A Proposed Semi-Passive Treatment System At Remote AML Sites

by

Robert H. Lambeth, PE, PG, LHG & Gene Andrews, PE

Millennium Science & Engineering, Inc.

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Problem: ARD discharging into a popular Wild & Scenic River floodplain

Question: Can you build a minimal cost, walk-away treatment system that has no footprint, odor, maintenance, or power needs?

Answer: It would be difficult! Or more precisely – **NO!**

History & Description

- Volcanogenic Massive Sulfide deposit
- Active 1898-1942
- Most production 1908-1916
- 13 Adits
- 2 Shafts
- 4 Levels below River
- 10,000 feet of workings

Ground Level View of Site

Aerial View of Site

Floodplain Looking West

All Adits

Adit Discharge

Discharge Quality

Flow = 10 gpm

pH = 2.9 su

Al = 19 mg/L

As = 0.016 mg/L

Cu = 3.5 mg/L

Fe = 93 mg/L

Pb = 0.21 mg/L

Se = 0.03 mg/L

Zn = 18 mg/L

Treatment Design Considerations

- Limited access
- No power
- Adit frequently flooded
- Entire valley is a floodplain
- Visibility
- Vandalism
- No water availability

Basic Treatment Options

Neutralization (mandatory)

- Within wetlands?
- Caustic?
- Lime?

Sludge handling

- Direct discharge?
- Settlement basin w/removal?
- Filtration w/removal

Neutralization Discussion

Lime addition

- Denser sludge
- Lower cost
- Doesn't freeze, but
- More maintenance
- Greater power requirements

Caustic addition (Preferred)

- Much easier and simpler to use
- Less power needs
- Lower maintenance

Bench & Field Tests

- Performed by Ionic Water Technologies, Inc., Reno, NV
- 8 gpd of 30% NaOH solution to pH 9
- All metals but Al declined to criteria in effluent
- Sludge passed TCLP, but leachate still exceeded some criteria
- Paint filter test was not performed

This Should Work!

