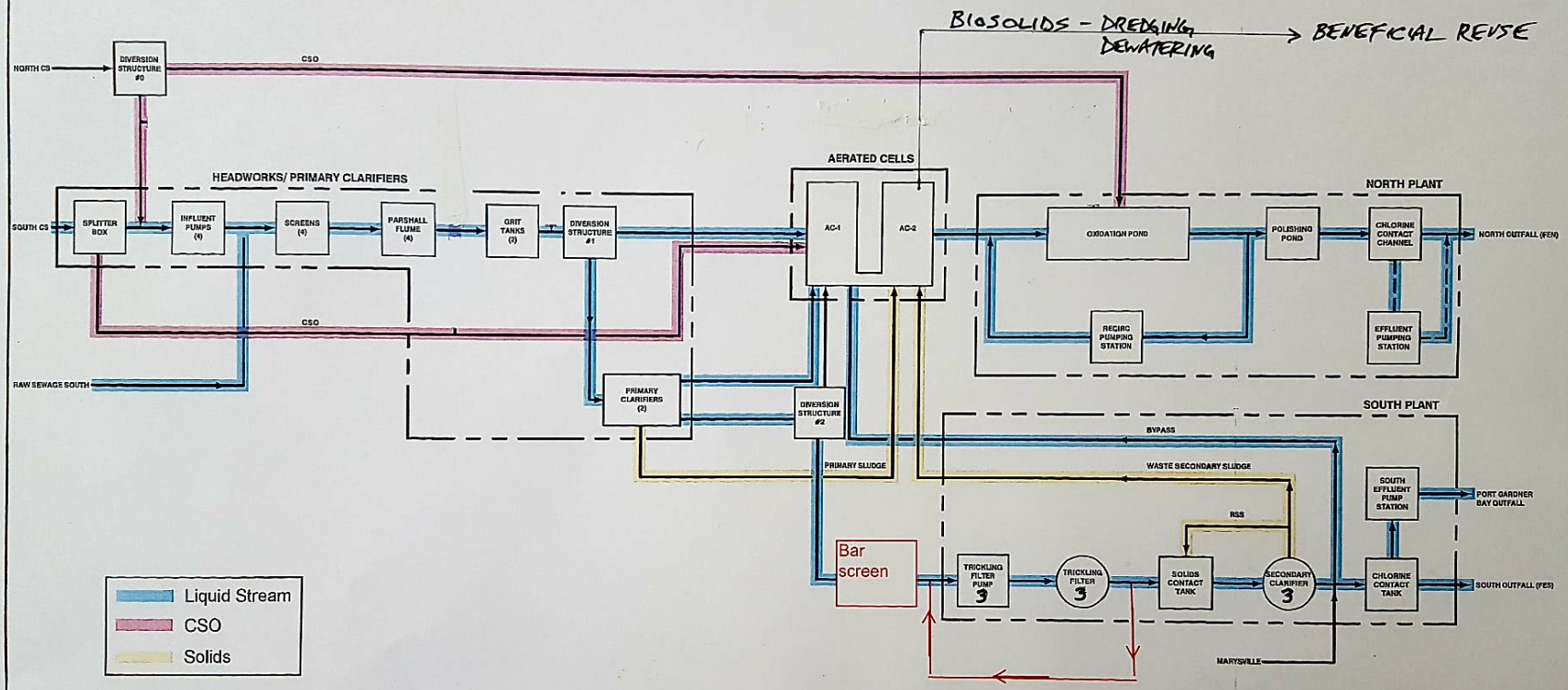
Biosolids Management in a Lagoon System

Chris Chesson
Senior Environmental Specialist
City of Everett PW

Water Pollution Control Facililty

- Dual Process facility consisting of a mechanical plant and facultative lagoon system
- Max Month Design Flow = 40.3 mgd
- 2 active outfalls
  - Lagoon system – Snohomish River
  - Mechanical Plant – Port Gardner Bay deep water



WPCF PROCESS SCHEMATIC

FIGURE 2.1

CITY OF EVERETT
WPCF ENGINEERING REPORT

Lagoon system

- 130 acre oxidation pond and 30 acre polishing pond (constructed in 1960, original WW facility for the City)
- 2 - 15 acre aeration cells (constructed in 1972) oxygen provided by mechanical means
- Anaerobic decomposition of solids
- Approximately 7-8 feet deep

