
TENORM in
Water Filter Backwash
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Neal Wilson

Minnesota Pollution Control Agency

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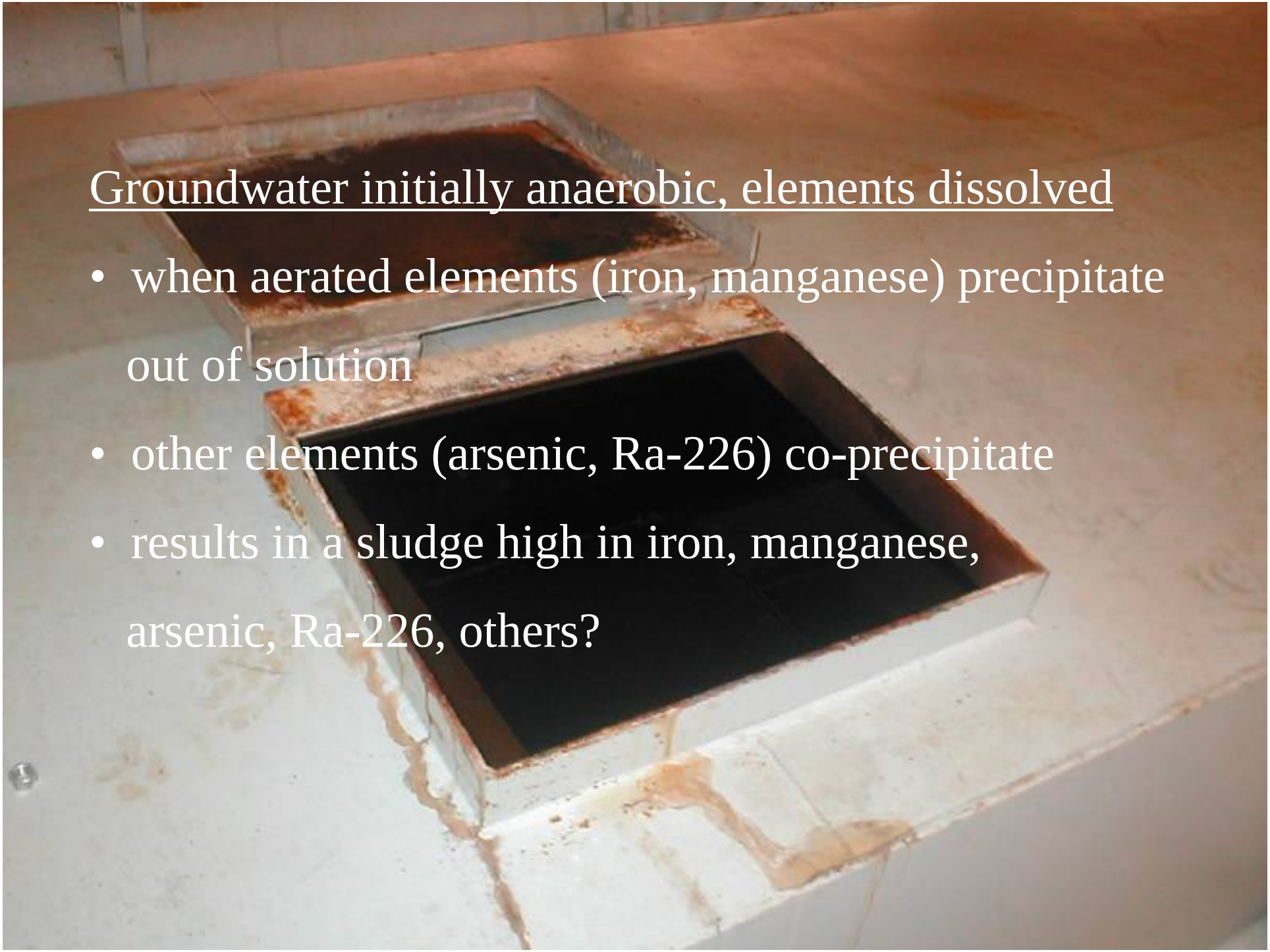
Water Filter Backwash (WFB)

- A liquid and solid
- From treating potable water for TSS, TDS
- Typically use a recirculating sand &/or anthracite filter, periodically backwashed

