

A Combination of Bauxsol™ Acid B Extra™ Blend and Biochar to Reduce Metal Concentrations in Eveline Acid Mine Drainage

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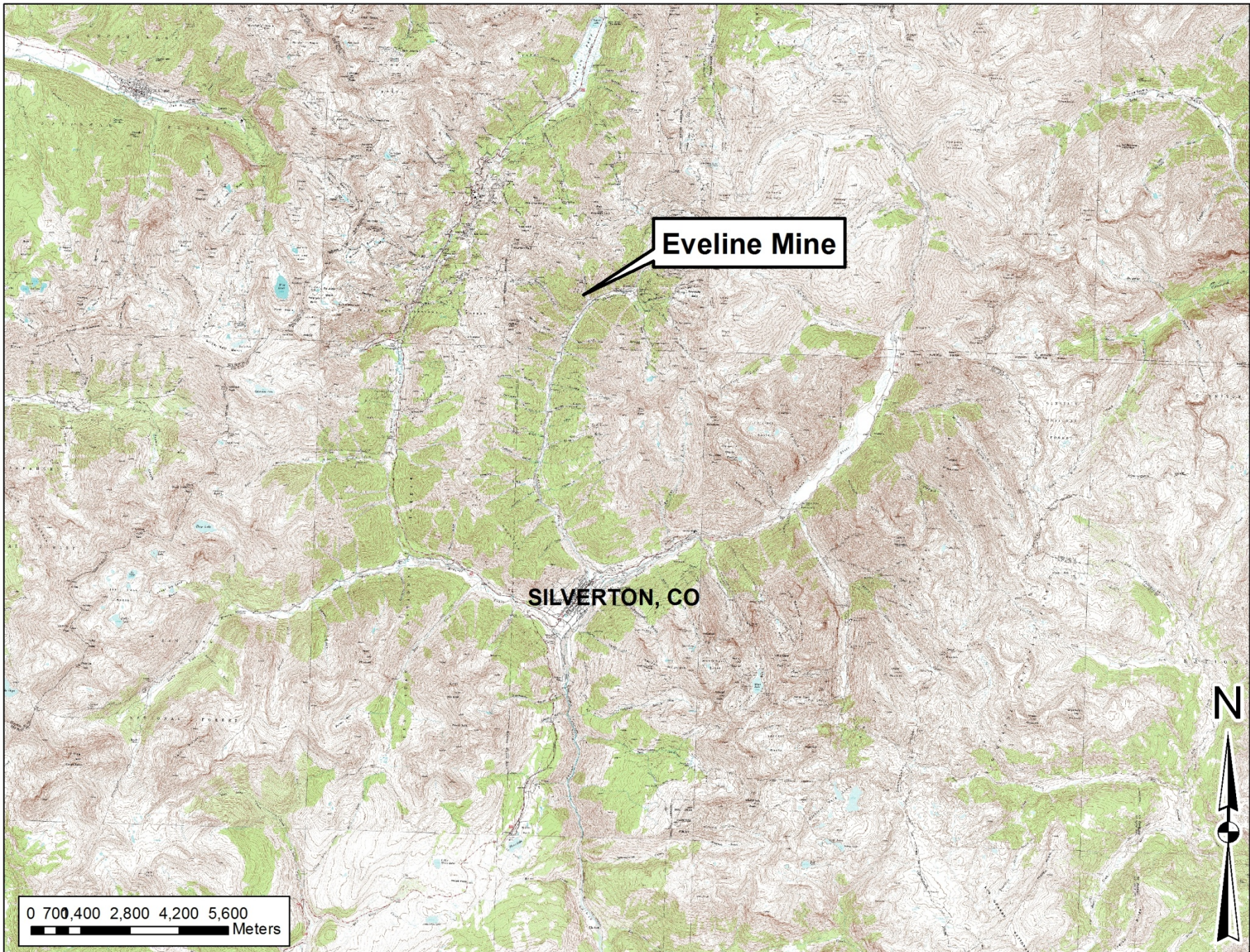