Aeration Cell Aerators

40 total

13 Splash @ 40 hp each

27 Brush @ 10 hp each

Hydrographic Survey prior to each biosolids removal

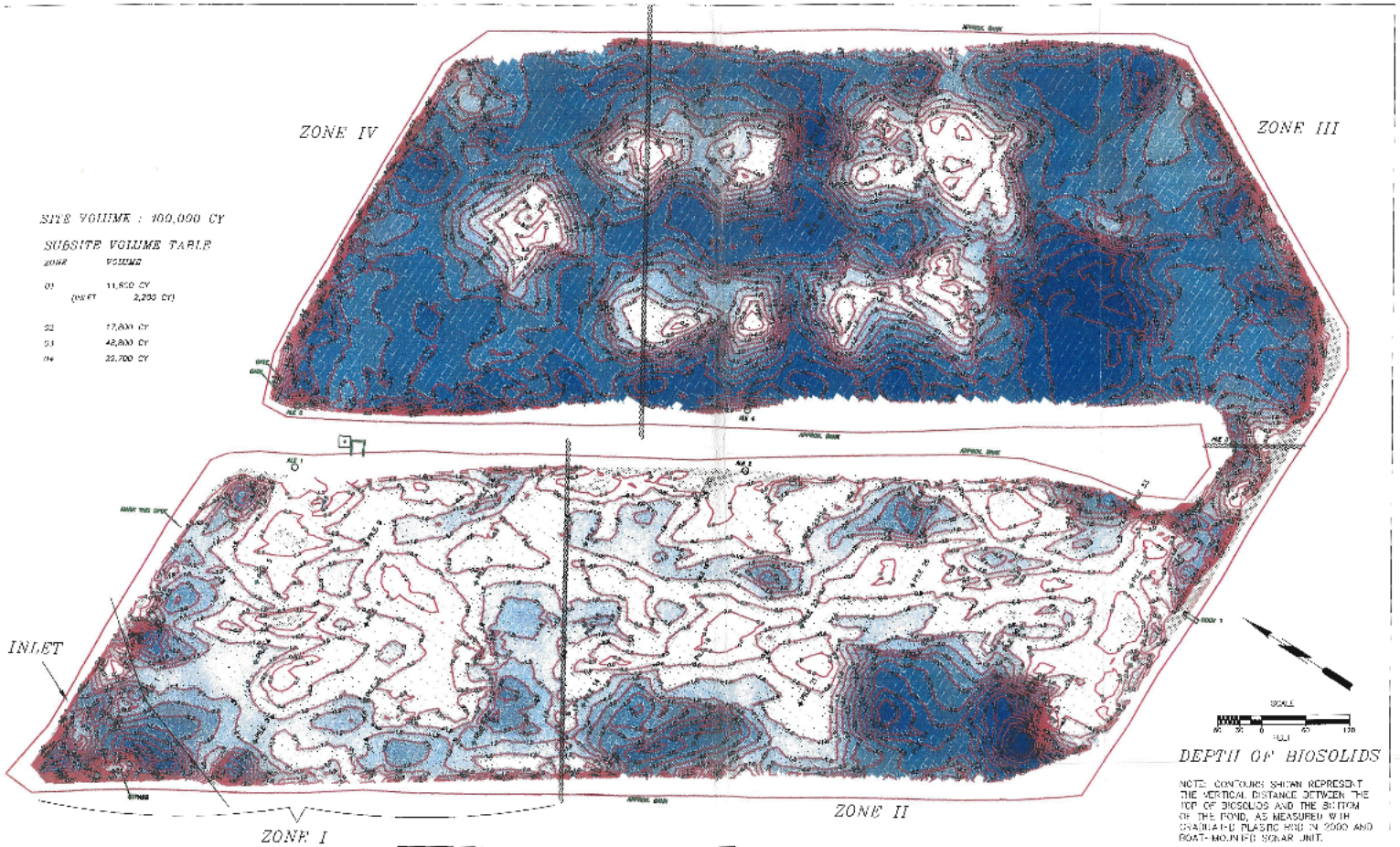
- Local Surveyor and Plant Staff
- Sonar device for top of biosolids measurements
- GPS each sampling location – 25 foot grid pattern
- Elevation difference between top of biosolids and bottom of pond (determined in 1999) is used to determine varying depths of biosolids

Contracted Dredging and Dewatering and Hauling and Land Application

- Hydrographic survey results (cubic yards)
- In –situ sampling results (metals, VAR, pathogens, nutrients, pH, %TS…)
- Estimate dry tons to be removed
- Specifications for 2 separate Contracts
- Dredging and Dewatering
  - $604,000 ($237/dt, $138,000 mob/demob)
- Hauling and Land Application
  - $207,000 (Snohomish County)

2002


2002
Write a description for your map.
7 4th St SE
Google earth
Image U.S. Geological Survey
400 ft
N



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CITY OF EVERETT W.P.C.F.

