



Fact Sheet

Remote Sensing and Smart Monitoring Options for Water Quality Management

Context

Providing sufficient water of a quality that is fit for specific purposes is a pivotal role of water utilities. Remote sensing and smart monitoring can provide cost-effective and timely options for tracking and managing changes to water catchments and infrastructure. Water quality is also central to the integrity of the environment as well as to supplying our needs for drinking water and agriculture. Remote monitoring of water resources and infrastructure is becoming increasingly useful in monitoring wildlife, feral animals, pest plants, unauthorised access to catchments and water sources, and determining the impact of bushfires, flooding, logging, and pollution in catchments. Recent advances in sensor technologies and wireless communications offer water managers economical, real-time water quality management tools and strategies.

What water quality issues are confronting water utilities?

A survey was carried out to identify the main challenges that water utilities face in daily operations. Based on feedback from industry partners (project 1090), the list was narrowed to five. Some technologies available in the market, or currently under development, that can address these challenges were identified. These technologies have been evaluated based on criteria such as cost, technology, product name, monitoring parameters, time to roll out the technology, reliability, availability, maintainability, communication management, trials and system description, public health impact and any relevant regulations.

1. Monitoring the effects of cyanobacteria on water quality:

Timeliness of cyanobacteria monitoring is a problem for some utilities as sampling is performed at limited locations and it usually takes between 4-8 days to get test results. Continuous monitoring would assist in providing warnings before taste, odour or skin irritations are reported as complaints to water utilities.

Solution & Products:	Monitoring Parameters (or) Applications
In-situ sensors: WISP-3, TriOS, ASD spectroradiometer, Bio-Optical Sensor System, AlgaeChek, Algae Torch, Hydrolab DS5, Hand held Dual Channel fluorometer, Trilogy, AquaFluor, EX01&EX02m , Unilix & Trilux, Cyclops.	Chl- <i>a</i> , phycocyanin Suspended sediments, Coloured Dissolved Organic Matter (CDOM) Water transparency, secchi disk depth, Occurrence of floating layers of cyanobacteria.
Seek & Destroy: MPC-Buoy	Chl- <i>a</i> (green algae), phycocyanin (blue-green algae), pH, turbidity, Dissolved Oxygen (DO), and water temperature.
Satellite solution providers: Water insight, Blue water satellite, Brockmann Consultants, Cyanolakes, GeoMAP	Consultancy for requirements analysis, training users to handle satellite data, earth observation data imaging and analysis, environmental data management systems, complex processing chains of satellite data, satellite data for development and integration of geospatial technologies

2. Monitoring the effects of contamination and extreme events on water quality:

Contamination of drinking source water can occur by many means, including overflow of sewers or septic systems and inflows of chemicals from surrounding catchment following rain, bushfires or spills. Current grab sampling techniques for contamination and extreme events may not be adequate in the future for providing quick responses.

Solution & Products	Monitoring Parameters (or) Applications
In-situ sensors: <i>E. coli</i> Sensor, Colifast ALARM, Colifast CALM, ColiMinder, BACTcontrol, ECM ECO analyser, Coliguard, Scan VIT, ViPrime	Phosphate, nitrate, DO, water temperature, crest level, surface velocity, total coliforms, <i>E. coli</i> , Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), turbidity, and suspended solids.
Autonomous solutions: Neptune SB-1, YSI 600, ESM 30 boat, Evologic Sonobot, Datamaran, Quest UAV, Quest UAV, water sampling drone, Precision Hawk, Valram, Amphibia.	Perform measurements regarding various parameters such as under water conductivity, water temperature, depth sounder, pressure gauge, pH, DO, turbidity, under water images, water quality mapping, pollution source tracking, emergency sampling and monitoring, fast response to sudden water pollution accident.

3. Monitoring climatological data:

There is a need for climatological data measurement such as soil moisture content, rainfall, wind speed over a large area - with sufficient precision for small sectors. Currently, individual gauging is the predominant way to gather climatological data. However, the collected data is often ineffective because of the rapid variation in the parameters over relatively small distances. Is there a better way to gather this data through technological solutions?

Solution & Products	Monitoring Parameters (or) Applications
Ground based weather station: Weather maestro, Pacific Data Systems, ET 107 weather station, Capricorn FLX weather station, ESIS weather station, ALG Global, Weather buoys, Seawatch wavescan buoy, 6152 Vantage Pro2 6620 Connect, RainWise PORTLOG 805-1018	Wind speed, wind direction, temperature, humidity, barometric pressure, rainfall, and solar radiation.
Decision Support System: WeatherMation LIVE	Provides data analytics of air temperature, relative humidity, wind speed, wind direction, rainfall, barometric pressure, solar radiation, and UV radiation.

4. Asset inspection and assessment:

This is an important activity to assess the extent of damage to physical assets such as pipelines, dams, spillways, water tanks. Damage can be caused by corrosion, age, sabotage, natural phenomena or disasters.

Solution & Products	Monitoring Parameters (or) Applications
Airborne solutions: RQ-20A, Scan eagle X200, Aerostar, Aeryon scout	Mapping of assets, aerial surveillance of assets, pipeline monitoring, and disaster management.
Autonomous solutions: Aspire Cam, PipeDiver, Fibre optic sensing, Neptune SB-1	Pipeline monitoring, corrosion monitoring, broken wire wraps, monitoring sedimentation in river bed, and underwater asset monitoring.
Decision Support System: TaKaDu system	Big data analytics of asset management.

5. Catchment characteristics:

Remote monitoring of catchment areas can provide information about illegal access, prevalence and spread of weeds and pest species, and regular planning of survey tasks.

Solution & Products	Monitoring Parameters (or) Applications
Underwater solutions: Neptune SB-1 and Hydroswarm	Drainage mapping and analysis, chemical component analysis of water such as monitoring levels of fertiliser due to runoff, growth of weeds and pest species in catchments, underwater mapping to 8 m, monitoring of dump sites, wildfire mapping to check water quality, post disaster mapping to analyse damage caused to catchments, environmental refuse volumes, blue-green algae outbreak, vegetation stress monitoring.
Airborne solutions: Phantom 3 Pro, Dragongflyer X6, Topodrone-100, Topodrone-500, SenseFly-albris, and eBee.	Helps in monitoring forest vegetation growth in various seasons, impact analysis of seasonal changes in mangroves growth, pollution in rivers caused by visible floating objects, river flow monitoring, riparian vegetation and other natural phenomena with high quality
Satellite solution providers: World Resources Institute (WRI), Hatfield Consultants, ALS Environmental Sciences, Water Drop Consulting	Geospatial mapping services, thematic data set, data visualisation in the form of charts and graphs.

This fact sheet summarises key findings from Project 1090-14 "Remote Sensing Recommendations to Water Industry for Water Quality Monitoring".