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MEMORANDUM

FROM: Robert Larson, Acting Director
Transportation and Regional Programs Division

TO: EPA Air Division Directors, Regions I - X
State and local agencies involved in preparing SIPs and conformity determinations

SUBJECT: Guidance on applicable methodologies to account for the benefits of infill in SIPs and conformity determinations

I. Introduction

The attached document, "Comparing Methodologies to Assess Transportation and Air Quality Impacts of Brownfields and Infill Development," EPA 231-R-01-001, was prepared for EPA's Office of Policy, Economics, and Innovation. This document discusses four methodologies to quantify the air quality benefits associated with infill development. "Comparing Methodologies" contains valuable information that will be helpful to areas that want to quantify air quality benefits of infill development and should be used in considering the methodologies available.

The purpose of this memorandum is to provide guidance regarding the use of the methodologies from "Comparing Methodologies" in preparing state implementation plans (SIPs) and transportation conformity determinations.

In addition to the information in this memorandum, areas that would like to calculate the benefits of infill development should rely on the guidance document called "Improving Air Quality through Land Use Activities," EPA 420-R-01-001, published January 2001. This guidance discusses statutory and regulatory requirements that must be followed when including the benefits of land use activities in SIPs and conformity determinations. It is available on our website at http://www.epa.gov/otaq/traq (then click on "Sustainable Development"), and can also be obtained through the National Service Center for Environmental Publications, by calling 1-800-490-9198.

As discussed in EPA's "Improving Air Quality through Land Use Activities," areas that want to quantify the benefits of a land use activity, such as infill development, must consult on the

methodologies and assumptions that are used in SIP development and conformity analyses. Emissions benefits from infill projects should be based on the best information available, and areas should ensure that double-counting of infill benefits does not occur. The transportation conformity rule (40 CFR 93.105) requires a consultation process be established for evaluating and choosing models and the latest assumptions used in conformity analyses. For example, in metropolitan areas, the metropolitan planning organization (MPO), the state air quality agency, the Department of Transportation (DOT), and EPA must consult on the models and assumptions before they are used for conformity. Areas should also consult with their EPA Regional office when quantifying the emissions impacts of infill for SIP development.

When would an area use one of these methodologies?

Overall land use patterns are captured in regional transportation modeling that is used in SIP development and conformity determinations, because population and employment forecasts must be made for the amount of travel and emissions to be estimated. Areas may decide to include the impacts of infill development in the regional transportation modeling used in SIPs and conformity, and if so, they would not use any of the methodologies described in the "Comparing Methodologies" document. They would capture the air quality benefits of the infill within the overall results of their transportation modeling. We believe this is a valid way to capture the benefits of an infill development, and a good method to use particularly when the infill development is large. Because the benefits of the infill development would be captured in the overall results, areas would not know the precise amount of benefit that an infill development would have.

Nevertheless, an area may not be able to capture the benefits of infill using the overall modeling process. First, a single infill development is often too small, relative to the size of the geographical units used in the transportation model, for it to affect the overall results of the transportation modeling. Second, an area may need to determine the benefits of an infill development at a time when the transportation modeling has already been done and will not be done again for several years. Third, an area may need to quantify the benefits from infill separately, rather than as part of the overall transportation modeling done for the area, to quantify the specific benefits that result. In these cases, an area could use one of these methodologies in accordance with this guidance.

II. Guidance on the four methodologies

As in "Comparing Methodologies," we use the abbreviations M1, M2, M3, and M4 to refer to the four methodologies. All of these methodologies are a way of answering the question, "if development did not go to the infill site, where would it have gone instead?"[1] These

[1]In quantifying the benefit of infill, the implicit assumption is that when an infill site is developed, the population and employment that would go to the infill site is growth that has already been accounted for in future forecasts. It is not more growth over and above what has been forecast. The population and employment associated with the infill site is growth that is being shifted from somewhere else in the region, rather than being additional growth to the region. This assumption has been made when areas develop long range planning scenarios; EPA

methodologies provide an alternate scenario for development, to be compared to the infill development scenario. Through this comparison, the air quality benefits of the infill development can be estimated. The alternate scenarios are:

M1: The population goes to a single "greenfield" site.
M2: The population goes to the fastest growing parts of the region.
M3: The population is distributed throughout the region, in amounts determined by the local land use model.
M4: The population is distributed throughout the region, in amounts proportional to the distribution of other growth.