AMD Active Treatment



AMD Sulfate Reducing Bioreactor



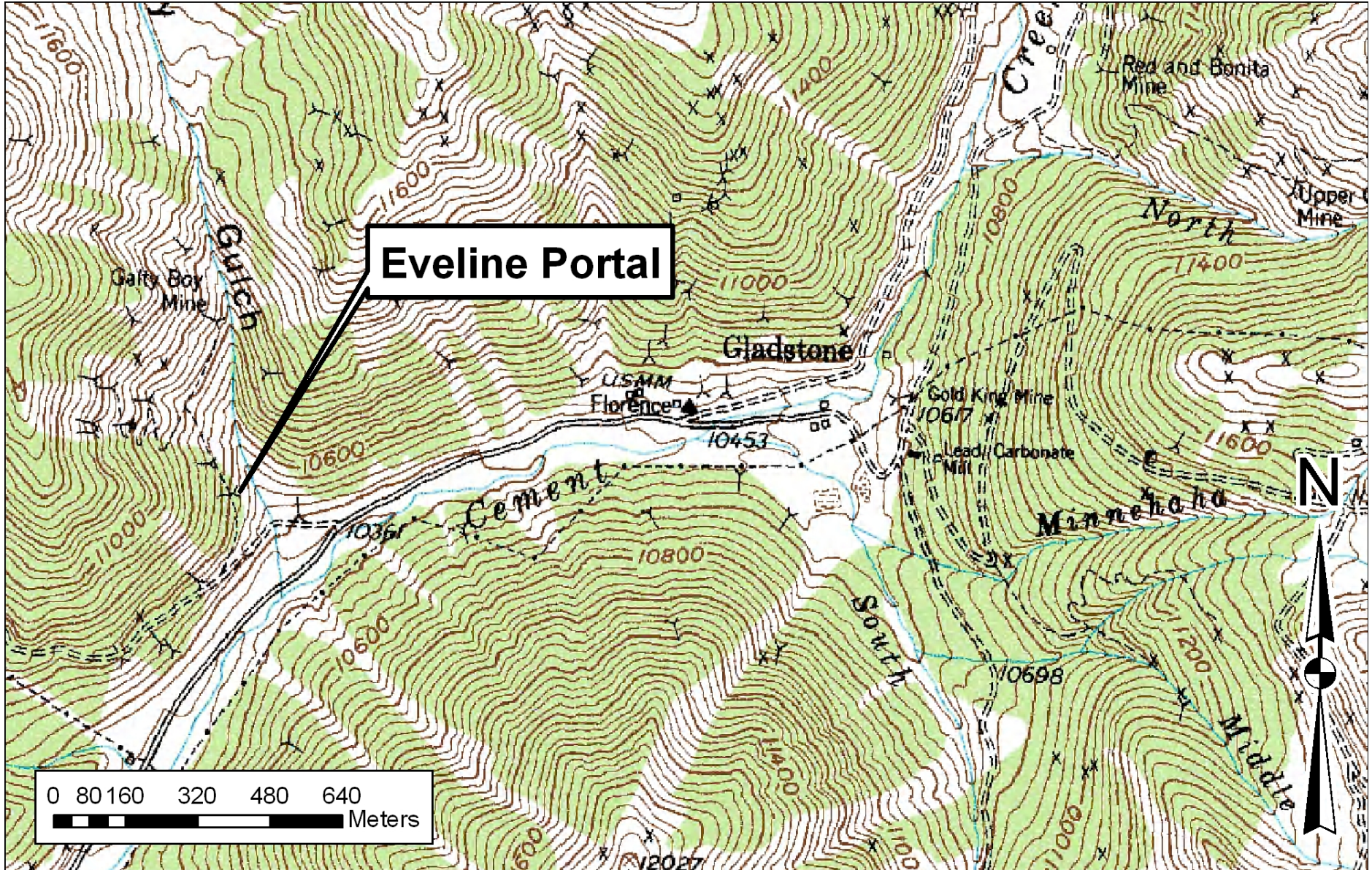


Eveline Mine

SILVERTON, CO

0 700 1,400 2,800 4,200 5,600
Meters





Eveline Mine





Eveline Mine

Co Rd 35



Eveline Mine Drainage

- BLM and ARSG identified the Eveline for remediation
- 2007 – BLM National Operations Center performs pilot tests

	Q (gpm)	pH	Al*	Cd*	Cu*	Fe*	Mn*	Zn*
Ford, Flemming, Odell 2009	7.6	3.2	9.4	0.014	0.08	25.2		1.1
Eveline inflow August 2012	3.6	3.4	13.5	0.02	0.10	29.4	1.06	1.5
Eveline inflow August 2011	5.5	3.3	12.9	0.021	0.07	29.5	0.95	1.3
Average	5.6	3.3	11.9	0.012	0.1	28.0	1.0	1.3

*mg/L

Eveline Treatment Vault

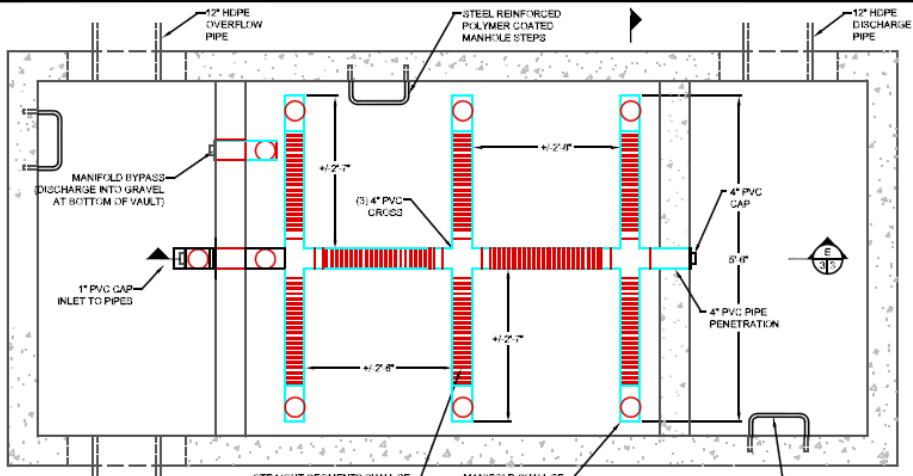
- **Designed to treat 8 gpm**
- **ARRA Funded**
- **Constructed in 2010**





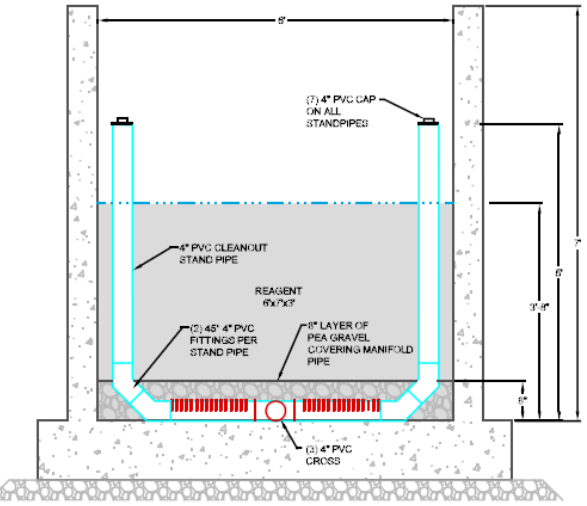


9-23-10
FIREBOX
FOUR CORNERS FIRE-CASE
Mitch Ward



STRAIGHT SEGMENTS SHALL BE SLOTTED AS SPECIFIED, WITH SLOTS ORIENTED UPWARDS
 MANIFOLD SHALL BE CONSTRUCTED OUT OF 4\"/>

WATER TREATMENT MANIFOLD DETAIL



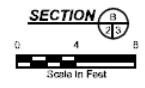
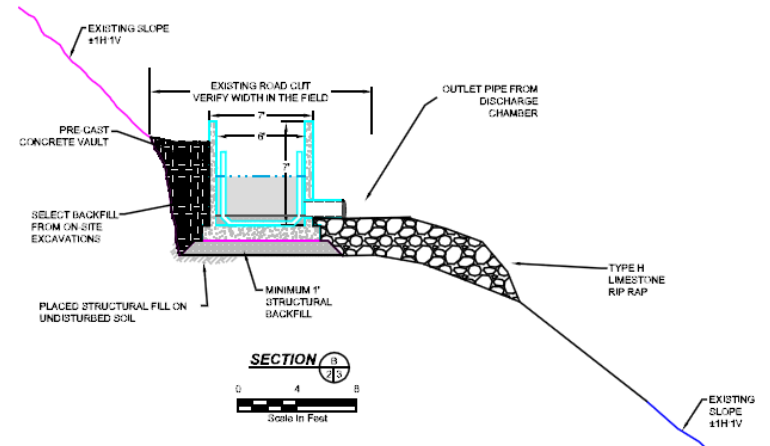
WATER TREATMENT MANIFOLD DETAIL



NOTE
 1. MANIFOLD TO BE CONSTRUCTED USING PVC PIPE & FITTINGS. FIELD VERIFY LENGTHS & CUT STRAIGHT PIPE TO ACCOMMODATE FITTING SIZES.