Discharge after main flush

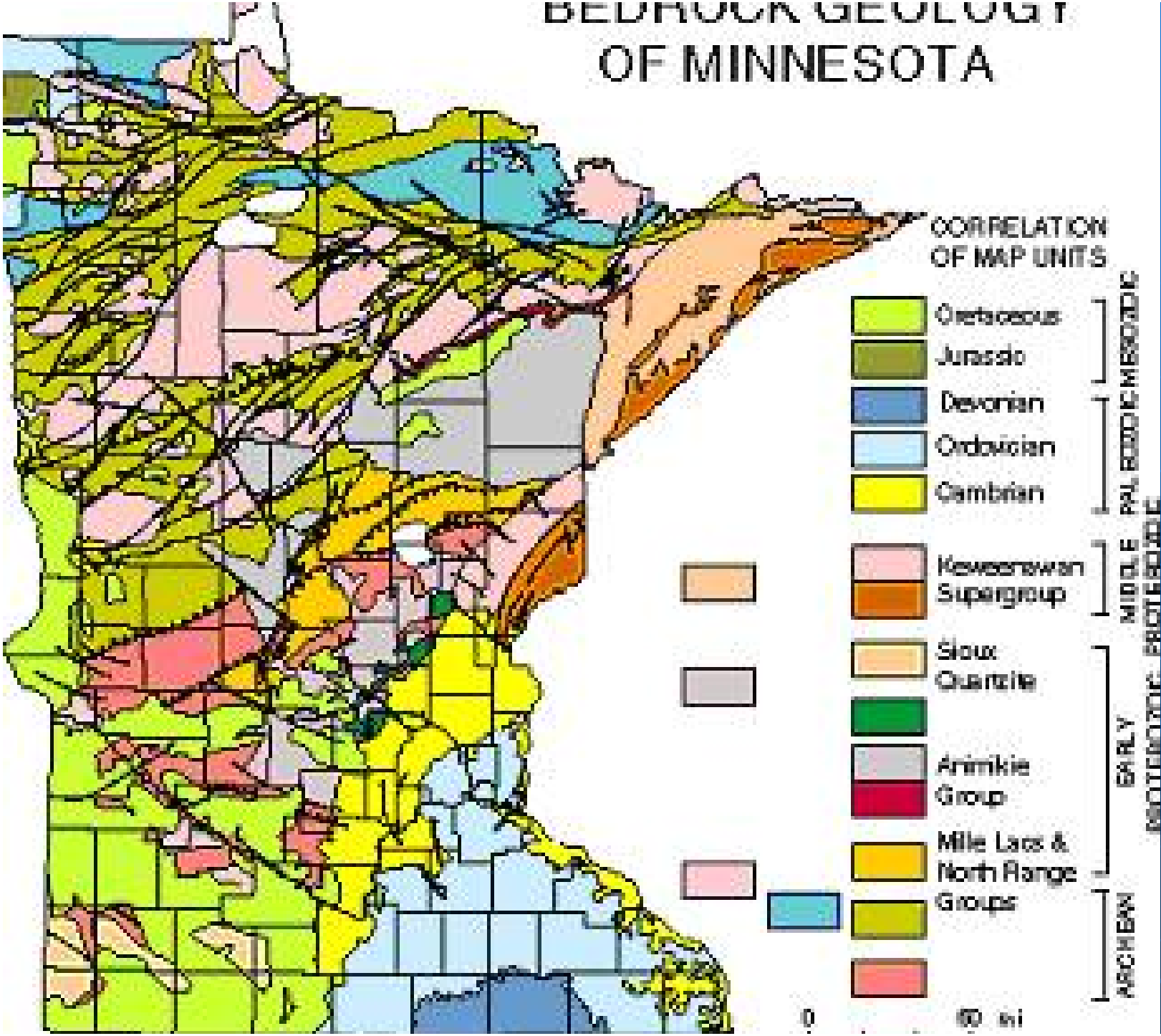
WFB Characteristics

- WFB is from groundwater
- Generation rates vary
- Most likely high in colloids (clay), iron and manganese
- May contain elevated levels of arsenic and Ra 226
- Other COC?

