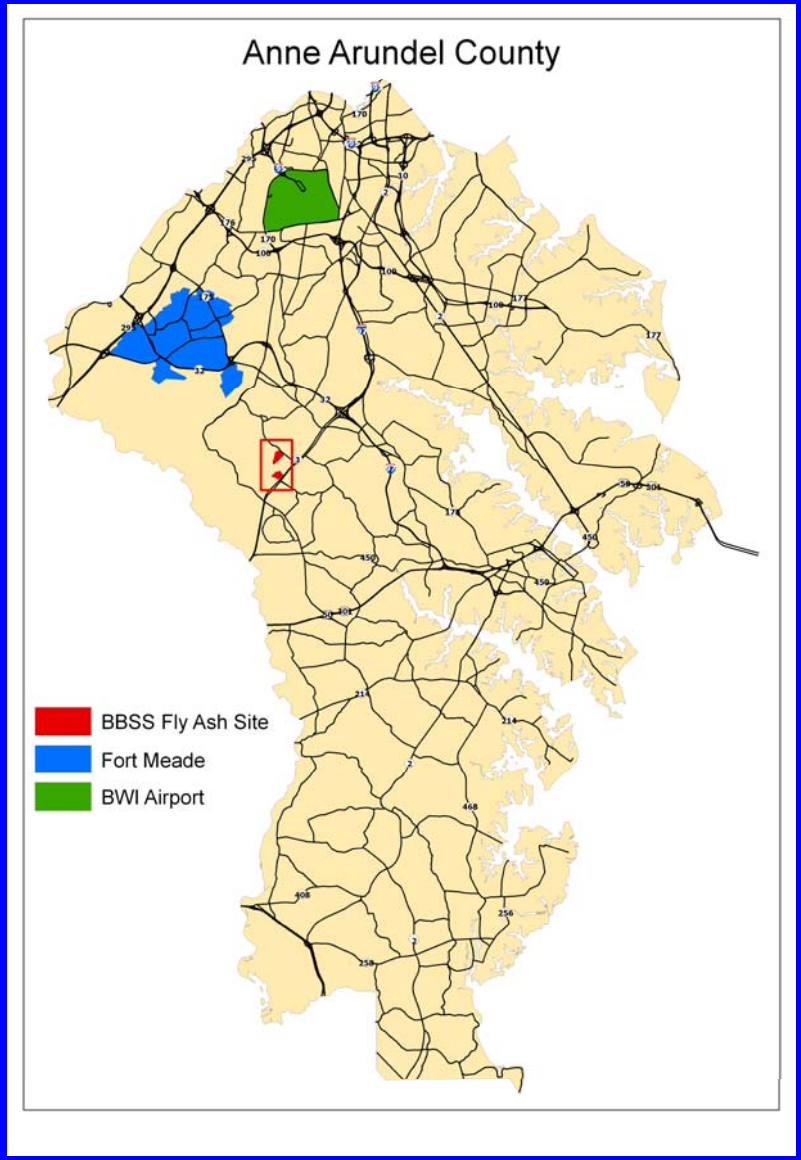
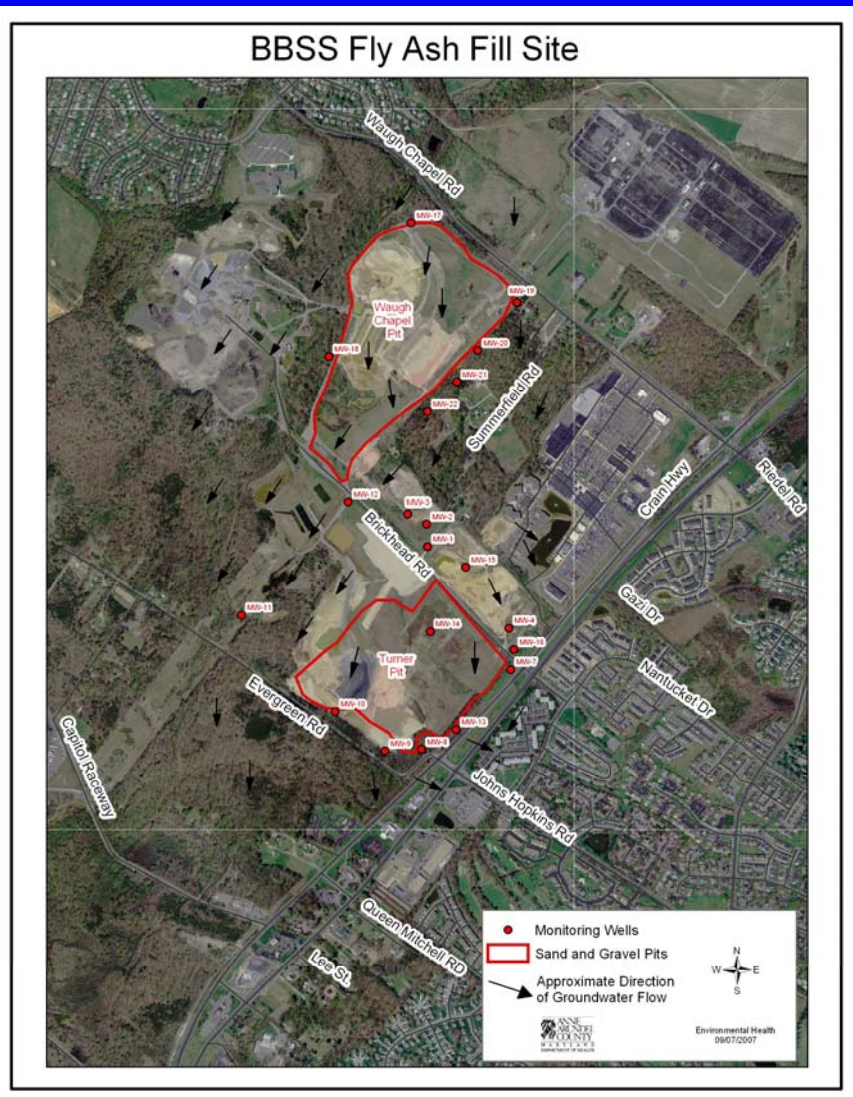
Impacts of Fly Ash on Groundwater in Anne Arundel County, Maryland

