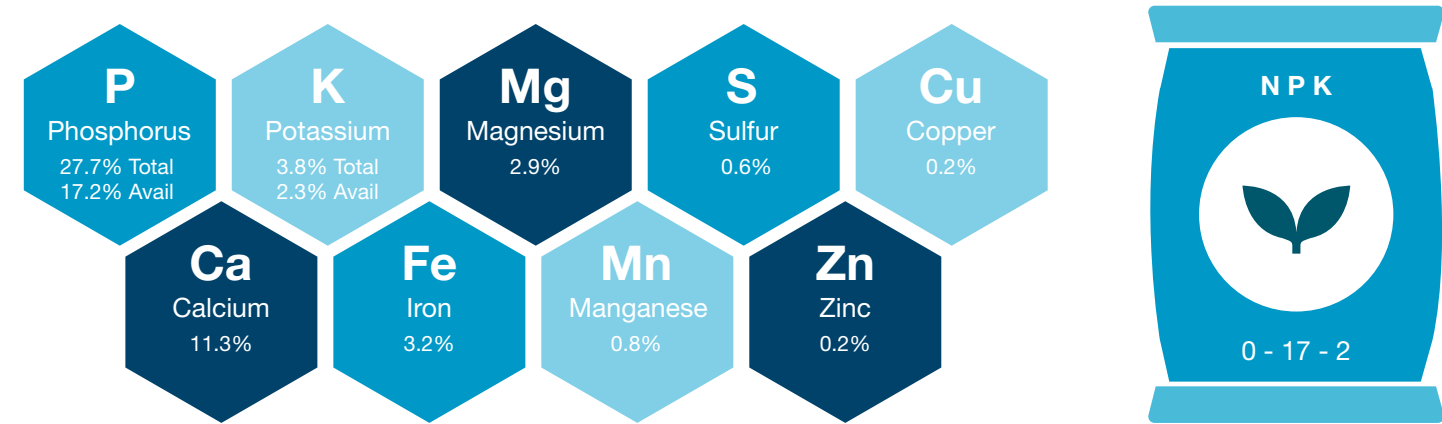


The ash remaining after the incineration process is low in metals, high in phosphorus, and has potential to be beneficially reused as a renewable phosphorus fertilizer.

## High Phosphorus and Valuable Macronutrients

The Metro Plant incineration system reduces 850 wet tons wet tons of wastewater solids to 40 tons. The phosphorus and micronutrients in the ash have an equivalent value of \$125/ ton as a commercial fertilizer. That’s a value of approximately \$1.8 million/year, not including saved landfill costs, and could provide fertilizer for 35,000 acres per year.



## Greenhouse Study

Starting in 2014 Metropolitan Council Environmental Services (MCES) partnered with the University of Minnesota to do a greenhouse study on the potential of using the ash a phosphorus fertilizer. The greenhouse study measured plant growth and metal uptake through lettuce and corn and compared to commercial grade fertilizer. Results showed promise of using the ash as a fertilizer.

## Field Study

In 2017, MCES and the University of Minnesota started on a three year field study to determine the viability of the ash as a phosphorus fertilizer in terms of its impacts on plant growth, soil chemical properties, and soil microbial populations. The study is being conducted on 3.5 acres at the University’s Rosemount Research Facility on rotations of corn and soybeans. Preliminary results in the first year of the study have found that the ash has the potential to be an effective phosphorus fertilizer. Corn grown with the ash responded similarly to other fertilizers and soil metals concentrations were also similar.