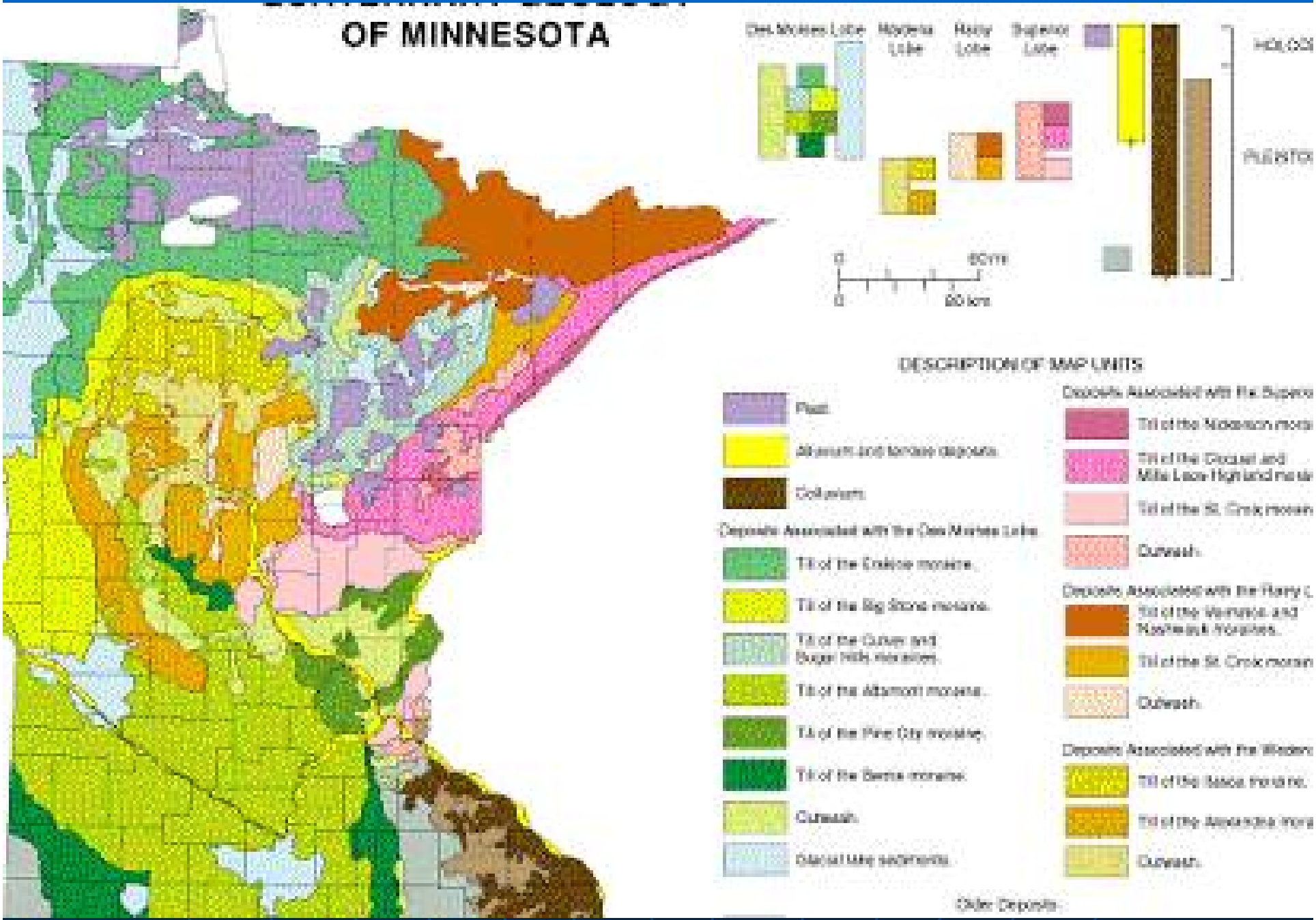


Groundwater initially anaerobic, elements dissolved

- when aerated elements (iron, manganese) precipitate out of solution
- other elements (arsenic, Ra-226) co-precipitate
- results in a sludge high in iron, manganese, arsenic, Ra-226, others?



Morton Gneiss
Ely Greenstone
Iron Range
Limestone
Sandstones


OF MINNESOTA
Des Moines Lobe
Rainy Lobe
Superior Lobe
DESCRIPTION OF MAP UNITS
Peat
Alluvium and fandeo deposits
Colluvium
Deposits Associated with the Des Moines Lobe
Till of the Emmet moraine
Till of the Big Stone moraine
Till of the Alberton moraine
Till of the Pine City moraine
Till of the Bemis moraine
Outwash
Glacial lake sediments
Deposits Associated with the Rainy L
Outwash
Outwash
Older Deposits


Discharge after
1.5 min.

