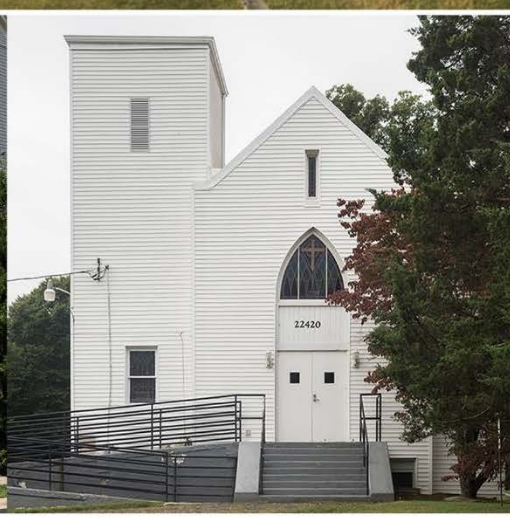
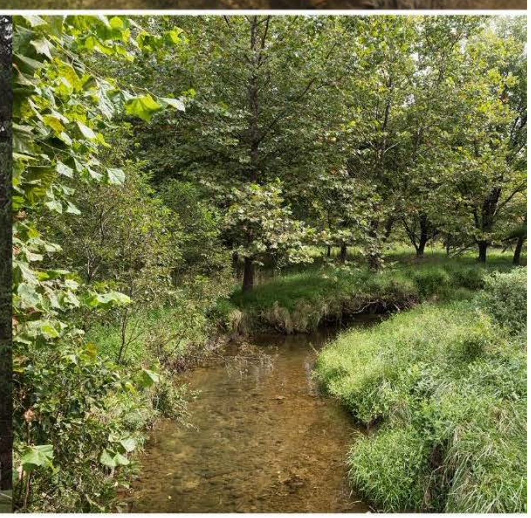
CLARKSBURG

GATEWAY SECTOR PLAN





PUBLIC HEARING DRAFT • APPENDICES A-J • JULY 2025

Montgomery Planning
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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APPENDIX A: ACRONYMS, AGENCIES, AND DEFINITIONS

ACRONYMS AND AGENCIES

BRT – Bus Rapid Transit

CAP – Climate Action Plan

CCT – Corridor Cities Transitway

COMSAT – Communications Satellite Corporation

CSDG – Complete Streets Design Guide

DGS – Department of General Services

EPRG – Equity Peer Review Group

GARE – Government Alliance on Race and Equity

HPC – Historic Preservation Commission

MCDOT – Montgomery County Department of Transportation

MCPS – Montgomery County Public Schools

MD DNR – Maryland Department of Natural Resources

MDOT SHA – Maryland Department of Transportation, State Highway Administration

M-NCPPC – Maryland-National Capital Park and Planning Commission

Montgomery Parks – Montgomery County Parks Department, an agency of the Maryland-National Capital Park and Planning Commission

Montgomery Planning – Montgomery County Planning Department, an agency of the Maryland-National Capital Park and Planning Commission

MPDU – Moderately Priced Dwelling Unit

MWCOG - Metropolitan Washington Council of Governments

NAACP – National Association for the Advancement of Colored People

POPS – Privately Owned Public Spaces

TDR – Transferable Development Rights

WMATA – Washington Metropolitan Area Transit Authority

WSSC - Washington Suburban Sanitary Commission

DEFINITIONS

Breezeway – Part of a network of special bikeways that are envisioned to carry a high number of bicyclists, primarily for longer, faster trips to central business districts (CBDs), transit stations, activity hubs and job centers. Breezeways may be designed as trails, sidepaths, separated bike lanes, and neighborhood greenways (*Montgomery County Bicycle Master Plan*).

Carbon footprint - The total greenhouse gas emissions caused by an individual, event, organization, service, place, or product, expressed as carbon dioxide equivalent (Wikipedia).

Compact Development – A pattern of land development focused on centers of activity where site elements including buildings, circulation, parking, environmental features, and gathering spaces are configured efficiently on a site and located close to nearby sites to allow safe and comfortable access by a range of travel modes (driving, walking, biking, rolling, and transit) (Montgomery Planning).

Complete Streets - Roadways that are designed and operated to provide safe, accessible, and healthy travel for all users of our roadway system, including pedestrians, bicyclists, transit riders, and motorists (MCDOT Complete Streets Design Guide).

Complete Communities - Places that include a variety of land uses, infrastructure, services and amenities that allow them to meet a wide range of needs for a variety of people within a short distance (also known as "15-Minute Living") (*Thrive Montgomery 2050*).

Corridor Connector – A near-term network of enhanced bus routes that builds on existing master-planned bus projects, including the MD 355 and Veirs Mill Road Bus Rapid Transit (BRT) projects to create a transit network that serves communities and employment centers along the I-270 corridor. (*Corridor Forward: The I-270 Transit Plan*).

Moderately Priced Dwelling Unit – Montgomery County's inclusionary zoning program which requires 12.5 to 15 percent of all new units in developments with 20 or more units to be affordable to moderate income households (65 to 70 percent of AMI).

Park(s) – M-NCPPC Parkland operated by the Montgomery County Parks Department.

Priority Urban Forests – Forest stands within Census tracts in Maryland identified by the Maryland State Department of Natural Resources for their significance to the conservation of biodiversity and managed to prioritize forest and tree retention over disturbance or removal. (MD DNR)

Privately Owned, Publicly Available Open Space(s) (POPS) – Privately owned open spaces open and accessible for public use.

Public Open Space(s) – Any open spaces accessible for public use regardless of ownership.

Sidepaths – Sidepaths are shared-use paths located parallel to and within the road right-of-way. They provide two-way travel routes designated for walking, bicycling, jogging and skating.

Special Protection Area – A geographic area where existing water resources or other environmental features relating to those water resources are of high quality or unusually sensitive and proposed land uses would threaten the quality or preservation of those resources or features in the absence of special water quality protection measures which are closely coordinated with appropriate land use controls (Montgomery Planning).

Targeted Ecological Areas - Lands and watersheds in the State of Maryland that are conservation priorities and represent some of the most ecologically valuable areas in the state (MD DNR).

Third Places – Public places on neutral ground where people can gather and interact and are able to host regular, voluntary, informal, and happily anticipated gatherings of individuals beyond the realms of home and work. Maybe on public or private property (Ray Oldenburg, *The Great Good Place*).

Vision Zero – Vision Zero is an approach to road safety founded on the principle that no one should be killed or seriously injured as a price of mobility. (*Montgomery County 2030 Vision Zero Action Plan*)

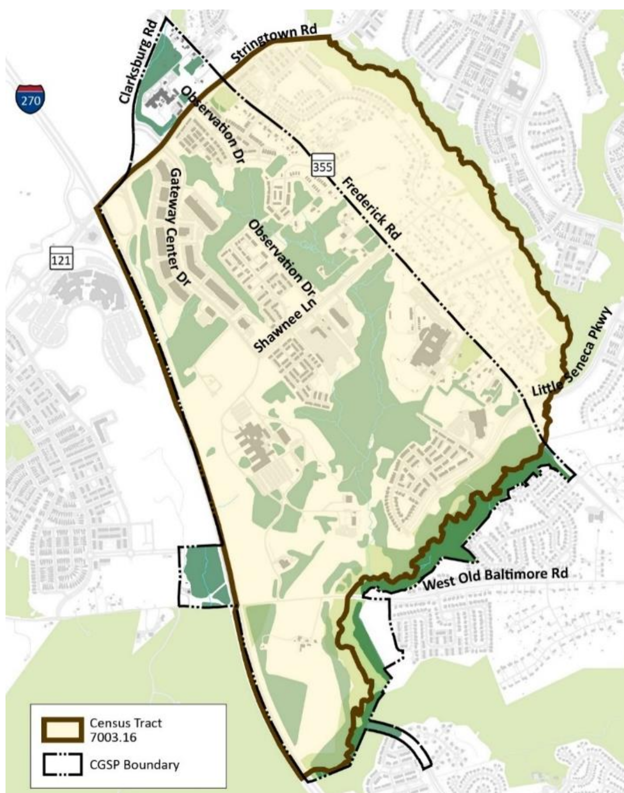
APPENDIX B: CLARKSBURG DEMOGRAPHIC PROFILE

Clarksburg Gateway Sector Plan Study Area

For the plan's demographic analysis, one census tract (7003.16) was selected as the "study area" to approximate the Clarksburg Gateway Sector Plan area (see Figure 1). This census tract covers all parts of the sector plan area with a resident population except for the area bounded by Stringtown Road, Clarksburg Road, and Frederick Road (MD 355). (The excluded area includes Clarksburg Elementary School and 45 residents (from the 2020 census results) and is part of a census block group (the smallest geographic level with detailed demographic information) that covers the large residential developments of the Cabin Branch area west of Interstate 270. Including this neighboring block group in the study area would skew the demographic statistics so that they would not be representative of the plan area.)

The study area also extends to the east of Frederick Road to Little Seneca Creek between Stringtown Road and Little Seneca Parkway and includes newer residential areas, such as the Highlands at Clarksburg subdivision, as well as older residential areas along Timber Creek Lane and Frederick Road.

Figure 1. Clarksburg Gateway Study Area



The study area is highlighted in yellow with a brown border. The Clarksburg Gateway Sector Plan area is outlined in a black dashed line

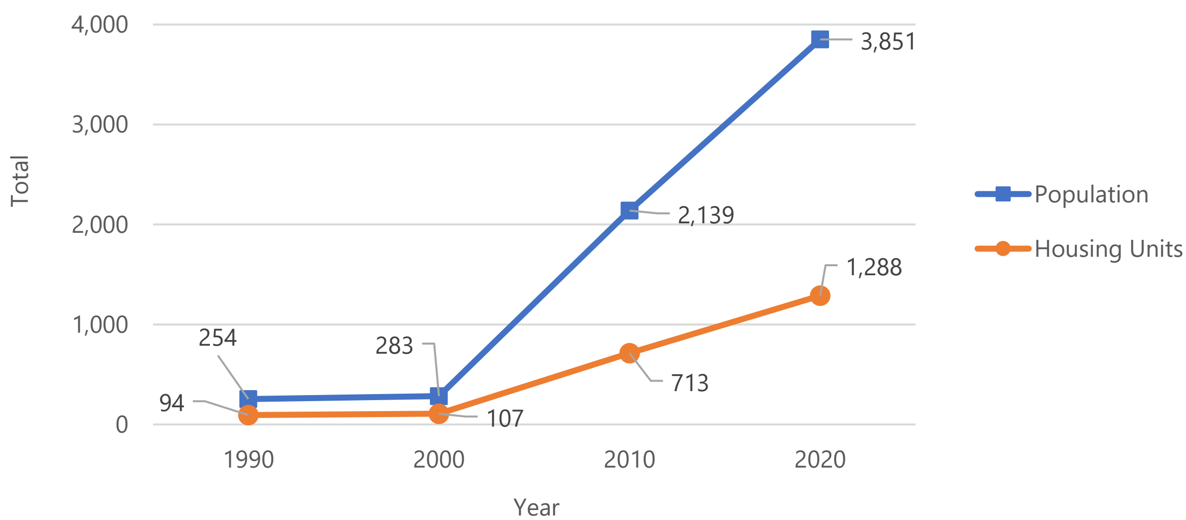
Population and Housing Growth: 1990-2020

The 2020 decennial census counted 3,851 persons and 1,288 housing units within the Clarksburg Gateway study area (see Figure 2). The study area's population experienced an enormous increase after 2000 as new subdivisions were built. In the 30 years between 1990 and 2020, the study area gained 3,597 residents, or a 1,416% increase; the number of housing units increased by 1,194 units or 1,270%. 99% of the population and housing growth since 1990 occurred in the two decades between 2000 and 2020. From 2000 to 2010, the area gained 1,856 residents (a 656% increase) and 606 housing units (a 566% increase). In the 2010s, the area gained almost as many people and housing units as the 2000s, with an increase of 1,712 residents (80%) and 575 housing units (81%).

The Clarksburg Gateway plan area has experienced a different population growth cycle than Montgomery County as a whole (see Figure 3). While the County's highest growth period occurred before 1990, Clarksburg Gateway's high growth period occurred after 2000. The study area's population and housing unit gains after 2000 reflect its rapid transition from a mostly rural locale to a suburban bedroom community.

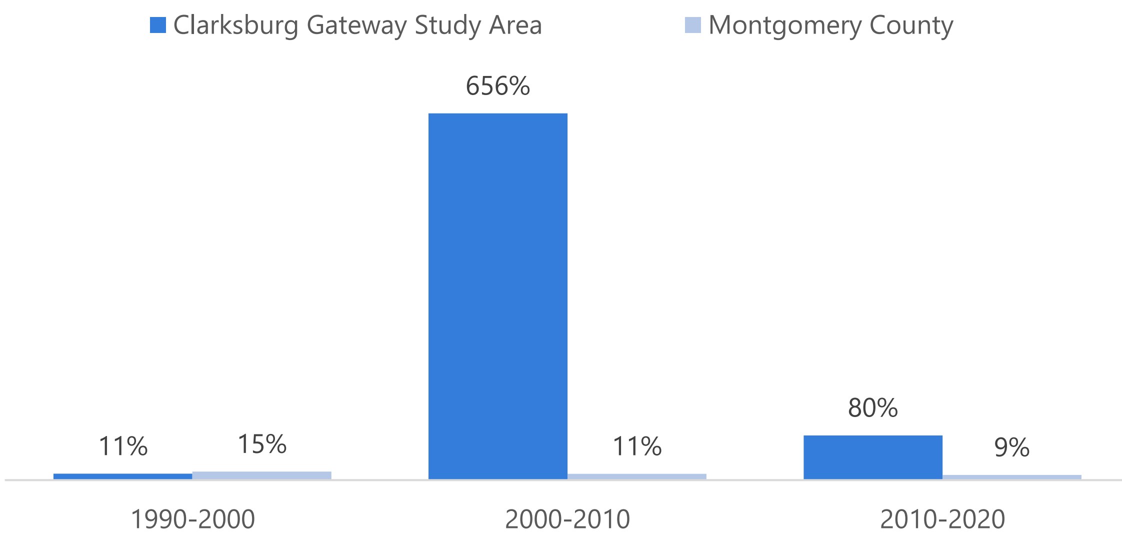
The greater Clarksburg area grew substantially in residential population during this period, as well, as new neighborhoods were built on former farms and forests on both sides of I-270. The Clarksburg Census Designated Place (CDP), an area generally consistent with the greater Clarksburg area, had a population of just over 29,000 people as of the 2020 decennial Census.

Figure 2. Clarksburg Gateway Study Area Population and Housing Units, 1990-2020



Source: Decennial Census, 1990-2020, U.S. Census Bureau

Figure 3: Population Growth of the Clarksburg Gateway Study Area and Montgomery County, 1990-2020



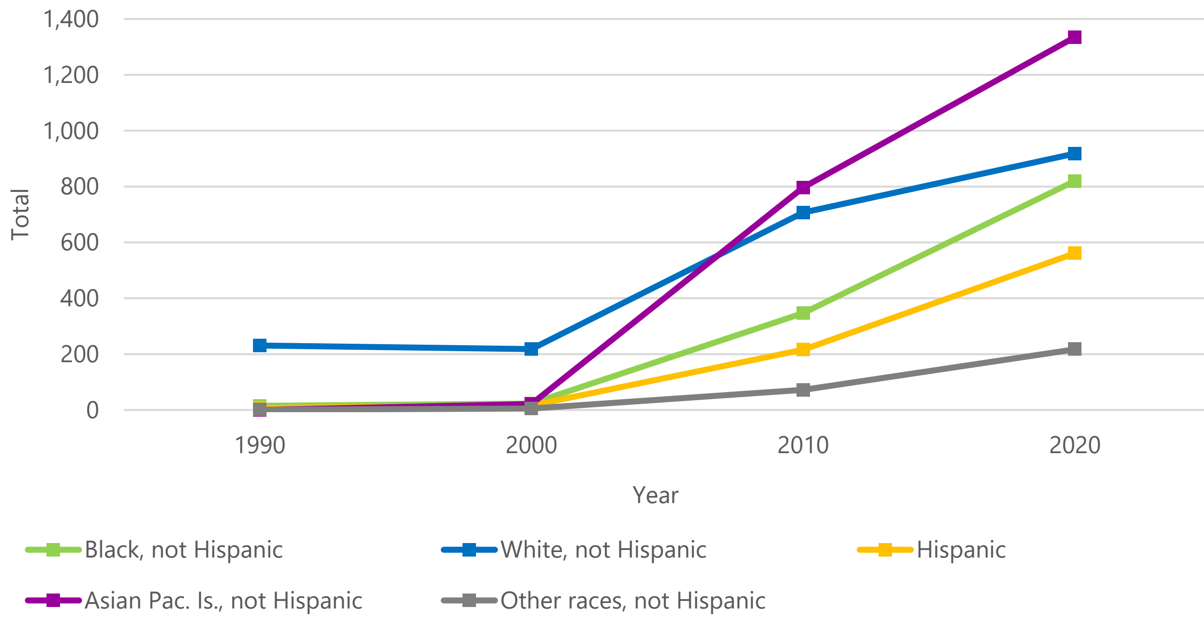
Source: Decennial Census, 1990-2020, U.S. Census Bureau

Population Diversity

As the overall population grew sharply from 2000 to 2010, the population of all major racial groups in the study area also increased. The largest growth in the 2000-2010 period occurred among the Asian or Pacific Islander population, which became the largest racial group, comprising over one-third (37%) of the study area's population in 2010. Population growth for all racial groups continued through the 2010s; the percentage of Hispanics and Blacks steadily increased during this decade. By 2020, Asians or Pacific Islanders were 35% of the population and were still the largest racial group, followed by Whites (24%), Blacks (21%), and Hispanics (15%) (see Chart 1). South Asians comprise the largest subgroup of Asians/Pacific Islanders in the study area.

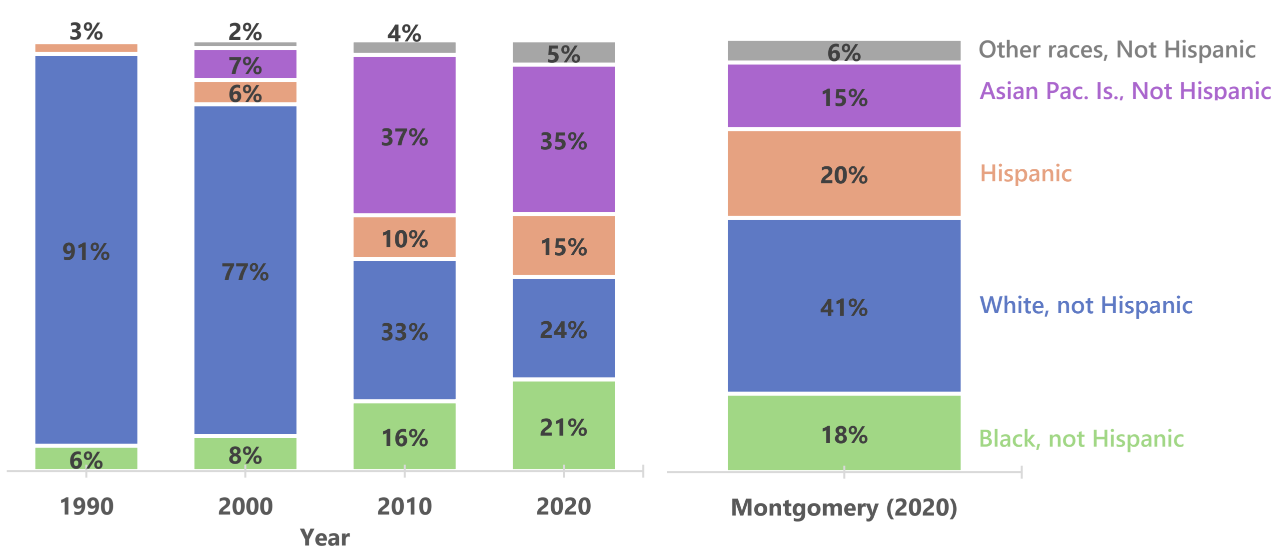
The Clarksburg Gateway study area, in comparison to Montgomery County as a whole, is far more racially diverse. The percentage of People of Color (persons who are not non-Hispanic White) in the study area is 76% compared to 59% across the County. The study area also has a larger percentage of the population who is Asian/Pacific Islander or Black than the County.

Figure 4: Clarksburg Gateway Study Area Population by Race and Ethnicity, 1990-2020



Source: Decennial Census, 1990-2020, U.S. Census Bureau

Figure 5: Share of the Population by Race and Ethnicity for the Clarksburg Gateway Study Area (1990-2020) and Montgomery County (2020)



Source: Decennial Census, 1990-2020, U.S. Census Bureau

Underlying the increase in the racial diversity is a notable foreign-born population and large numbers of non-English speakers. According to the 2021 American Community Survey's (ACS) 5-year estimates, 44% of the residents, or about 1,600 people, in the study area were born in another country, a higher rate of foreign-born than for all of Montgomery County (32%).

Over 60% of the study area's residents ages 5 and over (or about 2,000 people) speak a language other than English at home. Among residents who speak another language at home, 24% of them (or nearly 500 people) speak English less than very well. (This group represents 15% of all residents ages 5 and over.) The most spoken foreign languages in the study area are Spanish, Chinese (including Mandarin and Cantonese), and Korean, which are spoken by 28%, 18%, and 11%, respectively, of residents who speak another language at home (see Figure 6). (In Figure 6, "Other Indo-European languages" and "Other Asian and Pacific Island languages" round out the list of top five languages. These categories may include individual languages that have large percentages of speakers but are not broken out by the Census Bureau.) Among residents who speak English less than very well, 24% of them are Chinese speakers, 24% are Korean speakers, and only 4% are Spanish speakers. (Figures 7 and 8 show the full list of languages published by the American Community Survey with estimates and percentages for the study area.)

Figure 6: Top Foreign Languages in the Clarksburg Gateway Study Area, 2021

Language	% of non-English	% less than very well
Spanish	28%	4%
Chinese (incl. Mandarin, Cantonese)	18%	24%
Other Indo-European languages	17%	20%
Other Asian and Pacific Island languages	12%	0%
Korean	11%	24%

Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Figure 7: Estimates of persons ages 5 and over who speak a foreign language at home in the Clarksburg Gateway Study Area, 2021

Language	Estimate	Percent
Persons age 5+ who speak non-English language at home	1,993	100%
Spanish	559	28%
French, Haitian, Cajun	14	1%
German or other West Germanic languages	0	0%
Russian, Polish, or other Slavic languages	0	0%
Other Indo-European languages	330	17%
Korean	216	11%
Chinese (incl. Mandarin, Cantonese)	368	18%
Vietnamese	13	1%
Tagalog (incl. Filipino)	101	5%
Other Asian and Pacific Island languages	238	12%
Arabic	13	1%
Other and unspecified languages	141	7%
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau		

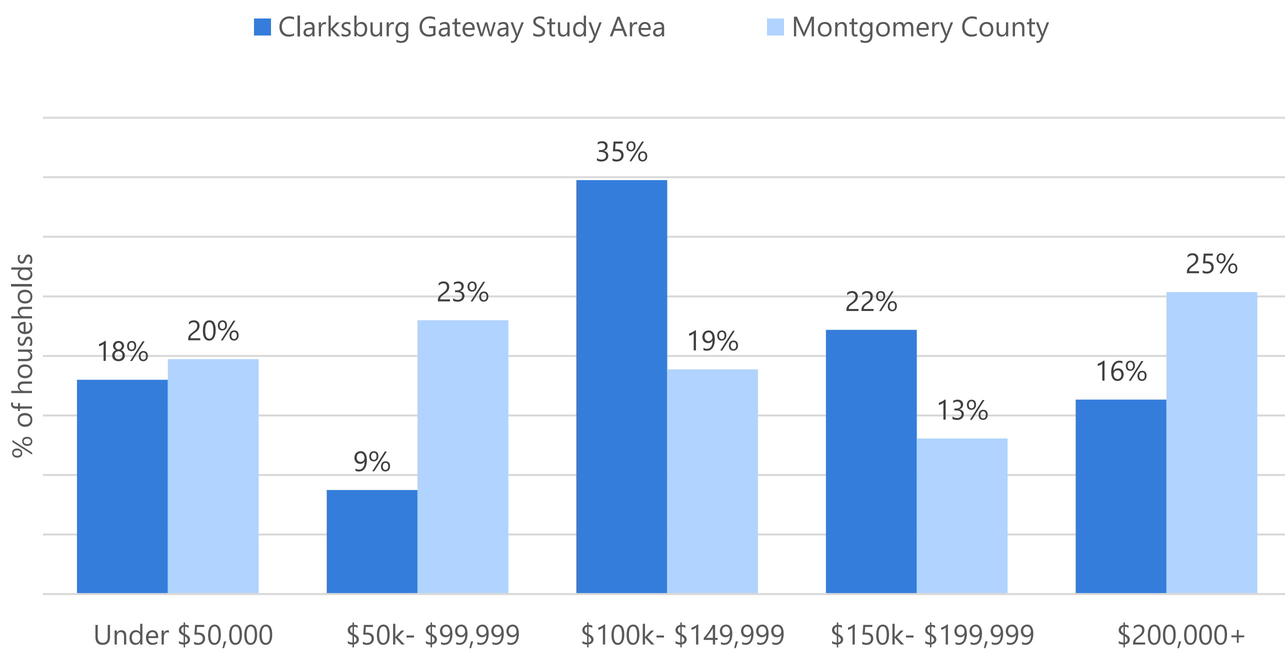
Figure 8: Estimates of persons ages 5 and over who speak English less than very well in the Clarksburg Gateway Study Area, 2021

Language	Estimate	Percent
Persons age 5+ who speak English less than very well	479	100%
Spanish	18	4%
French, Haitian, Cajun	0	0%
German or other West Germanic languages	0	0%
Russian, Polish, or other Slavic languages	0	0%
Other Indo-European languages	96	20%
Korean	116	24%
Chinese (incl. Mandarin, Cantonese)	113	24%
Vietnamese	13	3%
Tagalog (incl. Filipino)	13	3%
Other Asian and Pacific Island languages	0	0%
Arabic	13	3%
Other and unspecified languages	97	20%
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau		

Socioeconomic Indicators

According to the 2021 ACS 5-year estimates, the median household income for the study area is $131,000, or 12% higher than Montgomery County’s median of $117,000. (However, the mean household income for the study area is nearly $135,000, below Montgomery County’s mean of $161,000. The County average may be skewed by very high-income households.) About 57% of households in the study area have incomes ranging from $100,000 to $200,000; only 32% of the County’s households have incomes in this range (see Figure 9). However, the study area has fewer high-end income households earning more than $200,000 (16%) when compared to the County (25%). 18% of the study area's households have incomes below $50,000, a similar percentage to the countywide number (20%). 10% of the population, or nearly 400 people, in the study area live in households with an income below the poverty level, which is not statistically different from the countywide figure of 7%.

Figure 9: Household Income Distribution for Clarksburg Gateway Study Area and Montgomery County, 2021



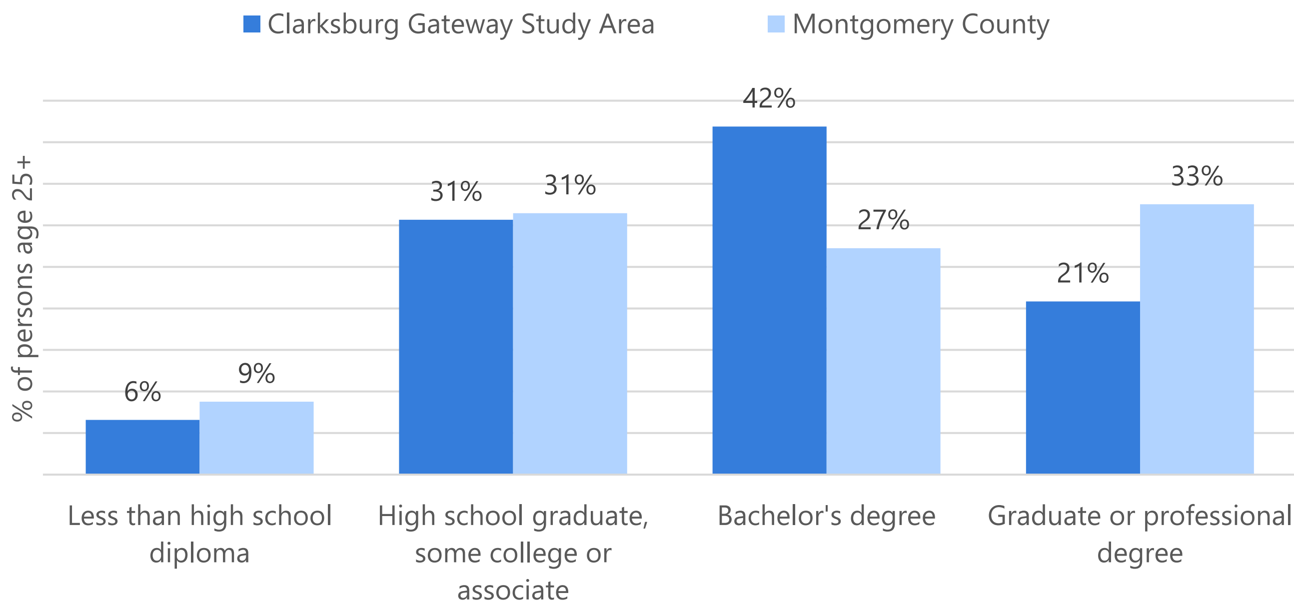
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Educational Attainment

Income is highly correlated with educational attainment and occupation. The study area has a solid concentration of persons ages 25 and over whose highest educational attainment is a Bachelor's degree (42%), a much higher share than Montgomery County has (27%) (see Figure 10). However, the study area has a lower percentage of those with Graduate or Professional degrees (21%) when compared to the County (33%). The percentage of residents ages 25 and with only a high school degree, some college education (but no degree), or an Associate's degree is 31%, approximately the same as the County (31%). Persons who did not graduate from high school make up 6% of the study area's population ages 25 and over, which is not statistically different from the County's 9%.

