



# WATER TREATMENT

Cleaning our way to a better future

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NATIONAL PUMP & ENERGY



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*"The water treatment process provided by NPE is a unique system that ensured John Holland complied with the strict environmental guidelines outlined by the Department of Environment Regulation. Furthermore the 24/7 monitoring and maintenance, effective communication and quality workmanship provided the Kings Square project management team with timely, accurate and consistent results."*

*Project Manager  
John Holland Group  
KS1*



## WATER TREATMENT

NPE has significant proven capability in the specialised area of water treatment and can provide the following key services when required on your project:

- Groundwater Remediation
- PFAS Treatment
- Hydrocarbon removal
- Metals Removal
- pH Correction
- Chemical Dosing
- Sludge Processing
- Effluent Management
- Environmental Monitoring and Reporting (including automated systems)
- Research and Development

The NPE team initially conducts water quality testing using both field and laboratory techniques depending on the application. This analysis is used to gather an understanding of the groundwater quality, characteristics and composition to determine a suitable treatment method. Along with water quality testing, NPE will review any relevant geotechnical reports, conduct internal soil investigations and perform onsite test sparging if required to determine the most suitable abstraction method and design an effective and feasible water treatment solution. This tailored solution is implemented to meet the required environmental legislation, the clients' goals, budget and time frame.

When engaged on a project, we take full ownership of the works contracted. We are dedicated to providing water management solutions and are continuously improving and developing new industry leading wastewater and groundwater management methodologies and technology.



# GROUNDWATER REMEDIATION

The principal objective of groundwater remediation at any site is to remove the waste material/free product and/or reduce the concentration of contaminants in the soil and/or groundwater to specific land use acceptable levels.

NPE will evaluate the various remedial alternatives for the client's site-specific goals and objectives. NPE will consider the following items when determining a tailored remediation solution:

- Human health risk and protection of human health
- Environmental Risk and protection of the environment
- The technical feasibility to conduct the remediation
- The extent of contamination
- Projected contamination removal, treatment rates and treatment volumes
- Space limitations and footprint requirements
- Project time frames
- Economical waste transport and disposal options
- Ongoing operations and maintenance costs
- Ease of technology application and implementation

Viable remedial technology is compared using some or all of the above criteria when determining the most cost-efficient and effective application for each site.

## BENEFITS OF GROUNDWATER REMEDIATION AND TREATMENT

- Treating water extracted from Acid Sulphate Soil prior to discharge removes hazardous exposure risks of iron sulphides being released into waterways which may have the potential to kill aquatic life and threaten biodiversity
- Increases water availability for commercial and environmental uses
- Treatment prior to discharge/recharge significantly improves water quality which benefits the sustainability of surrounding aquifers and waterways
- Treated water can be recycled for project construction use e.g. dust suppression
- Effective treatment may provide additional discharge options when applying for discharge licences





# PFAS TREATMENT

Using specialised technology, NPE has a proven solution for the decontamination of PFAS. The NPE PFAS treatment plant is a solution with a small footprint, low energy consumption and results in a small, dry and thermally oxidisable waste by-product. This means that a clear path from water decontamination through waste destruction now exists, providing an economically viable solution to a present environmental problem.

PFAS removal can be conducted in stages through the purpose-built filtering process which considers not only removal of the listed PFAS compounds but also the waste generated.

Over 90% of PFAS is removed in the first stage of filtering with the residue being contained in a dry cartridge that is both easy and safe to handle, store, transport and thermally oxidise.

## NPE'S KEY CONSIDERATIONS

- Environmental Protection
- Removal of PFAS to achieve PFAS NEPM Aquatic Ecosystem Guideline Values
- Feasible waste handling and transport options
- Future risk of thermal oxidation (which is Zero with our system)
- Cost to treat is competitive with comparative methods currently available in the market
- Energy usage
- Footprint of system
- Mobility of system
- Waste volume produced



# HYDROCARBON REMOVAL SOLUTIONS

Removal of Hydrocarbons must be considered when sites have historical exposure to petroleum-based products and other organic compounds. Hydrocarbon removal systems can be installed as a plug-and-play system or can be specifically designed for the requirements of the project. Oil is chemically bonded and will never be released back into the water streams.

