



## **STATEMENT OF QUALIFICATIONS**

***MARK A. REINSEL, Ph.D., P.E.***

### ***Water Treatment Process Development, Evaluation, Testing and Design***

As president of Apex Engineering, I provide process engineering expertise to:

1. Identify and implement appropriate treatment technologies,
2. Achieve water supply or reuse objectives, and
3. Meet discharge standards.

I have nearly 30 years of experience in consulting, industry and academia. Most of my recent work has focused on treating mining and other industrial wastewaters through chemical, physical and biological methods (both active and passive).

#### **AREAS OF EXPERTISE:**

- Analysis of treatment alternatives for industrial wastewater, groundwater, drinking water and stormwater
- Process design and budgetary cost estimates
- Bench and pilot testing
- Innovative technology investigation and development
- Field installation and start-up
- Process analysis and trouble-shooting
- Hazardous waste treatment
- Technical writing

#### **HIGHEST DEGREE:**

Ph.D. Chemical Engineering, Montana State University, 1995

#### **TECHNICAL TRAINING:**

Reverse Osmosis  
Biological Nutrient Removal  
Advanced Waste Water Treatment  
Design of Alternative On-Site Wastewater Systems

#### **PATENTS:**

Anoxic Biotreatment Cell – U.S. Patent #5,908,555

#### **PROFESSIONAL LICENSES AND MEMBERSHIPS:**

Registered Professional Engineer – Montana and Nevada  
Lifetime Member – American Institute of Chemical Engineers (AIChE)

## ACID ROCK DRAINAGE EXPERIENCE

### FEATURED PROJECT:

- Central Treatment Plant Operations – Kellogg, Idaho  
*Process engineer for the Kellogg Central Treatment Plant: leading efforts in plant upgrades and optimization, effluent quality improvement and cost reduction. This 2000-gpm lime treatment plant removes metals from acid rock drainage at a large Superfund site prior to discharge to a trout stream.*



**Following modifications to Central Treatment Plant operations (at no capital cost), annual operating costs were reduced by \$110,000.**

### OTHER SIMILAR PROJECTS:

- Lucky Jack Water Treatment Plant – Crested Butte, Colorado
- Treatment Plant Cost Analysis – Butte, Montana
- Treatment Plant Preliminary Design – Whitehall, Montana
- Passive Bioreactor Pilot Test – Patagonia, Arizona
- Biological Treatment of Heap Leach Water – Elko, Nevada
- Sulfate Removal Evaluation – Butte, Montana
- Sulfate-Reducing Bacteria Project – Butte, Montana
- Treatment Plant Optimization – Zortman, Montana

## MINING/SMELTING WASTEWATER EXPERIENCE

### FEATURED PROJECT:

- Biological Nitrate Removal (Plant Design) – Nye, Montana  
*Project manager for design and implementation of an Anoxic Biotreatment Cell (ABC) for nitrate removal from mine adit discharge water. Researched available technologies, designed reactor system (including microbial, chemical, mechanical and electrical aspects), and oversaw construction. Initial bioreactor exceeded design criteria by operating at flows up to 160 gpm and up to 95 percent removal of nitrate.*