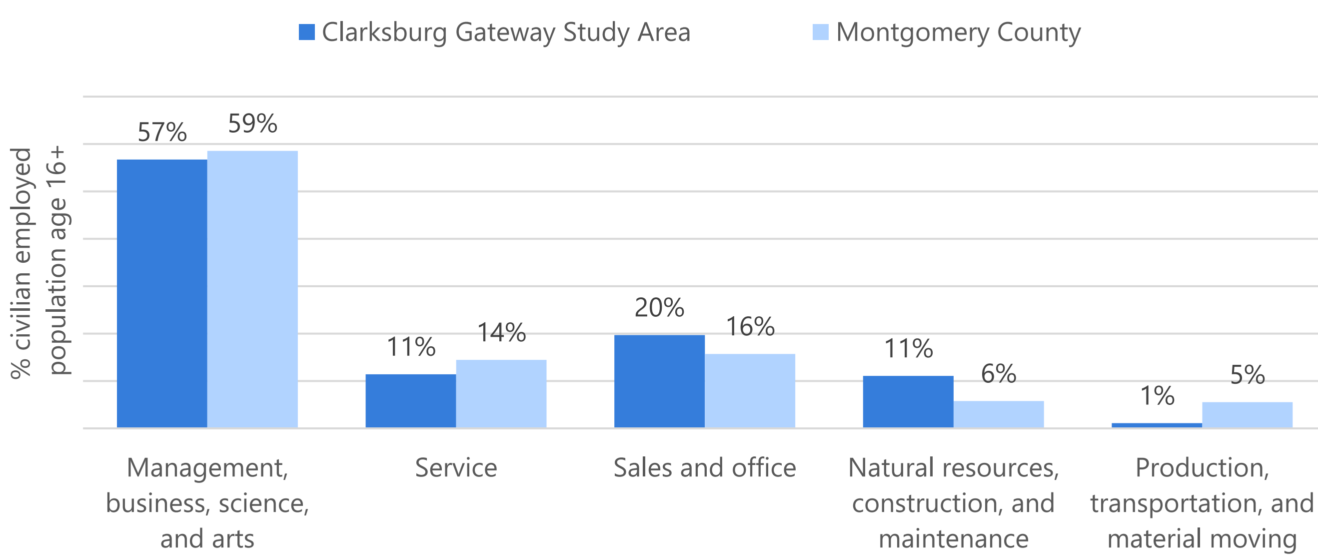
The occupation distribution of the study area's civilian employed population ages 16 and over is similar to the County's distribution (see Figure 11). Most of the study area's employed workforce has an occupation in the management, business, science, and arts category (57%), as is the majority of Montgomery County's employed residents (59%). Fewer study area residents are employed in sales and office occupations (20%), service occupations (11%), and natural resources, construction, and maintenance occupations (11%); these figures are also not statistically significant from their respective countywide numbers. The County has a higher share of its employed workforce in production, transportation, and material moving occupations (6%) than the study area has (1%).

Figure 10: Educational Attainment of Persons Ages 25 and Over for Clarksburg Gateway Study Area and Montgomery County, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

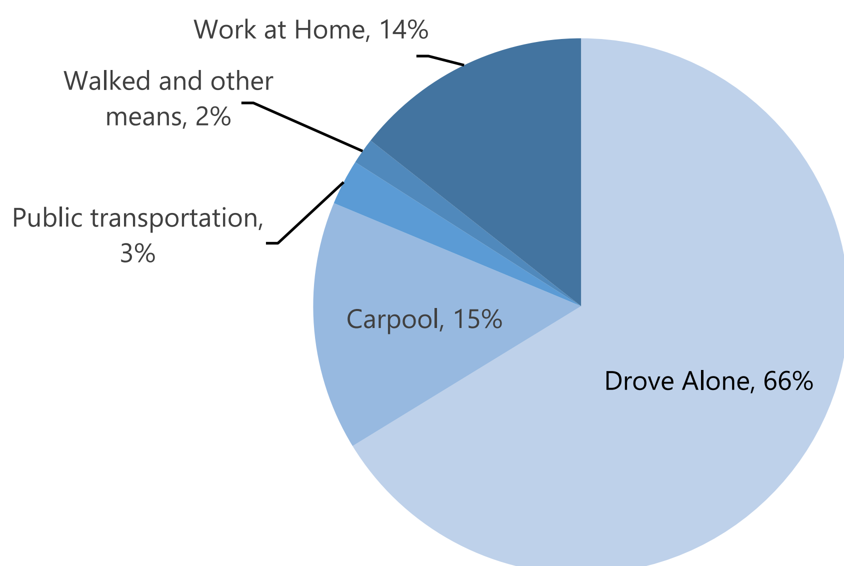
Figure 11: Occupation of Civilian Employed Population Ages 16 and Over for Clarksburg Gateway Study Area and Montgomery County, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

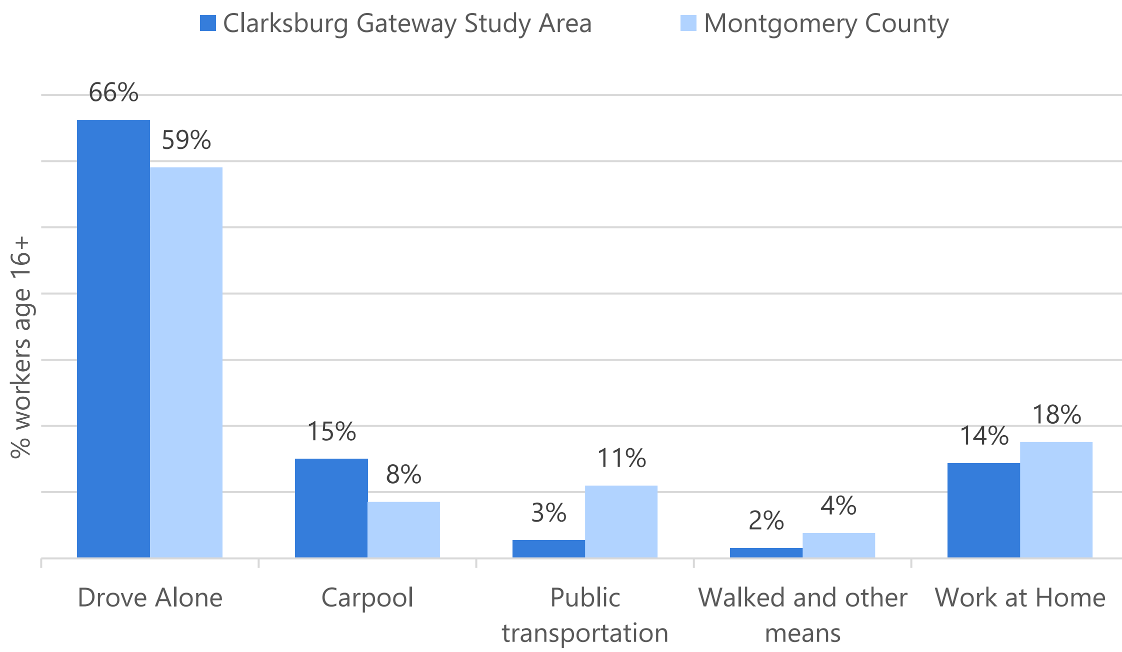
Among workers ages 16 and over living in the study area, 66% drove alone to work, another 15% carpooled, and 14% worked at home (see Figure 12). Use of public transportation, walking, and other means of transportation by workers living in the study area are negligible, in contrast to the County which has 15% of workers commuting by these transportation modes (11% with public transportation and 4% by walking and other means) and a smaller percentage of workers driving alone (59%) or carpooling (9%) (see Figure 13). About three-quarters (75%) of workers in the study area have a job within Montgomery County, and 15% commute outside of Maryland (most likely to DC or Virginia) (see Figure 14). Slightly more County workers commute (23%) outside of Maryland and fewer work within Montgomery County (67%) (see Figure 15). On average, residents of the study area travel 42 minutes to work, slightly longer than the average for the County (34 minutes).

Figure 12: Mode of Transportation for Commuting to Work for Workers Ages 16 and Over for Clarksburg Gateway Study Area, 2021



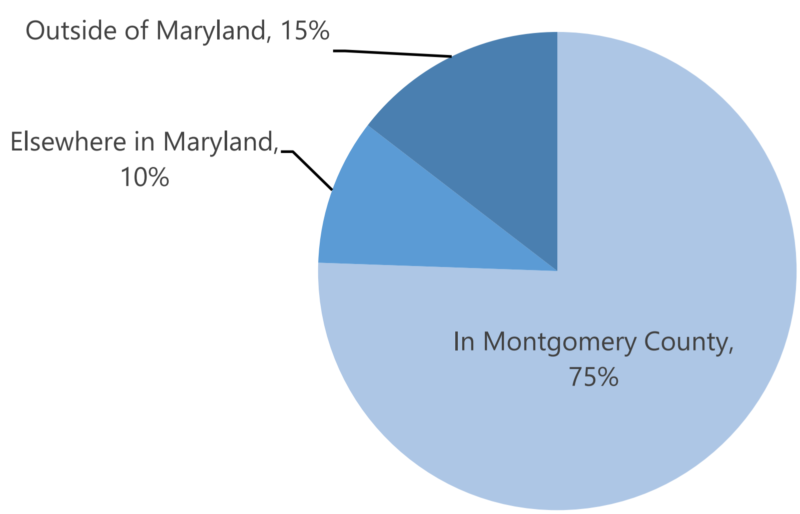
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Figure 13: Mode of Transportation for Commuting to Work for Workers Ages 16 and Over for Clarksburg Gateway Study Area and Montgomery County, 2021



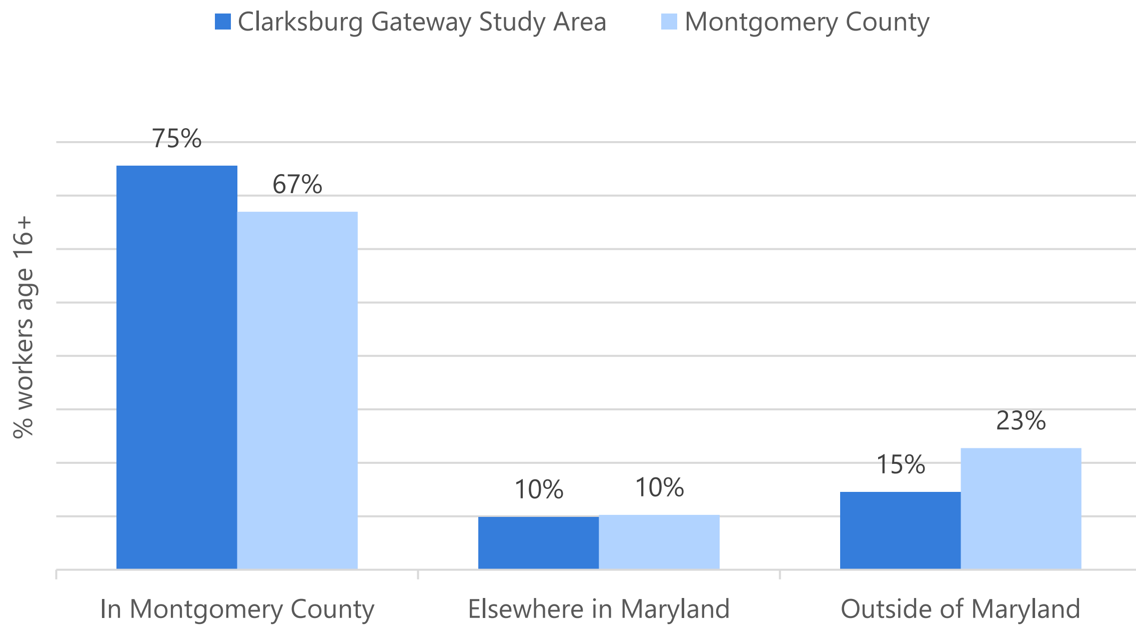
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Figure 14: Place of Work for Workers Ages 16 and Over for Clarksburg Gateway Study Area, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Figure 15: Place of Work for Workers Ages 16 and Over for Clarksburg Gateway Study Area and Montgomery County, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

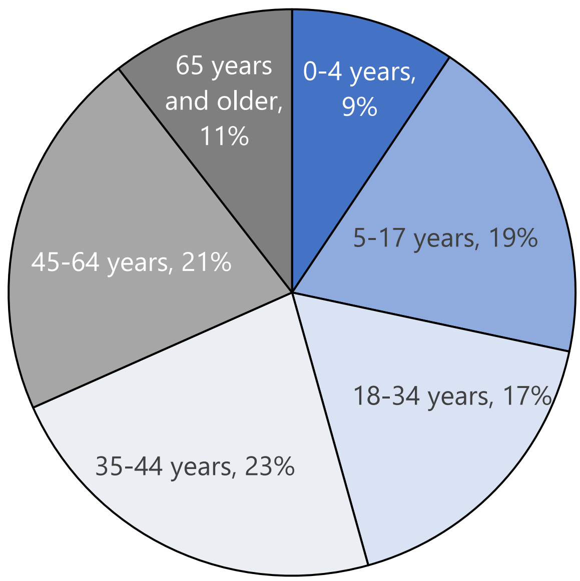
Housing Cost Burden

The study area also has a large percentage of households that experience a significant housing cost burden, defined as spending more than 30% of household income on housing costs. 30% of owner-occupied households with a mortgage have a housing cost burden, a proportion similar to the countywide percentage (26%). Among renter-occupied households, 37% have a housing cost burden; however, this estimate is less reliable because renters make up a small percentage (18%) of the households in the study area. (Housing costs for owner-occupied households include mortgage payments, condominium and other fees, real estate taxes, homeowners' insurance premiums, and costs for electricity, heating/gas, and water/sewer. Housing costs for renter-occupied households include rent payments and costs for electricity, heating/gas, and water/sewer.)

Age Structure and Household Type

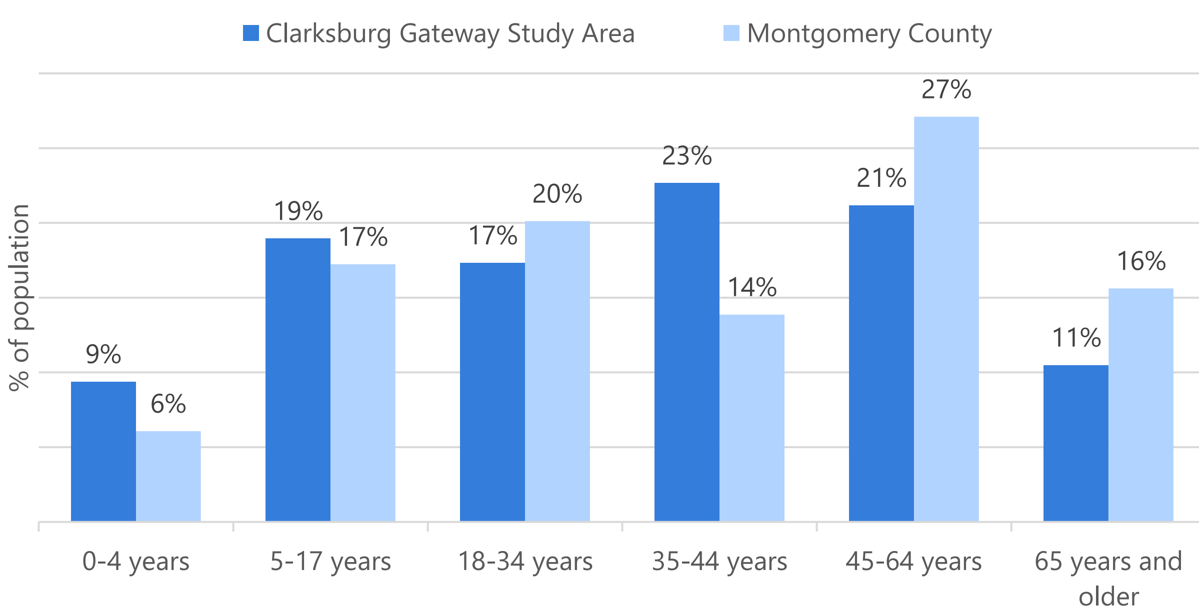
Residents of the study area are predominantly working-age adults and children, as reported in the 2021 ACS 5-year estimates. 61% of the population are ages 18 to 64, and children (ages 17 and under) make up another 28% of residents (see Figure 16). Persons ages 65 and over are 11% of the population. The study area's population is also younger than Montgomery County's overall. While the study area's median age is 36.7, the County's median age is nearly three years more at 39.6. A comparison of the age distribution between the study area and the County shows a notably larger share of the study area's population (23%) that is 35 to 44 years, whereas the County only has 14% of its population in this age range (see Figure 17). The study area has a smaller share of its population in the oldest two age ranges than the County. Only 32% of the study area's population is age 45 and above, but 43% of the County's population is in this age range.

Figure 16: Age Distribution for Clarksburg Gateway Study Area, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

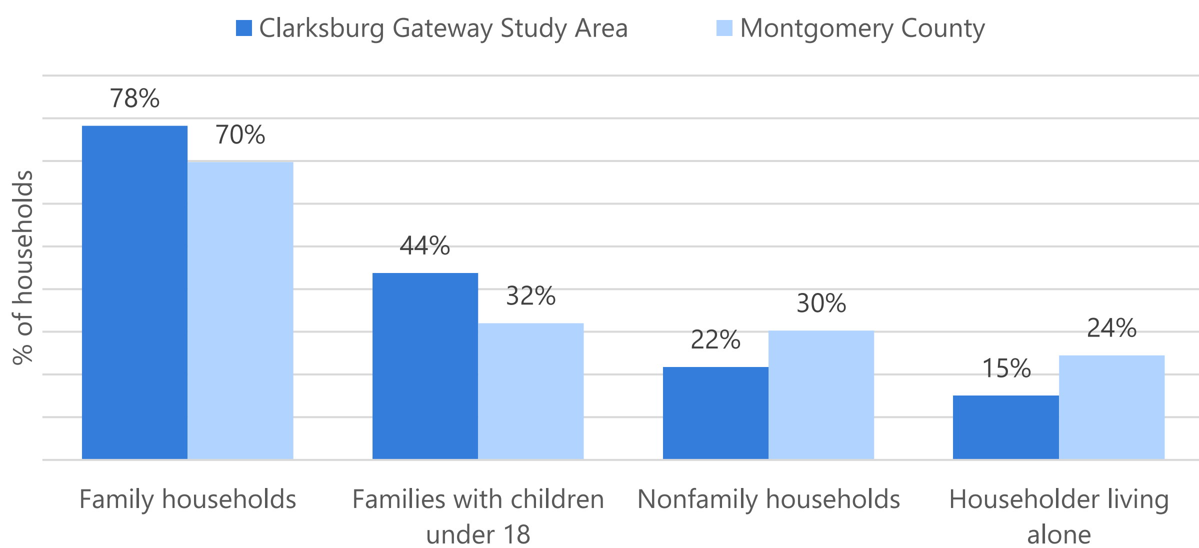
Figure 17: Age Distribution for Clarksburg Gateway Study Area and Montgomery County, 2021



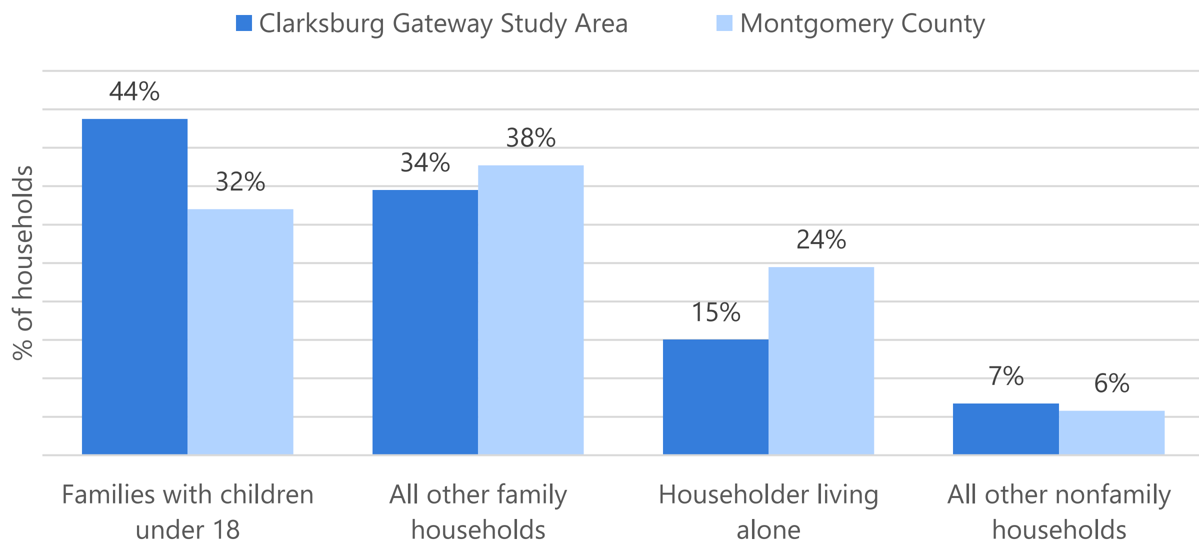
Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

Households in the study area are predominantly family households (78%), and 44% of all households are families with children under 18 years of age (see Figure 18). 15% of households have only one person. In comparison, 70% of Montgomery County households are family households, and for family households with children under 18 years of age, that figure drops to 32%. One-person households consist of 24% of all households in the County.

Figure 18: Household Type for Clarksburg Gateway Study Area and Montgomery County, 2021



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau



Source: 2021 American Community Survey, 5-year estimates, U.S. Census Bureau

APPENDIX C: CLARKSBURG MARKET STUDY

Executive Summary

The Research and Strategic Projects (RSP) Division of Montgomery Planning prepared this comprehensive market study in support of the Clarksburg Gateway Sector Plan. The market study summarizes existing demographic, economic, and real estate market conditions in the Sector Plan Area (Plan Area) to guide land use recommendations as part of the Sector Plan. The primary purpose of this study is to establish market demand for new residential and nonresidential development based on development trends, preferences, and gaps in both Clarksburg and Montgomery County overall. Findings from this market study, combined with additional analysis by Planning staff and community input, will inform the development of master plan recommendations.

The larger Clarksburg area (Market Study Area) has experienced the fastest population and housing growth of any part of Montgomery County over the past 20 years. As a result, this relatively new community has a unique demographic profile and housing market compared to the rest of the county. Generally, Clarksburg has larger households, more families, and younger and more diverse residents than Montgomery County overall. The median age in the Clarksburg area is approximately 38 years, which is slightly below that of the county overall (40 years). Since 2000, the area has shifted from majority non-Hispanic white to a far more racially diverse community. As of 2021, Asian residents comprise the largest racial and ethnic group, accounting for 37 percent of Clarksburg Market Study Area residents, compared with 15 percent of the county population.

Households in Clarksburg are generally well-educated, which is consistent with their high incomes. While Clarksburg households are generally high-income, the area lacks the extremely high-income households that exist in other parts of Montgomery County, such as Bethesda. With large household sizes, incomes on a per capita basis in the Market Study Area lag countywide per capita incomes.

The higher-than-average commute times in Clarksburg imply that residents, similar to Germantown, travel to the Washington D.C vicinity for work. Despite these long commutes, however, people are moving to Clarksburg, a trend which may be explained by the relative affordability of larger housing units in this area.

Households in the Market Study Area are predominantly composed of homeowners, where 88 percent of occupied units are owned, and 12 percent are rented. This prevalence of owner-occupied housing is consistent with a housing stock that is primarily single-family development. The Clarksburg area has a larger share of townhomes (31 percent) compared with the county average (18 percent), but a notably smaller share of multifamily units (10.2 percent versus 34.7 percent). There is a limited supply of multifamily rental units. Over 80 percent of the Market Study Area’s housing stock was built since 2000 and they exhibit similar sizes and quality. These housing units tend to be larger than average, and although they command sale prices that are below the county average on a per square foot basis, they still require relatively high incomes. Because of the size of these single-family homes, there is a notable share of above moderate-income households that are cost burdened.

Summary of Recommendations

Based on demographic, housing, and real estate market data analyzed, this study supports the development of more housing that incorporates a wider range of housing types. Housing units in the Clarksburg area are concentrated in single-family housing types, all of which have a similar vintage, size, quality, and price point. The area is lacking multifamily units, including rentals, which would attract younger residents and smaller households, and diversify the income of the area to create more dynamic demand for amenities and retail.

The Plan Area’s nonresidential inventory is dominated by ‘flex’ properties along Gateway Center Drive, accounting for 1.1 million square feet in total. This space is underutilized, as seen by the Elion properties high vacancy rate of 18 percent compared to the countywide vacancy rate of 8.1 percent for flex properties. Although flex space is in short supply in Montgomery County, the flex development in the Plan Area is small, it underutilizes large lot sizes and is highly vacant, particularly when including the former COMSAT building. Given this trend, and the public demand for mixed-use spaces with housing and retail, flex development is unlikely to be the highest and best use of sites along Gateway Center Drive.

Despite the vision expressed in the *1994 Clarksburg Master Plan*, the Clarksburg area is not an office market today. It has a small inventory, many of which are not traditional office buildings. Challenges in the office market have led to high vacancy rates and low rents in neighboring Germantown compared to the county, which itself is experiencing low rents and high vacancy rates. This suggests that it would be difficult to develop new office buildings in the Clarksburg area in the near future.

Data from CoStar, stakeholders interviewed for this study, and comments from community meetings all clearly state that the Clarksburg area is under-retailed, despite the presence of the Clarksburg Outlet Mall. Retail square footage per capita data demonstrates lagging retail development in the Market Study Area, while the vacancy rate of less than one percent demonstrates the high demand and low supply of retail services. The planned Clarksburg Town Center will add much-needed retail to the area and includes the space for a grocery anchor. In addition to retail, the Clarksburg Town Center site plan application proposes 189 multifamily units, which contribute to the housing diversity of the area.

This analysis examines evidence of market demand for a hotel use in the Plan Area and given no lodging establishments between Germantown and Frederick and recent development in the Clarksburg area, the potential for a hotel is worth consideration. Hotel and lodging uses can be considered to meet the gap in the market for both a limited-service hotel and a resort-type facility to support and promote local tourism to the Ag Reserve, Clarksburg Outlets, and the nearby Maryland Soccerplex. This plan could help support hotel development through recommendations and implementation of improved transit connections to nearby centers, more community amenities, and other local attractions.

Study Geographies

The Clarksburg Gateway Sector Plan Area (Plan Area) consists of approximately 969 acres and is generally bound by I-270 to the west, Clarksburg Road to the north, Frederick Road (MD 355) to the east, and West Old Baltimore Road and Little Seneca Greenway to the south.

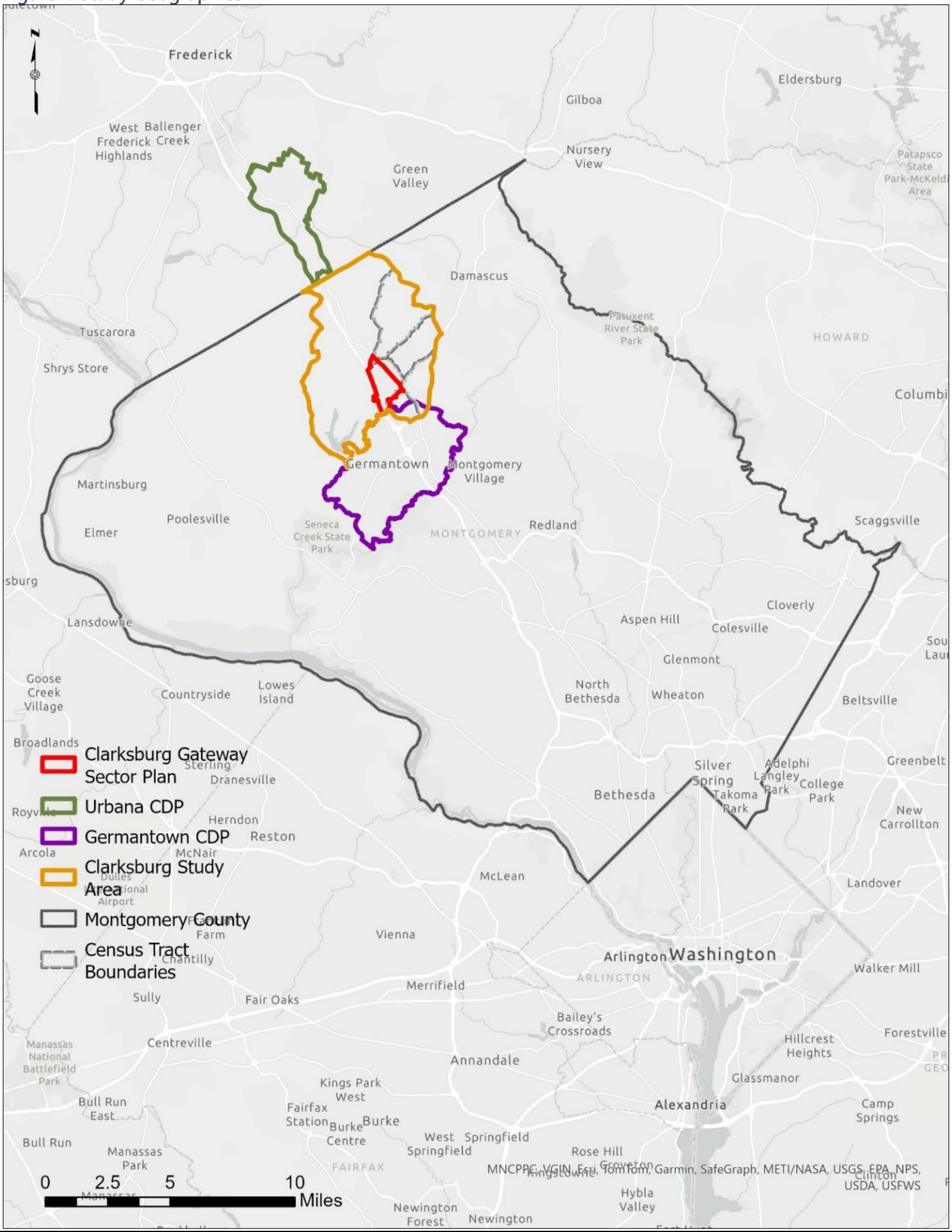
To understand the broader market of the Clarksburg area and contextualize the trends seen in the Plan Area, the main geographic focus of this market study is the "Market Study Area". This geography is defined as the six census tracts that encompass and border the Plan Area, as seen in **Figure 1**.[1] Figure 2 provides a zoomed in view of the Market Study Area, showing the six census tracts along with aerial imagery of the developed and undeveloped land in the area.