DESIGN CRITERIA:

1. AVERAGE DRAINAGE FLOW RATE 7.86 gpm
2. VOLUME OF REAGENT IN WATER TREATMENT VAULT 359 GALLONS MINIMUM
3. FLOW RATE AND REACTANT CONTACT TIME PER ILM REPORT (TREATMENT OF ACID MINE DRAINAGE USING BAUXSOL AND ZERO-VALENT IRON)
4. SITE TOPOGRAPHY FROM ILM DRAWINGS
5. DESIGNED TO FLOW THROUGH THE PIPES
6. VAULT DESIGNED TO FLOW THROUGH GRAVEL IF PIPES CLOG



AS BUILT

EVELINE MINE			
DRAINAGE TREATMENT DETAILS			
NO.	REVISIONS DESCRIPTION	DATE	BY

DESIGNED BY: [redacted] DATE: 11/16/11
 DRAWN BY: [redacted] DATE: 11/16/11
 CHECKED BY: [redacted] SCALE: AS NOTED







125-10
SERIES
PREFABRICATED
WOOD

2011 - ZVI



Bauxsol™ Acid B Extra™

- Altered by-product of the Alumina Refining Industry
- Purchased from Virotec
- Basic
- Fine grained powder
- Iron rich and silica rich minerals
- Has been used to treat tailings ponds and waste piles







2012 Eveline Bauxsol™ Pilot Tests

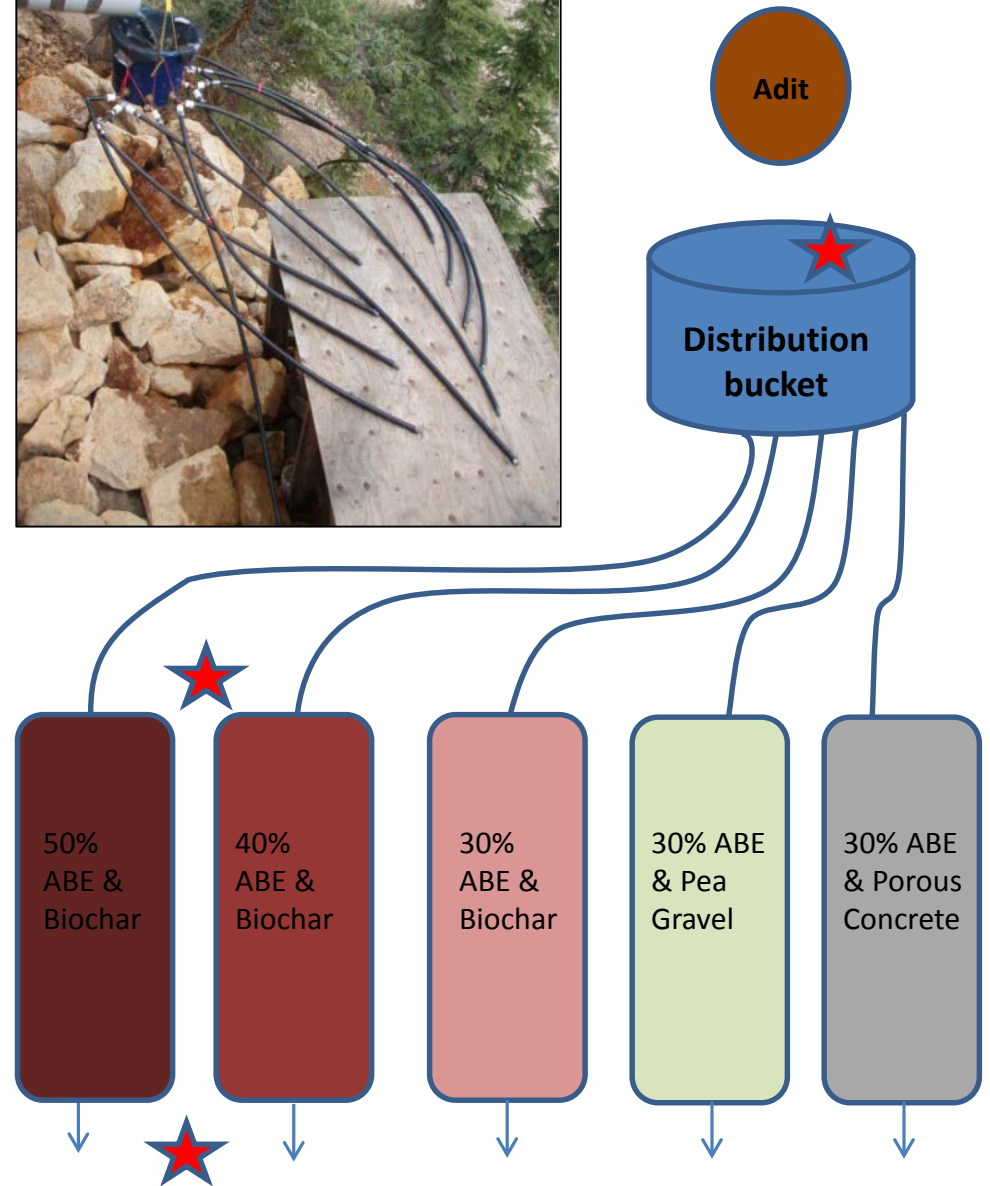
- Biochar
- Porous Concrete (Aerix)
- Pea Gravel