**This full-scale Anoxic Biotreatment Cell at the Stillwater Mine is part of two systems treating a total of 2400 gpm.**

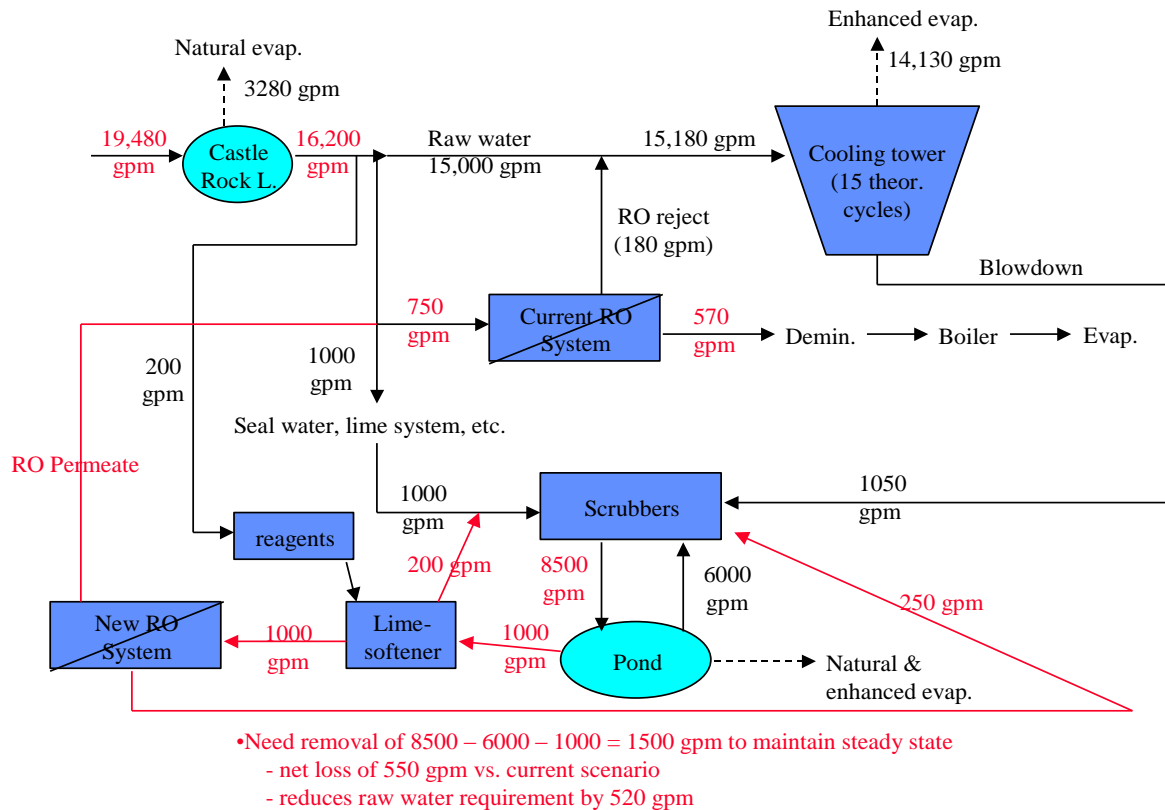
### OTHER SIMILAR PROJECTS:

- Buckhorn Mountain Mine Project – Republic, Washington
- Kensington Mine Water Treatment Plant – Juneau, Alaska
- Idaho Cobalt Project – Salmon, Idaho
- Montanore Mine – Libby, Montana
- Biological Treatment Systems – Republic, Washington
- Arsenic Removal Evaluation – Elko, Nevada
- *In Situ* Biological Nitrate Removal – Nye, Montana
- Biological Nitrate Removal (Pilot Test) – Cajamarca, Peru
- Biological Selenium Removal (Pilot Test) – Jordan Valley, Oregon
- Passive Biotreatment System – Hilger, Montana
- Smelter Wastewater Treatment Plant Optimization – East Helena, Montana
- Evaluation of Thallium Removal Options – Hilger, Montana
- Reverse Osmosis Treatment Plant Design – Noxon, Montana

## OTHER INDUSTRIAL WASTEWATER EXPERIENCE

### FEATURED PROJECT:

- Analysis of Water Reuse and Treatment Options – Colstrip, Montana  
*Project manager to determine methods for reducing process water inventory at this coal-fired power generation facility. Investigation included bench-scale testing, modeling and cost analysis of numerous water use and treatment options. Summarized findings in a report for the client, which was presented to regulatory authorities.*



**This flowsheet adding lime softening plus reverse osmosis to the existing process was one of many treatment options developed.**

