SUBURBIA: SATELLITE OR SPRAWL

By Roland B. Greeley*

(First of two papers presented at a meeting of the Sanitary Section, B.S.C.E., held on October 1, 1958.)

My major objective in this paper is to raise with sanitary engineers some basic questions in the borderline zone between sanitary engineering and comprehensive planning. City planners, and the political entities which they serve, are making major decisions on assumed answers to these questions every day. I believe our assumed answers are, at least, in the right direction; but I am not sure. If the sanitary engineers can give us reliable information we may be able to avoid very serious mistakes. As a minimum, these mistakes, if they be mistakes, will cost our metropolitan areas many millions of dollars in the future. As a maximum—well let us just say that the answers to these questions could quite reasonably dictate the future patterns of our urban areas for generations.

I shall present the questions in some detail later on. For now, let it suffice for me to say that they all relate to the devices which may be available to carry water to, and remove sewage from, homes, businesses, and factories of varying density patterns in metropolitan areas of the future.

During the past century we have evolved from a dominantly rural to a dominantly urban society, from a country of farms and relatively small industrial and cultural centers to a vast complex of metropolitan areas, where, at least in the Northeast, the rural farm areas are barely incidents in a vast urban sprawl.

Advances in technology, in leisure time, in standards of living, in attitudes toward nature and open space have made this possible, or according to some, have forced this pattern upon us.

When the factory was tied to the prime mover by belts and pulleys, and the worker's home had to be within reasonable walking distance of the factory, our cities had to be small—10 or 15 square miles in area. Relatively high density of settlement was essential if the city was to grow to a population of 100,000.

As ease in transportation of fuel, and worker-commuting by rail

* Associate Professor of Regional Planning, Massachusetts Institute of Technology.

developed, the effective size of the city became multiplied by a factor of ten, or more. The city could expand to a population of a quarter or half a million with a significantly lower density of land use—with much more open space—without increasing inconvenience and without impairing the essential functions of the urban area.

Then along came electric power, the automobile and the bus, the transportation of goods and materials by truck, and the effective area of the City, or metropolis, was again multiplied by a factor of at least ten.[9] We can now have a metropolis of ten million just as easily as we could have a city of 100,000 a century ago. Or we can have a metropolis of 2½ million, as in Boston, at only one-fourth the average density of the city of 100,000 at the time of the Civil War.

As economic and industrial activities in our Metropolitan areas continue to decentralize, and as the speed and flexibility of commuting increases, we approach a situation where most people could live at what have been considered essentially rural densities and still be within reach of virtually all of the advantages which we have associated with urban centers. For example, all of the population increase forecast for the entire United States in the next fifty years could be housed on one-acre lots and still be within an hour's drive of one or more of the major existing urban centers along the Atlantic Seaboard—from Portland and Albany to Richmond and Norfolk.

Such a pattern may be utterly ridiculous. But the fact remains that significant numbers of us want to live on large lots in the outer suburbs; and in nearly all respects it is quite possible for us to do so.

"In nearly all respects." The qualification recognizes, perhaps most significantly of all, the fact that technological changes in the field of water supply and sewage disposal tend more and more to favor high rather than low densities. The changes have all tended to increase the demand for water, and the load of sewage; but these changes have resulted in greater, rather than less, difficulty in serving relatively low-density areas.

There are several factors involved here, but I want to emphasize only one: the means of sewage disposal in low-density residential areas.

The Massachusetts Department of Commerce has recently conducted a study of "The Effects of Large Lot Size on Residential Development" (published by Urban Land Institute, 1958). A major element of that study was the analysis of the variation in cost of development lots with size of lot. As lots increase in frontage and

area the cost does not increase as a straight-line function, since certain elements of cost can be reduced—width and weight of pavement, sidewalks, etc. The largest single increment is the cost of the public sewer system. Roughly speaking, the lot which must have public sewers will cost about $1000 more than the lot which can provide its own sewage disposal (the breaking point in this Report is assumed to be when the lot attains a size of about one acre). Assuming a "reasonable" raw-land cost of $1000 per acre, the capital cost of a half-acre lot with public sewers is slightly more than the cost of a one-acre lot with adequate septic tank. But if the one-acre lot turns out later to need public sewers, then the gross cost exceeds the cost of a two-acre lot, if we assume that the larger lot would never need public sewers.

