Auditing Shows Up Mistakes Of The Past: *Please* Don't Repeat!

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Many Councils have installed GPTs... Some good, some bad, and some ugly and many not meeting their original intent of protecting the environment. This is about the lessons learnt from the mistakes of the past so that they may not be repeated again!

1. INTRODUCTION

Most Councils have millions of dollars' worth of GPTs and other primary treatment devices in the ground and many do not know how they are performing and what could be done to improve them. In some cases devices may have been swapped by contractors, they may have been installed incorrectly, some could have hydraulic problems, blowing lids, etc. Some could be bypassing due to blockages of inlets and screens. Access, civil and structural problems, especially with lids can be issues for some devices. Holes in screens or broken welds or screens removed, or broken bags, or the area behind the screen could be full,….. all of which lead to loss of pollution which is counter to the objectives of WSUD.

Thankfully many Councils have already stepped up to audit their GPT and WSUD assets. One of the most important aspects of this is the lessons learned, after all, if the mistakes of the past are not learned and addressed, they are doomed to be repeated. This paper anonymously details mistakes made in the past in the hope that Councils, asset managers, environmentalists and proprietors can learn from them and avoid making them in the future…..

In this paper it is hoped we can somewhat "Close the Loop", by providing REAL information back to decision makers on what's working, what's not…. and most importantly why.

This paper also asks the question, that whilst we are spending millions on new GPT/SQID/WSUD constructions, are we spending enough on the maintenance of them to keep them performing. Do we understand what maintenance is truly required on our stormwater quality assets? And can we afford this?

The audits aimed to validate performance in the field, any functional/operational problems, and any maintenance issues. The audits invariably produced a rectifications list that could then be prioritised on the cost/benefits of the environmental outcomes they would deliver in the future. And this would feed into a future capital works program. The audit outcomes highlighted some interesting trends and anomalies. It identified areas for savings, as well as future investment requirements to upgrade existing assets. It also identified a need to upgrade maintenance practices for a lot of the assets.

Here is a very simple rule……"*learn from the mistakes of others*". And hopefully you'll make less mistakes yourself. This paper will help you do that. To make it simple and entertaining, these have been subjectively listed in order of the extent of the problems within the industry:

1.1. GPTS ARE PART OF WSUD

GPTs and other primary treatments ***ARE*** part of Water Sensitive Urban Design. They have a major role to play, are being used on new and retrofit projects every day, but some Councils still consider WSUD to just mean biofiltration, raingardens, swales and wetlands. As such……. There is not much love for the poor old ugly GPTs…… and its showing.

Primary Treatment Assets (also called Hard Engineering Assets) include treatments such as GPTs, Oil & Grit Separators, baffle tanks, media filters, litter baskets, bags, nets and trashracks.

Secondary Treatment Assets (also called Soft Engineering), generally have a biological function as well, such as biofiltration, sed basins, ponds, swales, infiltration systems, raingardens and wetlands.

At present there is about 99% of the industry talking about the secondary treatment or soft engineering solutions, and only 1% interested in the GPTs. This has been the case for most of the past decade, and as a result, it is the experience of the author, that Primary Treatment assets are maintained WORSE than the more "popular" secondary treatment assets.

And the interesting part about this is that most Maintenance Managers don't realise there's a problem.

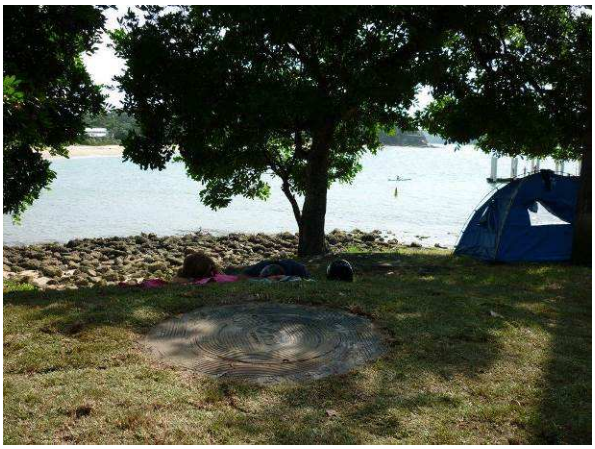
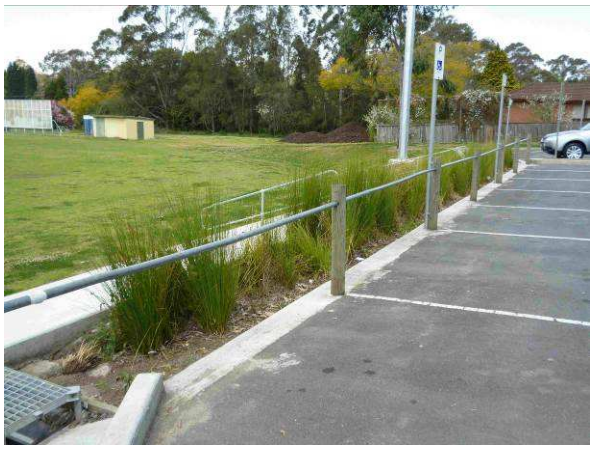



Figure 1 A nice GPT stormwater treatment asset and a nice bio retention stormwater treatment asset

1.2. MAINTENANCE/CLEANING OF STORMWATER TREATMENT ASSETS

"*Nothing works unless you clean it and maintain it*". This statement may seem blatantly obvious, but the facts are that most GPTs are not being cleaned with an adequate cleaning frequency. In some cases due to:

- poor handover practices (Council unaware of SQIDs)
- Inadequate access
- Broken components or lids
- Insufficient budget, and
- A general lack of knowledge regarding how the device is supposed to work and what triggers a clean.

The fact is that most Councils don't have sufficient or accurate enough information on all their SQIDs. This leads to higher cleaning prices because contractors need to build in contingency costs based on lack of information.

It can also lead to devices that are non-operational, being cleaned, and left in a state of being non-operational. Again wasting valuable cleaning dollars. Well understood handover procedures are critical to keeping the asset database correct, and not having stormwater solutions drop off the map.

It's important for Council Maintenance Managers to understand all their treatment solutions, how they should be cleaned, the cost for cleaning and the frequency. Only then can they budget to do the job correctly.

Figure 2 A basket massively overfull. A forgotten GPT leads to deposition in the upstream pipe and potential flooding issues.

1.3. WHAT DO YOU MEAN BY A CLEANING SPEC?

Most Councils also don't include a "cleaning specification" for each device when the tender the cleaning. They assume the cleaners know everything and will automatically do everything required. Without the spec however, the cleaner may just open a lid, suck out the contents, put the lid back on and leave. In fact that's what happens 95% of the time. But if that's what the cleaner has priced to do, then that's what gets done. But this can leave many devices non-operational, without anyone being aware of it.

Councils should have a brief but clear spec for the monitoring, regular cleaning, and Annual Cleaning of *ALL* their WSUD/SQID treatments.

This will also ensure all cleaning tenderers are quoting to deliver the same service. Without accurate information on which to quote, and a cleaning spec on what Council expects will be done during a cleaning, its common for cleans to not be as thorough as may be required.

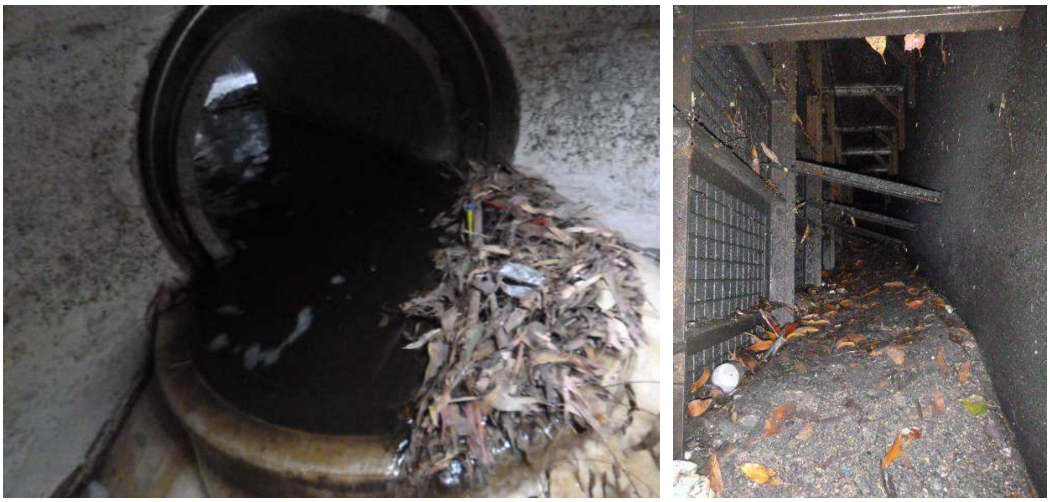


Figure 3. Humeceptor inlet blocked, but not on the cleaning spec to check it or clean it. Sediment buildup behind Ecosol screens without the specification to clean behind the screens.

1.4. IS MY GPT TOO SMALL?

Its unfortunately been a common practice for some proprietors to downsize or undersize devices, to give them a commercially competitive advantage, so they make the sale. This undersizing trend, has led to a frighteningly large number of undersized devices, that fill so fast, Council cant afford to keep up with the cleaning.

Developers and contractors will always push for the smallest and cheapest solution that will get approval. If Council are unaware of how to correctly size a raingarden or biofiltration system or GPT, then it very regularly gets designed and built too small. GPTs sized on treatable flowrate are most likely to be undersized. Resulting in cleaning frequencies of monthly or less. Which in reality is unaffordable.

They should be sized based on multiple parameters of which treatable flowrate SHOULD RATE VERY LOW ON THE LIST. The most relevant parameter has now become the REAL pollution storage volume, because this affects cleaning frequency, Life Cycle Costs and long term maintenance affordability.

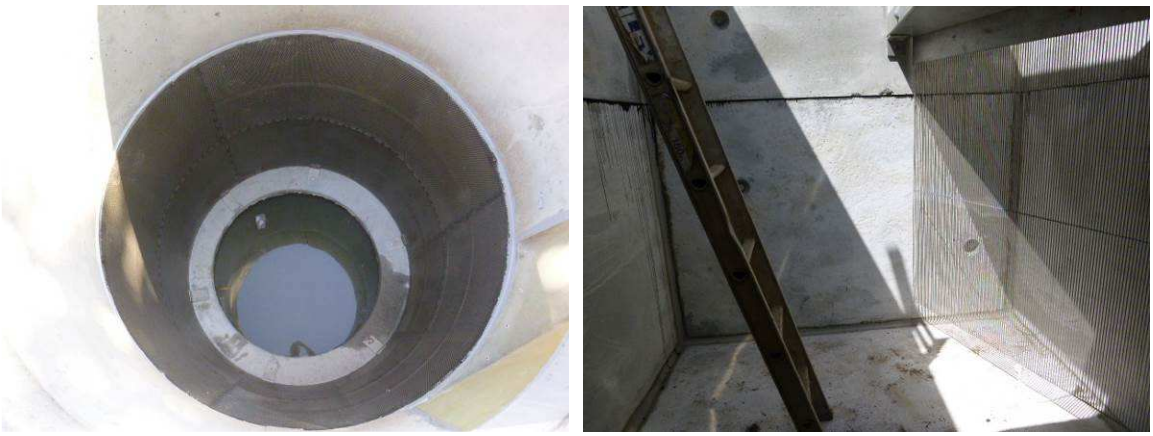


Figure 4 The sump storage volume is more important than performance. CDS units and Humegards have generally large storage volumes.

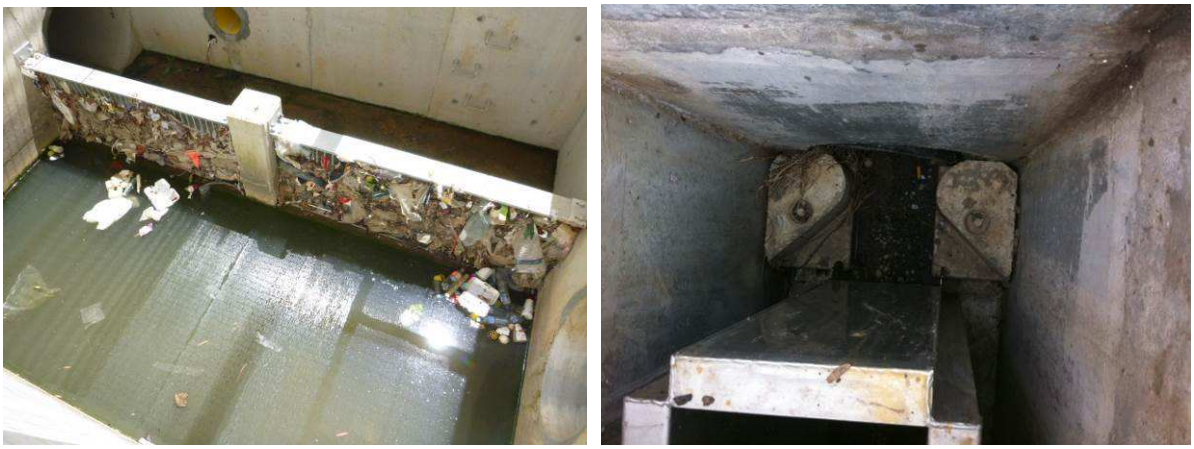


Figure 5 For the pipe size and catchment area, this trashrack is way too small. For the catchment this Ecosol was way too small, its structure is half covering the inlet pipe and was very quickly full and non-operational.

1.5. WHAT DO YOU MEAN IT'S GOT A BACKWATER ISSUE?

Large numbers of devices have backwater issues, that owners and Maintenance Managers are unaware of. Tidal devices where you have the device connected to tidal waterways for more than half the time are not highly desirable. The salt water itself is not really a problem, but the inability to suction clean as desired is annoying. But that's not the backwater problem……

Many GPTs discharge from the device, or from a short length of pipe, into a vegetated creek or swale. If not cleaned regularly, or sometimes, even if they are cleaned regularly, the fine silts and nutrients bypassing the GPT, cause the downstream vegetation to grow. As it grows, it impedes the flow path, then leaves and silt start to build up on the vegetation, but the vegetation grows through it, and more sediment gets caught, and so on. This can result in situations where the downstream creek level has risen to such an extent that it is causing a backwater on the device, dramatically reducing its performance, complicating its cleaning, and resulting in most flows bypassing treatment and degrading the downstream environment they were meant to protect.

The level of creekbeds and specifically the impact of dense macrophytes, can severely impact the treatment ability of many primary treatment assets. This problem shows up at almost EVERY audit.

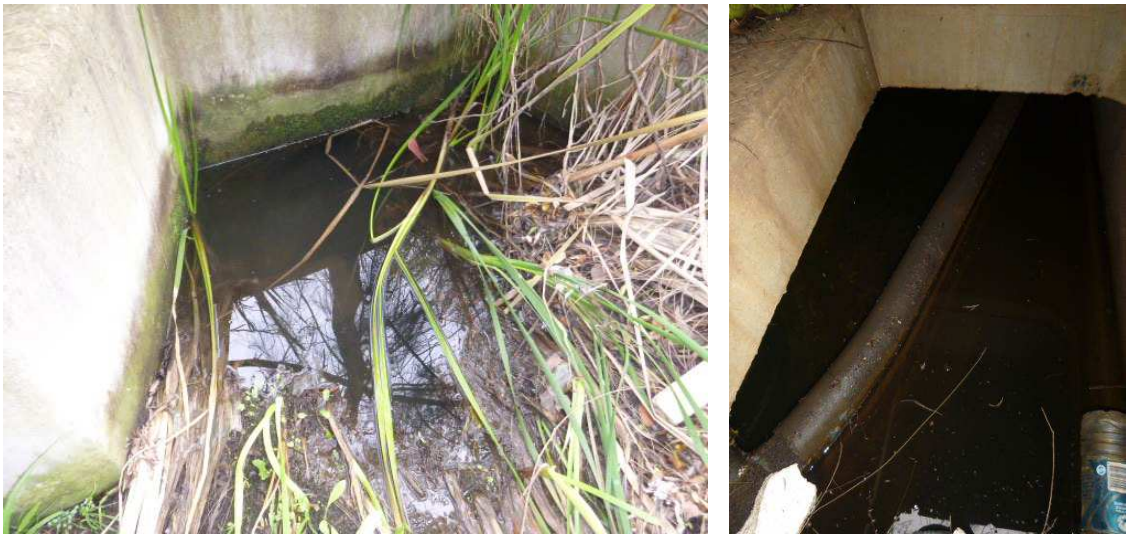


Figure 6 Elevated downstream creek levels have caused the pipe to be completely submerged, and the CleansAll weir that should be 600mm tall is only 30mm high. Non-operational.

