**Exhibit A: Project Description**
**(Scope of Work, Special Requirements)**

**Project Title: Development and Commercialization of Autonomous Chemical and Biological Instrumentation for Water Quality Monitoring**

**Research Effort 1 - Arsenate sensor:** The chemically-selective compounds being produced in the Berryman lab utilize electron withdrawing groups around a molecular scaffold to create an electropositive halogen center where selective bonding of anions occurs. The selectivity is tuned by modifying the geometry of the binding pocket and electrostatic charge of the receptor. The scaffolds of the compounds are typically comprised of multiple aromatic rings and ethynyl spacers. They will optimize scaffold geometry by modulating their arylethynyl sequences. They will link chromophores or fluorophores to the receptor scaffolds if necessary to improve sensitivity. After this synthesis and testing phase (~1 year), the technology will be evaluated for incorporation into an analytical system, i.e. as an ion-selective electrode type sensor, within a flow analysis scheme utilizing the DeGrandpre tracer technology, or as a pseudostationary phase in the Palmer electrophoresis system.

**Research Effort 2 - Field capable capillary electrophoresis:** The Palmer lab uses reversible addition fragmentation transfer (RAFT) polymerization for unprecedented control over the chemistry and architecture of capillary electrophoresis (CE) separation materials. This technology has recently been used for the simultaneous separation and detection of seven inorganic ions and 14 nitro-aromatic compounds in six minutes. The Palmer group will develop and optimize RAFT chemistries for the separation of species that specifically impact the quality of natural waters such as nutrients (nitrate, phosphate, ammonium) and organic pollutants. The Palmer lab will also develop and optimize their benchtop technologies into portable micro-analysis devices.

**Research Effort 3 - eDNA sampler**: The Amish/Luikart group will develop and apply cutting edge eDNA testing for highly sensitive, simple and inexpensive biological species monitoring. The method is based on the amplification by quantitative polymerase chain reaction (qPCR) of small amounts of the target organism's DNA (in eggs/sperm, microscopic larvae, or shed in feces, urine or sloughed cells), confirming the presence or absence of aquatic invasive species, pathogens, and rare native species. They will use existing eDNA research, environmental data (water temperature, flow, and turbidity), and novel metagenomic eDNA approaches to guide automated water sampling and filtration techniques for field based testing.

**Research Effort 4 - Autonomous pH and TMT sensor:** The DeGrandpre lab will use their tracer monitored titration methodology (TMT) for development of the pH and alkalinity water quality monitoring system. The TMT greatly simplifies titration technology by eliminating the need for complex and expensive volumetric pumping systems. In the method, a light-absorbing tracer is added to the titrant and the amount of titrant added is calculated by quantifying the tracer. The lab has recently further simplified a high precision TMT instrument developed for seawater alkalinity, making inexpensive but high quality measurements possible. This system uses a "static" mixer to mix sample and titrant rather than the stirred cell used in the earlier

design. The current benchtop system will be straightforward to convert to a field-ready device for environmental monitoring and industrial process control. The pH analysis is readily combined with the system because it uses a pH indicator similar to the tracer indicator used in the titrant.