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# Detector de calidad del agua Proteus: Propuesta de despliegue en Granadilla de Abona para facilitar la detección en tiempo real de e-coli y otros contaminantes en el mar.

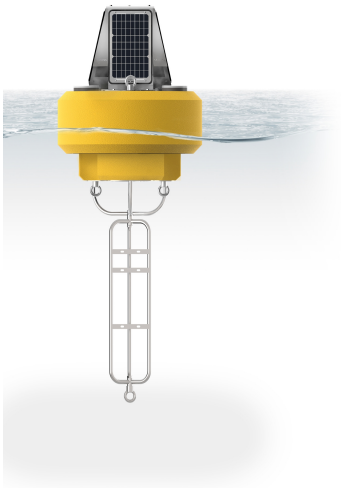
## *Acerca de Proteus*

La sonda de calidad del agua Proteus es un instrumento diseñado para detectar una serie de condiciones, incluida la e-coli, y enviar datos en tiempo real. Esta tecnología es relativamente nueva, y este sistema se está implantando con éxito en muchos países.

La sonda se fija a una boya, equipada con un panel solar y un transmisor de datos, que puede conectarse mediante GPS o una red telefónica local.

Proteus puede configurarse para enviar datos a intervalos definidos por el usuario, por ejemplo, cada 15 minutos, 1 hora, etc. Estos datos son recogidos por un software, que puede crear alertas.

Estas alertas pueden ser en forma de mensajes SMS o alertas por correo electrónico, ya sea a destinatarios seleccionados (guardacostas, policía local, etc.) o al público en general que se haya registrado. El software también puede interactuar con otras aplicaciones, como sitios web de acceso público, aplicaciones móviles para Android o iOS, o incluso pantallas LCD de gran tamaño, instaladas en las entradas de las playas.



También se pueden configurar parámetros adicionales, por ejemplo, la temperatura del agua, la altura y frecuencia de las olas, la turbidez del agua, la contaminación química o por petróleo, etc.

### *Mantenimiento requerido*

El Proteus tiene una función de autolimpieza mecánica, que se activa cada vez que la unidad toma una muestra de agua. Por lo tanto, el mantenimiento y la calibración programados son mínimos, aproximadamente cada 6 meses. La sonda puede extraerse de la parte superior de la boya, para permitir un fácil acceso para su mantenimiento, recalibración, reprogramación o sustitución.

### *Plazo y coste del montaje*

El tiempo estimado de implantación, incluyendo el pedido, la programación, la solicitud de permisos y la instalación, es de entre 8 y 14 semanas.
El coste aproximado es el siguiente
1ª unidad (con el paquete de software); aproximadamente 38.000 euros instalada.
Unidades adicionales; entre 28.000€ y 36.000€ (dependiendo de la función adicional del sensor, como detección de petróleo, etc). Además, será necesario programar una interfaz de software básica para integrar los datos y las alertas con las interfaces de usuario.

Se estima que 6 unidades proporcionarán una detección adecuada a la costa de Granadilla de Abona, aunque se recomienda una prueba piloto, con una unidad desplegada en aguas más tranquilas "aptos para nadar", y la segunda unidad desplegada en aguas más dinámicas, donde se practica windsurf y kitesurf.

### *Compatibilidad y homologación*

Hay que advertir que este sistema no sustituye a los métodos de análisis que se utilizan actualmente. Se trata de una tecnología nueva, por lo que aún no ha sido homologada para este fin en España. No obstante, cabe suponer que en el futuro este instrumento y método recibirán la homologación de la UE.  Hasta entonces, puede considerarse que funciona como un sistema de alerta anticipada.

Las marcas de todos los componentes necesarios tiene un distribuidor autorizado en España. Todos los equipos tienen una garantía de 2 a 3 años.

***Asociación Salvar La Tejita y Proteus***

La Asociación Salvar La Tejita está dispuesta a compartir toda la información en relación con los aspectos técnicos de este sistema con cualquier administración o institución. Además, el equipo técnico de SLT está dispuesto a coordinar, ayudar y asesorar sin coste económico alguno.