Impacts of Fly Ash on Groundwater in Anne Arundel County, Maryland

- Investigation began in October 2006 after notification from MDE and Constellation Power Source Generation.
- Monitoring wells at a sand and gravel pit and a nearby residential well showed elevated levels of metals and sulfates during monitoring as required by MDE.
- Sand and gravel pits have been reclaimed by fly ash deposition since 1995.
- Anne Arundel County Department of Health responded to MDE and Constellation Power Source Generation findings by conducting several rounds of water sampling for metals and sulfates to determine the water quality in this area.


Anne Arundel County
BBSS Fly Ash Site
Fort Meade
BWI Airport


BBSS Fly Ash Fill Site
Waugh Chapel Rd
Waugh Chapel Pit
Summerfield Rd
Crain Hwy
Riedel Rd
Brickhead Rd
Cazil Dr
Turner Pit
Nantucket Dr
Evergreen Rd
Capitol Raceway
Johns Hopkins Rd
Queen Mitchell RD
Lee St
MW-17
MW-19
MW-20
MW-18
MW-21
MW-22
MW-12
MW-3
MW-2
MW-1
MW-16
MW-11
MW-14
MW-4
MW-15
MW-7
MW-10
MW-13
MW-5
MW-6
Monitoring Wells
Sand and Gravel Pits
Approximate Direction of Groundwater Flow
N
W
E
S
Environmental Health
09/07/2007

Constituents of Fly Ash

- Sulfate
- Aluminum
- Arsenic
- Cadmium
- Thallium
- Selenium
- Manganese
- Many other trace metals

