

# Surface-First™ Water Intelligence: Monitoring Methods Comparison

Comparison of monitoring approaches for hydrocarbons, HABs and dissolved organics across surface and open waters

Each monitoring method has unique strengths for different monitoring objectives and applications

| Criteria                  | Surface-First™ Water Intelligence                                                                                                                   | Submerged Probes                                                                                                                                          | Grab Sampling + Lab Analysis                                                                                                              | Satellite Remote Sensing                                                                                                                                      | Airborne Sensing (Hyperspectral)                                                                                                                    |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensor Contact with Water | No                                                                                                                                                  | Yes                                                                                                                                                       | Yes                                                                                                                                       | No                                                                                                                                                            | No                                                                                                                                                  |
| Primary Monitoring Layer  | Surface layer — before mixing                                                                                                                       | Water column — after entering                                                                                                                             | Surface & water column                                                                                                                    | Surface layer (large-scale)                                                                                                                                   | Surface layer (resolution dependent)                                                                                                                |
| Real-Time Monitoring      | Continuous, real-time                                                                                                                               | Continuous (between maintenance)                                                                                                                          | No                                                                                                                                        | No                                                                                                                                                            | Near-real-time when in use                                                                                                                          |
| Typical Parameters        | <ul style="list-style-type: none"><li>Hydrocarbons (thin surface films / slicks)</li><li>HABs / Algae (multi-pigment)</li><li>CDOM / fDOM</li></ul> | <ul style="list-style-type: none"><li>Hydrocarbons* (below-surface / dissolved)</li><li>HABs / Algae (multi-pigment)</li><li>CDOM / fDOM, other</li></ul> | <ul style="list-style-type: none"><li>Hydrocarbons (at and below-surface)</li><li>HABs / Algae (full ID)</li><li>CDOM (full ID)</li></ul> | <ul style="list-style-type: none"><li>Hydrocarbons (med-to-large slicks)</li><li>HABs (large blooms, mono/dual-pigment**)</li><li>CDOM (absorption)</li></ul> | <ul style="list-style-type: none"><li>Hydrocarbons (small-to-large slicks)</li><li>HABs / Algae (multi-pigment)</li><li>CDOM (absorption)</li></ul> |
| Spatial Coverage (Scale)  | Flexible — spot, local area, or wide area                                                                                                           | Single point / localized                                                                                                                                  | Point / localized                                                                                                                         | Global / regional                                                                                                                                             | Regional / targeted area                                                                                                                            |
| Depth Profiling           | Surface layer only (typ. <1 m in clear water)                                                                                                       | Yes                                                                                                                                                       | Yes                                                                                                                                       | No                                                                                                                                                            | No                                                                                                                                                  |
| Deployment Flexibility    | High — non-contact; fixed, pan-tilt, buoy, boat or drone                                                                                            | Submerged mounting                                                                                                                                        | Site visits & personnel required                                                                                                          | Externally scheduled (fixed revisit cycles)                                                                                                                   | Aircraft or UAV platform required                                                                                                                   |
| Relative Cost             | Medium (\$\$\$)                                                                                                                                     | Medium (\$\$\$) (TCO driven by maintenance)                                                                                                               | Medium-High (\$\$\$\$) (high labor / analysis)                                                                                            | Low (\$)                                                                                                                                                      | High (\$\$\$\$\$)                                                                                                                                   |
| Maintenance Requirements  | Minimal (occasional lens wiping)                                                                                                                    | Routine (cleaning, recalibration)                                                                                                                         | Labor-intensive (site visits and laboratory analysis)                                                                                     | None                                                                                                                                                          | Aircraft scheduling & support                                                                                                                       |