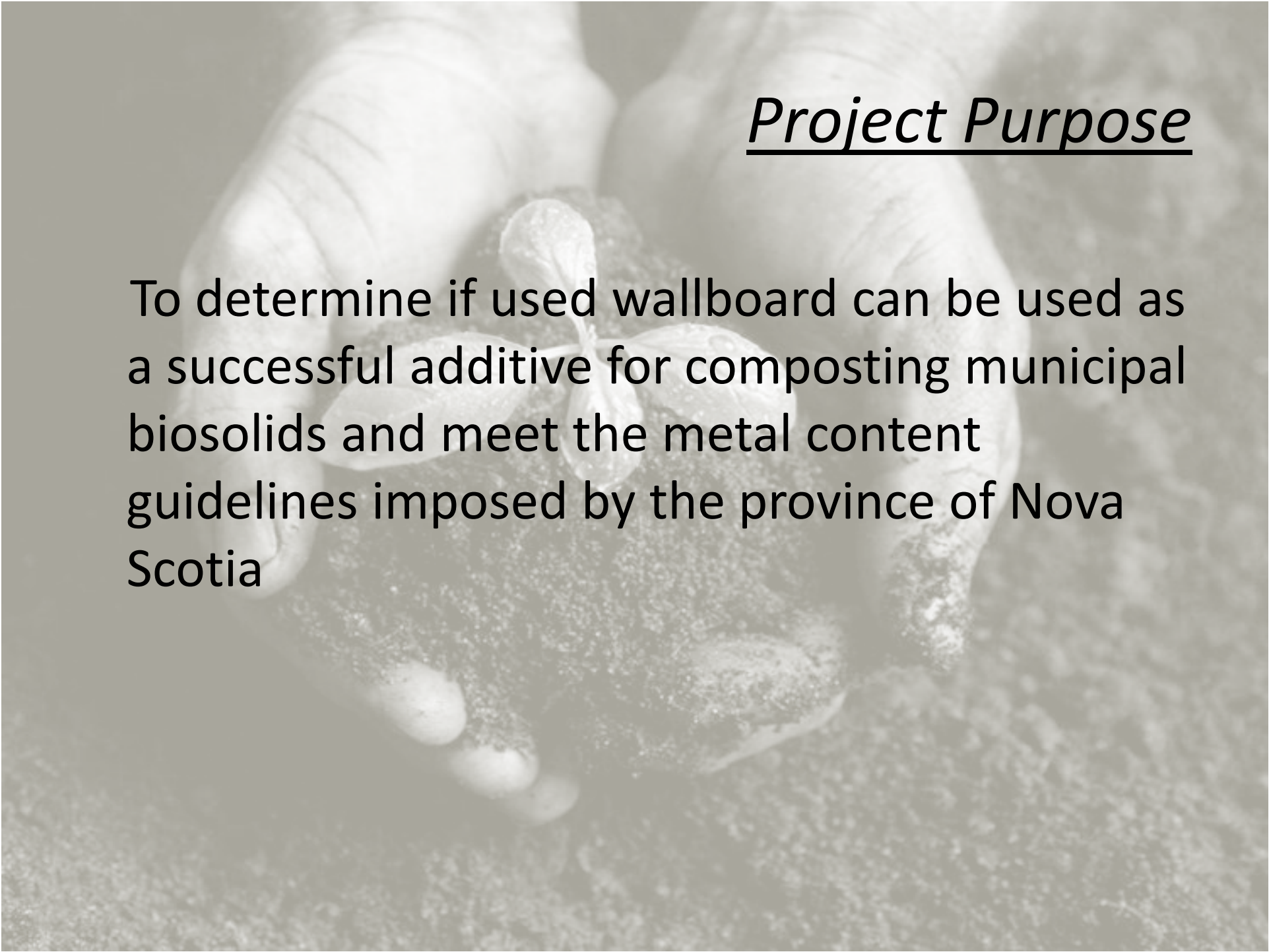


A close-up photograph of a pair of weathered, brown hands gently holding a small, vibrant green seedling with four leaves. The seedling is growing out of a mound of dark, rich soil. The background is a blurred expanse of similar soil, creating a sense of depth and focus on the hands and the young plant.