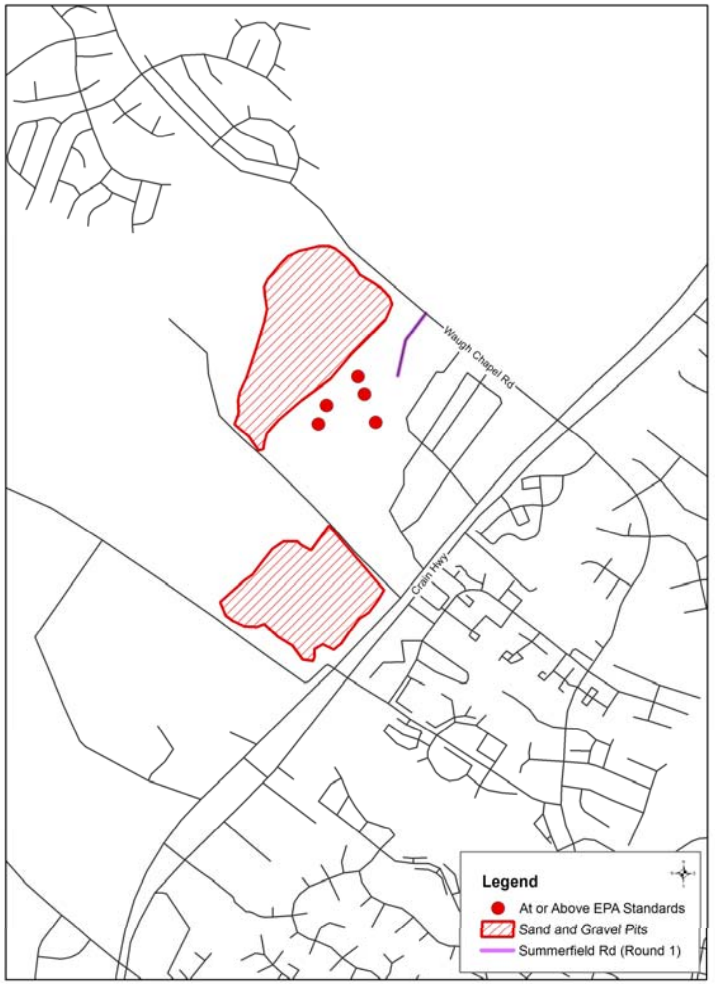
Results and Current Status of Investigation

- Tested 83 properties during the four rounds of sampling
- All results have been received and reported to the property owners
- The following metals and sulfates have been found in some wells

Round 1

5 Wells Sampled

- 4 exceed Cadmium MCL
- 1 exceeds Beryllium MCL
- 3 exceed Thallium MCL
- 5 exceed Aluminum SMCL
- 5 exceed Manganese SMCL
- 4 exceed Sulfates SMCL



•Results are pretreatment
MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

Round 2

12 Wells Sampled

- 4 exceed Lead MCL
- 1 exceeds Thallium MCL
- 6 exceed Aluminum SMCL
- 3 exceed Manganese SMCL
- 1 exceeds Sulfates SMCL

- 2 wells meet EPA Standards

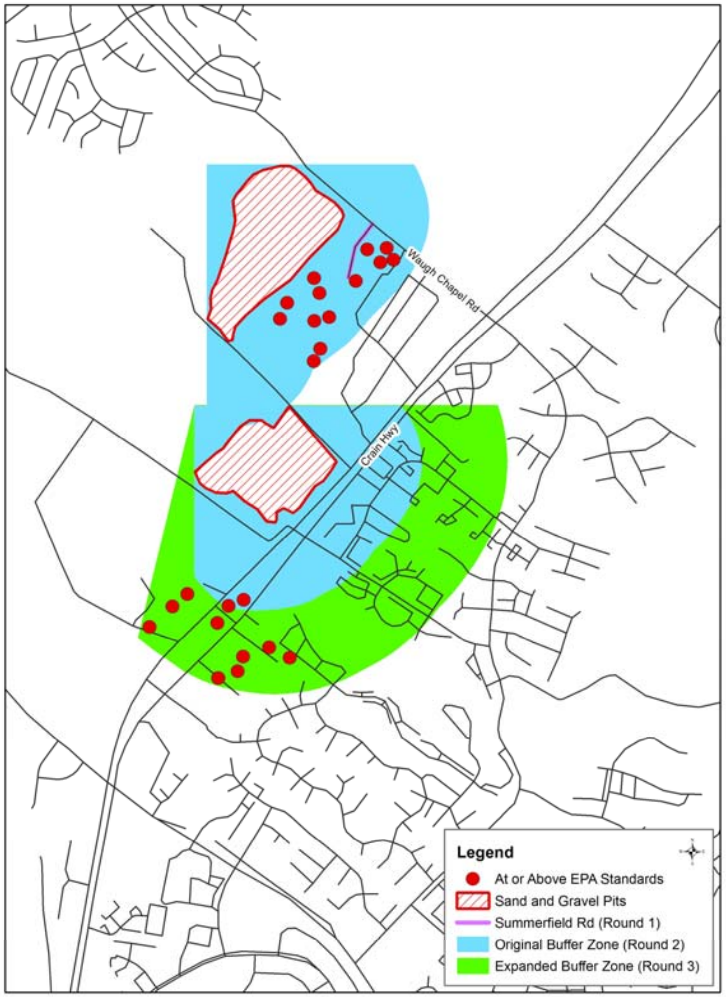
MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

