Power & Water

Sono-Electrochemical Water Treatment

Dr Chris Bullen

Chemical dosing
without the addition of liquid chemicals

Power & Water

Our Proposition:

An Affordable, Sustainable, Environmentally Safe Solution for Water Treatment

We offer this through:

Expertise and experience in supplying modular, liquid chemical free, equipment and solutions

Our Technology

- Power & Water Sono-ElectroChemical (Sono EC) treatment systems provide an alternative to liquid chemical systems by use of the patented Soneco® process.
- The process combines both electrolysis with ultrasound in a single modular design.
- Use of ultrasound overcomes standard Electro Chemical (EC) passivation issues.
- Suited for automation and remote operation.
- Equipment can be used with existing treatment plant or as part of a new system.
- Can be supplied as a stand-alone system, easily integrated into existing infrastructure or used as part of a complete treatment systems.

Why use Sono EC?

- The use of liquid chemicals often requires the treatment process to be upgraded to allow for:
  - Improved site access, including turning circles to allow for chemical deliveries
  - Increased bunded area for locating chemical dosing container
  - Other H&S issues with transport, handling, storage, shower facilities, over/under-dosing, need for clean water supply to site etc.
- Additionally, there are pressures on the availability of the chemicals whose costs are also predicted to increase.

- P&W patented Sono EC process significantly reduces the upgrade requirements and reduces risk (H&S and commercial) associated with supply of liquid chemicals.

The Solution - Soneco®

Soneco is an innovative Sono-Electrochemical treatment process of combining electrolysis and ultrasound to generate the required directly from electrode plates.

- Electro Chemical Reactions include:
  - Sono-EC (Electro Coagulation)
  - Sono-pH (Electro Hydroxide generation)
  - Sono-AOP (Advanced Oxidation Processes)
- The use of ultrasound acts as a cleaning-in-place (CIP); maintaining an evenly reactive treatment surface and gaining full electrode utilisation.
- This feature maintains electrical efficiency of the reactor and keeps power consumption to a minimum.
- Electrode replacement is a simple lift out, lift in operation that is designed to be carried out by a single operative.

DB2 Reactor

Standard DB Reactors

DB1 Reactor

DB2 Reactor

DB4 Reactor

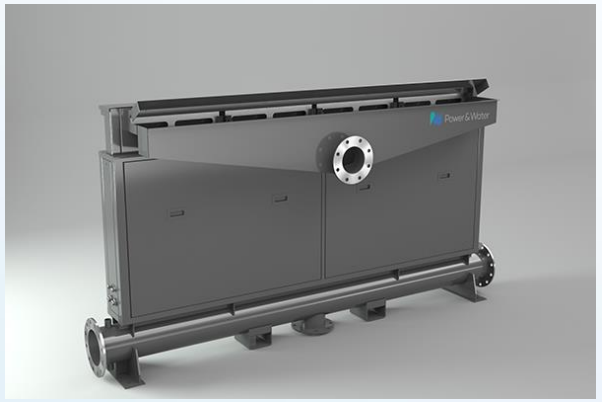
Soneco Products

- Based on packaged plant design, the standard units are as follows:
- Standard Reactors: DB1, DB2, DB4.
- To provide extra treatment units are operated in parallel.

- Power supply changes depending on water conductivity

- P&W solutions can be from individual reactors to complete treatment systems.

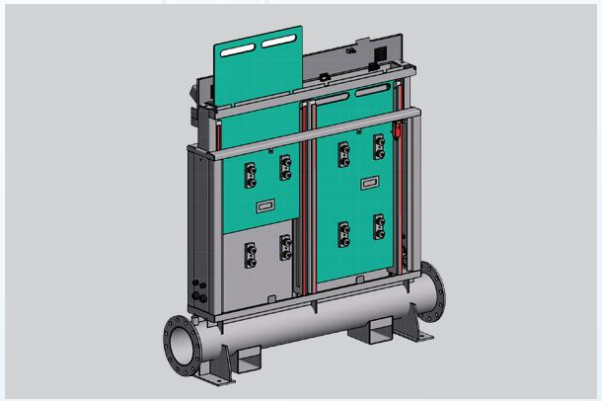
1. DB Series Reactors



2. DB Systems

3. Power Supply Units

4. Electrode Plates



Our Proposition

Providing expertise and experience in the supply of non-liquid chemical equipment and processes