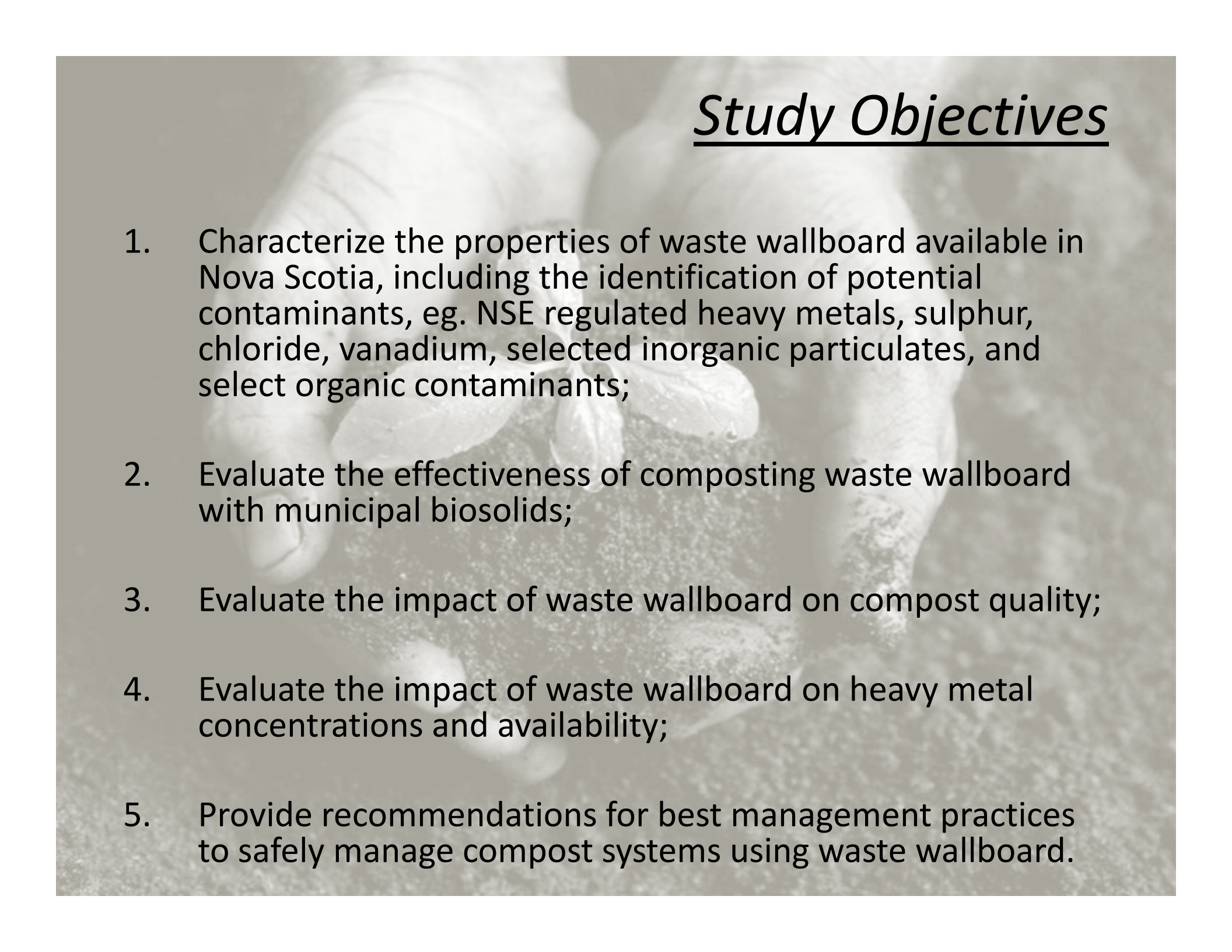
Characterization of Used Gypsum Wallboard as a potential Composting Additive for Municipal Biosolids

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Project Purpose

To determine if used wallboard can be used as a successful additive for composting municipal biosolids and meet the metal content guidelines imposed by the province of Nova Scotia



Study Objectives

1. Characterize the properties of waste wallboard available in Nova Scotia, including the identification of potential contaminants, eg. NSE regulated heavy metals, sulphur, chloride, vanadium, selected inorganic particulates, and select organic contaminants;
2. Evaluate the effectiveness of composting waste wallboard with municipal biosolids;
3. Evaluate the impact of waste wallboard on compost quality;
4. Evaluate the impact of waste wallboard on heavy metal concentrations and availability;
5. Provide recommendations for best management practices to safely manage compost systems using waste wallboard.