Round 3

11 Wells Sampled

- 2 exceed Cadmium MCL
- 2 exceed Thallium MCL
- 3 exceed Lead MCL
- 1 exceeds Arsenic MCL
- 11 exceed Aluminum SMCL
- 5 exceed Manganese SMCL

MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

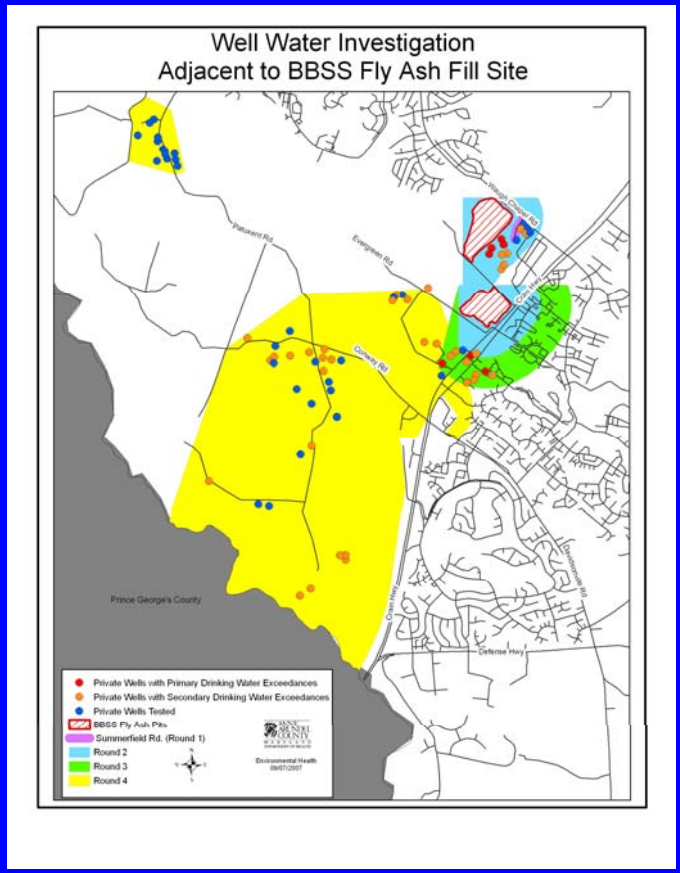


Round 4

55 Wells Sampled

- 13 exceed Lead MCL
- 22 exceed Aluminum SMCL
- 1 exceeds Manganese SMCL

- 24 wells meet EPA Standards



MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

Results Table

Substance	Detected in Number of Wells	Amount Detected (Range)	Number of Wells At or Exceeding MCL	Number of Wells At or Exceeding SMCL	EPA MCL	EPA SMCL
Arsenic	4	3-25 ppb	1	N/A	10 ppb	N/A
Beryllium	4	1-5 ppb	1	N/A	4 ppb	N/A
Cadmium	7	4.4-16 ppb	6	N/A	5 ppb	N/A
Lead (often related to household plumbing)	35	5-160 ppb	20	N/A	15 ppb	N/A
Thallium	8	1-6 ppb	6	N/A	2 ppb	N/A
Aluminum	43	100-55,800 ppb	N/A	43	No MCL	50-200 ppb
Manganese	14	60-2,370 ppb	N/A	14	No MCL	50 ppb
Sulfates	45	10,000-1,189,800 ppb	N/A	5	N/A	250,000 ppb

