



The State of New Hampshire  
*Department of Environmental Services*



Michael P. Nolin  
Commissioner

November 22, 2004

To Interested Parties

**Subject: Interim Best Management Practices Approved for Co-Disposal of Construction and Demolition Process Fines with Municipal Solid Waste**

I am very pleased to inform you that the New Hampshire Department of Environmental Service's Waste Management Division (NHDES-WMD) has adopted interim best management practices (BMPs) for the co-disposal of construction and demolition (C&D) fines with municipal solid waste (MSW). As an alternative to the ban on the use of C&D fines as a daily cover material issued on July 26, 2004, the co-disposal of C&D fines with MSW including their use as alternate daily cover may be done per the attached interim best management practices (BMPs). This modification to the ban is effective immediately.

"We" have made tremendous strides in coming up with these comprehensive interim BMPs. My utmost appreciation goes out to all who have contributed to their development. NHDES-WMD continues to work with industry, academia and other regulatory agencies to develop even more comprehensive BMPs for the use of C&D process fines. The attached interim BMP document represents the first step in that process. We here at NHDES-WMD remain dedicated to working with these distinguished individuals as we move towards adoption of final BMPs.

If you have questions regarding this letter or the attached BMPs, please call Michael E. Guilfooy, P.E. at (603) 271-6467.

Sincerely,

Anthony P. Giunta, P.G., Director  
Waste Management Division

Attachments: Interim Best Management Practices for the Use of C&D Process Fines

cc: Mike Nolin, Commissioner  
Robert Scott, Director, ARD  
Michael Guilfooy, P.E., SWMB  
Jim Martin, PIP

## **Interim Best Management Practices For the Use of C&D Process Fines**

### **Introduction**

As New Hampshire landfills are filled with processed and unprocessed mixed construction and demolition debris (C&D), containing gypsum, it has been observed that the potential for the generation of hydrogen sulfide gas has increased. Therefore, the New Hampshire Department of Environmental Services (NH DES) is issuing this Interim Best Management Practice for the Use of C&D Process Fines to ensure that the potential for hydrogen sulfide generation from processed C&D Fines, C&D, MSW (putrescent materials) and/or a combination thereof is minimized and the release of landfill gases from the cover is mitigated.

### **Background**

Hydrogen sulfide gas (H<sub>2</sub>S) is produced in a landfill when sulfur compounds decompose in the presence of moisture and absence of oxygen (anaerobic condition). It is believed the principle source of H<sub>2</sub>S at landfills is gypsum, the primary component of drywall materials in C&D debris. It is also believed that the potential for hydrogen sulfide gas and other reduced sulfur compounds increases based on the organic content within the landfill.

H<sub>2</sub>S is slightly heavier than air and has a rotten egg odor. The human odor threshold for H<sub>2</sub>S is approximately 0.2 parts per billion (ppb) in air. In some states, Florida for instance, as much as 12,000 parts per million (ppm) H<sub>2</sub>S has been measured emanating from waste drywall stockpiles. H<sub>2</sub>S is created when sulfur-reducing bacteria (SRB) consume and metabolize sulfate. In C&D the main source of sulfate is gypsum, which consists mostly of calcium sulfate.

H<sub>2</sub>S is only created under certain conditions. When any one of those conditions is absent, the SRB cannot live and therefore, H<sub>2</sub>S will not be produced. The following table provides details.

<b>Condition</b>	<b>Detail</b>
pH	Between 4 and 9 (optimum)
Temperature	Between 30 <sup>0</sup> C and 38 <sup>0</sup> C (optimum)
Absence of air	Anaerobic (no oxygen)
Food Source	Sulfate ions
Water	Moist or wet
Carbon source	Wood, paper, glue, etc.

In recent years there have been reports across the United States of nuisance odor conditions created from the use of C&D Fines. To date, most of those problems have been traced back to the use of C&D Fines or disposal of C&D in large amounts in landfills.

In general, the types of Fines being produced in New Hampshire today by C&D recyclers ranges in particle size from 3/8” minus to 2” minus. Sulfate concentrations have been reported as high as 60,000 mg/Kg and organic content generally ranges from <10% to 35%.

**Interim Standards and Best Management Practices**

The Department has reviewed guidance documents and standards from a number of states in the U.S. that have addressed the disposal of C&D fines in MSW landfills. After receiving comments from a number of industry stakeholders, the Department has developed the following proposed interim standards and BMP’s.

- Particle size
- Organic content
- Sulfate concentration

The following table provides details.

<b>Characteristic</b>	<b>Recommended Standard Range</b>
Particle Size	Up to 2”
Organic Content	Up to 35%
Sulfate Content	Up to *60,000 mg/Kg

\*Based on sulfate solubility analysis via EPA Method 9036 (or 9036)

The following Interim Best Management Practices (BMPs) establish a standard operating procedure when using C&D Fines as ADC or for grading and shaping. They include:

- Gypsum removal prior to processing or transfer,
- Disposal of bulk gypsum in one area,
- Mixing the ADC with soil,
- Mixing the ADC with ash (coal or wood ash), and
- Education regarding the sulfur cycle in landfills.

**Gypsum Removal**

Processors should remove as much gypsum as practicable prior to processing or transferring C&D. While it’s impossible to remove all the gypsum from mixed C&D loads, a large amount can be removed thereby lowering the potential for H<sub>2</sub>S to generate from the ADC fines.

**Gypsum Disposal**

Gypsum that is removed from C&D loads prior to processing or transfer, or source-separated at the site of demolition, should be disposed of at the landfill in a way that minimizes the generation of H<sub>2</sub>S. Techniques such as disposal in a single confined area of a cell in much the same way that asbestos is disposed can be used to isolate the gypsum. An effort should be made to seal this area of the cell with a “cap” (low permeability soil or equivalent) as an interim measure to help limit the amount of H<sub>2</sub>S that is emitted out of

the landfill or the amount of moisture (precipitation) reaching the gypsum. In any case, removal efficiency of gas collection must be assured.

#### **Use as ADC**

It is recommended that the sulfate concentration in fines be determined and its gas and water infiltration sealing abilities verified such that the material can be used by itself as daily cover without excessive H<sub>2</sub>S generation. Until this concentration is known and achieved, fines meeting the specifications in the above table can be used per the following.

Mixing fines with soil at a 50:50 ratio and /or coal ash has been demonstrated in some cases to be an effective way of controlling H<sub>2</sub>S generation. On the other hand, using C&D fines alone as ADC has been shown to result in significant increase in H<sub>2</sub>S generation within a MSW landfill environment. It is Department policy therefore, that the use of C&D fines as ADC must incorporate other materials that minimize H<sub>2</sub>S production and mitigate infiltration of rainwater and release of landfill gas in order to be used. A reasonable technical demonstration must be submitted for any C&D fines / mixture proposed for ADC.

#### **Education**

Probably the most important BMP to employ is the education of recyclers, transfer station operators and landfill operators of the sulfur cycle in landfills. When these groups of people are aware of the mechanisms that result in the production of H<sub>2</sub>S, the dangers of exposure and how to effectively restrict the production of H<sub>2</sub>S, then smart choices can be made on a daily basis that will result in a safer environment.