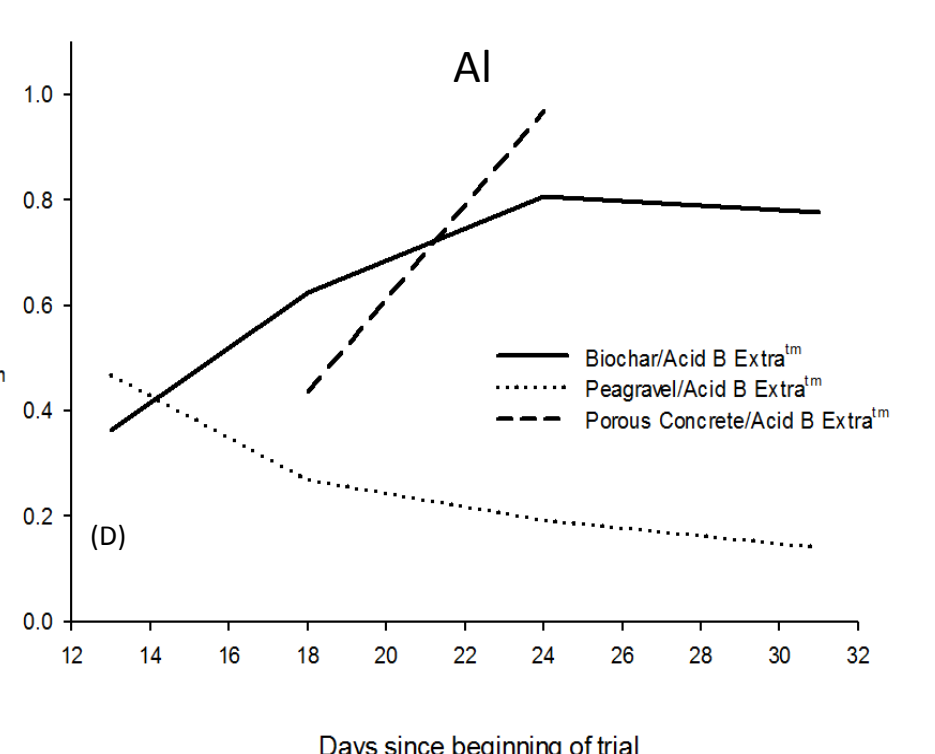
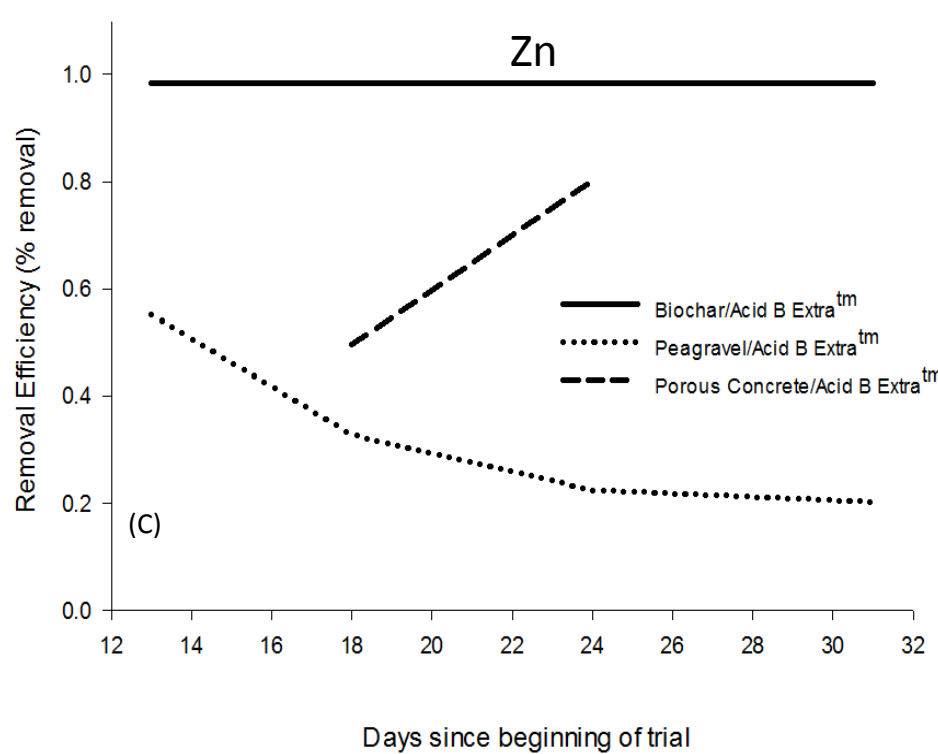
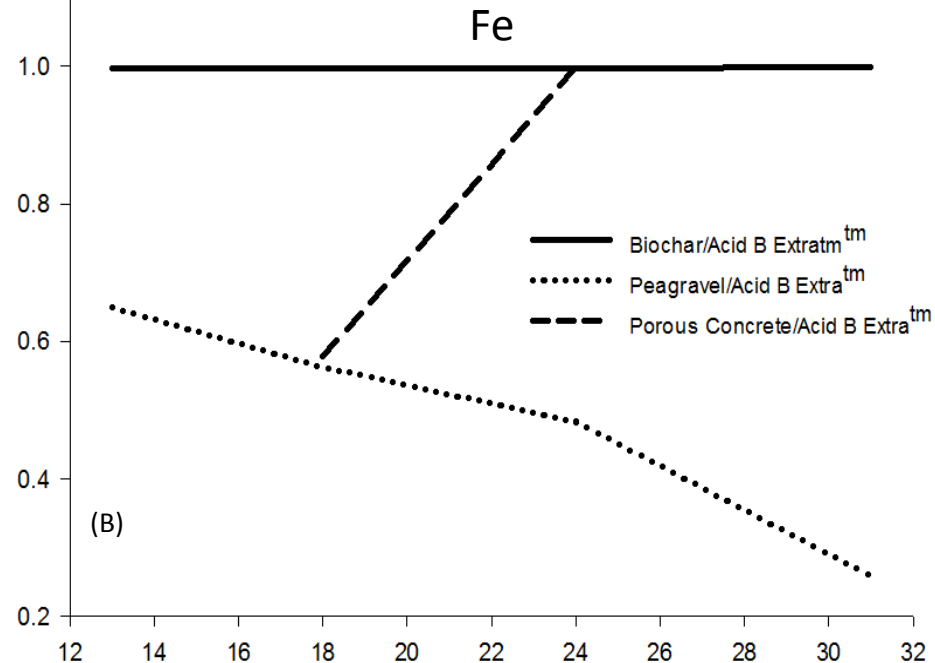
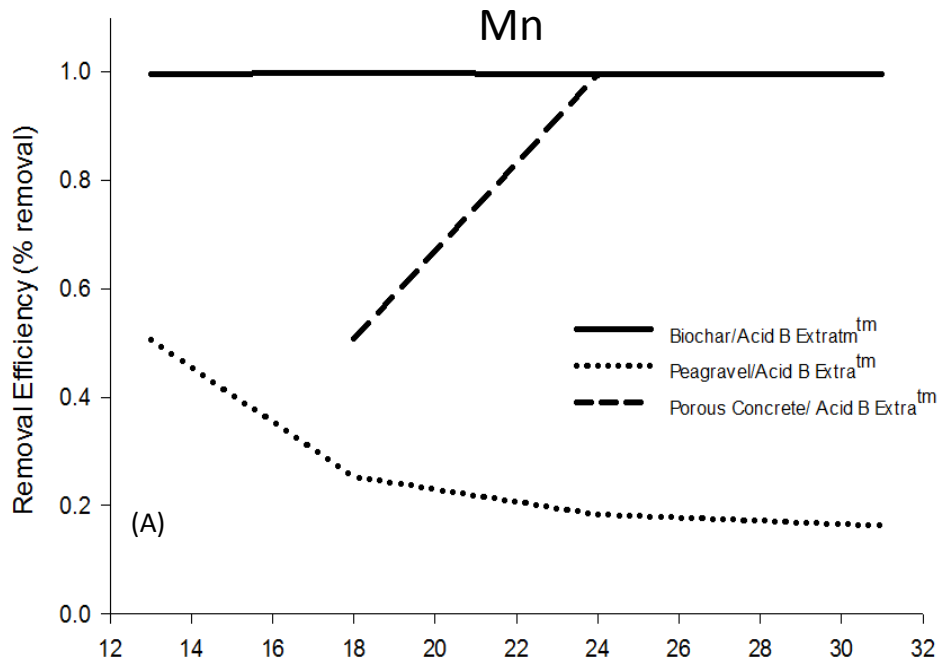