1.6. SURELY IT WAS INSTALLED CORRECTLY?

Instances where civil contractors have installed GPTs poorly or wrongly is alarmingly high. It's important for Council to get out the gas detector and climb inside their primary treatment assets and inspect them before accepting handover. Problems with gaps, cracks, exposed reo, concrete spoil, damage during construction, levels wrong, etc is all too common.

If someone at Council is not available to do an inspection prior to handover, there are independent and experienced consultants who can do it, or proprietors who could possibly do it too. A thorough inspection prior to handover will also show up issues like sediment buildup behind screens, sediment loads filling upstream pipes and poor construction works. Council can then force rectification of these problems, prior to inheriting them, and having to pay for the rectifications themselves.

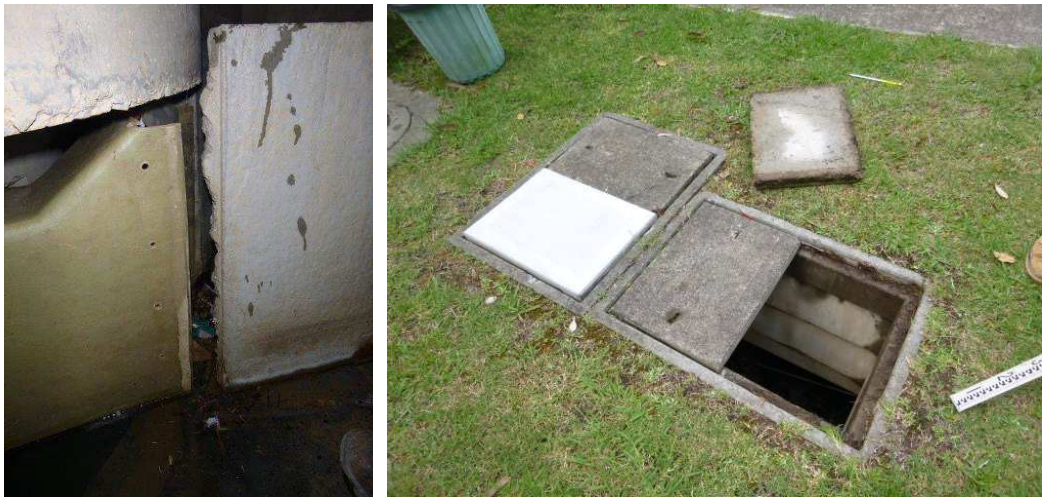


Figure 7 The precast weir in a completely standard CDS unit was installed back to front so the inlet chute attaches to nothing and there is a 50mm gap between the weir and the inlet. In the photo on the right, the Humegard lid was put on 90^0 wrong, so there is no vertical access to the screens or pollution storage zone. Poor installation and no inspection at handover.

1.7. MY EXCLUSION BARS KEEP BLOCKING….

It's an all too frequent problem. Exclusion bars put on to keep the kids out of the system, become the limiting element for the success of the system. Small bars put over the very throat of the inlet block the fastest and send the treatment into bypass.

Likewise exclusion bars over the outlet of a device can also block (especially if the device is a poor one). There are good designs and bad designs, but the good ones take into account access, pollution, cleaning, hydraulic impact, they are as large as possible, and don't have any connections to the floor.

If you have issues like this, speak to someone who specialises in exclusion bars.

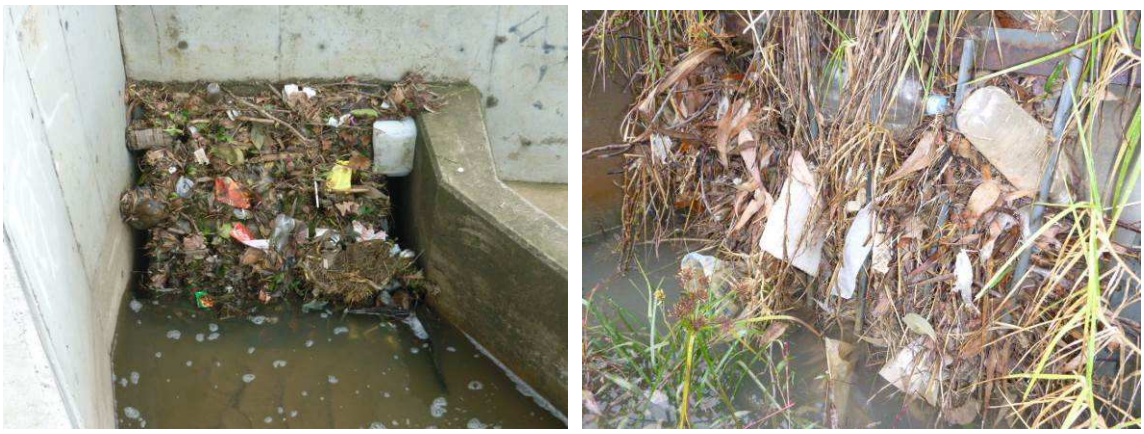


Figure 8 Inlet exclusion bars with poor design. Outlet exclusion bars with poor design. Poorly considered exclusion bars lead to blockage, bypassing, pollution downstream and high maintenance costs.

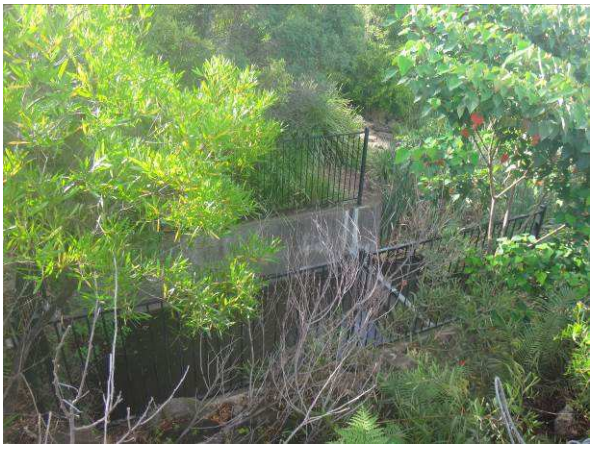
1.8. YEAH, WE COULD HAVE DONE WITH BETTER ACCESS.

This is one of the most basic of all components to a solution. Yet in every audit we find poor access to be a way too common problem. This could be due to having nowhere to park, access too narrow for the cleaning machinery, overgrown vegetation, vegetation planted to "hide" a SQID lid, that then impacts the ability to actually get the lid off. In many cases, solutions are sited based on maximising the catchment area, or land ownership, or hydraulics, with little thought of the machinery to maintain the solution.

Typical problems include, driveways into GPTs and trashracks that are too steep, driveways that get wet and slippery during the cleaning then the truck cant get out, lack of turning room, no thought about turning circles, parking areas too far away from a device, soft topsoil and turf around a device that gets "rutted" and creates trip hazards when vehicles drive on it.

Some solutions are designed to be cleaned manually, but the pollution is wet and too heavy to carry. Some devices have small lids, so you struggle to get a man down inside the device with a suction hose. Some devices have no access to behind the screens, and with poor maintenance, this can lead to a requirement to cut screens off and replace them.

The lesson to learn here is simple: involve the Maintenance Manager at design stage, and get them to sign off on the solution having satisfactory access for ease of long term maintenance.



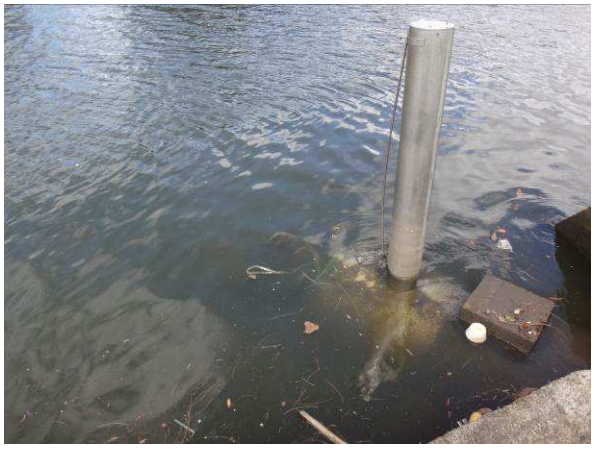


Figure 9 This GPT has no vehicle access, so manual cleaning is required, and this results in higher costs and lower performance. The submerged nettech above requires cleaning contractors to drive across a golf course to access it. Poor hydraulically, poor access.

1.9. VELOCITY?.... HOW DOES THAT AFFECT MY SQID?

Velocity is essentially the speed that flow enters the solution. In Soft Engineered solutions, it can cause scouring, undercutting and resuspension.

In Hard Engineered solutions, it can aid or hinder performance, cause high headlosses and resuspension with consequent blockage. Devices that are suited to high velocity flows are the vortex style devices that use the energy in the velocity, and transform it into rotational energy to assist with pollution capture and also retention. In high velocity situations, devices that function based on settlement are not well suited.

In high velocity situations, devices that use direct screening to try and filter pollution out, tend to block and most suffer some kind of resuspension. Some are better than others, and it really depends on the pollution storage volume, and whether pollution is stored in the screening area or not, but direct screening GPTs are not well suited to high velocity situations either.

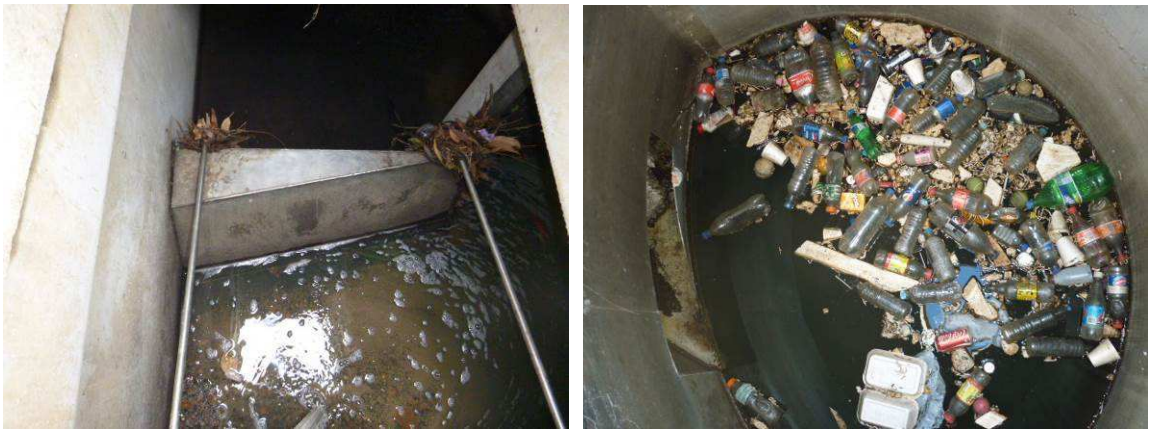


Figure 10 The Humegard weir has bent, is wedged in a low flow bypass position and flow is going over the boom that could not handle the force of the water due to the high grade and velocity of the incoming flow. The VortCapture GPT is a vortex style device designed to utilise the energy in higher velocity flows.

1.10. GREASE THOSE LIDS

This sounds so basic it's almost insulting to have to put it in. But once a year EVERY lid on every solution should be opened, sediment, dirt, rust, etc cleaned off with a wire brush, and a new 1mm layer of grease put on them. This is specifically aimed at the "gatic" style lids, be they square or circular.

If you don't open and grease them, in a few years….. they don't open. It might cost $50 per year to grease the lids, or every 5 years pay $3000 to cut out the lid and replace it.

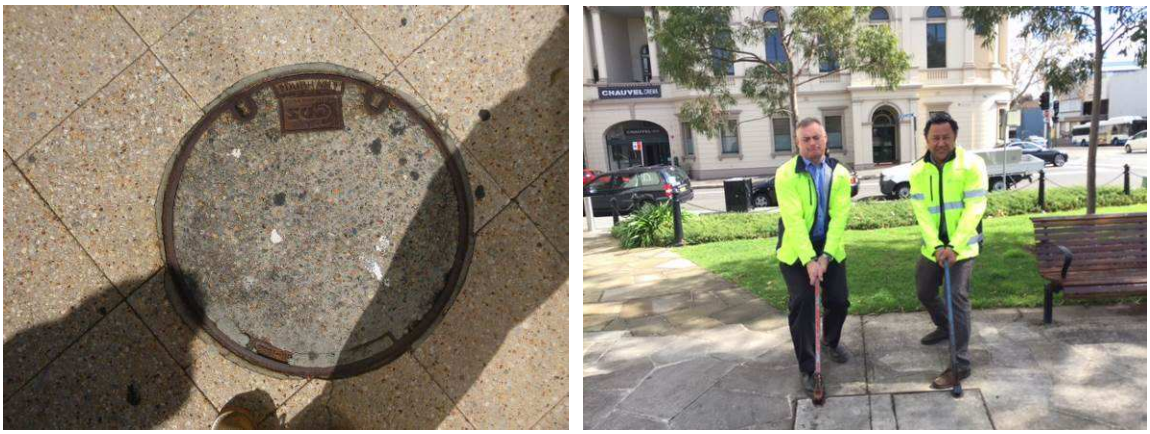


Figure 11 The CDS diversion chamber was not opened for so long that is now has to be replaced. Larger lids, especially heavy duty gatics become a real WHS issue over time, and really need to be greased EVERY year or even 2 men wont be able to open them.

1.11. CONFINED SPACES ENTRY FOR MOST UNDERGROUND SOLUTIONS

Don't believe it when a proprietor tells you the device can be adequately cleaned from the surface with no need for confined spaces entry, it's not true.

In almost all cases, you need to inspect inlets, outlets, behind screens, low flow diversions, the state of the screens, pollution build-up, and ensure moving parts remain moving.

As part of the Annual Clean for ALL devices, someone should enter the device and the diversion structure (if it has one) and inspect everything from top to bottom. This also assumes that the Annual Clean for ALL devices is done by Suction. Some regular cleans can be via grab truck or basket removal, but Annual Cleans are all suction, so the device can be completely emptied and inspected.

For many devices, that are regularly suction cleaned, and then silty water is decanted back into the device, this is acceptable for regular cleans, but this will also lead to a build-up of fine silts in the lower portion of the device. So once a year, ALL the water should be taken away, so the build-up of silts in the device is removed.