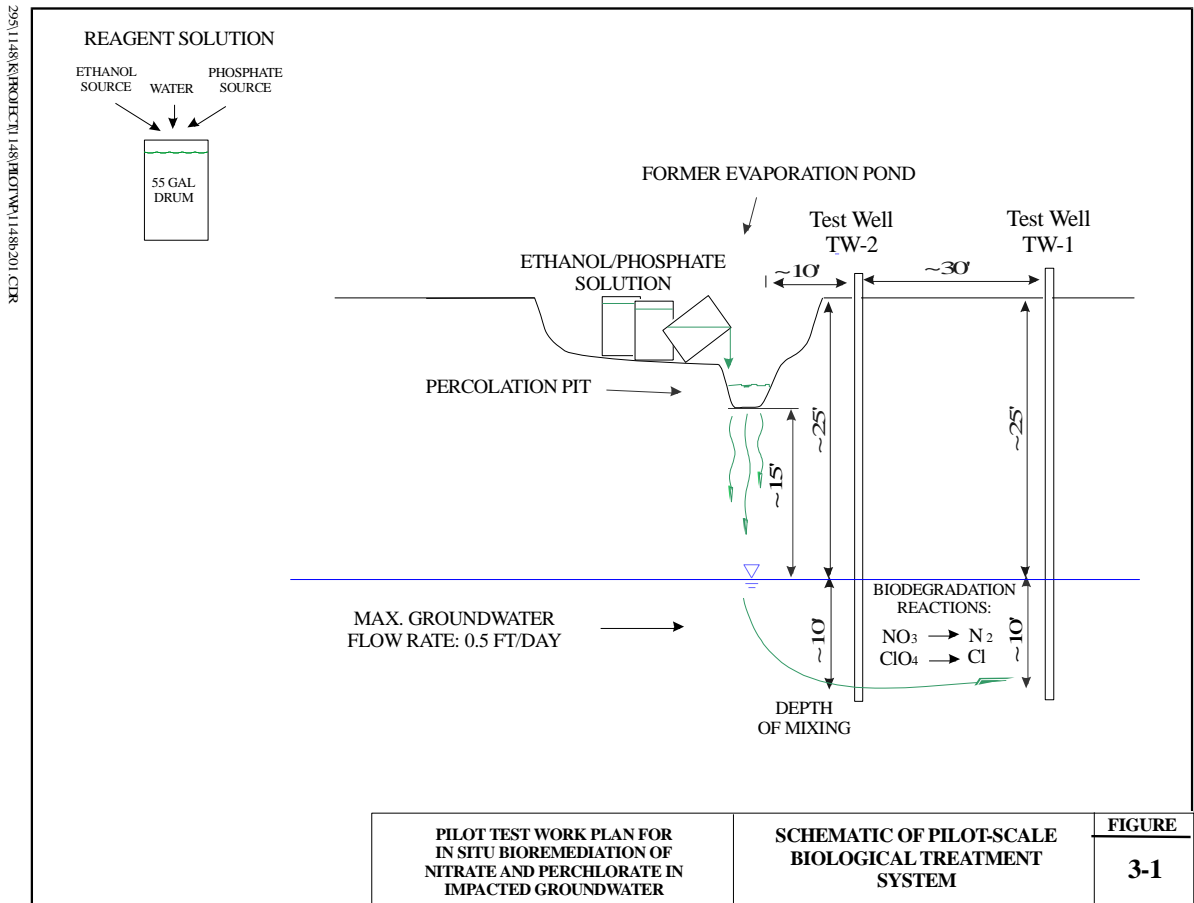
### OTHER SIMILAR PROJECTS:

- Treatment Alternatives for Cooling Tower Blowdown – Billings, Montana
- Antimony Removal from Car Wash Water – Kalispell, Montana
- Arsenic Removal from Power Plant Discharge – Canadys, South Carolina
- Textile Wastewater Treatment – La Paz, Bolivia
- Sulfur-Modified Iron for Arsenic Removal – Concord, California
- High Efficiency Reverse Osmosis Pilot Test for Metal Finishing Wastewater – Kansas City, Missouri
- Sulfate Removal for Battery Manufacturer – Lexington, Kentucky
- Phosphorus Plant Water Treatment – Pocatello, Idaho

## GROUNDWATER TREATMENT EXPERIENCE

### FEATURED PROJECT:

- Biological Nitrate and Perchlorate Removal – Lincoln, California  
*Process engineer for nitrate and perchlorate removal from contaminated groundwater at an operating explosives plant. Following a series of pilot tests, Phase I of full-scale remediation and monitoring is now underway.*



### OTHER SIMILAR PROJECTS:

- Groundwater Treatment for Mining Use – Roundup, Montana
- *In Situ* Biological Nitrate Removal – Nye, Montana
- Hydrogen Peroxide Injection for Enhanced Bioremediation – Helena, Montana
- Biological Nitrate Removal at an Explosives Facility – Battle Mountain, Nevada
- Arsenic Removal from Landfill Leachate – Tacoma, Washington
- Hydro Process for Oilfield or Coal Bed Methane Produced Water – several sites

### **STORMWATER TREATMENT PROJECTS:**

- Stormwater Treatment Preliminary Design Report – Kalispell, Montana  
*Process engineer for preliminary design report on stormwater treatment options and costs for the proposed Glacier Mall project, which would be the largest mall in the state.*
- Closed Smelter Superfund Site – Tacoma, Washington  
*Investigated technologies for treating surface water to meet the remediation goals for arsenic and metals proposed by EPA for this closed smelter site. Developed six treatment options, with their achievable quality levels and associated costs, for Technical Impracticability Report. Performed bench-scale and pilot-scale settling tests to meet remediation goals using polymer addition and filtration, and incorporated findings into Preliminary and Intermediate Design documents.*

