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The ORNL LANDSCAPE DEVELOPMENT PLAN

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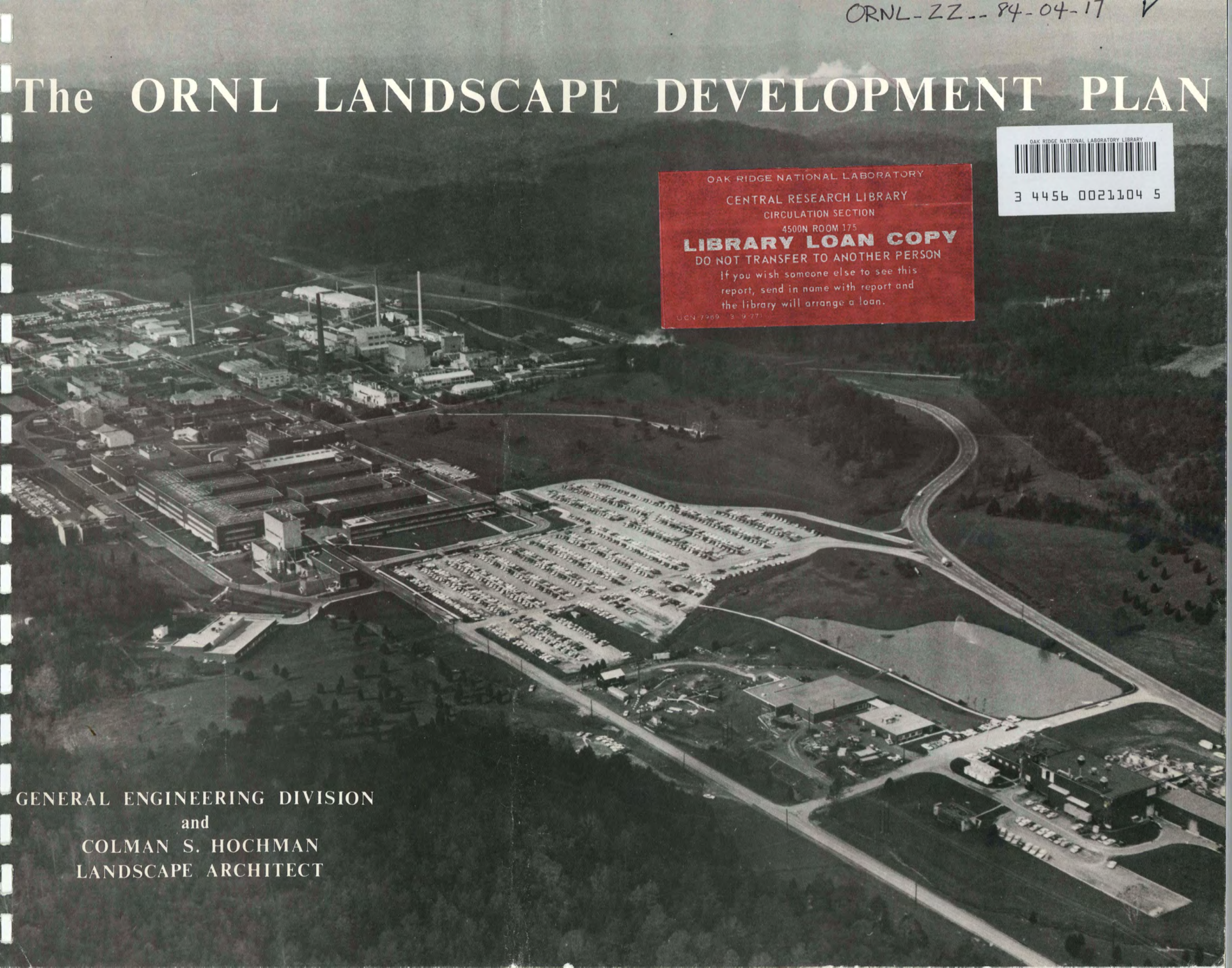

GENERAL ENGINEERING DIVISION
and
COLMAN S. HOCHMAN
LANDSCAPE ARCHITECT

MAY 1969

THE ORNL LANDSCAPE DEVELOPMENT PLAN

In a short span of 25 years, the Oak Ridge National Laboratory has come from farmland to a highly developed and internationally known center of research. Its beginning was in the wartime Manhattan Project. At the end of World War II, it was decided that this assemblage of talent and capability should not be disbanded, and the role of National Laboratory was assumed. As a consequence, Program H was conceived in the late forties and resulted in a nucleus of modern research facilities that cost $19 million.

The Laboratory has continued to grow since that time, and the initial research complex has been extended. The complement of scientific tools – reactors, accelerators, and computers – has been increased. Major accomplishments have been realized in the basic sciences, in reactor and chemical technology, and in isotopes development, and the back-up system of supporting functions has experienced parallel growth. One of the world's most versatile institutes of research is the result, and because of this concentration of capability and the pressure of the world's unsolved problems, the Laboratory is destined to grow.

In the vigorous years past, things being built into the landscape of the Laboratory have not always been given careful attention. This has become a matter of real concern lest future additions permanently damage the true image of the Laboratory. Growth without an overall scheme has resulted in a difficult landscape at best, and there is no understood plan that will result in orderly and appropriate development in the future. The answer seemed obvious: a landscape development plan was necessary. That is the subject of this report.

The ORNL Landscape Development Plan was commissioned in the spring of 1968. The objective was to bring the Laboratory grounds to an acceptable level of appearance in a period of five years. It was also felt that certain guidelines should be established to insure continued development in context with this initial work. The quality of environment to be developed was set as approximating that of the campus of a major university, and the product desired was described as a plan of action rather than a design. The types of action recommended under this plan should provide prompt improvements and should also reduce the burden of maintenance of Laboratory grounds wherever possible.

From limited experience, it was judged that the primary objectives of the five-year plan could be achieved at a spending rate of $100,000 per year for plant materials and their installation. A lesser rate would cause proportionate delay. Construction funds will also be required to solve some problems such as those associated with landscaping within construction projects, relocation of utilities, permanentizing older wood buildings, and other similar projects that will upgrade the Laboratory landscape.

A landscape architect was retained to provide professional assistance, and work on the development plan was launched by systematically identifying all the influential factors related to use of the landscape. The hierarchy of pathways – primary, secondary, and tertiary streets and walkways – was clearly defined. The order of prominence of facilities was stated, and the service and business accesses to these buildings were recognized. The existing features of the terrain and landscape development that have a strong influence were also cataloged. Finally, the proposed additions of new facilities were recorded where there is firm reason for use of a particular site. These basics were provided the landscape architect.

The landscape architect added his own impressions, analysis, and professional judgment to determine the best measures for revitalizing the existing Laboratory areas and for pointing the way for future development. His analysis of the problem areas, solutions, and methods of development form the bulk of this report. A series of broad-brush plans for bringing our existing facilities and grounds to an acceptable level are included, and standards are provided for the organized alignment of repetitive features such as curb and gutter patterns, street signs, and bus stops. Priorities are assigned to the work to be done in the order of importance to the Laboratory scene, and the broad plan for future growth of the central research complex is outlined in schematic fashion. This scheme for future development is not an engineered plan but a natural and graceful extension of the Laboratory as it now exists.

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ANALYSIS OF PROBLEM AREAS

Analyzing the problem areas of the Laboratory, we might first attempt to arrange the characteristics in the order of their visual strength or dominance over the landscape and at the same time with equal measure by the impression they impart. The importance of such an analysis is in discovering the degree of visual organization or disorganization associated with the Laboratory and then working with it. Before attempting to improve the overall appearance of the Laboratory, the main elements that we are attempting to guide must be defined. These elements are catagorized by two groupings: the visual characteristics outside the Laboratory and the visual characteristics within the Laboratory. A descending order of importance has been given each of the lists, but it should be made clear that this order is the impression of the author and not necessarily fact. Furthermore, all of these visual elements are interrelated and all must be considered within a comprehensive framework.

VISUAL CHARACTERISTICS OUTSIDE THE LABORATORY

When viewed from the periphery, the visual characteristics that give a person his impression of the Laboratory are the stacks, utility lines, approach zones, and the main entrance. As illustrated in Fig. 1, the landscape is visually dominated by the many process ventilation and smoke stacks, while numerous utility lines vie for spatial dominance. To the casual observer, the soaring stacks may create a great deal of visual excitement and speculation about the function of the Laboratory. However, the uncoordinated array of utility lines strikes a discordant note.

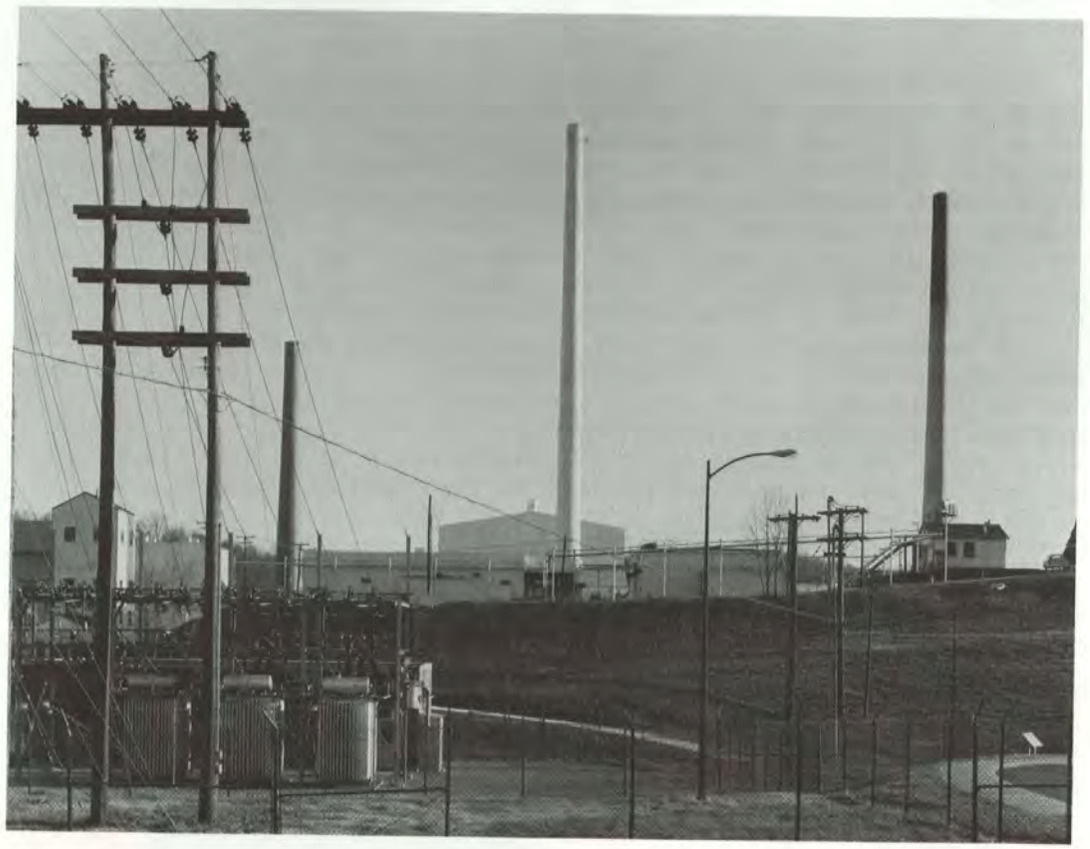


Fig. 1. Stacks and Utility Lines Vie for Dominance of Landscape.

From any one vantage point, utility lines run in a multitude of directions. The closer one approaches the Laboratory proper, the greater the number of utility lines he sees. It is obvious that there has been little coordination or attempt to minimize these lines or to blend them into the landscape. Two examples nearly side by side demonstrate this point. Utility lines run parallel to White Oak Avenue between the 6000 and 7000 Complexes on both sides of the road. To the north, the utility lines are generously spaced from the edge of the road and intermingle with the trees. In sharp contrast, there is a utility line set only a few feet off the paving along the south edge of the road. It appears that all the lines of the road and the utility line converge at one distant point. This forced perspective is undesirable and creates the illusion of utility lines dominating the space of the roadway.

