Oil Industry Environment Working Group - Water Discharges Guideline Update

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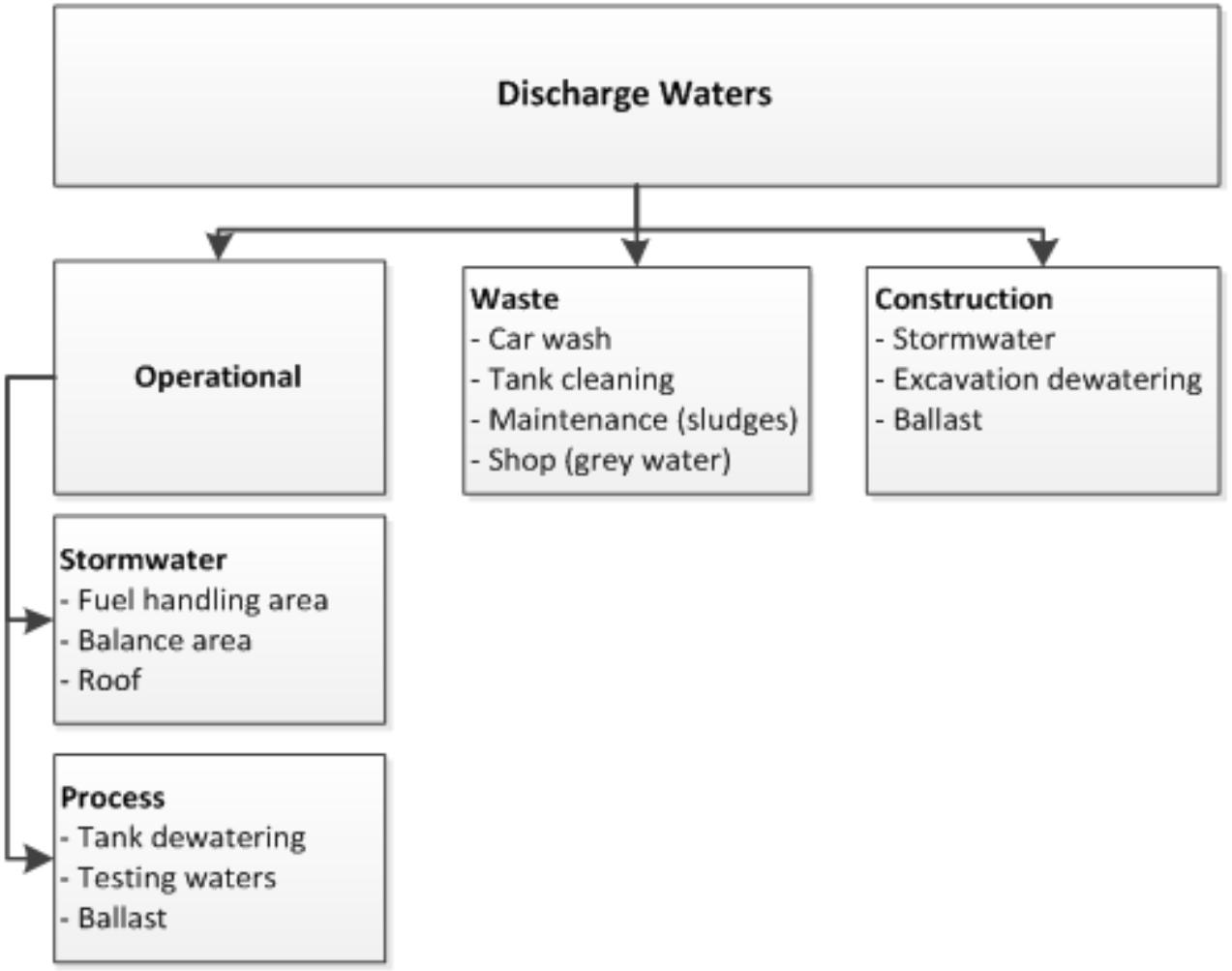
OIEWG and the Guidelines

- The Oil Industry Environment Working Group (OIEWG) formed mid 1990s - a forum for environmental management in the downstream petroleum industry.
- One of the first OIEWG activities was the development of a set of “Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand”.
- The Guidelines were developed by an MfE Task Group (OIEWG and Councils) with predominantly Oil Industry funding.