### **DRINKING WATER PROJECTS:**

- Arsenic Removal – Great Falls, Montana  
*Investigating treatment alternatives for arsenic removal for a small utility, and providing preliminary engineering design and cost estimates for central treatment and water blending.*
- Arsenic Removal – Dixon, Montana  
*Investigated treatment alternatives for arsenic removal for a small tribal utility, and provided preliminary engineering design and cost estimates for both a central treatment system and point-of-use devices.*
- Arsenic, Manganese and Radon Removal – Carter, Montana  
*Investigated and analyzed treatment alternatives (for arsenic, manganese and radon) for a small utility, and provided preliminary engineering design and cost estimates for both a central treatment system and point-of-use devices.*
- Copper Removal – Boulder, Montana  
*Served as process engineer to evaluate and implement a solution for high copper concentrations in the drinking water distribution system.*

### **GENERAL ENGINEERING PROJECTS:**

- Legal Aspects of Project Engineering – Butte, Montana  
*Teaching MPEM 5030 as a required course for a Master's of Project Engineering and Management. This degree is offered jointly on-line by Montana State University and Montana Tech.*
- Hazardous Waste Engineering – Butte, Montana  
*Teaching MPEM 5130 and serving on several graduate student committees.*
- Writing technical and legal articles for *Hazardous Waste Consultant*
- Process Engineering Services for Plant Optimization – Corpus Christi, Texas
- Process Engineering Services for Cost Reduction – Hutchinson, Minnesota
- Product Engineering Services for Quality Improvement – Hutchinson, Minnesota



## CLIENT REFERENCES:

- “Mark distinguishes himself as a key person in the development of an innovative and cost-effective approach to conditions at the site. I am especially impressed at his responsiveness and his sensitivity to the budgetary and operational needs of Alpha Explosives. He designed an elegantly simple and effective bioremediation technique for a pilot test that is expected to reduce by an order of magnitude the overall cost and time for our cleanup. He patiently fields my questions and demonstrates the ability to translate technical issues into layman’s terms.

“Mark’s expertise in water treatment and his ability to develop bioremediation alternatives have been invaluable to this company and we anticipate a continuing relationship as the solution to the site’s problems takes shape.”

Richard Driscoll  
Former Environmental Manager  
Alpha Explosives  
Lincoln, California

- “Mark has been a key member of our very successful operation of the Kellogg Central Treatment Plant for the past three years, and I know our client has appreciated Mark’s timely responses on a wide variety of technical issues. I’m looking forward to teaming with Mark on our next three-year contract.”

Don Ferguson, President  
Ferguson Contracting, Inc.  
Kellogg, Idaho

- “I have known Dr. Mark Reinsel for several years while working together on my water treatment process. Dr. Reinsel contributed greatly to the commercial development of my patented Sulfur Modified Iron (SMI) process which now has National Sanitary Foundation (NSF) Certification 60 and 61 approval for drinking water applications.

“His accomplishments, while working with the media, included: 1) summarizing and analyzing data from other researchers; 2) developing an applied research program to explore SMI’s utility for wastewater, which led to claims granted in our third patent, and 3) being the catalyst behind the federal funding for SMI pilot testing.

“I would unconditionally recommend utilizing Mark’s expertise for any water quality-related issues. He was an instrumental force while working with us.”

Peter F. Santina, President  
SMI, Inc.  
Concord, California

## **CLIENT LIST:**

- Alpha Explosives
- America Textile
- American Chemet
- Applied Biosciences
- ASARCO, Inc.
- Aspen Air
- Aspen Publishing
- Barrick Goldstrike
- BMP Investments, Inc.
- Canyon Resources
- Carter Chouteau County Water District
- Cascade Earth Sciences
- CDM
- City of Boulder, Montana
- Coastal Chem
- Environmental Resources Management (ERM), Inc.
- Ferguson Contracting, Inc.
- FMC Corporation
- Formation Capital Corp.
- Glacier International Airport
- Golden Sunlight Mines, Inc.
- Gore Hill Water District
- Great West Engineering
- Hecla Mining Company
- Hydrometrics, Inc.
- Kinross Gold Corporation
- Kobex Resources Ltd.
- Land and Water Consulting, Inc.
- Mines Management, Inc.
- Mine Waste Technology Program
- Molybdenum
- Montana Resources
- Montana State University
- Montana Tech-University of Montana
- Morrison-Maierle, Inc.
- Newmont Mining Corporation
- Olympus Technical Services
- PPL Montana
- Red Vector.com
- Robinson Nevada Mining Company
- RTW Engineering
- Ruby Creek Mining
- SMI, Inc.
- Stillwater Mining Company
- U.S. Army Corps of Engineers
- U.S. Energy Corp.
- Wharf Resources