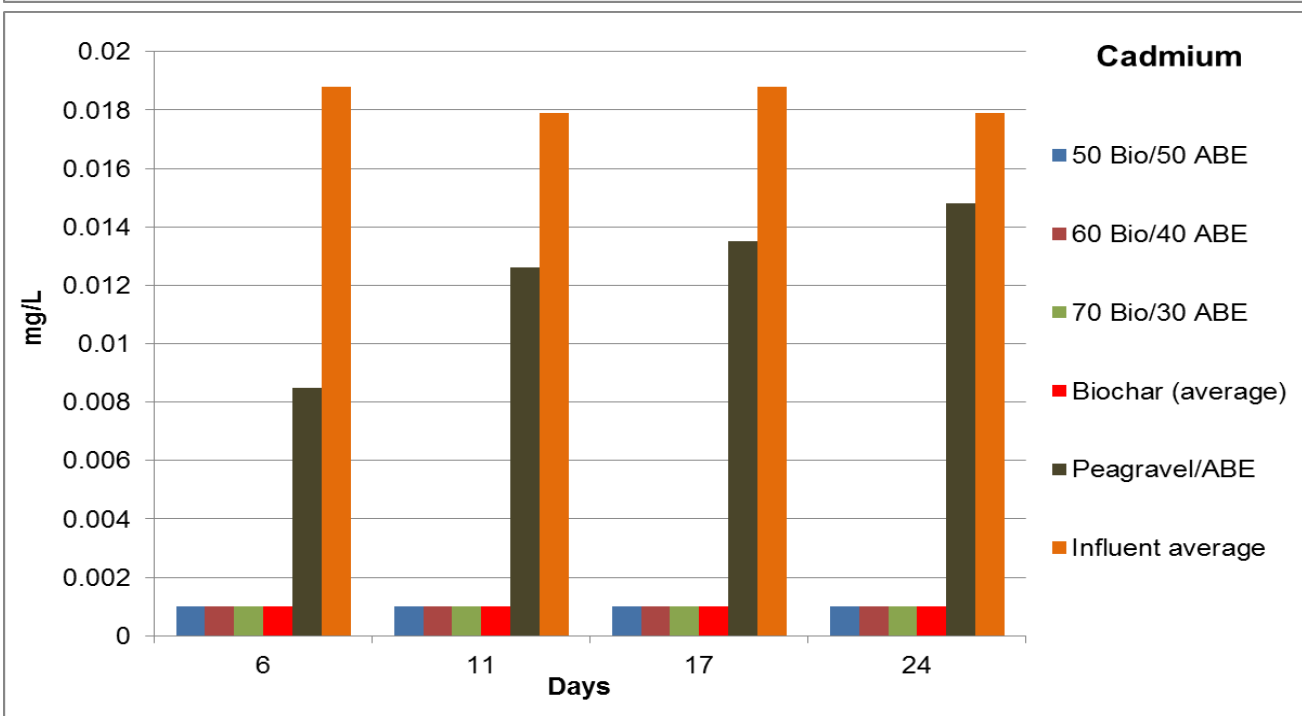
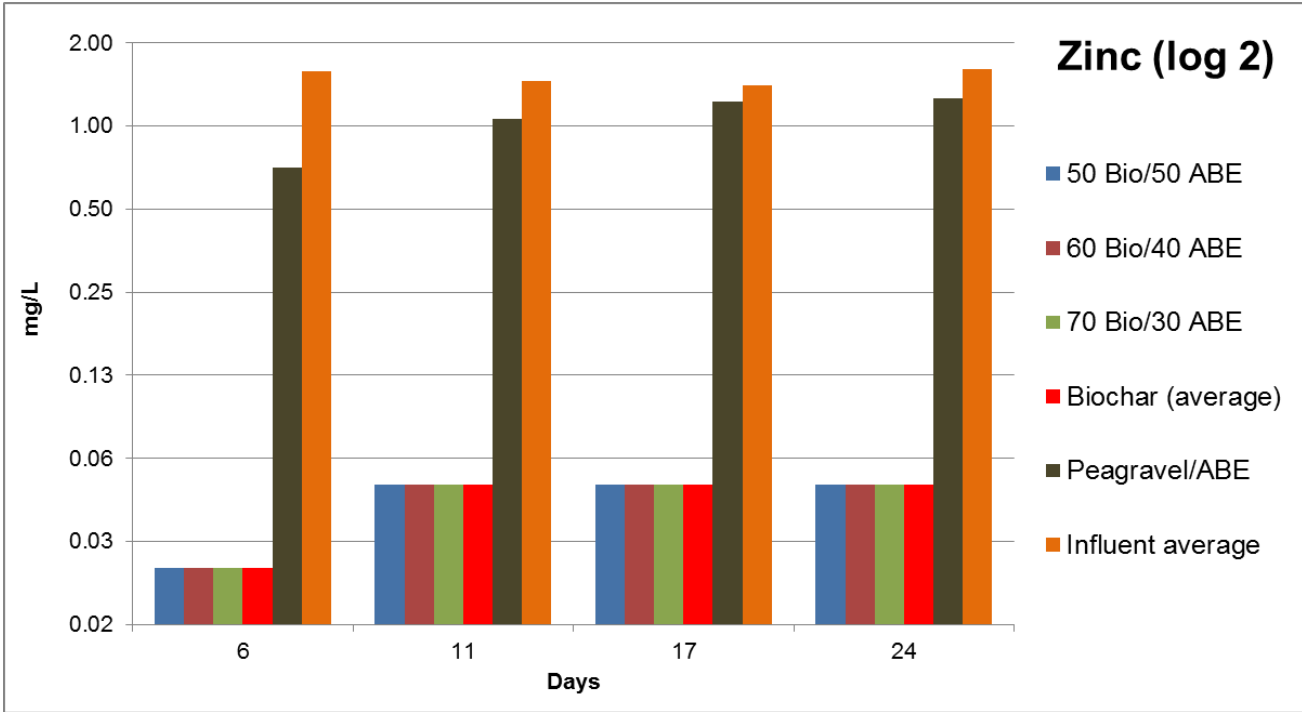