Settlement Option Issues

Wetlands

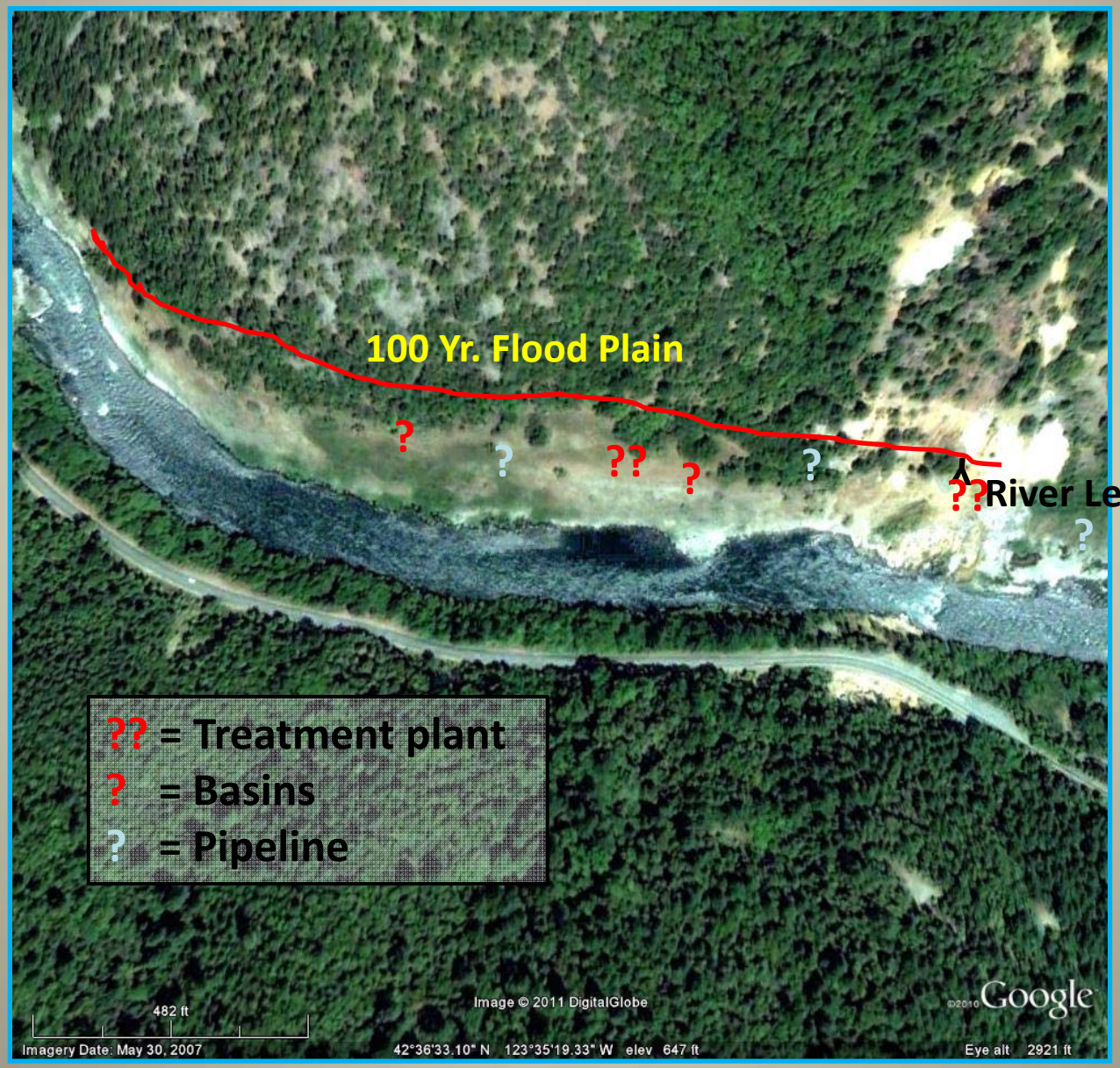
- Would have to be in the floodplain
- Will 10 gpm sustain an adequate size system for the pH?
- Visible and subject to vandalism

Settlement basins

- Would have to be in the floodplain
- Visible and subject to vandalism

>> Sludge removal for both awkward and the disturbed sludge may not pass the Paint Filter Test<<

Potential Locations



Alternative Proposal!