As one approaches the Laboratory from the east, the scene from Bethel Valley Road is a poor one. Near the 7000 Complex, the view of the service portion of the plant is particularly poor, as shown in Fig. 2. Measures are being taken to correct some of these deficiencies. As it is presently handled, parking along Bethel Valley Road detracts substantially from the general appearance, and the new visitors' access to the Graphite Reactor is approached from this road. Current plans call for intensive landscape treatment in this area, but it will not be sufficient to screen out the adjacent substation. It seems as though a facility that by its very nature is offensive could initially have been located in an area away from the only access road or architecturally treated in a better manner.

As illustrated in Fig. 3, it is extremely difficult to visually distinguish the main entrance of the Laboratory from that of a parking lot. There is no feeling of beauty or spaciousness here. Furthermore, the traffic pattern is conflicting and somewhat awkward. In total, there is no feeling of entry as one approaches the main entrance to the Laboratory.

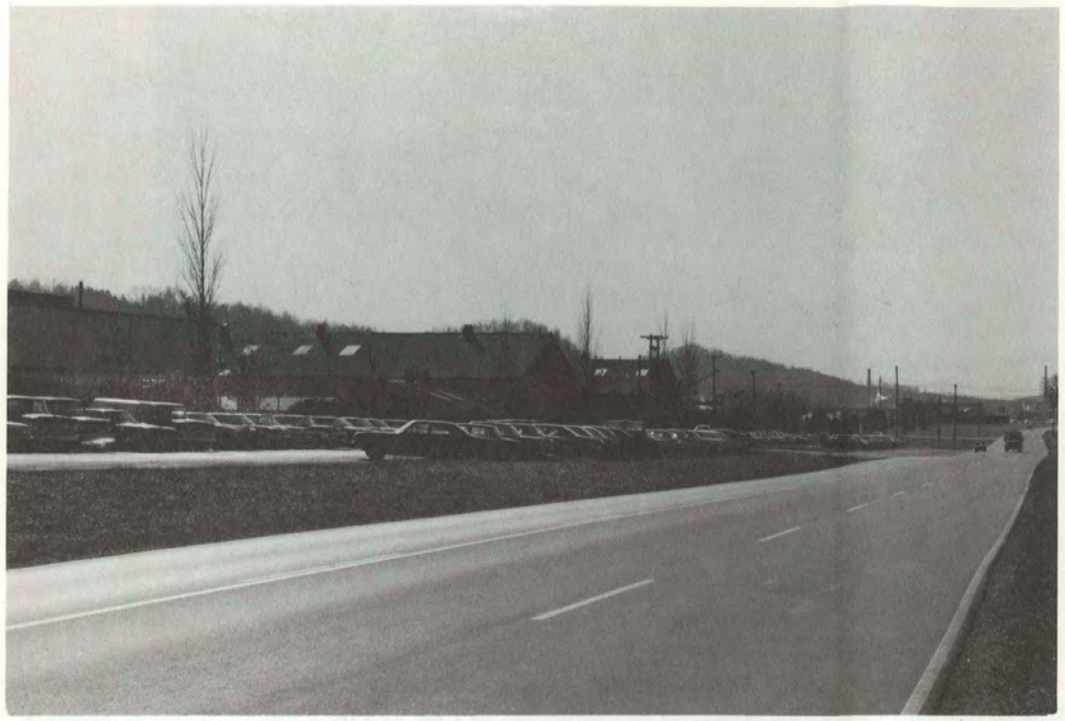


Fig. 2. View of 7000 Complex From Bethel Valley Road.

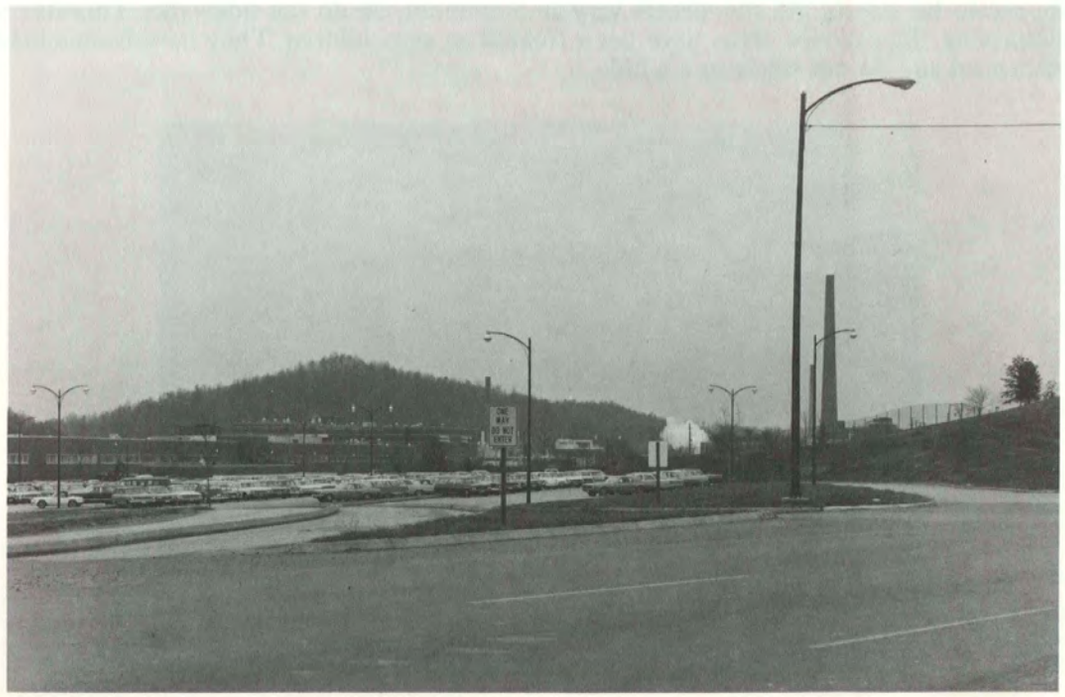


Fig. 3. Main Entrance of Laboratory as Seen From Bethel Valley Road.

VISUAL CHARACTERISTICS WITHIN THE LABORATORY

When viewed from within, the visual characteristics that give a person his impression of the Laboratory include the main entrance point, utility lines, building masses, hierarchy of roads, pavement treatment, land use, landscaping, signs, and the street furniture. These visual characteristics are discussed as they appear in three major areas of the Laboratory: the central Laboratory site, the 7000 Complex, and the HFIR Complex.

Central Laboratory Site

While functional, adequate, and well located, the main portal and immediate entrance areas to the central Laboratory site lack pleasantness and graciousness from both within and without. This is illustrated in the view of the main portal seen from the immediate entrance area that is shown in Fig. 4.

Fig. 4. Main Portal to the Central Laboratory Site as Seen From the Immediate Entrance Area.

The overhead utility lines seen from within the central Laboratory site are visually disturbing nearly everywhere they exist. Their ungainly size, color, repetitious pattern, and slicing through the landscape do not readily contribute to a harmonious composition. As a general rule, when the overhead utility lines run parallel to the direction of movement and sight, they are more obnoxious and more difficult to mask. This is illustrated by the overhead lines along Central Avenue, and they should be removed. On the other hand, the overhead utility lines perpendicular to the line of sight, such as those parallel to Fifth Street when viewed from Central Avenue, are being masked effectively. The overhead steam lines are even more visually distracting than power and communication lines, as shown in Fig. 5. With the relatively few overhead steam lines present, they should be taken down or effectively screened at an early date.

Fig. 5. Overhead Steam, Power, and Communication Lines Parallel to Central Avenue.

An example of the variety in building masses found along Central Avenue is shown in Fig. 6. Because of the extreme variety of uses to which these buildings have been put and because of the long period of time over which they were constructed, the architectural conglomeration exemplified in Fig. 6 exists. Variety is the keynote. The bulk of the buildings vary as to color, scale, surfacing materials, and setbacks; and there is very little that commends them as entities. Consideration is being given at this time to painting the metallic and wood buildings in harmonious colors and emphasizing their better features with accenting hues. For the most part, the brick and limestone buildings are very simple and well handled. However, when seen from the front, the 4500-North building is so large and massive that it does not relate to any other buildings.

While it is quite apparent that Central Avenue is the main road through the central Laboratory site designwise, it lacks the continuity of construction elements necessary to carry this image through visually. There is a change in the width of the paving and sidewalks and in the curbing pattern in nearly every block. There are other roads of consequence within the central Laboratory site, but these also are afflicted with the problem of distinguishing their importance in terms of standardized construction. A definite hierarchy of roads should be established relative to the order of importance of the individual roads so that street widths, sidewalks, and curbs will match from block to block. Within this concept, the access to service areas should be limited to roads of lesser importance to minimize the views into these sometimes unsightly areas.

Fig. 6. Example of Variety in Building Masses Seen From Central Avenue.

The most noticeable aspect of the paving treatment within the central Laboratory site is its continuous variance, as is illustrated in Fig. 7. The most distracting element is that the alignment of streets does not carry through from block to block. For instance, on Third Street below the cafeteria, the alignment north of Central Avenue differs from that south of Central Avenue. Elsewhere, it is frequently impossible to visually distinguish between a service drive and a major street. Rounding of the curb tends to break the straight lines of the street, and these should be continuous. Driveways should be handled with a ramp curb and gutter or with a full curb rather than making them appear to be streets. As the streets vary in alignment, so do the sidewalks. This also is distracting. The service areas have been treated as stepchildren. They have been added piecemeal and do not relate as a whole.

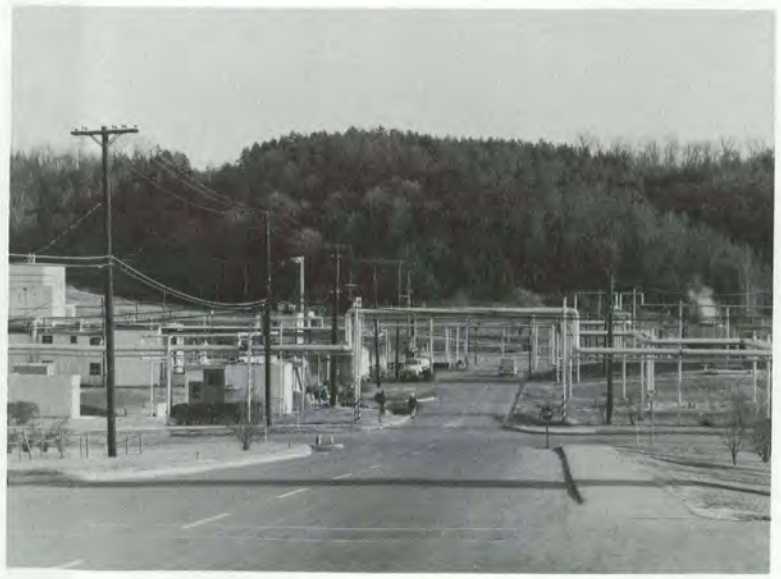


Fig. 7. Variance in Paving Treatment Within the Central Laboratory Site.

The size and bulk of the buildings along Central Avenue and the surfacing materials used on them give very strong indications of the land usage within the central Laboratory site. It is almost obvious that the structures from First Street to Third Street are primarily service buildings because of their one-story treatment. From Third Street to Fifth Street we find taller more massive buildings. This is a development zone. From Fifth Street to the 6000 Complex we find brick buildings with two and three stories that are of more recent vintage. This is the research zone. Central Avenue passes through all of these zones and must unite them.

The landscaping of a few buildings is satisfactory; however, it is nonexistent for most buildings. Street trees, barrier plantings, and similar elements are nearly nonexistent throughout the entire central Laboratory site. This lack of continuity or lack of softening elements marks the difference between an industrial complex and one of campus-like character. Because of the wide variety of buildings, there is no uniform pattern for identifying them. Street furniture in the form of benches, specially paved areas, trash receptacles, and overhead shading structures is nonexistent.