We Offer

A Modular, Affordable, Sustainable, Environmentally Safe Solution for Wastewater Treatment

	Aquaculture	Construction Ground Water Treatment	Municipal Wastewater Treatment	Industrial Water Pre-treatment	Abandoned Mine Water Treatment	Agriculture
Market Sectors						
Application Areas	Solids removal and sludge conditioning	Treatment of site run-off water	P removal and process enhancement	Load and treatment cost reduction	Metal precipitation and pH adjustment	Nitrogen removal from treated slurry
Soneco® Product Features	• Non-liquid Chemical • Remote Monitoring and Control • Predictive Maintenance • Treatment Control Options • Automatic Start and Stop		• Compact Footprint • Package plant options • Low Carbon Process • Modular Plant Design • Wide-ranging Treatment		• Varying process configurations • Suitable for new or existing processes • Low Voltage Process • Simple user interface	
Sector Benefits	▪ Increase in production opportunity ▪ Reduced sludge volume and transport requirements ▪ Suitable for sensitive areas (AONB, SSI etc) ▪ More sustainable waste management ▪ Key element in the Circular Economy	▪ Low on-site monitoring ▪ Flexible control allowing easy site optimisation ▪ Reduced transport and on-site health and safety concerns ▪ Discharge can be monitored and controlled	▪ Validated for P Removal ▪ Additional contaminant removal ▪ Low operator & maintenance time ▪ Minimal downtime ▪ Flexible control options include: Auto, Fixed, Profile, Flow/Load ▪ Reduced iron failure risk ▪ Environmentally-safe	▪ Discharge can be monitored and fully controlled ▪ Treatment adaptable to variations in feed stream ▪ Simple plant operation and maintenance ▪ Operator training can be provided	▪ Suitable for rugged, remote locations ▪ Wide treatment potential ▪ Safer means to neutralise acid mine drainage ▪ Potential to power using renewables	▪ Reduced slurry storage required ▪ Produce compact, spreadable solids ▪ Treated water suitable for land irrigation ▪ Addresses NVZ regulatory requirements

Case Study 1: Aquaculture

- Ocean Matters
- Complete treatment system: Balance tank, Sono EC, flocculator and DAF unit
- Project drivers are to meet treated water targets whilst sludge generated goes to land

DB1 Reactor

Control Panel

Flocculation tank

Dissolved air flotation (DAF)

Case Study 1: Aquaculture

- Ocean Matters - Complete treatment system

Table 1: Aquaculture treatment system water quality results

Parameter	Average Influent	Average Treated Water	Average % Removal
Total Suspended Solids (mg/l)	290	36.0	87.8
Total Phosphorus (mg/l)	5.00	0.67	86.6
Soluble Reactive Phosphorus (mg/l)	1.58	0.09	94.3
Conductivity (mS/cm)	50.0	49.1	N/A

Average flow rate 9.0 m^3/h

Case Study 2: Aquaculture

- Grieg Seafood Kunes
- Single DB4 Reactor
- P&W Soneco formed part of a larger treatment system
- Soneco used to condition the wastewater
- Sludge recovered used as a fertilizer

DB4 Reactor

Case Study 3: Construction

- Treatment of construction site runoff
- Complete mobile treatment system
- Sono EC, flocculator and lamella clarifier
- System ensures water can be discharged off site