Involves Water Quality and Solid Waste

- Minnesota Estimate:
  - At least 35 under NPDES MNG64 general permit (permit expires 7/07)
  - At least 15 MN00 individual permits

- WFB is defined as a solid waste: MR 7035.0300 Subp. 100: "Solid waste" means garbage, refuse, sludge from a water supply treatment plant...

Management Options

- Liquid and solids both to a WWTF
- Liquid and solids both to a pond
- Liquid to a WWTF, solids to a pond (or opposite)

- Solids: to a WWTF, a landfill, land application, or construction fill

Pond Solids Cleanout

- Frequency of pond cleanout related to volume of water, TSS and TDS
- Some cleaned out every year, some only every 20 years

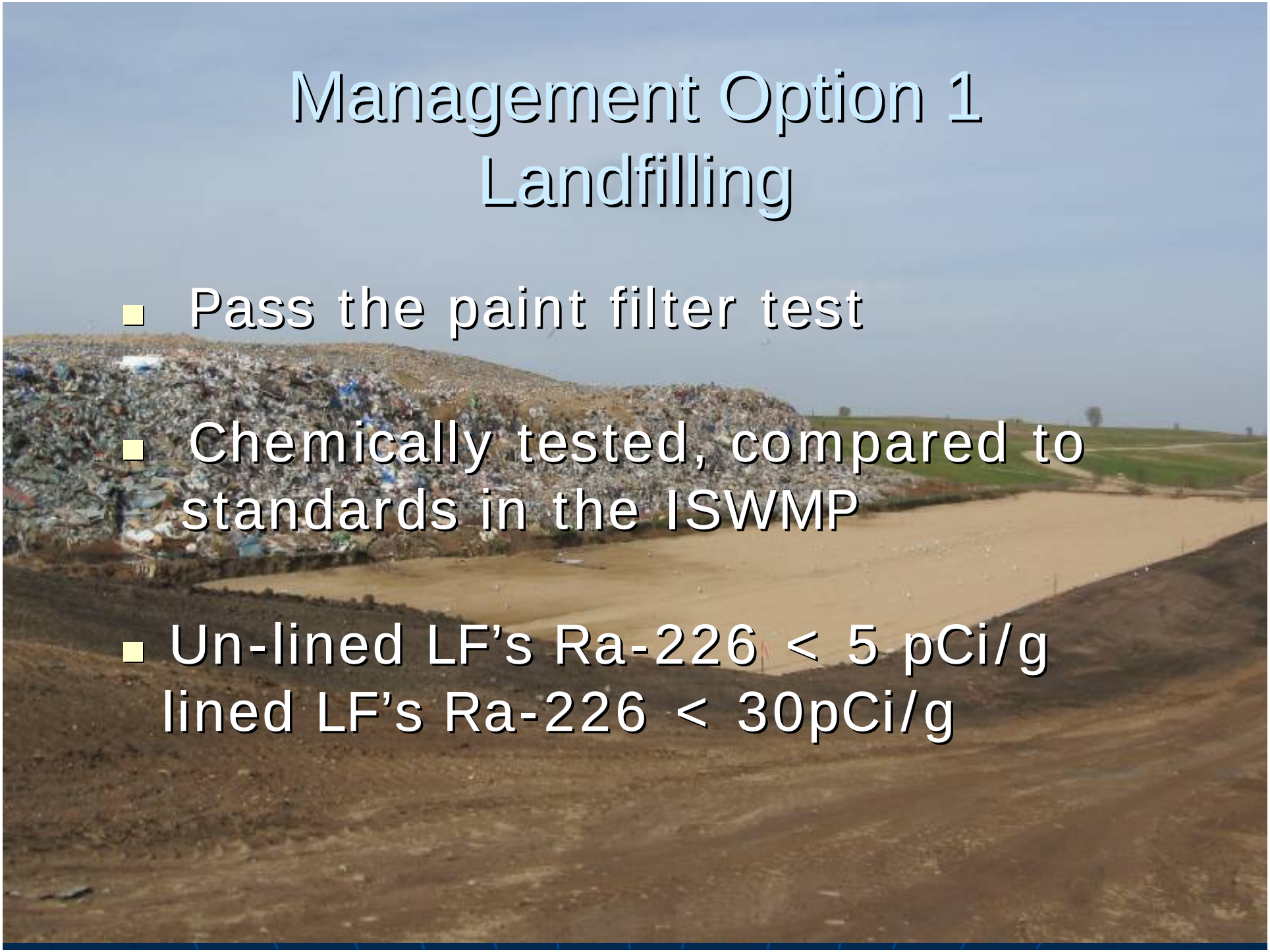
Current Status

- Several WFB NPDES permits with specific language and date requirements non-compliant

- Some discharged into “ravines”
- How to best manage WFB?

Proposed WFB Management Options

- Landfill
- Land application
- Through to a WWTF
- Construction fill



Management Option 1 Landfilling

- Pass the paint filter test
- Chemically tested, compared to standards in the ISWMP
- Un-lined LF's Ra-226 < 5 pCi/g lined LF's Ra-226 < 30pCi/g

Management Option 2