*Perímetro de boya típico para la protección contra los deportes náuticos*

# CB-450

## DATA BUOY

- Self-powered data logging buoy
- Cellular, Iridium satellite, or radio telemetry
- Supports a variety of environmental sensors
- Accommodates most environmental data loggers
- Rugged polymer-coated foam hull

The NexSens **CB-450** Data Buoy is designed for deployment in lakes, rivers, coastal waters, harbors, estuaries and other freshwater or marine environments. The floating platform supports both topside and subsurface environmental monitoring sensors including weather stations, wave sensors, thermistor strings, multi-parameter sondes, Doppler current profilers and other monitoring instruments.

The buoy is constructed of an inner core of cross-linked polyethylene foam with a tough polyurea skin. A topside 20" tall stainless steel tower includes three 15-watt 12VDC semi-flexible solar panels, and a center 10" ID x 19.5" tall instrument well accommodates batteries, data loggers, sensors, and more. Three 4" pass-through holes with female NPT bottom threads allow for quick connection of instrument deployment pipes and custom sensor mounts. The stainless steel frame supports both single point and multi-point moorings.

The **CB-450** Data Buoy is optimized for use with NexSens **X2-CB** data loggers. Wireless telemetry options include cellular, Iridium satellite, and spread spectrum radio. Compatible digital sensor interfaces include RS-232, RS-485 and SDI-12. Each sensor port offers a UW receptacle connector with double O-ring seal for a reliable waterproof connection. For custom integrations, an optional pass through data well lid includes a set of plugs and cable gland fittings..