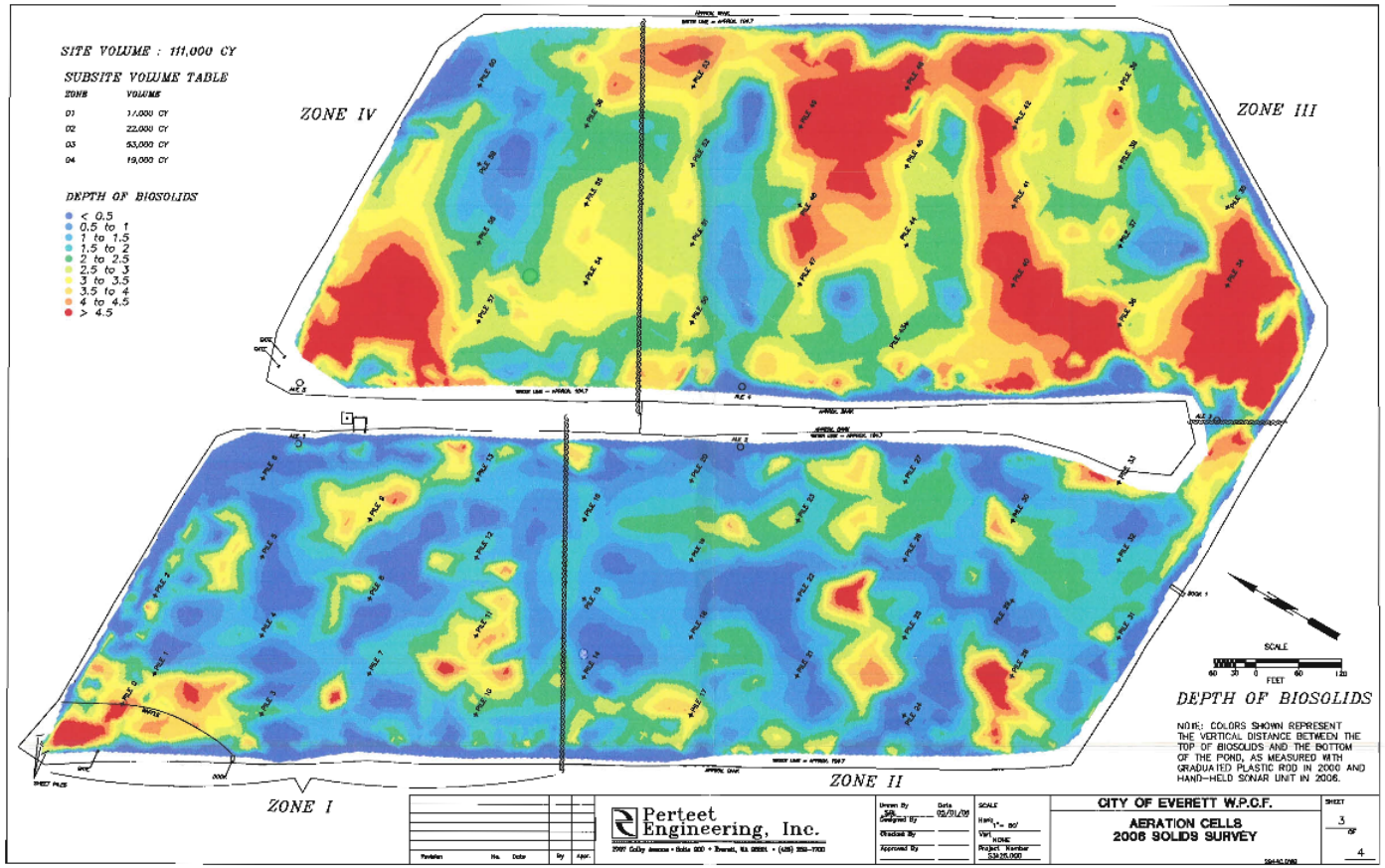
AERATION CELLS
2003 SOLIDS SURVEY

4 of 4

2005


2005
Write a description for your map.
7 4th St SE
Google earth
Image © 2016 DigitalGlobe
400 ft
N

2006 Survey


SITE VOLUME : 111,000 CY
SUBSITE VOLUME TABLE
ZONE VOLUME
01 11,000 CY
02 22,000 CY
03 53,000 CY
04 19,000 CY
DEPTH OF BIOSOLIDS
< 0.5
0.5 to 1
1 to 1.5
1.5 to 2
2 to 2.5
2.5 to 3
3 to 3.5
3.5 to 4
4 to 4.5
> 4.5
ZONE IV
ZONE III
ZONE II
ZONE I
SCALE
FEET
DEPTH OF BIOSOLIDS
NOTE: COLORS SHOWN REPRESENT THE VERTICAL DISTANCE BETWEEN THE TOP OF BIOSOLIDS AND THE BOTTOM OF THE POND, AS MEASURED WITH GRADUATED PLASTIC ROD IN 2000 AND HAND-HELD SONAR UNIT IN 2006.
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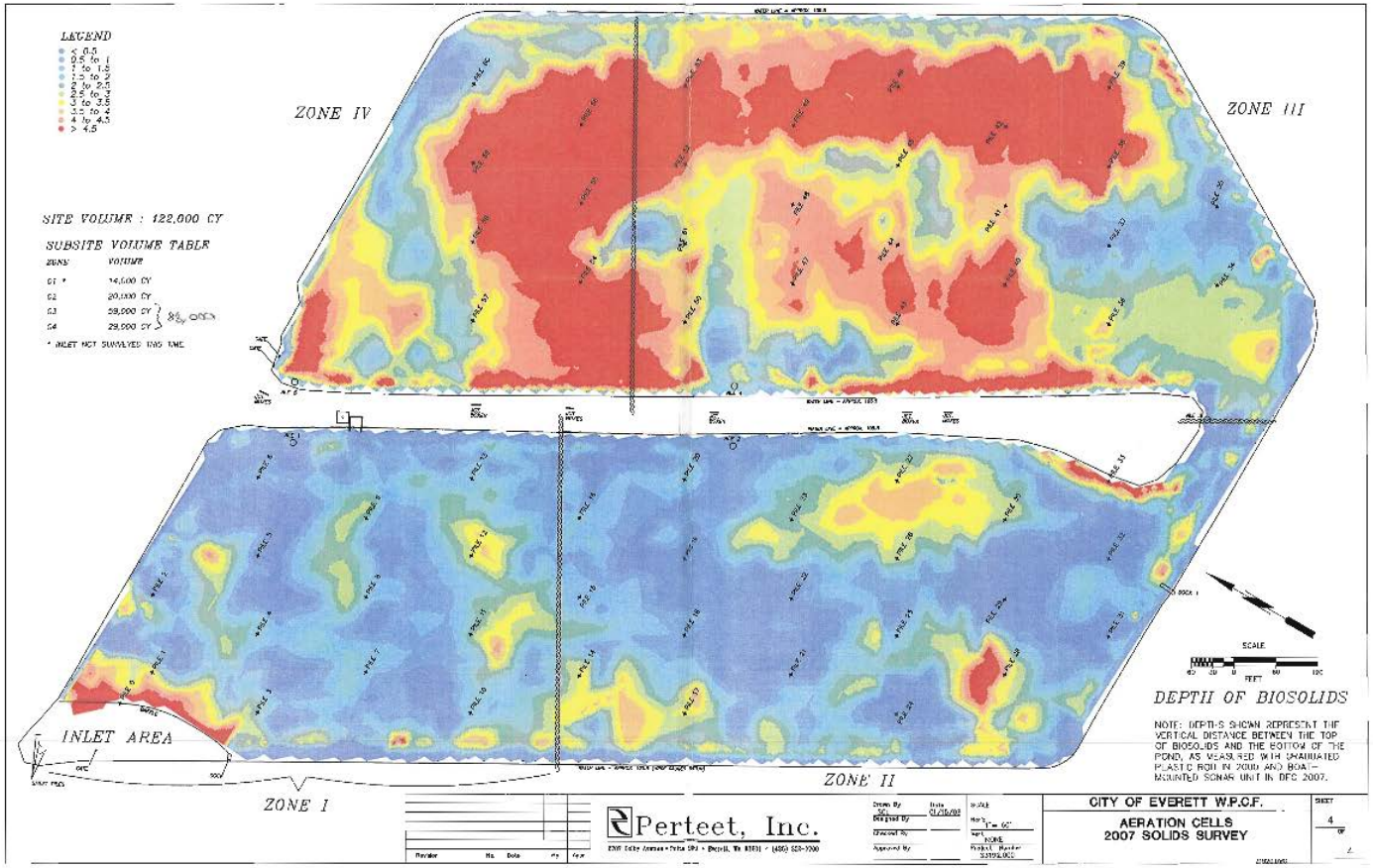
CITY OF EVERETT W.P.C.F.
AERATION CELLS
2006 SOLIDS SURVEY
SHEET 3 OF 4