Case Study 3: Construction

- Construction Runoff – Mobile treatment system

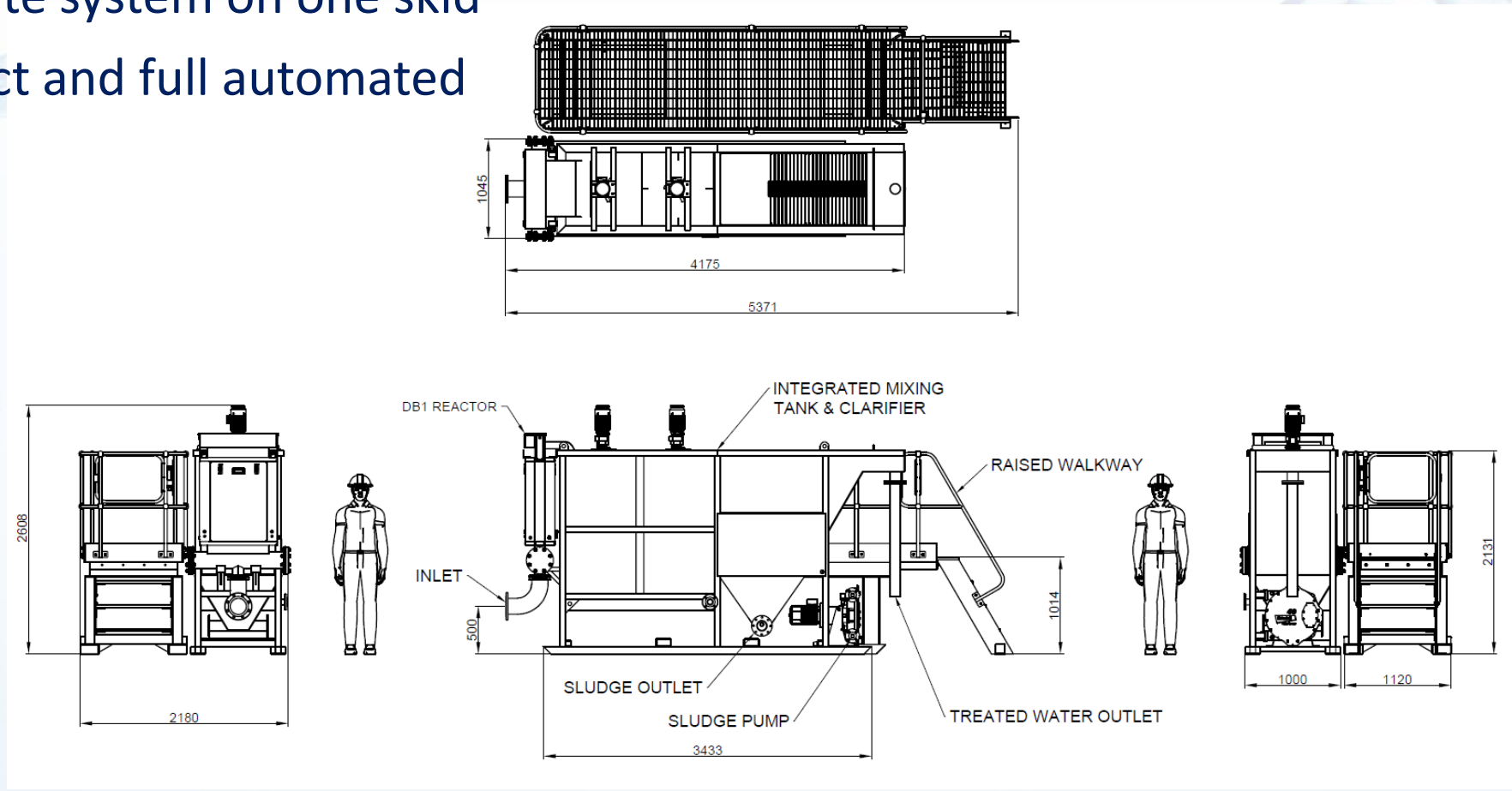
Table 2: Construction site water quality results

Parameter	Average Influent	Average Treated Water	Average % Removal
Total Suspended Solids (mg/l)	443	19.7	95.5
Turbidity (NTU)	202	26.8	86.7
Conductivity (mS/cm)	524	524	N/A

Average flow rate 4.3 m^3/h

Solution 1: Construction System

- Integrated packaged construction solution system
- Complete system on one skid
- Compact and full automated



Case Study 4: Municipal

- Treatment of municipal sewage for phosphorus removal
- Proven alternative to liquid chemical dosing
- Stand alone or integrated with existing infrastructure

Sono EC (DB2) with Lamella Clarifier

Stand alone Sono EC (DB2)