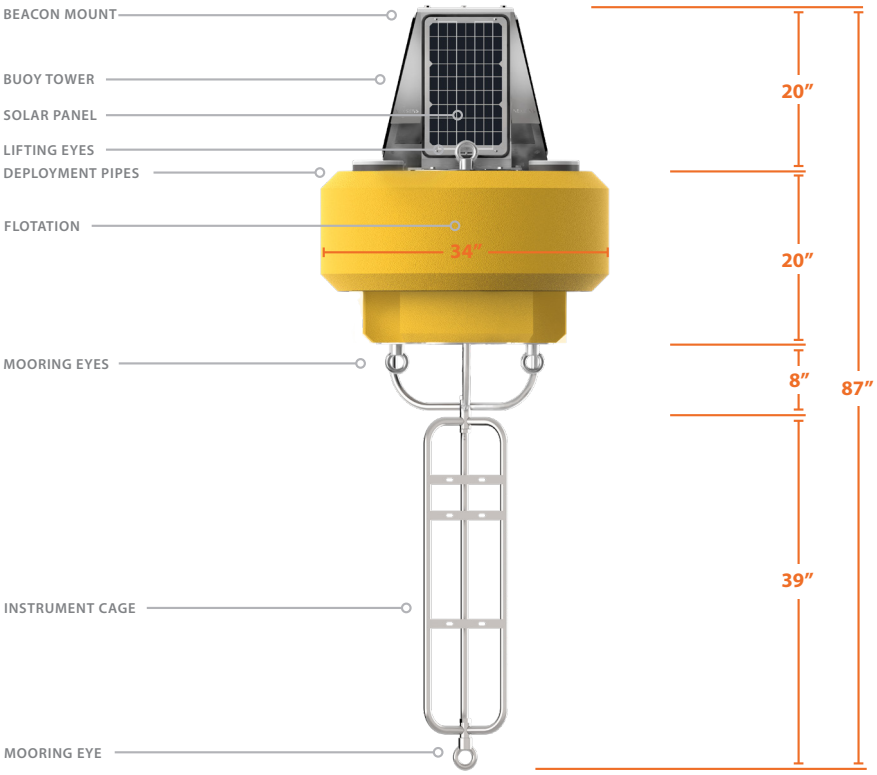
NEXSENS technology

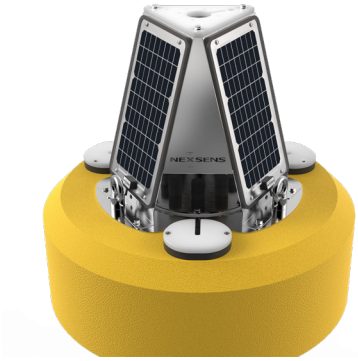
# CB-450

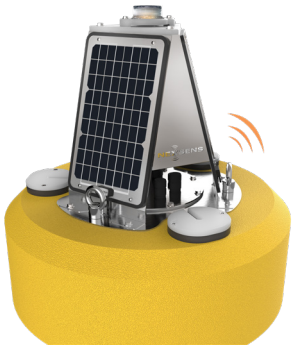
## DATA BUOY

## specifications

| | |
|---|---|
| Hull Outer Diameter | 34.0″ (86.4cm) |
| Hull Height | 20.0″ (50.8cm) |
| Data Well Inner Diameter | 10.3″ (26.2cm) |
| Data Well Height | 19.5″ (49.5cm) |
| Pass-Through Hole Diameter | 4.0″ (10.2cm) |
| Tower Height | 20.0″ (50.80cm) |
| Solar Panels | 3x 15-watts |
| Weight | 130 lb (59kg) |
| Net Buoyancy | 450 lb (204kg) |
| Hull Material | Cross-linked polyethylene foam with polyurea coating & stainless steel deck |
| Hardware Material | 316 stainless steel |
| Mooring Attachments | 3x 3/4″ eyenuts |





## parts list

| Part # | Description |
|---|---|
| CB-450 | Data buoy with polymer-coated foam hull & (3) 15-watt solar panels, 450 lb. buoyancy |
| CB-A05-1 | CB-Series buoy battery harness with integrated solar regulator & (1) 28 A-Hr battery |
| CB-A05-2 | CB-Series buoy battery harness with integrated solar regulator & (2) 28 A-Hr batteries |
| CB-PTL | CB-Series buoy pass through data well lid for custom integrations, includes set of plugs & cable gland fittings |
| X2-CB | X2-CB buoy-mounted data logger |
| M550-F-Y | Solar marine light with flange mount & 1-3 nautical mile range, 15 flashes per minute, yellow |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PROTEUS INSTRUMENTS

# Proteus Water Quality Probe

**An award-winning, patented, multi-parameter, real-time sensor platform to accurately and reliably measure BOD, COD, TOC and Coliforms (total, E. coli or faecal) in permanent and temporary applications.**

The Proteus is the world's first scientifically proven real-time sensor for measuring BOD that can measure a wide range of water quality, environmental and industrial applications. A multiprobe that measures your choice of parameter, all in one package, that can deliver data in the toughest field conditions. The Proteus has been designed for its ease of use, reliable data and economical operation.

## Applications

BOD/COD/TOC Loading to Wastewater Treatment Works
Combined Sewage Overflow event monitoring
Point Source Pollution monitoring
Total Coliform Monitoring (E. coli, total or faecal)
Efficiencies of Wastewater Treatment Works
Diffuse Pollution Monitoring
Groundwater Water Quality Monitoring
Survey tool combined with Bluetooth®
SCADA, RTU and logger integration via RS232, SDI-12, Modbus® RTU

## Parameters include:

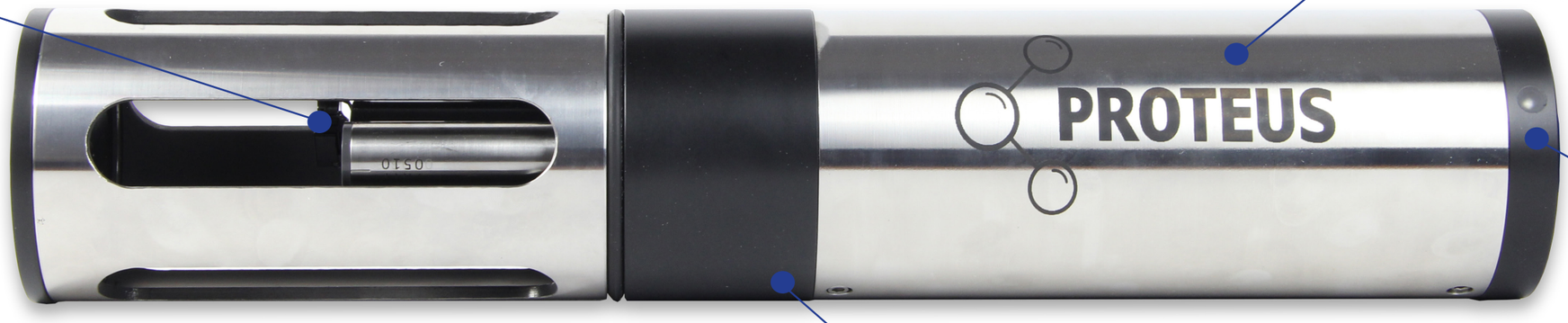
BOD, COD, TOC, DOC
Dissolved Oxygen
Pressure
Chloride
pH
Temperature
Optical Brighteners
Nitrate
ORP / REDOX
Coliforms (faecal, E. coli, total)
Tryptophan
Refined Oils
Ammonium
EC / Salinity / TDS
Turbidity
Crude Oils
CDOM