Greenhouse Study



Field Study

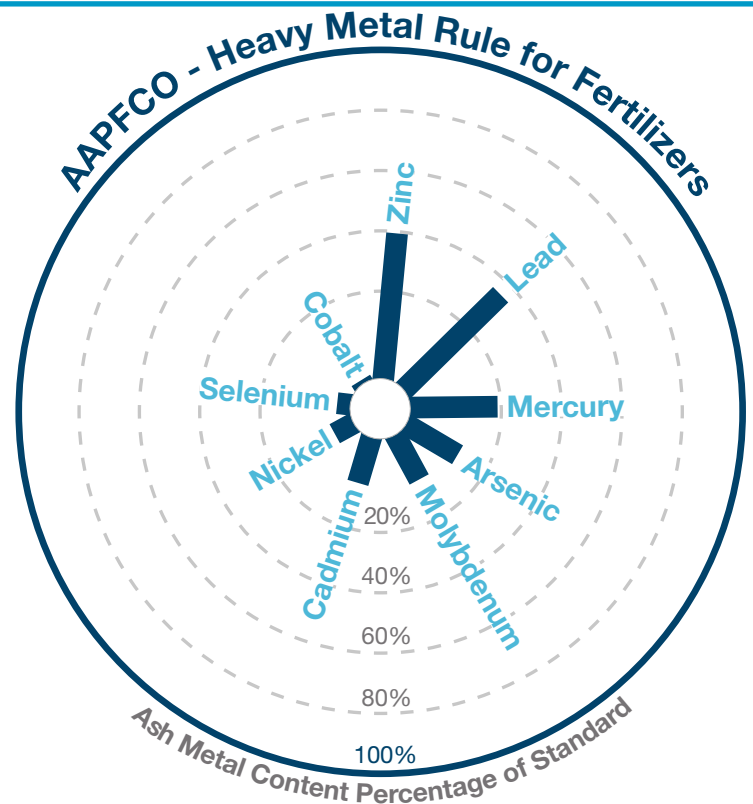


Applying the Ash During Field Study

## Metro Plant Ash has Low Metals

The metals in Metro Ash are well below the levels developed by the Association of American Plant Food Control Officials (AAPFCO) heavy metal rule for commercial grade fertilizers.

The data to the right is based on 32 tests from 2017 to 2018 and compares the ash metal amounts as a percentage of the referenced standard.

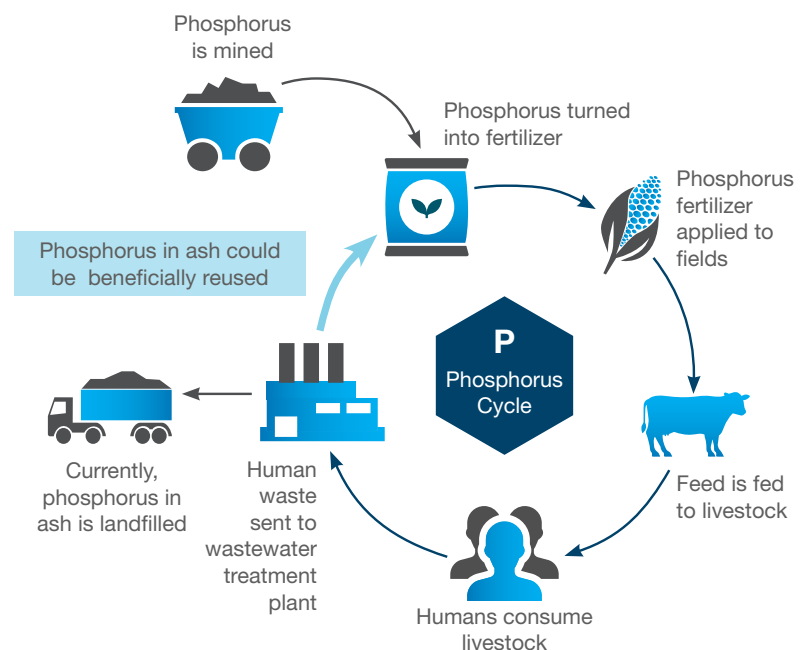


## Reusing Ash is Sustainable



Phosphorus is an essential nutrient for plants and animals and is used in agriculture to ensure high crop yields. However, phosphorus is also a non-renewable resource with a limited supply which cannot be manufactured or destroyed.

If this ash can be used as a phosphorus fertilizer, it could provide a renewable source of phosphorus and reduce our reliance on mined and imported phosphorus.



## Next Steps

MCES will continue its field study with the University of Minnesota to document the impacts of beneficially reusing the ash as a phosphorus fertilizer. The Metro Plant ash is currently considered a solid waste and is disposed of in an industrial waste landfill. In order to beneficially reuse it as fertilizer, MCES will submit a case specific beneficial use determination to the Minnesota Pollution Control Agency.

### Learn more

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### MCES Mission

Provide wastewater services and integrated planning to ensure sustainable water quality and water supply for the region.