DISCUSSION by John M. Bell, Purdue University, Lafayette, Ind.

The authors have presented a unique approach for estimating, on the basis of available data, the change that can be expected in the next 30 years in the physical and chemical nature of municipal refuse. Their approach of categorizing the material into those specific constituents which can individually be reasonably examined for future trends in national consumption is a most appropriate one.

The methodology developed to predict future quantity and quality of refuse for any specific locale in the country is summarized in Table 13. These equations require, however, as indicated by the authors, that base data on present quantity and quality be available for that locale.

Although the authors have indicated numerous times throughout their paper that their data are strictly national averages (in some cases, state averages), it cannot be emphasized strongly enough that these data should not be promiscuously used as representing any and/or all particular locale(s). It not only "may not have any validity", as the authors suggest, it probably does not have any validity.

It is believed that the authors' warnings about the usefulness of the specific data they have presented are somewhat stifled by their mention of the "relatively small 95 percent confidence limits" in column 6 of Table 4. These values are artificially low because they are based on standard deviations of sets of data which are, in themselves, probably means. If the original data are not means, then one could question their value on the basis of their being a likely representative single sample.

Seven years of research experience by the discusser at Purdue University in the development of sampling methodology has indicated that there is little usefulness of "national averages". For example, the combustible portion of municipal refuse was found to vary anywhere from 20 to 75 percent. Such variation is due primarily to the local practice and/or regulation concerning backyard incineration.

The authors are aware of this significant aspect, I'm sure. In fact, it is the very realization of the extreme variation in the quantity and quality of municipal refuse from one locale to another which necessitated their use of the "yard-waste-free" and "miscellaneous-free" basis.

The discusser can appreciate the frustration of the authors in their attempt to obtain some reliable data to calculate "national average" values on which they could apply their methodology for projections. As they stress throughout their paper, and rightfully so, there is an appalling lack of "good" or "useful" data available in this country on the nature of municipal refuse.

The sampling methodology to obtain the data needed at any particular locale is available. I refer you to Appendix A of the American Public Works Association' publication entitled "Municipal Refuse Disposal", 2nd Edition, 1966; and to the next paper to be presented at this Conference.

After such sampling and analysis is performed, then the methodology presented by the authors would be most applicable for purposes of obtaining projection data which we are going to need to adequately manage the collection and disposal of municipal refuse in this country.
velopment, however, can only be considered preliminary.

To be more specific, the predictive equation for the total (municipal) refuse load for a given locality and year is obtained from the product of four estimates: (1) the percent collected, (2) the predicted total population, (3) the per capita generation rate in 1968, and (4) the total change in the generation rate since 1968. The bulk of the paper is devoted to the development of these estimates and this is where the problems arise.

Both (1) and (3) (the percent collected and the 1968 per capita generation rate) depend entirely on the quality of a municipal-refuse generation estimate originally made for New Jersey. They also depend on the assumption that the only source of variation from this estimate is caused by regional differences in the yard waste generated. There are many other possible sources of regional variation that can be suggested: the degree of urbanization, seasonal effects on other categories, the standard of living, ethnic or cultural differences, the amount of demolition and construction taking place.

These same sources of variation could drastically effect the composition of a region’s municipal refuse. This, in turn, would alter the calculation of estimate (4) (the total change in the per capita generation rate since 1968).

Also note that the complete scope of solid waste has not been considered. Projections have been made for municipal solid waste only, industrial and agricultural solid waste are not included. California and New Jersey estimated that municipal solid waste was only about one-third of the total solid waste being generated within their jurisdictions in 1968.

In conclusion, the impression received from reading the paper is that the techniques and data presented can be used to project the future solid waste burden on a regional basis, when in fact they cannot.

AUTHORS’ REPLY to John M. Bell

We wish to agree with Professor Bell’s comment upon the objective of our paper: to develop a national average refuse composition. Although we suggested a technique to provide a first guess at a composition by state, this reflected more our desire for such a guess (rather than no guess at all) for the purposes of estimating the state-wise variations in incinerator air pollution (as it relates to compositional effects) rather than to imply that we could, indeed, accurately predict these compositions.

Our comments regarding the “small 95 percent confidence limits” were more intended to strengthen our argument that a national average domestic/light-commercial refuse composition is a valid concept than that the limits shown reflect the possible variations to be expected.

AUTHORS’ REPLY to Paul Britton

In general, the opening criticisms of Mr. Britton are valid, viz. the results (total quantity of municipal refuse collected for disposal) are dependent upon weakly founded estimates. We also are unhappy at the limited data base for percent collected and generation rates. Indeed, we were most grateful to the discusser’s organization (BSWM) for the data we had. Continued pursuit of such data by BSWM and others will be useful to future researchers in this area. Unfortunately, however, we could not wait and although we would accept the prefix of ‘preliminary’ to our analysis and results, we have not seen better.

The assumption that regional compositional variations are predominantly due to differences in the yard waste and miscellaneous categories seems borne out by the data. The composition of refuse (on a yard waste and miscellaneous free-basis) from a number of widely different areas seems to fall into a relatively narrow range of values. Since we were seeking a national average refuse composition, these results were encouraging. The projections for this sub-set of refuse categories (note that our technique treats growth in each category separately) may not, therefore, be greatly in error.

The attempt at regionalization of the refuse composition projections can and probably should be viewed as a vernier trim on a rough estimate. For the purposes of our NAPCA effort, and to suggest trends, however, the attempt was pertinent and useful.

That our analysis does not extend to industrial or agricultural waste was explicitly stated in the paper. Given that, whether or not our analysis provides a precise estimate of average regional solid waste burden has yet to be shown. Thus, Mr. Britton’s closing remark seems unduly critical in view of the limited data base. Until such data and more rigorous techniques are available, our method and conclusions may be useful to state and regional planners. However, they are no replacement for quality data taken at the local level.