Key features include:

- Removes hydrocarbons, Colloidal Heavy Metals, Organic Polymers and Persistent Organic Pollutants
- The filter system is rated at 10 L/s, up to a maximum total flow of 20 L/s, depending on system configuration
- Highly efficient at 99.9% single-pass efficiency and will not release the pollutants back into the water stream once they are captured
- The hydrocarbon removal system used by NPE has been successfully used on many sites around Australia





# CHEMICAL DOSING UNIT

Complimenting the environmental offering from NPE, the Chemical Dosing Unit (CDU) is a pH correction system used to treat extracted groundwater with high or low pH and Total Titratable Acid (TTA) levels. The CDU is also used to successfully treat water with Possible Acid Sulphate Soil (PASS), ammonia and nitrogen oxide content. They can be custom-built for a client's specific requirements and have processing rates ranging up to 60 L/s. Compact and smart wired (results are remotely accessible 24/7), the solar-powered units require a small footprint but deliver big results.

## CDU Features:

- Fully automated chemical dosing system
- Web based remote monitoring and adjustment
- Fully insulated and ventilated
- Fully bunded chemical storage
- Eye wash station and chemical handling PPE
- Solar powered
- Self-contained and Portable
- 24/7 monitored alarm system
- Custom built to suit project-specific requirements
- Easy to adjust pH dosing unit
- Fully Lockable
- CDU Specifications:
- Length: 1.96 m (CDU Plus: 2.4 m)
- Height: 2 m (CDU Plus: 2.4 m)
- Width: 1.94 m (CDU Plus: 2.2 m)
- Dry Weight: 1050 kg (CDU Plus: 2250 kg)
- Gross Weight: 2200 kg (CDU Plus: 3750 kg)
- Max flow rate: 60 L/s
- Min flow rate: 1 L/s
- Internal pipe diameter: 150 mm
- Max chemical capacity: 1 kL
- Max bund capacity: 1.2 kL

## CHEMICAL

NPE provides water treatment chemicals at competitive prices, delivering to site using compliant fleet and equipment. All chemicals used on site are risk assessed with safety data sheets (SDS) provided and stored appropriately in secured and labelled bunded IBC's.

NPE can assist clients with finding the correct water treatment chemicals to suit the water treatment requirements. Ensuring the most effective and lowest consumption rates are applied.



# CLARIFIERS

"The team's vast knowledge of the dewatering system on site was invaluable to the successful management of the water on this complicated project"

Project Manager  
Pindan Construction  
Rosewood Age Care

## Trident

Our range of clarifiers is designed to significantly speed up the settling time for sediment impacted water. A range of capacities is available to select from depending on the application.

One of our units is the Trident which has been designed as a simple and highly efficient water clarification system, suitable for the removal of silt, sand and other solids at flow rates up to 5L/s. They are ideal for project sites with space restrictions and come equipped with portable emergency eyewash stations. The Trident 2 is the latest release, offered by NPE, and comes with web-based remote access, remote adjustment and 24/7 monitoring.

Water enters Trident 2 and flows into the inlet distribution chamber. This chamber allows even flow distribution through the inclined plate pack, without entraining any of the settled solids. The water flows upwards through the plate pack and the solids slide down to the hopper. The clarified water is collected in the discharged flumes and overflows into the discharge well before exiting the unit. Solids are collected in the hopper and are thickened by gravity, prior to being discharged via the sludge outlet. The Trident 2 sludge hopper has 60-degree sides to allow gravity thickening and removal, without the need for a mechanical scraper.

Although the following can be logged manually at the unit, NPE provides optional telemetry for 24/7 web-based monitoring alarms and logging of the following parameters:

- Inlet pH
- Discharge pH
- Discharge Turbidity
- Instantaneous flowrate
- Total discharge

### Trident 2 Features:

- Fully automated chemical dosing system
- Web based remote monitoring and adjustment
- Eye wash station and chemical handling PPE
- Self-contained and Portable
- 24/7 monitored alarm system
- Easy to adjust pH dosing unit

### Trident 2 Specifications:

- Length: 2.2 m; Height: 3.6 m.
- Width: 2.194 m
- Capacity 5360 L
- Max flow rate: 5 l/s; Min flow rate: 1 l/s
- Internal pipe diameter: 100/50 mm
- Dry weight: 1675 kg

## Lamella Plate Clarifier

The NPE Clarifiers are designed to manage the settlement of solids from dewatering and wastewater effluent. Clarifier requirements for a given project are largely dependent on flow rate, analysis of the water quality and the content of suspended solids or dissolved particles in the influent.