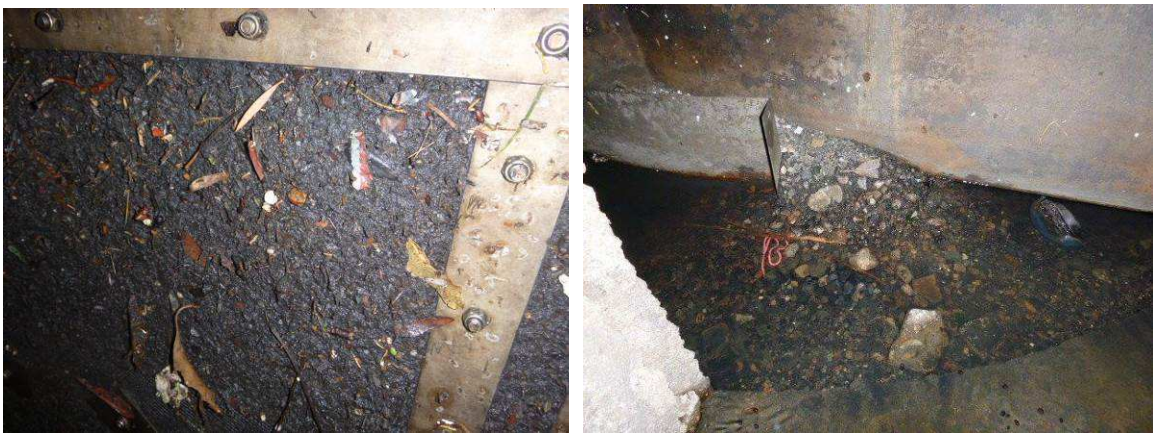


Figure 12 Blocked screens. Sediment buildup behind the screens.

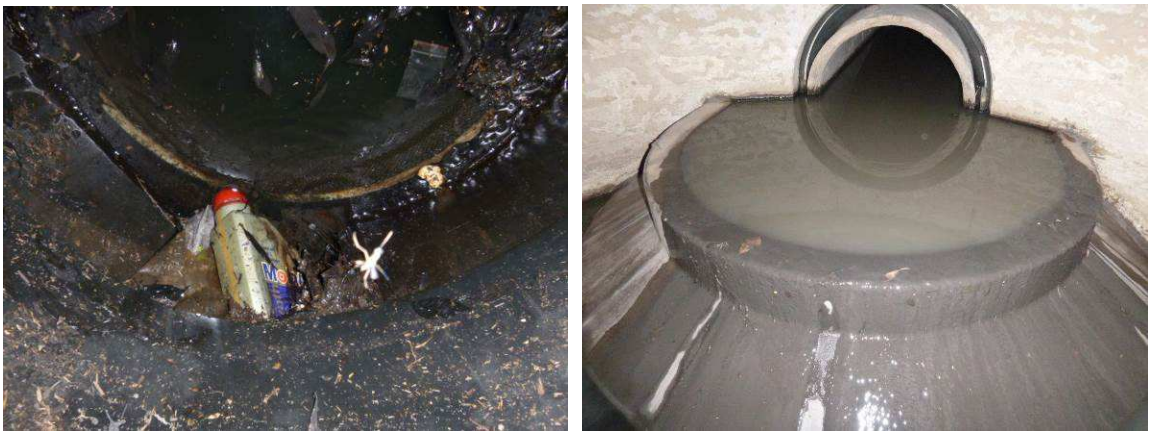


Figure 13 Blocked inlets and more blocked inlets.

1.12. MY WETLAND IS UNCLEANABLE

It's common with most old wetlands, that they are online, with multiple inlets, and no way and nowhere to dewater the wetland to if you wanted to clean it.

Many also have poor vehicle access to get in and cull/harvest macrophytes. And many also have few options for storage of the silts and organics when they are removed. Ideally there should be an area that material removed by a dredge, or spider, or excavator, can be placed on an embankment and allowed to drain dry before use in landscaping or other disposal.

If your wetland is very hard to clean, its highly recommended to look at retrofitting a sediment forebay and "macrophyte filter" near the inlet/s so that hopefully the majority of the pollution entering the

wetland can be contained in a small area at the inlet, that ideally should take into consideration that a long reach excavator can get about 20m from each bank, so don't make it wider than 40m.

The alternative to this is to install an effective and correctly sized primary treatment device upstream, and trap 90% of pollution in something that is designed for ease of regular maintenance (and then make sure this gets maintained).

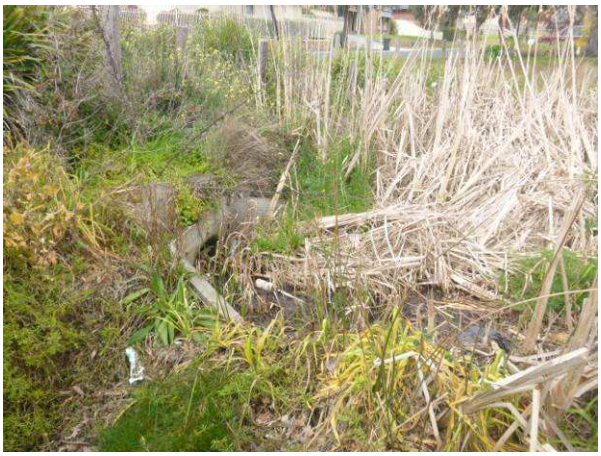
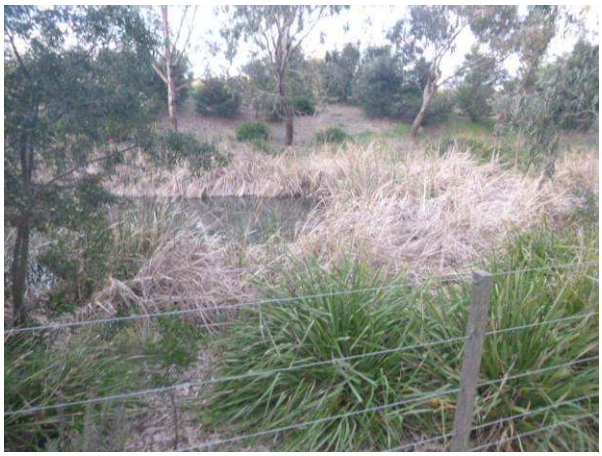



Figure 14 Partly dead, overgrown, ugly and causing the upstream treatment to bypass.

1.13. I'VE GOT PROBLEMS CLEANING MY PIT TRAPS

The theory of "at-source" controls is great, but in practice it's less reliable and more expensive than in-line or end-of –line treatment.

Whilst most Councils have a sucker truck and street sweeper vehicles that work 8 hours a day 5 days a week, it's hard to keep up with the cleaning demands of Gully pit traps, trapped gullies, pit baskets, etc. They tend to hold small amounts of pollution, block readily (especially if the apertures are 1mm or less), and this leads to bypassing and/or flooding impacts. In several recent audits, there was not a single gully pit trap that was operational.

The difficulty in accessing them for cleaning, with cars parked over them, means many traps just don't get cleaned. When located on main roads, this access is even worse, and if traffic management or night work is required, the costs go up significantly but the benefits don't.

Whilst a good "last resort" and well suited to small shopping centres etc., the use of large numbers of gully pit traps is strongly advised against, because of the cost and difficulty of the ongoing maintenance for the next 50 years.

Councils should also note that when this type of solution is in private hands, we've note bags cut open at the bottom, broken frames, no understanding of pit hydraulics and bypass requirements, and many many blocked and unmaintained devices. If Council expects these solutions to be working, they will need to monitor/audit the devices in private ownership.

Figure 15 Full to ground level and no flow going through the pit. No bag, frame broken, frame extends over the pipe at the base, so there is nothing good about this trap.

1.14. MY SWALE IS A PAIN TO MAINTAIN

Grassed swales are a common and potentially very practical way of treating and conveying water from roads and carparks. They can be attractive and easy to maintain.

However, some are very flat, and if the soil below has plenty of clay in it, the ground can become waterlogged and boggy. Then the Council ride on mower gets bogged, and starts leaving ruts. These ruts cause trip hazards and allow water to pool and mosquitos to breed. Then the boggy area doesn't get mowed, and soon the grass becomes high, the flow path is further impeded, the snakes move in, and it starts looking ugly. Subsoil drainage, or a low flow dish drain could help with this situation, or Council might consider excavating it out, and turning it into a permanent linear wetland.

If grassed swales are used when the ground is too steep, it's common for erosion to be a problem. Check dams, or reinforced turf in the base of the swale can assist. In some cases Councils have installed rock swale drains when the grade is over 2%, and this can look good and work well initially, but over time, pollution, sediment, litter and weeds will make it look ugly. And it can't be mowed, so the only 2 things to do are manually cleaning it regularly, or poisoning the weeds, which makes it look dead and ugly.

Vegetated Swales that don't require mowing can need less regular maintenance, but tend to suffer more from erosion, and when the plants grow, they can distort or divert the flow out of the swale. So annually, some harvesting or plant management can be expected.

But if you get swales right, they can be a brilliant treatment technique. That is, assuming that when you mow them, you have a catcher on the mower, and don't leave the grass clippings in the swale, ready to be washed downstream in the next storm.

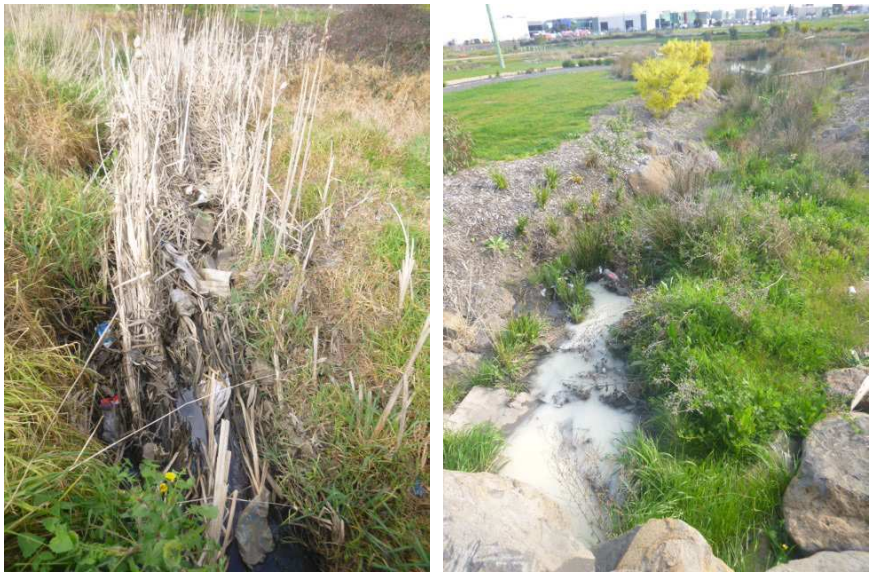


Figure 16 Vegetated swale with pollution and grass swale with paint spills.

1.15. SO HOW OFTEN DO I HAVE TO CLEAN MY SQIDS?

Don't let devices get to the point of non-operation or failure. Most primary treatments have O&M Manuals that provide advice. But as a general rule of thumb, if you are storing the pollution away from the screening or treatment area, then clean it when this area is full. If you are storing your pollution within a screening area, clean when the screen area is either blocked or pollution is halfway up the screens.

Wetlands are harder to determine, and swales/biofiltration/raingardens can be even harder still. When the infiltration rate has dropped to half, or water is ponding there for 2 days or more, then it time to clean it.

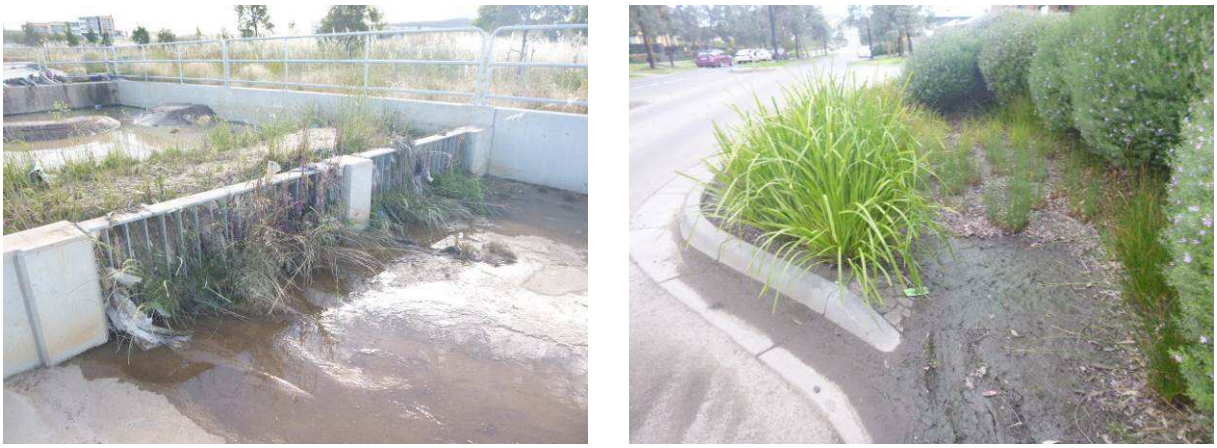


Figure 17 In this photo, the developer has shown pure neglect for the trashrack. This is disgraceful. And a raingarden so overloaded its stopped working.

1.16. TIDAL FLAPS WORK… DON'T THEY?

Tidal flap proprietors will likely tell you otherwise, but the author has never seen a tidal flap that was working. They bend, break, get vandalised, get stuck partially open and never seal properly. However what they do do, is put an increased resistance on flow trying to leave the line which

increases backwater and decreases the performance on any upstream treatment, and commonly raises upstream water levels to INCREASE the risk of flooding not DECREASE it. Put simply, tidal flaps don't work and cause problems, take them off.

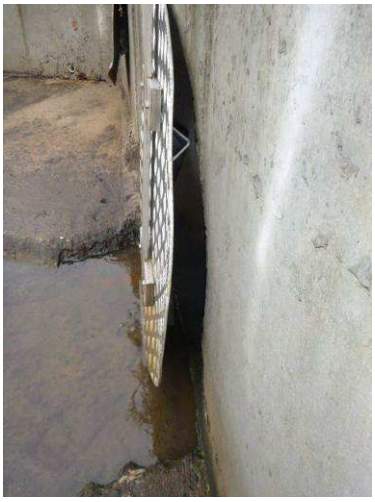



Figure 18 Most tidal flaps get bent and don't seal, so they don't stop the tide anyway.

1.17. MY LIDS ARE TOO HEAVY

Lids to access and monitor any type of underground SQID should be able to be easily opened (and shut again) by a single person. Lids that require 2 people to open them double the cost, and some lids are so heavy that you need a machine, and these should be replaced.

Lids that are well sized, easy to access and allow appropriate cleaning, should be used.


Figure 19 If there is the need for large lids, make them 2 part. Don't automatically go for D class lids if you are not putting them in a roadway. The easier it is to monitor and clean your SQID assets, the more reliably they will get cleaned.

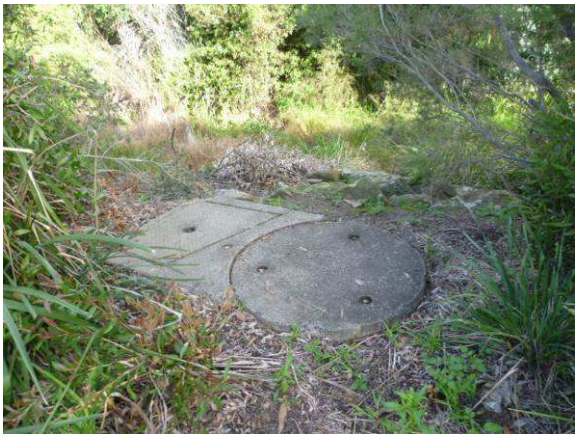
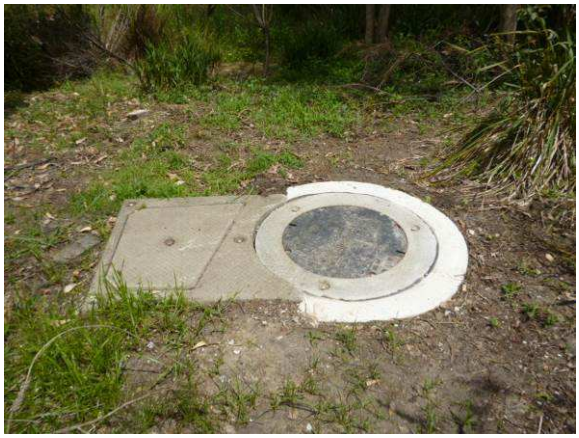



Figure 20 All Cleansall 375 GPTs need the lids replaced with ones that can be opened for inspection and cleaning without the need for a machine. Photos above show a CleansAll 375 lid before, and after, which also included a new lid surround, to prevent the dirt falling in when the lid was removed for cleaning.