Please refer to"Comparing Methodologies" for the complete description of the methodologies.

Given the strengths and weaknesses of the four methodologies, we believe:

- M3 is the best approach, and should be used by areas that have land use models.
- M4 and M2 are preferred approaches in areas that don't have land use models.
- M1 is the weakest of the approaches, and should not be used for SIPs and conformity, but is still useful as a sketch planning tool.

If an area chooses to use M2, M3, or M4 (or a variation of it that is described in "Comparing Methodologies,") the area should follow the steps described in "Comparing Methodologies." Deviations from or adaptations of these steps could be acceptable but must be discussed through the interagency consultation process.

A. Areas that have a land use model should use M3

The purpose of land use models is to assess where new population and development will occur, based on the available land area and local conditions. As indicated in "Comparing Methodologies," regional land use models are suited to answer the question, "How will regional

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believes it is a valid assumption.

However, these methodologies compare scenarios where growth is added in both the infill and the comparison scenario. This is why the question is stated, "if growth didn't go to the infill development, where would it have gone instead?" In these methodologies, the two scenarios being compared have the same total population, but this total is slightly higher than the area's planned forecast. The total is higher by the population associated with the infill development, a very small portion of the total regional population.

Some might argue that this doesn't accurately represent the "no-build" case. However, adding growth to both scenarios is a convenience for calculation's sake, and does not represent an expected increase in regional population. To compare infill with the no-build case, the infill scenario would have to draw anticipated growth from elsewhere in the region, since the assumption is that population will remain the same, regardless of individual projects that are built.

Comparing two scenarios where growth is added in both cases is very similar to comparing a scenario where infill "pulls" growth from elsewhere in the region to the "no-build" case. Therefore, we believe adding growth to both scenarios is a valid way to examine the benefits of infill.

land use change in response to increased infill?" In addition, using a land use model is an objective method to determine where population and employment would occur if the infill site is not developed. Land use models are objective in that they are the least influenced by personal opinion. In M3, the land use model chooses where growth would go if the infill site were not developed. Therefore, results should be replicable regardless of who runs the model. Given their purpose and their objectivity, we believe that land use models are the best method of developing an alternate scenario for comparing an infill development, and should be used by areas that have land use models.

EPA encourages areas that currently do not have a land use model to obtain one if they use a travel demand model, given that it can provide an objective basis for transportation modeling and subsequently, emissions modeling. See EPA's "Improving Air Quality through Land Use Activities," for more information regarding land use models.

One limitation of M3 is that land use models may not be able to analyze small developments, if the size of the unit area examined within the model is too big. Land use models must be consistent with the travel demand model used. At best, the size of the geographical unit examined in the land use model can only be as small as the size of a geographical unit examined in the travel demand model, called a travel analysis zone (TAZ). Some land use models use census tracts as the smallest geographical unit examined. We encourage areas, where possible, to refine both travel demand models and land use models to examine smaller geographic areas. Doing so will improve their capability to examine small changes accurately. However, even given this potential limitation, land use models are useful for examining reallocation of population at a broad regional level.

B. Areas that don't have land use models should use M4 or M2

For areas that do not yet use a land use model, we believe M4 and M2 are also acceptable methods.

M4. As discussed in "Comparing Methodologies," M4 is also an objective method, because it is based on travel demand and emissions modeling outputs. M4 provides a way to estimate the effects of growth being "widely dispersed" throughout the region if the infill development were not built. M4 simulates dispersing growth by determining the average VMT and emissions associated with new growth, and multiplying by the population of the infill site. In this way, M4 is essentially a substitute for running a land use model, or adjusting housing and employment characteristics of each TAZ (please see "Comparing Methodologies" for the full description of M4).

One disadvantage of M4 as described in "Comparing Methodologies" is that it attributes all changes in VMT and emissions over time to new population. It does not separate out the effects of additions to the transportation network, or new emission reducing technologies or regulations. However, though average emissions may be overestimated

or underestimated, that over- or underestimate is applied to both the infill case and the comparison scenario, so we believe that this drawback is relatively minor.