What's in Scope



Why a Guideline Review

- These guidelines are almost 20 years old
- There have been significant developments in Stormwater management since the guidelines were published in 1998.
- Accepted as best practice by most regulators and incorporated by reference by some plans.
- The 1998 guideline is still relevant but there is a perception in some quarters that it may be dated.
- A considerable amount of new work has been done on Stormwater issues by the Industry to support new resource consents.
- OIEWG is active in submitting on plan changes and raising industry standards across the board.
- It became apparent that it would be more effective to incorporate the new knowledge base in an update to the MfE guidelines – rather than re-litigate matters with each consent.
- Expanded scope to encompass a wider range of discharges

Developments and New Concerns Since 1998

- Dewatering for underground tank installations
- Wider variety of treatment devices such as tree pits, swales and in drain filters
- Targeting of general vehicle related contaminants in parking areas (balance areas)
- Introduction of diesel emission fluids (DEF) to treat nitrous oxide emissions

New Body of Knowledge

- Oil Industry spill data
- Considerable body of evidence developed by Z leading to OIEWG project to update the guidelines.
- “Stormwater and Sediment Monitoring Data from Service Stations and Control Sites in Auckland Region” (URS 2008).
- “Stormwater Treatment Devices Monitoring at Representative Z Service Stations in Auckland Region” (PDP 2013).
- “Diesel Exhaust Fluid Stormwater Management” (Easton et al, 2015).
- “Dewatering Hydrocarbon Impacted Sites” (Robertson and Lukey 2017).
- Related work by Golder on fate of hydrocarbons in stormwater and a sediment study (vacuuming roads and forecourt) in prep.
- “The Management of Hydrocarbons in Stormwater Runoff- A literature Review Auckland Council Technical Report 2016/010” (Kennedy et al 2016)
- “Is there any Benefit for Enhanced Stormwater Treatment from Non-Forecourt Discharges” (Easton and Robertson 2017)

Research Supporting the Guideline Update

State of knowledge

- Well maintained API and SPEL interceptors achieve a high standard of control over hydrocarbons.
- Dissolved hydrocarbon is short lived in stormwater systems.
- TSS and metals treatment efficiencies (from settlement) are high in large volume API and SPEL stormwater treatment devices (interceptors) treating forecourt area.
- Sediment load on site has been associated with adjacent road traffic (Kennedy in press).
- The industry standard for non-forecourt areas (catchment areas that do not include refuelling activities) is to use simple sumps.
- Z has moved towards trapped sums with ability to retain product if vehicle fuel tanks are leaking (this typically becomes evident when cars are refuelled).