Proposed Studies

Study 1: In-vessel composting

- In-vessel composter located at the BEEC used with waste wallboard and municipal biosolids with a conventional bulking agent;
- Mixed continuously for up to 8 weeks;
- Measured parameters during composting (ambient temperature, compost temperature);
- Chemical parameters pH /EC, moisture content, total C and N, sulphur, chlorine, and trace elements.

Study 2: Lysimeter Study

- Composts with papered and de-papered used wallboard and a control with only biosolids established on soils and allowed to compost over four month periods (repeated 4x);
- Water, soils, and composts measured at regular intervals, and during periods of flow water will be collected with autosamplers;
- Carbon mineralization, total nitrogen, pathogen, trace elements, organic contaminants, and availability of other plant macro- and micronutrients will be measured throughout the study period;
- Recommendations for maximum application rates of the compost will be provided on the basis of the study results;
- Maximum heavy metal concentrations resulting from the use of the final compost product will also be provided.

Study 3: Field Composting Studies

- A field scale composting trial will be conducted at a partner site;
- One study will be conducted using waste wallboard and municipal biosolids with a conventional bulking agent;
- Weighed materials will be introduced into a windrow system and mixed on a regular basis for the first 6 months;
- Measured parameters during composting (ambient temperature, compost temperature);
- Samples will be collected on a bi-weekly basis from various locations and depths from the windrow and measured for pH /EC, moisture content, total C and N, sulphur, chlorine, selected organic contaminants, and trace elements;
- Availability of other plant macro- and micronutrients will be measured throughout the study period;
- The final compost will be analyzed to determine concentrations of inorganic contaminants and pathogens to establish appropriate land application rates;
- Recommendations for Best Management Practices related to diversion of the wallboard by-product into composts with municipal biosolids and final compost use will be provided on the basis of the study results.