7000 Complex

Overhead utility lines within the 7000 Complex are very minor problems. The only place they are highly noticeable is parallel to White Oak Avenue. These utility lines need some treatment to blend them into a more tolerable landscape.

It is quite obvious that the buildings within the 7000 Complex were constructed of less expensive materials. However, this is accentuated by a wide variety of colors and, in some instances, the lack of recent painting. The mass and size of these buildings is not overpowering because there is a substantial amount of open space between buildings. In order to make this space effective, a large number of trees should be planted within the complex to visually separate the buildings and differentiate one mass from another.

While of secondary importance within the entire Laboratory, White Oak Avenue is a primary artery to the 7000 Complex. However, this road has no definition of bounds within the complex, and it in effect meanders through a cluster of buildings. Because of its central location, White Oak Avenue should be realigned and straightened, suitably paved and curbed, and sidewalks should be added. More than any other element, this road creates a negative appearance within the 7000 Complex because of its low-grade appearance.

Parking or service areas abound in all directions relative to the 7000 Complex, and this lack of definition adds to a messy appearance. Some thought is being given to the removal of the parking areas along Bethel Valley Road, and this will certainly help. Measures are also being taken to create a nice parking area at the west gate to the 7000 Complex south of White Oak Avenue. If handled with care, this could have a satisfactory appearance. Presently, there is no stopping of the gravel or the asphalt paving; it just goes on. To obtain a pleasing appearance, some green areas should be introduced between the asphalt areas and the parking areas should be curbed or otherwise defined from those of grass or groundcover.

Landscaping is nearly nonexistent within the 7000 Complex, and signs are few and of a very commercial nature. The landscaping required within this area consists primarily of the planting of trees. The types of signs decided upon and used within the central Laboratory site should also be used within the 7000 Complex.

HFIR Complex

The immediate entrance to the HFIR Complex, shown in Fig. 8, is of a particularly low character. Parking needs to be handled in a better fashion, and the curves and road lines should be straightened for a more pleasant appearance. Planting of a simple and effective nature is needed immediately in front of the fence. Most of the paving, curbs, and gutters throughout the HFIR Complex are very well handled. Treatment of this high caliber should be applied to the major parking areas seen as one enters the complex.

Fig. 8. Entrance to the HFIR Complex.

The very large buildings within the HFIR Complex are generously spaced a suitable distance from one another with large setbacks, as shown in Fig. 9. Their colors and materials tend to be harmonious, few in number, and of a subtle hue. The continuity and scale within the complex is most pleasing, particularly when considering that these are heavy industrial facilities, and it is very pleasing to feel the large open spaces with the absence of overhead utility lines. However, building entrances are very difficult to find in a few cases; they are in the least likely places.

It is quite obvious that considerable consideration has been given to the creation of pleasant grades and flowing lawn areas around a few of the large buildings. These contribute to overall visual pleasantness. Only a small amount of landscaping has been planted, but most of it is effective. When combined with the contour of shapes, these areas look fine. However, a substantial number of trees is needed within the complex. As the major concentration of buildings is approached, the clay embankments are most noticeable and need immediate attention. While the signs within the complex tend to be standardized, they are not particularly effective.

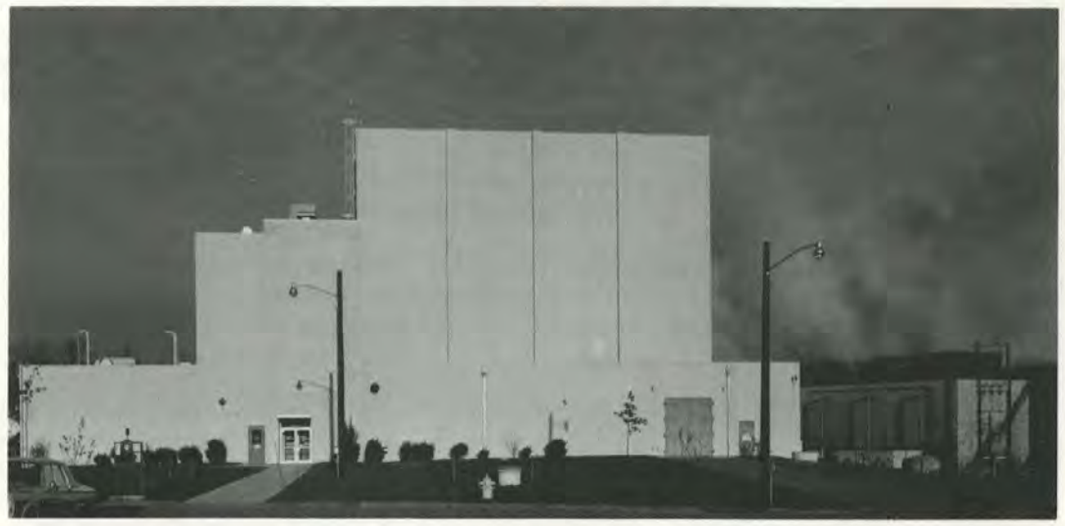


Fig. 9. Pleasing Building Masses Within the HFIR Complex.

NATURE OF LANDSCAPE DEVELOPMENT PLAN

The organization of a coordinated landscape development and improvement program for ORNL is dependent upon an understanding of the controlling factors involved. Primary among these are the physical growth determinants within the overall area, and an understanding of these is necessary for the extension of suitable growth patterns.

Basically, the existing natural buildable area within the central Laboratory site is a relatively flat strip approximately 200 yards wide. This area is defined by a continuous ridge on the north and a creek, which is made physically stronger by an abrupt hillside, on the south. Historically, these determinants have set up a lineal pattern of growth parallel to both the creek and the ridge since crossing either would require expensive engineering treatment. This pattern of growth within the central Laboratory site is illustrated in Fig. 10.

Central Avenue, lying nearly halfway between the creek and the ridge, has followed this historical pattern and has been the major artery around which growth has clustered. Following Central Avenue from west to east, the present basic pattern of land use within the central Laboratory site can be traced, as is illustrated in Fig. 11. Service facilities are located between First and Third Streets, developmental facilities are located between Third and Fifth Streets, and the research facilities are located between Fifth Street and the 6000 Complex. There are slight variances within each of these general areas, but the basic overall pattern is as outlined. The strongest pattern for any further continuation of the general research area would seem to indicate the extension of Central Avenue as the connecting element for all of the building masses.

Within each of the service and developmental areas at present, there is a substantial amount of adjacent land which lends itself to expansion for either additions to existing buildings or for new buildings. The expansion of service and developmental facilities therefore does not present a land planning problem for the future. The problems within these areas require only straightforward solutions, such as high-quality site construction, moderate building treatment, and landscaping, to accomplish the desired physical improvements. However, expansion of the research areas between the 4500 Complex and the 6000 Complex and the surrounding area will involve a large number of variables that will require land planning as well as landscape development.

In making this study of the landscape development at ORNL, it has become obvious that our solution to the overall problem must take two forms. This involves separating the service and developmental areas, those areas requiring no extensive land planning for expansion of individual buildings or for expansion requiring new sites, from the research areas. The landscape development within the service and developmental areas requires building improvements; site improvements, including walks, drives, service areas, curbs, and paving; and the planting of trees, shrubs, and groundcover. Within this context, there are no broad concepts that will affect Laboratory growth and development in these areas. These improvement measures are discussed in the following chapter entitled "Specific Treatments for Laboratory Areas." This discussion includes the areas between Building 1000 and Fifth Street; between the 4500 and 6000 Complexes; the 7000 Complex, which is a service area; and the HFIR Complex.

Expansion of the research areas from the 4500 Complex to the 6000 Complex and development of a landscape treatment concept that will link the research areas with present facilities will require both extensive land planning for growth and landscape development for improvement. Because of its importance to the overall growth and development of the Laboratory, this phase of the plan should be established prior to that for treating the remainder of the Laboratory.

FACTORS INFLUENCING LAND PLANNING FOR RESEARCH AREAS

There is a substantial amount of land available for expansion to the east of Building 4500 North and to the north of the 6000 Complex. There is also a substantial amount of land available between the 6000 and 7000 Complexes. If research facilities were located in this latter area, each might have its own parking lot with good access to the complex as a whole. However, this pattern would be contrary to a very basic theme initiated in the planning for the 4500 Complex. At that time, the basic consideration was to bring all research-oriented personnel together within the closest possible physical distance so that they would have an opportunity to interact with their co-workers. This idea continues to have great validity. If used as a basic consideration in the concept of future growth, the first priority of expansion will be in the immediate area of the 4500 Complex or the 6000 Complex with the outlying areas between the 6000 and 7000 Complexes used for those research facilities whose physical needs would require larger land areas.

The prime area for expansion of research facilities is east of Building 4500 North, and extensive studies have been made to determine the form that this physical expansion should take. With the possible expansion of research facilities by one and one-half times over the next 30 years (an estimate based on past growth), these new building masses will alter the landscape significantly. Their impact upon the land use, the feeling of spaciousness, and the natural setting will be profound. It is from this vantage point that the expansion and development plans have been considered. Specific engineering and program requirements have been discussed with regard to the growth concept in preliminary investigative work and no obviously difficult problems have arisen. However, each new facility proposed for this area will have to be given thorough consideration in the planning stage to determine its relation with the complex as a whole.

Because of limitations to growth and to interaction among individuals, the research facilities cannot be extended indefinitely. They should therefore be grouped to fit the program and site conditions. Within this context, Research Area 1, the 4500 Complex presently within the security fence, would be expanded by adding to Building 4500 North immediately across Central Avenue. This will nearly duplicate the number of square feet that presently exists within Building 4500 North. Such an expansion would provide for the changing space requirements of individual groups presently occupying the 4500 Complex. Those groups requiring more space that are not fixed by heavy investments in equipment can be moved into the addition with relative ease, leaving expansion room for the other groups within the existing building. In this manner, it is hoped that the 4500 Complex can grow in an architecturally suitable way.

By concept, Research Area 2 is comprised of those facilities which lie beyond the present security fence. The work done in this area is either generally related to that done within the Laboratory or it will benefit from the vast concentration of scientific talent within the Laboratory. The building masses within Research Area 2 will be limited to two- or three-story structures and the buildable space is horizontal rather than vertical. In developing the concept for expansion of the research areas, the circulation pattern, parking areas, open spaces, and a linking tree matrix are all factors that must be considered.

Circulation

With further expansion of the Laboratory only a few years away, it would be prudent to consider vehicular circulation in general and major access points in particular. The future of Bethel Valley Road seems to be as an interstate connector between I-75 and I-40. This will substantially increase the amount of traffic on it and change its present character. It should therefore be designed as a limited-access highway. Consequently, it is necessary to seek points of major ingress to the Laboratory to meet the needs of increased vehicular traffic and swift safe exit for peak-hour traffic. An access to the west, one to the east, and a refinement of the present midpoint entrance to the Laboratory will be required in the future.