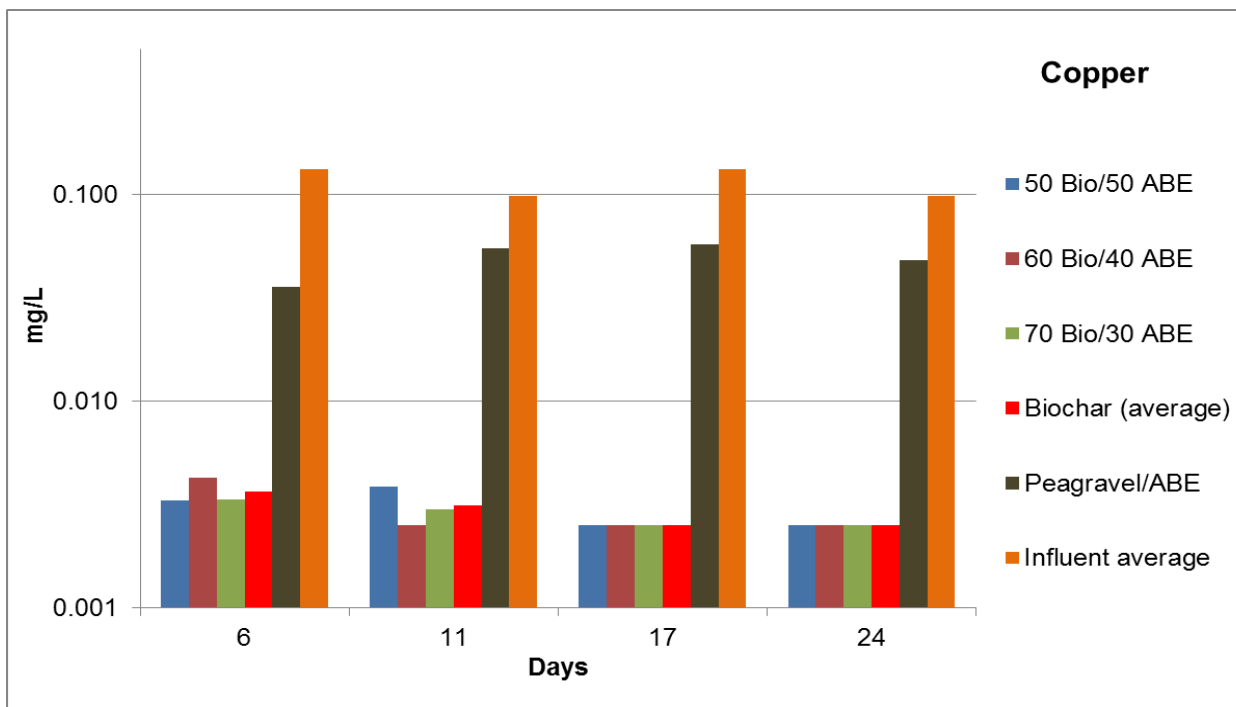
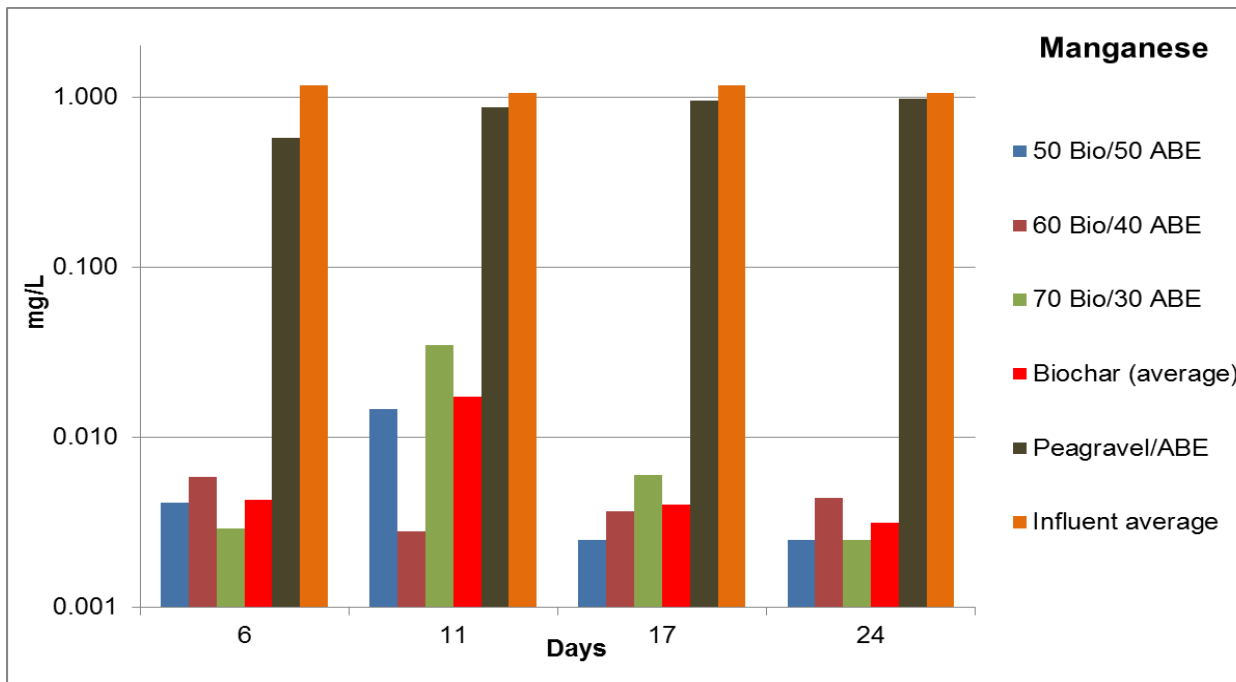