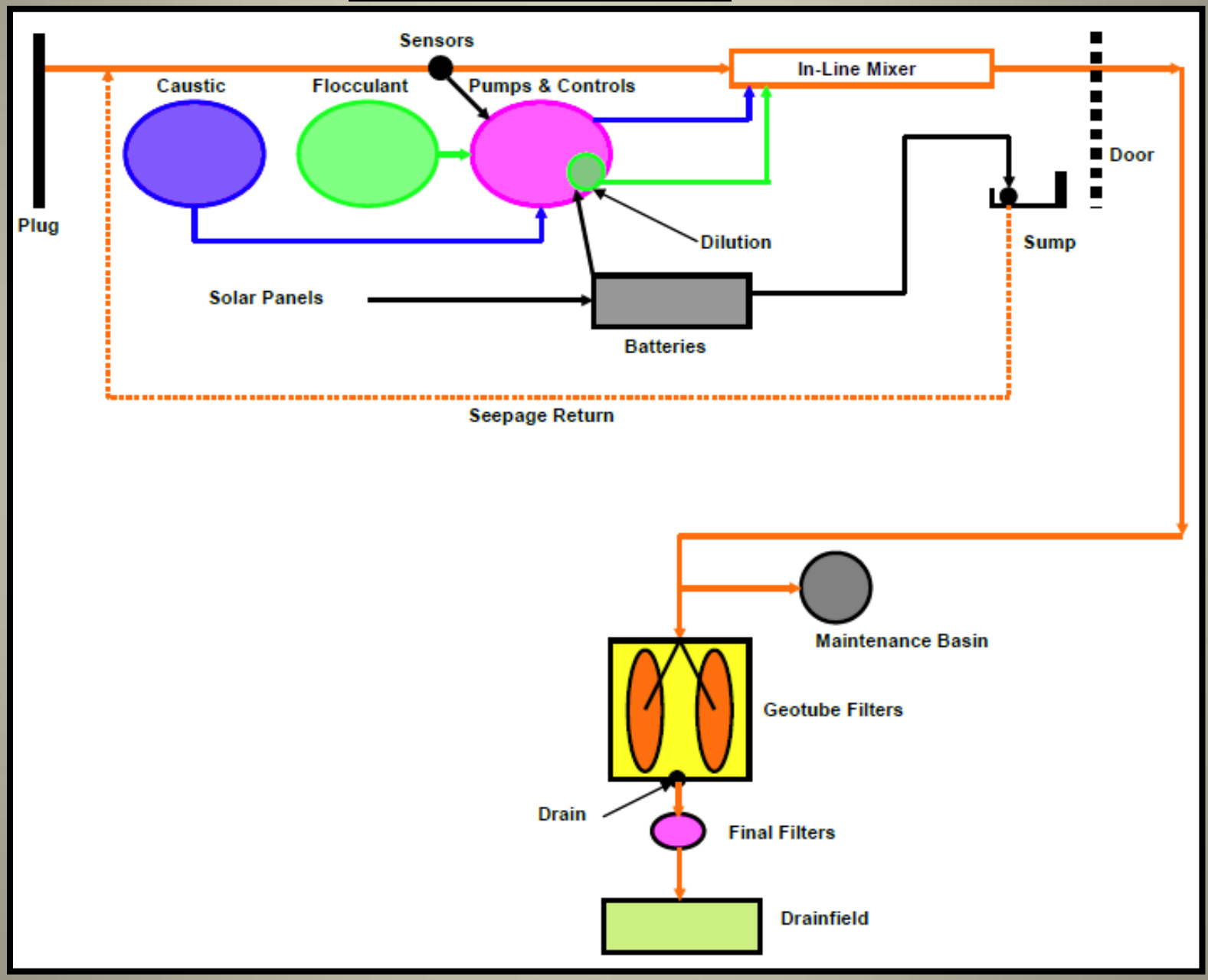
1. Concrete plug in adit
   - Can create head!
   - Stops inundation!
2. Treatment system underground
   - Hides it!
   - Protects it!
3. Treated effluent to fabric filters
   - Contains sludge!
   - Protects sludge from flooding!
4. Discharge to drainfield for polish and concealment!

Sludge Disposal ?!?