The process of the Lamella Plate Clarifiers is as follows:

- Water is pumped through the inlet pipe and travels upward over the inclined plates
- If required, flocculent and polymer may be added via slow-release flocculent block or by separate dosing equipment. This is subject to influent water quality.
- Particles settle inside the clarifier and slide down into the sludge funnel
- Accumulated particles are removed from the bottom of the clarifier as required
- Flocculated particles continue to settle out allowing the clear water to flow upwards over the inclined plates and decant into the outlet chamber





# SAND TRAPS AND MUD GRUBBERS

Our range of Sand Traps and Mud Grubbers is designed to significantly speed up the settling time for sediment impacted water. A range of capacities is available to select from depending on the application. Sand Traps and Mud Grubbers are built with separate compartments separated by sandwich panels. This allows settlement time and then clean water to decant into the next compartment until reaching the outlet chamber.

## Mud Grubber 6000 Specs

- Dimensions (LxWxH) mm 3500(L) x 1600(W) x 1700(H)
- Capacity 6000L
- Empty Weight 1100 kg
- Full Weight (Water) 7800 kg
- Maximum lift mass 1100 kg
- Minimum no. of slings 4
- Max. internal sling angle 60 degrees between any two slings



# METALS REMOVAL MODULE (MRM)

The MRM is a custom-built water treatment system primarily intended to remove excess iron and other metals from extracted groundwater before it being discharged into the environment. The raw water produced through the MRM process is classed as high quality which can, in turn, be safely and reinjected back into the aquifer or discharged into the stormwater system. The MRM can remove contaminants such as Manganese, Zinc, Arsenic and other heavy metals. While each MRM can comfortably process 15 L/s. of raw water, it can be further customised to process higher or lower discharge rates (subject to water analysis). The MRM is an effective water treatment solution for projects with stringent discharge criteria, as this method is capable of treating the harshest and most corrosive groundwater and has been proven to remove iron levels down to  $\leq 0.3$  mg/L. The MRM units are set up in conjunction with additional water treatment modules such as clarifiers, settlement tanks and aeration tanks. All materials used to build the water treatment system comply with Australian Standards.

## MRM Features:

- Fully automated and self-contained
- Web-Based Remote Monitoring and adjustment
- Programmable logic controller (PLC) with Human Machine Interface (HMI) touchscreen
- Self-adjusting pumps
- Backwash cycle
- Water Pressure/Level Alarm system
- Insulated and Ventilated
- Fully Bunded Chemical storage
- Minimal Noise/Vibrations
- Safety features such as Isolation Switch, eyewash and chemical handling PPE
- Custom built to suit space and treatment requirement
- Portable, can be safely stacked at a height

## Specifications:

- Area footprint: 6 m x 3 m (minimum)
- Height: 2.7 m
- Gross Weight: 15000 kg
- Minimum Flow rate: N/A
- Optimum flow rate: 15 l/s
- Power supply: 32 amps 3ph
- Maximum chemical capacity: 800 l
- Maximum Bund Capacity: 1000 l



Meeting the environmental legislation in water treatment and disposal has made dewatering projects more challenging for project managers and developers. NPE are the leaders in the provision of effective, customised and reliable solutions that not only meet but often exceed legislative requirements."





# EFFLUENT MANAGEMENT

NPE specialises in the consistent delivery of improved groundwater treatment technology and continues with the effective and efficient management and disposal of effluent – a by-product of the extracted water treatment process. One of our underlying principles is to deliver sustainable practices that are environmentally sound in theory as well as in practice.

NPE invested more than two (2) years of research and development resulting in an effluent processing solution that can now be completed onsite. The effluent produced, also known as liquid sludge, was previously removed from the project site for processing and disposal which incurred additional transportation and scheduling costs. The benefits of this research and development are an environmentally effective process that maintains an economically viable operation which in turn benefits the client's bottom line.

## Sludge Processing

The Sludge Processing Unit (SPU) is the tool used by NPE within the effluent management system. The press maximises the amount of water recovered from the liquid sludge, significantly reducing the volume of sludge and converting all liquid waste into a spreadable form that is then classified as solid waste for offsite disposal. The SPU is custom designed and built to site-specific requirements and is suitable for various applications.



*"Grateful to have been involved in the new technology and innovation invested into this project by your company regarding the sludge disposal system. It gave your company a competitive advantage at the start of the project and I look forward to seeing this technology used and refined on future projects"*

*Commercial Manager  
City Busport Alliance  
Perth Busport*



# MONITORING & REPORTING

Monitoring of the water treatment system is completed on several levels. The operational systems can be controlled remotely using remote connectivity software which enables functions such as pH adjustment, turning the system on and off as well as the implementation of incremental operational adjustments. Both the MRMs and CDUs are equipped with water and pH level alarms as well as a flow rate alarm system that monitors any overflows or emergencies such as power outages. Our systems are monitored 24/7 with teams rotated through a rostered call-out schedule which allows emergencies to be identified and attended to immediately.