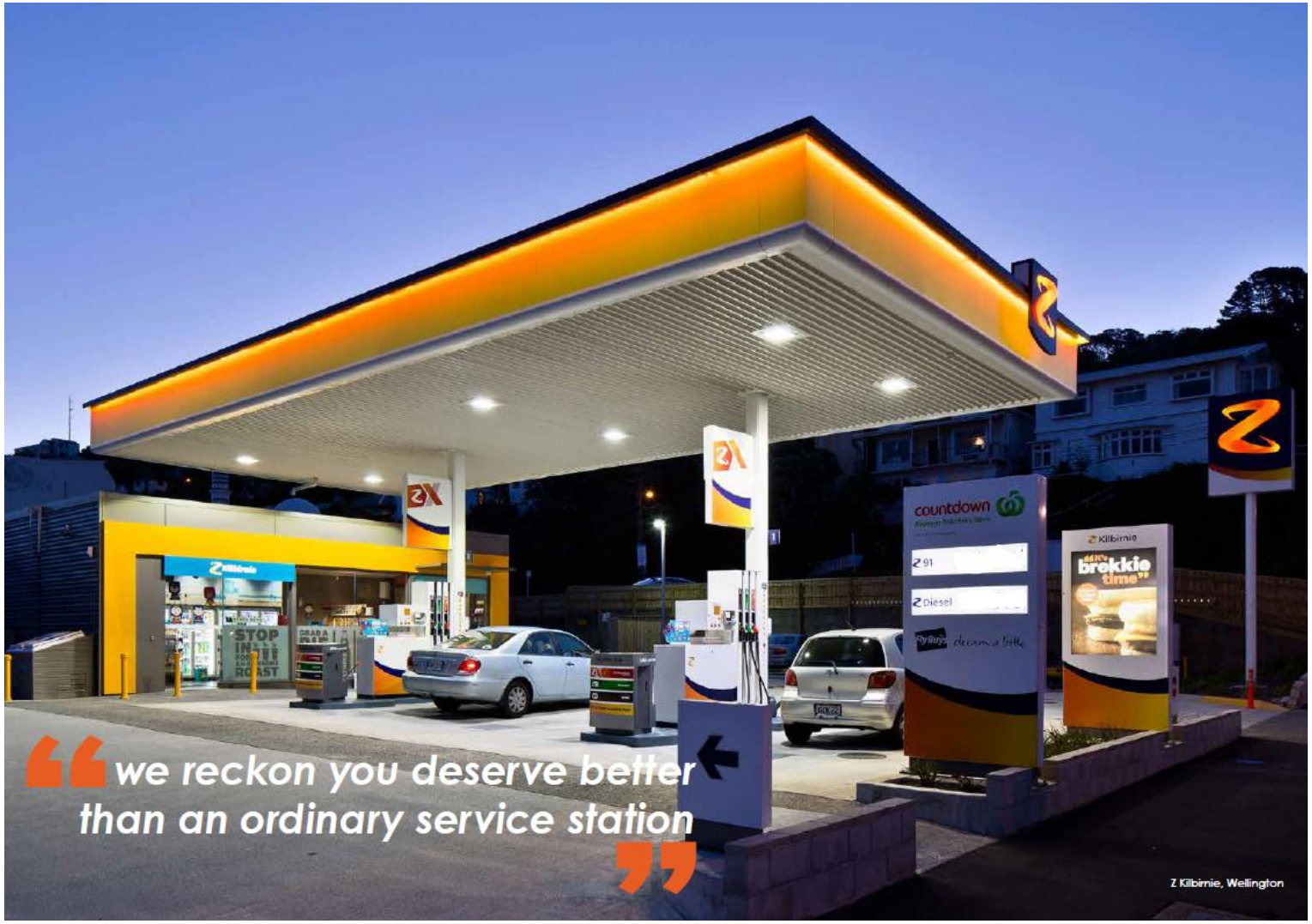
Key Research Conclusions

- A visual approach to monitoring TPH during dewatering is protective of the environment if completed according to a specific protocol and adequately supervised.
- Sediment load from service stations is low compared to the load from the surrounding urban catchments. Catchment approaches to Stormwater management may be more cost effective than targeting low contaminant load sites.
- In particularly sensitive catchments use of stormfilters may be appropriate to protect water quality. Ie Stormfilters to manage non-forecourt discharges should be considered on a case-by-case basis, not as a blanket requirement for every service station.
- A site specific assessment approach is recommended for the assessment of environmental effects associated from Diesel Exhaust Fluid use (Easton et al, 2015).
- Spill data highlights vehicle tank failures occurring in balance areas.

Draft Guideline

- Aiming to Finalise in 2018
- The OIEWG will be incorporating the findings of this work into the guideline review. If you know of any other relevant work please let us know.
- OIEWG is also looking for feedback on the existing guidelines and interested parties for consultation.
- Please email martin.robertson@z.co.nz if you have any feedback or suggestions.

