

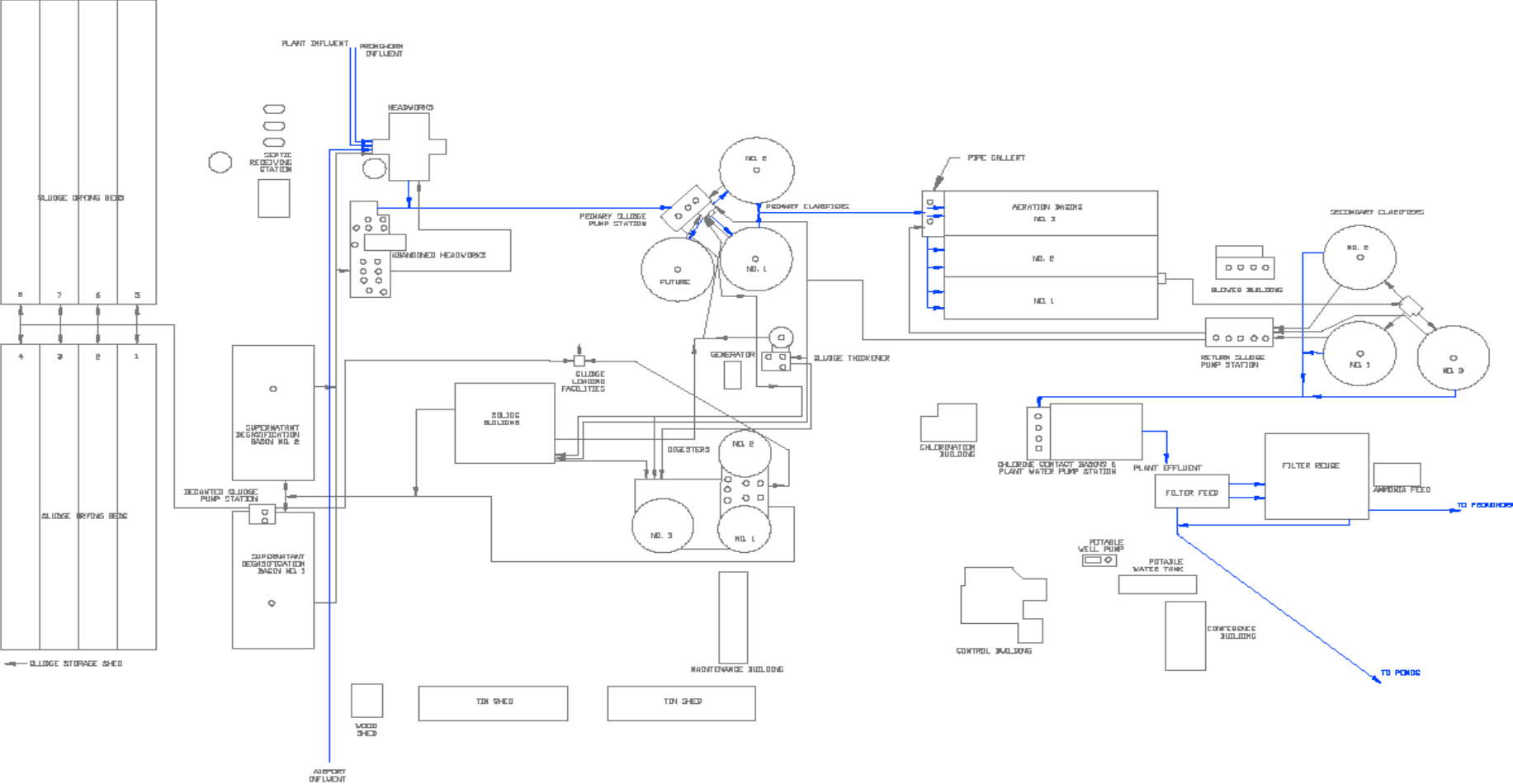


## **CITY OF BEND'S UNLIKELY PATH TO CLASS A BIOSOLIDS**





# WATER RECLAMATION FACILITY





- Average Daily Flow: 5.8MGD
- Reuse Flow Pronghorn Golf Course: >2.5MGD
- Digester Sludge Concentration: 3.3%
- Solids Production :2,500 cu/yd/yr
- Available Application Land: 1600 acres