M2. Another option available to areas that don't use a land use model is M2. As in M3 and M4, M2 is an objective method, in that it relies on the model to distribute new growth. In M2, growth is distributed to the fastest growing travel analysis zones (TAZ). M2 could be applied using different cut-off points for the number of TAZs, e.g., areas could:

a. distribute growth to the 20 fastest growing TAZs, in proportion to the percentage of new growth going to suburban and urban areas;

b. distribute growth to a percentage of the total TAZs, such as the fastest growing 10% of TAZs;

c. calculate the mean growth and standard deviation of TAZs, and distribute growth to the TAZs where growth is greater than or equal to three standard deviations above the mean;

Please rely on"Comparing Methodologies" for a full description of the methodology and its variations.

The disadvantage of options (a) and (b) is that no solid basis exists for either choosing a particular number of TAZs or choosing a particular percentage of areas in which to distribute growth. However, we believe this drawback is minor. Even if as few as the 20 fastest TAZs are chosen, growth is distributed in a way that is replicable, comparable, and conservative. Areas should consider the size of the infill project when determining how many TAZs would be reasonable. The larger the infill project, the greater the number of TAZs should be chosen for the comparison scenario. The number of TAZs chosen when applying M2 must be agreed to through the interagency consultation process, but we believe areas should choose at least 20, as was done in EPA's "Comparing Methodologies" study.

We recommend that areas with a large number of TAZs choose options (b) or (c) rather than (a). For example, in an area with 500 TAZs, assigning the infill growth to just 20 TAZs only spreads the growth into 4 % of the TAZs. Such an area may decide to assign the infill to 10% of their TAZs, which would be 50 of them. Areas should select enough TAZs to reasonably represent how growth is occurring in the area. The percentage selected should be decided on through the interagency consultation process.

C. Circumstances where M1 is appropriate

In M1, the development of an infill site is compared to a scenario in which the infill growth goes

to one, two, or three "greenfield" sites in the area (please see "Comparing Methodologies" for the full description of the methodology).

EPA believes that M1 has several disadvantages and the other methods are superior and more appropriate for quantifying the benefit of infill in a SIP or in a conformity determination.

What are M1's disadvantages?

The main disadvantage of this approach is that choosing a site for comparison is done subjectively. With M1, it would always be possible to find some site that is farther away than the chosen infill site. Therefore, regardless of where the infill site is located, it would always be possible to choose a site farther away that would thus generate a greater amount of VMT and emissions if the infill growth were to be allocated there. In this way, M1 is subjective: its results can be influenced by the comparison site that is chosen. For example, suppose an infill development is on the edge of a town; it doesn't have an air quality benefit when analyzed with M3, M4, or M2. It would still be possible to show it has an air quality benefit using M1, because a comparison site could be chosen that is even farther away than the infill site. In addition, this methodology oversimplifies where the alternative growth will go by allocating it all to one site.

When is M1 useful?

We believe M1's primary usefulness is to illustrate the effects of location choices. M1 can be used as a sketch planning tool to show that infill growth results in fewer VMT and emissions, compared to growth that may be occurring on the edge of the region. While this method is not appropriate for SIP and conformity analysis, areas can use M1 when comparing different scenarios, such as analyzing alternative scenarios under NEPA. As a sketch planning tool, M1 may have some advantage over the more detailed approaches of M2, M3, and M4. For example, M1 is conceptually easy to understand and therefore may be the best way of demonstrating the benefits of infill to people who are not familiar with the intricacies of land use, travel, and emission models.

III. Other Methodologies

EPA recognizes that areas may develop other methodologies that are equally valid as M2, M3, and M4. For example, areas may decide that rather than add a small amount of population to both the infill and the comparison case, as occurs in these methodologies, they would prefer to retain the population total that has been established. While the approaches outlined above in most cases augment established population totals with a small amount of additional development, a preferred approach may be to add development to certain zones – "receiver zones," while simultaneously subtracting growth from other zones – "donor zones" – to retain the original approved regional land-use totals. Doing so would ensure that development scenarios may be reasonably compared against existing model estimates, which may eliminate the need for an additional model run.

IV. Conclusion

Areas should examine the information in "Comparing Methodologies" as well as this memorandum in determining how to quantify the air quality benefit of infill development. Questions regarding these methodologies should be directed to Geoff Anderson at (202) 260-5044; questions regarding this guidance memorandum should be directed to Laura Berry at (734) 214-4858.