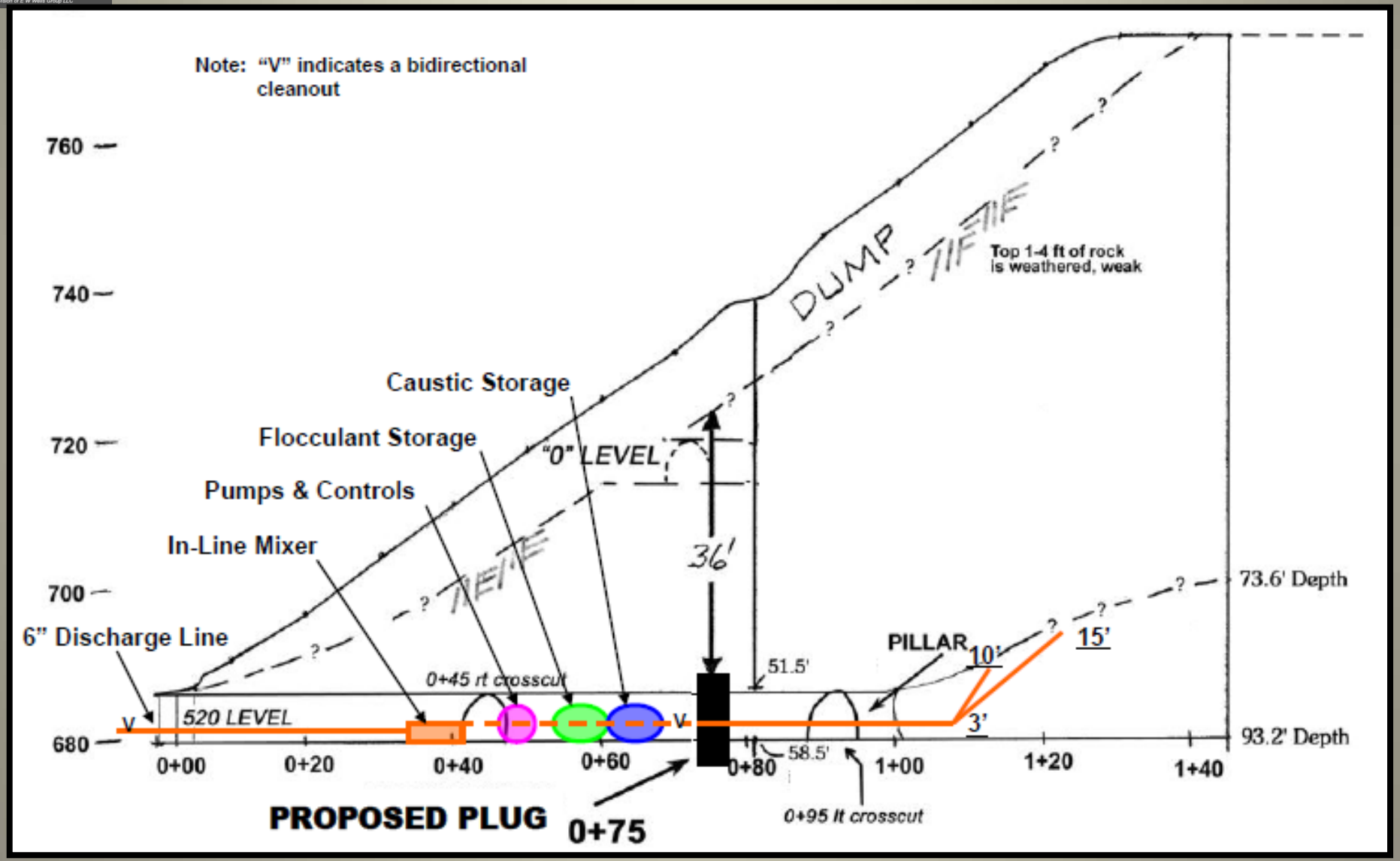
- Use multiple fabric filter tubes in series!
- Containerize filter tubes in large garbage dumpsters!
- Change out full filter tubes quickly!
- Dispose in local landfill!
  - The sludge passes TCLP!
  - The sludge should pass the Paint Filter Test!