1.18. WHAT IS THE BEST WAY TO CLEAN MY GPTS?

The most common way is via suction. This requires removal or decanting of the free water, and then pollution removed is in a fully saturated state, so Council could be paying to tip water. It's also generally done with one person on the end of the hose in a confined space. But it is very thorough, and the cleaners rarely leave anything in the GPTs. It also allows an internal inspection of everything, which is why this is the method required for Annual Cleaning for all GPTs.

But grab cleaning, which doesn't require removal of the water, and can be done with less staff, and no confined spaces access, is generally quicker and cheaper. It doesn't get the full 100% of pollution be can be expected to remove 80-90% if done well.

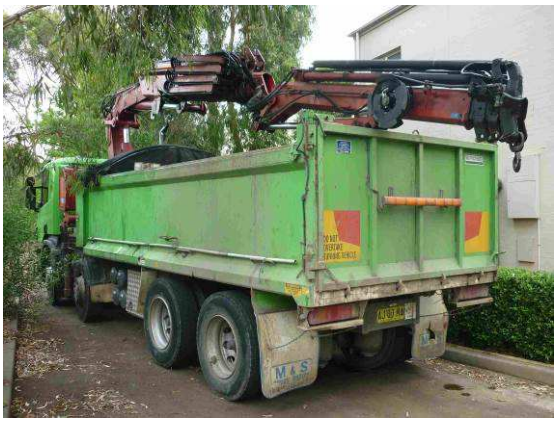



Figure 21 Whichever cleaning method Council chooses, or the cleaning contractor uses, its important to note that the trucks used are fairly large, so driveways and parking areas for them are a good idea. Whilst not required everywhere, it avoids rutting if you have at least a semi-formalised access.

2. CONCLUSIONS

Doing an audit of your hard engineering and soft engineering assets, should be done about once a decade, by an independent company that has the knowledge of all the treatments to be audited, plus the training and equipment needed to do the audit.

The outcomes of the audit, commonly identify issues and problems specific to each site. But once these are know, and options to address these are costed, then Council can make informed decisions about how they wish to proceed. The audits undertaken over the past 6 years by Optimal Stormwater have shown up a series of common issues, and these were addressed above.

Its important for the lessons learned by the auditors, to be relayed to the Maintenance Staff, the Capital Works section, the DA Engineers, the Environmental section at Council, as well as staff in the Parks and Roads areas.

If we are to truly "*learn by our mistakes*" we need to highlight the common problems and address them, and build the capacity of our co-workers so these mistakes don't get repeated. It also helps if we can "*learn by the mistakes of others*" and not repeat them ourselves.

3. ACKNOWLEDGMENTS

This work was conducted in collaboration with Simon Weaver, and other staff over the past 6 years at Optimal Stormwater.

I wish to thank the many Councils that have allowed Optimal Stormwater to provide the Auditing they needed to get their Stormwater assets back into operation.

Auditing shows up Mistakes of the past…….Please Don't Repeat

by

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Introduction

Why don't the results on the ground, meet the targets that were predicted during the modelling?

Why are we getting problems and who's fault is it?

How hard can it be, to design something:

reliable, efficient and cost effective to maintain?.....

And then clean it properly…..

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- This presentation hits the top 20 reasons and issues that we aren't getting the results we want.

- The paper has 18, but you get a bonus 2 for showing up today.

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1. GPTs *ARE* part of WSUD

- GPTs are the most common primary treatment method for many stormwater treatment systems.
- The proprietary solutions have a place, as do the vegetated ones, that are commonly secondary treatment.
- When correctly sized, sited, and designed…. they can produce awesome results.
- But without cleaning, GPTs suffer the same fate as any other treatment

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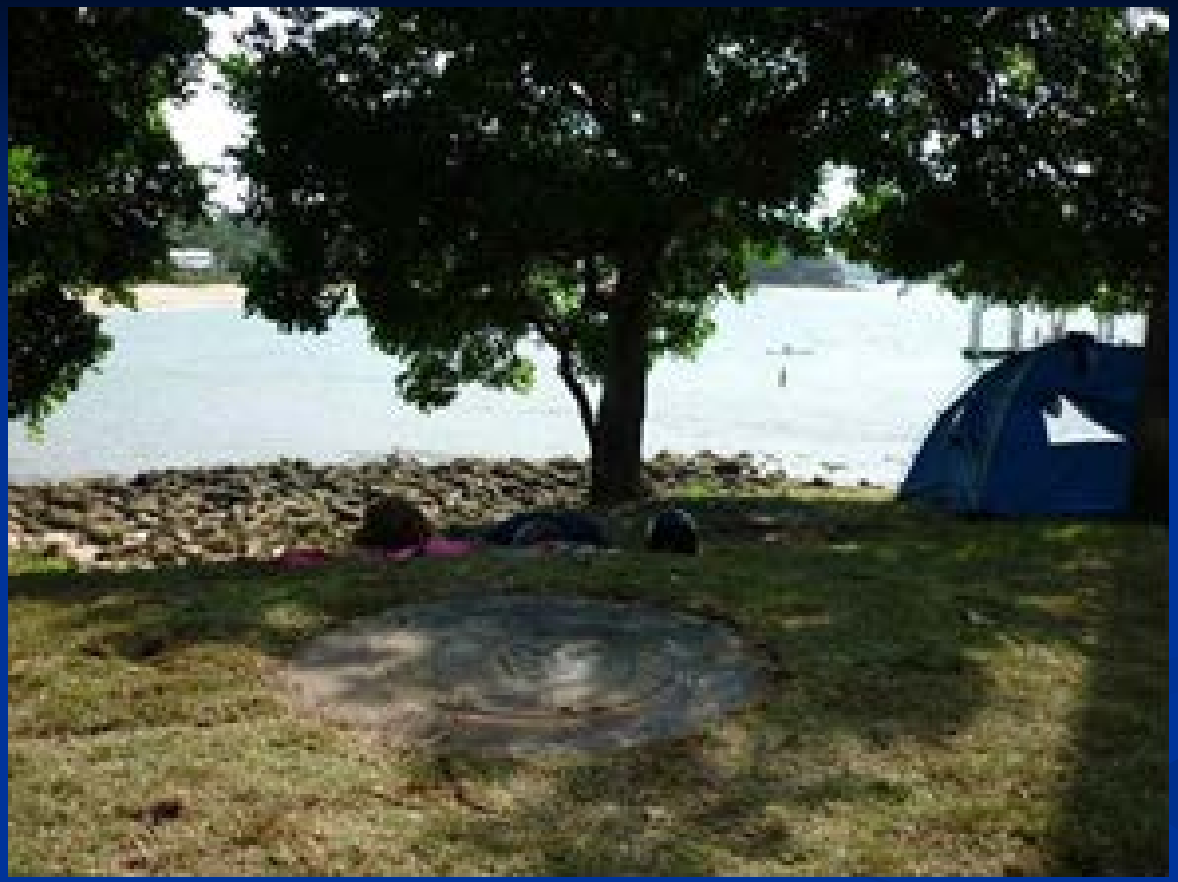

A nice GPT, good access, people happy to sunbake 2m from it.

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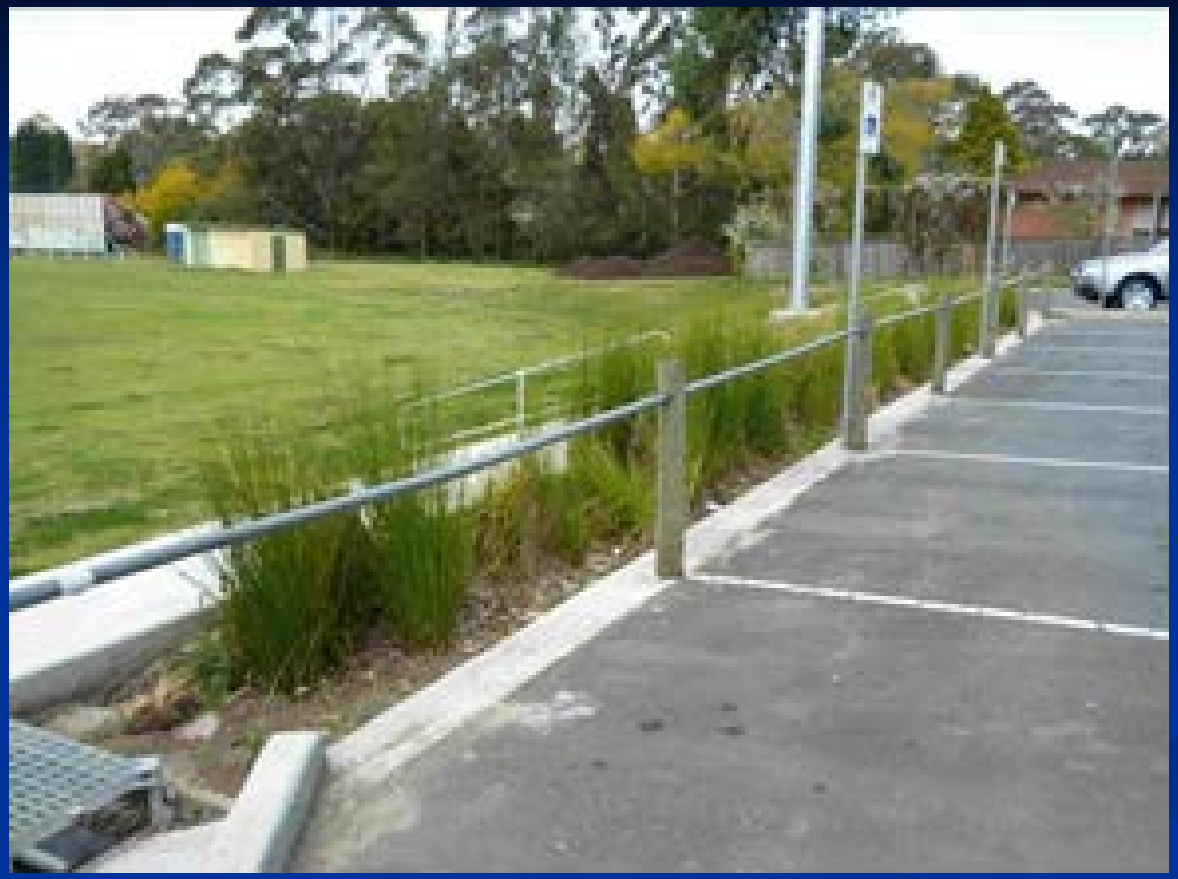

A nice bioretention system treating a carpark, generally attractive and working well.

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Who's talking…..

- At present about 99% of the industry is talking about vegetated solutions: bioretention, swales, wetlands, raingardens, etc "WSUD".
- Only 1% are talking about GPTs and primary treatment,
- No talk, no training, no advice on cleaning and servicing these assets, has left many in a poor condition.

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Audit Outcomes

- With little attention, and no love from anybody, the primary treatments for many Councils are now in a WORSE state than the "sexier" new "WSUD" treatments.
- Both primary and secondary treatments need attention, but at present, its not happening evenly or fairly or as needed.
- GPTs are part of WSUD and need some love.

2. Cleaning of treatment assets

The main reasons for poor cleaning:

- Poor handover practices
- Inadequate access
- Broken lids or heavy lids
- Insufficient budget, and
- A general lack of knowledge regarding *how* to clean the device correctly, and *what* triggers a clean

.

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A massively overful CDS unit. This is 200% full.

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- Lack of GPT cleaning has led to deposition in the upstream pipework (flooding potential)

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3. What is a "cleaning spec"

- How many Councils actually tell their cleaning contractor what they want done, and how many leave it up to the cleaners?
- Without a cleaning spec, tenderers for the cleaning contract will put in their cheapest pricing based on doing the absolute minimum.
- With no spec, you are 99% likely to NOT get the cleaning/servicing you need.

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- This Humeceptor was being cleaned every 3 months, but sat non-operational for years. The down pipe must also be checked and cleaned.

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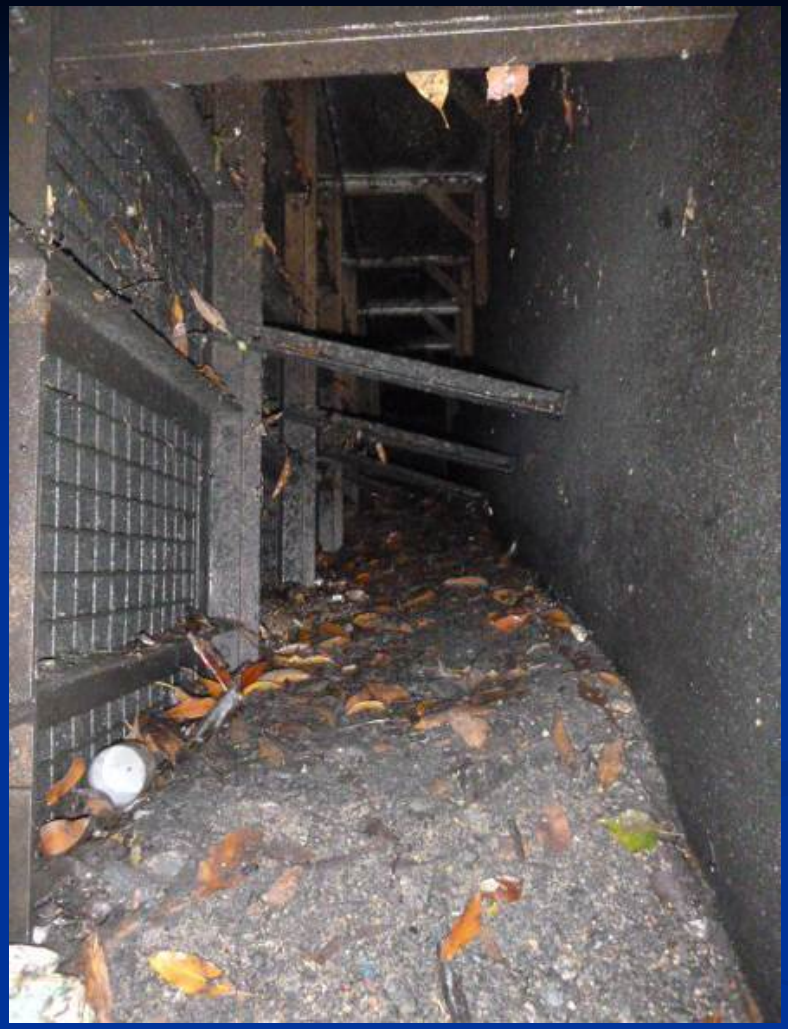

- Early cleaning manuals by Ecosol made no mention of the need to clean behind the screens, but they do now.

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4. Is my GPT too small?

- Historically many GPTs were sized based on claimed treatable flowrates, but if a shopping trolley can treat 5000L/s, that should tell you how much faith you can put in those.
- Auditing has shown up over half of all GPTs installed are too small. Many also have other issues.
- As a minimum sump storage should cater for the 3 month cleaning frequency.