Health Facts on Fly Ash Constituents

Constituent	Maximum recommended level in water- parts per billion	Recommended level in water based on :	What are possible health effects?	Can it cause Cancer?
Aluminum	50 - 200 ppb	High levels can cause cloudy water and a metallic taste	Not harmful for most people since less than 1% is absorbed into the body. Extremely large amounts can effect the brain, bone and other organs in some people(those on dialysis and those who cannot eat and receive nutrition directly in the vein).	No
Arsenic	10 ppb	High levels may be harmful to health	Extremely large amounts(like 300 -30,000 ppb) can cause nausea, diarrhea, anemia, bruising and a "pins and needles" feeling. Smaller amounts over many years can effect the nervous system, skin(dark patches, thick corns), blood vessels and cause anemia	Yes...Skin, liver, bladder, kidney, and prostate cancer. Lung cancer if inhaled.
Beryllium	4 ppb	High levels may be harmful to health	No human effects reported from swallowing beryllium. Lung disease and allergy possible if beryllium is in the air.	Lung cancer possible if breathed in large amounts.
Cadmium	5 ppb	High levels may be harmful to health	Cadmium can build up in the kidneys and cause kidney damage and fragile bones. Lung damage is also possible if it is breathed in the air	Probably
Lead	15 ppb	High levels may be harmful to health	Lead can effect the brain and nervous system, especially in infants and children, resulting in delayed physical and mental development. It can also cause kidney damage and anemia.	Probably
Manganese	50 ppb	High levels can cause black -brown water color, staining, and a bitter metallic taste.	Some manganese is necessary for a health body. Extremely high amounts can effect the brain and nervous system, as well as the reproductive system.	Probably not
Sulfate	250,000 ppb	High levels can cause salty taste	Sulfates can have a temporary laxative effect (increase bowel movements) and in high amounts they may cause diarrhea.	No
Thallium	2 ppb	High levels may be harmful to health	Extremely large amounts of thallium can cause temporaryhair loss, vomiting, diarrhea, and affect the nervous system and other organs. No human effects reported from smaller amounts over time.	Unknown

References

EPA. Drinking Water Contaminants. Updated Oct 19 2006. Available at http://www.epa.gov/safewater/mcl.html

ATSDR. Public Health Statements. Updated Nov 11 2006. Available at http://www.atsdr.cdc.gov/phshome.html

Public Water Supply

- Fortunately, majority of surrounding area is served by public water supply.
- Public well field consists of 9 wells that range in depth from 580 ft. to 1,245 ft.
- They are utilizing an aquifer that is much deeper than the aquifer being utilized by the properties in the affected area. These aquifers are separated by a significant confining layer of clay.
- These wells have been tested and found to be free of fly ash constituents

Public Notification

- All properties where well water was sampled have been notified of results in writing. Many of the owners have sought follow up information from department sanitarians.
- The department has also provided all results to both MDE and Constellation Power Source Generation.
- Several media outlets have also received the results of our investigation

Next Steps

- Bill 64-07 introduced to ban future fly ash deposition in Anne Arundel County
- Constellation Power Source Generation voluntarily suspends fly ash placement at the BBSS site as of September 17, 2007
- Draft consent decree issued to Constellation Power Source Generation by MDE and negotiations are ongoing between these parties

Future Concerns/Goals

- Permanent potable water supply for those properties with drinking water exceedances
- Air quality protection
- Full clean up of contaminated groundwater in the area
- Ensure all affected residents receive a full health assessment

References

- Anne Arundel County Department of Health
- Maryland Department of the Environment
- Environmental Protection Agency
- Maryland Department of Natural Resources Power Plant Research Program
- Anne Arundel County Department of Public Works