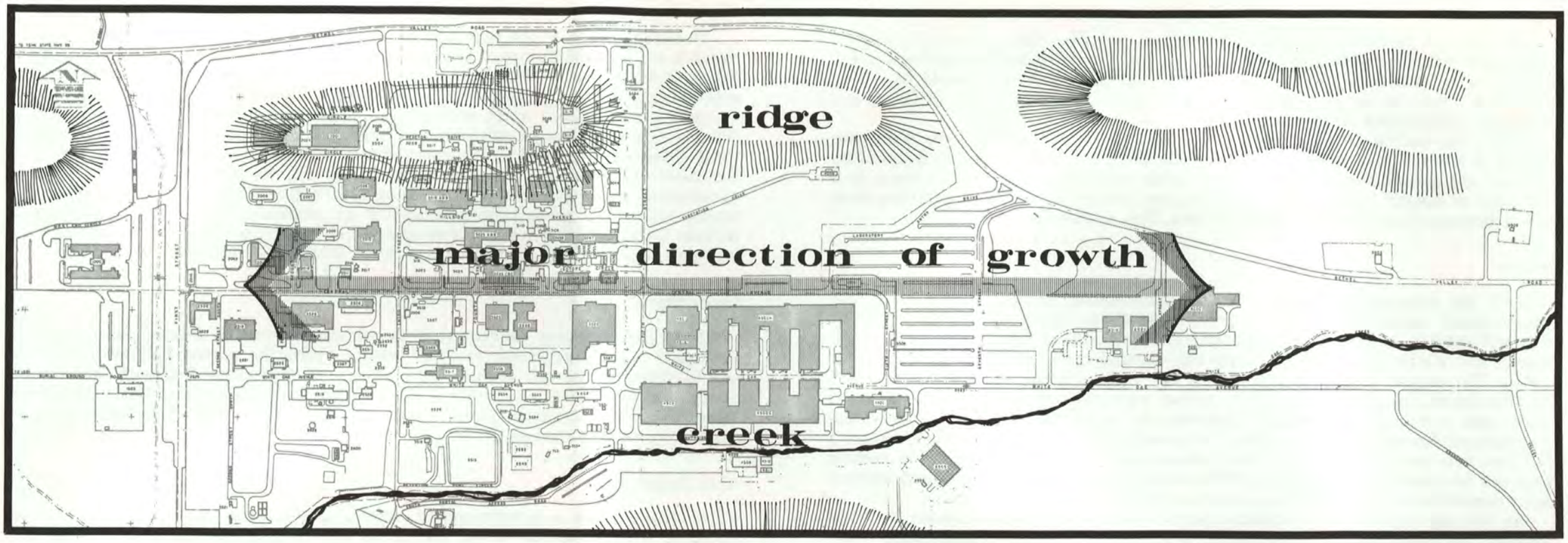


Fig. 10. Influence of Physical Determinants on the Growth Pattern of the Central Laboratory Site.

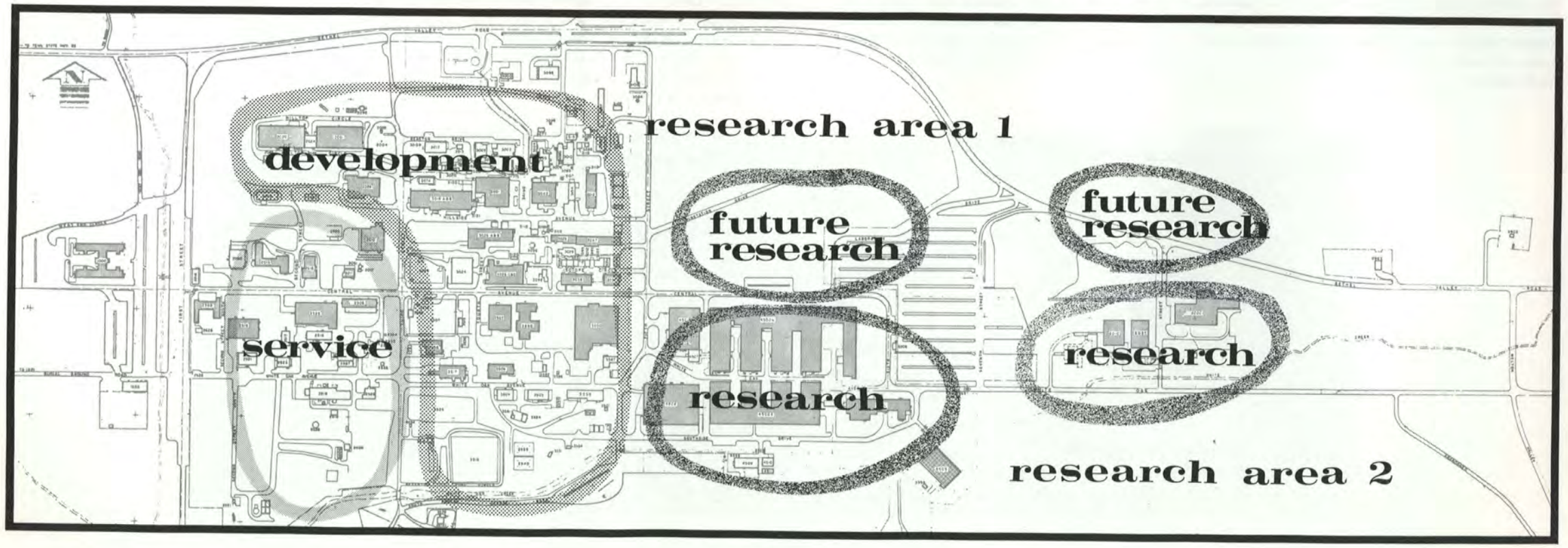


Fig. 11. Basic Pattern of Land Use Within the Central Laboratory Site.

For the west portion of the central Laboratory site, First Street or possibly a street farther west would provide a suitable arrival point. Melton Valley Access Road is well situated as an east access to the Laboratory. The main approach would be a long curved drive through an opening in the ridge into the large open space of the valley, creating an exciting and dramatic entrance.

Within the central Laboratory site, it is quite obvious that there are really two systems of roads. The first provides access from the major highways to the Laboratory area, and the second lies within and immediately adjacent to the security fence. It is quite easy to discern the primary, secondary, and tertiary roads in each grouping from their alignment, length, and terminating points. This is illustrated in Fig. 12.

Parking

With the foreseeable expansion of the Laboratory, parking facilities will not become more numerous or closer to individual offices. Quite the contrary. Parking areas will tend to be farther away and much more costly at times. The people-to-car ratio is also declining, thereby sending the demand curve for more parking space upward. The present concept for parking is that these areas lie along the periphery of the Laboratory site with the building masses concentrated within. This is a sound policy and one that is generally followed in every type of large institutional development. However, if we consider the possibility of expanding Research Areas 1 and 2 to two and one-half times their present size, the problems related to parking space can be appreciated more fully. There is not enough suitable flat ground within a highly convenient walking distance of each and every building.

To put this problem in quantitative terms, we might use as an example the 4500 Complex, including Building 4500 North, Building 4500 South, and Building 4508. These buildings together have a gross area of 943,000 ft^2 and approximately 1545 employees. The average ratio for parking is that one parking space is provided for every two employees. Consequently, 775 parking spaces are presently needed for this group. Based on this ratio, at least two and seven-tenths times the present number of parking spaces will be needed to accommodate 2080 employees. Allowing 130 cars per acre, 16 acres of land would be required to provide suitable parking space. Furthermore, this land should not concentrate the automobile traffic.

In reality, there is not that amount of available land within a 5-minute walking distance of the 4500 Complex. While closer to the 6000 Complex, the acreage south of White Oak Avenue is the single largest resource of flat land. Consequently, three solutions present themselves. The first is to make some walk 10 minutes, the second is to park some distance away and bus people to their job sites, and the third is to provide parking structures south of Building 4500 South across the creek. Any one of these three solutions will raise substantial discussion in time to come. In our plan of the basic circulation system illustrated in Fig. 12, we have shown a parking deck constructed across the creek from Building 4500 South to take advantage of minimally usable space. The present possibilities for an immediate increase in parking space include the area at the northern terminus of Fifth Street within the security fence, the area near Building 1000, and the area south of White Oak Avenue.

Open Spaces

A major organizing element that we can use as a tool to develop the Laboratory landscape is the articulation of open spaces. Within the central Laboratory site, we would propose that the primary open spaces be those identified with the research areas, as shown in Fig. 13. Research Area 1 clusters about an open grassy hillside and Research Area 2 clusters about a pond with the main entrance to the Laboratory cradled in between them in the largest open space.

Tree Matrix

A vital element in organizing and creating spaces is the planting of trees in major patterns. We shall call this a tree matrix for convenience. This would work within the central Laboratory site much as do street trees within an urbanized area. Such plantings usually create smaller spaces within a much larger space. The larger space in this case is the valley, and the smaller spaces are the block or sub-block spaces. We create a unity by using the same tree planting along a road, and this is suggested for Central Avenue. We obtain visual identity with particular functions, blocks, lines, or directions by planting different types of trees in different blocks. Thus, the overall function of the tree matrix is to give scale and humanize feeling. Such a tree matrix is shown in Fig. 14.

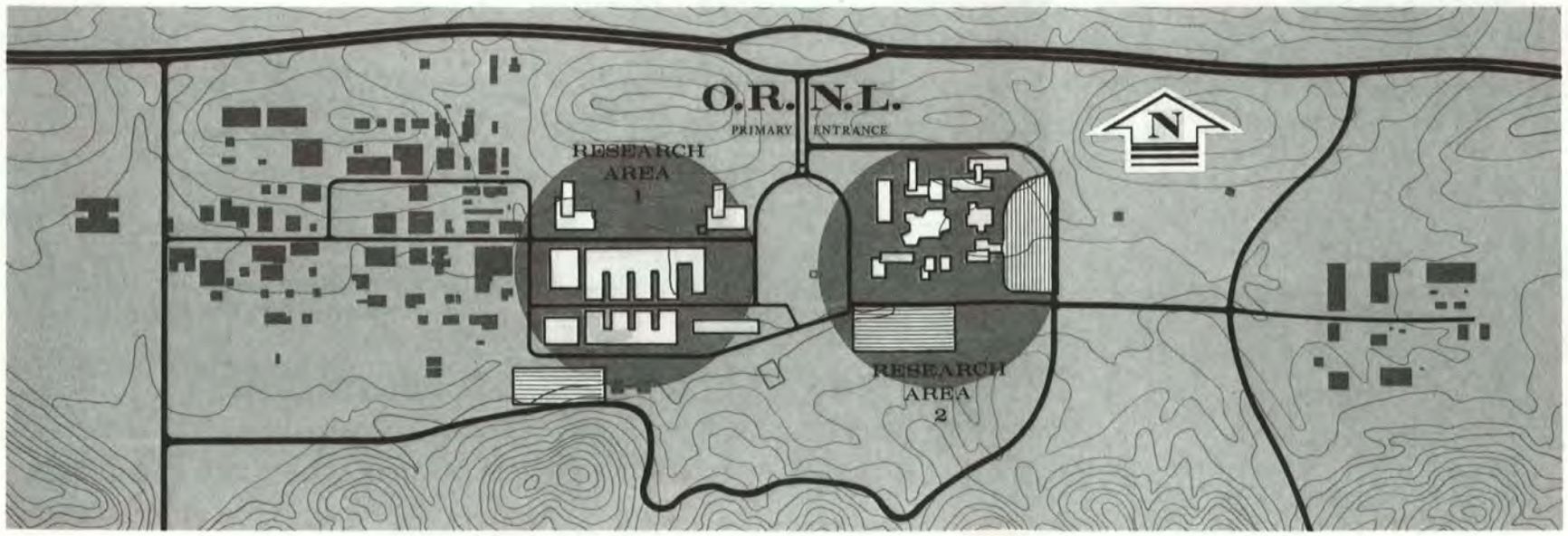


Fig. 12. Circulation Pattern for the Central Laboratory Site.