The study considers three additional geographies to further position Clarksburg within the region. The first is the Germantown Census Designated Place (CDP) located within Montgomery County, south of Clarksburg along I-270. Second is the Urbana CDP, situated in Frederick County north of Clarksburg along I-270 (see **Figure 1**). These geographies are also compared to Montgomery County as a whole. Note that there is some overlap between the Clarksburg Market Study Area and Germantown CDP, mostly consisting of single-family detached units, and therefore, the data presented for these geographies is not entirely mutually exclusive.

This market study primarily draws comparisons between the larger Market Study Area and the three context geographies – Germantown, Urbana, and Montgomery County – to provide a fuller picture of Clarksburg's market trends. While the focus of this report is on the Market Study Area, data on the smaller Plan Area geography is included when relevant.

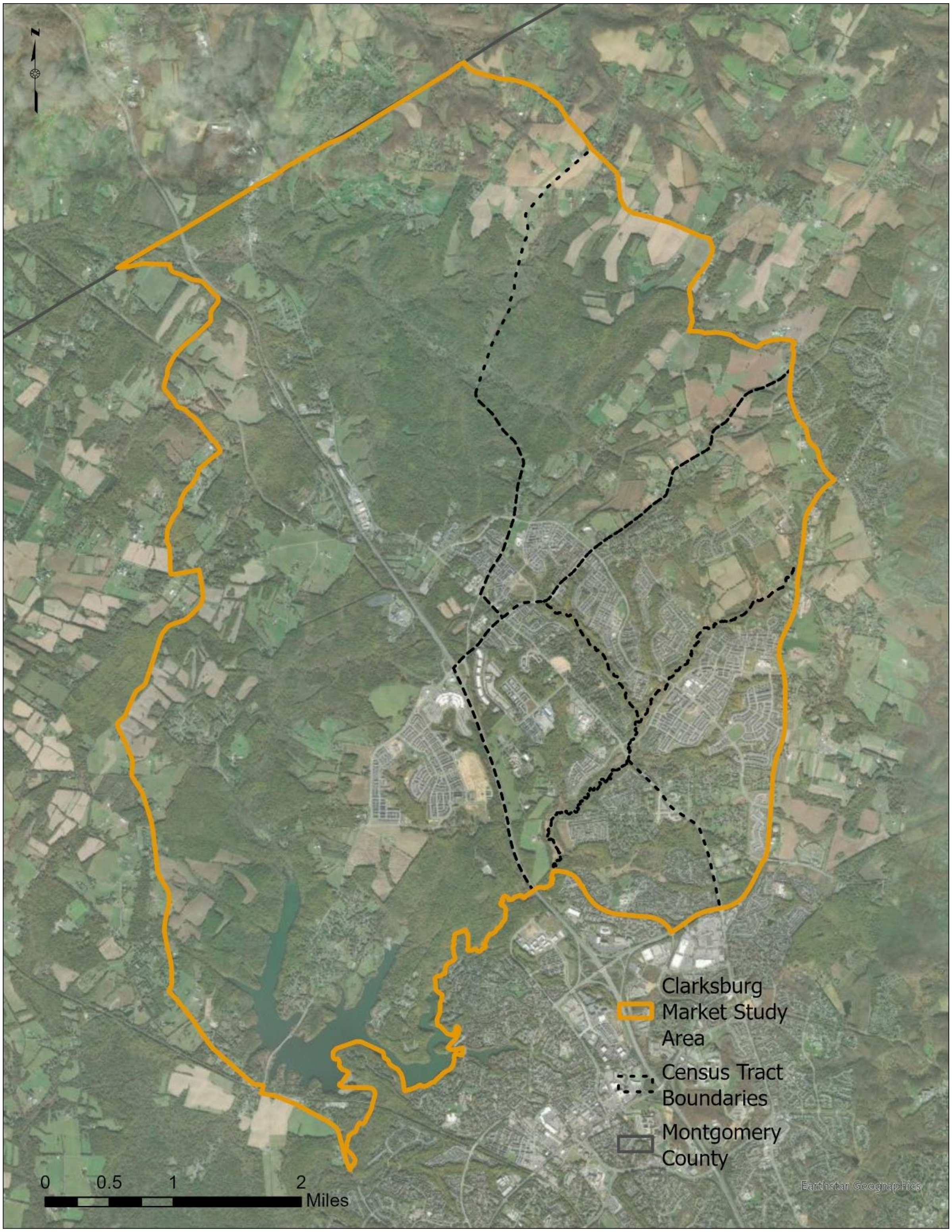
[1] These six census tracts were chosen as the "Market Study Area" in consultation with the master planning team. They encompass what the community perceives as the Clarksburg area. This area is larger than the Clarksburg Census Designated Place (CDP), which is a boundary constructed based on population density and excludes a considerable portion of the greater Clarksburg region.

Figure 1: Study Geographies



Source: Montgomery Planning, 2024.

Figure 2: Clarksburg Market Study Area



Source: Montgomery Planning, 2024.

Existing Market Conditions

Demographic Conditions

Population and Households

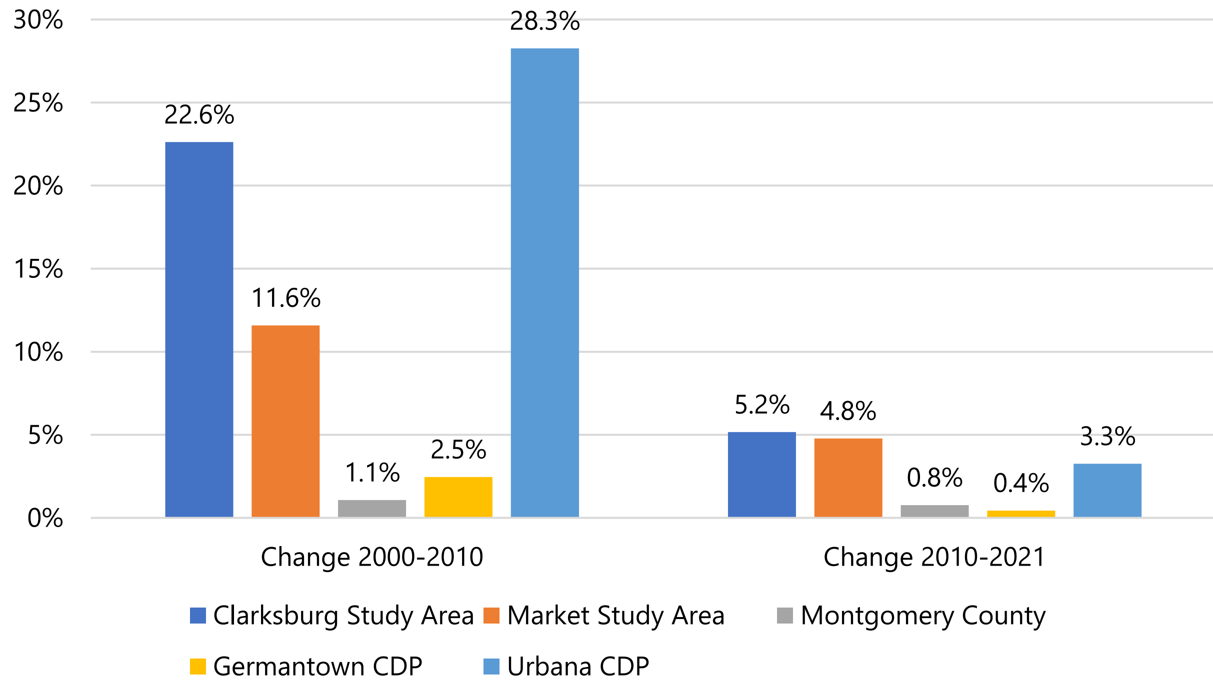
The Clarksburg area has experienced tremendous population growth over the past two decades, transforming from one of the few remaining undeveloped areas along the I-270 corridor to an established suburban bedroom community. As a result of new housing construction in the 2000s, the population in the Market Study Area grew from 6,250 in 2000 to 18,708 in 2010, an increase of nearly 200 percent. Clarksburg sustained this significant population growth rate from 2010 to 2021, increasing 67 percent over the past decade from 18,708 to 31,270 residents.

Growth in Clarksburg far outpaced the rest of Montgomery County, which experienced population growth of 11 percent between 2000 and 2010, and nine percent from 2010 to 2021. During this same period, the Germantown population grew 27.5 percent from 2000 to 2010, which is more than double the population growth in the county. Although this growth rate is far below that of the Clarksburg area in this decade, Germantown was more developed in 2000 than Clarksburg. This high level of growth in the 2000s is consistent with the history of new housing development along the I-270 corridor. Following this period, however, Germantown's population growth diminished between 2010 and 2021, falling to just five percent, and below the county average.

Although fast-growing for Montgomery County, Clarksburg grew at a similar rate to Urbana in Frederick County, also along I-270 and just north of the Montgomery County line. Urbana's population grew by over 1000 percent, from 774 residents in 2000 to 9,327 in 2010. Urbana also sustained high rates of growth from 2010 to 2021, growing by 42 percent to 13,271 total residents.

Trends in household growth in all geographies generally mirror trends in population growth. In the Market Study Area and Urbana CDP, household growth was strong in the 2000s and was slower but still high in the 2010s. Notably, and as shown in Table 1, population growth slightly outpaced household growth from 2000 to 2021 in all geographies. The change in average household size reflects this trend, steadily increasing from 2000. The Market Study Area and Urbana have higher average household sizes than the Germantown CDP and Montgomery County as a whole, which likely reflect the higher share of single-family detached units in the Clarksburg area (see Units in Structure section).

Figure 3: Average Annual Growth Rate, 2000-2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 1: Population, Households, and Average Household Size, 2000-2021

				Change, 2000-2010			Change, 2010-2021		
Population	**2000**	**2010**	**2021**	**Number**	**Percent**	**Average Annual (%)**	**Number**	**Percent**	**Average Annual (%)**
Clarksburg Market Study Area	6,250	18,708	31,270	12,458	199.3%	11.6%	12,562	67.1%	4.8%
Montgomery County	873,384	971,777	1,057,201	98,393	11.3%	1.1%	85,424	8.8%	0.8%
Germantown CDP	67,241	85,729	89,995	18,488	27.5%	2.5%	4,266	5.0%	0.4%
Urbana CDP	774	9,327	13,271	8,553	1105.0%	28.3%	3,944	42.3%	3.3%

				Change, 2000-2010			Change, 2010-2021		
Households	**2000**	**2010**	**2021**	**Number**	**Percent**	**Average Annual (%)**	**Number**	**Percent**	**Average Annual (%)**
Clarksburg Market Study Area	1,979	5,455	9,547	3,476	175.6%	10.7%	4,092	75.0%	5.2%
Montgomery County	324,577	357,086	383,308	32,509	10.0%	1.0%	26,222	7.3%	0.6%
Germantown CDP	24,882	30,254	31,152	5,372	21.6%	2.0%	898	3.0%	0.3%
Urbana CDP	264	2,841	3,906	2,577	976.1%	26.8%	1,065	37.5%	2.9%

Average Household Size	**2000**	**2010**	**2021**	**2023**
Clarksburg Market Study Area	3.16	3.29	3.20	3.25
Montgomery County	2.66	2.70	2.74	2.71
Germantown CDP	2.70	2.83	2.89	2.84
Urbana CDP	2.93	3.28	3.40	3.30

Note:
(a) Average household size data is not available from Esri's estimates of five-year 2017-2022 ACS data. Data presented here is from Esri's estimates for 2023. For more information, please refer to the Data Sources and Approach subsection in the Appendix of this report.

Source: Esri Business Analyst, 2023; Montgomery Planning, 2023.

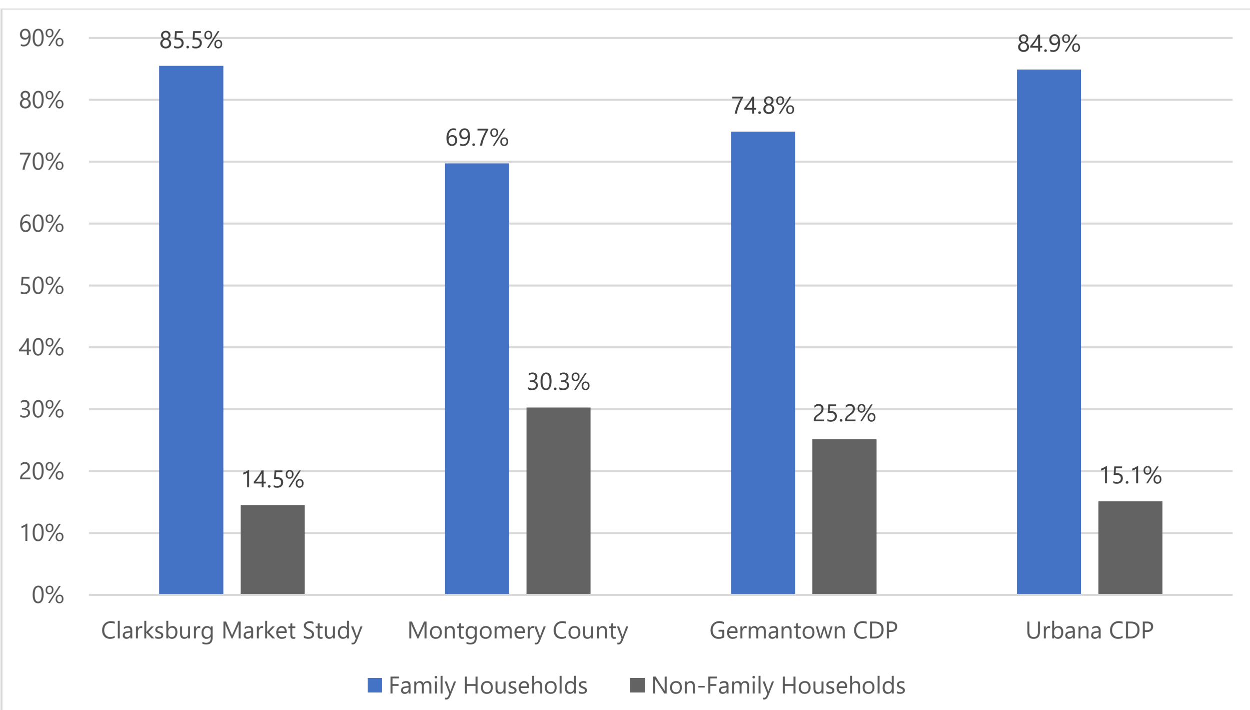
Household Composition

The Census distinguishes between family and nonfamily households. A nonfamily household consists of a householder living alone or sharing the home exclusively with people to whom he/she is not related. A family household is maintained by a householder who is in a family – a group of two people or more related by birth, marriage, or adoption and residing together – and includes any unrelated people who may be living there.

In all study geographies, most households are family households, accounting for 85.5 percent of households in the Market Study Area. Compared to the greater region, the Market Study Area falls at the upper end of the range, with Montgomery County and Germantown composed of less than 75 percent of family households and Urbana with approximately 85 percent. The higher average household sizes in the Market Study Area and Urbana relative to Germantown and the County reflect this trend.

In the two fastest-growing geographies – the Market Study Area and the Urbana CDP – it is notable that non-family households grew at a faster rate than family households. By contrast, growth in family households outpaced growth in nonfamily households in Montgomery County and the Germantown CDP, although there was overall limited growth in these geographies between 2010 and 2021. These data indicate higher levels of affordability for nonfamily households in Clarksburg and Urbana, which may reflect both price points and a variety of housing types and sizes.

Figure 4: Household Composition, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 2: Household Composition, 2010-2021

Clarksburg Market Study Area	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Family Households	4,711	86.4%	8,161	85.5%	3,450	73.2%	5.1%
Non-Family Households	744	13.6%	1,386	14.5%	642	86.3%	5.8%
Total Households	**5,455**	**100.0%**	**9,547**	**100.0%**	**4,092**	**75.0%**	**5.2%**

Montgomery County	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Family Households	244,898	68.6%	267,285	69.7%	22,387	9.1%	0.8%
Non-Family Households	112,188	31.4%	116,023	30.3%	3,835	3.4%	0.3%
Total Households	**357,086**	**100.0%**	**383,308**	**100.0%**	**26,222**	**7.3%**	**0.6%**

Germantown CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Family Households	21,617	71.5%	23,317	74.8%	1,700	7.9%	0.7%
Non-Family Households	8,637	28.5%	7,835	25.2%	-802	-9.3%	-0.9%
Total Households	**30,254**	**100.0%**	**31,152**	**100.0%**	**898**	**3.0%**	**0.3%**

Urbana CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Family Households	2,435	85.7%	3,316	84.9%	881	36.2%	2.8%
Non-Family Households	406	14.3%	590	15.1%	184	45.3%	3.5%
Total Households	**2,841**	**100.0%**	**3,906**	**100.0%**	**1,065**	**37.5%**	**2.9%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2023.

Age Distribution

In this section, we use ESRI's 2023 estimates to analyze the population under 18 years. The Market Study Area has a median age of approximately 38 years, which is slightly younger than the median age in Montgomery County overall (40 years). As seen in Figure 5 and

	2010		2023		Change, 2010-2023	
Clarksburg Market Study Area	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	5,687	30.4%	9,739	26.4%	4,052	71.3%
18-24	1,349	7.2%	2,330	6.3%	981	72.7%
25-34	2,460	13.1%	4,381	11.9%	1,921	78.1%
35-44	3,602	19.3%	6,062	16.4%	2,460	68.3%
45-54	2,953	15.8%	5,037	13.7%	2,084	70.6%
55-64	1,597	8.5%	4,617	12.5%	3,020	189.1%
65 or older	1,060	5.7%	4,716	12.8%	3,656	344.9%
Total Population	**18,708**	**100.0%**	**36,882**	**100.0%**	**18,174**	**97.1%**

	2010		2023		Change, 2010-2023	
Montgomery County	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	233,530	24.0%	239,103	22.2%	5,573	2.4%
18-24	73,058	7.5%	79,257	7.4%	6,199	8.5%
25-34	132,393	13.6%	138,785	12.9%	6,392	4.8%
35-44	140,565	14.5%	151,259	14.1%	10,694	7.6%
45-54	153,481	15.8%	137,526	12.8%	-15,955	-10.4%
55-64	118,981	12.2%	139,908	13.0%	20,927	17.6%
65 or older	119,769	12.3%	189,924	17.7%	70,155	58.6%
Total Population	**971,777**	**100.0%**	**1,075,762**	**100.0%**	**103,985**	**10.7%**

	2010		2023		Change, 2010-2023	
Germantown CDP	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	23,380	27.3%	23,514	25.4%	134	0.6%
18-24	6,898	8.0%	7,503	8.1%	605	8.8%
25-34	14,462	16.9%	15,147	16.3%	685	4.7%
35-44	15,139	17.7%	15,783	17.0%	644	4.3%
45-54	13,555	15.8%	12,355	13.3%	-1,200	-8.9%
55-64	7,860	9.2%	10,063	10.9%	2,203	28.0%
65 or older	4,431	5.2%	8,378	9.0%	3,947	89.1%
Total Population	**85,725**	**100.0%**	**92,743**	**100.0%**	**7,018**	**8.2%**

	2010		2023		Change, 2010-2023	
Urbana CDP	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	3,253	34.9%	5,074	31.9%	1,821	56.0%
18-24	429	4.6%	1,057	6.6%	628	146.4%
25-34	1,217	13.0%	1,679	10.6%	462	38.0%
35-44	2,077	22.3%	3,020	19.0%	943	45.4%
45-54	1,302	14.0%	2,322	14.6%	1,020	78.3%

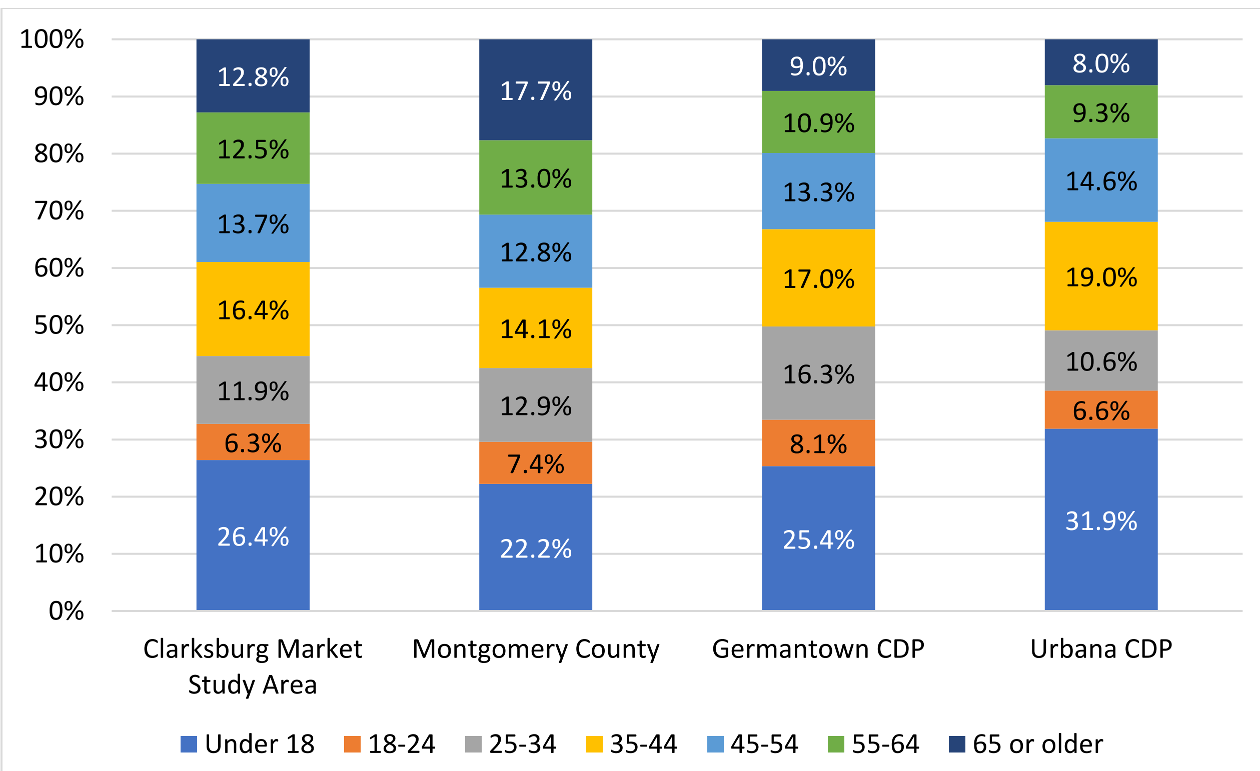
55-64	651	7.0%	1,478	9.3%	827	127.0%
65 or older	400	4.3%	1,278	8.0%	878	219.5%
Total Population	**9,329**	**100.0%**	**15,908**	**100.0%**	**6,579**	**70.5%**

Table 3, the Clarksburg area has higher rates of children (under 18 years) and lower rates of seniors (over 65 years) than Montgomery County.

The age profile in the Clarksburg area resembles Germantown more than Montgomery County overall, as it also has a higher share of residents under 18 and fewer residents below 65. However, unlike Clarksburg, the Germantown CDP has a larger share of residents between 18 and 34 years. While these residents account for 18 percent of residents in Clarksburg, they account for over 24 percent of residents in Germantown.

This discrepancy may reflect the greater diversity of housing units in Germantown, where over 30 percent of housing units are in multifamily structures, compared to ten percent in the Market Study Area (see Units in Structure section). Based on income levels and lifestyle preferences, younger workers tend to rent smaller units. Germantown may also have younger working residents because it is closer to Washington, D.C., and other centers of activity. The age profile in Urbana resembles that of Clarksburg in contrast to Germantown for similar reasons.

Figure 5: Age Distribution, 2023



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

	2010	2023	Change, 2010-2023

Clarksburg Market Study Area	Number	Percent	Number	Percent	Number	Percent
Under 18	5,687	30.4%	9,739	26.4%	4,052	71.3%
18-24	1,349	7.2%	2,330	6.3%	981	72.7%
25-34	2,460	13.1%	4,381	11.9%	1,921	78.1%
35-44	3,602	19.3%	6,062	16.4%	2,460	68.3%
45-54	2,953	15.8%	5,037	13.7%	2,084	70.6%
55-64	1,597	8.5%	4,617	12.5%	3,020	189.1%
65 or older	1,060	5.7%	4,716	12.8%	3,656	344.9%
Total Population	**18,708**	**100.0%**	**36,882**	**100.0%**	**18,174**	**97.1%**

	2010		2023		Change, 2010-2023	
Montgomery County	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	233,530	24.0%	239,103	22.2%	5,573	2.4%
18-24	73,058	7.5%	79,257	7.4%	6,199	8.5%
25-34	132,393	13.6%	138,785	12.9%	6,392	4.8%
35-44	140,565	14.5%	151,259	14.1%	10,694	7.6%
45-54	153,481	15.8%	137,526	12.8%	-15,955	-10.4%
55-64	118,981	12.2%	139,908	13.0%	20,927	17.6%
65 or older	119,769	12.3%	189,924	17.7%	70,155	58.6%
Total Population	**971,777**	**100.0%**	**1,075,762**	**100.0%**	**103,985**	**10.7%**

	2010		2023		Change, 2010-2023	
Germantown CDP	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	23,380	27.3%	23,514	25.4%	134	0.6%
18-24	6,898	8.0%	7,503	8.1%	605	8.8%
25-34	14,462	16.9%	15,147	16.3%	685	4.7%
35-44	15,139	17.7%	15,783	17.0%	644	4.3%
45-54	13,555	15.8%	12,355	13.3%	-1,200	-8.9%
55-64	7,860	9.2%	10,063	10.9%	2,203	28.0%
65 or older	4,431	5.2%	8,378	9.0%	3,947	89.1%
Total Population	**85,725**	**100.0%**	**92,743**	**100.0%**	**7,018**	**8.2%**

	2010		2023		Change, 2010-2023	
Urbana CDP	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Under 18	3,253	34.9%	5,074	31.9%	1,821	56.0%
18-24	429	4.6%	1,057	6.6%	628	146.4%
25-34	1,217	13.0%	1,679	10.6%	462	38.0%
35-44	2,077	22.3%	3,020	19.0%	943	45.4%
45-54	1,302	14.0%	2,322	14.6%	1,020	78.3%
55-64	651	7.0%	1,478	9.3%	827	127.0%
65 or older	400	4.3%	1,278	8.0%	878	219.5%
Total Population	**9,329**	**100.0%**	**15,908**	**100.0%**	**6,579**	**70.5%**

Table 3: Age Distribution, 2010-2023

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Racial and Ethnic Distribution

The Clarksburg area is a diverse community with a distinct racial and ethnic profile compared to Montgomery County overall. As of 2021, Asian residents comprise the largest racial and ethnic group, accounting for 37 percent of Market Study Area residents. Non-Hispanic White residents are the second largest group (30 percent), followed by Black/African Americans (16.7 percent) and Hispanic or Latino residents (11 percent).

Not only is the share of Asian residents in Clarksburg as of 2021 very large, but Asian residents also comprised over half of the total population growth between 2010 and 2021. Although Germantown has a smaller share of Asian residents with 20 percent, Asian residents also comprised approximately 50 percent of the growth there between 2010 and 2021. By comparison, Asian residents were 30 percent of the population growth in Montgomery County during the same period.

While difficult to speculate about the draw of the I-270 corridor to a specific racial or ethnic group, Clarksburg and Germantown have experienced new housing development that has outpaced the County overall and is likely one explanation for the increasing diversity in these places. Indeed, in fast-growing Urbana, Asian residents comprise nearly 20 percent of population growth since 2010 for a total share of 17.5 percent in 2021.

In Clarksburg, there was disproportionately fast growth in every racial and ethnic group, even among non-Hispanic White residents, whose total numbers declined countywide between 2010 and 2021. In the Market Study Area, Hispanic and Latino residents increased by 82 percent compared to 26 percent in the county, and Black/African American residents increased by 88 percent compared to 18 percent in the county. The same is true for growth in these groups in Germantown from 2010 to 2021. This further supports the notion that growth through housing development may improve diversity.[2]

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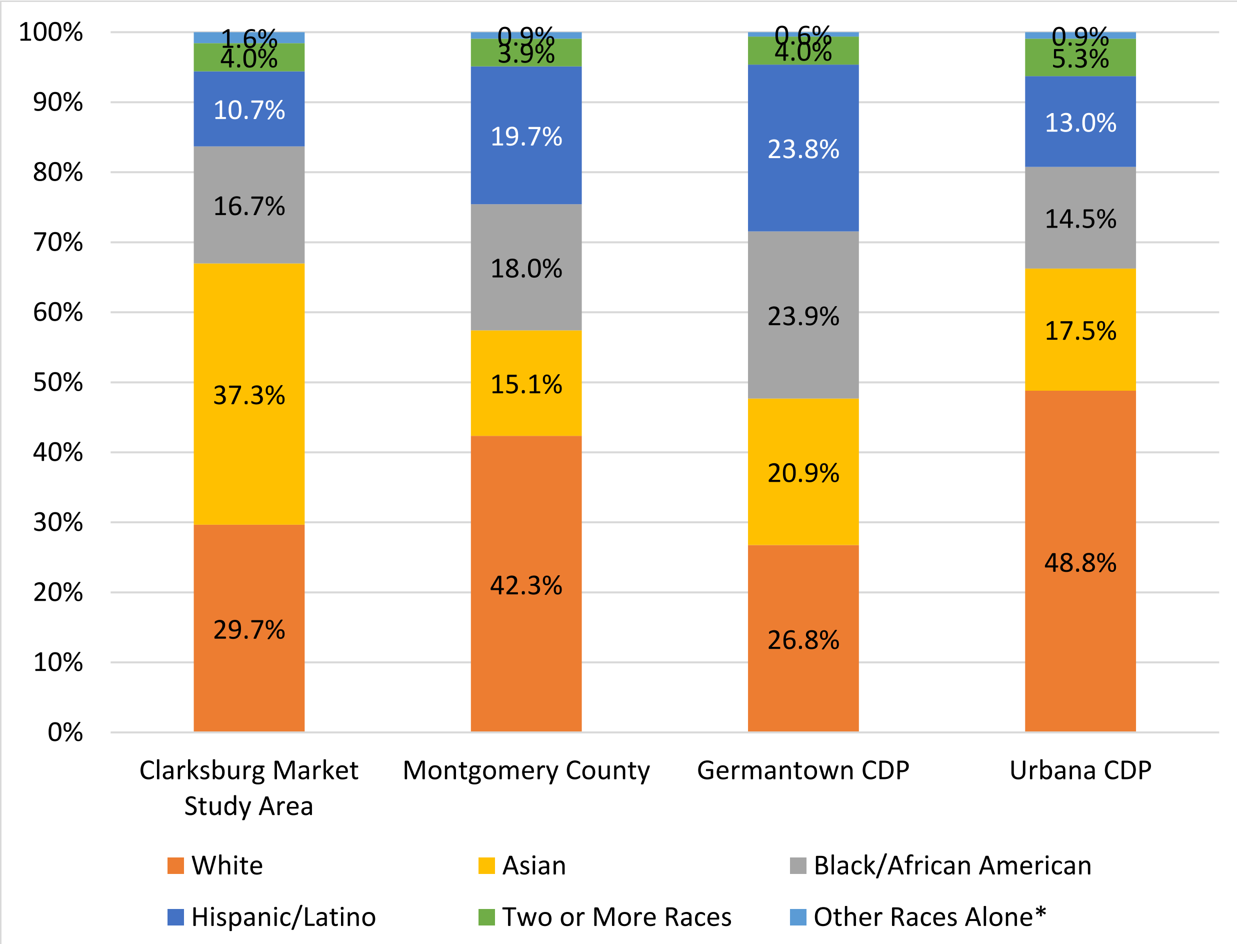
[2] See https://montgomeryplanning.org/tools/research/special-studies/neighborhood-change-in-the-washington-metropolitan-area/ for a deeper analysis of neighborhood change across Montgomery County and the Washington DC, metropolitan region.