Supplementary Information



API /SPEL performance

- Monitoring of sediment and API / SPEL discharges
- Synthetic Rainfall studies
- Forecourt vacuum study
- Concluded APIs and SPELS adequate and perform valuable sediment settling function

Synthetic Rainfall Studies

- Synthetic Rainfall - monitoring events used in this project were synthetically generated using sprinkler arrays.
- An influent flow rate of 1 L/s was conducted (0.5 L/s per cartridge). This was to allow performance results to be compared to previous Stormfilter studies (Contech 2006a, and Contech, 2006b, and Contech 2008).

Balance Area Treatment

Knowledge Gap

- Benefits from enhanced treatment of low levels of contaminants from non-forecourt areas have not been adequately demonstrated.
- Industry studies and PDPs irrigation study have shown low treatment efficiencies where sediment load is low.
- Treatment achieved is a combination of settlement (from the filter collaring the outlet) and filtration in the device
- Stormwater treatment devices used to manage non-forecourt drainage catchments have limited overall catchment benefit.

Stormfilter Performance

- The results obtained at the trial site are very consistent with other Stormfilter evaluation reports conducted (Contech, 2006a, Contech, 2006b, and Contech 2008).

- The catch pits monitored at Z Moorhouse performed very well and exceeded performance efficiencies reported in previous catch pit performance studies.

- Dissolved phase treatment is occurring in the stormfilter with some TSS reduction also occurring in the sump housing the filter. The collaring effect of the filter on the outflow may enhance treatment in the sump.

- Concluded little benefit on a catchment basis. Treatment efficiencies will be low where sediment load is low.

Diesel Exhaust Fluid

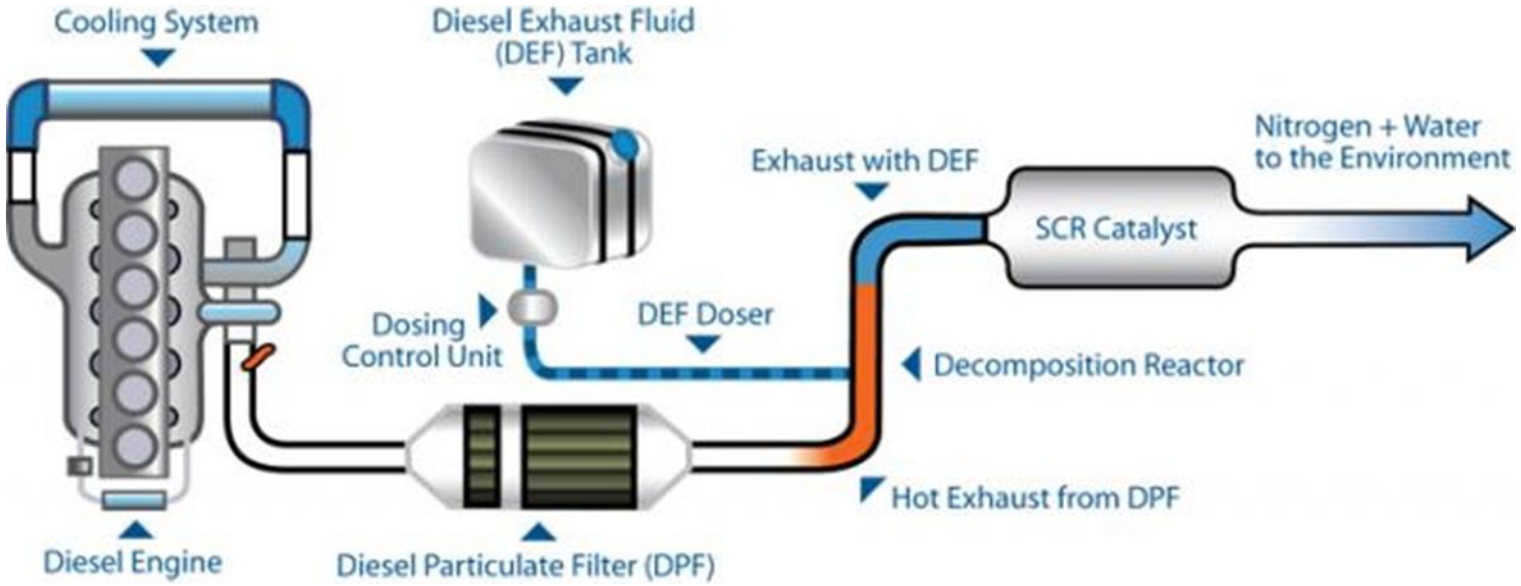
- Diesel Exhaust Fluid – ZDEC, AdBlue, GoClear.
- Reduce NOx emissions from diesel vehicles.
- Additional fluid that is put into a separate 60 – 80 L tank.

