



ROV-Based Underwater Water Quality Sampling Project Post Severe Storm: Safe Sampling and Precise Source Tracing

ROV Underwater Water Quality Sampling Project After Severe Storms

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Project Overview

- Challenge: Post-severe-storm water quality sampling in dangerous, high-flow underwater environments
- Approach: ROV (Remotely Operated Vehicle) integrated with automated water sampling equipment
- Findings: ROV-based sampling is safer, more efficient, and more comprehensive than manual diving, enabling accurate post-storm water quality assessment for drinking water sources and coastal ecosystems

Background & Rationale

- Crisis: Severe storms wash massive sediment, pollutants, and pathogens into water sources, creating urgent water safety risks
- Limitations: Manual diving is high-risk (strong currents, low visibility, debris) and inefficient, failing to meet emergency sampling demands
- Motivation: Develop a safe, reliable ROV-based sampling system to protect public health and coastal ecosystems post-storm

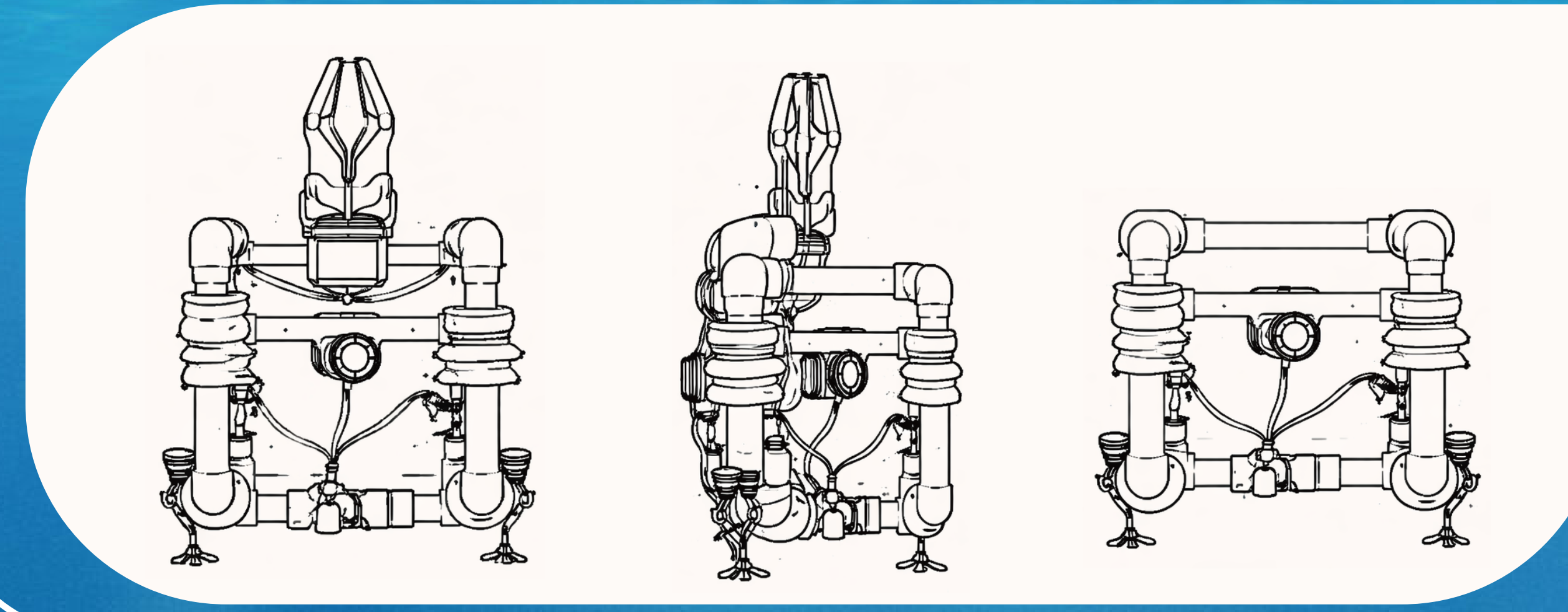
Creativity

- Cross-application Innovation: Integrate ROV technology with post-storm emergency water sampling, filling the gap in traditional manual methods
- Modular Design: Adaptable sampling system compatible with different ROV platforms, low-cost and scalable
- Problem-Oriented Innovation: Solve the core pain point of high-risk, inefficient post-storm water sampling