Land Application

- Chemically tested
- Follow “AFS” method

Possible Acre Furrow Slice Method

Determine maximum land application rate

Possible Limits:

- Biosolids (soil) cumulative limits
- MPCA Tier I Soil Leaching Values
- MPCA Tier I Soil Reference Values
- Others?

---Use most restrictive, calculated limit---

DRAFT Acre Furrow Slice Arsenic Calculation

- AFS = top 6” topsoil = 2,000,000 lb/acre

exp. Arsenic: **SRV** = 5 mg/kg; 5 mg/1 kg = X mg/909,091 kg; X = 4,545,455 mg/acre allowable;

4.54 kg * 2.2 lb/kg = 10 lb./acre
(note: Biosolid As limit is 37 lb/acre)

Exp.: Arsenic in sample = 269 ug/g = 0.000269 g/g;
SRV = 10 lb/A;
[(10 lb/A)/0.000269 lb./lb.)]= 37,175 lb/A

37,175 lb./A maximum of dry RRRWS backwash that can be land applied if using the SRV

Acre Furrow Slice
Ra-226 Calculation

MDH proposed standard = 5 pCi/g = 5000 pCi/kg;
[(5000 pCi/kg) = (X kg/909090 kg/A)]; X = 4,545,455,000 pCi/acre

Proposed MDH AFS limit = 4,545,455,000 pCi/A

Exp.: Ra-226 = 29 pCi/G = 29000 pCi/kg;
[4,545,455,000 pCi/ 29000 pCi/kg] = 156,739 kg/A;
[(156,739 kg)(2.2 lb/kg)] = 344,827 lb/A (dry weight)

[(344,827 lb)/(2,000 lb/ton)]/[(0.15*)] = 1,149 tons (wet weight)