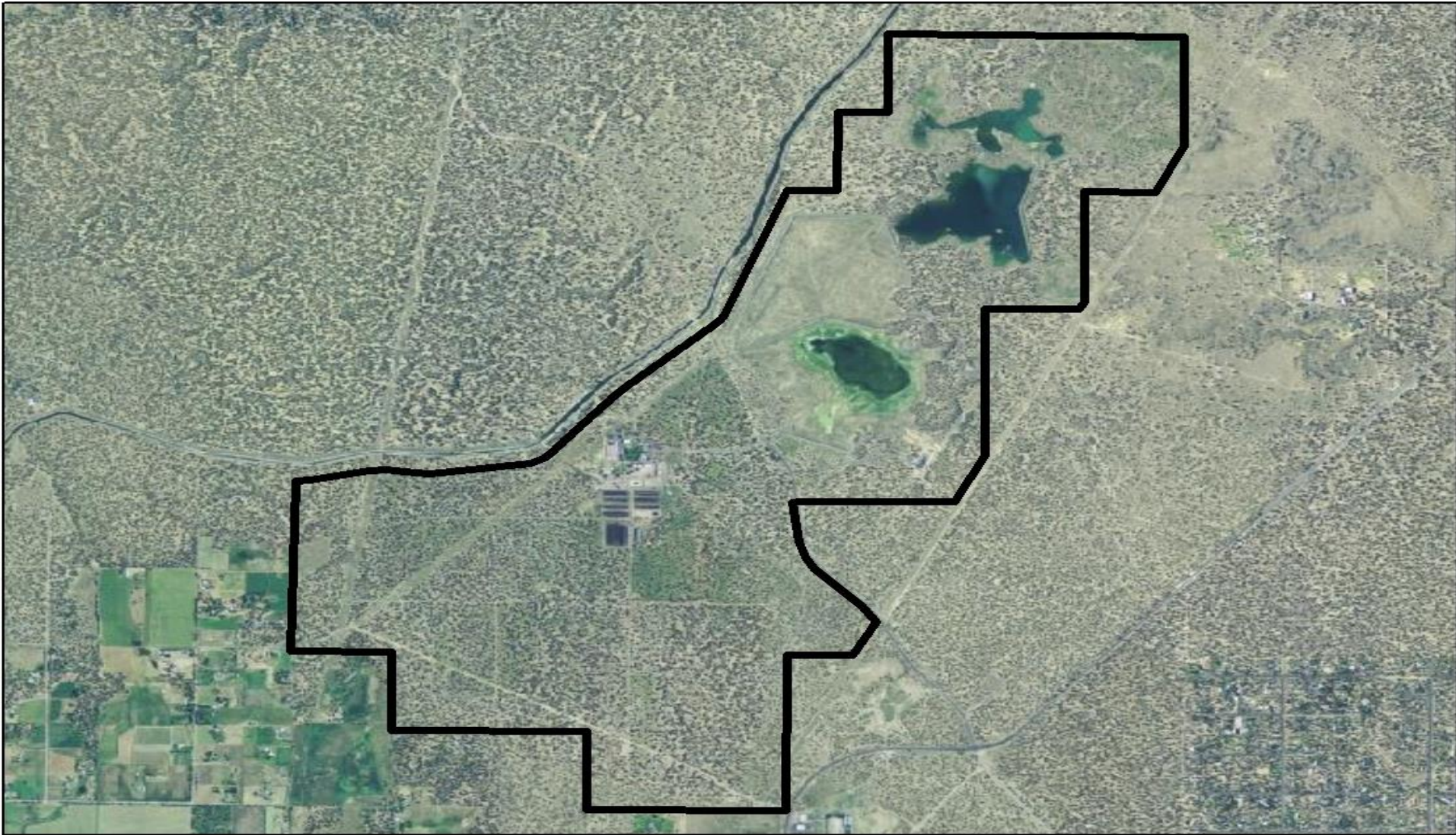
# HEADWORKS SCREENING EQUIPMENT 3MM AND 6 MM SCREENING



**ANAEROBIC DIGESTERS ONE 900,000 AND TWO 450,000 GALLON**



1600 ACRES PLANT FACILITIES



12 ACRES OF DRYING BED CAPACITY





SUMMER DRYING PERIOD



BROWN BEAR OPERATION



MID SUMMER OPERATION



CLASS A STORAGE AREA



LAND APPLICATION OF BIOSOLIDS 1,600 ACRES APPLICATION SITES.



LATE WINTER LAND APPLICATION



LAND APPLICATION



CLASS A BIOSOLIDS







10/22/2014

DECEMBER 2014 CLEAR CREEK STUDY SITE



# CLEAR CREEK SITE STAKEHOLDERS: NORTH FORK JOHN DAY WATERSHED COUNSEL, UNITED STATES FOREST SERVICE, CONFEDERATED TRIBES OF UMATILLA, OREGON DEQ, OREGON WATERSHED ENHANCEMENT BOARD.