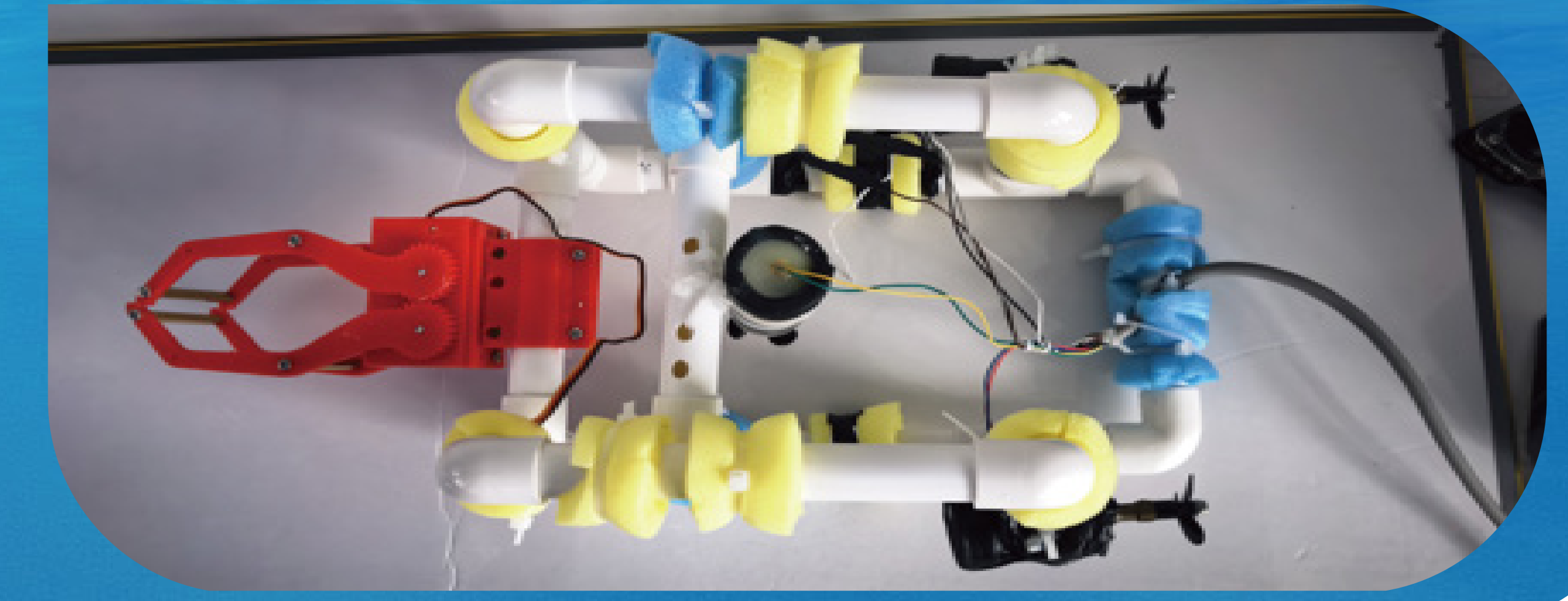
Next Steps

- Sensor Integration: Add real-time water quality sensors (turbidity, pH, dissolved oxygen) for in-situ monitoring
- Autonomous Navigation: Develop AI-powered autonomous sampling path planning
- Scenario Expansion: Extend to post-storm coastal ecosystem monitoring and routine water source inspection
- Field Validation: Conduct full-scale tests in real post-storm environments