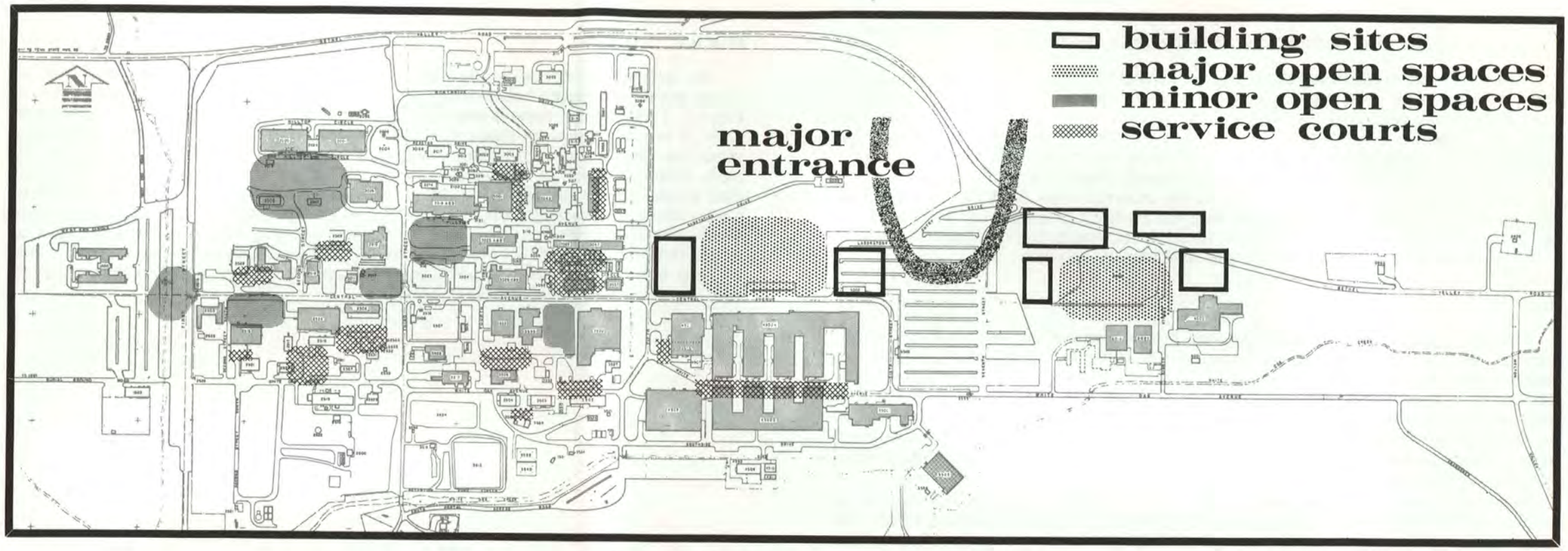


Fig. 13. Spatial Development of Laboratory Areas.

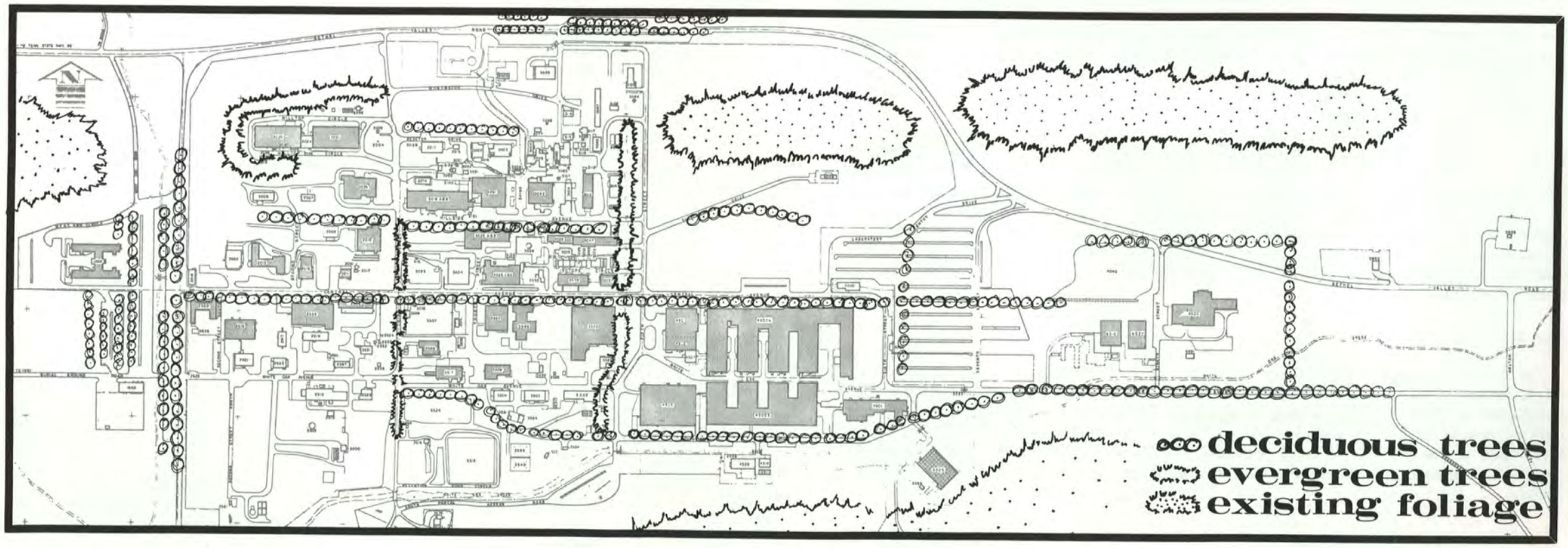


Fig. 14. Tree Matrix for the Central Laboratory Site.

DEVELOPMENT PLANS FOR RESEARCH AREAS

After considering all the factors that have a major influence on the physical growth of the research areas, three plans were devised to direct the orderly growth of these areas. Plan A was conceived for multiphase expansion of two groupings of buildings to form two research areas. Plans B.1 and B.2 represent more distant additions of buildings to the proposed areas of Plan A. However, they represent two different ideas directed toward achieving essentially the same result, which is a substantial addition to the square footage of working space within the research areas. Both Plan B.1 and Plan B.2 are prepared with the assumptions that the building programs can be adapted to the space proposed and that it is more desirable to concentrate additional research facilities within these existing areas than to find another location.

Plan A

The two major research areas envisioned in this plan will be separated by a grand entrance space in scale with the massing of the buildings, as illustrated in Fig. 15. Bethel Valley Road is shown as realigned, and one-way traffic patterns permit easier ingress and egress to the main entrance of the Laboratory. Within this plan there is only one high-rise structure. This vertical element will be the last phase of construction because it is not deemed highly desirable as a pattern of growth within the Laboratory. Such a structure forces a concentration of traffic, but it would permit an efficient grouping of certain central services.

Under this plan, the parking area will remain essentially where it now is, east of Building 4500 North. However, there will be some substantial revisions within the parking area, with trees being planted in the islands in the area. This tree planting and other tree massing, a plaza within Research Area 2, a terraced hillside, and well-developed sites are the main landscape features of Plan A. Trees need to be planted in abundant quantities throughout the site to create a human scale and guiding lines of visual interest, softening the architectural components. While it is intended that the plaza area be very architectural in character and highly urban, it will have broad levels with gentle steps to change grades and will feature a massive piece of sculpture or a fountain. Further definition of this plaza area is dependent upon the architectural character of the buildings surrounding it. They should be carefully coordinated for architectural interest and harmony.

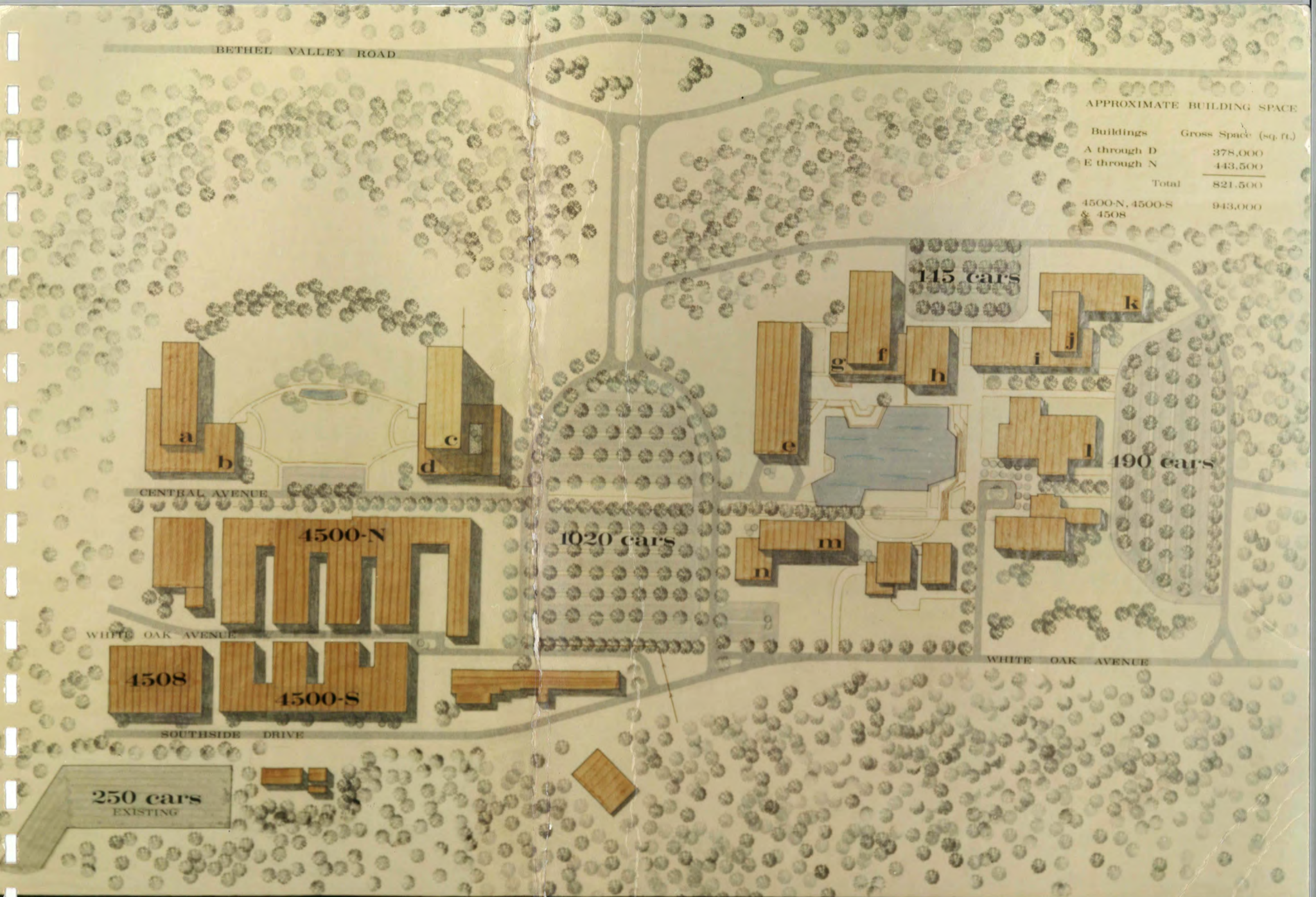
It is recognized that the ideas developed for Plan A are of a preliminary and suggestive nature only and that their reality lies in the fact that additional building masses will be needed in the future, but these buildings are as yet unprogrammed. Consequently, we have made some broad assumptions concerning the height and bulk of those buildings required for the future. They are shaped to relate to adjacent buildings and to create pleasant spaces, as illustrated in the perspective view of Plan-A expansion of the research areas shown in Fig. 16. It is of utmost importance that these qualities continue to be considered as these future buildings reach the construction stage in years to come.

Plan B.1

A direct expansion of the functions in Building 4500 North, as illustrated in Fig. 17, is proposed under Plan B.1. This plan also leaves open the beautiful entrance space developed in Plan A. This entrance space is flanked by three high-rise structures. Parking spaces have been added south of the 6000 Complex and there are two parking structures across the creek from Building 4500 South. However, the arrangement shown is schematic only and does not necessarily represent the true shape of things to come.

