GUIDELINE 11 – ASH UTILIZATION FOR SOIL STABILIZATION, FILLER MATERIALS AND OTHER ENGINEERING USES

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The North Dakota Department of Environmental Quality is working with a number of power plants, coal-fired boiler operators, coal mines, and other entities wishing to utilize waste materials such as coal-fired fly ash and/or bottom ash for engineering purposes. Some projects such as road stabilization, underground mine stabilization, controlled strength flowable fill, and other uses have been reviewed and approved by the Department based on an evaluation of the material=s engineering and environmental properties. Persons proposing use of waste materials for beneficial reuse need to demonstrate that the material will be beneficially used without adversely impacting the environment.

Beneficial reuse must be carefully considered to ensure it is not simply "*use constituting disposal"* or "*sham recycling."* Proposers should be familiar with the state's environmental laws and rules, including the North Dakota Solid Waste Law, Chapter 23.1-08 North Dakota Century Code (NDCC); the North Dakota Solid Waste Management Rules, Article 33.1-20 North Dakota Administrative Code (NDAC); as well as the state's Water Pollution laws, Chapter 61-28 NDCC, which includes Section 61-28-06 which states in part:

> "It shall be unlawful for any person:
>
> a. To cause pollution in any waters of the state or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any waters of the state . . ."

The Department needs to review important aspects of any proposal, including, but not limited to, the ash quality and quantity, the proposed use of the ash, site characteristics, potential receptors, how the material will be handled, contingency plans in case adverse environmental conditions arise, how the site will be monitored to ensure environmental protection, what will be done when use of the material is completed, any local health or zoning issues, site closure and reclamation, etc. At a minimum, any proposal should address the following:

1. **Background information on the source, quality, and quantity of the ash** including the generator of the ash; the type of facility, the boilers, the pollution control equipment, etc., used in generating and collecting the ash; the source and the type of fuel used in the process; the variability of the ash; whether it is a mixture of other materials or waste streams; how it is stored and handled prior to any disposal or use; and any other information necessary.

2. **Analysis of the ash,** including both existing information and, as necessary, some leach analysis. Information that might be provided would include mineralogical properties and total analysis plus an assessment of the environmental leachability of the ash materials. At a minimum, an ash leach test on one or more representative samples utilizing either: (1) a **modified** EPA Synthetic Precipitation Leaching Procedure (SPLP) Method 1312, with a *solution to solid ratio 4:1*, or (2) A modified ASTM D-3987 procedure with a *solution to solid ratio of 4:1*. A list of chemical parameters is attached to this

memorandum. The detection limits for analysis must be substantially below the safe drinking water standards.

3. **A discussion and details on the proposed use of the ash**, including any admixtures, fill materials, soil, etc., should be provided. Information that is essential for review includes a description of the actual beneficial use; the mix ratio and design lift thickness; type and quality of fill materials, moisture levels, compaction, and engineering properties (including the strength and durability of materials), and what the material will be covered with, assessment of weathering, material breakup, etc., should be provided.

4. **A laboratory simulation** of the environmental properties of the proposed use should be addressed. Laboratory simulation testing to replicate field conditions determine leachability of the material as-placed should be provided. Upon discussion with the Department, a field simulation test should be agreed upon that will be adequate to determine any impact on the environment from initial waste placement, and any impact through continued weathering, mechanical abrasion, erosion, field runoff, etc. Various simulation tests have been approved by the Department, including kinetic tests simulating infiltration of water through fill materials.

   One publication that has been utilized for evaluating ash utilization in a mine setting is the publication "*Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia"* by Dr. William A. Price, Reclamation Section, Energy and Minerals Division, Ministry of Employment and Investment, Bag 5000, Smithers, British Columbia, V0J2N0. Other information is available in Departmental files or may be proposed by the applicant based on the conceptual field application. Laboratory simulation of the field application methods might also entail testing of the materials due to its fate in the environment through weathering, breakup, erosion, abrasion, excavation, etc.

5. **The site characteristics**, including soils, topography, geology, hydrogeology, groundwater quality, surface water conditions and flow, vegetation, etc.

6. **Potential receptors**, including nearby communities, residences, parks, natural areas, neighboring land use, waterways, site drainage, groundwater conditions and quality groundwater wells, and any other information necessary to assess potential impacts to health and the environment.

7. **Description of the material handling and conceptual construction**, including transport and storage of materials, placement of materials, equipment, construction techniques, moisture application and monitoring, mixing, testing, etc., as well as controls and monitoring of windblown dust, stormwater and/or any ponded water must be described.

8. **The proposal should address reasonable contingencies** such as discontinuance of the application methods, cleanup of the site should environmental damage occur, final disposal of placed materials after the life of the project, etc.

9. **Approval by any local health, environmental, and permitting authorities** must be obtained before the project is conducted. Any Departmental approval is contingent upon and does not supersede compliance with all local environmental, health, and

building code requirements.

10. **Monitoring of surface, groundwater, air, and soil** may be required.

11. The proposer should provide routine reports on construction and operation progress, monitoring results, final construction details and, for ongoing projects, periodic re-analysis of the ash material on an annual basis or, more often, under the following circumstances:

    a. The process generating that waste changes, such as the installation of different boilers, burners, pollution control equipment, or any other process change which might influence the character of the waste being utilized;

    b. In the event that the raw material or type of fuel changes; and

    c. Any other changes or variances which may influence the characteristics of the ash/product or the mixture used in the construction project.

This outline is provided for guidance purposes only. Additional requirements or conditions may be stipulated by the Department, dependent on the particular application, site characteristics, or other regulatory requirements.

Parameters and Methods for Assessing Leachability* of Fly Ash and Runoff from Fly Ash Utilization Sites in North Dakota (parameters may be reduced based upon review)

a. Basic water parameters:

(1) Appearance (including color, foaming, and odor)
(2) pH
(3) Specific conductance
(4) Temperature

b. General geochemical parameters:

(1) Ammonia nitrogen
(2) Total hardness
(3) Iron
(4) Aluminum
(5) Calcium
(6) Magnesium
(7) Manganese
(8) Potassium
(9) Total alkalinity
(10) Bicarbonate
(11) Carbonate
(12) Chloride
(13) Fluoride
(14) Nitrate + Nitrite, as N
(15) Total phosphorus
(16) Sulfate
(17) Sodium
(18) Total dissolved solids (TDS)
(19) Total suspended solids (TSS)
(20) Cation/anion balance
(21) Sodium Adsorption Ratio (SAR)

c. Heavy Metals:

Group A:

(1) Arsenic
(2) Barium
(3) Boron
(4) Cadmium
(5) Chromium
(6) Lead
(7) Mercury
(8) Selenium
(9) Silver

Group B:

(10) Antimony
(11) Beryllium
(12) Cobalt
(13) Copper
(14) Nickel
(15) Thallium
(16) Vanadium
(17) Zinc

d. For Fly Ash waste analysis, naturally occurring radionuclides:

(1) Gross Alpha Particle Radioactivity (pCi/1)
(2) Radium 226 and 228 (pCi/1)
(3) Uranium

*Ash leach test on one or more representative sample(s) using a **modified** EPA Synthetic Precipitation Leaching Procedure (SPLP) method 1312 with a **solution to solid ratio of 4:1. A modified ASTM D-3987 procedure with a solution to solid ratio of 4:1 may also be used.** Laboratory detection limits must be substantially below the level of any state or federal drinking water standard or goal.