Figure 6: Racial and Ethnic Distribution, 2021



**The "Other Races Alone" group includes the categories of American Indian/Alaska Native, Pacific Islander, and Other Race.*

Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 4: Racial and Ethnic Distribution, 2010-2021

Clarksburg Market Study Area	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent
Hispanic/Latino	**1,841**	**9.8%**	**3,350**	**10.7%**	**1,509**	**82.0%**
Not Hispanic/Latino	**16,867**	**90.2%**	**27,920**	**89.3%**	**11,053**	**65.5%**
White	8,069	43.1%	9,280	29.7%	1,211	**15.0%**
Black/African American	2,777	14.8%	5,227	16.7%	2,450	**88.2%**
Native American	14	0.1%	107	0.3%	93	**664.3%**
Asian	5,372	28.7%	11,665	37.3%	6,293	**117.1%**
Native Hawaiian/Pacific Islander	12	0.1%	0	0.0%	(12)	**-100.0%**
Other	39	0.2%	383	1.2%	344	**882.1%**
Two or More Races	584	3.1%	1,258	4.0%	674	**115.4%**
Total Population	**18,708**	**100.0%**	**31,270**	**100.0%**	**12,562**	**67.1%**

Montgomery County	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent
Hispanic/Latino	**165,398**	**17.0%**	**208,216**	**19.7%**	**42,818**	**25.9%**
Not Hispanic/Latino	**806,379**	**83.0%**	**848,985**	**80.3%**	**42,606**	**5.3%**
White	478,765	49.3%	447,683	42.3%	(31,082)	**-6.5%**
Black/African American	161,689	16.6%	190,282	18.0%	28,593	**17.7%**
Native American	1,580	0.2%	1,450	0.1%	(130)	**-8.2%**
Asian	134,677	13.9%	159,466	15.1%	24,789	**18.4%**
Native Hawaiian/Pacific Islander	427	0.0%	333	0.0%	(94)	**-22.0%**
Other	3,617	0.4%	8,030	0.8%	4,413	**122.0%**
Two or More Races	25,624	2.6%	41,741	3.9%	16,117	**62.9%**
Total Population	**971,777**	**100.0%**	**1,057,201**	**100.0%**	**85,424**	**8.8%**

Germantown CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent
Hispanic/Latino	**15,750**	**18.4%**	**21,450**	**23.8%**	**5,700**	**36.2%**
Not Hispanic/Latino	**69,967**	**81.6%**	**68,545**	**76.2%**	**(1,422)**	**-2.0%**
White	31,337	36.6%	24,083	26.8%	(7,254)	**-23.1%**
Black/African American	18,573	21.7%	21,481	23.9%	2,908	**15.7%**
Native American	186	0.2%	40	0.0%	(146)	**-78.5%**
Asian	16,763	19.6%	18,824	20.9%	2,061	**12.3%**
Native Hawaiian/Pacific Islander	29	0.0%	0	0.0%	(29)	**-100.0%**
Other	262	0.3%	522	0.6%	260	**99.2%**
Two or More Races	2,817	3.3%	3,595	4.0%	778	**27.6%**
Total Population	**85,717**	**100.0%**	**89,995**	**100.0%**	**4,278**	**5.0%**

Urbana CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent
Hispanic/Latino	**918**	**9.8%**	**1,722**	**13.0%**	**804**	**87.6%**
Not Hispanic/Latino	**8,408**	**90.2%**	**11,549**	**87.0%**	**3,141**	**37.4%**
White	5,648	60.6%	6,477	48.8%	829	**14.7%**
Black/African American	822	8.8%	1,924	14.5%	1,102	**134.1%**
Native American	15	0.2%	61	0.5%	46	**306.7%**
Asian	1,570	16.8%	2,316	17.5%	746	**47.5%**
Native Hawaiian/Pacific Islander	2	0.0%	33	0.2%	31	**1550.0%**
Other	34	0.4%	30	0.2%	(4)	**-11.8%**
Two or More Races	317	3.4%	708	5.3%	391	**123.3%**
Total Population	**9,326**	**100.0%**	**13,271**	**100.0%**	**3,945**	**42.3%**

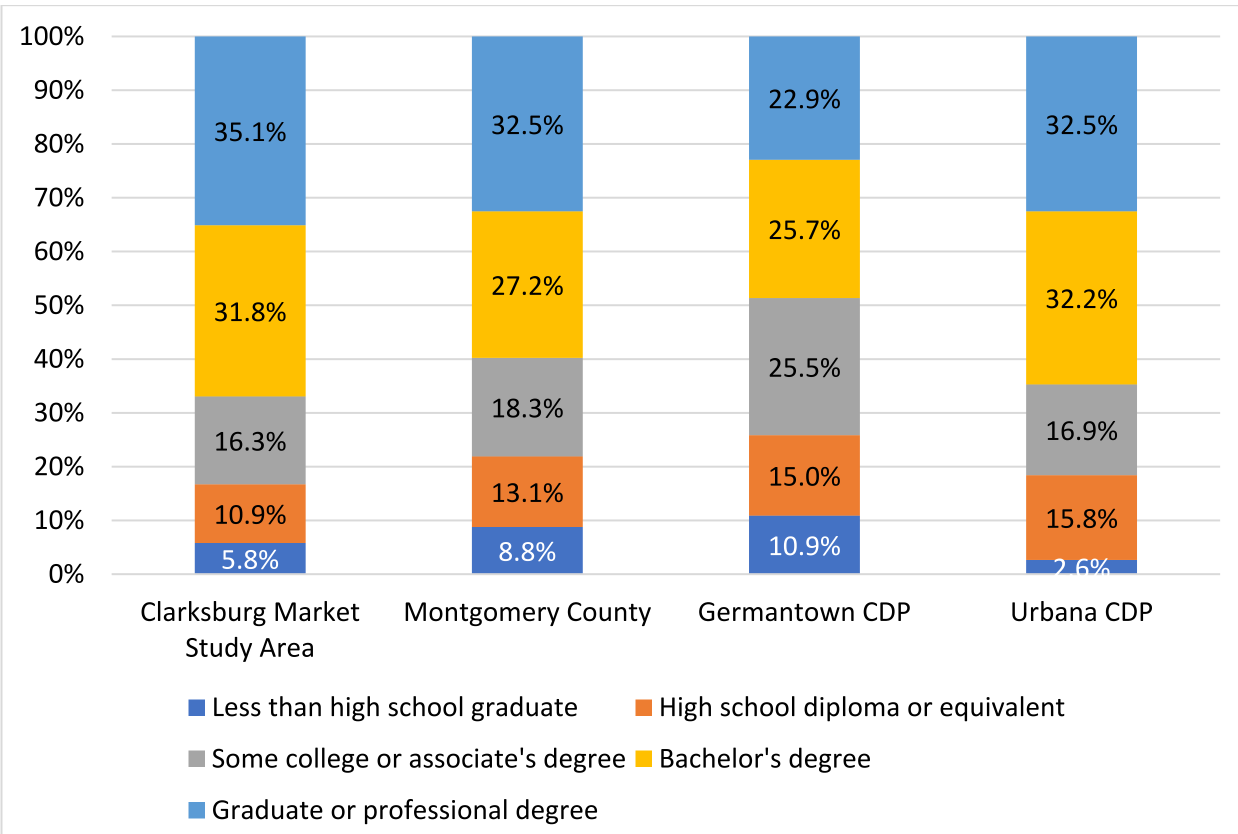
Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Educational Attainment

The Clarksburg Area has a highly educated population with two-thirds of residents over 25 years of age holding a bachelor's degree or higher. Approximately 35 percent of Market Study Area residents have a Graduate or Professional Degree, which exceeds the county's share of residents with a higher educational degree (32.5 percent). Educational attainment among residents in Urbana resembles that of Clarksburg, reinforcing the idea that Clarksburg and Urbana are likely attracting similar demand for housing. Notably, despite its closer proximity to employment centers and Washington, D.C., fewer than half of Germantown residents over 25 have a bachelor's degree or higher.

The summary of educational attainment, as shown in Figure 7 and Table 5, is consistent with the income distribution in these geographies, as discussed in the Income Distribution subsection of this market study.

Figure 7: Educational Attainment, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 5: Educational Attainment, 2021

	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP	
Educational Attainment (a)	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Less than 9th Grade	563	2.8%	35,878	4.9%	3,188	5.3%	117	1.5%
9th to 12th Grade, No Diploma	610	3.0%	28,060	3.8%	3,326	5.6%	90	1.1%
High School Diploma or Equiv.	2,210	10.9%	95,734	13.1%	8,975	15.0%	1,240	15.8%
Some College, No Degree	1,988	9.8%	93,376	12.8%	10,540	17.6%	936	11.9%
Associate Degree	1,312	6.5%	40,215	5.5%	4,724	7.9%	392	5.0%
Bachelor's Degree	6,442	31.8%	198,678	27.2%	15,406	25.7%	2,529	32.2%
Graduate/Professional Degree	7,103	35.1%	237,226	32.5%	13,734	22.9%	2,558	32.5%
Total Population Age 25+	**20,228**	**100.0%**	**729,167**	**100.0%**	**59,893**	**100.0%**	**7,862**	**100.0%**
Without High School Diploma	**1,173**	**5.8%**	**63,938**	**8.8%**	**6,514**	**10.9%**	**207**	**2.6%**
Bachelor's Degree or Higher	**13,545**	**67.0%**	**435,904**	**59.8%**	**29,140**	**48.7%**	**5,087**	**64.7%**

Note:
(a) Educational attainment data represents residents aged 25 or older.

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Economic Conditions

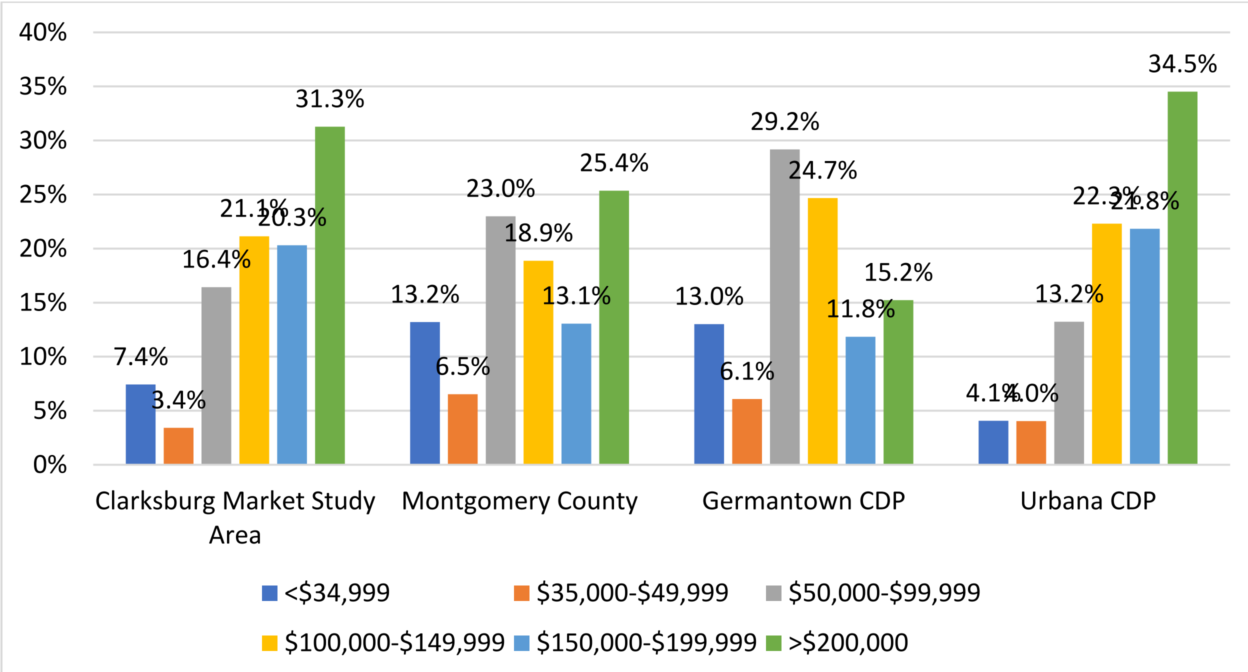
Income Distribution

The Clarksburg area is a relatively high-income community as exhibited through the Market Study Area's median household income of $153,000. The distribution of household incomes is somewhat skewed by very high-income households, as the average household income is $165,000. With an average household size of 3.20, the per capita income of the Market Study Area is $52,000.

The data suggests that the Clarksburg area has a smaller range of household incomes compared to the county overall. As Figure 8 and Table 6 show, Montgomery County has a higher share of households earning less than $35,000, which likely explains why the county has a lower median household income of $117,000 compared to the Market Study Area. The data is limited to tallying households earning $200,000 or more, but it is likely that the contingent of very high household incomes (well above $200,000) is driving the county average household income to $161,000. Given that the average household size in the county is smaller than in the Market Study Area, the per capita income is higher at $59,000. Therefore, while the Clarksburg area is a relatively high-income community, it does not have as many households at the extremes of the countywide income distribution. One explanation for this is the relatively recent and somewhat homogenous housing development in Clarksburg (see Housing Characteristics section).

Consistent with other findings in the demographic and economic data, the income distribution in Urbana is similar to, but slightly higher than, that of the Clarksburg Market Study Area, where the higher median and average household incomes are indicative of a slightly larger average household size.

Figure 8: Income Distribution, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 6: Income Distribution, 2021

Income Category	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<$34,999	709	7.4%	50,583	13.2%	4,052	13.0%	159	4.1%
$35,000-$49,999	326	3.4%	25,021	6.5%	1,893	6.1%	158	4.0%
$50,000-$99,999	1,569	16.4%	88,121	23.0%	9,090	29.2%	517	13.2%
$100,000-$149,999	2,018	21.1%	72,343	18.9%	7,685	24.7%	871	22.3%
$150,000-$199,999	1,939	20.3%	50,054	13.1%	3,691	11.8%	853	21.8%
>$200,000	2,986	31.3%	97,186	25.4%	4,743	15.2%	1,348	34.5%
Total Households	**9,547**	**100.0%**	**383,308**	**100.0%**	**31,154**	**100.0%**	**3,906**	**100.0%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Resident Employment by Industry

Of the 15,755 employed residents of the Market Study Area, one-half work in Professional/Scientific/Tech Services, Health Care/Social Assistance, and Public Administration. As reported in Table 7, 24 percent of Market Study Area residents work in Professional/Scientific/Tech Services, 15 percent in Health Care/Social Assistance, and 11 percent in Public Administration. This is in line with the county overall, where 42 percent of the labor force is employed in these top three sectors.

As of 2023, the Market Study Area registers an unemployment rate of 2.8 percent. Although this is slightly lower than the county's unemployment rate of 3.1 percent, the entire region records low unemployment rates that are consistent with nationwide unemployment trends.

Table 7: Resident Employment by Industry, 2021

	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP	
Industry	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Agriculture/Forestry/Fishing/Hunting	41	0%	1,206	0%	98	0%	0	0%
Mining/Quarrying/Oil & Gas Extraction	0	0%	134	0%	12	0%	0	0%
Construction	1,060	7%	35,128	6%	2,998	6%	358	5%
Manufacturing	653	4%	16,770	3%	2,033	4%	603	9%
Wholesale Trade	44	0%	6,197	1%	467	1%	57	1%
Retail Trade	1,183	8%	41,892	7%	5,236	10%	458	7%
Transportation/Warehousing	172	1%	15,008	3%	1,575	3%	174	3%
Utilities	23	0%	1,322	0%	187	0%	0	0%
Information	444	3%	13,790	2%	850	2%	88	1%
Finance/Insurance	854	5%	22,810	4%	2,372	5%	348	5%
Real Estate/Rental/Leasing	282	2%	12,852	2%	842	2%	135	2%
Professional/Scientific/Tech Services	3,776	24%	101,907	18%	8,201	16%	1,484	22%
Management of Companies/Enterprises	17	0%	661	0%	24	0%	3	0%
Admin/Support/Waste Management Services	160	1%	23,103	4%	2,037	4%	226	3%
Educational Services	1,338	8%	53,854	10%	4,749	10%	752	11%
Health Care/Social Assistance	2,339	15%	69,014	12%	6,166	12%	553	8%
Arts/Entertainment/Recreation	199	1%	11,273	2%	815	2%	124	2%
Accommodation/Food Services	689	4%	32,570	6%	3,665	7%	283	4%
Other Services (excl. Public Administration)	747	5%	39,372	7%	2,703	5%	275	4%
Public Administration	1,734	11%	64,092	11%	4,936	10%	896	13%
Total Employed Residents	**15,755**	**100%**	**562,955**	**100%**	**49,966**	**100%**	**6,817**	**100%**
Unemployment Rate (2023)	2.8%		3.1%		3.1%		2.0%	

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Jobs by Industry

This section examines the types of jobs that exist within each of the study geographies. This differs from the previous section that analyzes the jobs of the residents of each area.

As detailed in Table 8, the top three industries in the Market Study Area are construction (19.0 percent), retail trade (14.7 percent), and educational services (9.8 percent). It is likely that many of the 1,382 construction jobs are associated with employees of a construction company headquartered in the area who do not necessarily work onsite, but have reported their address as the company's headquarters. Given that the share of the Market Study Area's jobs in these three industries is higher than the number of residents who work in them (see Table 7), it is probable that many workers in these fields do not live in Clarksburg. Compared to the county, the Market Study Area has a lower share of Professional/Scientific/Tech Services jobs (6.6 percent versus 13.3 percent) and Healthcare/Social Assistance jobs (6.6 percent versus 15.3 percent).

Based on the Quarterly Census of Employment and Wages (QCEW) data from 2021, the Plan Area currently has about 50 businesses and 1,350 jobs, exceeding the number of households (840). There are about 20 more businesses but 60 fewer jobs than in 2010 as mid-sized businesses have closed or left the area while smaller businesses have taken their place. The largest employers in the Plan Area are in the Gateway 270 office park and include Thales Defense and Security, RRAI (formerly Robotic Research), the Brightfocus Foundation, and Moyer and Sons Moving and Storage nearby on Shawnee Lane.

Table 8: Jobs by Industry, 2021

	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP	
Industry	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Agriculture/Forestry/Fishing/Hunting	29	0.4%	359	0.1%	2	0.0%	2	0.0%
Mining/Quarrying/Oil & Gas Extraction	0	0.0%	207	0.0%	14	0.1%	0	0.0%
Construction	1,382	19.0%	28,487	5.9%	788	3.2%	498	11.0%
Manufacturing	71	1.0%	13,465	2.8%	1,205	4.9%	325	7.2%
Wholesale Trade	27	0.4%	6,320	1.3%	343	1.4%	52	1.1%
Retail Trade	1,069	14.7%	52,265	10.8%	3,646	14.9%	366	8.1%
Transportation/Warehousing	309	4.3%	5,586	1.2%	166	0.7%	0	0.0%
Utilities	0	0.0%	341	0.1%	80	0.3%	25	0.6%
Information	296	4.1%	19,962	4.1%	3,371	13.8%	112	2.5%
Finance/Insurance	69	0.9%	22,081	4.6%	641	2.6%	614	13.6%
Real Estate/Rental/Leasing	348	4.8%	20,673	4.3%	1,003	4.1%	89	2.0%
Professional/Scientific/Tech Services	476	6.6%	63,978	13.3%	3,216	13.2%	203	4.5%
Management of Companies/Enterprises	0	0.0%	545	0.1%	2	0.0%	10	0.2%
Admin/Support/Waste Management Services	284	3.9%	16,500	3.4%	399	1.6%	74	1.6%
Educational Services	709	9.8%	32,252	6.7%	2,149	8.8%	693	15.3%
Health Care/Social Assistance	478	6.6%	73,892	15.3%	2,312	9.5%	473	10.5%
Arts/Entertainment/Recreation	128	1.8%	9,501	2.0%	392	1.6%	34	0.8%
Accommodation/Food Services	234	3.2%	36,114	7.5%	2,474	10.1%	548	12.1%
Other Services (excl. Public Administration)	631	8.7%	38,459	8.0%	1,003	4.1%	177	3.9%
Public Administration	596	8.2%	32,529	6.7%	666	2.7%	112	2.5%
Unclassified Establishments	131	1.8%	8,882	1.8%	533	2.2%	115	2.5%
Total Workers	**7,267**	**100.0%**	**482,398**	**100.0%**	**24,405**	**100.0%**	**4,522**	**100.0%**

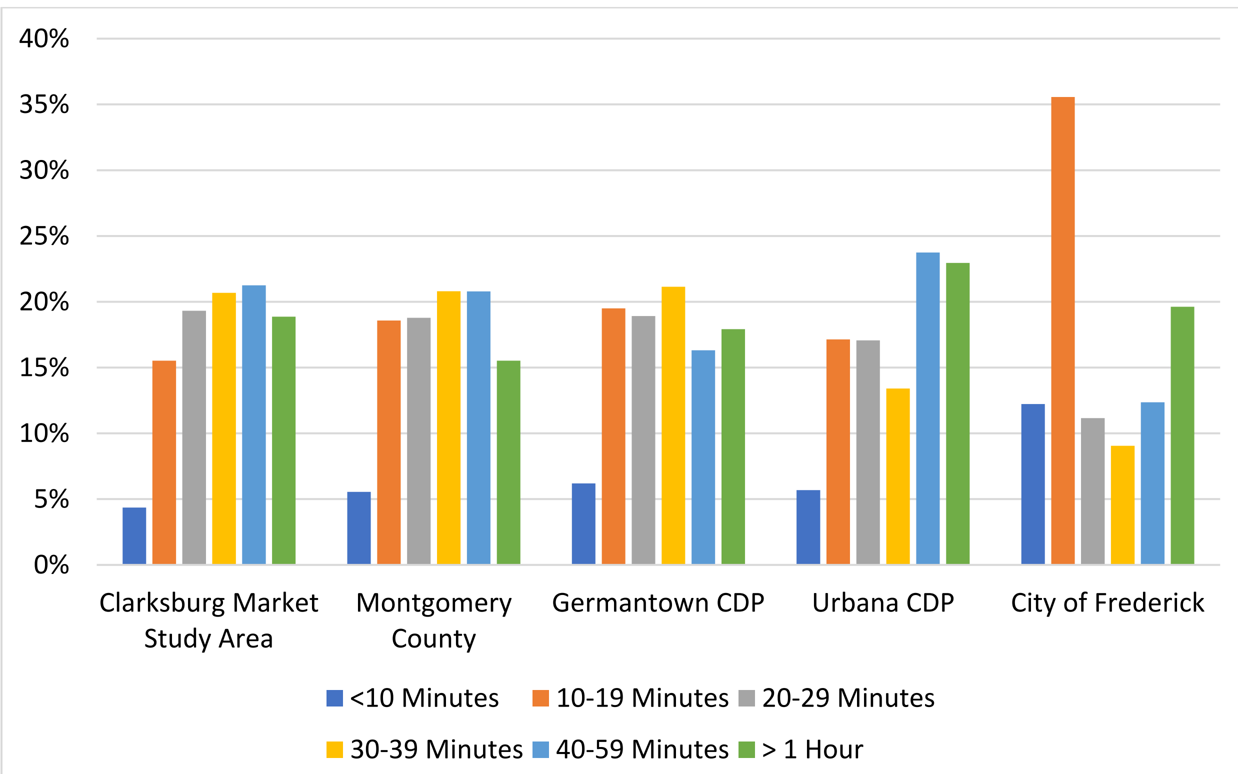
Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Commute Patterns

The majority (60.8 percent) of employed residents in the Market Study Area spend 30 minutes or more commuting to work one-way, while 18.9 percent spend one hour or more on their one-way travel to work. As Figure 9 and Table 9 display, commute times in the Clarksburg area exceed those of the county and of Germantown.

The higher-than-average commute times in Clarksburg imply that residents, similar to Germantown, travel to the Washington D.C vicinity for work. Despite these long commutes, however, people are moving to Clarksburg, a trend which may be explained by the relative affordability of larger housing units in this area. The City of Frederick located north of Clarksburg on I-270, serves as a notable comparison point. Although located farther from D.C., it exhibits shorter commute times. Nearly half of its residents (47.8 percent) travel less than 20 minutes to work, suggesting that people living in Frederick are likely able to work nearby. This is significant because despite the proximity of Clarksburg to Frederick, residents in Clarksburg seem to work in a different market than residents choosing to live in Frederick.

Figure 9: Commute Time for Employed Residents, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 9: Commute Time for Employed Residents, 2021

	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP		City of Frederick	
Commute to Work	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
<10 Minutes	556	4.4%	25,320	5.6%	2,662	6.2%	318	5.7%	4,492	12.2%
10-19 Minutes	1,983	15.5%	84,698	18.6%	8,374	19.5%	958	17.1%	13,072	35.6%
20-29 Minutes	2,467	19.3%	85,650	18.8%	8,121	18.9%	954	17.1%	4,101	11.2%
30-39 Minutes	2,642	20.7%	94,858	20.8%	9,076	21.1%	749	13.4%	3,329	9.1%
40-59 Minutes	2,715	21.3%	94,796	20.8%	7,005	16.3%	1,327	23.7%	4,544	12.4%
> 1 Hour	2,410	18.9%	70,792	15.5%	7,695	17.9%	1,283	23.0%	7,213	19.6%
Total	**12,773**	**100%**	**456,114**	**100%**	**42,933**	**100%**	**5,589**	**100%**	**36,751**	**100%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Housing Characteristics

Household Tenure

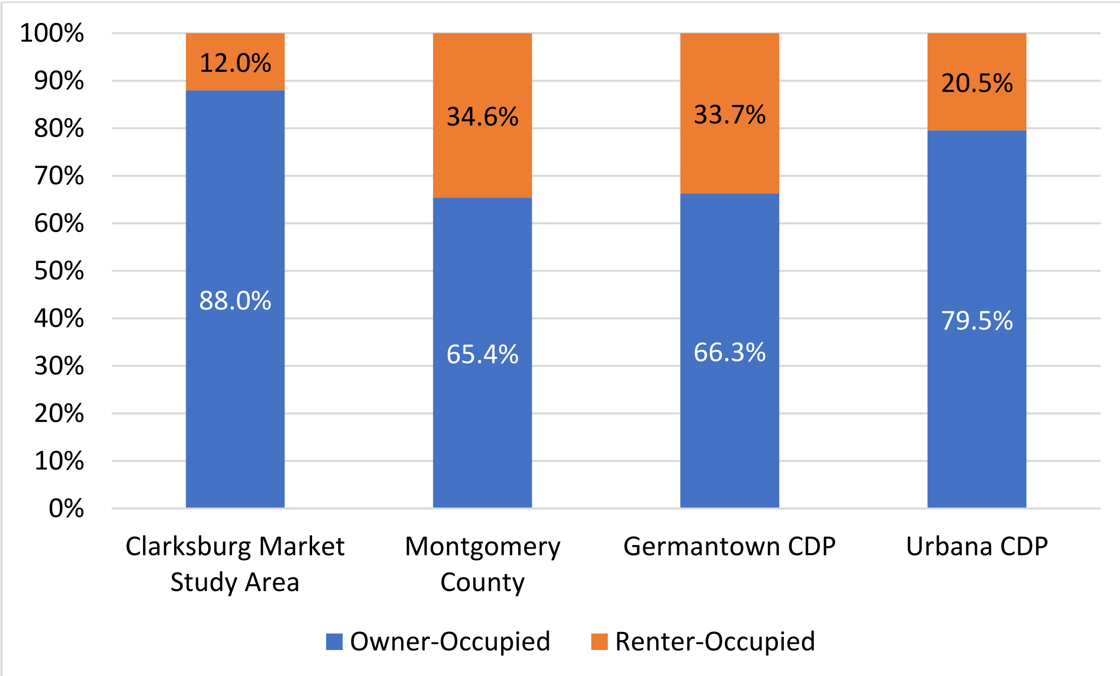
Households in the Market Study Area are predominantly composed of homeowners, where 88 percent of occupied units are owned, and 12 percent are rented. Despite this prevalence of owner households, the Market Study Area experienced rates of growth in renter households that outpaced growth in owner households due to the area having essentially no rental units available until recently. Between 2010 and 2021, renter occupancy in the Market Study Area increased 111.4 percent from 542 to 1,146 households, outpacing the 71 percent growth in owner households.

Interestingly, while the Market Study Area has 1,146 renter households, there are only 1,001 units in multifamily structures[3] (see Units in Structure section). This suggests that some single-family homes that are generally owner-occupied are being rented, likely by households at an income level below what is required to purchase single family units at the average price for Clarksburg. This is further discussed in the Residential Market section of this report. A similar trend can be observed in Urbana where the number of renter-occupied units exceeds the number of units in multifamily structures.