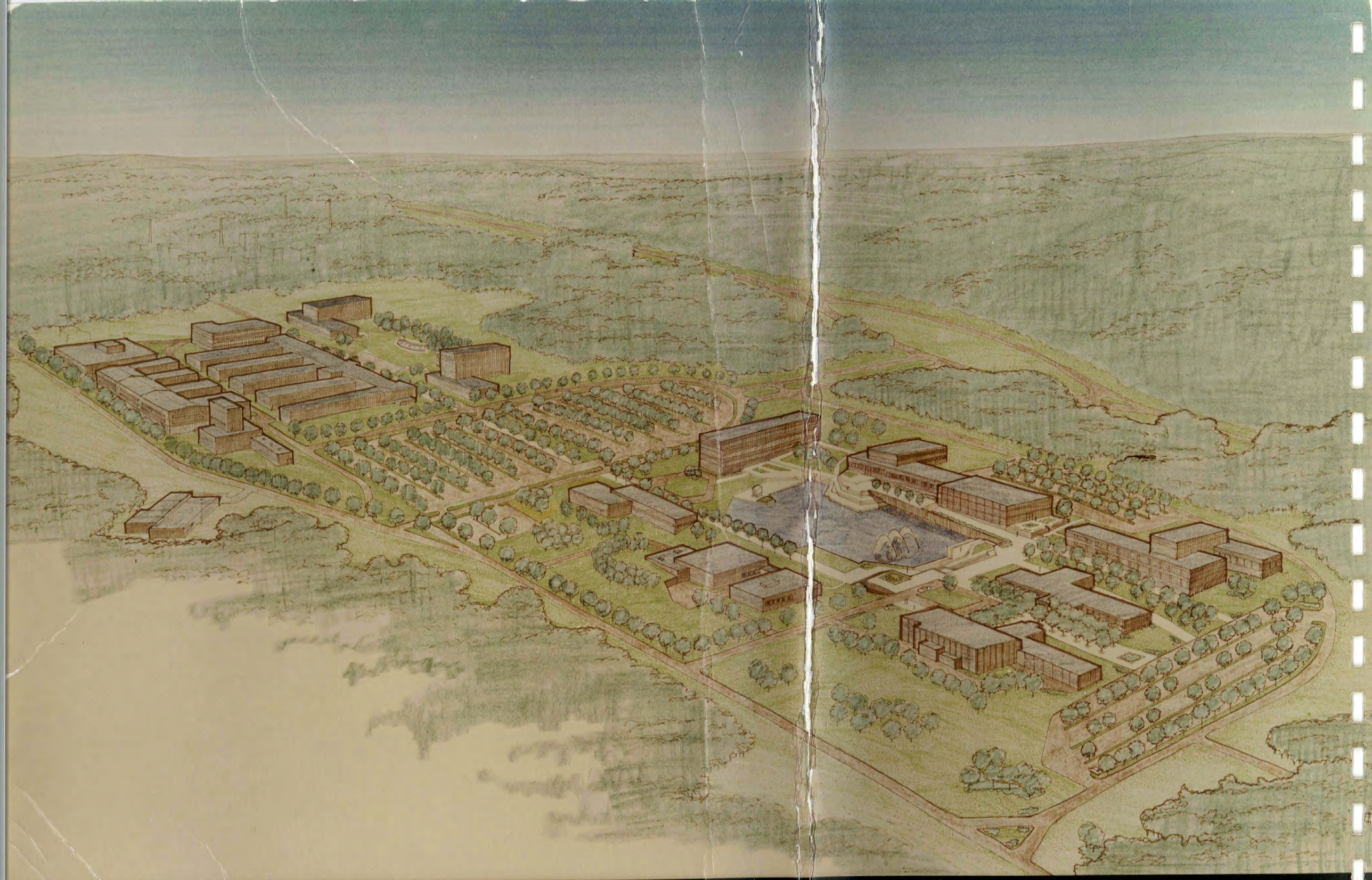
Plan B.2

An extremely large mass through which the automobile would have to pass to attain entry to the main Laboratory area is proposed in Plan B.2, which is illustrated in Fig. 18. This building mass is impossible to comprehend architecturally at a pedestrian scale. It is proposed as an element which the occupants of an automobile whizzing by along the Bethel Valley interstate connector can see and grasp at speeds around 60 mph. There would be a circulation pattern at the ground level of this building mass that would permit pedestrians to be picked up and dropped off and give access to lower levels, which might include parking and service areas. Three high-rise towers would guard the entrance, creating an extremely exciting large-scale mass the likes of which there are very few in the world. Symbolically, this building mass would bridge the gap between that of the previously conceived 4500 Complex and that of future buildings conceived for the 6000 Complex.



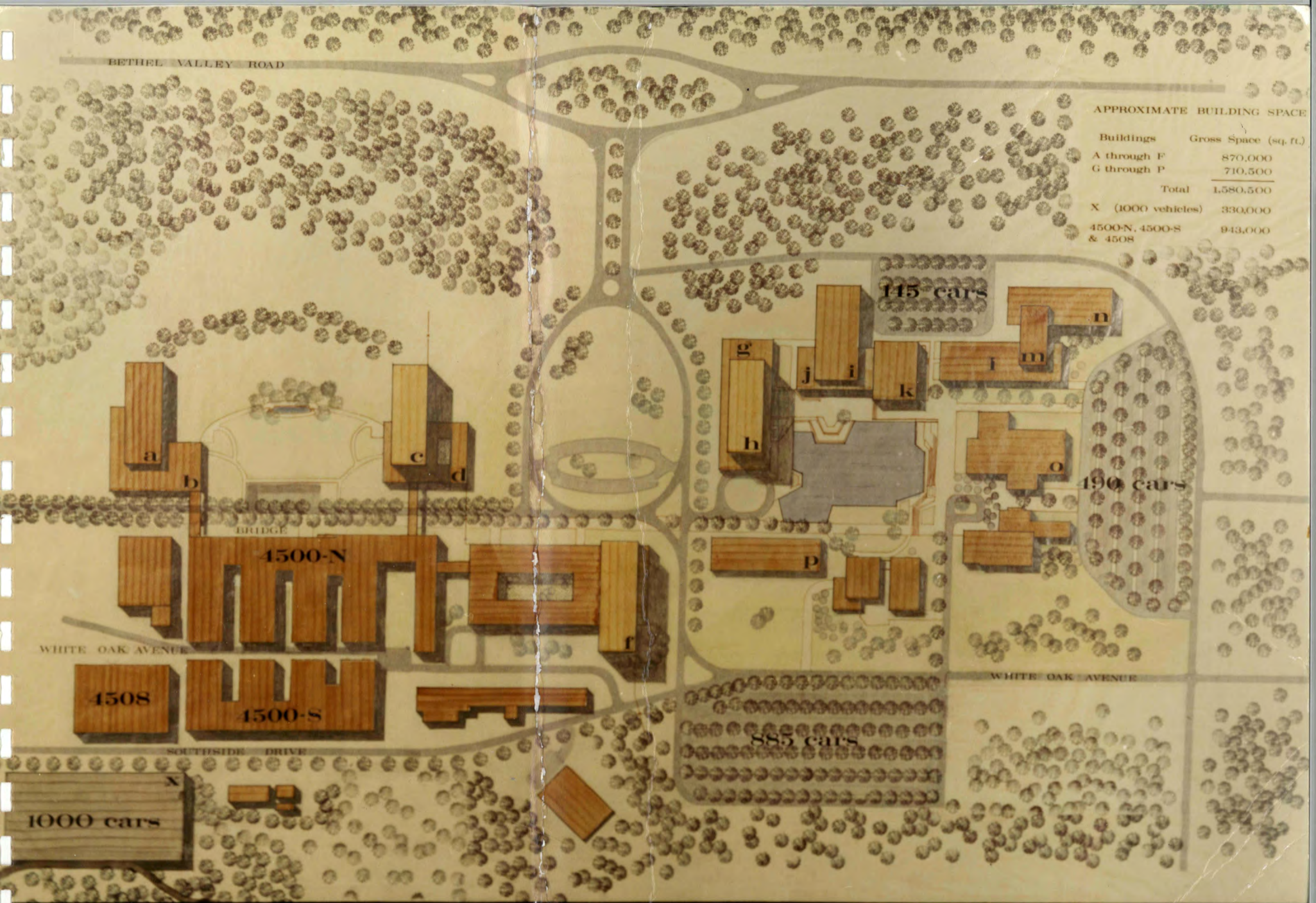
OAK RIDGE NATIONAL LABORATORY
LANDSCAPE DEVELOPMENT PLAN A

FIG. 15



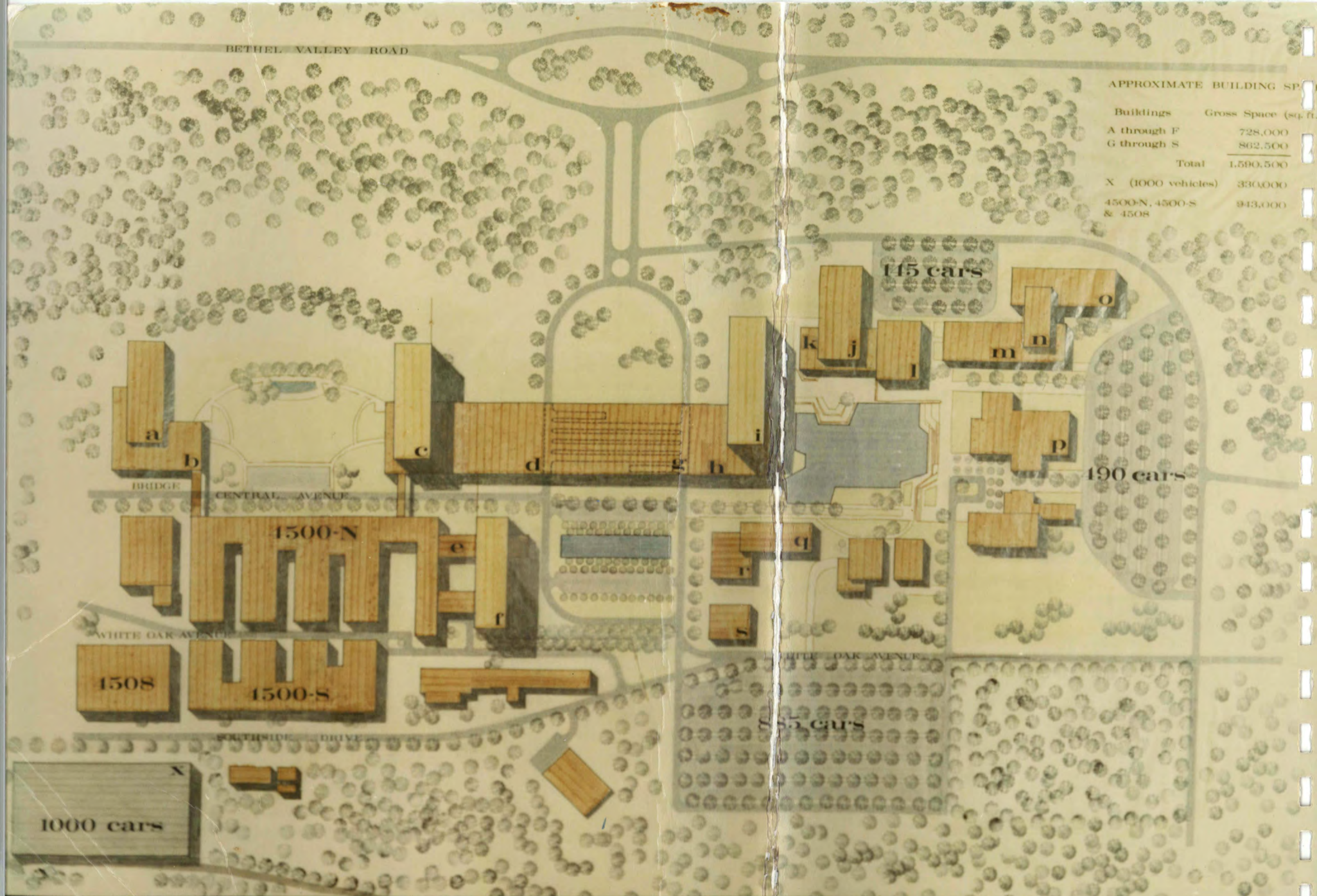
OAK RIDGE NATIONAL LABORATORY
PERSPECTIVE VIEW OF PLAN A

FIG. 16



OAK RIDGE NATIONAL LABORATORY
LANDSCAPE DEVELOPMENT PLAN B.1

FIG. 17



OAK RIDGE NATIONAL LABORATORY
LANDSCAPE DEVELOPMENT PLAN B.2

FIG. 18

SPECIFIC TREATMENTS FOR LABORATORY AREAS

The broad range of specific treatments required to achieve a coordinated landscape improvement and development program are detailed in this chapter. The basic elements of visual landscape improvement are discussed in detail, and plans for their application in specific areas of the Laboratory are described. These measures have been designed from a consideration of actual field conditions and are presented herein as concrete proposals for solutions to aesthetic and functional problems. They are also intended as design considerations that hopefully shall prevent future problems from downgrading the environment.