**Self cleaning:** As it is essential that optical sensors have a cleaning mechanism, the Proteus is also supplied with an integral wiper which cleans all of the Proteus' sensors before every measurement cycle.

**Process control:** Let the Proteus monitor multiple process parameters 24/7.

Simple to use & intuitive software

**Ultra-low maintenance:** The system is fully serviceable in the field and requires almost no maintenance. Logs data unattended minimizing manpower requirements and safety issues.




**Multiple power options:** Power can be provided by an optional internal lithium battery pack for unattended logging, or an external power source (battery, mains or solar). External ON/OFF switch for logging without need for PC connection.

**Coliforms:** The Proteus is the first instrument globally that has the potential to measure bacteria/ coliforms in drinking water in real time.

Status LED

**Scalable:** The patented and award-winning Proteus breaks the boundaries of water quality meters. The Proteus offers a unique platform to add additional sensors such as pH, REDOX, electrical conductivity, dissolved oxygen, turbidity and many others.

**Robust:** Exceptional build quality with stainless steel and Delrin outer casing

**Easy integration:** The Proteus can be effortlessly integrated with telemetry/SCADA systems and other datalogging devices with external RS232/Modbus/SDI12 or simply by using its internal datalogger. The integrated datalogger can log 1,000,000 readings and it can be used with Tablets/Mobile Phones.

## Sensor Specifications

| Parameter | | Range** | Resolution | Accuracy | Comments |
|---|---|---|---|---|---|
| **BOD** | BOD mg/l | 0-300 mg/l | 0.01 mg/l | ±5 % of reading* | Local site calibration can improve accuracy. |
| **Coliform Counts** | CFU/100 ml | >1 count/100ml | 1 count/100ml | ±10 Coliforms* | Local site calibration can improve accuracy. Can be used for faecal coliforms, E. coli or total coliforms. |
| **COD** | COD mg/l | 0-600 mg/l | 0.01 mg/l | ±5 % of reading* | Local site calibration can improve accuracy. |
| **DOC** | DOC mg/l | 0 - 400 mg/l | 0.01 mg/l | ±5 % of reading* | Local site calibration can improve accuracy. |
| **TOC** | TOC mg/l | 0 - 500 mg/l | 0.01 mg/l | ±5 % of reading* | Local site calibration can improve accuracy. |
| **Temperature** | Water Temperature | -5 to 50°C | 0.01 | ±0.1 | Never needs calibration. |
| **pH/ORP** | pH | 0 to 14 units | 0.01 | ±0.1 within 10°C of calibration, 0.2°C otherwise | Refillable reference electrode; corrected for temperature; typical sensor life > 4 years. |
| | ORP | -999 to 999 mV | 1 | ±20 mV | Platinum ORP sensor is combined with pH sensor. |
| **Turbidity** | Total Suspended Solids (TSS) | 0 to 500 mg/l | 4 digits with maximum of two decimals | ±2 % of reading or 0.2 | Calculated using the correlation between turbidity and a sediment standard or sample. Local calibration can be applied **. |
| | Turbidity | 0-40 NTU | 4 digits with maximum of two decimals | ±2 % of reading or 0.2 | Compensated for temperature; filtered for non-turbidity spikes; includes wiper to clean the optics. |
| | | 40-400 NTU | | ±2 % of reading or 0.2 | |
| | | 400-5000 NTU | | ±2 % of range | |
| | Transmissivity | 0 to 100 % transmission | 4 digits | Linearity of 0.99$R^2$ | Mounts alongside the Proteus. |
| **Optical Dissolved Oxygen** | Concentration | 0 to 20 mg/l | 0.01 | ±0.1 | Compensated for temperature and salinity; EPA approved "lifetime" luminescence method; typical sensor cap life > 4 years. |
| | | 20 to 30 mg/l | 0.01 | ±0.15 | |
| | | 30 to 50 mg/l | 0.1 | ±5 % of reading | |
| | % saturation | 0 to 500 % saturation | 0.1% | Corresponds with the accuracy of the concentration reading | |
| **Conductivity** | Specific conductance, µS/cm | 0 to 5000 µS/cm | 0.1 | ±0.5 % of reading ±0.001 | Corrected for temperature; four easy-to-clean graphite electrodes. |
| | Specific conductance, mS/cm | 0 to 100 mS/cm | 0.001 | ±1 % of reading | |
| | | 100 to 275 mS/cm | 0.001 | ±2 % of reading | |
| | Salinity | 0 to 70 PSU | 0.01 | ±2 % of reading | Calculated from specific conductance. PSU = Practical Salinity Units which is equivalent to ppt. |
| | Total dissolved solids (TDS) | 0 to 65 g/l | 0.1 | ±5 % of reading | Calculated from specific conductance. |