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- Adequate pollution storage volume is essential to address the pollution load. Some devices have bigger storages than others

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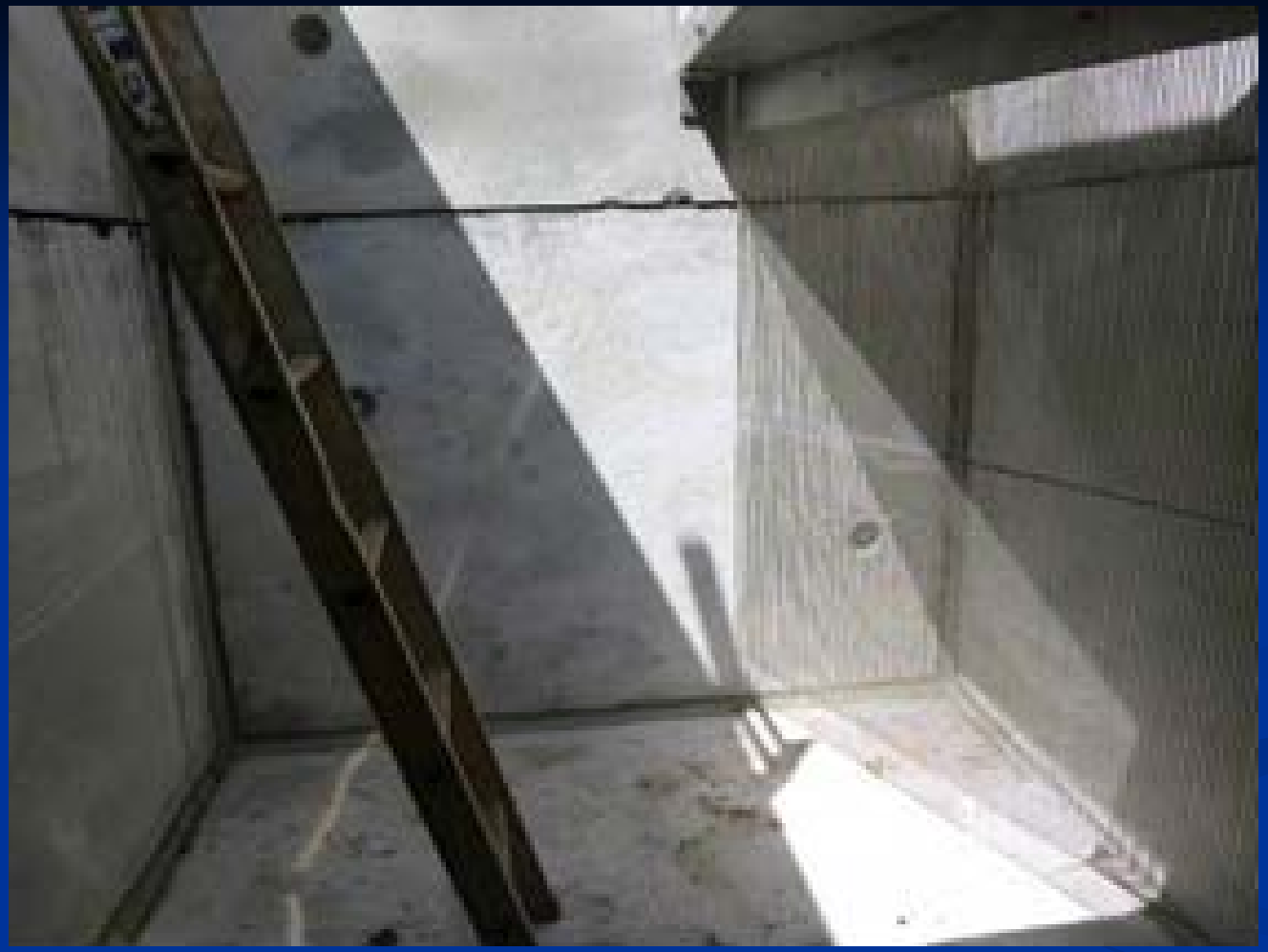

- CDS and Humegards offer the largest storages, but you also need to know what constitutes "full" and triggers a clean.

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- This Canberra style GPT is way too small.

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- If the weirs block over the inlet pipe, it should be evident that the device is too small, as per whoever selected this model of Ecosol.

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5. Backwater issues

- Most solutions use a drop or weir to direct the flow through a structure.
- If a backwater (tidal or not) drowns out that weir, the device wont work.
- Enough said…… be very careful about backwater, it impacts functionality first, but can significantly complicate cleaning.

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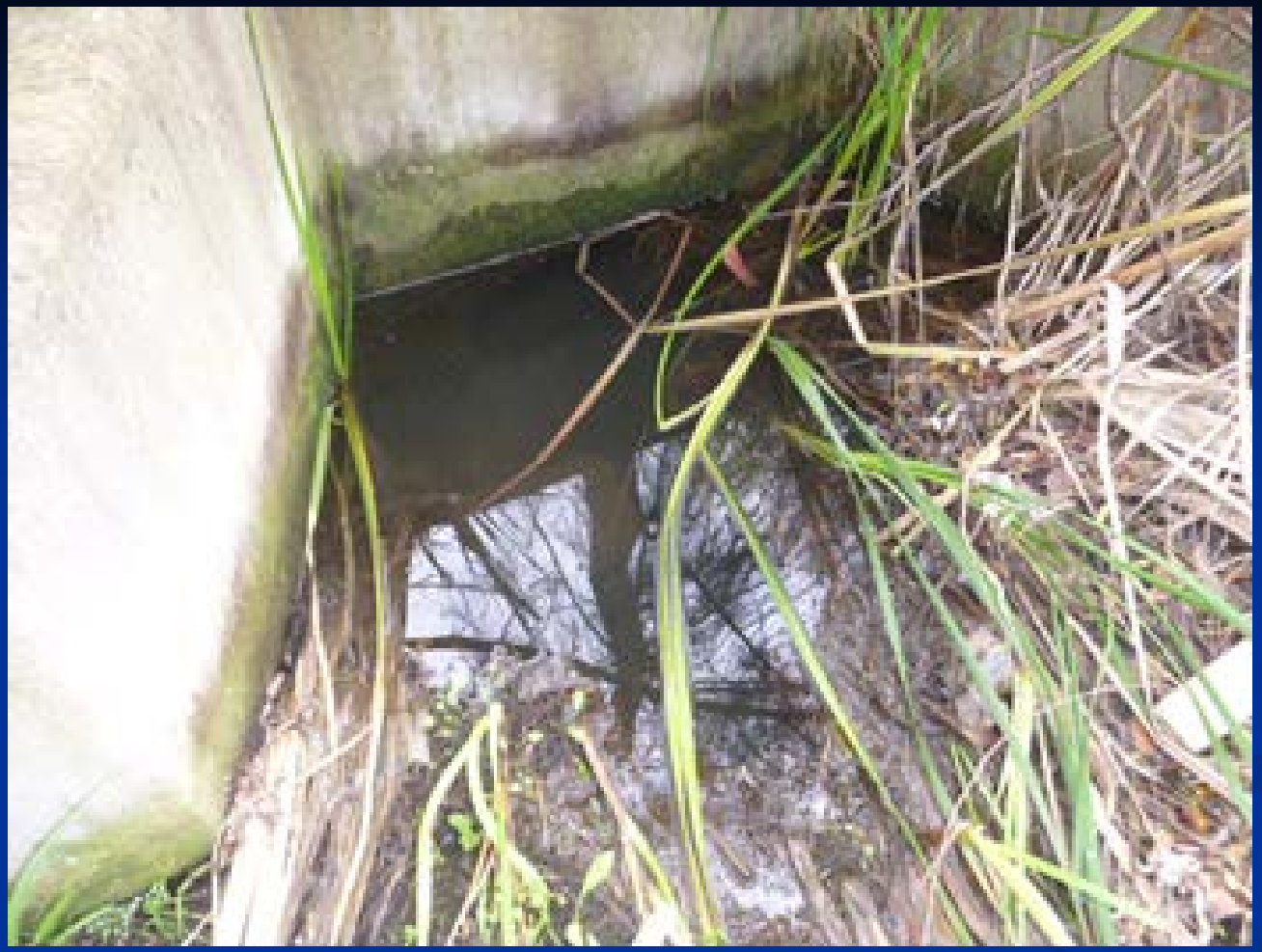

- A Humeceptor with a 200mm weir, trying to operate with 400mm backwater. Device not working, and uncleanable. This is the outlet.

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- A Cleansall with a 600mm weir and 560mm of backwater. Note pollution on wrong side of weir.

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6. Surely it was installed correctly

- Auditing has revealed about 20% of GPTs were not installed correctly.
- Concrete filling in pipes, poor joints, wrong levels, lack of understanding about lids, etc etc
- Councils need to check that the devices they are inheriting are in perfect working order BEFORE they accept them. This means pumpdown, and internal inspections. (it'll be worth it)

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- A CDS with the weir installed back to front. It doesn't even join the inlet chute, theres a 50mm gap! (beware idiots and shortcutters)

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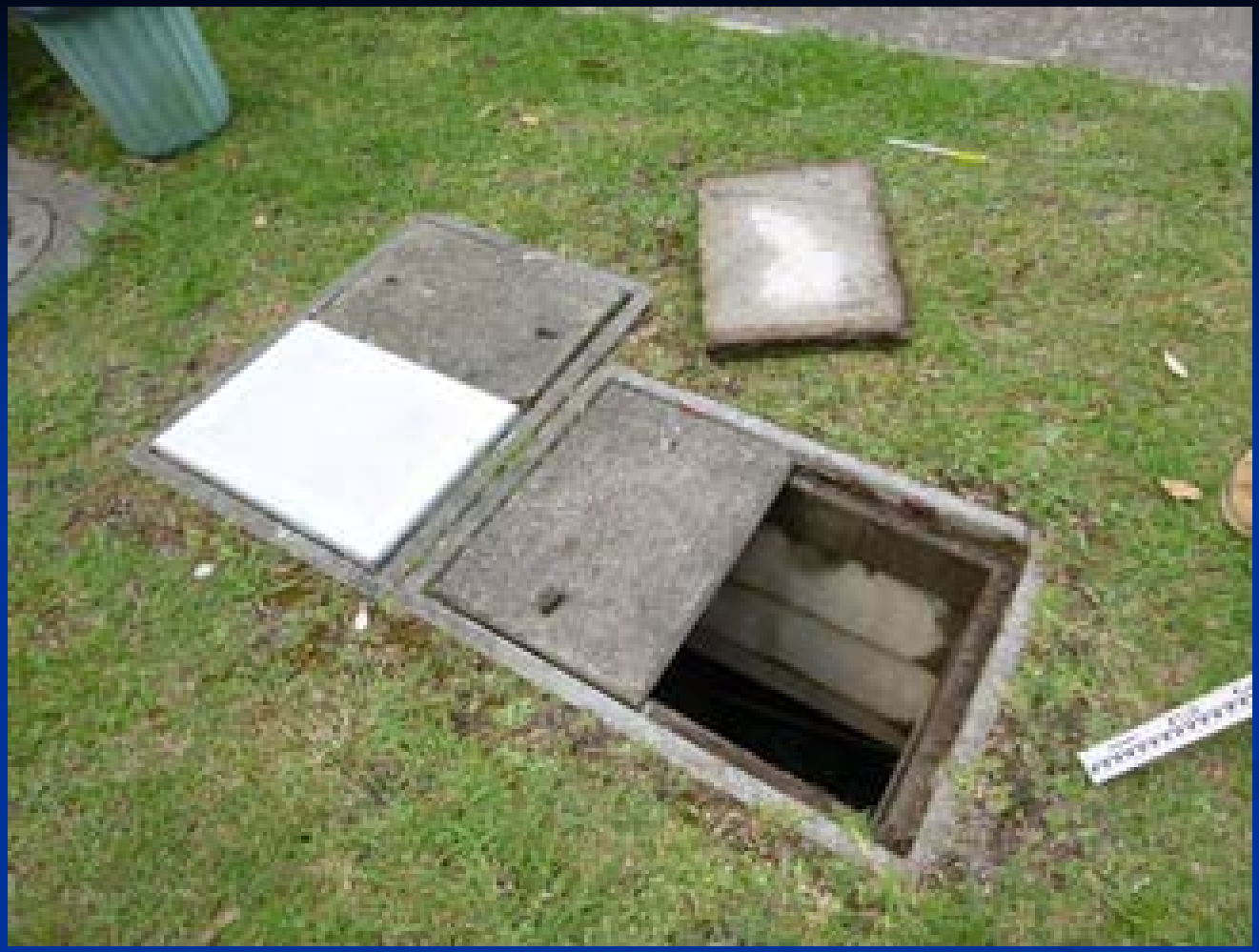

- A Humegard with two lids, but neither is over the area that stores pollution!

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7. Exclusion bars block

- Exclusion bars are commonly required on open systems to exclude kids from entering.
- They can function like a bad trashrack and (depending on design) can block readily and cause loss of pollution, and maintenance headaches.
- Include their inspection and cleaning in the cleaning spec.
- Some are a lot better than others. Ask around.

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- A GPT, with very poor exclusion bars right over the throat. This blockage was after one rain.

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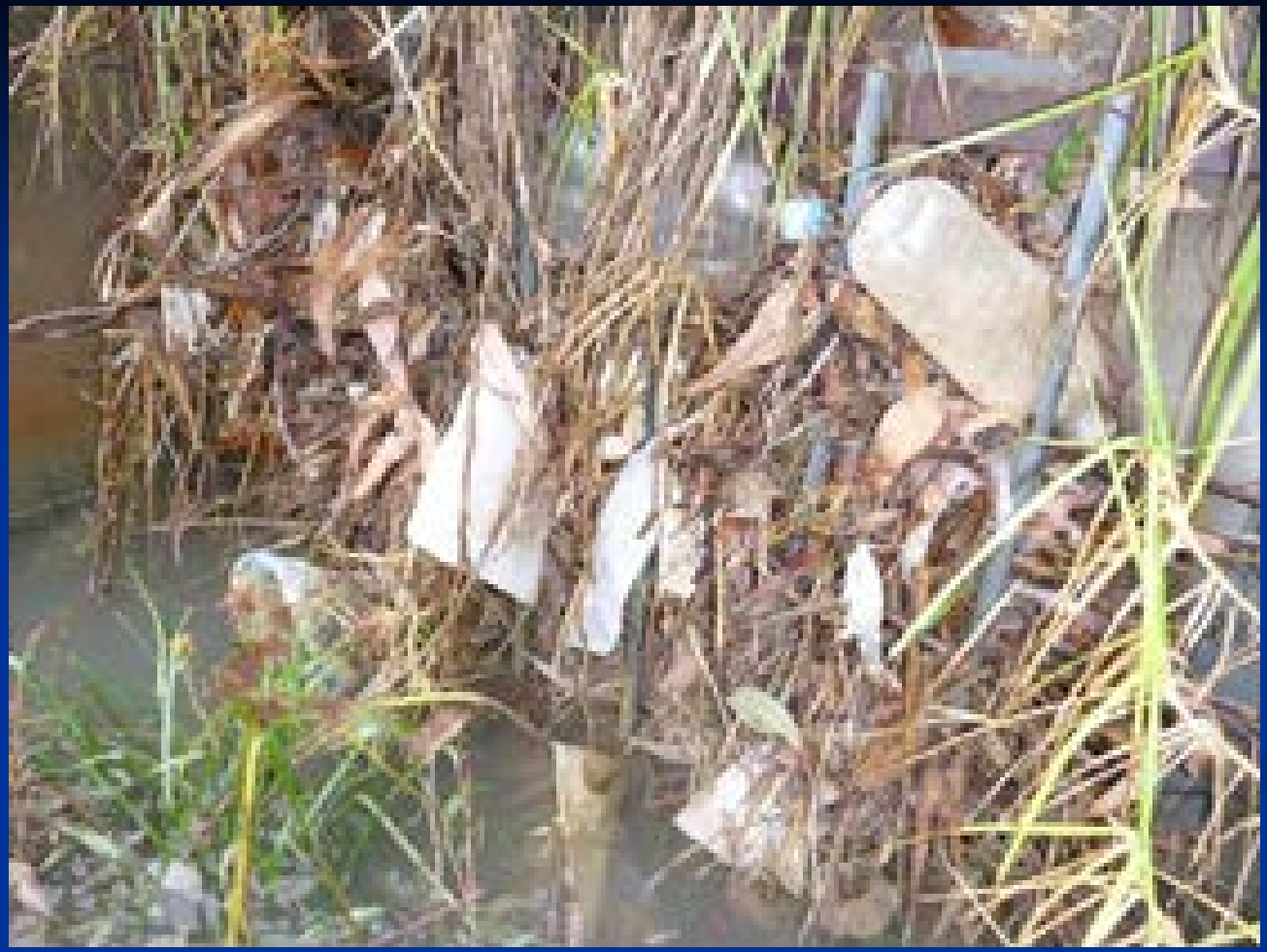

- A GPT, with poor cleaning, bypassed this pollution which blocked on the outlet and caused flooding upstream.