Case Study 4: Municipal

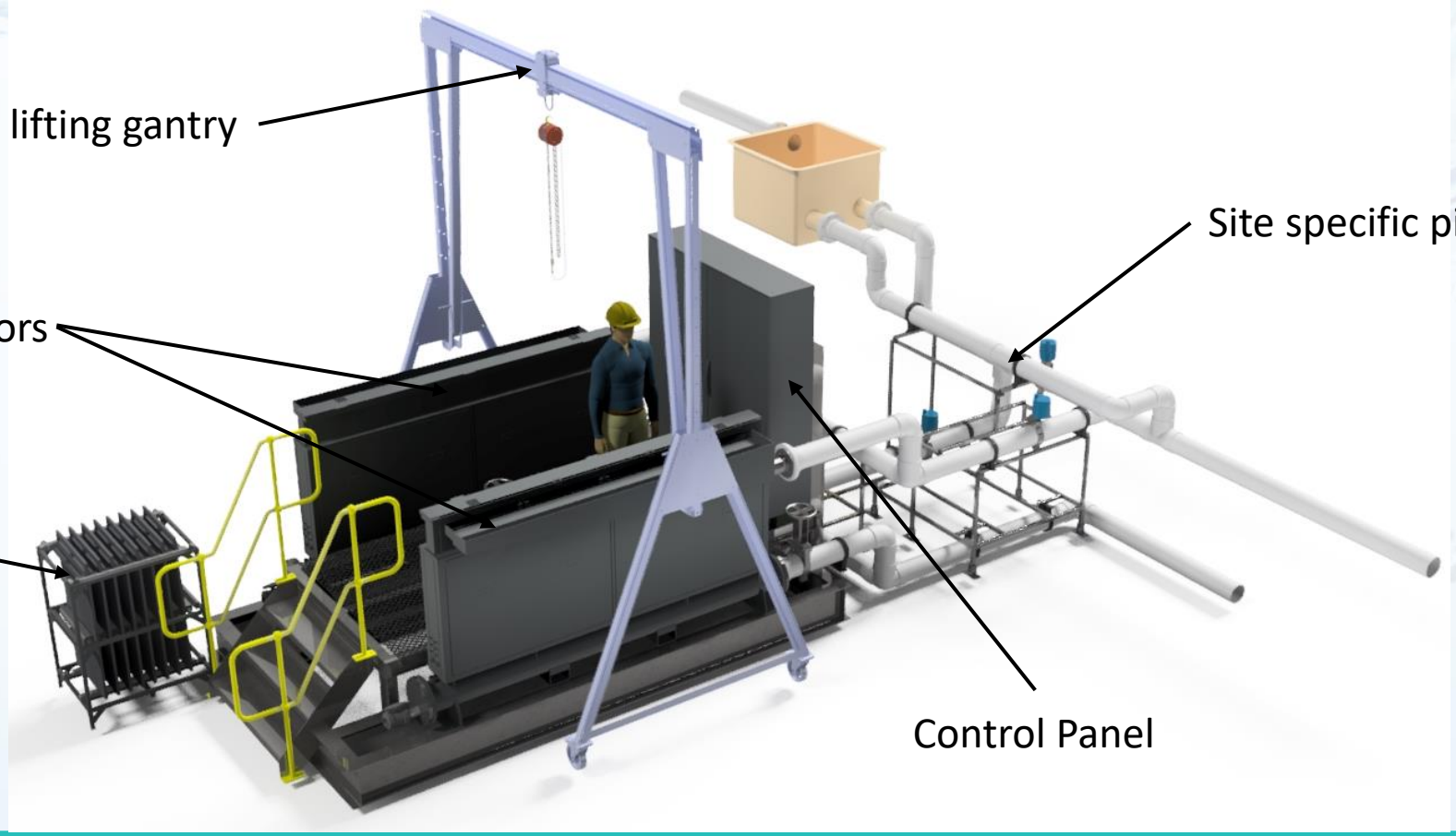
Table 3: Municipal water quality results

Parameter (mg/l)	Average Influent	Average Treated Water	Average % Removal
Total Phosphorus	4.72	0.37	96.87
Soluble Reactive Phosphorus	3.96	0.03	99.79
Total Iron	0.54	3.13	-479.6
Dissolved Iron	0.06	0.03	64.29
Total Suspended Solids	21.52	8.91	88.87
Biochemical Oxygen Demand	3.71	1.23	90.48
Chemical Oxygen Demand	41.14	17.61	86.57
Ammonia	0.31	0.46	56.53
Alkalinity	153	136.45	22.58
pH (unit)	7.72	7.93	-

Table data showing Southern Water Report for R&D: Soneco® (UKWIR, PRN: 639287) Average Values based on 40 influent and 38 effluent samples