You may say, rightfully, that I am getting excited about a problem which, at most, only amounts to a couple of thousand dollars per lot. My retort is that whether this amont of money be large or small, it is one of the most significant factors determining our suburban patterns today; that guesses as to whether a lot of a given size will, or will not, need public sewerage are dictating, time after time, our zoning policy, our subdivision policy, and therefore our basic plans of streets and land use for a matter of generations or even centuries.

In the highly critical band of residential densities ranging from two or three families per acre to only half a family per acre, we are confronted with the following premises:

(1) Any layout that really permits use of private sewage disposal means for each lot is likely to be cheaper (capital cost) than any layout which does not.

(2) Any layout which is most favorable for private means of disposal is likely to be the most expensive to convert to sewers at a later date.

(3) If a sewage system is to be needed in the anticipated future, then some form of clustering (regardless of the over-all density) is more economical.

(4) Unless really small public disposal systems are likely to be feasible, then all clusters must be so laid out that they will fit into a single massive sewerage system.

Obviously many factors other than the cost of sewage disposal do, and should, enter into decisions as to what the basic pattern of

suburban residence should be. Nevertheless, with emphasis currently on the desirability of low-density, and with marginal costs of land a highly-important factor in the competitive market, the economics of sewage disposal actually plays a dominant role. Many decisions are being based on possibly false assumptions as to what type of disposal will work in the long run; many of the decisions might be significantly altered if it were known what the sewerage pattern will eventually have to be.

This makes the following questions, to which I referred above, highly important:

(1) What types of sewage disposal, at what density patterns, can be relied upon?

(2) Can we know enough about long-range costs of sewerage to make realistic gambles?

(3) Are treatment plants (such as "package plants") for small clusters of homes (or industry or business or schools) going to be reasonably inexpensive, and dependable?

(4) Can we hope to understand soil conditions well enough, *before* we build, to prophesy safely where private disposal systems will work?

(5) Is there reason to assume that sanitary engineering technology will evolve fast enough so that septic tanks or cesspools installed correctly now will continue to be useful indefinitely, assuming only such maintenance measures as can be enforced?

(6) What are the criteria governing present correct installation, in terms of soil types, lot sizes, and over-all densities?

I repeat what I said at the outset: Decisions are being made, and will have to be made continuously, which depend upon the answers to these questions. Regardless of whether the decisions are made by planners, health officials, or sanitary engineers, it is up to the latter to provide the technical answers. These answers may be the determining factor as to whether our suburbs expand in a pattern of really low-density sprawl, of many small clusters surrounded by open space, or of tentacle-like extensions from the main core. Whether they are the determining factor or not, they should be available to the planners, and even more important to the public, so as to permit the orderly and efficient growth of our suburban areas.

Let me close with a couple of simple analogies—simple but I think fair:

The highway engineers might readily conclude that the only safe intersection is a full clover-leaf; and that lacking this the next best bets are either stop-lights or a policeman. Still it is recognized that for relative safety and efficiency we can reasonably design simple crossroads with such inexpensive safety and regulatory devices as signs and painted lines, for the vast majority of our worst intersections.

Similarly, most sanitary engineers of twenty years ago plugged for "pure" streams. Then, beginning in the early 1940's, there evolved the concept of basing pollution control on relative rather than absolute objectives, and the systems of stream classification were worked out which are, I understand, now being applied. A class "C" stream is not absolutely healthy, or absolutely safe, or absolutely satisfactory; but it is "acceptable" in many actual situations.

These are both practical compromises with the ideal, recognizing that society seems to prefer to take calculated risks rather than pay for ideal conditions. We are now taking risks, so far as sewage disposal and health are concerned, in laying out new subdivisions, new suburbs. But in most cases these risks are based on intuition rather than calculation. The aid of the sanitary engineers is gravely needed to help calculate the risks—to assess the relative dangers and relative costs of the several practical alternates—and thereby give planners and developers a more reliable basis for the all-important decisions which must be made.