## ASSURING CLEAN WATER AFTER HISTORIC MINING ACTIVITY

**M**ining in the Granite area during the early 1900's utilized both dredging and hard rock underground mining. At this site, you can see the remains of two types of mining systems.

Dredging involves a floating factory that lifts rocks and sediment out of a stream, extracts gold and then replaces rock "tailings" along the creek banks.

A dredge operation alters the natural curved, meandering river. It becomes a straight course lined with smooth rocks.

Hard rock mining requires a tunnel with miners going underground to follow a vein of gold. At many abandoned mine sites, shaft openings, called adits, often appear as an inconspicuous opening in a hillside. Where they are exposed to runoff

or groundwater seepage, mine shafts expose mineralized earth material to water, which can create acid mine drainage. Acid mine drainage and heavy metals contamination, the two primary threats caused by abandoned mine sites, can cause discoloration, sterilize streams of aquatic life, and pose significant human health risks for miles downstream.



Illustration by Bob Robinson  
Courtesy of Don Edlund

At this location you can see the effects of both mining systems. The river lacks pools, and vegetative cover to protect fish. Notice the orange settling ponds that catch the excess metals and acids flowing out of the old hard rock mine on the hill, preventing those metals and acids from entering the stream.

This illustration shows a generalized example of a passive-treatment settling pond reclamation site. Acid mine drainage flows downhill into a series of settling ponds, each one allowing the outflow's toxic heavy metals to precipitate out and collect incrementally as the flow progresses through the treatment zone. Propagation of wetland vegetation in and around these settling ponds not only aids in stabilizing soils, but also provides additional filtering of toxic materials and acidified water before it mixes with clean surface water resources.

Various organizations and landowners are working to correct the effects of the old mining activities. The private landowners are working to restore the quality of the streams while maintaining the history of the mine. Helping the landowners are the North Fork John Day Watershed Council, United States Forest Service, Confederated Tribes of the Umatilla Indian Reservation, Oregon Department of Environmental Quality, and Oregon Watershed Enhancement Board.



CONTROL



07/09/2015

WOOD



07/09/2015



07/09/2015



07/09/2015

CLASS A STANDARD EXCEPTIONAL QUALITY UNRESTRICTED USE



<u>Fecal Coliform Limit</u>		
Less than 1,000 MPN/gram Dry Weight		
<u>Salmonella Limit</u>		
Less than 3 MPN/ 4 grams Dry Weight		
<u>Helminth Ova Limit</u>		
Less than 1 Viable Ova/ 4 grams Dry Weight		
<u>Enteric Virus Limit</u>		
Less than 1 PFU/ 4 grams Dry Weight		



## NUTRIENT AND METALS ANALYSIS



Analyte (mg/kg Dry Weight)	Average (mg/kg Dry Weight)
Total Kjeldahl Nitrogen	55500
*Ammonia as N	1940
*Nitrate as N	137
*Organic N	53500
Total Phosphorus(P)	30250
Potassium(K)	2900
PH	7.10
Total Solids %	89.0
Volatile Solids %	68.3
Analyte (mg/kg Dry Weight)	Average (mg/kg Dry Weight)
Arsenic	3.8
Cadmium	1.1
Chromium	18
Copper	338
Lead	30
** Mercury	0.5
Molybdenum	8.1
Nickel	19
Selenium	3.4
Silver	4.1
Zinc	478



Sample Numbers: BioVir Laboratories	141492-008
Enteric Virus pfu/4 g TS	<1
Total Solids	88.5
Sample Name	Composite of #1-7
Sample Numbers: City of Bend	Zone 1
Sample Numbers: BioVir Laboratories	141492-008
Viable Helminth Ova	<1
Total Solids	88.5
Sample Name	Zone 1
Sample Numbers: City of Bend	B4J2107-01
Sample Numbers: Soil Control Laboratories	4100690-1
Fecal Coliform MPN/g	930
Salmonella MPN/g	<3
Total Solids	88.9



- Biochar has been used as a soil amendment in many agricultural systems. It can improve soil organic matter, nutrient cycling, and water holding capacity to enhance plant growth. Its composition is highly variable and the final product is a result of fuel type and moisture content, burn condition, duration, and ambient temperature. Past studies have shown increased water retention of biochar-amended agricultural soils.



- Even though the control was planted similar to the soil amendment treatments there was little to no vegetation.
- Wood chips are not a suitable amendment for mine land reclamation at this site.
- Some combination of Biosolids(nutrient) and biochar(water holding) are probably a good place to continue working if vegetation is the goal.
- Researchers will be on site this month to gather nutrient data. More to come.....



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