2007


2007
Write a description for your map.
7 4th St SE
Google earth
Image © 2016 DigitalGlobe
400 ft
N

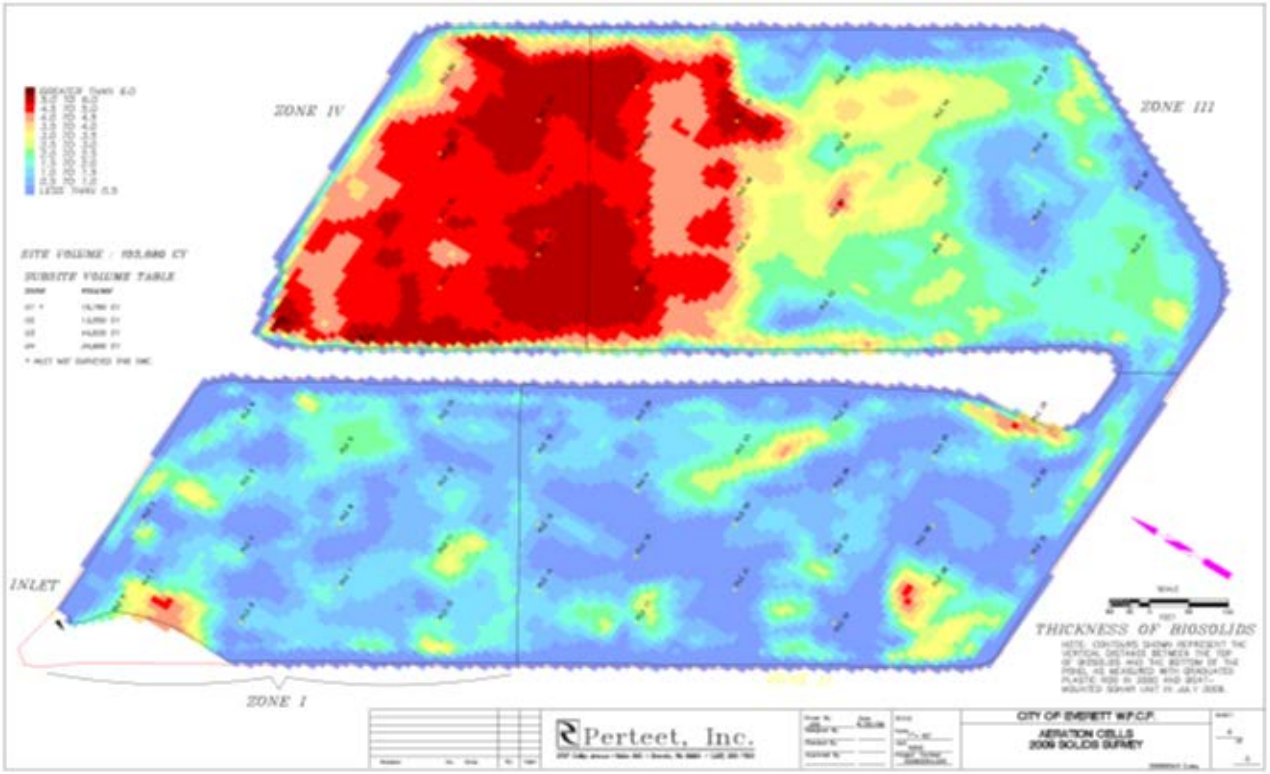
2007


LEGEND
< 0.5
0.5 to 1
1 to 1.5
1.5 to 2
2 to 2.5
2.5 to 3
3 to 3.5
3.5 to 4
4 to 4.5
> 4.5
SITE VOLUME : 122,000 CY
SUBSITE VOLUME TABLE
ZONE
VOLUME
01 *
14,000 CY
02
20,000 CY
03
28,000 CY
04
29,000 CY
* INLET NOT SURVEYED THIS TIME
ZONE IV
ZONE III
ZONE II
ZONE I
INLET AREA
SCALE
FEET
DEPTH OF BIOSOLIDS
NOTE: DEPTHS SHOWN REPRESENT THE VERTICAL DISTANCE BETWEEN THE TOP OF BIOSOLIDS AND THE BOTTOM OF THE POND, AS MEASURED WITH UNMANNED PLASTIC ROW IN POND AND BOAT-MOUNTED SONAR UNIT IN DEC 2007.
Perteet, Inc.
CITY OF EVERETT W.P.C.F.
AERATION CELLS
2007 SOLIDS SURVEY
SHEET
4