Compared to the Clarksburg area, the county and Germantown have far fewer owner households, with owner households comprising 65.4 percent and 66.3 percent, respectively. The relatively larger share of renter households in the county and Germantown is in line with the availability of units in multifamily buildings.

[3] In this study, multifamily structures are defined as buildings with 2 or more units.

Figure 10: Household Tenure, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 10: Household Tenure, 2010-2021

Clarksburg Market Study Area	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Owner-Occupied	4,913	90.1%	8,401	88.0%	3,488	71.0%	5.0%
Renter-Occupied	542	9.9%	1,146	12.0%	604	111.4%	7.0%
Total Occupied Units	**5,455**	**100.0%**	**9,547**	**100.0%**	**4,092**	**75.0%**	**5.2%**

Montgomery County	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Owner-Occupied	241,465	67.6%	250,746	65.4%	9,281	3.8%	0.3%
Renter-Occupied	115,621	32.4%	132,562	34.6%	16,941	14.7%	1.3%
Total Occupied Units	**357,086**	**100.0%**	**383,308**	**100.0%**	**26,222**	**7.3%**	**0.6%**

Germantown CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Owner-Occupied	20,950	69.3%	20,646	66.3%	(304)	-1.5%	-0.1%
Renter-Occupied	9,296	30.7%	10,506	33.7%	1,210	13.0%	1.1%
Total Occupied Units	**30,246**	**100.0%**	**31,152**	**100.0%**	**906**	**3.0%**	**0.3%**

Urbana CDP	2010 Number	2010 Percent	2021 Number	2021 Percent	Change, 2010-2021 Number	Change, 2010-2021 Percent	Change, 2010-2021 Average Annual (%)
Owner-Occupied	2,592	91.2%	3,107	79.5%	515	19.9%	1.7%
Renter-Occupied	249	8.8%	799	20.5%	550	220.9%	11.2%
Total Occupied Units	**2,841**	**100.0%**	**3,906**	**100.0%**	**1,065**	**37.5%**	**2.9%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

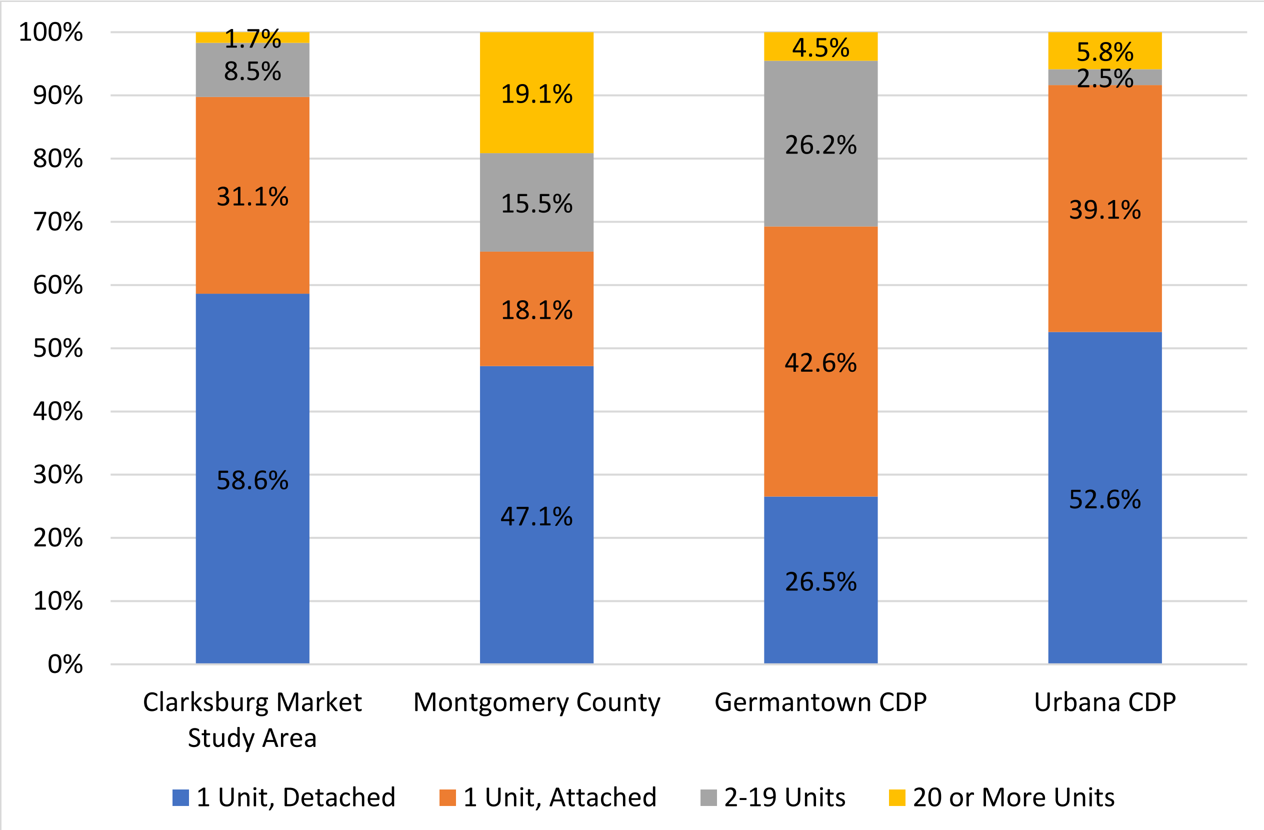
Units in Structure

This section examines the distribution of the number of units in residential buildings. Table 11 below reflects the number of units in each of the listed structure types. For example, the number '107' in the Market Study Area column refers to a total of 107 units in structures that have 50 or more units.

The Clarksburg Market Study Area has a relatively homogenous housing stock, with nearly 90 percent of all units being single-family. Of these, 31 percent are townhomes and 59 percent are single-family detached units. Compared to the county, the Market Study Area has a notably smaller share of multifamily units. While 34.7 percent of the county's housing stock is in multifamily structures, this figure is only 10.2 percent for the Market Study Area. The Market Study Area has a larger share of townhomes with 31 percent, compared to 18 percent in the county. This composition of unit types helps explain Clarksburg's larger average household size compared to that of the county.

While the share of townhomes in the Market Study Area exceeds that of the county, it is considerably lower than in Germantown (42.6 percent). Given similarities in population and housing trends between Germantown of the 1990s and Clarksburg of the 2000s, this data may indicate the future of development in the Clarksburg and Urbana areas. If the Sector Plan allows for more, denser development, the distribution of units in structure in Clarksburg could eventually resemble that of Germantown.

Figure 11: Units in Structure, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 11: Units in Structure, 2021

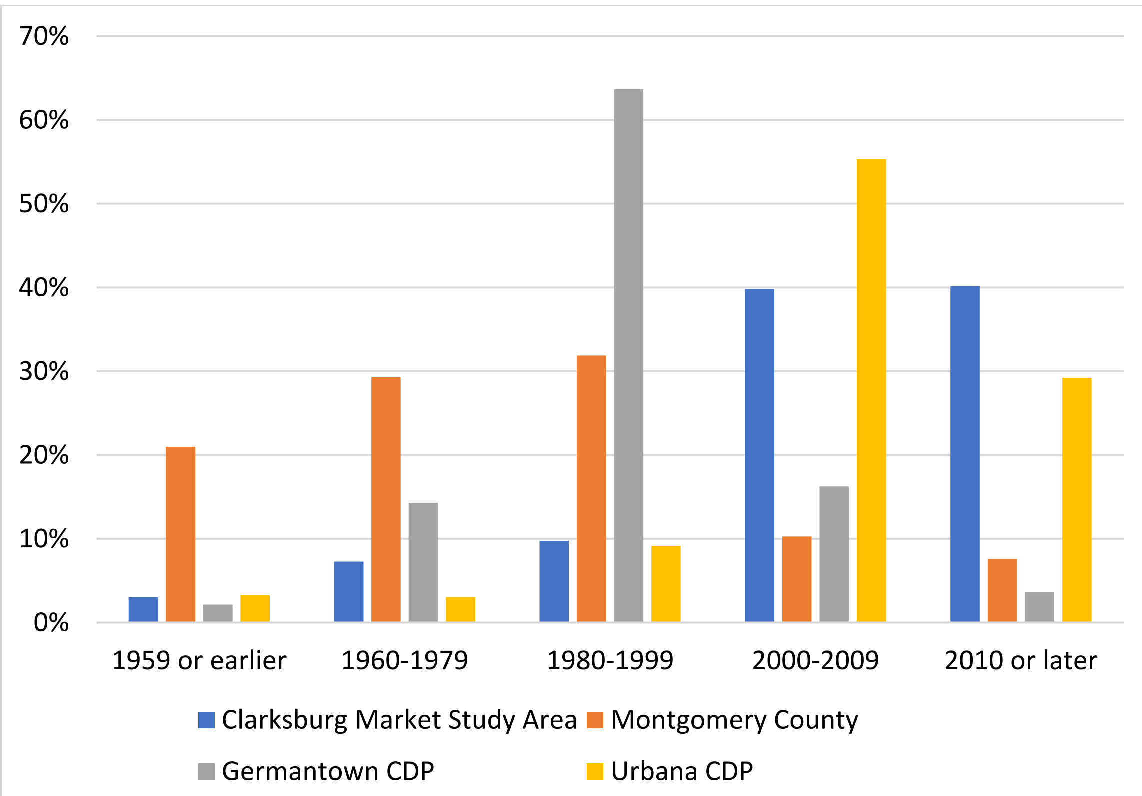
	Clarksburg Market Study Area		Montgomery County		Germantown CDP		Urbana CDP	
Units in Structure	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
1 Unit, Detached	5,732	58.6%	189,327	47.1%	8,530	26.5%	2,094	52.6%
1 Unit, Attached	3,045	31.1%	72,743	18.1%	13,729	42.6%	1,556	39.1%
2 Units	31	0.3%	1,977	0.5%	288	0.9%	18	0.5%
3-4 Units	138	1.4%	5,835	1.5%	1,121	3.5%	0	0.0%
5-9 Units	76	0.8%	19,526	4.9%	1,934	6.0%	0	0.0%
10-19 Units	591	6.0%	35,155	8.7%	5,085	15.8%	82	2.1%
20-49 Units	58	0.6%	11,710	2.9%	597	1.9%	139	3.5%
50+ Units	107	1.1%	65,099	16.2%	853	2.6%	94	2.4%
Other (a)	0	0.0%	570	0.1%	69	0.2%	0	0.0%
Total Units	**9,778**	**100%**	**401,942**	**100%**	**32,206**	**100%**	**3,983**	**100%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Year Built

As seen in Figure 12 and Table 12, development in the Clarksburg area flourished in the 2000s. Over 80 percent of the Market Study Area's housing stock was built since 2000. With 70 percent of the countywide housing units built by 1990, development in Clarksburg followed on the heels of housing development moving north along I-270, particularly as other parts of the county were built out. In fact, Germantown beckoned the future of Clarksburg, with a dramatic rate of development in the 1980s and 1990s similar to that of Clarksburg since 2000. Over 60 percent of Germantown was developed between 1980 and 1999, with development continuing into the 2000s. Clarksburg and Urbana have developed in tandem, with development beginning in earnest in the 2000s, again highlighting similarities between these two markets.

Figure 12: Year Built, 2021



Source: ESRI Business Analyst, 2023; Montgomery Planning, 2024.

Table 12: Year Built, 2021

Year Built	Clarksburg Market Study Area Number	Clarksburg Market Study Area Percent	Montgomery County Number	Montgomery County Percent	Germantown CDP Number	Germantown CDP Percent	Urbana CDP Number	Urbana CDP Percent
1939 or earlier	114	1.2%	17,703	4.4%	312	1.0%	50	1.3%
1940-1949	28	0.3%	20,216	5.0%	5	0.0%	18	0.5%
1950-1959	153	1.6%	46,414	11.5%	369	1.1%	62	1.6%
1960-1969	341	3.5%	57,056	14.2%	597	1.9%	57	1.4%
1970-1979	370	3.8%	60,641	15.1%	4,003	12.4%	64	1.6%
1980-1989	157	1.6%	79,782	19.8%	11,543	35.8%	115	2.9%
1990-1999	797	8.2%	48,352	12.0%	8,961	27.8%	249	6.3%
2000-2009	3,892	39.8%	41,335	10.3%	5,232	16.2%	2,203	55.3%
2010 or later	3,926	40.2%	30,443	7.6%	1,183	3.7%	1,164	29.2%
Total Units	**9,778**	**100.0%**	**401,942**	**100.0%**	**32,205**	**100.0%**	**3,982**	**100.0%**

Source: Esri Business Analyst, 2023; Montgomery Planning, 2024.

Housing Affordability

CHAS Data

Table 14 shows housing cost burdens by income bracket and tenure according to Comprehensive Housing Affordability Strategy (CHAS) data published by the U.S. Department of Housing and Urban Development (HUD). The CHAS dataset is based on five-year estimates from the American Community Survey (ACS). Most recent data reflect five-year ACS data for 2016-2020. Households are classified into income categories based on the annually reported HUD Area Median Family Income (HAMFI) for Montgomery County. These income categories can be classified as high, above moderate, moderate, low, very low, and extremely low income as seen in Table 13. The HAMFI for a family of four in Montgomery County in 2023 is $152,000.

Table 13: Income categories by HAMFI Level

Income Category	HUD Area Median Family Income (HAMFI) Level
Extremely low income	<=30 percent of HAMFI
Very low income	>30 percent of HAMFI but <=50 percent of HAMFI
Low income	>50 percent but <=80 percent of HAMFI
Moderate income	>80 percent but <=100 percent of HAMFI
Above moderate income	>100 percent but <=120 percent of HAMFI
High income	>120 percent of HAMFI

As Table 14 shows, nearly three-quarters of Market Study Area households earn more than median income (100 percent of HAMFI) while 68.5 percent of Plan Area households comprise the above median-income groups. In line with national trends, a larger percentage of renter households in the Clarksburg area are in lower income categories. In the Market Study Area, 45.5 percent of renter households earn less than or equal to 100 percent of HAMFI, compared to 22.4 percent of owner households. By comparison, 65.2 percent of owner households are high-income. A similar trend is seen in the Plan Area where 52.1 percent of renter households earn less than 100 percent HAMFI, compared to only 25.2 percent of owner households. More than half (52.8 percent) of owner households in the Plan Area earn greater than 120 percent of HAMFI. Despite the notable presence of lower income households, especially among renter households, the income profile of the Clarksburg areas skews towards moderate- and higher-income households.

Table 14: Distribution of Households by HUD Area Median Family Income Level, 2016-2020 Five-Year Sample Period

	Renter Households		Owner Households		All Households	
Income Category	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Plan Area Census Tract (a)						
Extremely Low Income	40	21.1%	130	14.6%	170	15.7%
Very Low Income	25	13.2%	24	2.7%	49	4.5%
Low Income	4	2.1%	15	1.7%	19	1.8%
Moderate Income	30	15.8%	55	6.2%	85	7.9%
Above Moderate Income	0	0.0%	185	20.8%	185	17.1%
High Income	85	44.7%	470	52.8%	555	51.4%
Total Households	**190**	**100.0%**	**890**	**100.0%**	**1,080**	**100.0%**
Market Study Area Census Tracts (b)						
Extremely Low Income	185	18.8%	475	5.9%	660	7.3%
Very Low Income	95	9.6%	373	4.6%	468	5.2%
Low Income	58	5.9%	375	4.7%	433	4.8%
Moderate Income	110	11.2%	580	7.2%	690	7.6%
Above Moderate Income	100	10.2%	985	12.3%	1,085	12.0%
High Income	435	44.2%	5,239	65.2%	5,674	62.9%
Total Households	**985**	**100.0%**	**8,035**	**100.0%**	**9,020**	**100.0%**

Notes:

(a) The Clarksburg Plan Area is defined by census tract 7003.16.

(b) The Clarksburg Market Study Area is defined by census tracts 7002.10, 7003.14, 7003.15, 7003.16, 7003.17, and 7003.18.

Sources: U.S. Department of Housing and Urban Development, 2016-2020 Comprehensive Housing Affordability Strategy (CHAS) data, 2023.

This analysis also evaluated housing cost burdens by income level and tenure. A cost-burdened household, as defined by HUD, spends more than 30 percent of its gross monthly income on housing costs. Households spending more than 50 percent of gross monthly income on housing costs are severely cost-burdened. This analysis first describes housing affordability conditions in the Market Study Area to understand the larger context, and then zooms in on conditions in the Plan Area. Demographic conditions are generally similar between these two geographies and most differences are explained by the denser nature of housing development in the Plan Area compared to the Market Study Area. Similarly, housing affordability conditions in the Plan Area resemble those of the Market Study Area except that the study area has more large single-family units, which influences findings on housing affordability for owner households in the Market Study Area compared to the Plan Area.

As

Clarksburg Gateway Market Study Area (a)	**Renter Households**		**Owner Households**		**All Households**	
Housing Cost Burden by Income Level	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Extremely Low Income [≤30% HAMFI] (b)(c)	**185**	**100.0%**	**475**	**100.0%**	**660**	**100.0%**
With ≤ 30% Housing Cost Burden	35	18.9%	100	21.1%	135	20.5%
With > 30%, but ≤ 50% Housing Cost Burden	50	27.0%	80	16.8%	130	19.7%
With > 50% Housing Cost Burden	100	54.1%	295	62.1%	395	59.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%
Very Low Income [>30% to ≤50% HAMFI]	**95**	**100.0%**	**373**	**100.0%**	**468**	**100.0%**
With ≤ 30% Housing Cost Burden	25	26.3%	115	30.8%	140	29.9%
With > 30%, but ≤ 50% Housing Cost Burden	35	36.8%	23	6.2%	58	12.4%
With > 50% Housing Cost Burden	35	36.8%	235	63.0%	270	57.7%
Low Income [>50% to ≤80% HAMFI]	**58**	**100.0%**	**375**	**100.0%**	**433**	**100.0%**
With ≤ 30% Housing Cost Burden	50	86.2%	85	22.7%	135	31.2%
With > 30%, but ≤ 50% Housing Cost Burden	8	13.8%	240	64.0%	248	57.3%
With > 50% Housing Cost Burden	0	0.0%	50	13.3%	50	11.5%
Moderate Income [>80% to ≤100% HAMFI]	**110**	**100.0%**	**580**	**100.0%**	**690**	**100.0%**
With ≤ 30% Housing Cost Burden	35	31.8%	460	79.3%	495	71.7%
With > 30%, but ≤ 50% Housing Cost Burden	75	68.2%	65	11.2%	140	20.3%
With > 50% Housing Cost Burden	0	0.0%	55	9.5%	55	8.0%
Above Moderate Income [>100% to ≤120% HAMFI]	**100**	**100.0%**	**985**	**100.0%**	**1,085**	**100.0%**
With ≤ 30% Housing Cost Burden	80	80.0%	555	56.3%	635	58.5%
With > 30%, but ≤ 50% Housing Cost Burden	20	20.0%	410	41.6%	430	39.6%
With > 50% Housing Cost Burden	0	0.0%	20	2.0%	20	1.8%

High Income [>120% HAMFI]	**435**	**100.0%**	**5,239**	**100.0%**	**5,674**	**100.0%**
With ≤ 30% Housing Cost Burden	435	100.0%	4,864	92.8%	5,299	93.4%
With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	375	7.2%	375	6.6%
With > 50% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
Total Households	**985**	**100.0%**	**8,035**	**100.0%**	**9,020**	**100.0%**
With ≤ 30% Housing Cost Burden	660	67.1%	6,179	77.0%	6,839	75.9%
With > 30%, but ≤ 50% Housing Cost Burden	188	19.1%	1,193	14.9%	1,381	15.3%
With > 50% Housing Cost Burden	135	13.7%	655	8.2%	790	8.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%

shows, the overall cost-burden rate among Market Study Area households is 24.1 percent, which is comparable to the share in the Plan Area (28 percent). This includes 8.8 percent and 12.2 percent severely cost-burdened households in the Market Study Area and Plan Area, respectively. As in most jurisdictions, as household median income increases, the rate of housing cost burden decreases. While 79.5 percent of Market Study Area households earning less than 30 percent of the HAMFI experience housing cost burden, this drops to 70.1 percent for very low -income households, 68.8 percent for low-income households, 28.3 percent for moderate-income households, and down to 6.6 percent for high-income households. Above moderate-income households are a notable outlier in this trend as 41.5 percent of these households are cost-burdened, up from 28.3 percent of moderate-income households. This spike in cost-burden may be attributed to an increase in household income. As incomes rise, owning a home becomes more feasible. Yet, ownership costs also increase as they include not only monthly mortgage payments but also property taxes, homeowners' insurance, and HOA or condo fees. Accordingly, the monthly housing costs for moderate income renter households considering buying a home may increase above 30 percent of gross monthly income, classifying them as cost burdened. As seen in

Clarksburg Gateway Market Study Area (a)	**Renter Households**		**Owner Households**		**All Households**	
Housing Cost Burden by Income Level	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Extremely Low Income [≤30% HAMFI] (b)(c)	**185**	**100.0%**	**475**	**100.0%**	**660**	**100.0%**
With ≤ 30% Housing Cost Burden	35	18.9%	100	21.1%	135	20.5%
With > 30%, but ≤ 50% Housing Cost Burden	50	27.0%	80	16.8%	130	19.7%
With > 50% Housing Cost Burden	100	54.1%	295	62.1%	395	59.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%
Very Low Income [>30% to ≤50% HAMFI]	**95**	**100.0%**	**373**	**100.0%**	**468**	**100.0%**
With ≤ 30% Housing Cost Burden	25	26.3%	115	30.8%	140	29.9%
With > 30%, but ≤ 50% Housing Cost Burden	35	36.8%	23	6.2%	58	12.4%
With > 50% Housing Cost Burden	35	36.8%	235	63.0%	270	57.7%
Low Income [>50% to ≤80% HAMFI]	**58**	**100.0%**	**375**	**100.0%**	**433**	**100.0%**
With ≤ 30% Housing Cost Burden	50	86.2%	85	22.7%	135	31.2%

With > 30%, but ≤ 50% Housing Cost Burden	8	13.8%	240	64.0%	248	57.3%
With > 50% Housing Cost Burden	0	0.0%	50	13.3%	50	11.5%
Moderate Income [>80% to ≤100% HAMFI]	**110**	**100.0%**	**580**	**100.0%**	**690**	**100.0%**
With ≤ 30% Housing Cost Burden	35	31.8%	460	79.3%	495	71.7%
With > 30%, but ≤ 50% Housing Cost Burden	75	68.2%	65	11.2%	140	20.3%
With > 50% Housing Cost Burden	0	0.0%	55	9.5%	55	8.0%
Above Moderate Income [>100% to ≤120% HAMFI]	**100**	**100.0%**	**985**	**100.0%**	**1,085**	**100.0%**
With ≤ 30% Housing Cost Burden	80	80.0%	555	56.3%	635	58.5%
With > 30%, but ≤ 50% Housing Cost Burden	20	20.0%	410	41.6%	430	39.6%
With > 50% Housing Cost Burden	0	0.0%	20	2.0%	20	1.8%
High Income [>120% HAMFI]	**435**	**100.0%**	**5,239**	**100.0%**	**5,674**	**100.0%**
With ≤ 30% Housing Cost Burden	435	100.0%	4,864	92.8%	5,299	93.4%
With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	375	7.2%	375	6.6%
With > 50% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
Total Households	**985**	**100.0%**	**8,035**	**100.0%**	**9,020**	**100.0%**
With ≤ 30% Housing Cost Burden	660	67.1%	6,179	77.0%	6,839	75.9%
With > 30%, but ≤ 50% Housing Cost Burden	188	19.1%	1,193	14.9%	1,381	15.3%
With > 50% Housing Cost Burden	135	13.7%	655	8.2%	790	8.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%

, as household income level increases from moderate to above moderate, the share of renter households decreases from 15.9 percent to 9.2 percent, demonstrating this shift towards home ownership.

In addition to renter households being more likely to have lower incomes, they also tend to have a higher share of cost burden relative to owner households. In the Market Study Area, 32.8 percent of all renter households are cost-burdened, while 23 percent of all owner households are cost-burdened.

The Plan Area largely mirrors the trends observed in the Market Study Area. As shown in Table 16, 88.2 percent of Plan Area households earning less than 30 percent of the HAMFI experience housing cost burden, compared to only 3.6 percent of high-income households. Notably, all low-income households in the Plan Area are cost-burdened, with owner households experiencing severe cost-burden, although the absolute number of these households is small. As with the Market Study Area, larger shares of renter households in the Plan Area have greater cost burdens than owner households. While 100 percent of extremely low-income renter households in the Plan Area are severely cost-burdened, this figure is only 42.3 percent for owner households of the same income group. Among renter households earning greater than 80 percent HAMFI, none are severely cost-burdened, suggesting that rents in the Plan Area are affordable to households in these moderate- and high-income brackets.

The primary difference between the Market Study and Plan Areas is observed in above moderate-income households, where 41.5 percent and 29.7 percent are cost-burdened, respectively. This variation may be explained by the range of unit types in each geography. With the availability of larger single family housing units for sale, the Market Study Area contains greater opportunities for home ownership than in the Plan Area. Yet, these larger units are more expensive than the smaller units of the Plan Area. As such, the Market Study Area witnesses a greater cost-burden associated with ownership of these larger single-family units that is not apparent with the smaller units in the Plan Area.

Table 15: Housing Cost Burdens by Income Bracket and Tenure, Montgomery County (MD), 2016-2020 Five-Year Sample Period

Clarksburg Gateway Market Study Area (a)	Renter Households		Owner Households		All Households	
Housing Cost Burden by Income Level	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Extremely Low Income [≤30% HAMFI] (b)(c)	**185**	**100.0%**	**475**	**100.0%**	**660**	**100.0%**
With ≤ 30% Housing Cost Burden	35	18.9%	100	21.1%	135	20.5%
With > 30%, but ≤ 50% Housing Cost Burden	50	27.0%	80	16.8%	130	19.7%
With > 50% Housing Cost Burden	100	54.1%	295	62.1%	395	59.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%
Very Low Income [>30% to ≤50% HAMFI]	**95**	**100.0%**	**373**	**100.0%**	**468**	**100.0%**
With ≤ 30% Housing Cost Burden	25	26.3%	115	30.8%	140	29.9%
With > 30%, but ≤ 50% Housing Cost Burden	35	36.8%	23	6.2%	58	12.4%
With > 50% Housing Cost Burden	35	36.8%	235	63.0%	270	57.7%
Low Income [>50% to ≤80% HAMFI]	**58**	**100.0%**	**375**	**100.0%**	**433**	**100.0%**
With ≤ 30% Housing Cost Burden	50	86.2%	85	22.7%	135	31.2%
With > 30%, but ≤ 50% Housing Cost Burden	8	13.8%	240	64.0%	248	57.3%
With > 50% Housing Cost Burden	0	0.0%	50	13.3%	50	11.5%
Moderate Income [>80% to ≤100% HAMFI]	**110**	**100.0%**	**580**	**100.0%**	**690**	**100.0%**
With ≤ 30% Housing Cost Burden	35	31.8%	460	79.3%	495	71.7%
With > 30%, but ≤ 50% Housing Cost Burden	75	68.2%	65	11.2%	140	20.3%
With > 50% Housing Cost Burden	0	0.0%	55	9.5%	55	8.0%
Above Moderate Income [>100% to ≤120% HAMFI]	**100**	**100.0%**	**985**	**100.0%**	**1,085**	**100.0%**
With ≤ 30% Housing Cost Burden	80	80.0%	555	56.3%	635	58.5%
With > 30%, but ≤ 50% Housing Cost Burden	20	20.0%	410	41.6%	430	39.6%
With > 50% Housing Cost Burden	0	0.0%	20	2.0%	20	1.8%
High Income [>120% HAMFI]	**435**	**100.0%**	**5,239**	**100.0%**	**5,674**	**100.0%**
With ≤ 30% Housing Cost Burden	435	100.0%	4,864	92.8%	5,299	93.4%
With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	375	7.2%	375	6.6%
With > 50% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
Total Households	**985**	**100.0%**	**8,035**	**100.0%**	**9,020**	**100.0%**
With ≤ 30% Housing Cost Burden	660	67.1%	6,179	77.0%	6,839	75.9%
With > 30%, but ≤ 50% Housing Cost Burden	188	19.1%	1,193	14.9%	1,381	15.3%
With > 50% Housing Cost Burden	135	13.7%	655	8.2%	790	8.8%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%

Notes:
(a) The Clarksburg Market Study Area is defined by census tracts 7002.10, 7003.14, 7003.15, 7003.16, 7003.17, and 7003.18.
(b) "HAMFI" is the HUD Area Median Family Income for Montgomery County.
(c) Totals do not equal the sum of individual figures due to independent rounding.

Sources: U.S. Department of Housing and Urban Development, 2016-2020 Comprehensive Housing Affordability Strategy (CHAS) data, 2023.