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8. Better access please

- Every cleaning company complains about poor access to some devices, and rightly so.
- You may not need a 4m wide concrete driveway, but you need to be able to get a cleaning vehicle in to whatever the solution is.
- Wetlands and ponds commonly have problems.
- Trees, area to decant water, services, traffic mgt, heavy lids, vehicle cant reach the device. All common problems.

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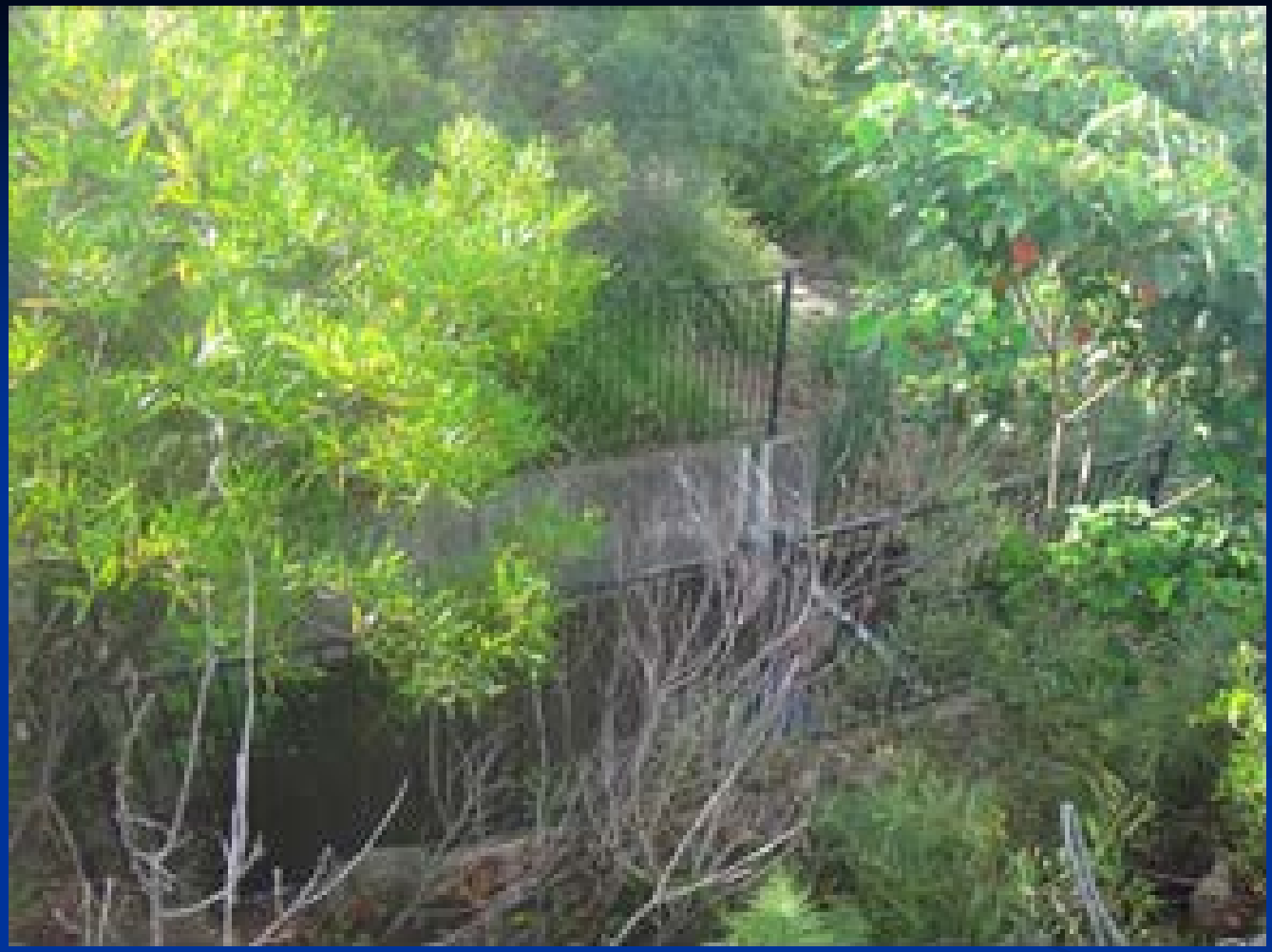

- An open GPT, with poor cleaning access, no bypass ability, and the truck cant get anywhere near it.

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- Cleaning this nettech is hard enough, but having to drive across a golf course to do it…. Time to find an alternative solution.

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9. Velocity, how does that impact?

- Velocity of the stormwater should be a major consideration for designers, but most don't even know why.
- Different devices handle high speed flows differently. Choose wisely.
- Settlement solutions don't like velocity
- Vortex solutions do like velocity

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- A Humegard with bent weir/boom, not moving. Note leaves stuck on top of the weir. Better when grades are <2%

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- A VortCapture makes good use of velocity. And is well suited to pipes on grades >2%

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10. Grease those lids

- Greasing gatic lids and manholes covers seems like such a common sense thing to do.
- But if its not in a cleaning spec, you can expect it wont get done.
- Left unopened for a few years, many lids wont open at all.
- Once a year, open ALL lids, and grease them. Simple!

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- A CDS Unit diversion chamber access, rusted in place because it wasn't on a spec to open it.

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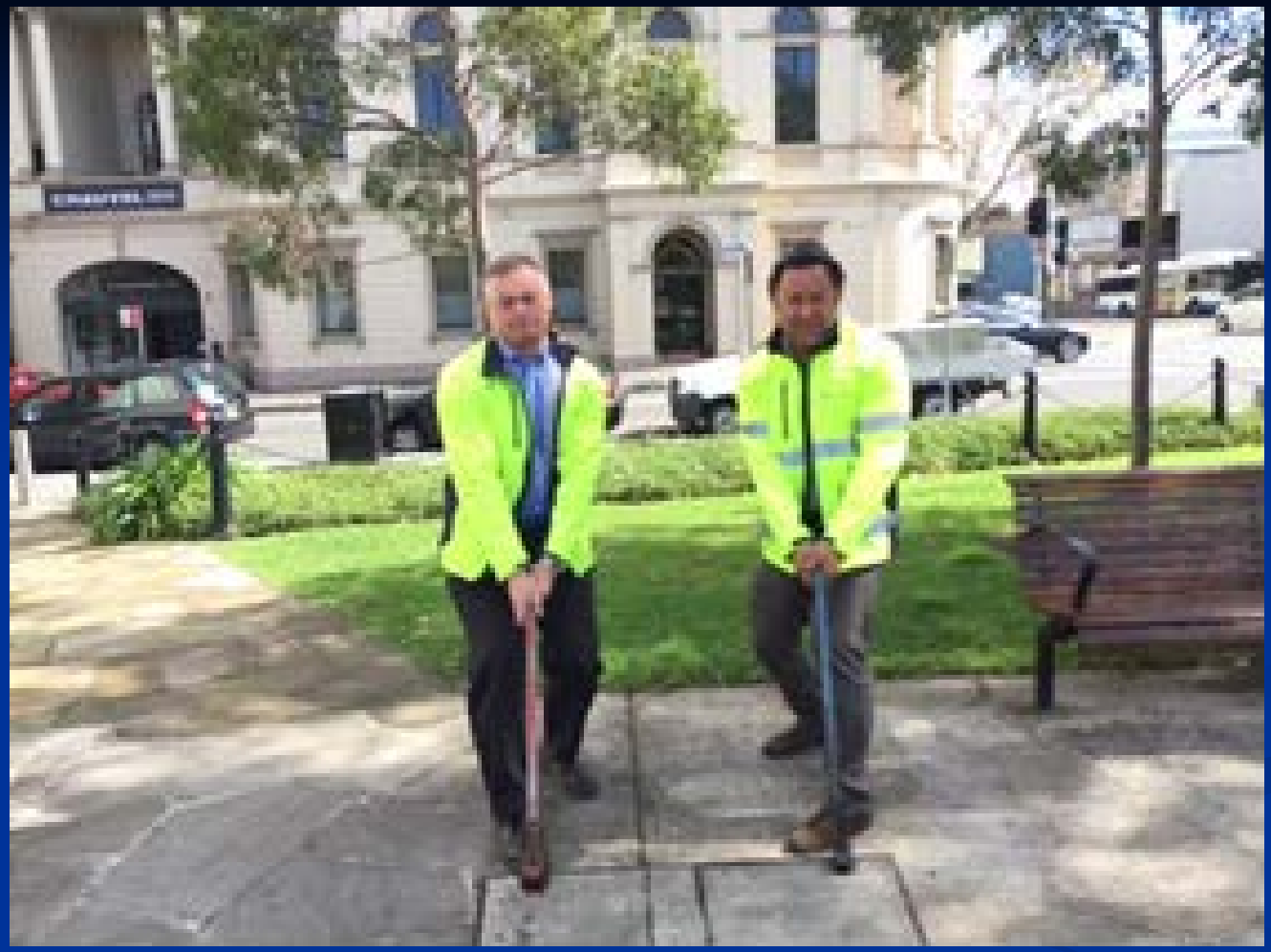

- Heavy lids that have not been greased are the worst. If 2 men cant even open it. Change the lid.

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11. Confined spaces entry reqd

- Entering a confined space is not hard or dangerous IF you are trained and know what you're doing.
- If you Don't enter confined spaces to inspect or audit your devices, you wont get the full picture on what's going on.
- All cleaning contractors are confined spaces trained. And cleaning is faster is someone is inside (hence cheaper)

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- Blocked screens. Sediment behind the screens. You wont know about hidden problems without going underground

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- Blocked inlet. And another blocked inlet.
- Have your cleaning spec note that confined spaces access is not just desirable, its expected.

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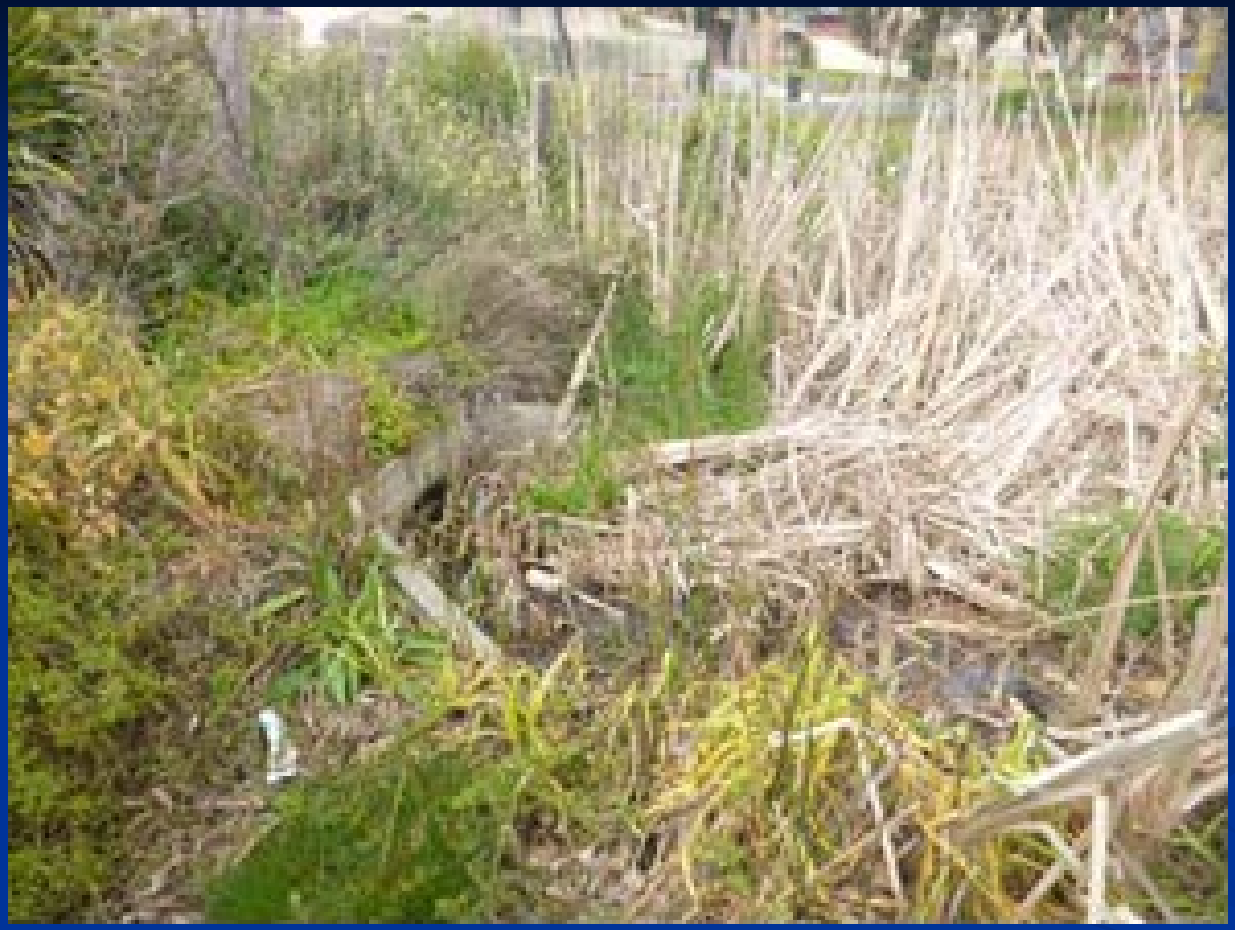
12. My wetland is uncleanable

- Poor access
- No ability or location to dewater
- No thought about macrophyte culling
- No upstream primary treatment
- Too hard, too expensive, and it doesn't get done



- The wetland is so overgrown its stopped the GPT working and is now causing flooding

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- the macrophytes are dead and should be culled to encourage new growth. If not removed they will decay and rot and release their nutrients.

13. Problems cleaning pit traps?

- "At source" good in theory, but its turning out to be less reliable and more expensive than "inline or end of line".
- Traffic management
- Night work
- Cars parked on top
- When they block water stays above ground with potential flooding impacts.