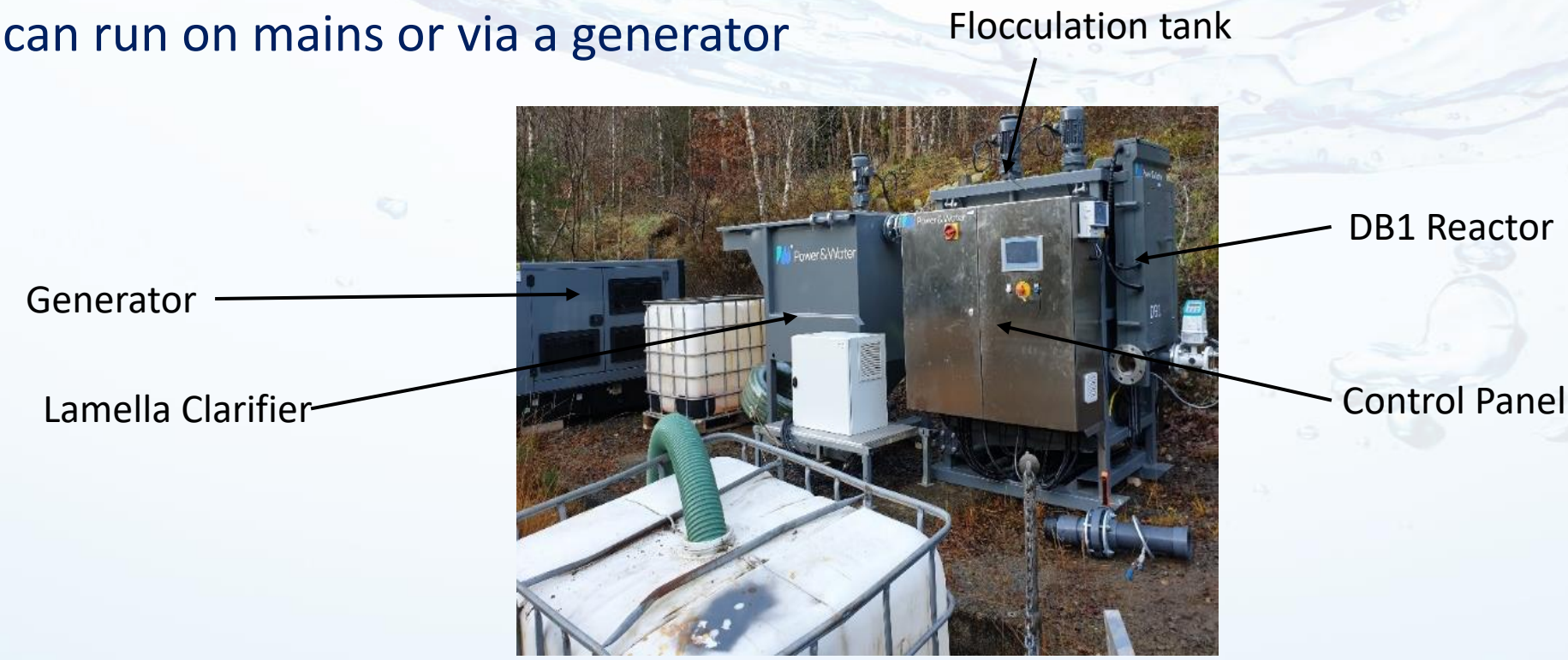
Solution 2: P Removal System

- Up to 1000PE Dual DB4 reactor system
- Proven alternative to liquid chemical dosing system



Case Study 5: Mining

- Treatment of acid minewater drainage
- Precipitation of dissolved metals by novel use of magnesium electrodes
- No liquid alkalis used
- Ideal for site with poor access
- System can run on mains or via a generator



Case Study 5: Minewater

Power & Water

Table 4: Minewater treatment water quality results

Parameter	Average Influent	Average Treated Water	Average % Removal
pH	3.3	8.5	
Cadmium (mg/l)	0.041	0.004	90.2
Zinc (mg/l)	17.8	1.65	90.7
Lead (mg/l)	0.79	0.01	98.7
Iron (mg/l)	17.4	1.79	89.7
Nickel (mg/l)	0.29	0.03	89.7
Aluminium (mg/l)	4.05	0.51	87.4
Magnesium (mg/l)	11.67	31.25	-167
Total Suspended Solids (mg/l)	125	11	91.2