- **Vehicle Exhaust Emissions Amendment 2012**

•Rule 33001/6 – Land Transport Rule: Vehicle Exhaust Emissions

- From 1 January 2011 all new heavy trucks imported into New Zealand must meet Euro 5 Emission Standards. Used heavy trucks from 1 January 2012.
- From January 2014 all new light diesel vehicles are required to meet Euro 5 Emission Standards. Used light diesel from 1 November 2016.
- To meet this standard, vehicles will have to use Selective Catalytic Reduction (SCR) technology.

What is Selective Catalytic Reduction ?



- SCR Catalyst is a honeycomb chamber made of ceramics (TiO) and base metals (catalysts) i.e. V_2O, $W0_3$ or zeolites.
- $4NO + 2(NH_2)2CO + O_2 \rightarrow 4N_2 + 4H_2O + CO_2$
- Achieves approximately 85% reduction in nitric oxide emission.

DEF Stormwater Issues

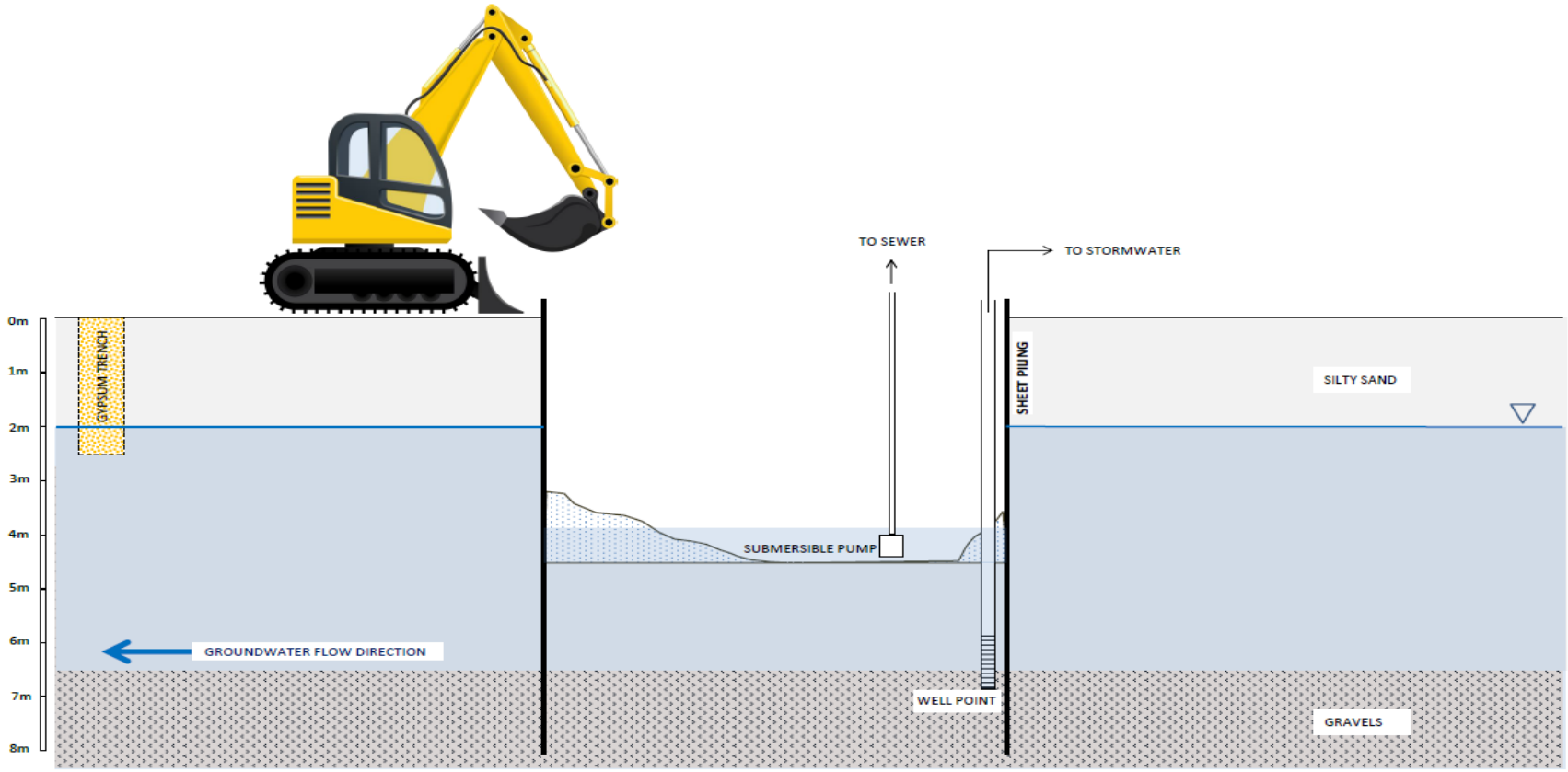
- Ammonia toxicity
- Development of a model for assessing risk
- Concluded consideration must be given to catchment size and treatment of Stormwater in small flow sensitive catchments
- Maintenance and cleaning of spills more critical than for fuels
- Manual shut-off capability required for spills (some SPELS have hydrocarbon detection for shut-off)