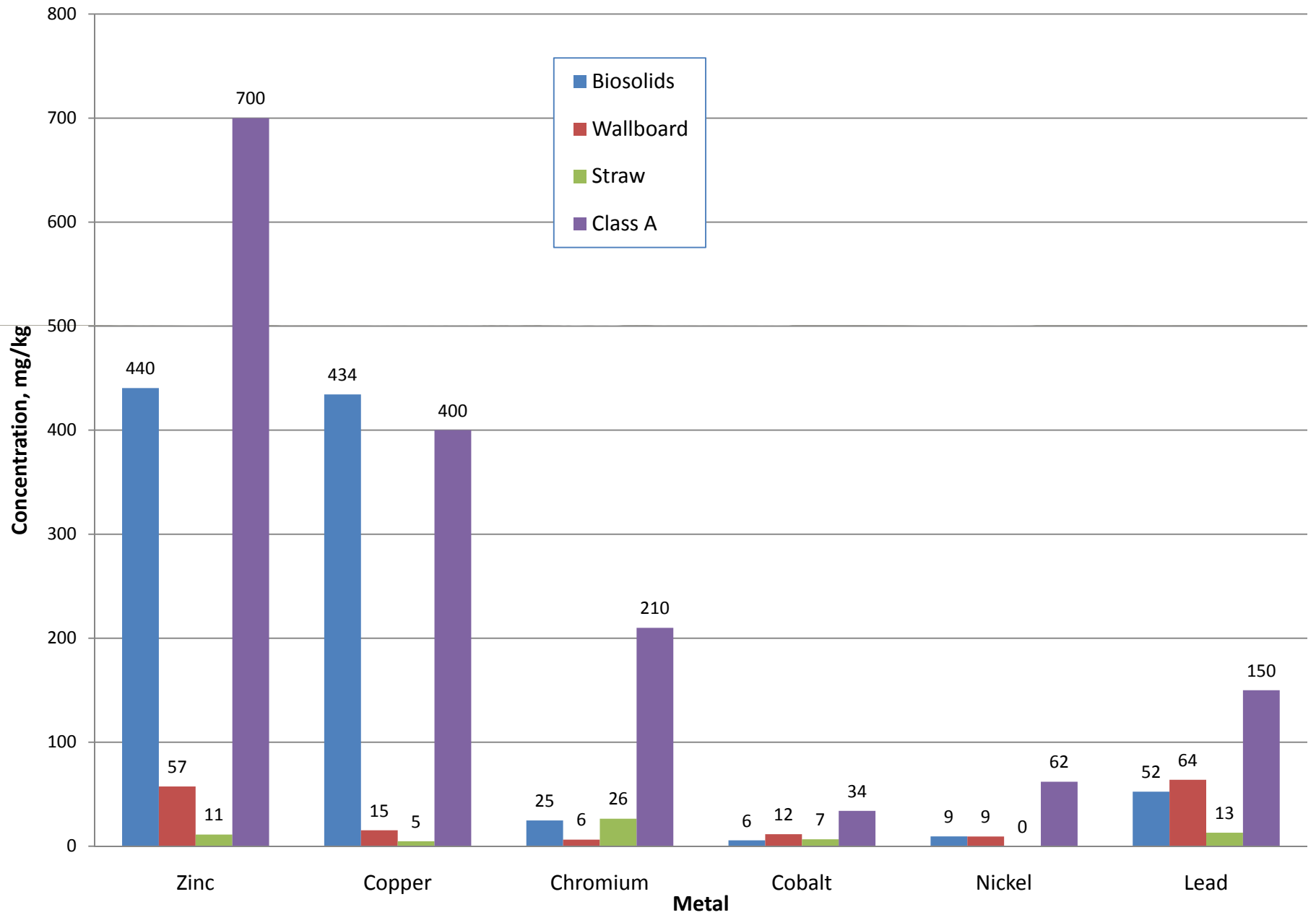
Study 1: In-Vessel Compost Mix Design

Raw Material	Moisture Content %	Total Carbon %	Nitrogen %
Biosolids	89.90	35.02	6.61
Used Wallboard	46.71	4.48	0.03
Straw	22.44	42.63	0.35