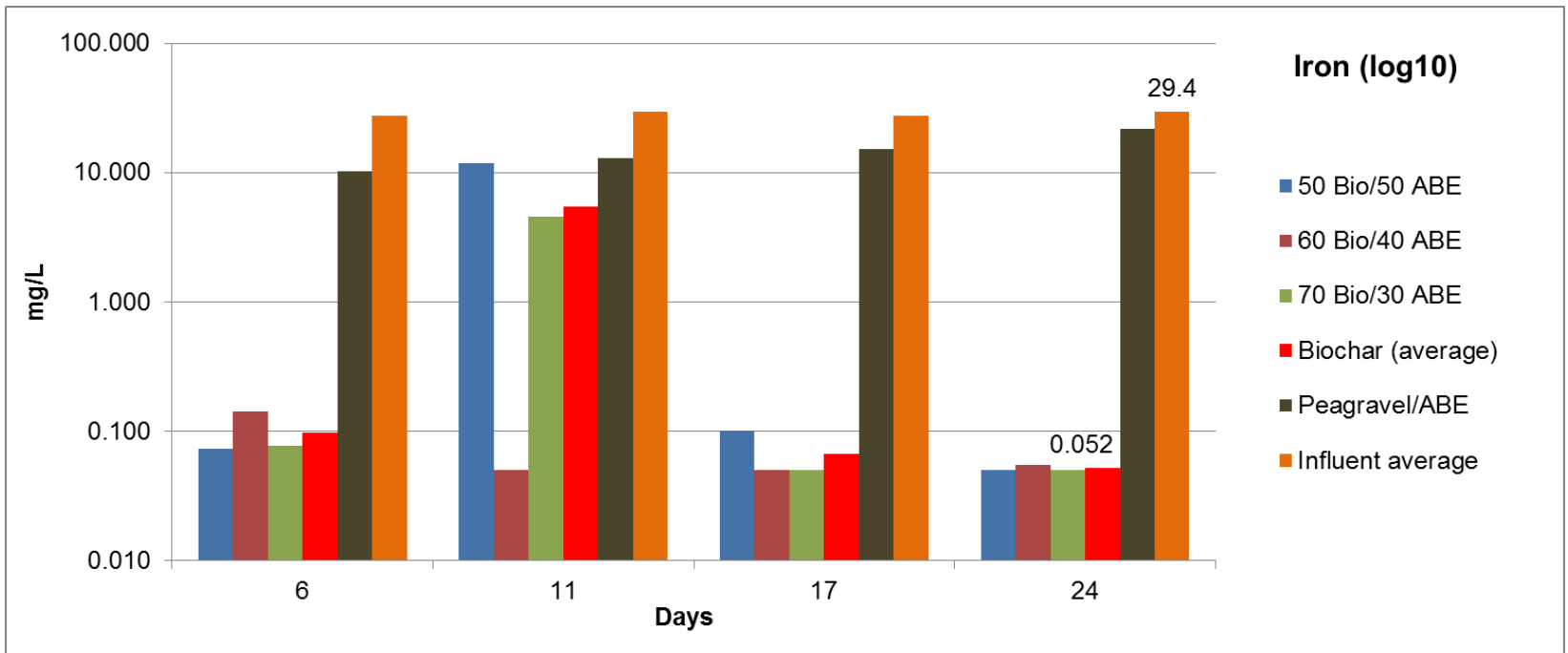
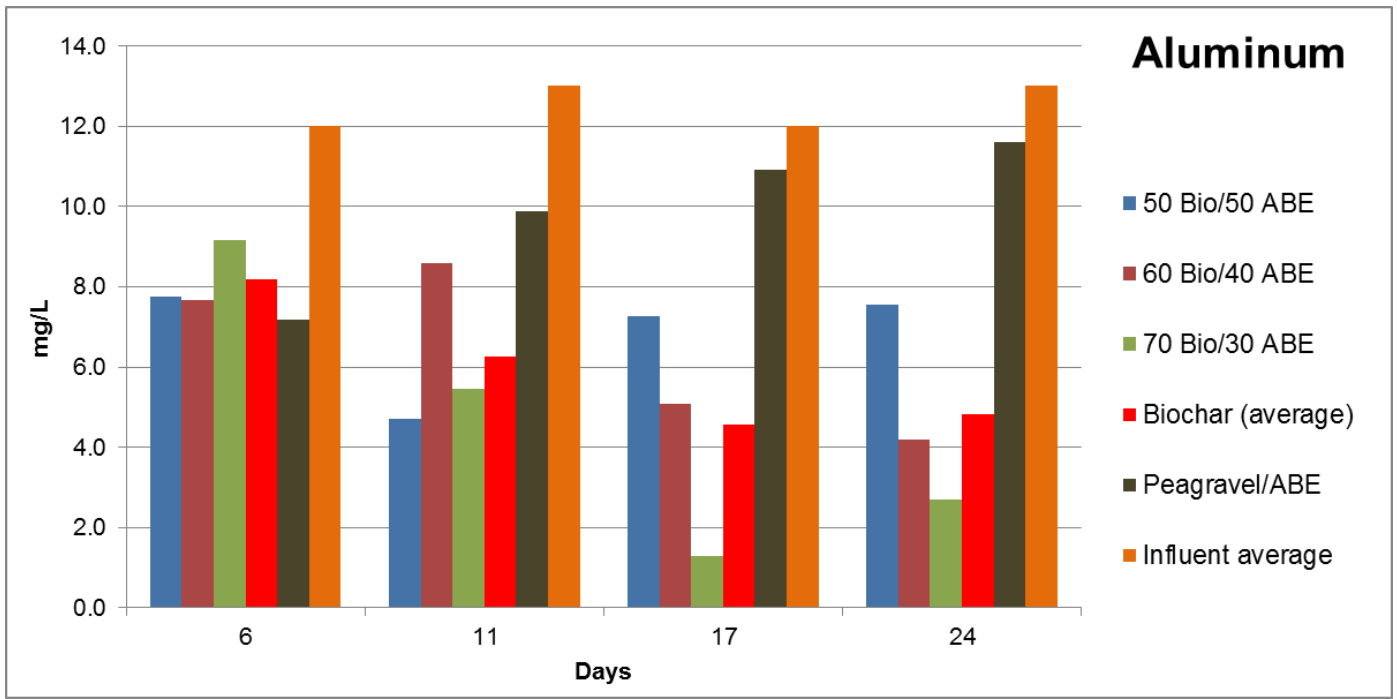