2009


2009
Write a description for your map.
7 4th St SE
Riverfront Trail
Google earth
Image U.S. Geological Survey
400 ft
N

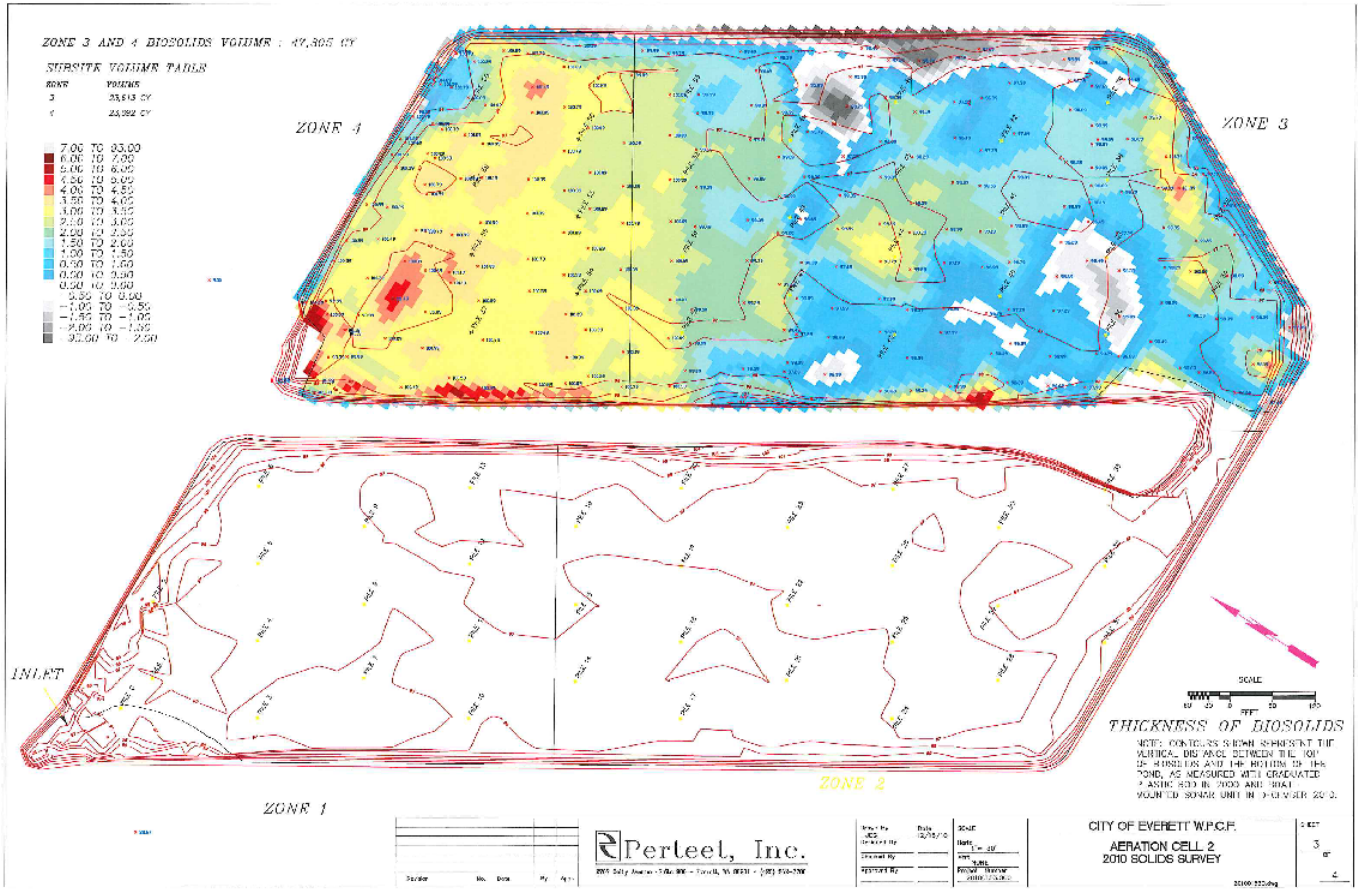
2009


ZONE IV
ZONE III
INLET
ZONE I
THICKNESS OF BIOSOLIDS
Perteet, Inc.
CITY OF EVERETT W.P.C.F.
AERATION CELLS
2009 SOLIDS SURVEY