BASIC ELEMENTS OF LANDSCAPE IMPROVEMENT

The basic elements of visual landscape improvement include paving and surface treatments, architectural treatments, spatial treatments, planting treatments, and street furniture and appointments.

Paving and Surface Treatments

The importance of continuity in the ground plane achieved through the lines of the paving cannot be stressed enough. These lines are one of the basic organizing elements within any complex. Essentially, the parallel lines of the asphalt paving meeting the edges of the curb, the gutter, and the sidewalk lines force a perspective toward a distant but nonexistent vanishing point. These lines running from block to block, all of which should provide a continuation of the same line, are very strong unifying elements and visually ties areas together. The greater the number of lines parallel to each other, the greater the force of continuity. Where they are not carried through or are broken at frequent intervals, visual disruption occurs. Consequently, they should be broken only for intersecting streets and not for driveways or other lesser access points. The only means of correcting this existing poor influence is by replacing those sections that are so constructed and by following a more prudent design course in the future.

Other elements of paving are also important. Specially treated paved areas should be developed in a few places where people congregate. Such areas should be treated with a finer type of paving, benches, retaining walls, and perhaps overhead structures or other elements necessary to create a generally pleasing area. These specially paved areas are treated differently to suggest different functional and aesthetic purposes, such as bus stops, courtyards, a terrace at the cafeteria, front entranceways to major buildings, and other gathering points.

In the service areas of the Laboratory, there frequently are several pieces of paving all connected by a common drive. As an alternate to this, it is proposed that a common drive connect a single large paved area, creating in essence a service court. Rear service areas need to be "squared up" to provide parking within them and, at the same time, to make them more usable. More shall be said about service courts later.

Consistence within each element of paving is important. The same type of concrete curb and gutter should be used throughout the area. Continuing concrete walks should be of the same surface finish and of the same width. Markings of paved areas should also have the same degree of consistency. Specially treated areas are the only design elements in this category that need to be considered individually from area to area from the standpoint of their nature. It is also important that the road alignment maintain the same design characteristics throughout. Standards for major and minor roads and streets within and without the central Laboratory site are given in the supplemental data section of this report.

Architectural Treatments

It is quite obvious that the wide range of building surfaces in the Laboratory is partially due to the wide use of these buildings. However, future building programs should limit the building materials used in general designs to those that will aesthetically compliment the existing structures. In most instances, these materials should be the same as those used in the existing buildings and should reflect the elements closest to the proposed structures. The same might also be said of the bulk or mass of future buildings. These buildings might be treated by following established patterns with one exception. Those buildings set closer than 30 ft to a street should not have additions that would be any closer than this distance to roadways. From an appearance standpoint, buildings located closer than this crowd the roadway and generally create a poor impression.

Additions to existing buildings should be handled in such a way that they do not appear as simple "add-ons" but as visual parts of the whole. Further, any addition should enhance the space between buildings. In many instances, there are only small spaces existing for the addition of new buildings, such as that space between Buildings 3550 and 3500. A small building placed between these two would give the appearance of four small buildings in a row. This would be a very poor solution in this particular area. It would be far more desirable to locate a new building back in line with the second wing of Building 3550. The new building would then essentially bridge the gap between Buildings 3550 and 3500, and the spacing between the four masses would vary and present a much more interesting site.

A scheme to harmonize the vast array of color combinations within the Laboratory is already under way. This program calls for the use of four basic colors with several accenting hues to highlight architectural features of individual structures. These color combinations are to be used for both wood and metal buildings. With judicial use of the combinations, the metal buildings will take on a light appearance rather than one of steel gray and, at the same time, a degree of harmony will be achieved.

Spatial Treatments

Two types of minor open spaces are considered within this classification. By definition, minor open spaces do not structure or create an image within the environment, nor do they occur in a regular pattern. Minor open spaces do, however, provide a pleasant relief. They are more accidental than planned. The two types of minor open spaces are pleasant grassy open spaces and those which we will term service courts.

The first type – the pleasant grassy open space – should be used to visually identify those buildings that create the space. Buildings with more generous setbacks are responsible for these greatly appreciated spots of green, which include space in front of Building 2518, the cafeteria, and between Buildings 3550 and 3500. In the 7000 Complex, a similar type of space might be found just north of the canteen, Building 7067. There seems to be no need to plan such a space within the HFIR Complex because all of the spacing is most generous.

There are many of the second type of minor open spaces – the service courts – within the Laboratory whose visual boundaries do not stop at functional limits or at the edges of paving. The views and vistas within seem endless. The objective here is to consolidate paved areas within the courtyards for more usable space and to visually terminate the views within any single service court. For example, we might look at the area immediately between Buildings 3525 and 3508. One can stand and see in almost any direction several hundred feet of endless paving, utility lines, and a variety of building masses. One can actually see down into the 2500 Complex and over into the area around Building 3503. This is most distracting visually and it actually creates a very low appearance. Service courts are proposed to alleviate this condition. A service court is either bounded by buildings or enclosed with plant materials, including a

7-ft-tall hedge reinforced visually by a combination of evergreen and deciduous trees. It is intended that these courts will be visually smaller than the present areas and that they be divided into suitable areas for all the service functions.

Planting Treatments

Plant materials can be used to perform a wide variety of chores within the Laboratory. We are concerned in this section with what plant materials can do on a small scale. This includes the development of vistas, screens, erosion control, softening of architectural lines and masses, and generally adding a sense of pleasantness about any space. However, it must be stressed that planting alone will not develop this desired pleasant feeling. Planting must be coordinated with consistent and well-developed surface treatments and appointments. We have developed a working vocabulary of plant groupings classified in accordance with their function and obvious size characteristics. These groupings are of large deciduous trees, small deciduous trees, evergreen trees, hedges, specimen evergreen trees, groundcovers, and natural seedlings.

Large deciduous trees are generally used to create masses or lines, such as the tree matrix. We might include numerous species in this category, but for demonstration purposes we will include the Willow Oak, Sycamore, Ash, Ginkgo, False Cypress, Sugar Maple, Tulip Poplar, and the Eastern Poplar.

Small deciduous trees are used to create visual barriers and lines, such as in front of Building 2013, or in informal groupings to show off their flowering or fruiting characteristics. We would include in this group such trees as the Dogwood, Flowering Crabapple, Callery Pear, Hawthorn, Redbud, Flowering Cherry, and the Golden Rain Tree.

Evergreen trees are generally grouped in masses to soften the architectural lines of building masses and to create an upward direction. Specimens used for this type of planting should be selected from among the White Pine, Foster Holly, American Holly, Loblolly Pine, and Cedar.

Hedges would generally be of two heights: either 4 ft or 7 ft. The 4-ft-tall hedge creates a line, barrier, and direction. The 7-ft-tall hedge does the same while also blocking out views. The materials used for the 4-ft hedge would include Japanese Holly, Evergreen Barberry, Juniper, and Jasmine. The materials used for the 7-ft hedge would be mostly Elaeagnus, Weeping Privet, Burford Holly, and Forsythia.

Specimen evergreen trees generally are situated as a focal point within an open space. The primary trees considered for this type of planting are the Southern Magnolia, American Holly, and Bay Magnolia. There are also some deciduous trees that might be considered for focal-point planting because of their year-round interest. These include the American Beech, Ginkgo, and River Birch.

Groundcovers may be required for either aesthetic or functional purposes, such as for erosion control or in areas where grass cannot be mowed. Within the wide grouping of plants that might be used to satisfy some of the requirements of this category are English Ivy, Vinca Minor, Crown Vetch, Honeysuckle, Liriope, Japanese Spurge, Aaronsbeard St. Johnswort, and several others. While grass is a groundcover, it is not included in this concept.

Natural seedlings are used to turn a grassy or cultivated area back to nature. A representative sample of native plant materials is used, concentrating on the more aggressive plants. The primary seedlings for this type of planting should be Loblolly Pine and Staghorn Sumac, and other seedlings that might be used in fewer quantities are Redbud, Dogwood, Cedar, and Locust. Then the area should be seeded or overseeded with Sericea Lespedeza. Over a period of time, these plants will take the shape of a naturally wooded area and seeds from other hardy plants will also become established in the area. This regeneration requires a long period of time, but a forest could be born again. However, the primary task of removing a certain lawn area from regular maintenance can be accomplished in a short time with this type of planting. Within five to ten years, these plantings will mass out and start to make a visual impact.

The above listed groupings have been designed to be understood in masses and do not include individual tailored plantings that will be required for each building for both foundation planting and the immediate area surrounding the building. However, these groupings do set a general tone for landscape development throughout the Laboratory, and this is illustrated in Fig. 19. A suggested tree schedule for the central Laboratory site is as follows.

Location	Type of Tree
Central Avenue	American Poplar
Third Street	White Pine
Southside Drive	Tulip Poplar
White Oak Avenue	Tulip Poplar
Peripheral Route Around 6000 Complex	Ginkgo
Primary Entrance	Willow Oak
Parking Areas	Eastern Poplar, Sycamore Callery Pear, Willow Oak

Street Furniture and Appointments

Within this broad classification of basic elements of landscape improvement are grouped all the visual elements not heretofore covered. These include signs, directional markers, bus stops, utility lines, fences, street lighting, and street furniture such as benches and trash receptacles. Many of these elements are not aesthetically desirable but are functional necessities. As such, they require discretion in their use if they are to visually add to the surroundings. If this is impossible, they should be planned for minimal detraction from the environment.

A concerted effort is presently under way to standardize signs, directional markers, bus stops, and street furniture to attain greater coordination and consistency throughout the Laboratory. Information related to these elements is given in the supplementary data section of this report. Those remaining elements discussed under this classification include the treatment of overhead utility lines, fencing, and street lighting.

Overhead utility lines are certainly the best example of functional necessities that should be treated for minimal detraction from their surroundings. There is no easy way in which overhead utility lines can actually add to the visual enhancement of our environment. They are a prime requisite for any enterprise human beings undertake, and the only pleasant way of handling them is to bury them out of sight. This is not feasible in view of the fantastic number of overhead lines within the Laboratory, and the funds are better spent elsewhere. However, it is feasible to do more selective planning in the future to negate their visual distrations. This would involve better selection of routes for these overhead lines, the use of poles from which lines can be hung in vertical series, and the use of nicer appearing poles. These are only makeshift solutions. The only reasonable solution between that which we hope to obtain and that which we have is to place underground those lines which are the most critical to our design for general pleasantness, to screen plant other lines intensely with evergreen trees, and to place tree groupings in open areas in such a manner that the rigidness of utility pole placement is played down.