## Sensor Specifications

| Parameter | | Range | Resolution | Accuracy | Comments |
|---|---|---|---|---|---|
| **Pressure** | Depth | 0 to 25 m | 0.01 | ±0.05 m | Conductivity sensor fitted for Salinity. |
| | | 0 to 200 m | | ±0.4 m | |
| | Vented depth (level) | 0 to 10 m | 0.001 | ±0.003 m | Compensated for temperature, salinity, barometric pressure. |
| | Barometric pressure | 400 to 900 mmHg | 0.1 mmHg | ±1.5 mmHg | Included with (non-vented) depth sensor. |
| **Fluorometers** | Chlorophyll a - blue | 0 to 500 µg/l | 6 digits with maximum of two decimals | Linearity of 0.99$R^2$ | Highest-quality LED based fluorometric sensors rated to 600 m depth otherwise max depth same as depth sensor. |
| | Chlorophyll b - red | 0 to 500 µg/l | | | |
| | Rhodamine dye | 0 to 1000 ppb | | | |
| | Phycocyanin (freshwater BGA) | 0 to 40,000 ppb | | | |
| | Phycoerythrin (marine BGA) | 0 to 750 ppb | | | |
| | CDOM/fDOM | 0 to 1250 or 0 to 5000 ppb | | | |
| | Optical brighteners | 0 to 15,000 ppb | | | |
| | Tryptophan | 0 to 20,000 ppb | | | |
| | Fluorescein dye | 0 to 500 ppb | | | |
| | Refined oil | 0 to 10,000 ppb | | | |
| | Crude oil | 0 to 1500 ppb | | | |
| **Ion-selective electrodes (ISE's)** | Ammonium | 0 to 100 mg/l as nitrogen | 0.1 | ±5 % or 2 mg/l | Corrected for ionic strength (via conductivity readings); the accuracy specification relies on non-trivial maintenance practice and frequent calibration near the temperature of measurement; ammonium and nitrate require tip replacement every 3 - 6 months. Please contact us for applications >10 m. |
| | Nitrate | 0 to 100 mg/l as nitrogen | | | |
| | Chloride | 0 to 18,000 mg/l | | | |
| | Sodium | 0 to 20,000 mg/l | | | |
| | Calcium | 0 to 40,000 mg/l | | | |
| | Bromide | 0 to 80,000 mg/l | | | |
| **TDG** | Total Dissolved Gas | 600-800 mmHg | 0.1 mmHg | ±0.1 mmHg | Pressure sensor with gas permeable membrane, max depth 15m. |
| **PAR** | Photometric PAR | 10,000 µmol/cm2 | 4 digits | ±5 % of reading | LiCor spherical sensor. |