2011


2011
Write a description for your map.
7 4th St SE
Google earth
400 ft
N

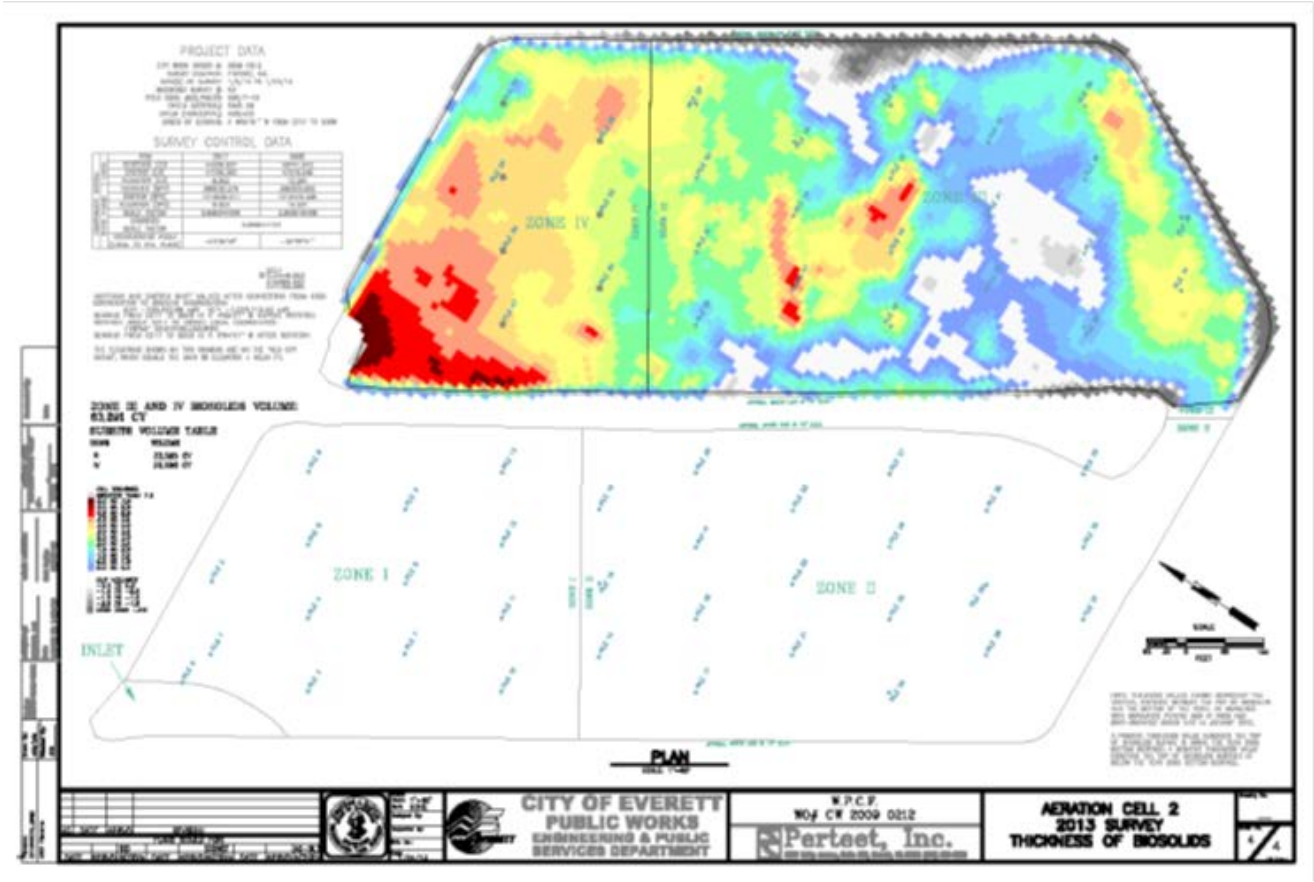
2011


ZONE 3 AND 4 BIOSOLIDS VOLUME : 47,305 CY
SUBSITE VOLUME TABLE
ZONE 4
ZONE 3
INLET
ZONE 1
ZONE 2
THICKNESS OF BIOSOLIDS
Perteet, Inc.
CITY OF EVERETT W.P.C.F.
AERATION CELL 2
2010 SOLIDS SURVEY

2013


2012
Write a description for your map.
7 4th St SE
Google earth
400 ft
N

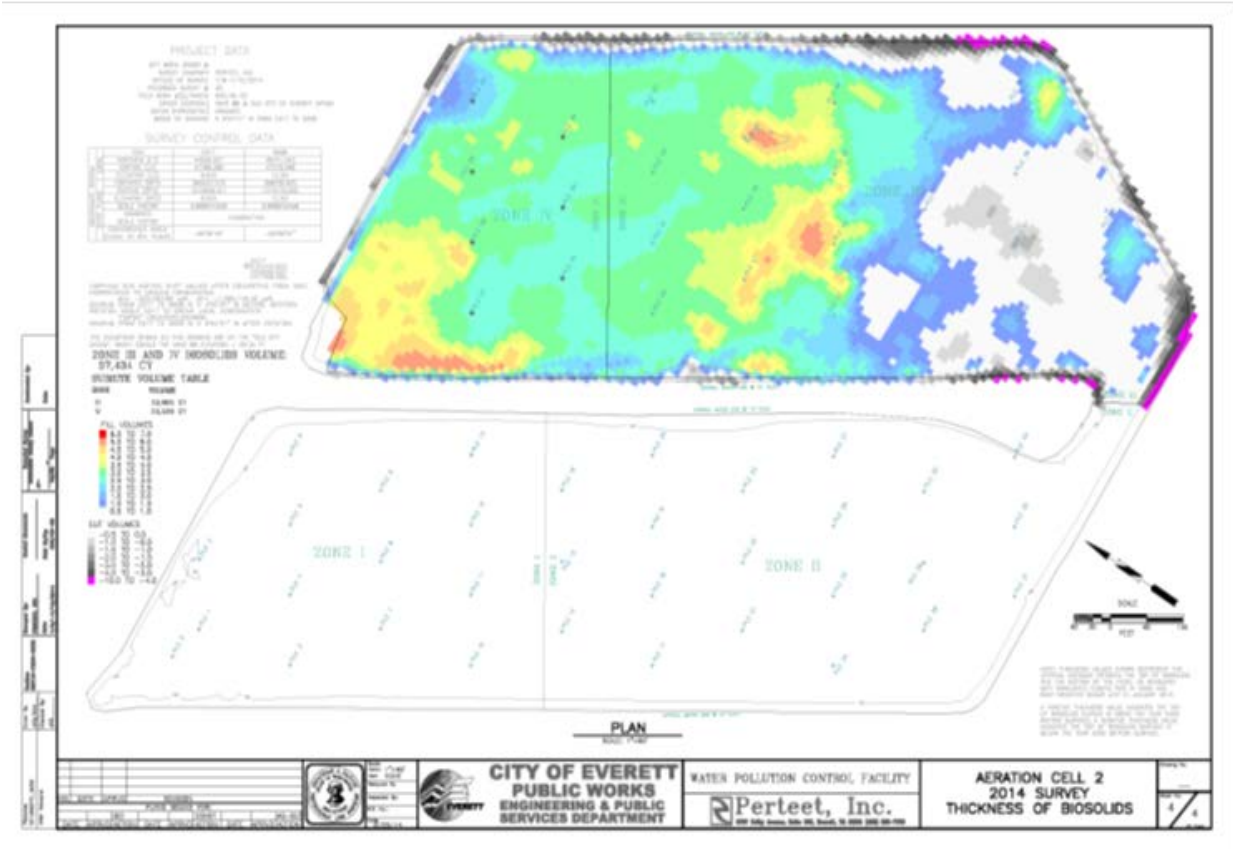
2013


PROJECT DATA
SURVEY CONTROL DATA
ZONE IV
ZONE I
ZONE II
INLET
PLAN
CITY OF EVERETT
PUBLIC WORKS
ENGINEERING & PUBLIC SERVICES DEPARTMENT
Perteet, Inc.
AERATION CELL 2
2013 SURVEY
THICKNESS OF BIOSOLIDS

