Dr. Adam Langley
Ardmore, PA 19003

April 16, 2021

Regarding: 1800 W Montgomery and 1835 County Line
Application number: 3833 pp

Planning Commission of Lower Merion Township
Building and Planning Committee of Lower Merion Township
Board of Commissioners of Lower Merion Township
Any Other Officials, Boards or Groups with Jurisdiction

Dear Madams and Sirs,

I am writing to register a comment on the proposed destruction of the forest at 1800 W Montgomery and 1835 County Line.

I'm an ecologist at Villanova University. My class last fall estimated a greenhouse footprint of the Lower Merion plans to convert an existing forest on County Line Road to a sports complex. Since then, we have obtained a detailed list of the trees to be removed by species and trunk diameter. Using standard methods based on US Forest Service protocols and primary literature, we estimated tree biomass and then converted to a carbon mass that will be released from their destruction. We also used literature to estimate associated emissions from soils that follow forest removal. Finally, we estimated how much CO_2 would be taken up by replacing half of the removed trees with young trees.

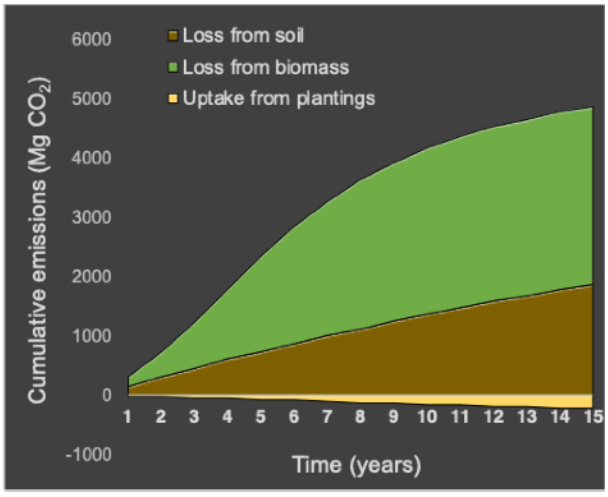

Fig. 1. Estimate of cumulative CO_2 emissions through time after land conversion from biomass and soil, and uptake by replanting.

Our estimate for net CO_2 release is 4640 metric tonnes (Megagrams or 1000 kg) over 15 years, the time frame that climate scientists say is key to slowing climate change. Replanting to offset the loss of the trees has little effect over this time frame (negative values in Fig. 1). Over fifty years, the net emissions grows to 5500 metric tonnes CO_2 as soil continues to lose carbon from the disturbance before the young trees begin to gain an appreciable amount of the carbon. The

net CO_2 released from removing this forest will negate over half the annual CO_2 emissions savings (8,300 metric tons) attributable to Lower Merion's conversion to 100%renewable energy. (https://www.mainlinemedianews.com/mainlinetimes/news/lower-merion-to-use-100-percent-renewable-electricity/article_0b6818a6-dc7a-11e8-be0e-aff53e0914d3.html).

Our analysis focused only on carbon dynamics, because those are the easiest to quantify, and did not consider the effects of losing the direct cooling effect of shade and evapotranspiration, or the effect of biodiversity loss, which would have the most severe and direct local impacts. The importance of loss of habitat to support biodiversity is magnified in areas like this that have few remaining forest stands.

I hope the broader ecological costs, globally and locally, of this loss will be considered by the township, especially given the goal of reducing emissions stated in the Lower Merion Township Environmental Action Plan.

Sincerely,

Adam Langley
Associate Professor of Biology
Adam.langley@Villanova.edu

Appendix

Methods

We estimated the biomass of each tree using these allometric equations for species groups based on the diamtere at breast height: https://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/2004/ne_gtr319.pdf

To determine how quickly CO_2 would be released from wood upon harvest we used a mean residence time of wood of 20 years (Profft et al. 2009). We did not consider understory contributions. To extrapolate to soil C loss we considered the fact that in temperate forests, 60% of ecosystem C is in the soil (Dixon et al. 1994) and that removing a forest releases an average of 30% of soil carbon over 10 years (Murty et al. 2002), with continued losses thereafter as soil can take centuries to equilibrate to new conditions.

To estimate carbon gain from planted trees we looked at ecosystem-scale carbon accumulation rates which are low (compared to loss rates) and linear for temperate deciduous forests (Cook-Patton et al. 2020). The greatest potential gain from replanting would be proportional to the land area (that fraction is unclear in this case – about half?) that is replanted and wouldn't be realized until those stands reach maturity (>100 years).

References

Chojnacky, David C., Linda S. Heath, and Jennifer C. Jenkins. "Updated generalized biomass equations for North American tree species." *Forestry* 87.1 (2014): 129-151.

Cook-Patton, Susan C., et al. "Mapping carbon accumulation potential from global natural forest regrowth." *Nature* 585.7826 (2020): 545-550.

Dixon, Robert K., et al. "Carbon pools and flux of global forest ecosystems." *Science* 263.5144 (1994): 185-190.

Murty, Danuse, et al. "Does conversion of forest to agricultural land change soil carbon and nitrogen? A review of the literature." *Global Change Biology* 8.2 (2002): 105-123.

Profft, Ingolf, et al. "Forest management and carbon sequestration in wood products." *European journal of forest research* 128.4 (2009): 399-413.