>>The landfill can still reject it!!<<

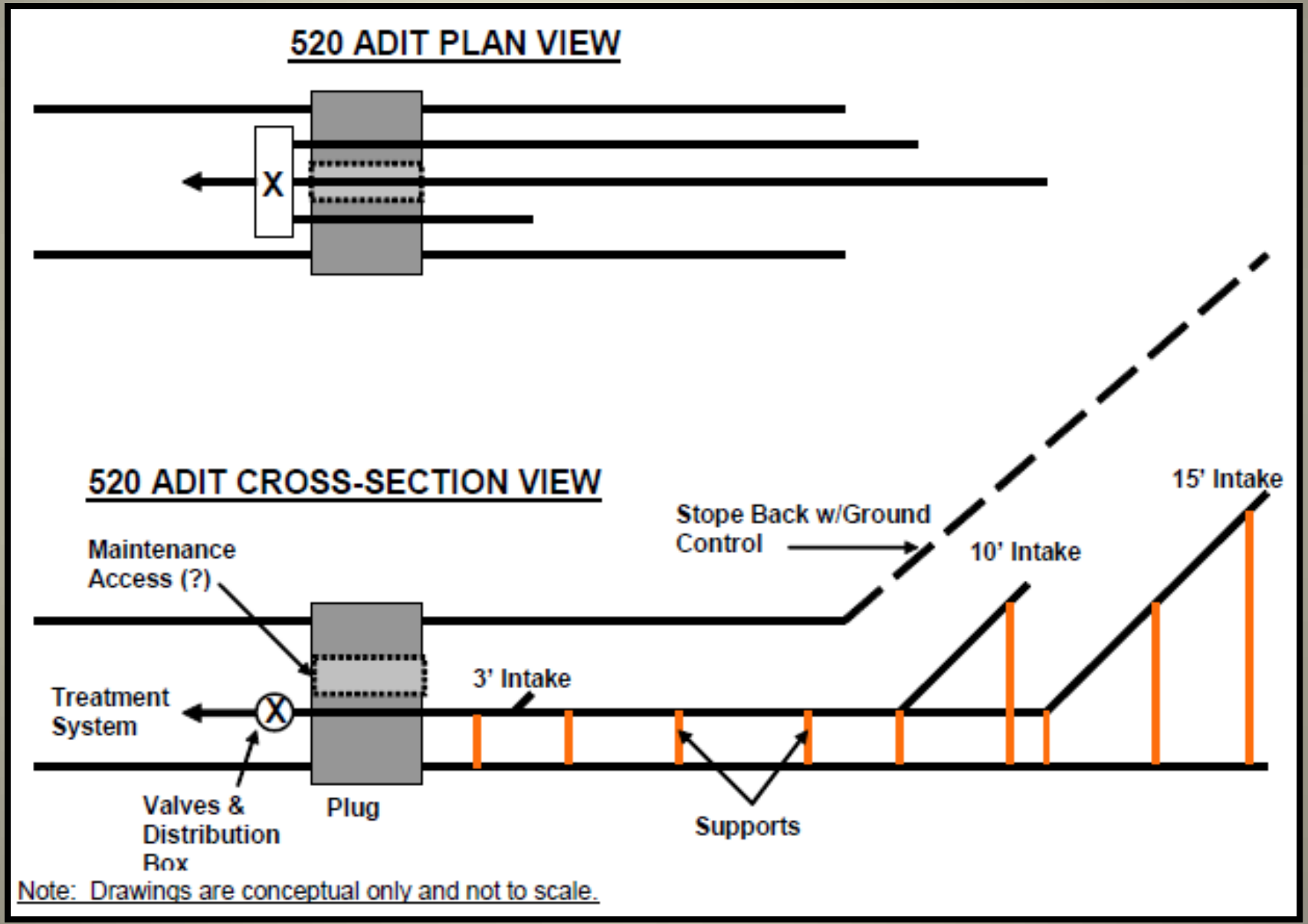
Flowsheet


Sensors
In-Line Mixer
Caustic
Flocculant
Pumps & Controls
Door
Plug
Dilution
Sump
Solar Panels
Batteries
Seepage Return
Maintenance Basin
Geotube Filters
Drain
Final Filters
Drainfield