2014


2014
Write a description for your map.
7 4th St SE
Google earth
400 ft
N

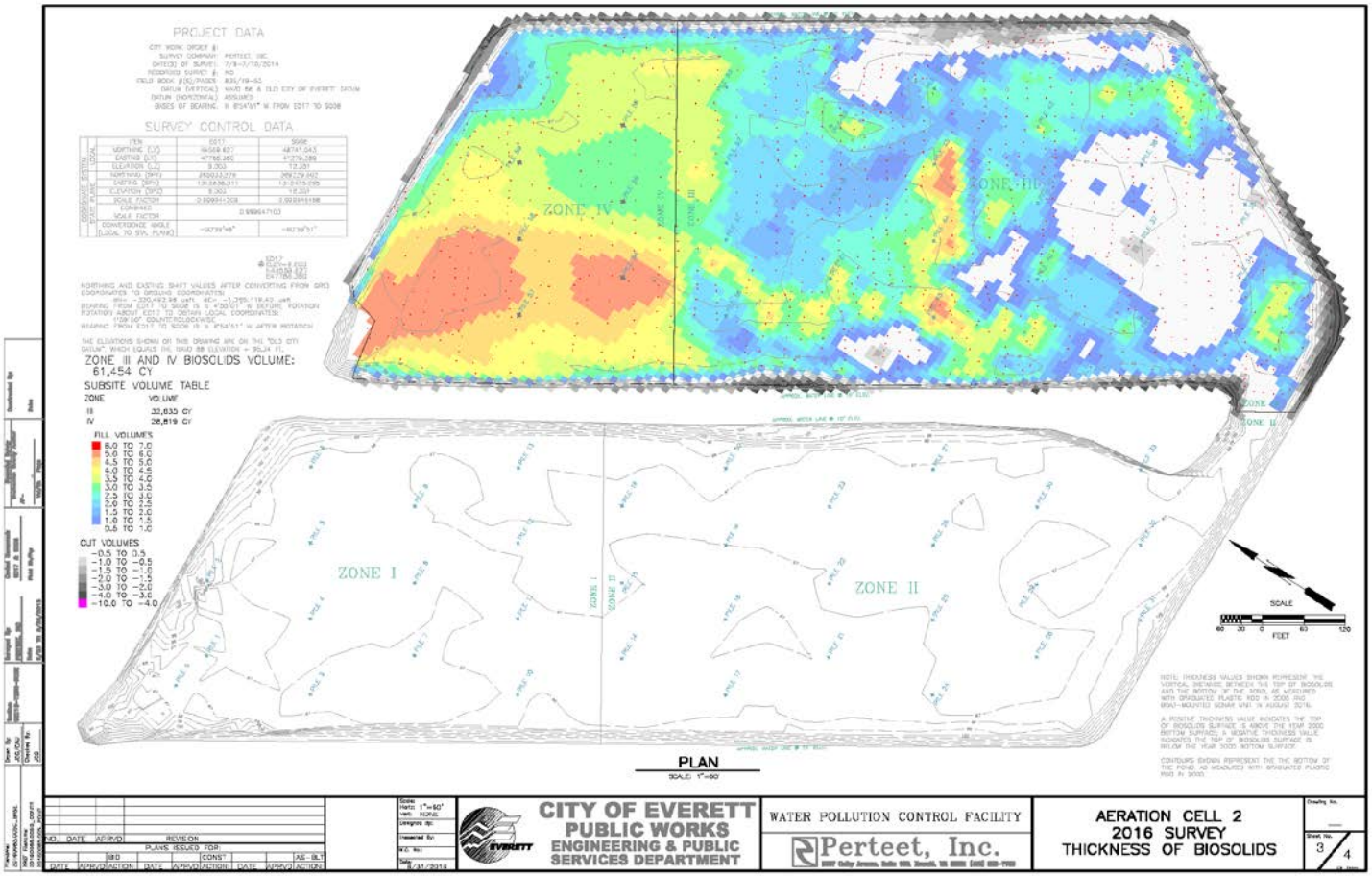
2014


PROJECT DATA
SURVEY CONTROL DATA
ZONE IV
ZONE I
ZONE II
PLAN
CITY OF EVERETT
PUBLIC WORKS
ENGINEERING & PUBLIC SERVICES DEPARTMENT
WATER POLLUTION CONTROL FACILITY
Perteet, Inc.
AERATION CELL 2
2014 SURVEY
THICKNESS OF BIOSOLIDS

2015


2015
Write a description for your map.
4027 4th St SE
4th St SE
Smith Island Trail
Langus Riverfront Trail
Google earth
N
600 ft