Table 16: Housing Cost Burdens by Income Bracket and Tenure, Montgomery County (MD), 2016-2020 Five-Year Sample Period

Clarksburg Gateway Plan Area (a)	**Renter Households**		**Owner Households**		**All Households**	
Housing Cost Burden by Income Level	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Extremely Low Income [≤30% HAMFI] (b) (c)	**40**	**100.0%**	**130**	**100.0%**	**170**	**100.0%**
With ≤ 30% Housing Cost Burden	0	0.0%	20	15.4%	20	11.8%
With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	55	42.3%	55	32.4%
With > 50% Housing Cost Burden	40	100.0%	55	42.3%	95	55.9%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%
Very Low Income [>30% to ≤50% HAMFI]	**25**	**100.0%**	**24**	**100.0%**	**49**	**100.0%**
With ≤ 30% Housing Cost Burden	25	100.0%	0	0.0%	25	51.0%
With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	4	16.7%	4	8.2%
With > 50% Housing Cost Burden	0	0.0%	20	83.3%	20	40.8%
Low Income [>50% to ≤80% HAMFI]	**4**	**100.0%**	**15**	**100.0%**	**19**	**100.0%**
With ≤ 30% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
With > 30%, but ≤ 50% Housing Cost Burden	4	100.0%	0	0.0%	4	21.1%
With > 50% Housing Cost Burden	0	0.0%	15	100.0%	15	78.9%
Moderate Income [>80% to ≤100% HAMFI]	**30**	**100.0%**	**55**	**100.0%**	**85**	**100.0%**
With ≤ 30% Housing Cost Burden	20	66.7%	35	63.6%	55	64.7%
With > 30%, but ≤ 50% Housing Cost Burden	10	33.3%	20	36.4%	30	35.3%
With > 50% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
Above Moderate Income [>100% to ≤120% HAMFI]	**0**	**0.0%**	**185**	**100.0%**	**185**	**100.0%**
With ≤ 30% Housing Cost Burden	0	0	130	70.3%	130	70.3%
With > 30%, but ≤ 50% Housing Cost Burden	0	0	55	29.7%	55	29.7%
With > 50% Housing Cost Burden	0	0	0	0.0%	0	0.0%
High Income [>120% HAMFI]	**85**	**100.0%**	**470**	**100.0%**	**555**	**100.0%**
With ≤ 30% Housing Cost Burden	85	100.0%	450	95.7%	535	96.4%

With > 30%, but ≤ 50% Housing Cost Burden	0	0.0%	20	4.3%	20	3.6%
With > 50% Housing Cost Burden	0	0.0%	0	0.0%	0	0.0%
Total Households	**190**	**100.0%**	**890**	**100.0%**	**1,080**	**100.0%**
With ≤ 30% Housing Cost Burden	130	70.7%	635	72.2%	765	72.0%
With > 30%, but ≤ 50% Housing Cost Burden	14	7.6%	154	17.5%	168	15.8%
With > 50% Housing Cost Burden	40	21.7%	90	10.2%	130	12.2%
Not Computed (No or Negative Income)	0	0.0%	0	0.0%	0	0.0%

Notes:
(a) The Clarksburg Plan Area is defined by census tract 7003.16.
(b) "HAMFI" is the HUD Area Median Family Income for Montgomery County.
(c) Totals do not equal the sum of individual figures due to independent rounding.

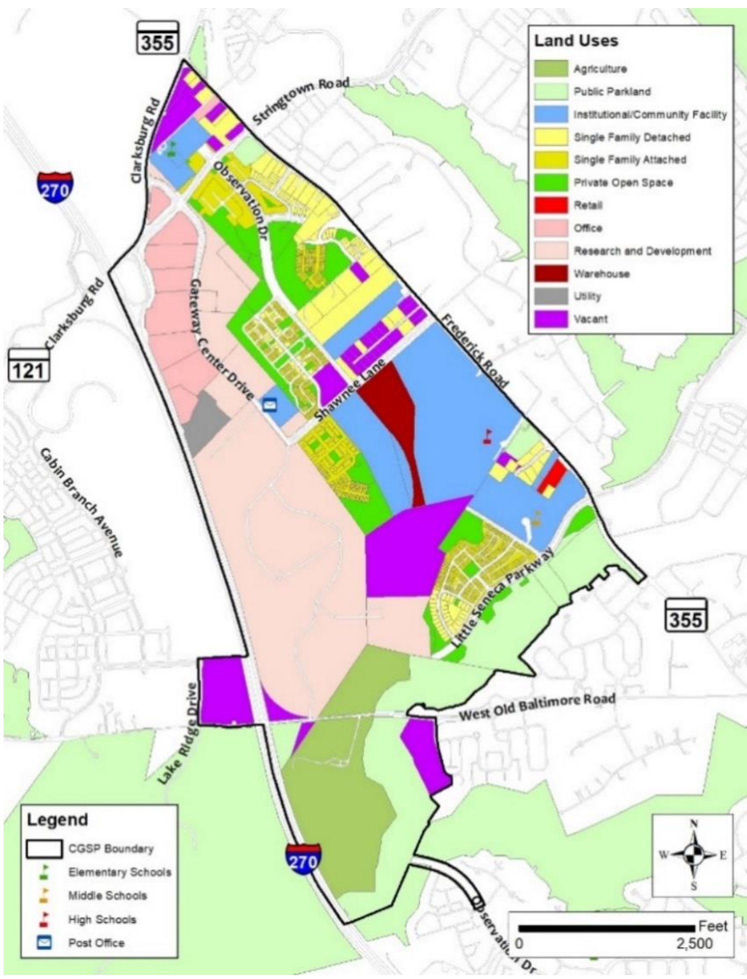
Sources: U.S. Department of Housing and Urban Development, 2016-2020 Comprehensive Housing Affordability Strategy (CHAS) data, 2024.

Real Estate Market Data

As Figure 13 shows, the largest land use in the Plan Area is the combined "flex" space comprised of R&D and office uses, which account for over 29 percent of the Plan Area. A large amount of this space includes undeveloped portions of the former COMSAT properties. At 15.5 percent, institutional/community facilities comprise the next largest land use category. This land is primarily used by Clarksburg High School, Rocky Hill Middle School, Clarksburg Elementary School, and the MCPS bus depot.

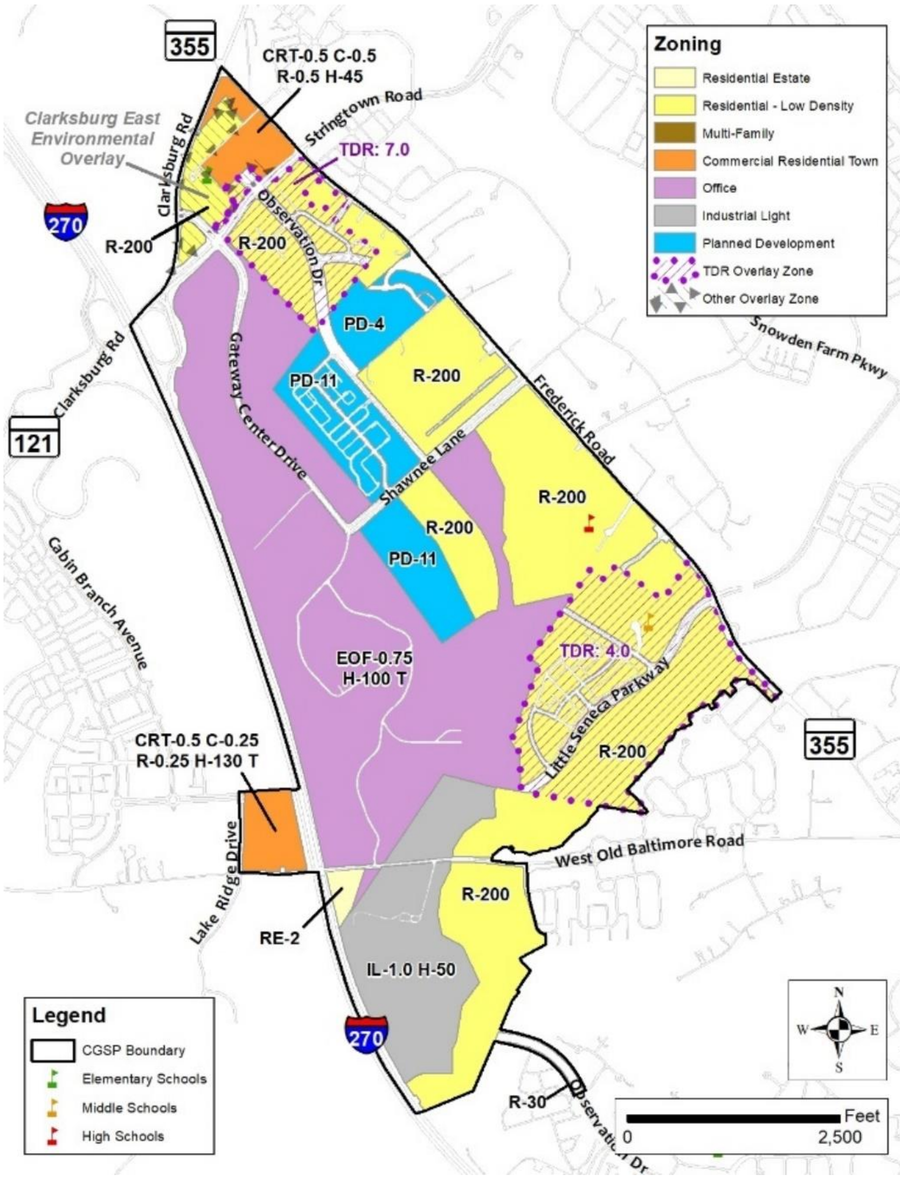
The R-200 zone is the single largest zone in the Plan Area, but most of this land is occupied by public parkland and the three schools. The remaining non-institutional-use R-200 land has been developed with housing, almost all of which was built using bonus density allowed by the TDR overlay zones. Three of the five residential subdivisions in the Plan Area were developed under Planned Development zones. The second largest zone in the Plan Area is the EOF zone, which is occupied by the Gateway 270 office park, the former COMSAT property, and the Moyer and Sons Moving and Storage.

Figure 13: Existing Land Uses in the Clarksburg Gateway Sector Plan Area



Source: Montgomery Planning, 2023.

Figure 14: Existing Zoning and Overlay Zones in Clarksburg Sector Plan Area



Source: Montgomery Planning, 2024.

As with the existing market conditions section, the real estate market data presented in the following sections is focused on the Market Study Area. Given the small size of the Plan Area, data in this geography are not necessarily representative of the potential for future development, which will be influenced by the larger Clarksburg market. The Market Study Area geography is more indicative of the demand the sector plan could help meet.

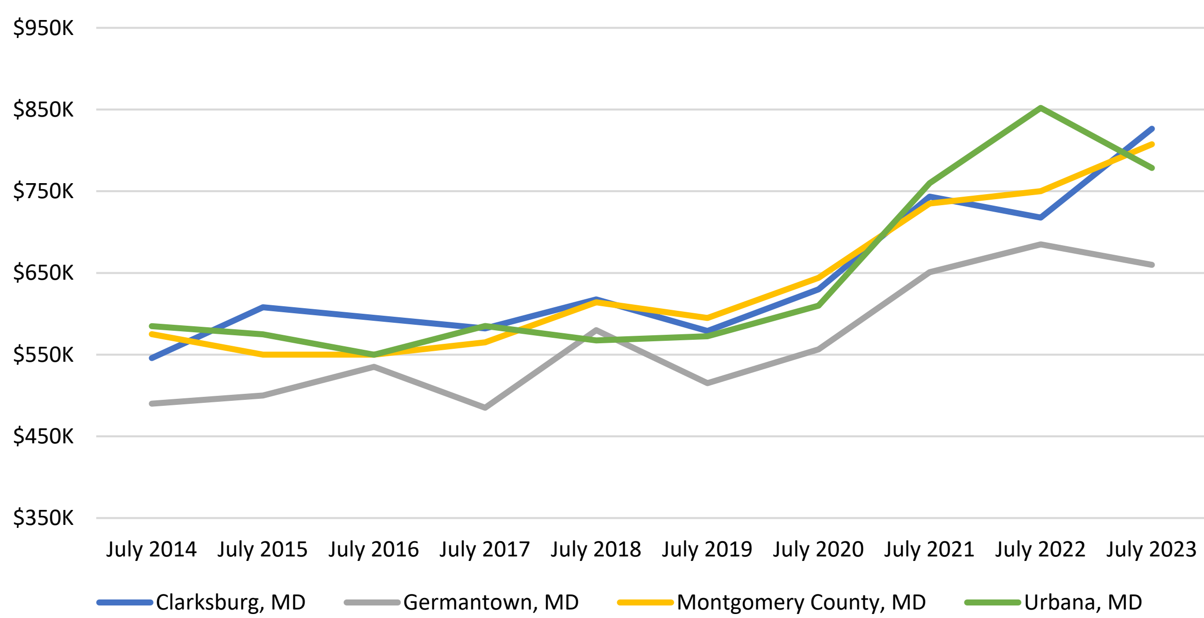
Residential Market

For Sale

As of July 2023, the median sale price in Clarksburg for a single-family detached unit was $827,000. Sale prices in Clarksburg mirror that of Montgomery County, where the median sale price was $808,000 in July 2023. While both Clarksburg and Montgomery County have higher median sale prices than Germantown, sale price trends in Germantown are consistent with the county given their similar landscape of diverse housing types. Clarksburg and Urbana have comparable sale prices, suggesting that they attract similar levels of demand.

Figure 15 shows the median sale price trends for single family detached units over the past decade for the Clarksburg, Germantown and Urbana CDPs and Montgomery County. The pandemic contributed to an acceleration of price growth in suburban markets as households sought, among other things, more space to accommodate teleworking. Between 2014 and 2020, the median sale price in Clarksburg increased by 15 percent, in line with increases in Germantown and Montgomery County overall. By contrast, Urbana experienced just a four percent increase in median sale price between 2014 and 2020. However, since 2020, the median sale prices in Clarksburg and Urbana have increased by 31 percent and 28 percent, respectively, slighter larger than the 25 percent increase in Montgomery County overall. Germantown has experienced a slightly lower 19 percent increase in median sale price. Demand for for-sale housing in Germantown was also catalyzed by the pandemic. However, according to experts in the real estate community interviewed for this study, this can be explained by Germantown having an older stock of housing compared to Clarksburg and Urbana and being further from Washington, D.C. than other submarkets within Montgomery County.

Figure 15: Median Sale Price Trends for Single Family Detached Units, July 2014 to July 2023



Source: Redfin, 2023; Montgomery Planning, 2024.

Recent sales data provides further detail about the types of units in demand and may indicate some gaps in the market. **Table 17** and Table 18 show the size and price ranges for homes sold in the larger Clarksburg Market Study Area between October 2022 and October 2023. In total, there were 278 single family homes sold during this period, including 159 townhomes and 119 single family detached units.

Four-bedroom units with an average size of 4,000 square feet comprised 85 percent of all single detached units sold in the Market Study Area and contributed to the overall average size of 3,800 square feet. With just one two-bedroom unit sold, the rest of the single-family detached units were three-bedroom units averaging 2,300 square feet. The size of these units reflects the demographic profile of the Clarksburg Market Study Area, which has a disproportionately large average household size and a high share of family households compared to the county overall (see Demographic Conditions section).

Examining average sales prices can provide deeper insight into the Clarksburg market. The average sale price for single family detached units in the Market Study Area was $789,000, which would require a household income of $226,000 for a household spending 30 percent of gross monthly income on housing costs (i.e., for a household to affordably purchase the average priced unit). While the sale price is in line with average countywide sale prices, the price per square foot in Clarksburg ($218) is lower than in Montgomery County overall ($309). As seen in the Income Distribution section of this report, though Clarksburg households tend to have high incomes, there are fewer households with very high incomes relative to the county.

Table 17: Clarksburg Market Study Area Single Family Detached Units Sale Price Distribution, October 2022 to October 2023

Single-Family Homes						
Sale Price Range	**1 bed**	**2 bed**	**3 bed**	**4+ bed**	**Total**	**Percent of Total**
Less than $500,000	0	1	2	0	3	**3%**
$500,000 - $749,999	0	0	14	30	44	**37%**
$750,000 - $999,999	0	0	1	62	63	**53%**
$1,000,000 - 1,499,999	0	0	0	9	9	**8%**
$1,500,000 or more	0	0	0	0	0	**0%**
Total	**0**	**1**	**17**	**101**	**119**	**100%**
Percent of Total	**0%**	**1%**	**14%**	**85%**	**100%**	
Average Sale Price	$0	$299,000	$588,360	$832,781	$788,992	
Average Unit Size (sf)	0	576	2,326	4,173	3,845	
Average Price per sf	$0	$519	$262	$209	$218	

Source: Multiple Listings Service via Redfin, 2023; Montgomery Planning, 2024.

Townhomes in the Market Study Area are similarly expensive to single family detached units, with an average sale price of $534,000. The townhomes are also relatively large, with an average size of 2,200 square feet and most units having three or four bedrooms. The average sale price per square foot ($241) is closer to, but still lower than, the countywide average for townhomes ($269). A household would require an income of approximately $153,000 to affordably purchase a townhome with the average sale price between October 2022 and October 2023.[4]

Table 18: Clarksburg Market Study Area Townhomes Sale Price Distribution, October 2022 to October 2023

Townhouses						
Sale Price Range	**1 bed**	**2 bed**	**3 bed**	**4+ bed**	**Total**	**Percent of Total**
Less than $500,000	0	7	37	2	46	**29%**
$500,000 - $749,999	0	1	62	49	112	**70%**
$750,000 - $999,999	0	0	1	0	1	**1%**
$1,000,000 - 1,499,999	0	0	0	0	0	**0%**
$1,500,000 or more	0	0	0	0	0	**0%**
Total	**0**	**8**	**100**	**51**	**159**	**100%**
Percent of Total	**0%**	**5%**	**63%**	**32%**	**100%**	
Average Sale Price	$0	$362,902	$511,196	$606,110	$533,686	
Average Unit Size (sf)	0	1,430	2,188	2,426	2,222	
Average Price per sf	$0	$254	$234	$252	$241	

Source: Multiple Listings Service via Redfin, 2023; Montgomery Planning, 2024.

The Market Study Area does include some units in multifamily structures – 21 condominium buildings and three apartment complexes. Approximately ten percent, or 1,000 units, of the units in the Market Study Area are in multifamily structures. Condo units are significantly cheaper than single-family units, with an average sale price of $311,000 and an average unit size of 1,600 square feet. These units are also cheaper on a per square foot basis with an average price of $191. Although there may be other factors, one explanation for the relatively few sales among condo units in Clarksburg is the scarcity of housing units at similar price points. In other words, condo owners may be unwilling to sell if they know they will not find similar units in the area.

This data is reflective of the Units in Structure distribution for the Market Study Area, which shows that housing units in Clarksburg are concentrated in single-family housing types, all of which have a similar vintage, size, quality, and price point. This may contribute to some

[4] This number is based on several ownership cost assumptions. These include a weighted average of statewide interest rates using the 'Explore Rates' tool on the Consumer Financial Protection Bureau (CFPB) website, a property tax rate based on a high-level analysis of tax rates in Montgomery County, and an annual homeowners insurance value based on an average of quoted insurance premiums from bankrate.com.

homogeneity in the community. The area is lacking multifamily units, including rentals, which would help to add younger residents and smaller households that would contribute to the diversity of the area and create more dynamic demand for amenities and retail. More housing diversity would improve the affordability of the area by providing housing at varied price points, creating more opportunity for different types of households to move in.

Multifamily Rental

There are three existing multifamily rental developments in the Market Study Area. These include the Axiom at Cabin Branch with 272 units, the Elms at Clarksburg Village with 360 units, and the Elms at Clarksburg Village Encore with 90 senior-restricted units. Additionally, there are some condominium units that are individually rented out by the owner.

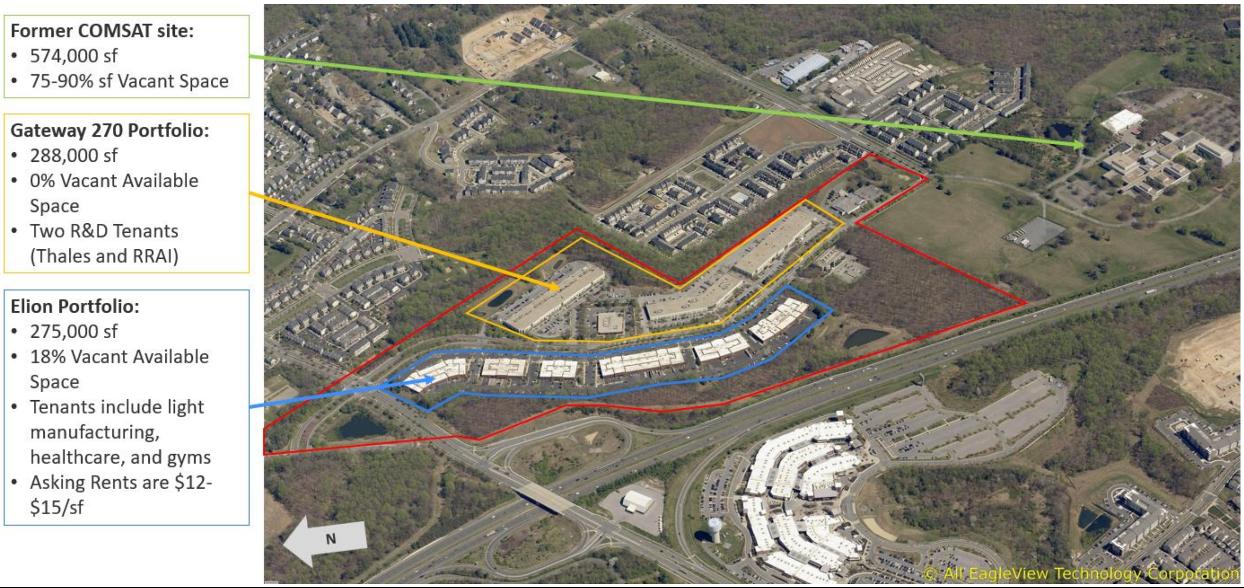
Nonresidential Market

There is 1.5 million square feet of nonresidential development within the Plan Area. The majority of this (1.1 million square feet) is comprised of 'flex' development, as defined by CoStar, a private commercial property data vendor. CoStar also identifies two small churches, a warehousing business and one retail/personal services building. As noted above, the Plan Area is dominated by one nonresidential use: the flex/light industrial properties along Gateway Center Drive that are also the primary employment generating uses.

Flex

The Plan Area's nonresidential inventory is dominated by flex properties along Gateway Center Drive, accounting for 1.1 million square feet in total. The broader Market Study Area also has a string of industrial properties along 355, north of the Plan Area. A flex building is a versatile space which can combine office, R&D, light industrial, and warehousing uses. Flex buildings tend to have ceiling heights under 18 feet. In the Plan Area, tenants include a mix of R&D, medical office, medical labs, flex-retail (gyms, church), light manufacturing, and warehousing. The flex buildings are grouped into three ownership portfolios, as shown in Figure 16. The COMSAT property on the south side of the plan area is owned by Lantian Gateway LLC; the buildings on the west side of Gateway Center Drive are owned by Elion; and the two buildings on the east side of Gateway Center Drive are owned by Gateway 270.

Figure 16: Summary and Map of Flex Development in the Clarksburg Plan Area



Source: Montgomery Planning, 2024.

The flex inventory includes approximately 574,000 square feet in the buildings on the former COMSAT property. CoStar estimates that approximately 75 percent of the COMSAT property is vacant; however, in correspondence with the master planning team, the property owner has indicated that the vacancy rate is closer to 90 percent. The Sector Plan will be analyzing the historical significance of this property and whether repositioning the site should include maintaining the existing structure.

Although the Elion portfolio and Gateway 270 properties have occupants, like COMSAT, they are also underutilized. The Gateway 270 Portfolio properties account for just 288,000 square feet of development on nearly 30 acres, which is equal to an FAR of 0.22. The Elion properties, with 275,000 square feet of space, similarly total an FAR of just 0.17. While the Gateway 270 Portfolio properties are fully leased as of Q4 2023, at least one of the tenants has indicated to stakeholders that it is seeking new space, which may or may not be in Montgomery County. The Elion properties have a relatively high vacancy rate of 18 percent compared to the countywide vacancy rate of 8.1 percent for flex properties. Although flex space is in short supply in Montgomery County, the flex development in the Plan Area is small, it underutilizes large lot sizes and is highly vacant, particularly when including COMSAT. Given this trend, and the public demand for mixed-use spaces with housing and retail, flex development is unlikely to be the highest and best use of sites along Gateway Center Drive going forward.

Office

Despite the vision expressed in the *1994 Clarksburg Master Plan*, the Clarksburg area is not an office market today. The Plan Area has just three buildings classified as office space, all three of which are located on Frederick Road.

The Market Study Area also does not have any traditional office buildings, and only includes more businesses on 11 properties that are small and/or look like single family homes (i.e., Class C buildings) and has five Class B office buildings with banks and personal services.

Given the small inventory, the vacancy rate is not a meaningful figure, and as the office space does not include any traditional office buildings, the vacancy rate and asking rents are not comparable to the countywide office market. Furthermore, the challenges in the office market have led to high vacancy rates and low rents in Germantown compared to the county, which itself is experiencing low rents and high vacancy rates. This would suggest that it would be challenging to develop new office buildings in Clarksburg in the near future.

Table 19: Office Inventory, Q3 2023

Office Summary	Clarksburg Study Area	Germantown Submarket	Frederick Submarket	Montgomery County
Inventory, Q3 2023 (bldgs)	16	71	693	1,518
Inventory, Q3 2023 (sf)	100,576	3,403,284	8,737,653	76,009,521
Avg. Asking Rents, Gross				
Avg. Asking Rent per sf, Q3 2022	$24.81	$24.02	$23.03	$31.65
Avg. Asking Rent per sf, Q3 2023	$13.89	$23.84	$24.66	$31.63
% Change, Q3 2022 - Q3 2023	-44.0%	-0.7%	7.1%	-0.1%
Vacancy				
Vacant sf, Q3 2023	1,900	674,658	669,843	12,164,785
Vacancy Rate, Q3 2023	1.9%	19.8%	7.7%	16.0%

Sources: CoStar, 2023; Montgomery Planning, 2024.

The projections in the *1994 Clarksburg Master Plan* assumed office development would maintain the growth rate it had at that time and that as the county built out, office development would follow auto networks, and specifically the I-270 corridor. In hindsight, many of the challenges the office market has faced were not apparent in 1994.

There are two factors that explain both the lack of office development in Clarksburg since the 1994 Master Plan and why new office development is unlikely. First, demand is lower than it has been historically. Technology has diminished the need for as much space, and popular cost saving measures like more open-format offices and fewer private offices with a door have also lowered office demand. Telework rates increased dramatically with the pandemic and are unlikely to fully return to pre-pandemic levels, further causing employers to rethink their needs for office space. Second, there has been a shift in master planning and real estate development priorities since 1994. With a greater awareness of climate change and persistent congestion as a result of expanding road networks,, auto-oriented development has transitioned to transit-oriented development.[5]

In fact, following the COVID-19 pandemic, the only office developments that are viable are new or renovated buildings near transit and a concentration of amenities like retail. Clarksburg does not currently have Metrorail or Bus Rapid Transit (BRT), in part due to transit that was promised in earlier Upcounty plans never being delivered. Though a BRT is planned with a terminus at the outlet mall, it is unlikely for this future transit access to be of the scale that will attract new office development. Given that formerly strong office markets in Montgomery County near existing transit have been experiencing high vacancy rates and pressure to redevelop, it will be challenging to attract major new office development to Clarksburg.

Retail

Data from CoStar, stakeholders interviewed for this study, and comments from community meetings all clearly state that the Clarksburg area is under-retailed, despite the presence of the Clarksburg Prelimium Outlets mall. While the 440,000 square foot mall is a major regional attraction and source of employment, it does not provide the variety of restaurants, entertainment, and neighborhood retail services that cater to local residents. The location of the mall and the location of the parking relative to the stores is also not conducive to the kinds of shopping and dining experiences residents have indicated they desire.

The Plan Area does not have any retail businesses as traditionally defined as department stores, grocery stores, and convenient stores. However, there are several businesses that provide local services, particularly between Stringtown and Clarksburg roads. These include a yoga studio, a psychic reader, and some educational service businesses.

The small Clarksburg Highlands Shopping Center is adjacent to the Plan Area and contains a mix of takeaway restaurants and professional services including a tutoring company and a dentist. One full-service restaurant, the Clarksburg Tavern, is also adjacent to the Plan Area along Frederick Road. The lack of variety is a principal concern in the community, where residents and stakeholders have suggested that people must travel over 20 to 25 minutes south on I-270 to meet their needs.

The Market Study Area has one grocery-anchored shopping center (Clarksburg Village Center) that, in addition to a Harris Teeter, includes some restaurants and professional services like banks and realtors. The Market Study Area also has some freestanding retail along Frederick Road, Ridge Road, and Gosnell Farm Drive that includes a mix of gas stations, banks, and convenience stores. Indicative of the high demand and low supply of retail, the vacancy rate in the Market Study Area is less than one percent, as seen in Table 20.

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[5] See this Office Market Assessment, which highlights unprecedented challenges confronting the Washington, DC region's office sector, including high and rising vacancies, flat rents, and slow absorption of new and relet space.

Retail square footage per capita data demonstrates lagging retail development in the Market Study Area. Given shifts in the economy and technology, the amount of retail square footage per resident in a place is constantly changing; therefore, it is difficult to determine a target figure. Nonetheless, in Montgomery County, the retail square footage per capita is 36 square feet, and 29 square feet per resident in Germantown. By contrast, in the Clarksburg Market Study Area, the retail square footage per capita is 21 square feet. When discounting the 390,000 square feet of outlets, this figure falls to just nine square feet per capita. Because of its distance to other population centers and customer bases, Clarksburg may need higher residential densities than other parts of the county to support more retail. Its position at the edge of the Ag Reserve makes retail particularly challenging and highlights why placemaking and transit access is even more crucial.

As of February 2024, the Planning Board unanimously approved the final phase of the Clarksburg Town Center, which will add much-needed retail to the area.[6] This space will include a Weis grocery store as the commercial center's anchor, attracting additional commercial tenants and new residents to Clarksburg. Amendments to this plan primarily removed previously approved office buildings and replaced them with multi-family residential and mixed-use buildings, while still providing a much-desired grocery store and opportunities for new retail and restaurants. The plan includes 189 dwelling units, which is in line with the growing trend of new retail being delivered as part of mixed-use projects. Therefore, supporting more retail could involve allowing for more mixed-use development in the Plan Area, as permitted under existing zoning.