* 15% solids

Formulas Used to Determine Cumulative Limits

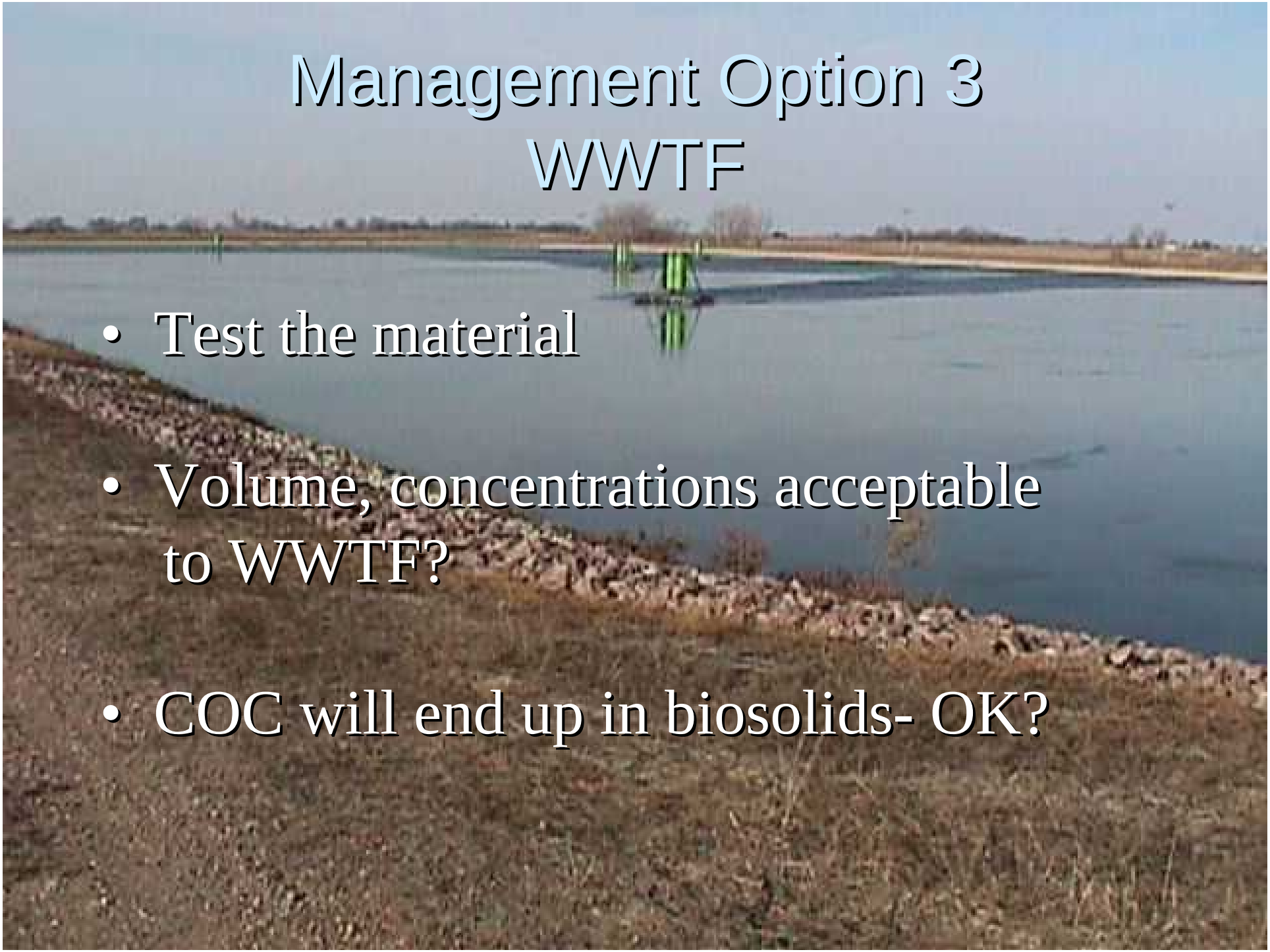
DRAFT

Arsenic maximum cumulative application (dry tons/acre)
37 lb/acre ÷ (arsenic conc. (mg/kg) x 0.002)

Ra-226 maximum cumulative application (dry tons/acre)
4.5 milliCi/ac ÷ (radium 226 conc. (pCi/g) x 0.0009)

The maximum allowable WFB application is the lesser of the two results above minus any amount applied to the site from previous applications.

Solids Applied (dry tons/acre) = Wet tons/acre Applied x % total solids (as a decimal fraction)



Management Option 3
WWTF

- Test the material
- Volume, concentrations acceptable to WWTF?
- COC will end up in biosolids- OK?

Use as Construction Fill

- Test the WFB for analytes
- Use AFS method
- Use limits table (directly)
- Calculate maximum amount of fill to stay under the limits

MPCA WFB Guidance

Is being drafted

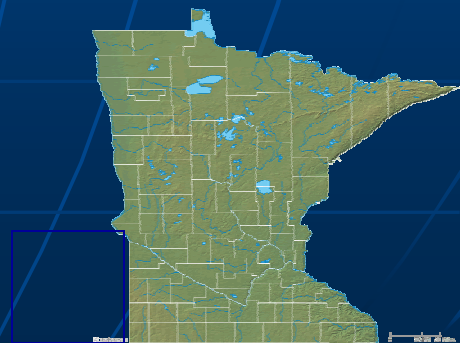
Will address

- Testing requirements
- Management options
- Reporting requirements

May only require testing, management of As and Ra-226

Summary and Conclusions

- In Minnesota, WFB is a solid waste
- WFB management will be delegated to NPDES permits
- Need to finalize land application limits, testing parameters



Questions

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