Dewatering

Can’t eliminate the need for dewatering

- Safety
- Quality control

We Need a Dry Pit



Distinguish two discharge streams
- pit sump water – higher level of treatment and sometimes sewer disposal
- well-point water treat and discharge to stormwater

Inflow to Treatment Vessel

Cleaner water drawn from beneath tank pit

dilutes shallow groundwater

Aeration of in-flowing water strips volatiles

A large capacity settling tank is required

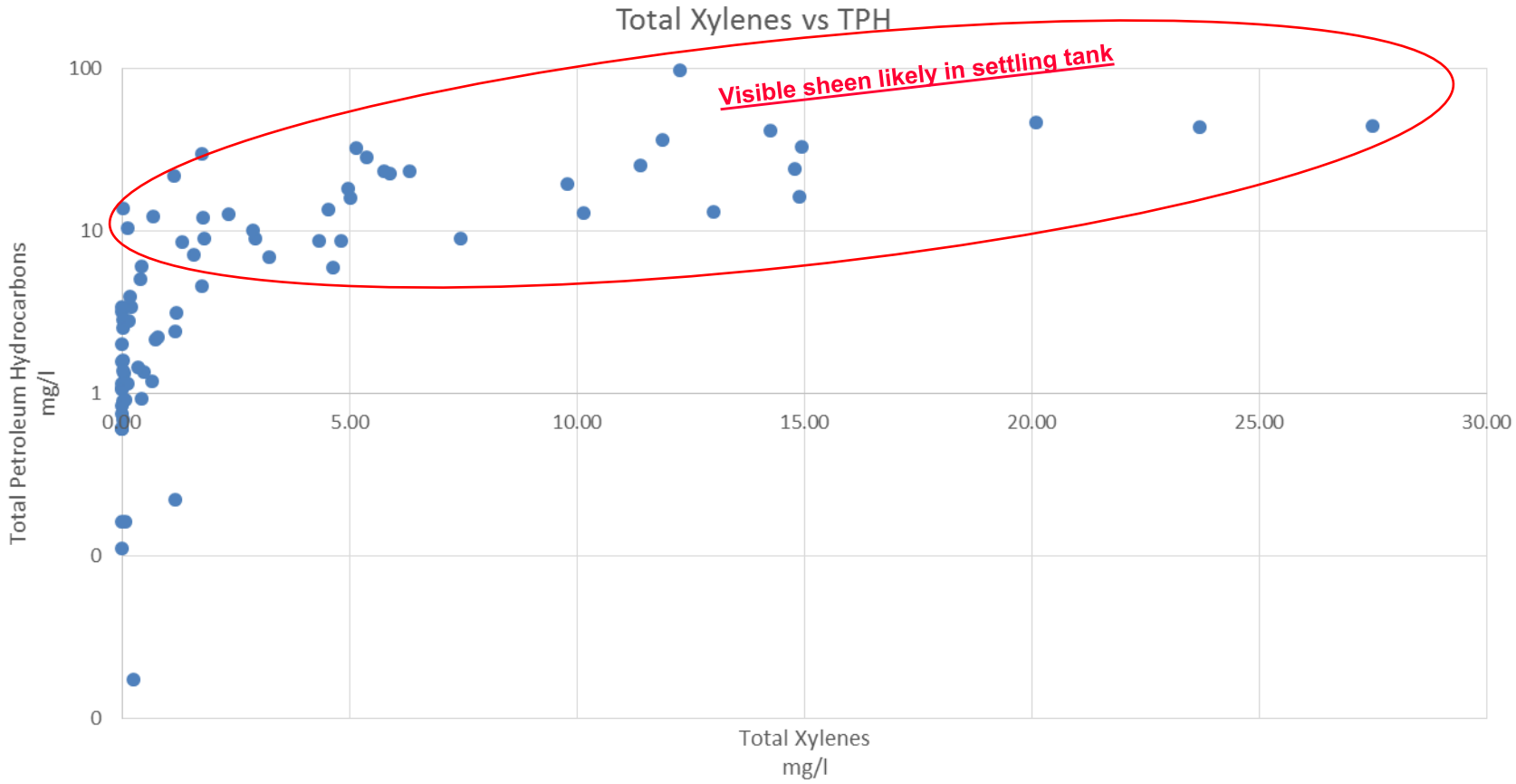
Flocs may need to be considered

Aerobic aerated receiving environment for stormwater drains

Inherent Aeration

Air sparging also used to address BTEX

TPH and Xylene Relationship



Note - Worst case results from monitoring wells on known contaminated sites not average sites (ie not dewatering discharges) Xylene limiting for ANZECC compliance

Observational Monitoring Approach

Environmental consultant regulates flow rate to within treatment capacity

I hour 2 hour and 4 hour samples shown

Samples take days to get to lab and be analysed – not practical to test and react whilst dewatering