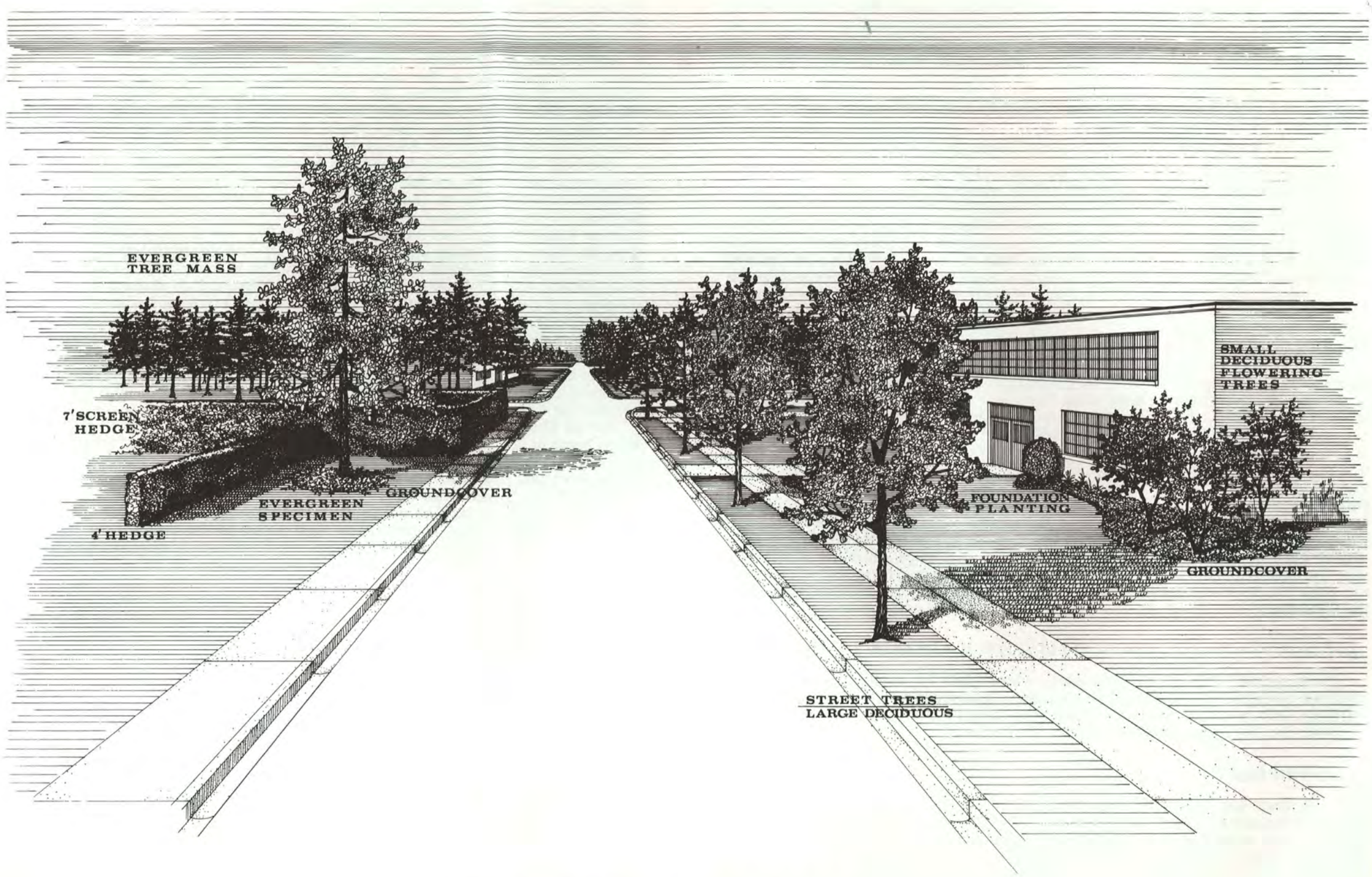


Fig. 19. Use of Basic Planting Groups Within the Laboratory.

Fencing, as presently handled, is a visual problem. As seen when passing by the Laboratory, the fencing gives a prison effect. Of all the basic elements of landscape improvement, this can be more readily handled than any other. Fencing treatment is an item of relatively low cost that will require virtually no additional materials. The prime requisites for fencing treatment include

1. selecting a fencing material that can be painted a green color to hopefully blend with the background and
2. placing the fence in such a manner that it will have a green background.

This can be accomplished by locating the fence so that it will tend to parallel the natural contours rather than a road or a ditch, by varying the distance between the fence and the road, by planting trees on both sides of the fence to give an effect of the fence weaving through the trees, and by setting the fence lower than eyesight wherever possible. The fencing should be treated in a somewhat special manner at main entrances to the Laboratory. Posts might be made out of square tubing and painted black or they might be hidden within a brick column. The gate itself might take the form of square steel tubing or even possibly wrought iron. The gatehouse set between the gates should also be of a pleasing appearance. The present metal ones are not. They could be made minimally attractive if they were painted and trimmed out in an interesting manner.

Street lighting within the Laboratory has a very low order of priority. Relatively speaking, very few people work at the Laboratory in the evening, there are no visitors in the evening, and those who do work there in the evening are familiar with their routes. Consequently, the footcandle requirement throughout the Laboratory is a low one. To give a pleasing effect, the street lighting should be coordinated with the tree matrix and landscape planting in general. For example, the street sections show a street tree planted in repeat fashion every 30 ft along one side of the entire length of the street. On the other side of this street, a clustering of small trees occurs at various points. If we are to make effective use of this pattern, the street lighting should be located on the side of the street where the clusters of smaller trees occur. If it is located on the side with the taller trees, the lighting shall certainly be lost in the trees and its effectiveness reduced. The styling of poles and lamps should be coordinated with the street signs, building markers, and pedestrian lights. The present fixtures are not attractive, and they do not enhance or relate to the architectural treatment within the Laboratory.

APPLICATION OF BASIC ELEMENTS IN SPECIFIC AREAS OF LABORATORY

Those specific areas of the Laboratory where plans for application of the basic elements of landscape improvement have been developed include the area between Building 1000 and Fifth Street, the research areas from the 4500 Complex to the 6000 Complex, the 7000 Complex, and the HFIR Complex.

First to Fifth Streets

More than any other, the area from First to Fifth Streets requires extensive treatment because of its relative importance and the previous developmental practices. The landscape improvement program for this area is illustrated in Fig. S.1 included in the supplemental data section of this report. The main elements of this program include treatment of the West Portal, Central Avenue, overhead utility lines, the visitors' access to the Graphite Reactor, service drives and courts, White Oak Avenue, specially paved areas, and of hillside planting. The order of their listing does not necessarily represent their order of importance.

West Portal Treatment. The West Portal needs to be refined and developed as an entrance, and the planned treatment of this area includes realignment of First Street, removal of the parking spaces near the fence, and the creation of a parking bay on the east side of the creek that is screened from the roadway. A focal point at the terminus of Central Avenue is thus developed. Tree plantings have been suggested throughout the parking area to soften the visual impact.

Central Avenue Treatment. Central Avenue is a spine to our landscape development plan. The cross section of the avenue needs to be standardized throughout, and this standardization should include the walks and curbs. The overhead utility lines paralleling this street should be placed underground. Where this cannot be done with the overhead steam lines, they should be screen planted. A typical planned cross-sectional view of Central Avenue is shown in Fig. 20.

Overhead Utility Line Treatment. As previously mentioned, the overhead utility lines parallel to Central Avenue should be placed underground. A heavy planting of evergreens on each side of the lines parallel to Third Street is needed. A random planting of trees intermingled with the power poles is needed in the open grassy areas between Bethel Valley Road and the Laboratory. In view of the proposed long-range plans, the lines immediately at the entrance of the east parking lot near Bethel Valley Road should be taken down. There is little that can be done with the overhead lines along Hillside Avenue short of putting them underground. A massing of street tree plantings and a massing of pines on the embankment in front of Building 3019 would visually help this area as seen from Central Avenue.

Visitors' Access to Graphite Reactor. The area making up the visitors' access to the Graphite Reactor is particularly significant because of the vast number of visitors who will gain an impression of the Laboratory from this vantage point. This area has been paved and a walkway constructed in accordance with a plan made nearly a year ago, and the first stage of planting has been completed.

Service Drives and Courts. Limiting drives to service areas makes a great deal of design sense in several areas of the Laboratory. Doing this will make the general area neater in appearance and will also provide more useful space. The first areas that should have this treatment are those in front of Buildings 2069 and 2013 and also those in front of Buildings 2011, 2506, and 3024. Visually, it would be highly desirable to eliminate such access in front of Building 3026, but this is functionally impossible. Plans are also under way to limit access to the South Tank Farm. The creation of service courts requires the removal of through traffic, and areas ideally suited for this are between Buildings 3012 and 3044; Buildings 2525, 2517, and 2516; Buildings 2516, 2506, and 2531; Buildings 3525, 3550, and 3508; and between Buildings 3500 and 3587.

White Oak Avenue Treatment. White Oak Avenue passes too close to Building 4505, resulting in a very awkward traffic pattern. Realignment of the road at this point would create a desirable service court at Building 4505 as well as the betterment of the existing traffic pattern. White Oak Avenue between Third and Fifth Streets should be visually terminated prior to its approach to Fifth Street South because of the poor views from Fifth Street into this area. There is one other street that needs to be terminated for visual purposes, and that is Fourth Street. It is not really a street but only a driveway and should be abandoned and the area approached from the other side. Other entrances along White Oak Avenue could benefit materially from appropriate treatment. The same might also be said of Hillside Drive if several entrances along it were redefined and redeveloped. Notably, the drive between Buildings 3012 and 3027 could be omitted altogether in favor of a service court to be entered from the rear.

Specially Paved Areas. The treatment proposed for specially paved areas is detailed in the supplemental data section of this report. The areas proposed for this type of treatment are to the east of Building 2518, in front of the cafeteria, a small area under the trees east of Building 3500, and perhaps a courtyard between two of the wings in Building 4500 North and South.

Fig. 20. Planned Cross-Sectional View of Central Avenue.

Hillside Planting. Planting is of particular importance for the slopes between Central Avenue and Hilltop Circle and Reactor Drive. These slopes are very hard to maintain, and our plan calls for them being planted with groundcovers, native seedlings, and masses of pines. All of these treatments are necessary to reduce maintenance and to enhance the appearance of the area. Similar treatment is planned around Building 2000, extending down to Fifth Street. Other plantings throughout the Laboratory will be relatively simple, with the primary emphasis being upon tree and hedge screen planting.

Research Areas

We have approached a landscape development plan for the research areas on a long-range land-planning basis in the preceding chapter. The recommendations presented in this section and illustrated in Fig. S.2 in the supplementary data section of this report are for a short-term landscape improvement program basic and relevant to the long-range program. Trees should be planted in the east parking lot, and the already developed landscape plans for Buildings 4500 North, 6010, and 6025 should be carried out, including the courtyard between Buildings 6010 and 6025. The paving in the parking area immediately in front of the main entrance to the Laboratory should be removed and replaced with a grass island. This will give a much more gracious approach to the entrance area and remove a large number of automobiles from the view seen from Bethel Valley Road. Scattered groups of trees should be planted throughout the area south of Bethel Valley Road to provide adequate foliage for the future. It is also in this area that the front entranceway to the Laboratory needs redevelopment. However, accomplishing this is dependent upon the realignment of Bethel Valley Road, and as such, it is a measure that must be viewed as a long-term improvement.

7000 Complex

The 7000 Complex has only a few problems that can be solved by landscape treatment, and the plan for this area is illustrated in Fig. S.3 in the supplemental data section of this report. White Oak Avenue should be realigned, and sidewalks and suitable driveway ramps should be added. Street trees should also be planted along White Oak Avenue. Parking and service areas need to be defined, and service areas around individual buildings should be screened much as the service courts in the central Laboratory site. Landscaping throughout the 7000 Complex is of a general nature consisting of adding to the naturally existing foliage and of adding a small portion of foundation planting.

HFIR Complex

As previously indicated, the HFIR Complex has been well developed and needs only a relatively small amount of landscape treatment concentrated at a few points. The plan for this area is illustrated in Fig. S.4 included in the supplementary data section of this report. The main entrance at Melton Valley Drive needs some straightening up, parking needs to be handled in a more orderly manner, and some planting and grassing needs to be added immediately in front. The embankment along the drive into the complex should be planted with a groundcover and some native seedlings. The biggest single task within this complex involves straightening up the parking area to the right as one approaches the complex. This is a main parking area that lacks definition and is visually messy. With uniform paving, curbs and gutters, controlled access, and planting, this could be an attractive area. The other treatments shown in the plan for the HFIR Complex are of a general nature.