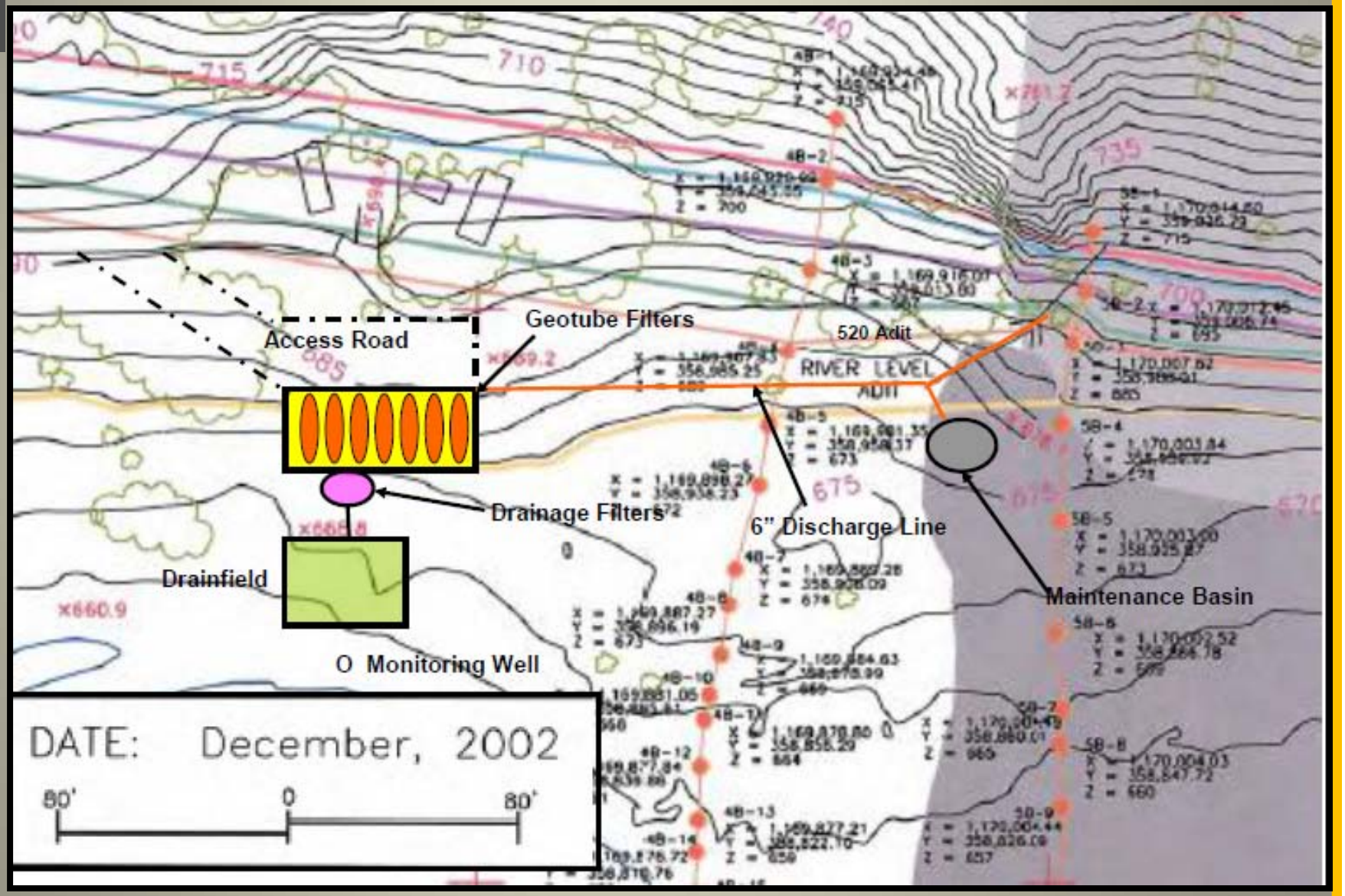
In-Adit Design



Pipe Detail


520 ADIT PLAN VIEW
X
520 ADIT CROSS-SECTION VIEW
Maintenance Access (?)
Stope Back w/Ground Control
10' Intake
15' Intake
3' Intake
Treatment System
X
Valves & Distribution Box
Plug
Supports
Note: Drawings are conceptual only and not to scale.

Surface Plan View



COSTS

Capital Cost = $1,900,000

Five Year Capital & Operating Cost = $2,828,000

Closing

1. More treatment/pilot tests are needed!
2. This can be phased in!
3. This is just one more wrench in the ARD remedial toolbox!

Comments?

Questions?

Sticker Shock?