Table 20: Retail Inventory, Q3 2023

Retail Summary	Clarksburg Study Area	Germantown Submarket	Montgomery County
Inventory, Q3 2023 (bldgs)	29	143	2,412
Inventory, Q3 2023 (sf)	1,052,032	2,613,095	37,952,779
Avg. Asking Rents, NNN			
Avg. Asking Rent per sf, Q3 2022	-	$33.99	$31.16
Avg. Asking Rent per sf, Q3 2023	$31.76	$34.33	$34.00
% Change, Q3 2022 - Q3 2023	0.00%	1.00%	9.11%
Vacancy			
Vacant sf, Q3 2023	7,082	82,426	2,035,852
Vacancy Rate, Q3 2023	0.7%	3.2%	5.4%

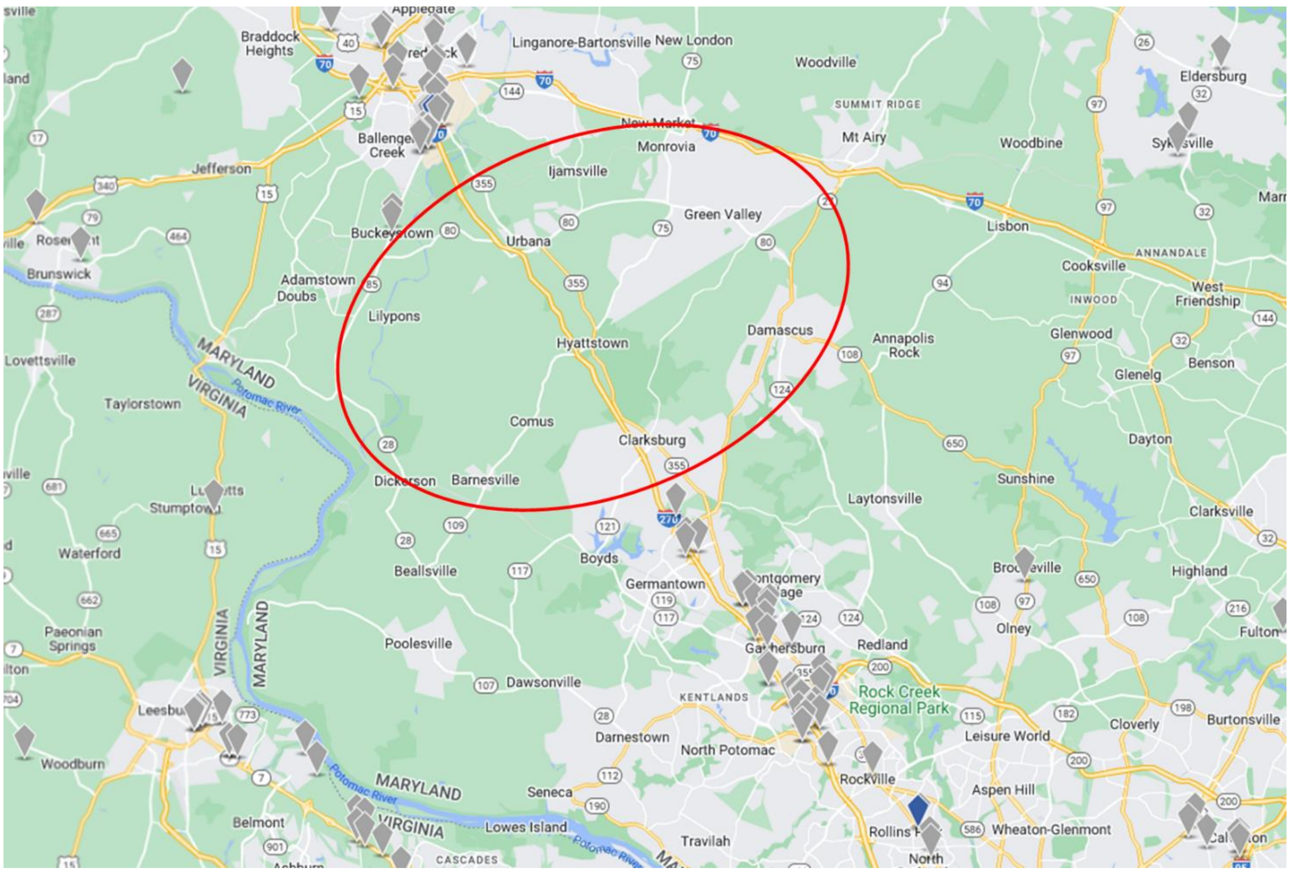
[6] See Clarksburg-Town-Center-Staff-Report-Final-002.pdf (montgomeryplanningboard.org) for more details.

Sources: *CoStar, 2023; Montgomery Planning, 2024.*

Lodging

This analysis examines evidence of market demand for a hotel use in the Plan Area. In fact, as shown in Figure 17, there are no lodging establishments between Germantown and Frederick. Historically, there may have been little demand for a hotel north of Germantown as there were few communities to serve. However, given the dramatic increase in development in the Clarksburg area and the sector planning effort, the potential for a hotel is worth considering.

Figure 17: Gap in Lodging Establishments in Clarksburg



Source: *CoStar, 2023; Montgomery Planning, 2024.*

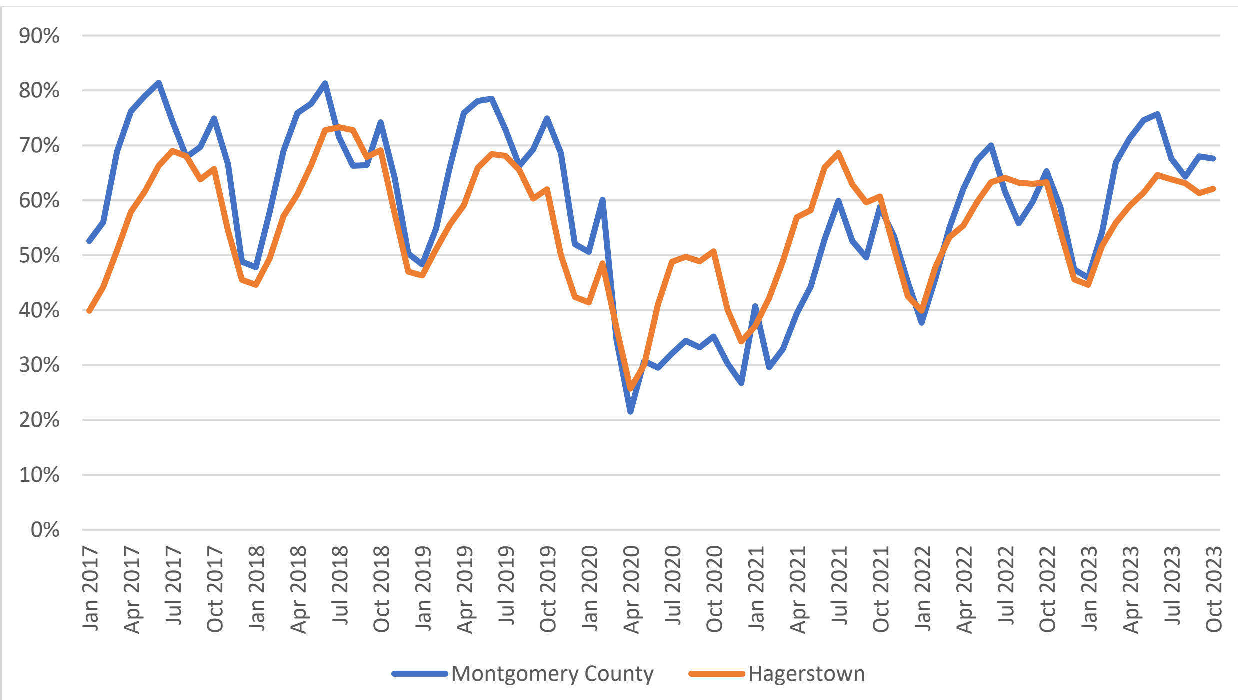
Estimating demand for hotels in this area is not straightforward, and this analysis does not make projections of potential visitors or revenue. As discussions with representatives of Visit Montgomery[7] revealed, a hotel in Clarksburg could draw visitors to the Montgomery County Agricultural Reserve (Ag Reserve) as well as the Maryland Soccerplex located in Germantown. In

[7] The mission of Visit Montgomery is to market and develop the county and its communities as a preferred destination for group and individual travel thereby fostering economic growth and quality of place through tourism.

the short term, demand for a hotel is more likely to be associated with the Rockville and Gaithersburg area, which can include tourists and business travelers. However, as nascent efforts to market attractions in the Ag Reserve increase, a hotel may be able to tap into increased demand for rooms locally.

Figure 18 shows occupancy rates for all hotels in Montgomery County and in the Hagerstown submarket, as defined by CoStar. The Hagerstown data is shown as a proxy for a rural area with outdoor attractions generally accessible to the Washington D.C. market, as this is the nature of demand the Ag Reserve could tap into in the future. Notably, Hagerstown also has an outlet mall which mirrors the demand such an attraction could bring to the Clarksburg area. Montgomery County hotels, which are all within the Washington, D.C. hotel submarket, follow trends in Washington, D.C. Prior to the pandemic, occupancy rates in Montgomery County hotels peaked at around 80 percent in June. Occupancy rates picked up in March following lows of around 50 percent in January and February.

Figure 18: Occupancy Rate in Montgomery County Lodging Establishments, 2017-2023



Source: CoStar, 2023; Montgomery Planning, 2024.

Hagerstown is generally a market oriented towards outdoor recreational vacations and attracts families. Similar to Washington, D.C., Hagerstown also has peak occupancy in the spring and summer, but occupancy does not dip until September, which is when school restarts and there are fewer family trips. Notably, the peak occupancy rate in Hagerstown is 70 percent, which generally indicates lower revenue per room.[8] Moreover, whereas D.C. occupancy rates have recovered to pre-pandemic levels, occupancy rates in Hagerstown have not. It is unclear what level of occupancy and profitability a hotel operator is looking for in the Clarksburg market but if demand for a hotel in Clarksburg is not driven by visitors to D.C., then the viability of a hotel would depend on increased demand for the Ag Reserve.

While there are few concrete conclusions to draw about the viability of a hotel in Clarksburg from the quantitative evidence, site selection factors hotel operators consider suggest that there is potential for a lodging establishment. Among these factors for hotel operators include airport proximity, availability of local attractions, nearby amenities like retail and restaurants, public safety, and a community's economic health. Clarksburg is a 45-minute to one-hour drive from three airports: Washington Dulles (IAD), Washington National (DCA), and Baltimore-Washington (BWI). Furthermore, Clarksburg is a safe community with a profile of high-income households. The growth in housing units may alone support some room nights. The proximity of the Maryland Soccerplex also serves as a notable local attraction. However, perhaps the most significant existing attraction is the Clarksburg Premium Outlets mall, which attracts visitors from outside the region and internationally. The outlets alone may support enough visitation for a hotel, although this analysis does not evaluate the financial feasibility of hotel development. While there are other hotels in Germantown, proximity to the outlets could be attractive to people, particularly if other retail and entertainment uses are developed within the Plan and Market Study areas.

As mentioned, growing efforts to market the Ag Reserve and boost activity at the Germantown Soccerplex may also help support the viability of a new hotel in the Plan Area. This plan could help support hotel development through recommendations and implementation of improved transit connections to nearby areas and D.C., more local amenities, and other attractions.

Summary of Findings

This market study examines and establishes market demand for new residential and nonresidential development based on market trends, preferences, and gaps in the Clarksburg area and Montgomery County overall. Findings from this market study, combined with additional analysis by planning staff and community input, will inform the development of recommendations for the Clarksburg Gateway Sector Plan.

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[8] Key metrics for the hotel market include occupancy rate, Average Daily Rate (ADR), and RevPAR (Revenue per Available Room). RevPAR is equal to occupancy rate multiplied by ADR, effectively measuring how much a hotel is generating in revenue per room after adjusting for occupancy rates, which fluctuate can weekly and seasonally. This analysis does not determine the appropriate RevPAR that would motivate the development of a new hotel in Clarksburg. However, trends in ADR and RevPAR for Montgomery County hotels and the Hagerstown submarket are shown in Appendix A.

Existing Market Conditions:

- The Clarksburg area has experienced the fastest population and housing growth of any part of Montgomery County over the past 20 years, resulting in a unique demographic profile and housing market compared to the rest of the county.
- Generally, Clarksburg has larger households, more families, and younger and more racially diverse residents than Montgomery County overall.
- Households in Clarksburg are generally well-educated, which is consistent with their high incomes.
- The higher-than-average commute times in Clarksburg imply that residents, similar to those in Germantown, travel to the Washington D.C vicinity for work.
- Households in the Clarksburg area are predominantly homeowners, which reflects a housing stock that is primarily single-family development. Over 80 percent of the Market Study Area's housing stock was built since 2000 and exhibits similar sizes and quality.
- The Sector Plan Area's nonresidential inventory is dominated by 'Flex' properties along Gateway Center Drive, accounting for 1.1 million square feet in total. Yet, this space is vastly underutilized, primarily due to the mostly empty former COMSAT building.
- Despite the vision expressed in the *1994 Clarksburg Master Plan*, the Clarksburg area is not an office market today. It has a small inventory of office space, most of which is not in traditional office buildings.
- Despite the presence of the Clarksburg Premium Outlets, the Clarksburg area is under-retailed. Retail square footage per capita in the Market Study Area is lower than that of the county and Germantown, and the vacancy rate of less than one percent demonstrates high demand and low supply of retail services.
- There are no lodging establishments between Germantown and Frederick, and with recent development in the Clarksburg Area, the potential for a hotel is worth consideration.

Recommendations:

1. Based on demographic, housing, and real estate market data analyzed, this study supports the development of more housing that incorporates a wider range of housing types. In particular, the addition of multifamily rental units would help attract younger residents and smaller households that will diversify the area and create more dynamic demand for amenities and retail.
2. Underutilization of Clarksburg's 'Flex' properties, coupled with public demand for mixed-use spaces with housing and retail, makes 'Flex' development unlikely to be the best use of sites along Gateway Center Drive.
3. The trend of low rents and high vacancy rates in Germantown's office market suggests that it would be difficult to develop new office buildings in the Clarksburg area.
4. The planned Clarksburg Town Center will add much-needed retail to the area and includes the space for a grocery anchor. In addition to retail, the Clarksburg Town

Center site plan proposes 189 dwelling units, which reflects the growing trend of new retail development being delivered as part of mixed-use development. Supporting more retail could involve allowing for more mixed-use development in the Plan Area.

5. Hotel and lodging uses can be considered in the Plan Area to meet the gap in the market for both a limited-service hotel and a resort-type facility to support and promote local tourism to the Ag Reserve, Clarksburg Premium Outlets, and the nearby Maryland Soccerplex.

Methodology

Data Sources and Approach

This study analyzes information from several data sources. Demographic and employment data are drawn from Esri, a national private data vendor that provides demographic and economic estimates for custom geographies. This feature is useful for non-Census defined geographies like the Sector Plan Area. Esri provides its own demographic and economic estimates for places using a mix of census and local administrative data, which it can estimate for any geography. Esri can also report Census and ACS data points directly, and using a proprietary algorithm for apportioning data, it can generate estimates for non-census defined geographies. It is important to note Esri's data and its estimates of Census and ACS data for non-census defined geographies can introduce error, and Esri does not report margins of error. Staff addressed this issue by comparing Esri's results to data from the Census Bureau for census-defined geographies to help ensure trends and orders of magnitude are in alignment. Staff did not identify any major discrepancies between data sources.

Real estate market data also comes from a mix of sources, including CoStar, the Multiple Listings Service, and Redfin. The data includes estimates of inventory, sales prices/rents, sales volume, absorption, deliveries, and vacancy for both for residential and nonresidential development. The analysis of nonresidential development spans the retail, office, flex, and lodging markets. Interviews with experts in the local real estate market, property owners, and other stakeholders helped to supplement the analysis.

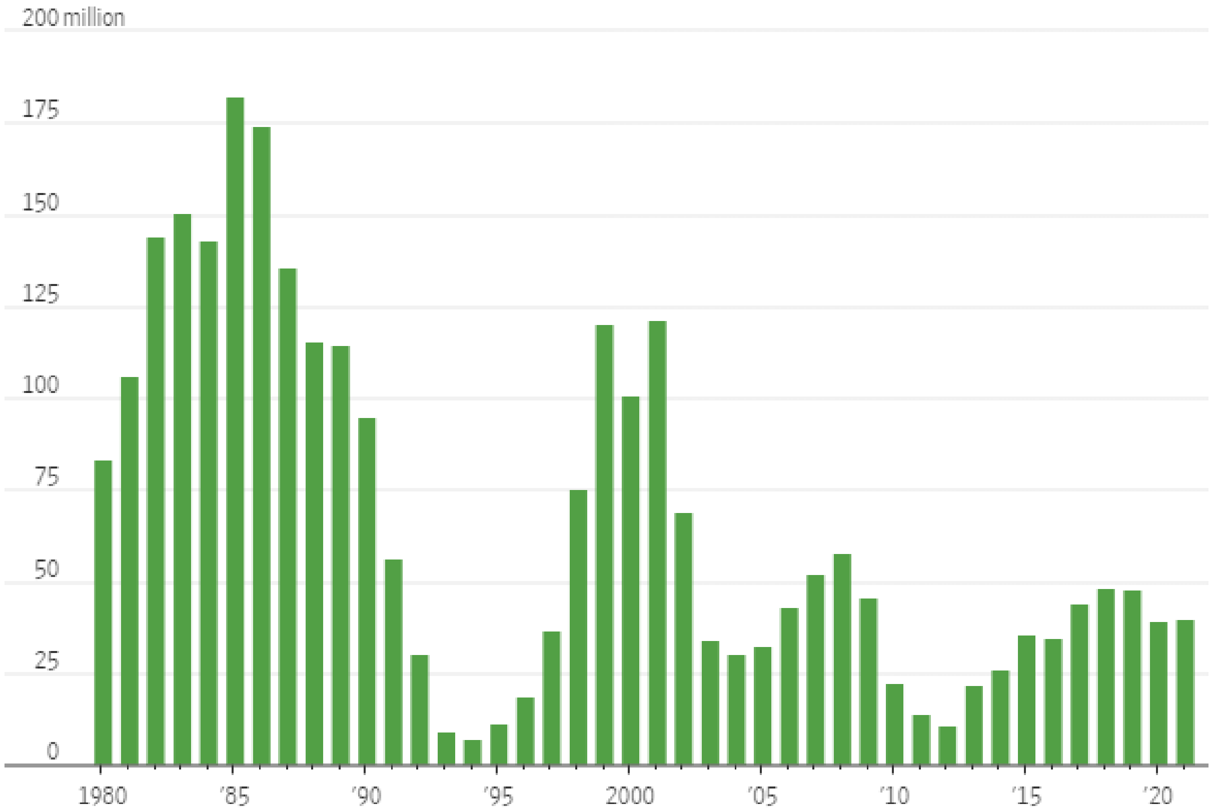
This study also examines data on housing affordability, identifying the rates of cost-burdened households by tenure and income level. These data were obtained from HUD's Office of Policy Development and Research (PD&R) Comprehensive Housing Affordability Strategy (CHAS).

The analysis contained in this report was completed in February 2024 and reflects the most current information available from each source at the time of analysis.

National office development trends

As shown in FigureFigure, office development boomed in the 1980s, slowed in the mid-1990s, and picked up again in the 2000s. Office development has not recovered to these historical levels since the Great Recession from 2007 to 2010.

Figure A-1: Annual Completions of New Office Space in Square Feet, Top 50 United States Metros



Source: Putzier, Konrad. "America's Office Glut Started Decades Before Pandemic." *Wall Street Journal.* August 23, 2022. https://www.wsj.com/articles/americas-office-glut-started-decades-before-pandemic-11661210031

Real estate experts have suggested that the office construction boom in the 1980s led to over-development of office nationally, in part due to the Reagan Administration allowing a faster rate of depreciation in commercial real estate thereby lowering tax bills for investors in commercial properties. Therefore, if planners nationwide used assumptions based on rates of office development in the 1980s, they were likely to overestimate office demand.

Stakeholders Interviewed

Rick Kelly – Senior Vice President, AMR Commercial

Jason Moyer – President & CEO, Moyer and Sons

Brittany Newman – Real Estate Agent, DRB Group Realty

Matt Honacki – Vice President of Sales, Stanley Martin Homes

Kelly Groff – President & CEO, Visit Montgomery

Montgomery Planning

CLARKSBURG GATEWAY SECTOR PLAN

COMMUNITY FEEDBACK REPORT

CLARKSBURG GATEWAY
Sector Plan

A report on community feedback received in the initial stages of the Clarksburg Gateway Sector Plan.

Completed: 2-7-2024

MCPB
Item No. 9
2-15-2024

Montgomery County
Planning Board
2425 Reedie Drive, Floor 14
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LOCATION

Clarksburg

MASTER PLAN

Clarksburg Gateway Sector Plan

Summary:

- The Community Feedback Report for the Clarksburg Gateway Sector Plan contains a summary of the comments Planning Staff has received from Clarksburg residents who live in and near the sector plan area from multiple sources from July through December 2023.

INTRODUCTION AND BACKGROUND

INTRODUCTION

The Clarksburg Gateway Sector Plan (CGSP) is an update to the 1994 *Clarksburg Master Plan & Hyattstown Special Study Area*, which was last amended with the 2014 *10 Mile Creek Area Limited Amendment*. The Sector Plan focuses on the major employment area located in the 1994 Plan's "Transit Corridor District" on the east side of I-270 in Clarksburg south of Clarksburg Road.

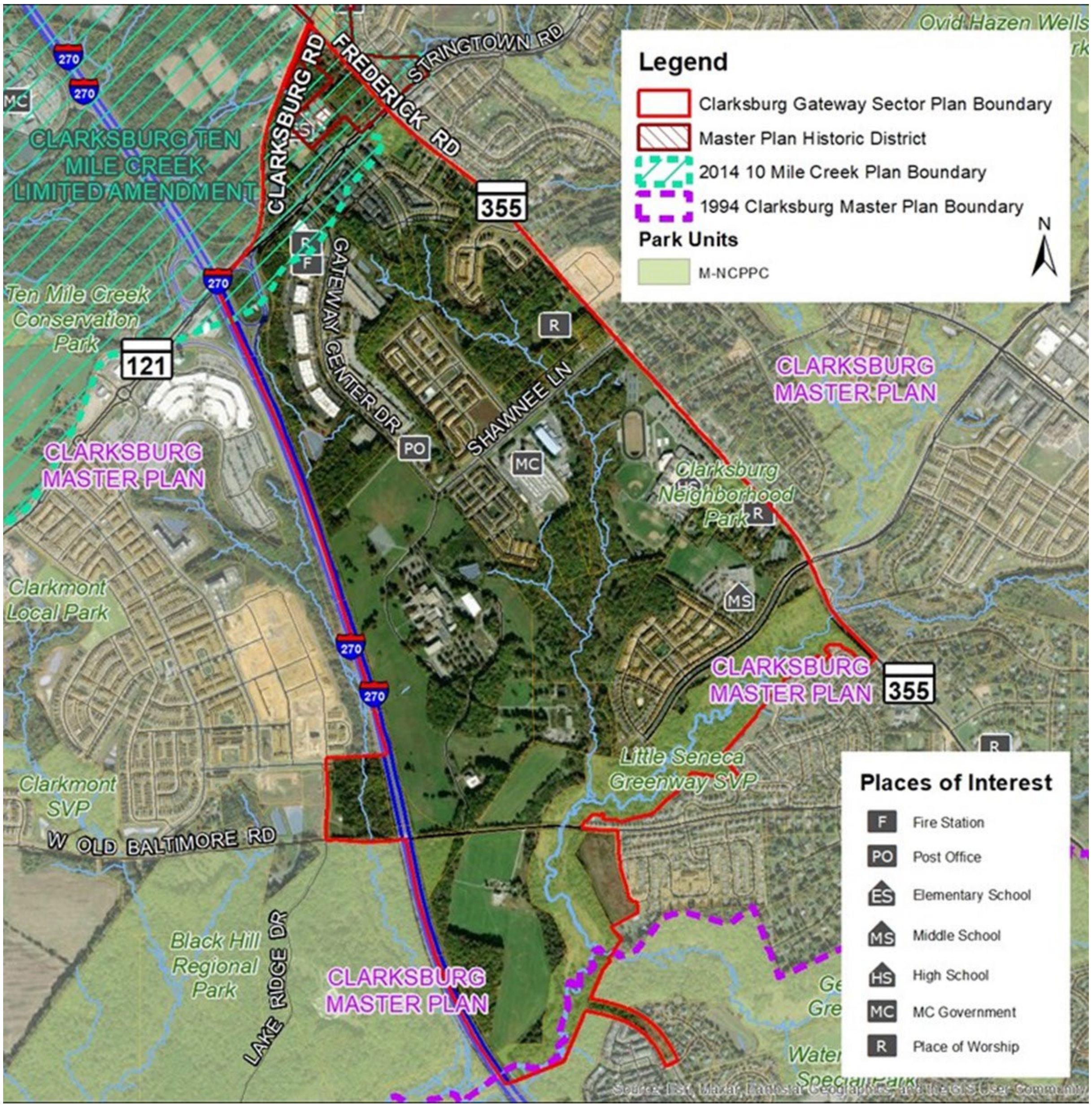


Figure 1. Sector plan boundary

The Sector Plan will evaluate the trends and conditions in the plan area and develop strategies to align the vision, recommendations, and overall staging requirements for the plan area with the county's adopted plans, policies, and priorities. The Sector Plan will provide recommendations for land use, zoning, urban design, transportation, the environment, historic preservation, and community facilities and will incorporate countywide initiatives into the plan area.

The Scope of Work and boundary for the Sector Plan were approved by the Planning Board on June 22, 2023. This was followed by a community kickoff meeting on July 26, 2023, door-to-door canvassing (with contracted vendor Everyday Canvassing), a series of four listening sessions, and an online survey. Staff presented the Existing Conditions Report to the Board on November 30, 2023. The Existing Conditions Report showed a racially and ethnically diverse area that has experienced explosive growth since 2000 but lacks adequate transportation infrastructure, public facilities, and employment opportunities. The report also showed that median incomes in the area are higher than the county average, the region is well-served by parks but that many park and recreational facilities are locally unavailable, and that there are several opportunities to preserve historic resources, especially with the Cesar Pelli-designed COMSAT building.

The community feedback received by the Planning team to date has been analyzed and organized into categories to better understand the most frequent comments and concerns. The goal is for this analysis of the feedback to inform the recommendations in the plan.

This feedback report represents the "Listen" phase of the plan, where plan participants share what they like and don't like about the plan area and suggest ways it can be improved. This phase included reaching residents through door-to-door canvassing, four listening sessions, and online engagement through an eLetter, survey, and social media.

At a glance, the feedback we received includes:

- Transportation: Residents would like to see a completed road network, better pedestrian and bicycling infrastructure, and more public transportation options.
- Public facilities: Residents want a library, a community center with recreation options and meeting rooms, and a public swimming pool open year-round.
- Quality of life: Residents for the most part consider Clarksburg to be peaceful and appreciate its small-town feel and the diversity of the population. But they desire a "complete community," with local restaurants, additional stores, and convenient public facilities. Many are worried about overdevelopment, especially if more houses are built without providing amenities the community currently lacks.
- Environment and parks: Residents appreciate the natural environment and frequently expressed a fondness for the forested areas, open spaces, and other green spaces, especially the regional parks in the area. But many are concerned that not enough will be done to protect water quality and forests as development continues. And many residents would like to see more local parks with active recreation opportunities for people of all ages.

SOURCE OF COMMENTS

The community engagement efforts for the Clarksburg Gateway Sector Plan began in the summer of 2023. Between the various engagement strategies, we recorded 755 comments, which vary in format based on their source, as described below.

Community Kickoff Meeting

On July 26, 2023, the CGSP team hosted a community "kickoff" meeting and open house at the Clarksburg Neighborhood Park. This meeting allowed us to start our communication with the Clarksburg community and to let them know we would be seeking their feedback and inviting their collaboration throughout the planning process. We asked attendees to post sticky notes on topic-specific boards set up around the room, and we also took notes to capture the oral comments. We recorded 139 comments from over 75 attendees at this meeting.

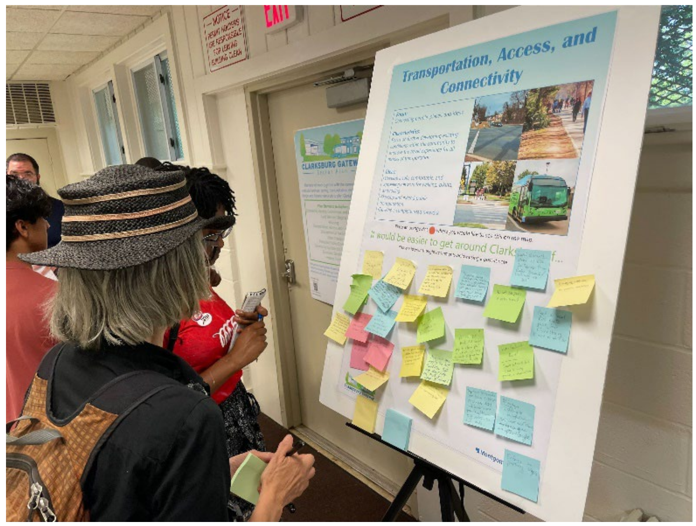


Figure 2. Community kickoff meeting attendees added sticky notes to topic boards.

Survey

At the kickoff meeting, we launched a survey with questions regarding the character of Clarksburg, what amenities the community felt were missing, what type of engagement would work best for them, and what would make this a successful new plan. This survey was open on the plan's website until mid-December and resulted in 126 surveys completed digitally; an additional four were completed by hand at the kickoff meeting. Survey responses vary from single-word answers to short paragraphs or bulleted lists. The survey included the following questions:

1. What do you like most about living in Clarksburg? Or what do you want to make sure is preserved?
2. What facilities and or amenities are lacking in Clarksburg (i.e. educational, bikeways and walkways, public transportation, government, medical, parks, recreation, retail, etc)?
3. What do you think needs improvement in Clarksburg?
4. The former COMSAT facility located along I-270 is one of the focus areas of this plan. What do you want to see happen at COMSAT facility site in the future and why?

5. What is your biggest concern about the future of Clarksburg?
6. This plan will be a success if…
7. Any additional thoughts or comments?

In-person Interviews by Everyday Canvassing

Between late June and late August, we collaborated with the non-profit organization Everyday Canvassing to interview the community to get a better understanding of what the people of Clarksburg think about their community's current state and what they would like to see in the future. Everyday Canvassing attempted to knock on every door within the five large residential neighborhoods within the plan area and a random sampling of residences surrounding the plan boundary. Their efforts resulted in 177 conversations which were transcribed in real-time. Several of the interview conversations are extensive, filling over a page of text, while others are brief at only a sentence or two.