* providing adequate field calibration ** customized ranges are available

| | |
|---|---|
| **Internal Power Battery Life** | 1 to 24 month depending on sensors / logging rates |
| **External Power** | 5-15 vdc |
| **Operating Temperature** | 0 to 50°C, non-freezing |
| **Calibrated Range** | 0 to 30°C, non-freezing |
| **Depth Rating** | 200 m |
| **Communications** | USB, RS232 as standard. Modbus RS485, SDI-12 and/or Bluetooth optional |
| **Sample Rate** | 1 Hz |
| **Data Memory** | >1,000,000 logged readings |
| **Logging Rates** | 1 second to 1 day |
| **Warranty** | 2 years (All sensors excluding ISE's) |

| General Specifications | Proteus 35 | Proteus 40 |
|---|---|---|
| **Diameter** | 89 mm (3.5") | 102 mm (4.00") |
| **Length - w/o Battery Pack** | 483 mm (19") | 483 mm (19") |
| **Weight - with IBP** | 4.1 kg (9.0 lbs) | 4.5 kg (10.0 lbs) |
| **Number of sensors** | Up to 11 | Up to 13 |
| **Battery Pack** | 8 "C" cells | 8 "C" cells |

| | Parameter Information |
|---|---|
| **Ammonia (NH3)** | Ammonia is normally found in very low concentrations in natural waters. It is a result of microbiological activity breaking down nitrogen-containing material. Elevated levels of ammonia can be very harmful to aquatic life and fish in particular. |
| **Biochemical Oxygen Demand (BOD)** | Biochemical oxygen demand is a measure of the amount of oxygen used by micro-organisms (e.g. aerobic bacteria) in the oxidation of organic matter. High levels of BOD (due to excess organic matter) indicate greater consumption of oxygen by micro-organisms, meaning less is available to fish and other aquatic life. |
| **Chemical Oxygen Demand (COD)** | Chemical Oxygen Demand (COD) measures the amount of oxygen required to chemically oxidize the organic material and inorganic nutrients, such as Ammonia or Nitrate, present in water. It is widely used as an indicator of organic pollution and many industrial and wastewater effluents have strict permits associated with COD concentration. |
| **Coliform Counts (total, faecal & e-coli)** | Local calibration is possible for 1-2 of these parameters. Total coliform bacteria are commonly found in the environment and not necessarily harmful. Faecal coliforms represent a sub-group of coliform bacteria and are found in large quantities in the intestines/faeces of animals and people. E.coli is a major sub-group of the faecal coliform group and represents the best indicator for faecal pollution monitoring. |
| **Colour** | Colour has historically been used as an indicator for Dissolved Organic Matter (DOM). CDOM (Chromomorphic Dissolved Organic Matter) sensors can accurately measure DOM. It is therefore possible to use CDOM to indicate colour and DOM with a local site calibration. |
| **Conductivity** | Conductivity is a measure of the ability of water to pass an electric current; it is affected by the presence of dissolved solids such as chloride, nitrate and phosphate. Conductivity can be a very useful indicator that a discharge of some sort has entered a stream, or some other change has occurred. |
| **Dissolved Oxygen** | Oxygen is essential for the survival of aquatic life and is incorporated into surface waters by direct absorption from the atmosphere, more so in turbulent streams. It is then consumed by organisms and decaying organic matter. An excess of decaying organic matter leads to a shortage of oxygen, which can prove fatal for fish. |
| **Dissolved Organic Carbon (DOC)** | Dissolved Organic Carbon is operationally defined as the amount of organic carbon based compounds that can pass through a 0.45 µm filter |
| **Nitrate (NO3)** | Nitrate is a naturally occurring by-product of the breakdown of organic waste. In low concentrations it stimulates the growth of aquatic plants. At higher concentrations it can be directly harmful and can also lead to excess algae growth and eutrophication. The primary source of excess nitrate is surface runoff from agricultural land. |
| **pH** | pH is related to the concentration of hydrogen ions in a solution and is a measure of acidity or alkalinity. In natural ecosystems it can vary from around 4.5, for acid peaty upland waters, to over 10.0 where there is intense photosynthetic activity. |
| **Redox (ORP)** | Redox (Reduction-oxidation) or ORP (Oxidation Reduction Potential) is a measure of the oxidising or reducing potential of a water body. Many important biochemical processes are oxidation or reduction reactions (e.g. ammonia>nitrite>nitrate). The ORP level in a river or treatment plant will govern (along with DO and pH levels) which reactions are prevalent. |
| **Temperature** | Physical temperature of the watercourse. Largely dictated by climate, but also of interest around thermal discharges. Temperature extremes can be harmful to aquatic organisms, and also have an effect on other parameters, e.g. pH and dissolved oxygen. |
| **Total Organic Carbon (TOC)** | Total Organic Carbon is a measure of the total amount of carbon in organic compounds in water. |
| **TSS (Total Suspended Solids)** | TSS (Total Suspended Solids) can be derived by using a turbidity (NTU) sensor to measure backscatter caused by suspended sediment in the water. As suspended sediment can be in the form of clay, silt, organic or organic matter there is no single relationship between turbidity and TSS. However, the relationship is typically near perfect ($R^2$>0.95) and can easily be derived by undertaking regression analysis between the two parameters and entering that factor into the Proteus software. |
| **Turbidity** | Turbidity is a measure of the clarity of water. Silts and soils that are suspended within rivers and lakes cause high levels of turbidity, especially during storm and run-off events. |