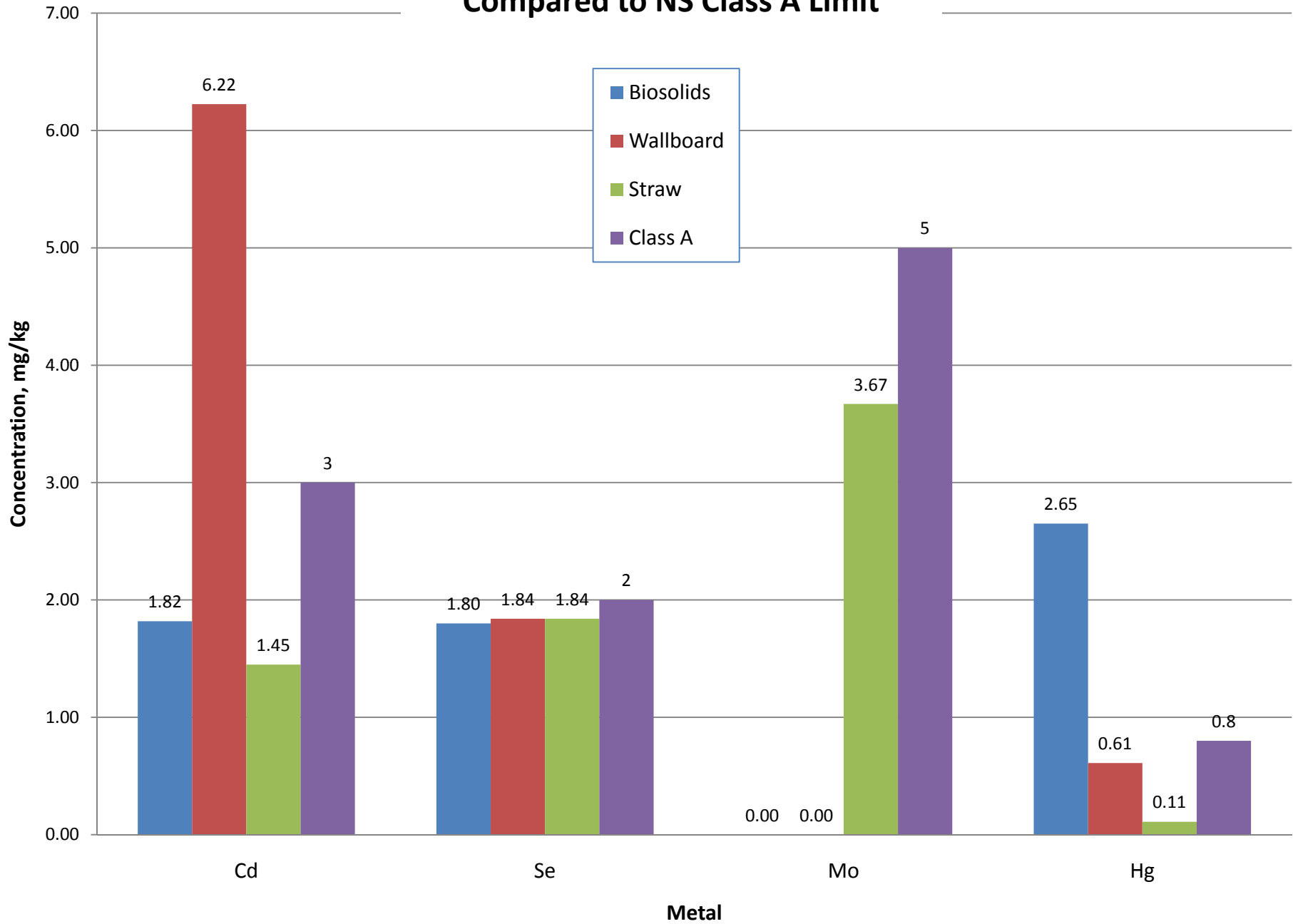


Compost Mix	Raw Materials, %			C:N Ratio	Moisture Content, %
	Biosolids	Wallboard	Straw		
Design				27.3:1	60
#1	40	40	20	27.4:1	59.1
#2	64	0	36	27.0:1	65.6

Raw Material Metal Concentration 1 Compared to NS Class A Limits



Raw Material Metal Concentrations 2 Compared to NS Class A Limit





Observations

- High cadmium concentrations in both used gypsum wallboard and biosolids composts
- High mercury, molybdenum, and copper concentrations in municipal biosolids
- Composting using up to 40% wallboard was successful