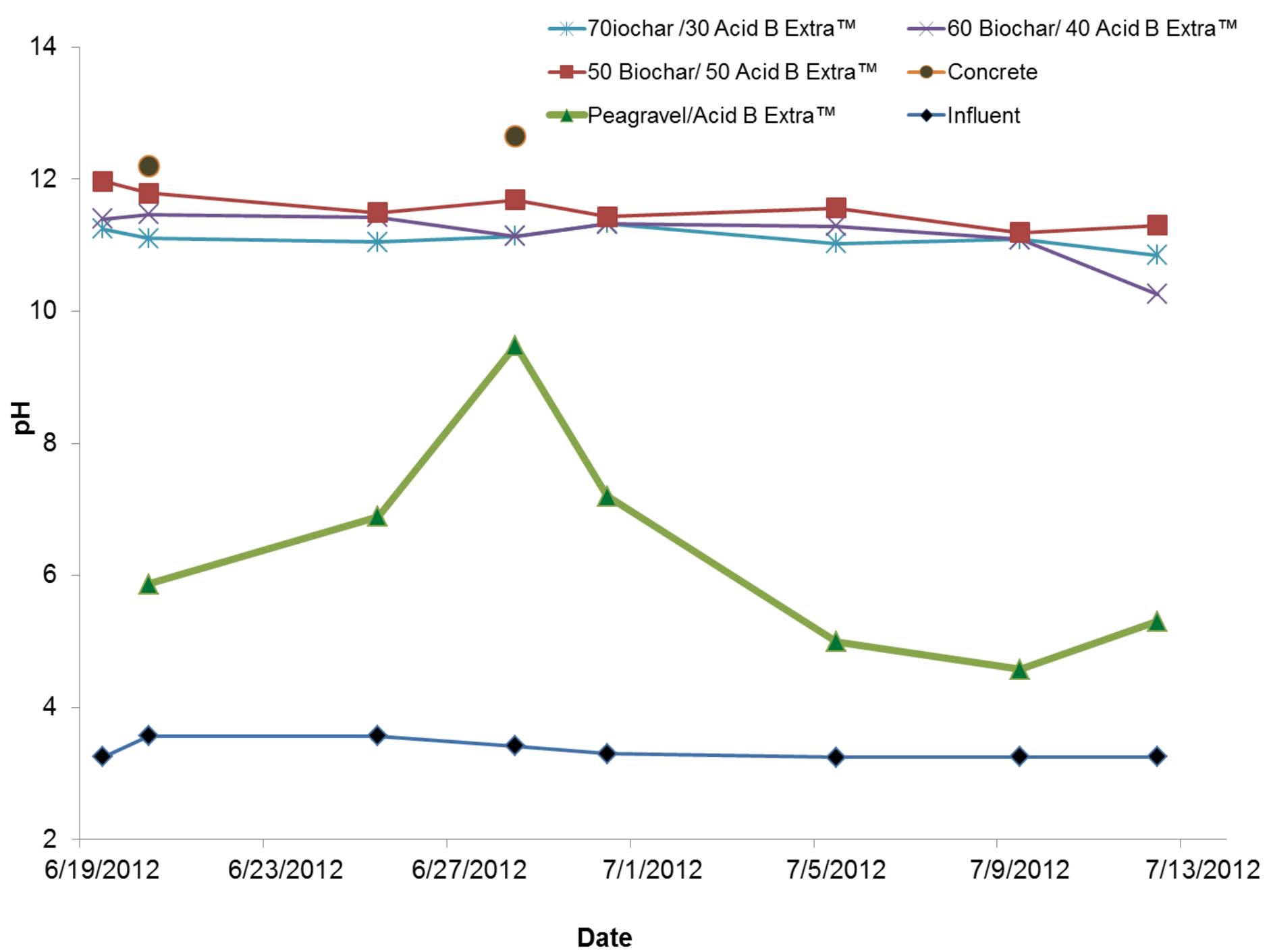












Conclusions

- Porous Concrete and Pea Gravel – may be suitable to PRB
- All Bauxsol™ Acid B Extra™ combinations performed similarly
- The 30% Bauxsol™ and 70% Biochar combination was installed in the Eveline Treatment Vault in September of 2012.
- Initial sampling indicates issues with plumbing, but some removal is occurring.
- Eveline sampled a month ago