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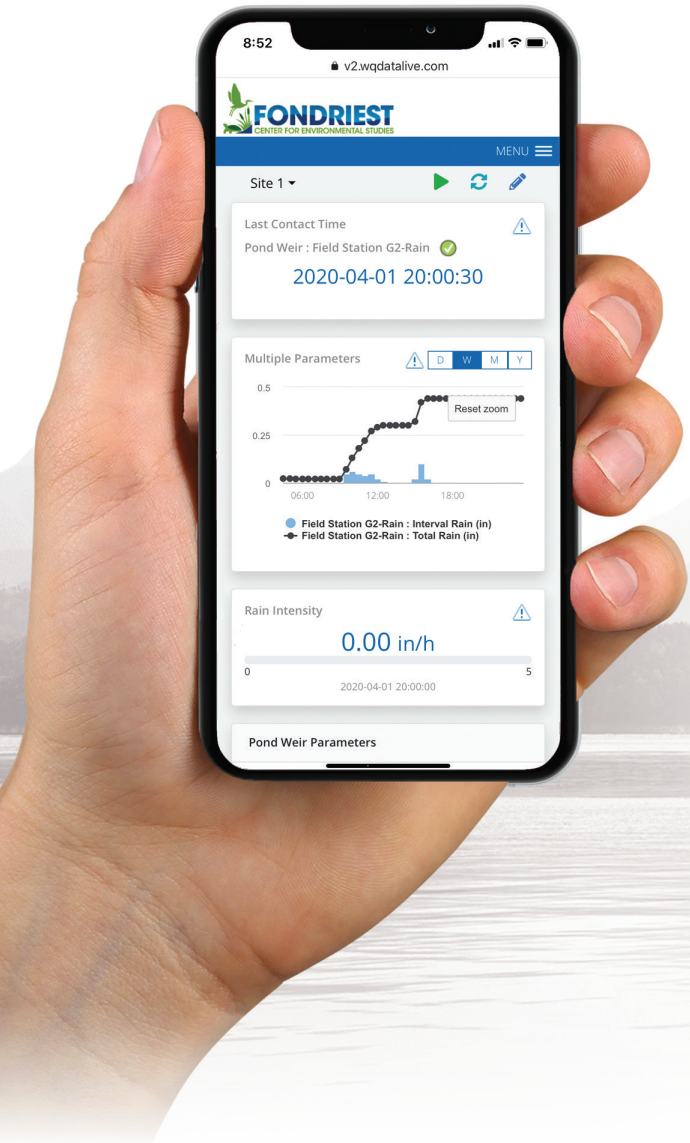
# WQData LIVE

## WEB DATACENTER

- 24/7 instant access to project data
- 2-way communication with remote systems
- Secure, password-protected site
- Interactive ESRI Leaflet map interface
- View & download tabular and graphical data




**WQData LIVE** is a web-based project management service that allows users 24/7 instant access to data collected from remote telemetry systems. Users with NexSens G2, X2 and V2 platforms have the ability to configure and update systems remotely via Wi-Fi, Ethernet, cellular or satellite telemetry. All projects are password-protected with multi-level access. Administrators have full access for remote communication and project modification, while collaborators are limited to viewing and exporting data.