Study 2: Lysimeter Study - Compost Mix Designs

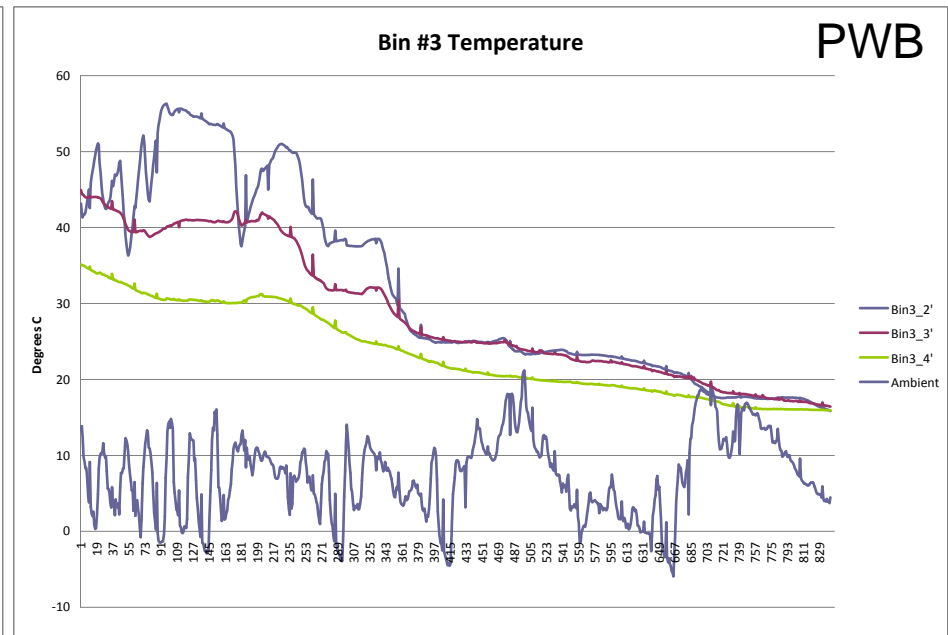
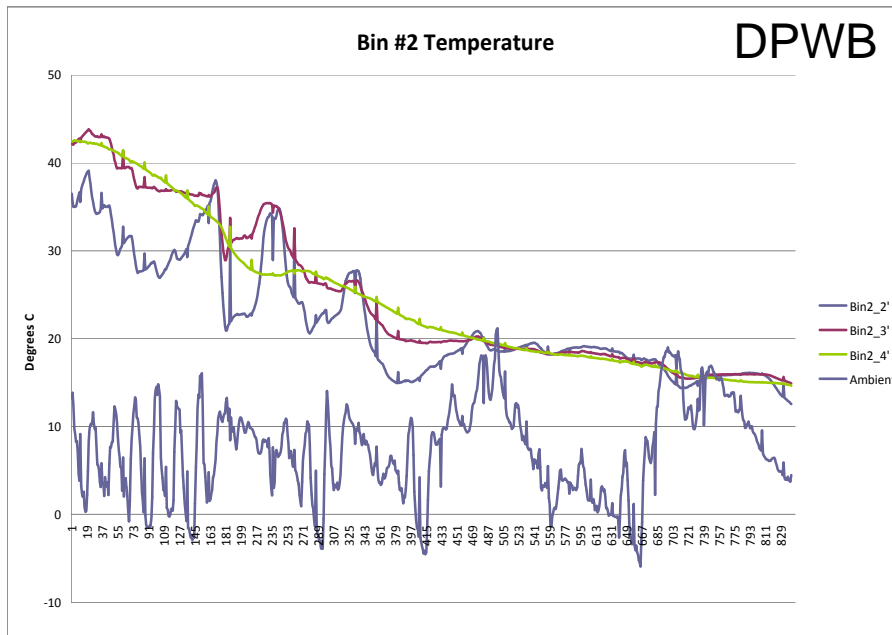
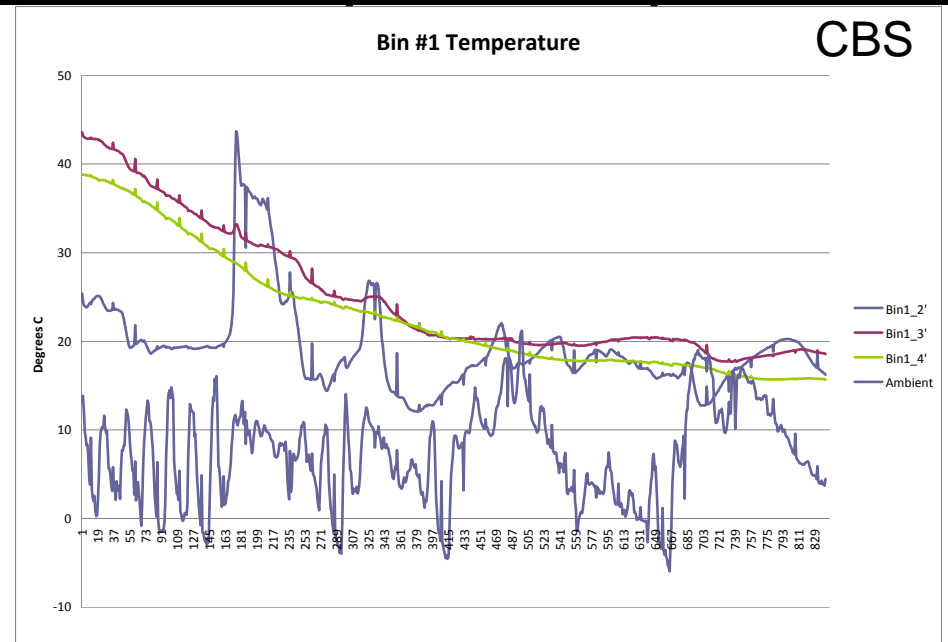
	CBS	DPWB	PWB
Biosolids	3048	3030	2900
Straw	1215	1300	1250
Horse Bedding (lbs)	1890	1970	1720
De-papered wallboard (lbs)	0	1510	0
Papered wallboard (lbs)	0	0	1260
Moisture %	71.22	61.70	60.98
C %	34.66	20.51	22.52
N %	1.92	1.13	1.19
C:N	18.05	18.20	18.90

*Target C:N Ratio was 23:1

Lysimeter Study – Compost Cells



Lysimeter Study – Observed Compost Temperatures





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