NPE has the ability and authority to provide environmental compliance reports as required. This ensures our clients are constantly across the performance of the water treatment system and the alliance with their legislative deliverables. Depending on the client's requirements, data such as discharge rates, drawdown rates, chemical usage, pre and post water test results as well as baseline monitoring can be collected by our team. Information collected is extrapolated into an in-house reporting system and submitted to the client. A web-based geotechnical instrumentation monitoring system that monitors drawdown requirements and discharge rates is also used as required.

## Environmental Monitoring

NPE can deliver an extensive water quality monitoring program with services including laboratory sampling, field monitoring, and compliance reporting. The program is designed to provide the client with the confidence to make informed decisions based on collected analytical data. Most importantly, the results offer the client documented evidence of environmental compliance. Testing is done on-site and samples are also sent to NATA certified laboratories for third party confirmatory testing and reporting.





# PAST PROJECTS

**Project:** Perth Busport  
**Client:** City Busport Alliance (Brookfield Multiplex, BG&E, MRA and PTA)  
**Treatment Method:** Processing Rate : 60 l/s  
**Equipment Used:** 2 MRM, Clarifiers, Aeration tanks, Settlement tanks, Alarm system and Sludge Press Each MRM was built capable of processing 30 l/s to meet client's requirement of 60 l/s.

**Project:** Kings Square Development Project, KS1, KS2, KS3 & KS4  
**Client :** John Holland Group, Broad Constructions and Probuild  
**Treatment Method:** pH correction, PASS treatment, iron and heavy metal removal  
**Processing Rate:** 15 l/s  
**Equipment Used:** MRM, Clarifiers, Aeration tanks, Settlement tanks, and Alarm system

**Project:** SOKO Apartments  
**Client:** Civic Construction Group  
**Treatment Method:** pH correction, iron and heavy metal removal/  
**Processing Rate:** 15 l/s  
**Equipment Used:** MRM, Clarifiers, Aeration tanks, Settlement tanks, Sludge Press and Alarm system

**Project:** BHP Tug Harbour Project  
**Client:** Lend Lease Engineering  
**Treatment Method:** pH correction, contaminants removal  
**Processing Rate:** 280 l/s  
**Equipment Used:** 2 CDU and Alarm Systems

Each clarifying tank capable of withholding 34 kL of liquid sludge at any given time. The installation and commissioning process took 30 days to complete.

System was designed to have a minimum total buffer storage capacity of 40kL or equivalent to 20 minutes supply at 35l/s to attenuate any large fluctuation in flows to the treatment and to provide some buffer storage in the even of treatment plant malfunction. Treatment successfully removed arsenic in the water and reduced the iron level to = 1mg/l prior to being reinjected into the aquifer.

A total of 5 million liquid sludge was processed via the sludge press, creating a total of 290 bags of 1m<sup>3</sup> sludge cakes. This process has managed to save the client close to a million dollars in disposal costs.

Due to the minimal availability of construction area, the MRM units for all the KS projects were placed within a shared area on the project. Each project required one MRM to run at 15 l/s. Groundwater was successfully treated with PASS removed and iron level reduced to = 1 mg/l. Treated water was reinjected into the aquifer and discharged to nearby water settlement basin.

The initial testing of the sludge filtration process was conducted on this project site to allow NPE to see the viability of this method on Perth Metropolitan Groundwater, with successful outcome.

The SOKO apartment development marked the first time the MRM and Sludge Management System was used by NPE as water treatment solutions in Queensland. Water analysis showed that the raw water had a very high iron level of 170mg/l. The discharge criterion for this site is less than 0.3mg/l. The method of iron removal practiced by other companies in Queensland, which is the clarification method is archaic and does not provide the clients with desirable results.

The MRM successfully reduced the iron level to less than 0.3mg/l and the sludge press managed the large amount of effluent efficiently. Treated water was discharged into the river and part of the sludge cakes was later reused by the client as part of land fill.

The BHP Tug Harbour project sees the usage of Chemical Dosing Unit to treat acidity in groundwater. The CDU's was designed and built to process 280 l/s prior to discharge into the ocean via the settlement basin. Initially, the level of ammonia and nitrogen oxide in the raw water was above the accepted level, after a few hiccups and process of elimination, both contaminants managed to be reduced to an acceptable level, and total titrable acid (TTA) level was reduced to = 40 mg/l.

The CDU operating system was fully separated outside of the CDU due to the large size of the pipeworks (355mm). Having the operating system separately outside of the CDU also allows for the system to service 4 discharge lines. A flow switch and HMI screens was built into the system to ensure efficiency in operations.





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