The online database offers the ability to view live readings, configure alerts to notify project personnel when data values exceed threshold limits, export data and more. The project dashboard includes an ESRI Leaflet map view showing all project sites on a map with zoom, scroll and drag capability. The bottom of the dashboard includes a project overview, data disclaimer and project photo. For projects with multiple locations, each site within a project shows the data loggers connected along with a site photo in a convenient viewing pane.

Clicking on any site within a project displays the most recent data values alongside a graph depicting a day, week, month or year of data. Within each parameter, users can register to receive alerts via email based on a high or low threshold. A rich set of meta data and diagnostic data specific to each site is displayed at the bottom for troubleshooting sensor or data logger issues. With this rich set of tools, **WQData LIVE** simplifies the task of managing an environmental monitoring project.

NEXSENS technology

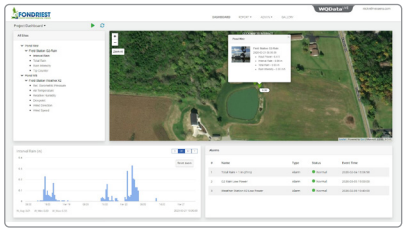
# WQData LIVE

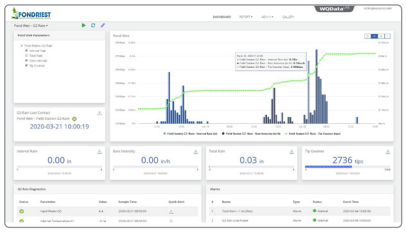
## WEB DATACENTER

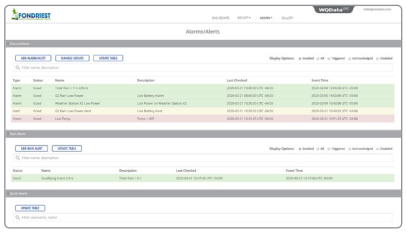
## plans

| | Basic | Advanced | Professional | Enterprise |
|---|---|---|---|---|
| Secure Cloud | ✓ | ✓ | ✓ | ✓ |
| Interactive Map | ✓ | ✓ | ✓ | ✓ |
| Multi-Level Users | ✓ | ✓ | ✓ | ✓ |
| Remote Configuration | ✓ | ✓ | ✓ | ✓ |
| Dashboards | ✓ | ✓ | ✓ | ✓ |
| Graph, Statistics, Tables | ✓ | ✓ | ✓ | ✓ |
| Reports | ✓ | ✓ | ✓ | ✓ |
| Quick Alerts | ✓ | ✓ | ✓ | ✓ |
| API | | ✓ | ✓ | ✓ |
| Data Export Tool | | ✓ | ✓ | ✓ |
| Alarms | | ✓ | ✓ | ✓ |
| Webcam Support | | | ✓ | ✓ |
| Calculated Parameters | | | ✓ | ✓ |
| Public Portal | | | ✓ | ✓ |
| Photo and Video Storage | | 1GB | 10GB | 50GB |
| Data Storage | 1-Year | Unlimited | Unlimited | Unlimited |
| Monthly Price Per Project | Free | Call | Call | Call* |
| Annual Price Per Project | Free | Call | Call | Call* |

*Unlimited Professional projects available with Enterprise







## parts list

| Part # | Description |
|---|---|
| WQData-A-M | WQData LIVE Advanced web datacenter service, priced per month |
| WQData-A-Y | WQData LIVE Advanced web datacenter service, priced per year |
| WQData-P-M | WQData LIVE Professional web datacenter service, priced per month |
| WQData-P-Y | WQData LIVE Professional web datacenter service, priced per year |
| WQData-E-M | WQData LIVE Enterprise web datacenter service, priced per month |
| WQData-E-Y | WQData LIVE Enterprise web datacenter service, priced per year |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