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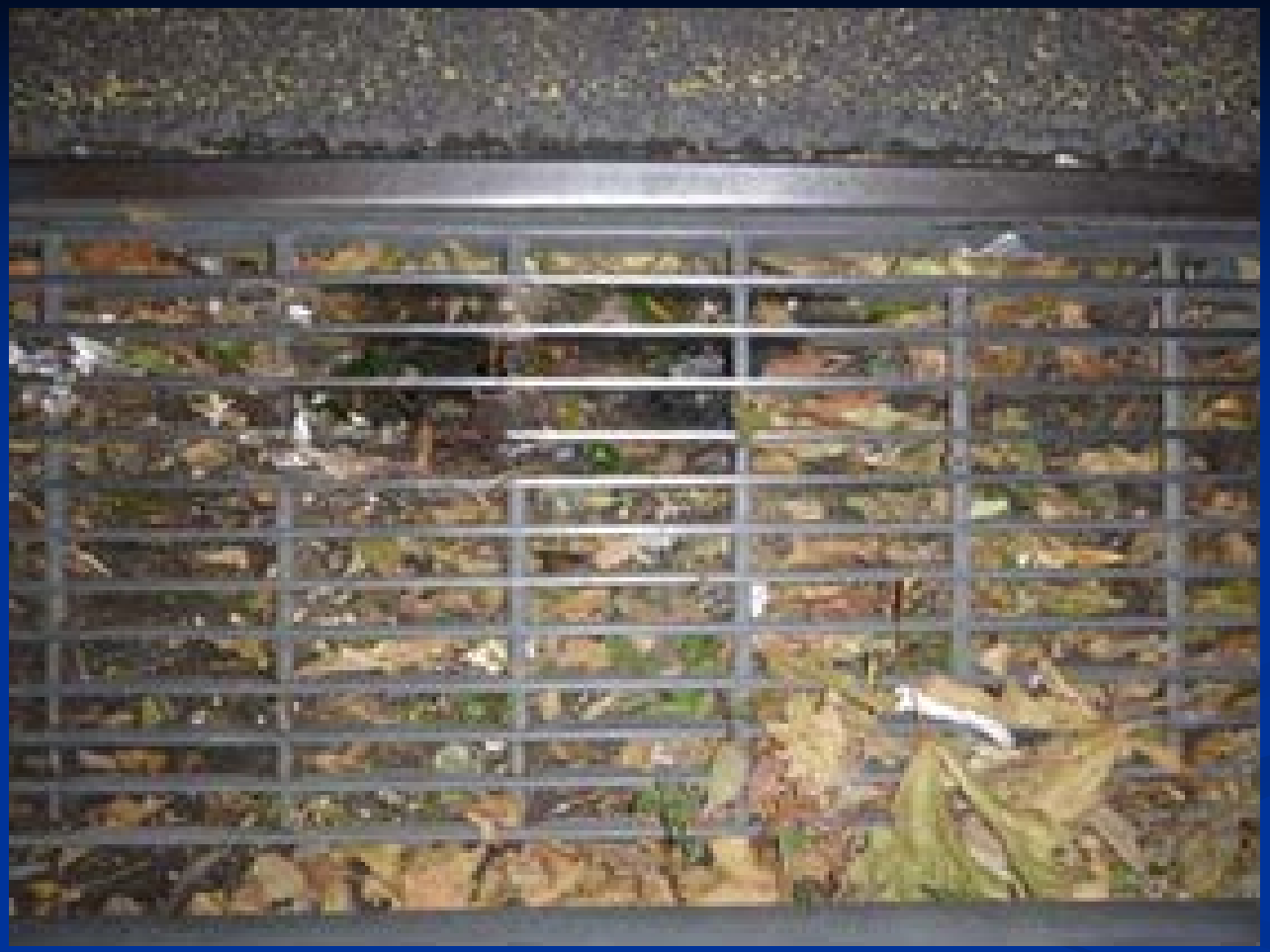

- There is a pit trap under the solid leaves and sediment right to the grate!

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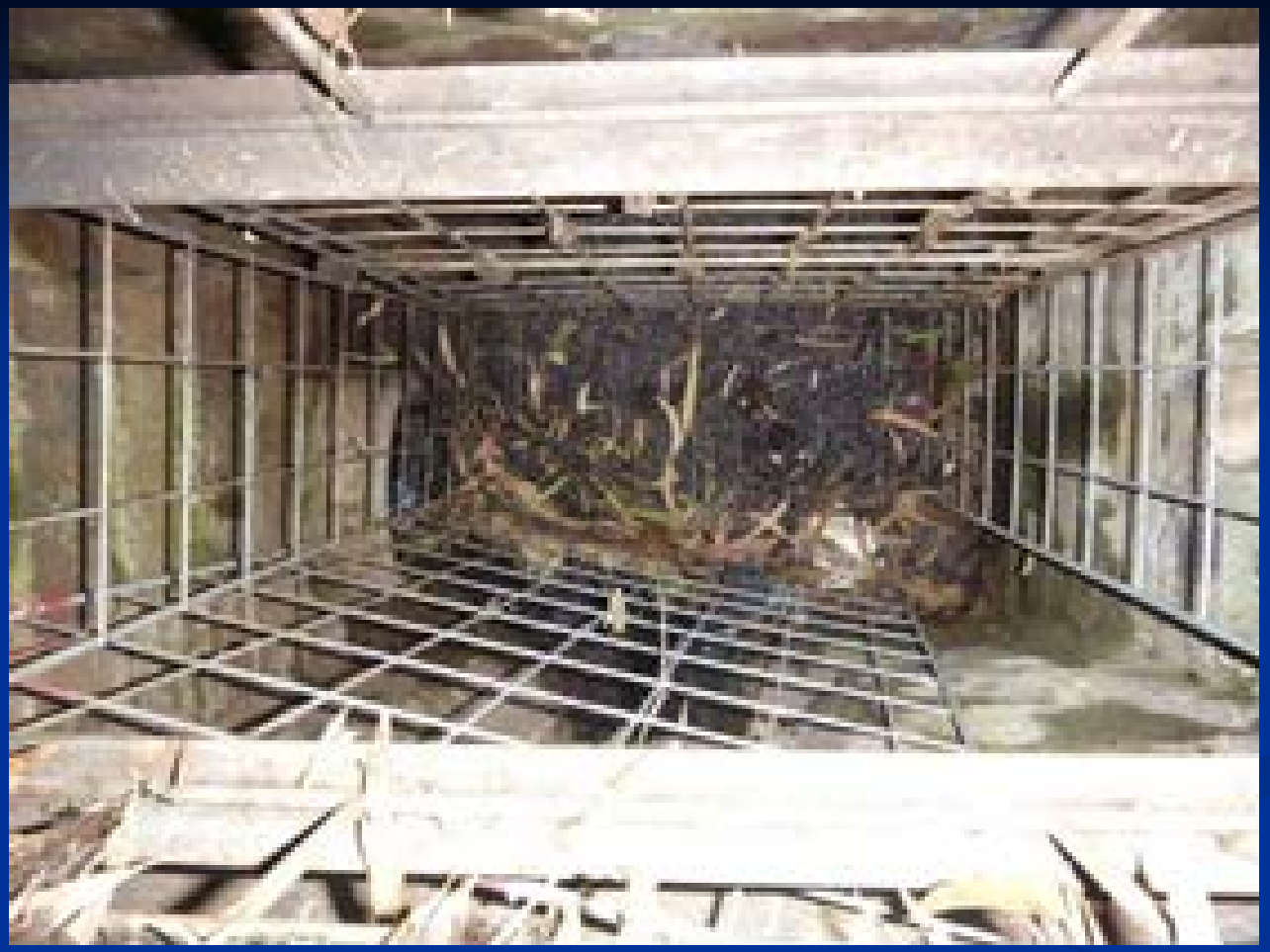

- Frame is broken, frame goes to the bottom and blocks flow, oh yeah…. No bag! Where did that go?

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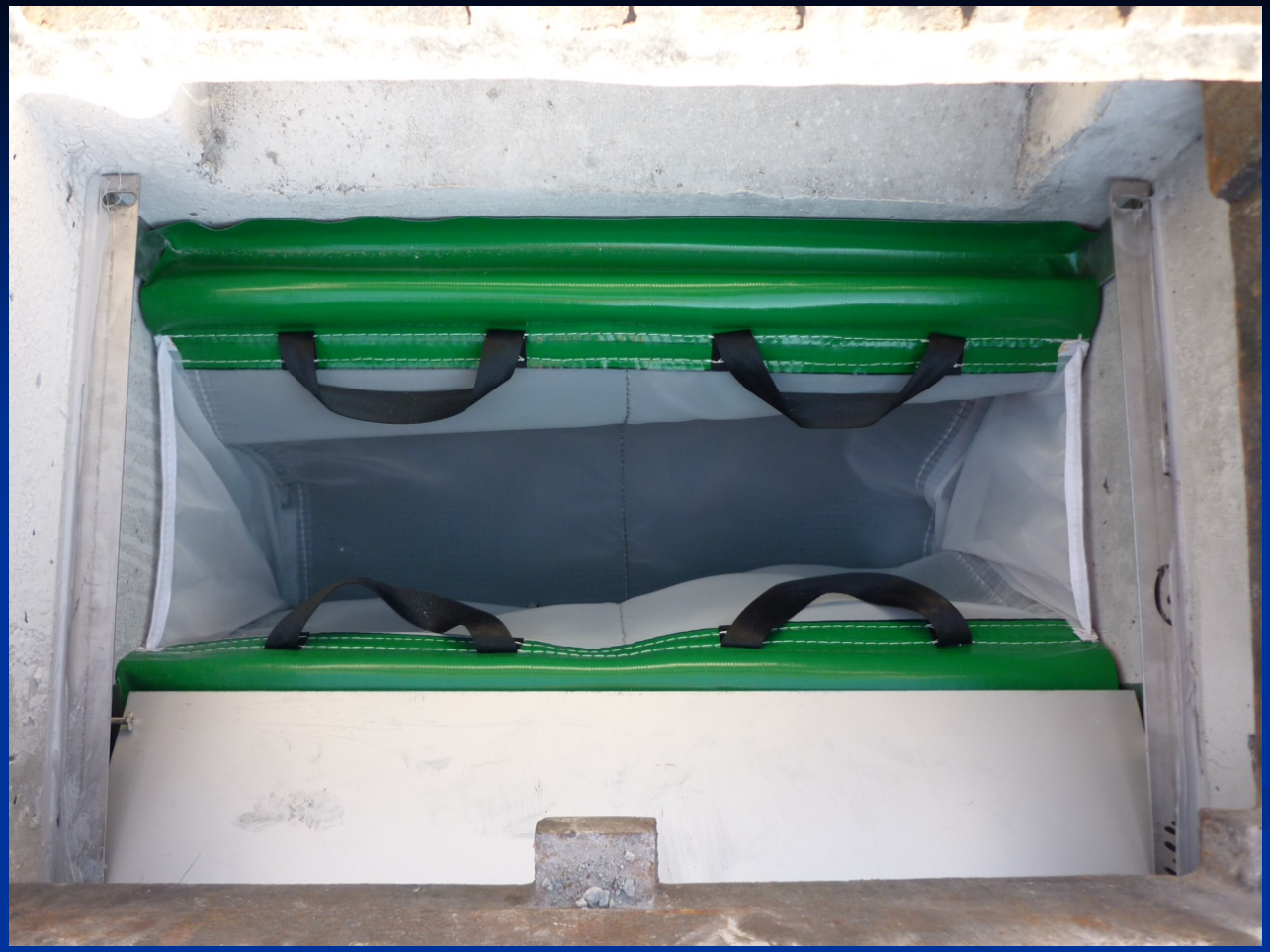

- New Ecosol RSF100 pit basket. Looks good.
- But its too deep, and mesh too fine.
- Use 5mm not 100 micron.

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14. My swale is a pain to maintain

- Grassed swales are good because maintenance crews with ride on mowers like them.
- Too flat, they can get boggy
- Too steep, they can erode
- Vegetated can be good or bad, but manual cleaning means cleaning is less likely to happen
- Vegetation can also allow erosion between plants, or cut off the flow path. Inspect for erosion annually at a minimum.

- Swale is overgrown, with pollution. It wants to be a creek.

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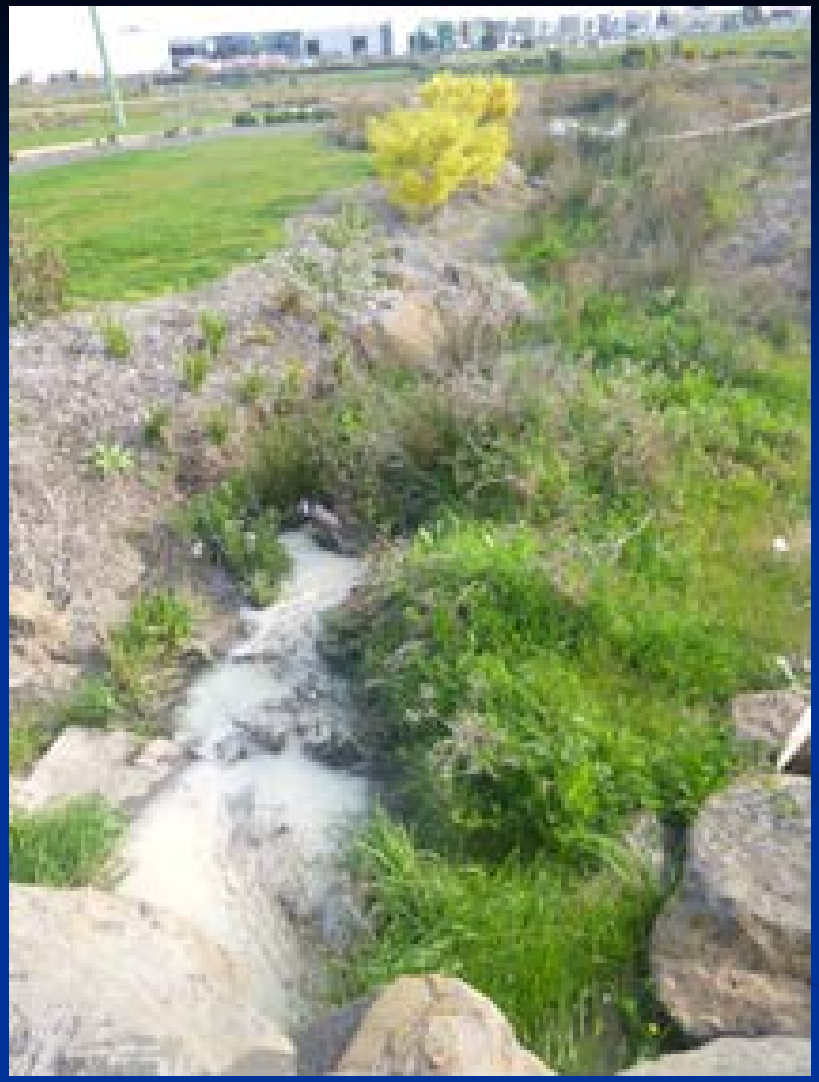

- A vegetated swale trying to deal with a paint. Too rocky and steep to mow so they use poison.

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15. How often do I clean my SQIDs?

- Depends on type, functionality, catchment area, loading and storage capacity in the device.
- Understand your "Cleaning Triggers".
- More cleaning is better, but unaffordable.
- GPTs ideally 3 monthly. Never more than 6 monthly.
- Pit traps monthly,
- Wetlands…..???? Depends on pretreatment.

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- The developer in charge of this trashrack should be shot. Sediment above the top of the rack!

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- Raingarden cleaning is commonly manual. This is either no cleaning or a slug of sediment, but its virtually non operational now.

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16. Tidal flaps work, don't they?

- Beware, beware, beware….
- I've never seen a tidal flap working on stormwater.
- Debris, flow force, moving part, sediment
- Tidal flaps CAUSE problems for upstream treatment.
- To stop backwater use a drop board or penstock, NOT a tidal flap.

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- It takes force/energy to lift the tidal flap, so this RAISES the water levels upstream, and can CAUSE flooding not stop it.