Raw Water | Precipitate | Treated Water

Soneco® Trial System

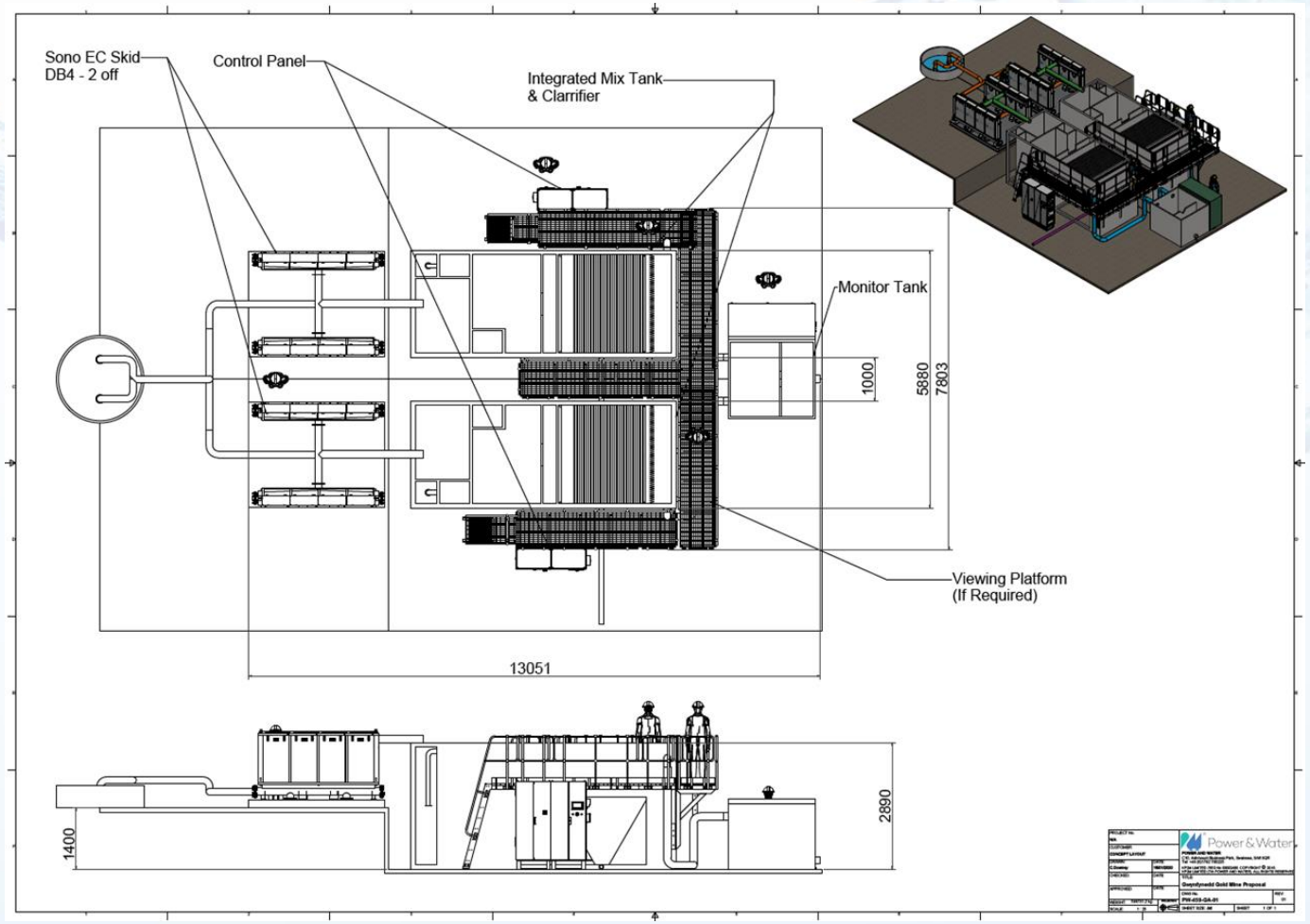
- Mobile Sono EC trial treatment system

- Supplied with
  - DB1 Reactor
  - Flocculator
  - Clarifier or DAF

Water clarification project proposal layout

- Modular systems ran in parallel to provide a complete solution

- 2No DB4 Reactors
- Integrated DAF Units



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Get in touch today and find out how we could help you!