Dewatering

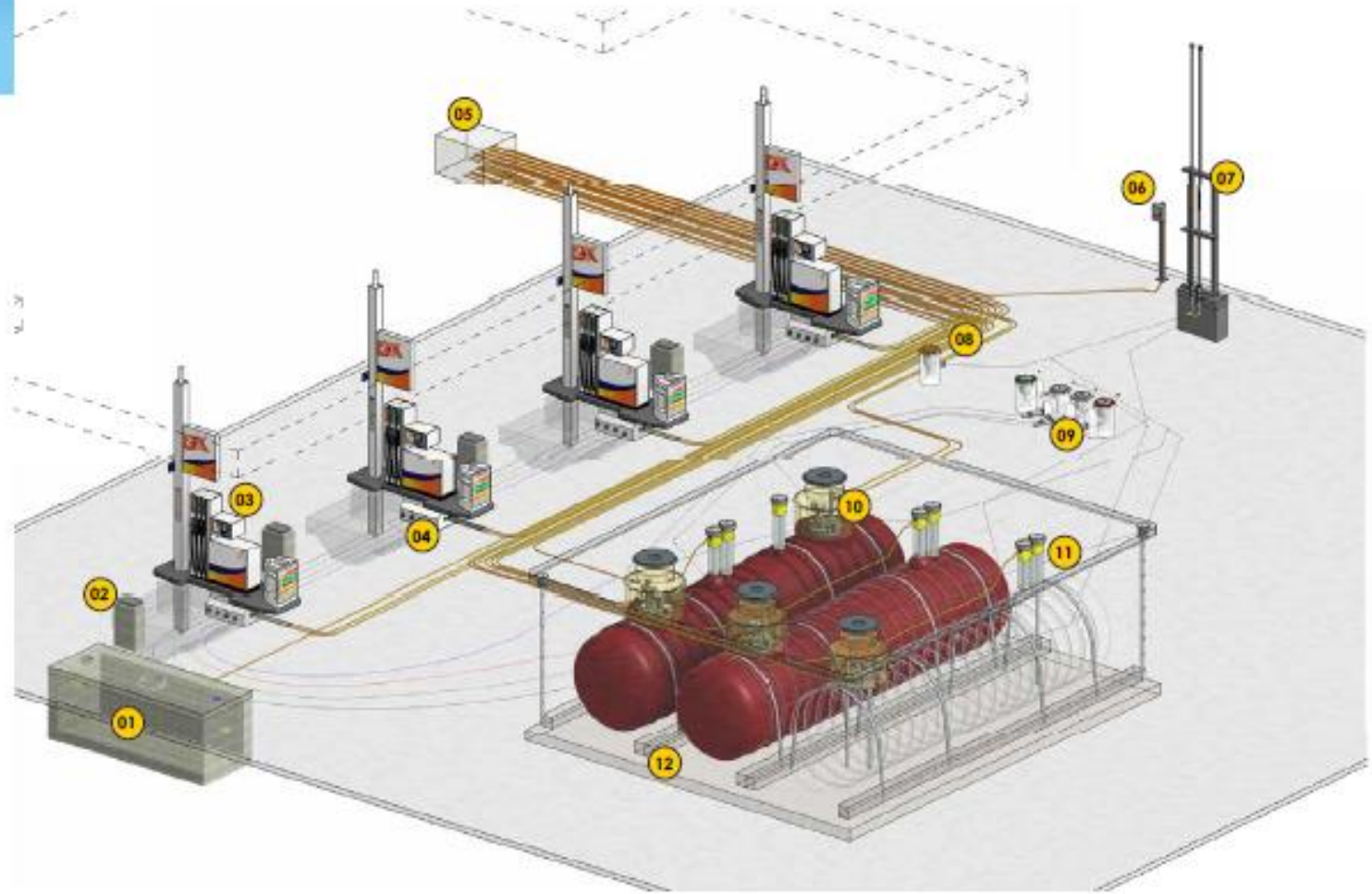
- Simple settlement tank and tolerance for a stabilisation period
- Pre planning to ensure treatment devices available – biggest failing is trying to get by with minimal treatment volume
- Concluded – Observational approach is often adequate for hydrocarbons at tank installs IF specific monitoring/documentation approach adopted.

Site Guidelines

- Some HSNO overlap
- Legacy grandfathering issues
- Minimum standards for site performance
- Maintenance
- API and SPELs to retain 2500l spill
- Trapped sumps
- Management (limit detergents to API / SPEL)

01.02 STANDARD UNDERGROUND STORAGE SYSTEM

01. API
02. FORECOURT DRAINAGE SUMP
03. FUEL DISPENSER
04. PUMP SUMP
05. CONDUIT SAND TRAP
06. REMOTE ATG
07. VENTS
08. VAPOUR RECOVERY POINT
09. REMOTE FILL POINTS
10. TANK MANWAY
11. INTERSTITIAL MONITOR & DIP POINT
12. UNDERGROUND TANKS (2 OR 3 BASED ON SITE REQUIREMENTS)



Fill Point Spill Containers

Fill Area Spill Containment

Under Pump Sumps

Interceptors for Fuelling Areas

"we reckon you deserve better than an ordinary service station"

Z Kilbirnie, Wellington