2016


PROJECT DATA
SURVEY CONTROL DATA
ZONE III AND IV BIOSOLIDS VOLUME:
61,454 CY
SUBSITE VOLUME TABLE
ZONE VOLUME
III 32,635 CY
IV 28,819 CY
FILL VOLUMES
CUT VOLUMES
ZONE I
ZONE II
ZONE III
ZONE IV
SCALE
FEET
PLAN
SCALE 1"=60'
CITY OF EVERETT
PUBLIC WORKS
ENGINEERING & PUBLIC
SERVICES DEPARTMENT
WATER POLLUTION CONTROL FACILITY
Perteet, Inc.
AERATION CELL 2
2016 SURVEY
THICKNESS OF BIOSOLIDS
3/4

Biosolids Regulations

- 40 CFR Part 503 – Federal Rule contained within the U.S. Clean Water Act
  - EPA administered
- WAC Chapter 173-308 – Washington State requirements
- City of Everett's Industrial Pretreatment Ordinance

Chapter 14.40 City Code – sets limits for pollutants that can be discharged to our sewage collection system

Biosolids Quality

The regulations focus on three parameters as a basis for determining biosolids quality:

1. The presence of *pollutants* (As, Cd, Cu, Pb, Hg, Mo, Ni, Se, Zn)
2. The presence of *pathogens* (e.g., bacteria, viruses, parasites)
3. The biosolids *attractiveness to vectors* (e.g., rodents, flies, mosquitoes).

Dredging

Dewatering

Cake Stockpiled on-site

Class B dewatered cake

Agriculture – corn and grass for silage, winter wheat and barley

Agriculture

- Lease agreement with private farmer
- City-owned land – 160 acres Lowell Snohomish River Road
- City – permitting through Ecology

- Private – Beneficial Use Facility
  - Contractor permitting, siting, and operations

Application at Agronomic Rate

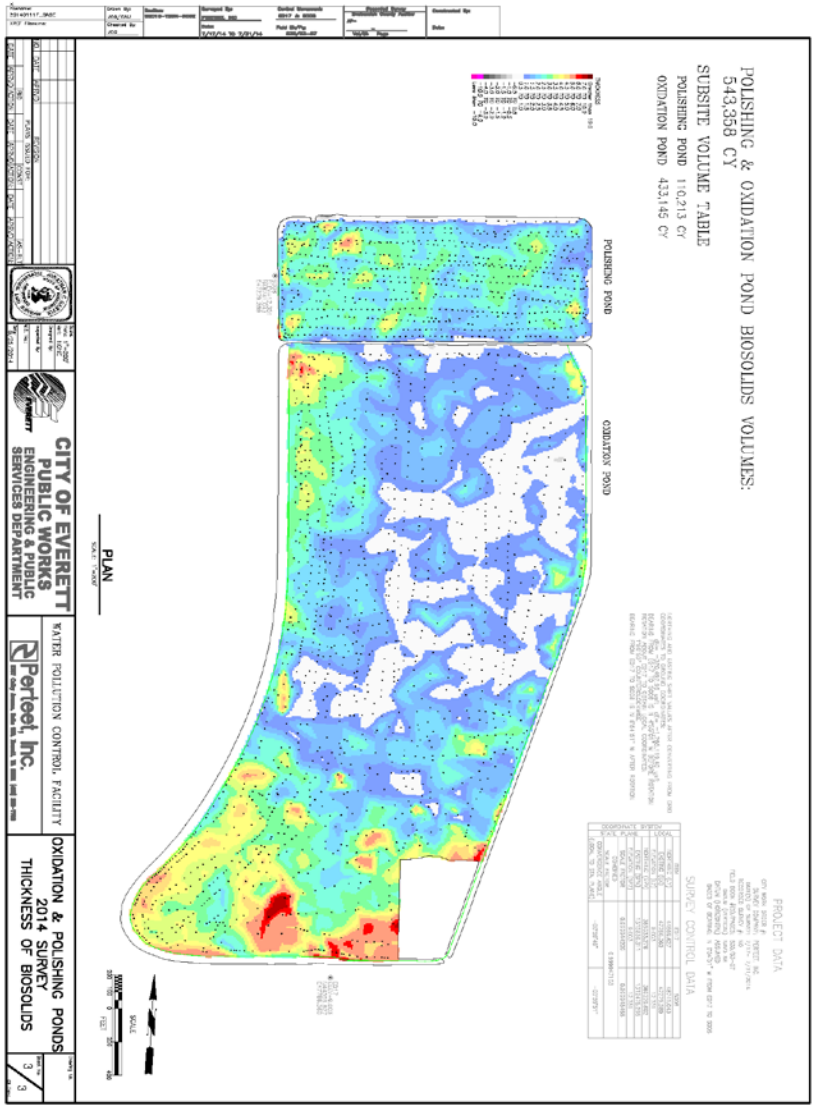
- Required by State Regulation – WAC 173-308
- Based on nitrogen requirements and availability
- Sample biosolids for available N
- Sample on-site soils for residual N (left over from previous applications or commercial fertilizer use)
- Meet intended crop N needs – corn or grass requires 200 lb N per acre for a decent yield
- Calculate a wet ton per acre rate

Class B Site

Class A Compost

- Land reclamation project with Snohomish PUD
- Approximately 500 cubic yards

Oxidation Pond



Solids Quality

- Total solids, total organic carbon, metals and semivolatile organic chemicals
- Primary targets were D/Fs, PCBs, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Emerging CoCs also targeted by the SQAPP included

  di(2-ethylhexyl)phthalate (DEHP), perfluorinated alkyl acids (PFAAs), triclosan, and triclocarban.
- Bioavailability study
- Lead was pollutant that exceeded threshold in 173-308 for unrestricted use
- Opted for disposal in Roosevelt Landfill

Contracted Operations
Landfill Disposal

- Disposal = $665,000 ($87/wet ton includes haul to rail, rail ot landfill and tipping fee)
- Dredging and dewatering = $553,000 ($214/dt

$125,000 mob/demob)

NW Biosolids