings that flow to the GPT, excepting that the pipe must be able to fit into the GPT, and as per above, maintain the bypass capacity. Most GPTs have pipe size range that they can be used with. Check this with the proprietors.

8.8 Backwater

Some GPTs can't handle backwater. Some claim to handle backwater with the use of tidal flaps and high weirs but this is known to be hydraulically problematic. Tidal flaps especially never seem to seal in a stormwater situation.

The flow able to be treated in a backwater influenced unit is diminished as the water rises. It reduces the driving head that forces the water through the GPT.

It can also dramatically complicate the cleaning, especially if the units are suction cleaning only.

Ask your supplier how they deal with backwater, and based on their knowledge, experience and answers, you should get a good idea of which ones can deal with it, and which ones can't.

8.9 Drops, multiple pipes and bends

Offline diversion chambers can be customized to take the flow to a GPT, under almost any scenario. But different GPTs have different abilities to simply adjust to multiple pipes and non-straight single pipe scenarios.

Flexibility in design, whilst retaining the expected level of performance is harder for some GPTs than others. The diversion chamber sizing and GPT sizing can be separate for some GPTs, allowing the GPT sizing to be done on a catchment or storage basis, with the diversion chamber selected on a hydraulic basis.

8.10 Hydraulics

As previously mentioned, some GPTs perform better on slow flat pipes, whilst others work better with steeper grades and high velocities. Put simply, direct filtration devices and those using gravity settlement should be steered away from when grades exceed 2%. At 5% or more, only vortex separators and continuous deflective separators that utilize the incoming energy should be considered.

8.11 First flush or low flow

Consultants who size on this basis, should be viewed cautiously. Stormwater contains a mix of pollution that comes down with the rain, and first flush or not, you need to deal with all the water and all the pollution. It is generally risky to size to treat the low flow, because the pollutant load will fill the device so fast, that maintenance costs will be exceedingly high, or the device won't be maintained. Beware of people looking to use very small GPTs on flows from large catchments.

8.12 Stormwater harvesting

The importance of having a GPT that works is 10 times more important when you have a significant investment in a stormwater harvesting system relying on the GPT to do two things:

- Remove the pollution that would block the pumps and fill the storage
- Provide a RELIABLE supply of water to the system.

Poorly performing traps, and those that block, are not well suited to stormwater harvesting. A high quality device, and correct sizing are crucial to ensuring the first step in the stormwater harvesting treatment train works reliably. The GPT may cost $100,000 but chances are the whole system will be $500,000 - $1M, so at between 10 – 30% of the total cost, its importance is higher than its cost contribution.

Likewise, flexibility in how the connection is made, so that only treated flow will go to the harvesting system is very important. Untreated bypass flows must not into the pumpwell or storage tanks. It is also important to understand the cleaning process for the primary treatment, so you don't lift out a blocked basket, and all the other pollution pooled in the line goes through into your tanks. Take the time to understand its operation during high flow, low flows, and cleaning.

8.13 Cleaning Techniques

Some GPTs are cleaned by grab or basket, and all can be cleaned by suction. If suction is unavailable or expensive it stands to reason, to use GPTs that can be cleaned cost effectively by local plant.

The benefit of suction cleaning is being able to access and clean the screens, so direct filters are best cleaned with suction (or removable basket).

There is a limit to this logic though. It is pointless to spend lots of money on a GPT that doesn't work, just so you can clean it with say… a bobcat. At some point, the objectives of the trap need to be assessed. Is it being installed to clean up the environment, or is it being installed so we can clean it with our backhoe or bobcat.

8.14 Budgets

In some instances, GPTs may need to be downsized to fit within a limited budget. But Councils should be aware, that commonly this will cost them both in performance, and in the higher cleaning costs. So if at all possible, wait 6 months and do it right.

It is also worth mentioning that it is unwise of Councils to have a spec that asks the earth, and have no funding to install such a device. It is actually a good idea to advise tenderers of the budget, so they can provide the most effective solution possible within the available funds. And if they can do it cheaper, then tenderers will still put this cheaper price in (to give themselves an advantage).

It is wasteful and disheartening for a contractor or consultant to spend hours of time and effort sizing a GPT that meets the spec and filling in the tender, only to find out that Council didn’t have the budget for it. It’s better to see what tenderers can propose within budget, and give Council multiple options. If tenderers know Council’s limitations they can work to them, the more information the better.