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- They bend and never seal properly, so the water will go up the pipe anyway. If you have them, take them off. One less thing to maintain.

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17. My lids are too heavy

- If a lid is too heavy for a single person to open then monitoring it will cost twice as much, because you need 2 people to open it.
- Use multipart lids, or C-class or B-class. Don't just default to D-class lids
- Remember the grease, it really helps.
- Easy to monitor and easy to clean, gets done
- If you need a machine, change the lid.

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- That's me, 110kgs of downward force on two gatic lifters, and I'm unable to open a D-class 900x900 gatic lid.

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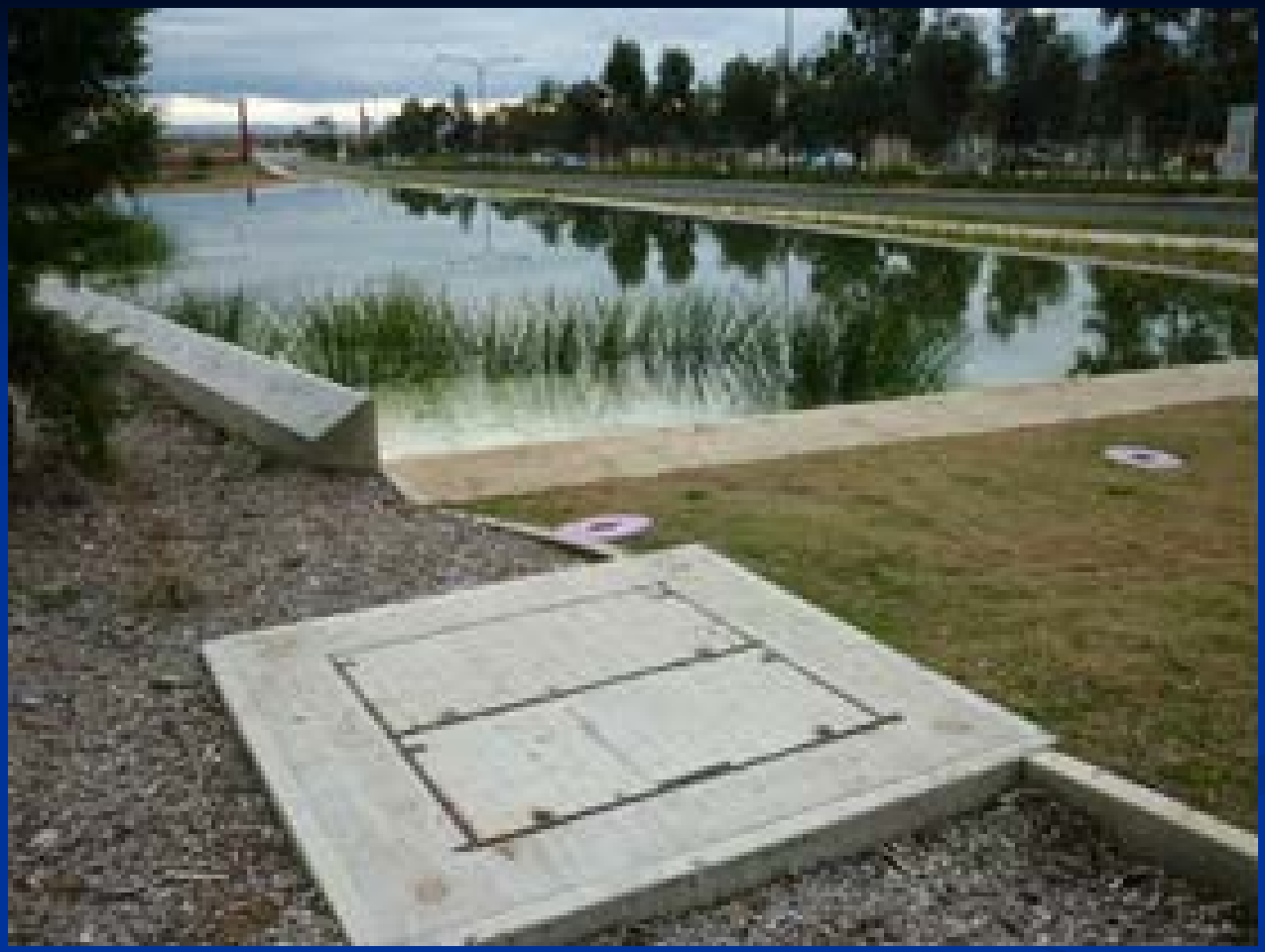

- Two part lids solve the weight problem if you need to go D-class. Also remember the direction the lids open. This is a good lid.

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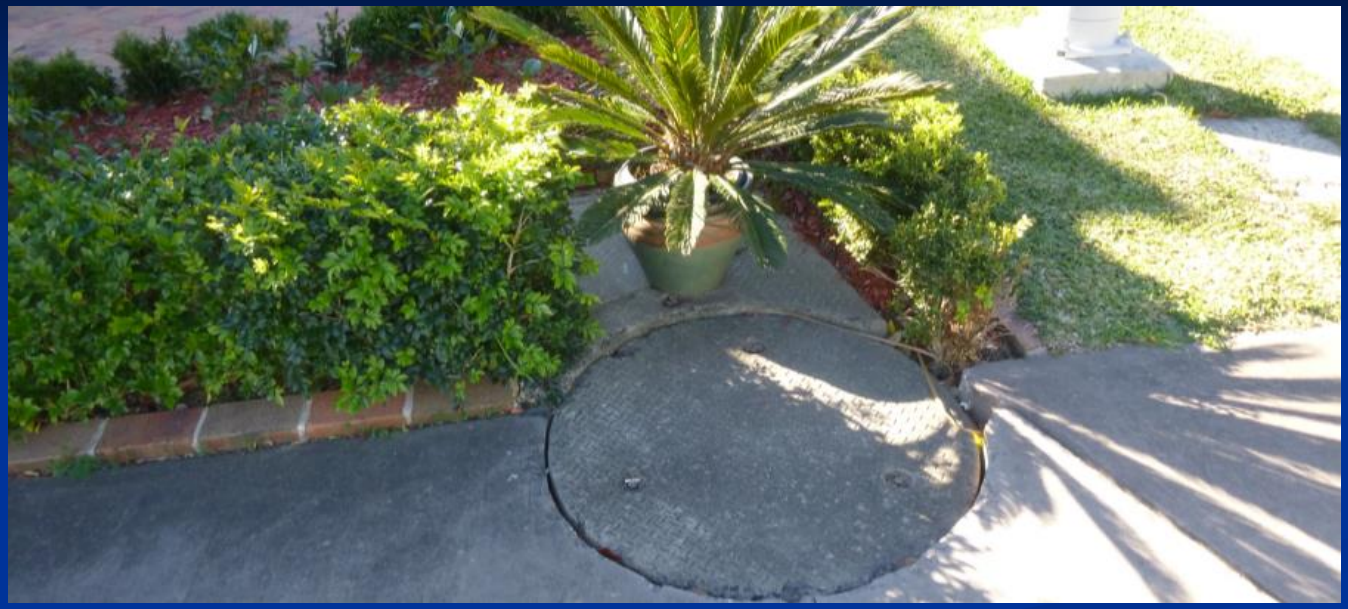

- If you have Cleansall 375 devices with the “old lid” Get them swapped, Rocla now make new monitorable lids.

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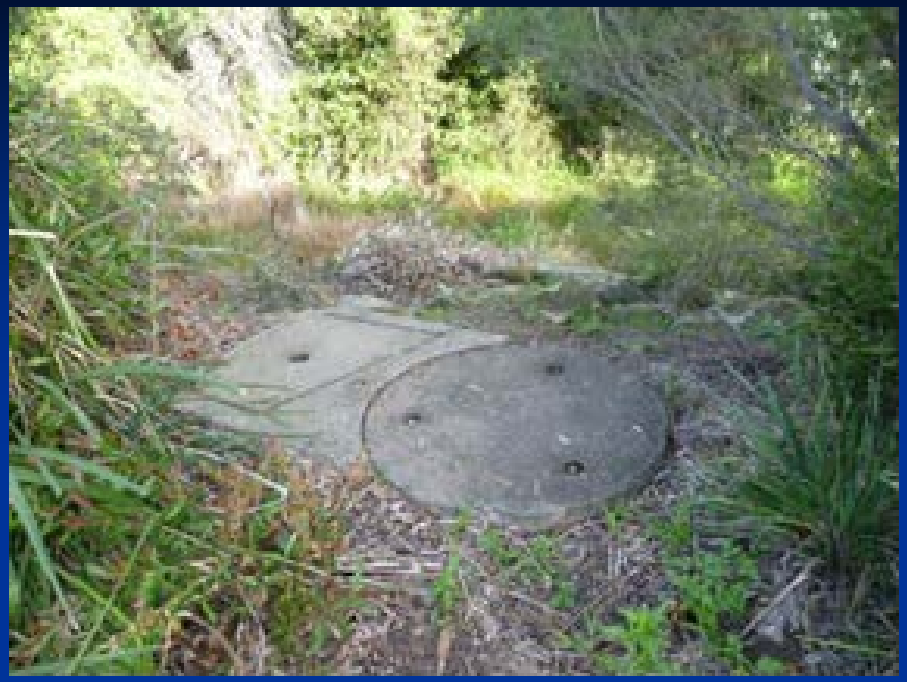

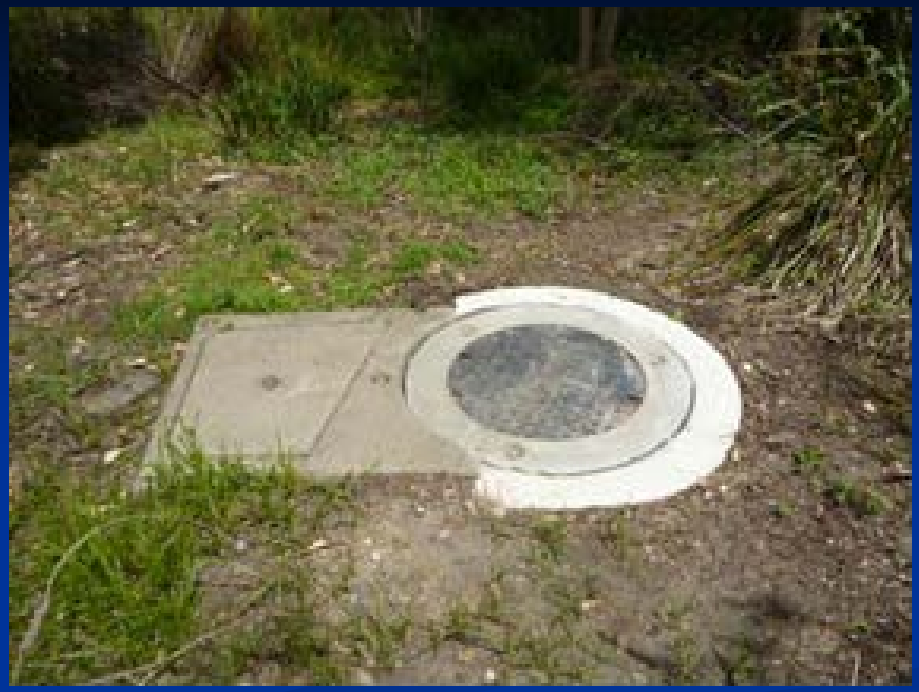

- Before and after with the cleansall 375 lid.
- Note the new lid surround to stop the soil falling in when you lift the lid off to get the basket out.

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18. Whats best to clean GPTs?

- Suction is the most popular, but you need to decant water, and need 3 people due to confined space, but you get to see EVERYTHING.
- Grab cleaning is faster and cheaper, so fine for 3 times per year, but annually it still needs a suction clean.
- Suction cleaners can get into diversion chambers and behind screens etc.

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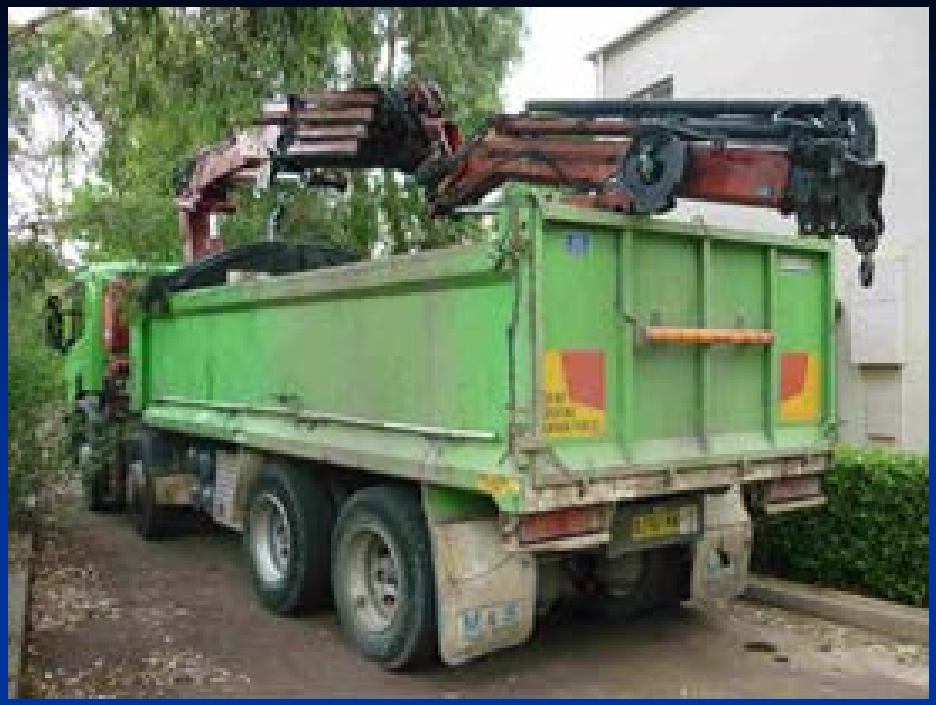

- Grab trucks are large and need good access.
- Grab trucks are the best "educational tool" when it comes to cleaning

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- Suction trucks are large and need good access.
- Even devices with baskets tend to get suction cleaned because its faster and easier.

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19. Out of site, out of mind

- Some Councils like trashracks because you can easily see when they need cleaning but this also makes them ugly.
- Underground solutions have much better aesthetics, better safety, better performance
- But being underground means they MUST be on a regular monitoring or cleaning program

- This type of device is poor, online and too small.
- But its cheap primary treatment and easy to clean. BUT its pretty ugly and will not be increasing property values….

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- The Stormfilter cartridge system is a high performance system….but only if you maintain it. In this case the upstream GPT was too small and didn't get maintained.

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20. Auditing and Budgeting

- Auditing will identify all your problems
- Gives you a Data Sheet and Report.
- It can then feed into costing the options and capital works budgets
- It can provide information on where improved cleaning techniques are required
- And based on catchment area, it can assist to predict the cleaning frequency to do it right.

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- This leads into determining the "correct budget" to do the maintenance properly
- If you don't know what it should cost,…. your cleaning is being done ….*down to a price, not up to a standard.*
- It gives Council Maintenance staff the ammunition to increase their cleaning budgets.
- Gives the Council Maintenance dept the ability to achieve MUCH MUCH MORE

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Conclusion: lets learn

- By highlighting some of the issues and problems our stormwater solutions suffer, we can all LEARN from our mistakes.
- Our past is *"littered with learning experiences"* and its up to us to learn from them, and grow.
- Speak to your Maintenance guys during design
- Feed the knowledge they have back into the design and approval process

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Lets turn “Mistakes of the Past”

Into

Learning Experiences in our

Stormwater Evolutionary Journey.

Thank you.

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