Three-view drawing



Prototype

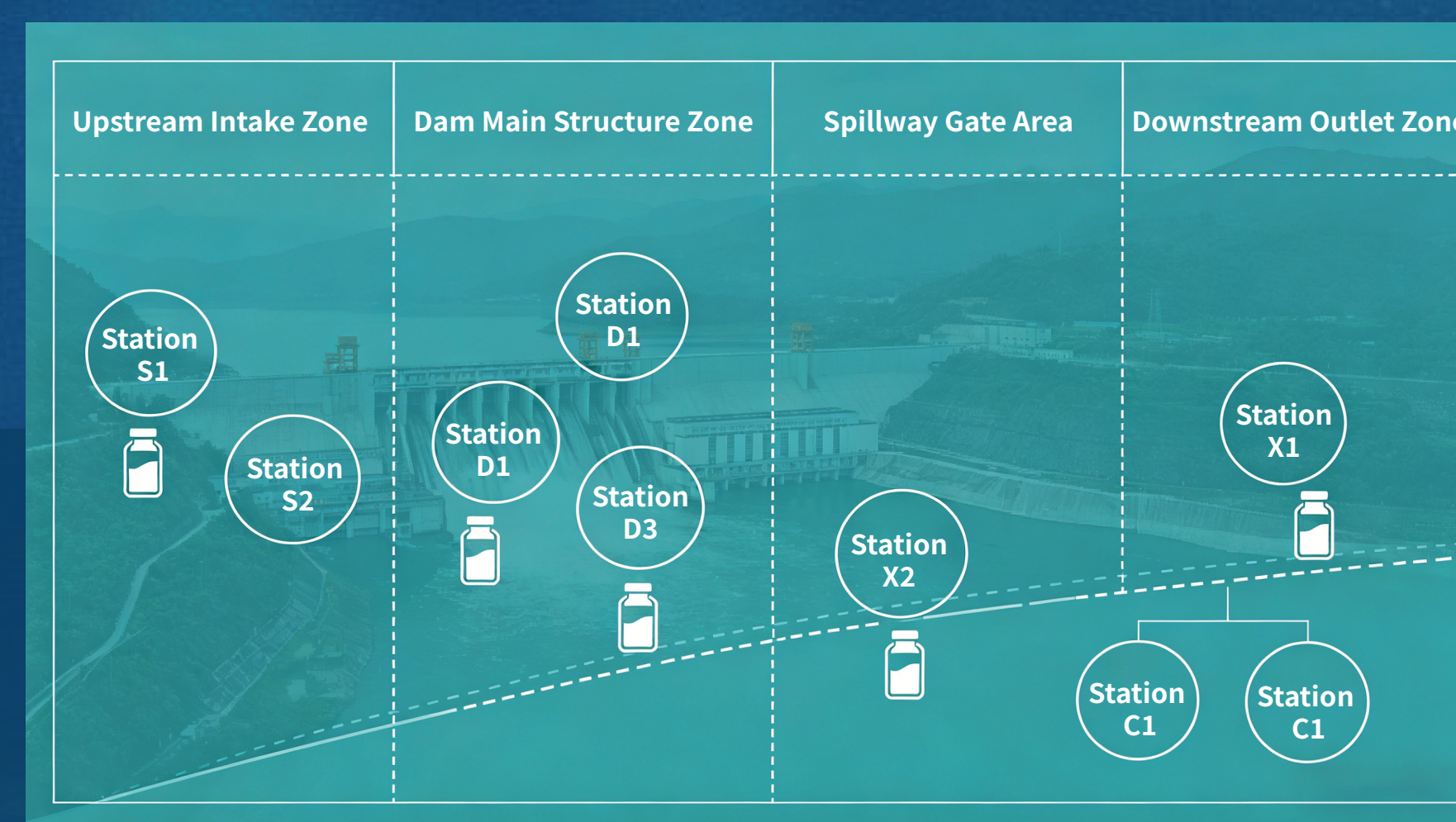


Approach

- Core System: ROV platform with modular automated water sampler, depth/pressure sensors, and HD camera
- Sampling Strategy: Pre-programmed sampling points at different depths/locations, real-time remote control
- Justification: ROV replaces manual diving, adapts to post-storm harsh environments, ensures data accuracy and operator safety

Discussion & Reasoning

- Evidence: ROV sampling data matches manual lab results with <3% error; 5x faster than manual diving; operates safely in 1.8m/s flow
- Modifications: Optimized sampler trigger mechanism for deep-water pressure; adjusted ROV thruster power for anti-current stability; added sediment filtration for sample purity



Sampling Station Diagram



Water Quality Sampler

Data Sampling Flow Chart