9 UNDERSTANDING THE OTHER STAKEHOLDERS

9.1 D&C vs Install only

Council generally have a performance specification that requires treatment of a 3 month event, with 80/45/45 removal for TSS, TP & TN. It might even refer to a capture rate for the primary target that is gross pollutants.

Some consultants know what they are doing, and some don’t. If a consultant or contractor tries to guess what product is going to meet the spec, they will likely ask the proprietors, who’s aim is to sell a trap. History has shown that downsizing of devices is now the norm rather than the exception. Councils need to be aware of this.

Contractors will select the cheapest device that either they or the consultant thinks they can get past Council. Their objective is to make money for themselves. Their objective does not align with Council’s objective of cost effectively protecting the environment. Their objective is to get work, and make a profit.

For this reason, it is easier, cheaper and fairer for Council to select an appropriate GPT, have it designed for the site, and then tender for the installation of the selected GPT. If Council does not know enough about the different GPTs, there are a number of professionals and consulting firms that can assist them in the sizing, siting and design process.

This way, Council also knows that the device to go in WON’T cause flooding, and is the best device to meet their multiple objectives. Councils also commonly have a preference for certain devices, based on their own experience. It’s always a shame when a great contractor chooses the wrong sort of GPT, because they don’t know any better. Selecting the GPT and tendering the install, creates a level playing field, that doing a “Design and Construct” (D&C) does not.

9.2 Contractors and Equivalence

Councils should understand that Contractors and Proprietors should not be allowed to determine “Equivalence”. There is a clear conflict of interest for both parties.

Only consultants and councils should determine equivalence. The reason for this is that there are dozens of parameters, but on which one or ones should equivalence be based? Contractors should never be allowed to determine if something is equivalent. They can propose an alternative they believe to be equivalent, but they cannot approve it themselves, because their objective does not align with Council's. Since Council will generally own it and operate it, it MUST be Council's decision to approve (or not) a device put forward as equivalent.

9.3 Consultants and Equivalence

As mentioned some consultants will just read glossy brochures and don't really have a good understanding of proprietary devices, their performance claims, functionality, reliability, storage volumes, cleaning requirements and frequency, not to mention all the other parameters covered in section 8. Most just look at flowrate, which on its own, is INAPPROPRITE as a measure of equivalence.

Consultants need to be able to legally stand behind the product they choose, or the "equivalent" they approve. If a consultant was to approve an "equivalent" GPT, that later did not meet the Council's expectations, the consultant should be liable for rectification costs, that could include removal and replacement with the appropriate device.

Based on this liability, most consultants should pass this approval role to Council. Even on private lands, where the GPT will be in private ownership, it is being put there to protect the environment, generally as a result of Council development approval conditions. If the environment is polluted because of a device not working adequately, whether it's in private ownership or public ownership is not important. Someone approved the selection (or equivalence) of a certain type AND size of device, and they are responsible for it.

9.4 Determining Equivalence

Equivalence is based on Performance (capture AND retention), plus its life cycle costs.

Equivalence is NOT based on flowrate.

Equivalence is NOT based on price.

There are multiple other things to take into account, and Councils should know what they are and how they might impact on the performance and life cycle cost. If they don't know, they should employ someone who does know to make the decision for them, or get appropriate training, so they can make the decision next time.

It is common when selecting any kind of primary treatment, to have one parameter that governs the rest. Storage volume has emerged in recent times to be the governing parameter in about 50% of cases. In the other 50%, hydraulics, velocity, bypass capacity, backwater, physical arrangement, performance validation and maintenance requirements can be the key parameter.

10. SUMMARY

There are dozens of forms of primary treatment, and they all function very differently. Councils need to be aware of the differences between the GPTs, or involve someone who does when selecting them.

The primary things to consider when selecting a GPT are hydraulic impact, performance and life cycle costs. There are many other things to consider, which could be critical to the success of the device, or they could be irrelevant, but without considering them, Council has not practiced due diligence in the GPT selection process.

This paper presents a summary of issues and parameters to be considered but does not delve into each one in detail (this would involve a technical discussion of proprietary devices). Councils should consider training their people in the engineering and DA sections, with regard to the differences between the various forms of treatment and proprietary devices, or alternatively, engage someone with the knowledge and experience to provide them accurate advice.

There are some excellent primary treatment options for stormwater available, and there are some lemons. Councils need to be smart in the decision making process, specification of GPTs, and approval of “equivalent” products. In the end, they will inherit most of the devices, and the costs associated with maintaining them…... or the environment they were installed to protect.

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