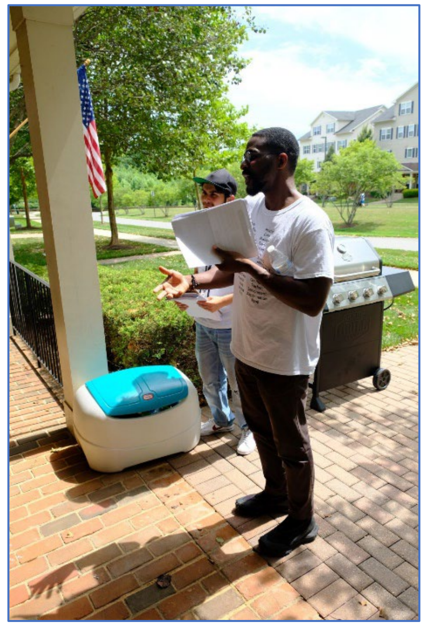


Figure 3 . Members of the Everyday Canvassing team at Gateway Commons

Listening Sessions

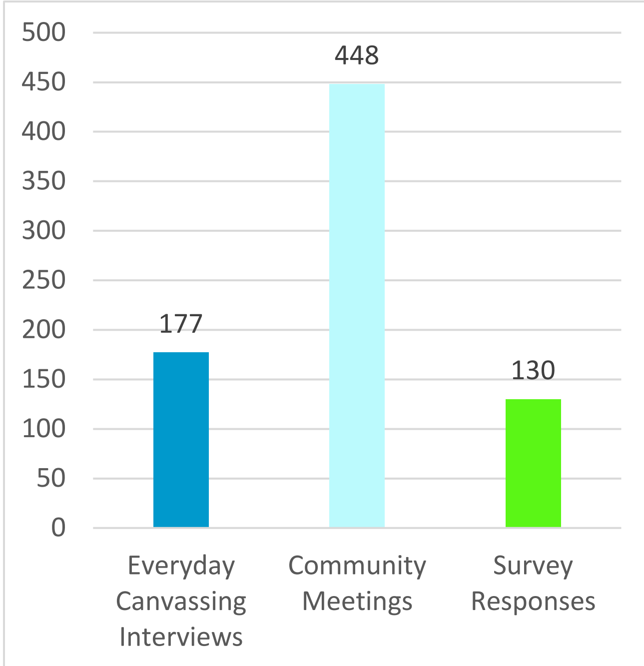
We held four "listening sessions" throughout October, each with different topics of discussion. The first listening session was the only virtual meeting and covered Transportation and Environment. The other three listening sessions were held in person at Rocky Hill Middle School in Clarksburg. The second listening session was on Housing, Economic Development, and

Figure 4. Title slide for online listening session presentation

Figure 5. Members of the community and planning team at the third listening session

Employment; the third listening session was on Parks and Trails, Historic Resources, Community Facilities, Community Identity, and Urban Design; and the fourth listening session was a catch-all meeting that included all of the topics from the three previous sessions. Between the four listening sessions, we were able to collect 309 comments. Most of these comments are short sentences, sentence fragments, and even single words captured by the note takers.

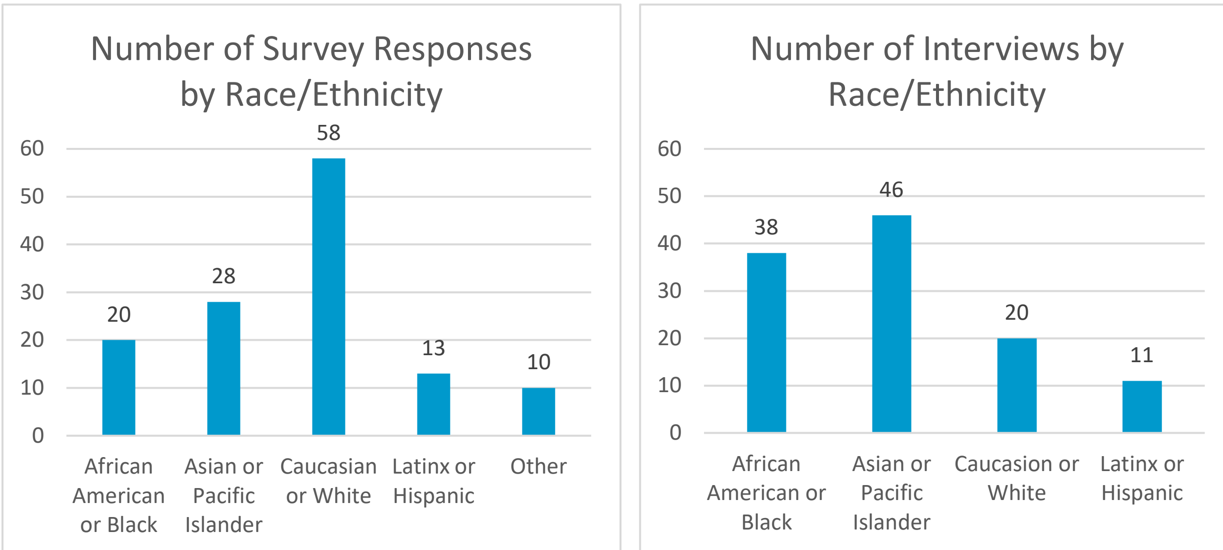
Chart 1. Comments by source. The community meetings include our kickoff meeting and four listening sessions.



DEMOGRAPHICS

Our online survey included questions on race and age, and Everyday Canvassing asked their interviewees similar questions in their data gathering tool. Only one survey respondent did not include responses to the demographic questions; for the Everyday Canvassing interviews, 62 of the 177 interviewees (35%) did not answer the question on race/ethnicity, and 61 of the interviewees did not answer the age range question.

Chart 2. Survey and interview responses by race and ethnicity, where provided



The total population of the study area used for the plan's demographic analysis is 3,851. Compare the charts above with the one below, which shows the racial and ethnic breakdown of the population according to the 2020 Census. For the most parts, the race and ethnicity of the respondents tracks fairly closely with the population, although whites were far more likely to respond by survey than those of other races.

Chart 3. Race and ethnicity of the plan's study area from the 2020 Census

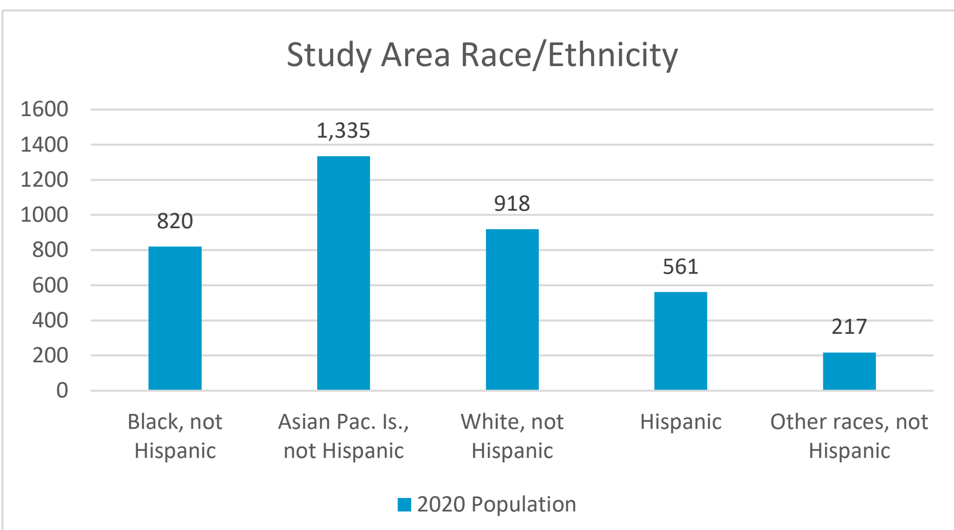
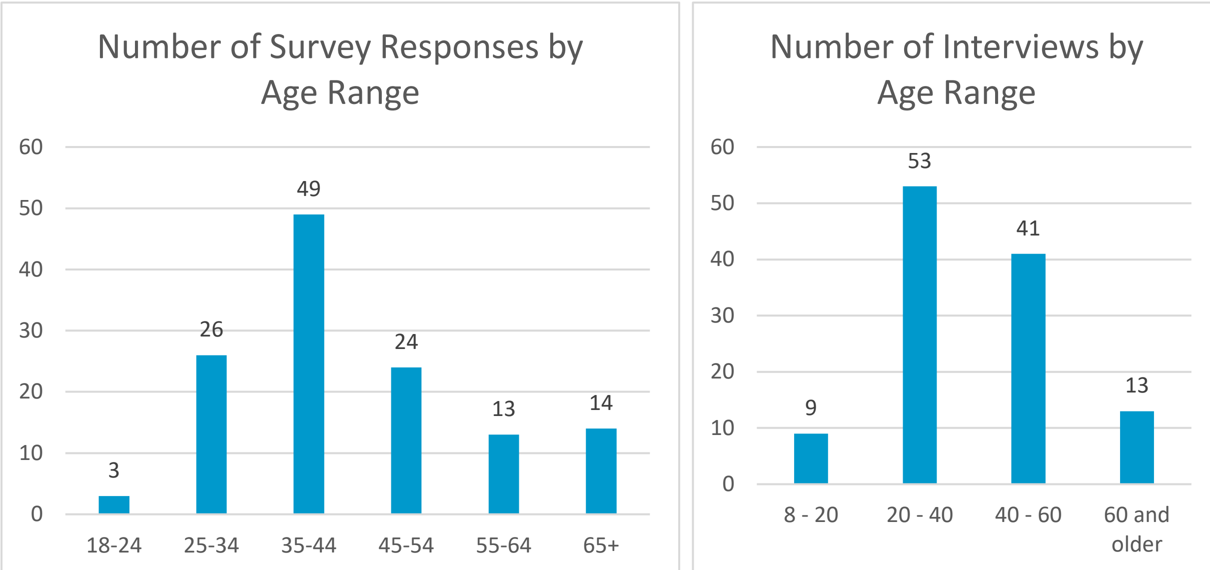
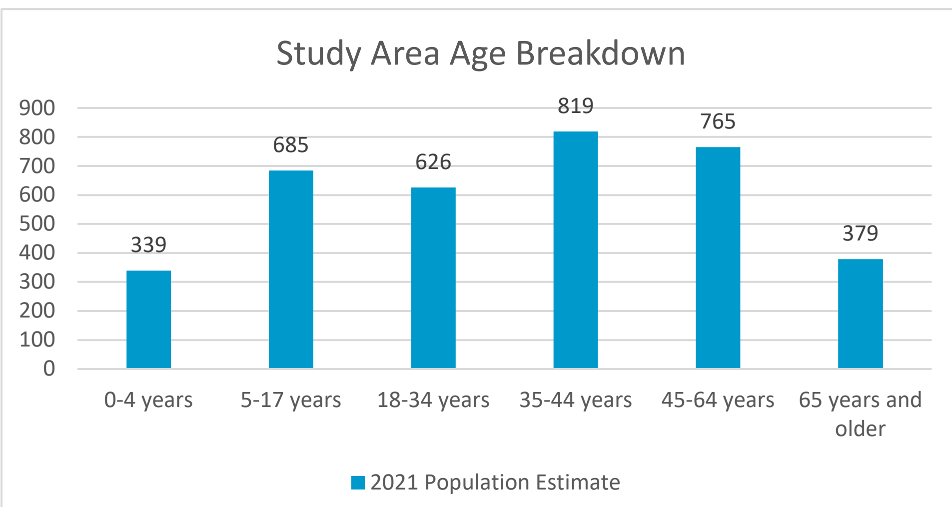


Chart 4. Survey and interview responses by age group, where provided



While the two data sources tracked ages in different categories, the respondent's ages tracked well with the age breakdown of the study area's population, shown below. Given that the most common household type in the study area is a family with children under 18, we would expect most respondents to be in the middle age categories.

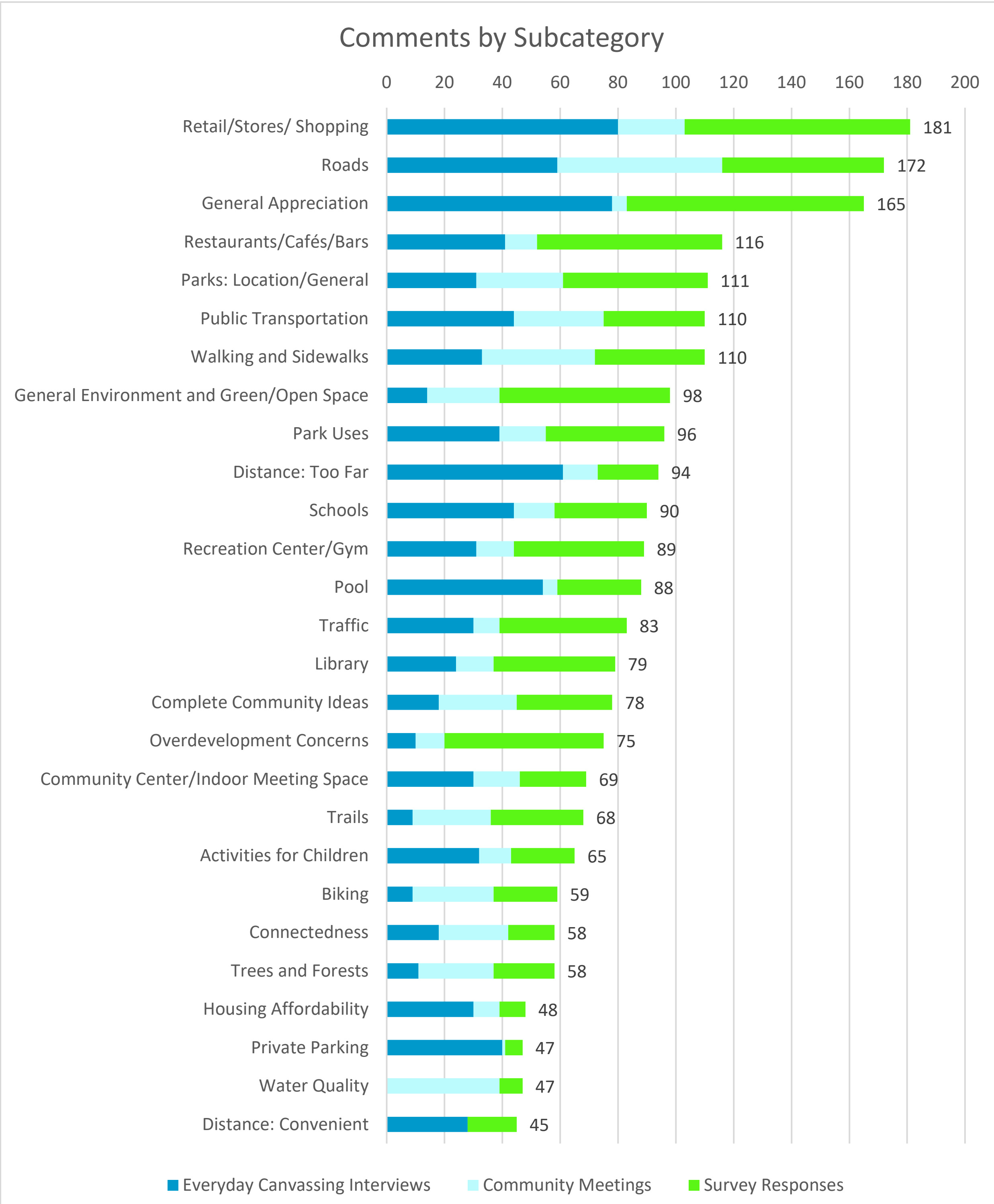
Chart 5. Age groups in the plan's study area according to the 2021 American Community Survey



COMMENTS BY SUBCATEGORY

Planners assigned each comment to one or more subcategories grouped into nine topic areas. We had 54 subcategories. Many of the comments covered numerous topics, and frequently several subcategories within a topic area. The chart on the next page shows the subcategories that received the most comments. In total, there were 3,036 subcategory entries from the755 comments.

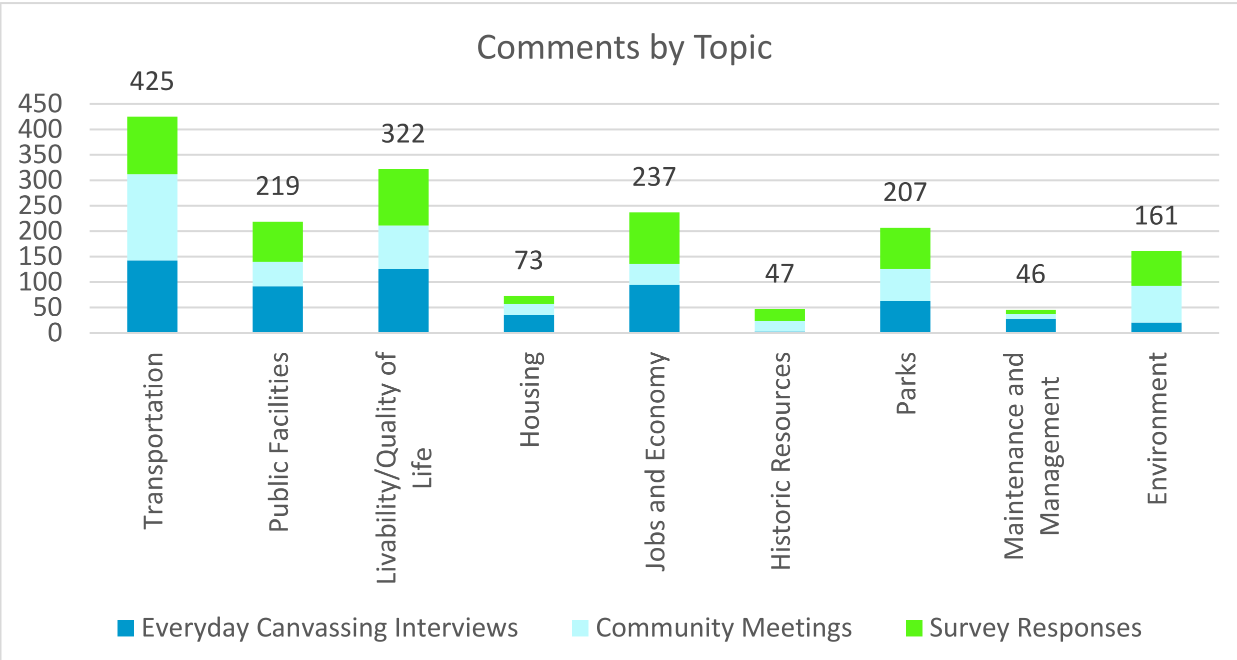
Chart 6. Subcategories receiving the most comments



COMMENTS BY TOPIC

The chart below indicates if any part of a comment fell into one of the broader topic areas. Because many comments touch on multiple issues, the 755 comments were assigned to 1,737 topic areas.

Chart 7. Comments received by topic area



The largest number of comments relate to transportation issues, followed by livability and jobs/economy issues. We also received many comments related to public facilities, parks, and the environment. These topic areas are described in the following sections.

WHAT WE HEARD

TRANSPORTATION

Comments related to transportation issues (425) accounted for the largest number of comments we received. The transportation comments were tracked in fifteen subcategories, which were combined into five groupings of related subcategories: Infrastructure, Public Transportation, Walking and Biking, Connectivity, and Safety. Most comments revolved around roads, the lack of public transportation options, mobility and accessibility issues, parking, and the distance to common destinations. Observation Drive was among the most noteworthy discussions topics, with residents divided on the road being built or being left unfinished.

The following word cloud highlights the terms we heard in comments related to transportation issues.

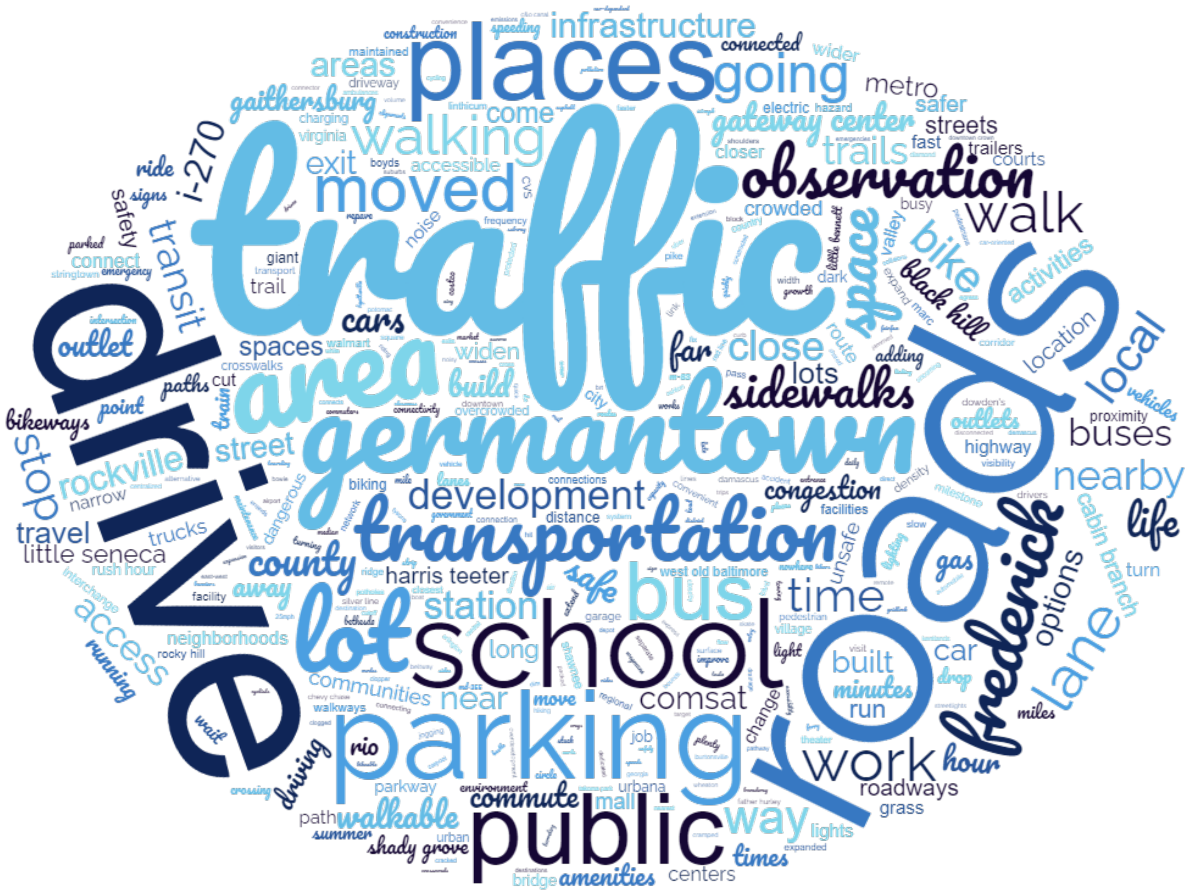
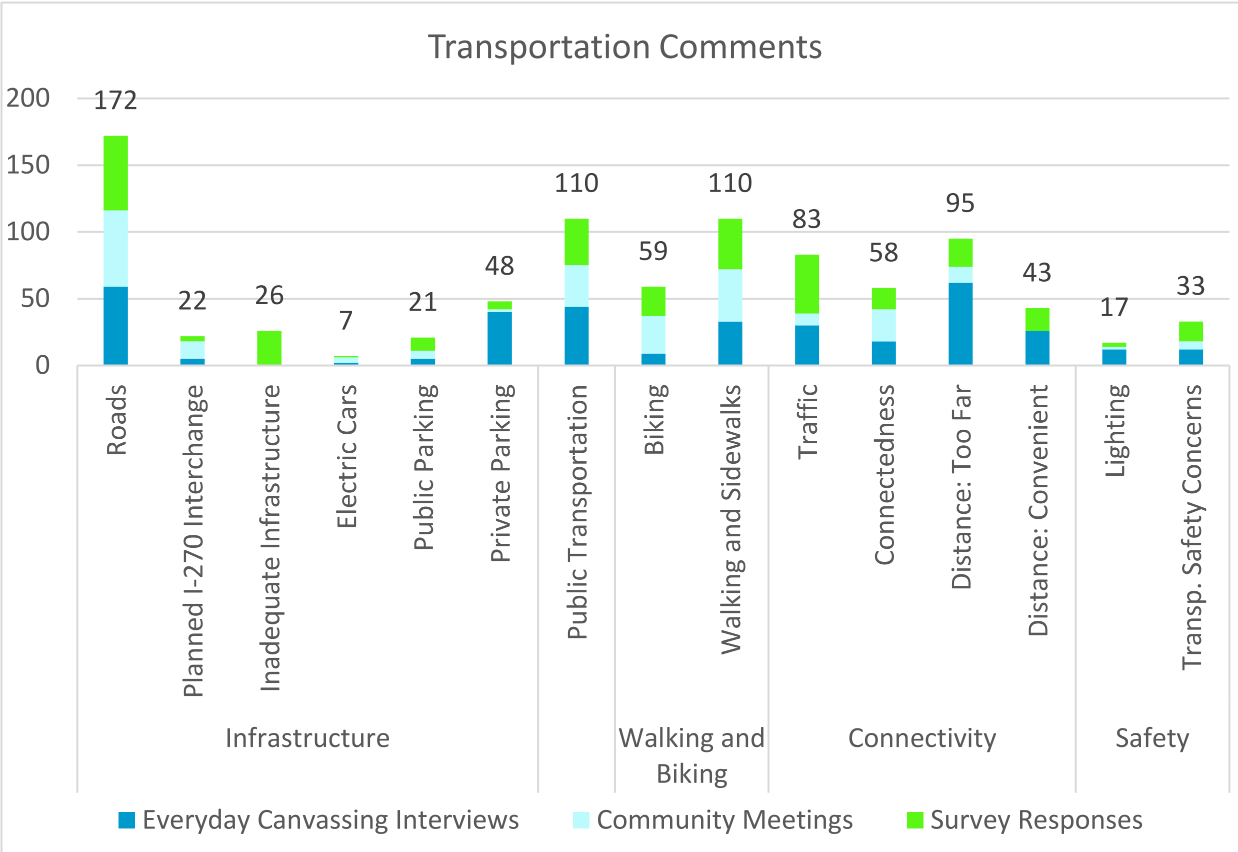


Figure 6. Word cloud highlighting the terms we heard in comments related to transportation

Chart 8. Transportation comments by subcategory



Infrastructure

The street network in Clarksburg is challenged by the community's topography and hydrologic features. Many residential communities in Clarksburg are separated by sensitive stream valleys from tributaries of Little Seneca Creek. Below are comments on specific existing and planned infrastructure.

Interstate 270 Interchange

Little Seneca Parkway exists in two discontinuous segments, one on the west side of I-270 and the other on the east side, with a gap in the middle. Included within this unbuilt portion of the road is a planned interchange at I-270, which, if built, would be designated "Exit 17." Some comments were in favor of completing the interchange, while others thought it unnecessary or environmentally problematic.

- *"I would also like to see Little Seneca Parkway on the east side of 270 be linked to Little Seneca Parkway on the west side. (I understand that would be a big project requiring a bridge over or under 270)."*

- *"The connections between the two parts of Little Seneca Parkway, and the Little Seneca Parkway/I-270 interchange, should be removed from all of the master and sector plans."*

Observation Drive

Observation Drive is a proposed roadway first mentioned in the 1994 master plan. The existing northern terminus of Observation Drive heading north from Germantown is at Waters Discovery Lane, which marks the southern boundary of the sector plan. Observation Drive's planned alignment is north-south through the center of the sector plan area, but to date only a few stretches have been built. Some comments desired that the road be built as planned to create an alternate north-south route to I-270 and Frederick Road. Others felt that other roads could be widened instead.

- *"Create alternate route North-South along Gateway or Observation."*
- *"Optimize Gateway Center Drive rather than build Observation Drive through 2-3 existing neighborhood communities."*
- *"Protect Little Seneca Creek and Little Seneca Lake by not building more highways and maintaining forest cover."*
- *"Don't build Observation Drive – there are enough roads in the area."*

Frederick Road and I-270

I-270 and Frederick Road (MD 355) are the only two practical options for north-south traffic in the area. Exit 18 (Clarksburg Road/Stringtown Road) is where I-270 narrows from three lanes in each direction (north/south) to two, creating regular bottlenecks during the evening commute. Most of the comments about these roads supported widening them.

- *"Both I-270 & 355 are congested, please improve."*
- *"Only n/s routes are I-270 and 355."*
- *"I-270, 3 lanes to 2 lanes each at exit 18 is a big problem."*
- *"I think route 355 should be a 4 lane road. During school time, it gets really busy."*

Inadequate Infrastructure

Many people spoke more generally about the infrastructure in the area, finding that it does not adequately meet current demands and that it will only get worse as the area grows.

- *"The fact that an additional 1000 homes are planned with little change in the roads & transportation infrastructure here is abominable."*
- *"Only house are built and not improving other infrastructure and balance is required."*
- *"Too much high-density housing without open recreational space or good infrastructure to support traffic congestion."*

Parking Issues

Many comments we received also mentioned issues with parking. Some of these comments were about public parking, but even more were about private parking issues. The majority of the private parking comments lamented the lack of parking spaces for both residents and guests of individual housing developments. Most of the public parking comments were about commercial vehicles continuously parked along both sides of Gateway Center Drive.

- *"Parking is an issue in the community, so I'd like to see more parking."*
- *"The parking is truly another issue. Sometimes we have to go to other communities for parking."*
- *"It is almost impossible to travel down Gateway Center Drive now due to all of the commercial vehicles parked all along the side…"*
- *"[Clarksburg Elementary School] does not have enough parking, and the school is not big enough to host events."*

Public Transportation

The greater community area is served by three bus routes, but two of these routes only operate during the morning and evening rush, and there are 30-40 minutes between buses on all the routes. Numerous comments stated a desire for more public transportation options in generally, especially given how infrequently buses run in the area.

- *"Bedroom community + little public transportation options = huge environmental impact of gas-powered vehicles & bad parking situations."*
- *"Need a local bus route just for Clarksburg, east and west of I-270."*
- *"Very slow public transit – every 45 minutes or so."*
- *"…the transportation would be better if the buses and metros came more frequently…"*
- *"If you don't have a car, transportation is hard…"*

Walking and Biking

There is a lot of overlap within the pedestrian and bicycling comments between sidewalk and bike lane concerns and the desire for paths and trails through or between parkland; the latter comments are covered in the Parks section of this report when it seemed more apt. 110 comments favored better walking and sidewalk infrastructure; 59 comments indicated a desire for better bicycling facilities.

- *"More bike paths."*
- *"Prioritize walking and bicycling – not just add these as an afterthought."*
- *"Always feels like pedestrians/cyclists are second priority."*
- *"Clarksburg area lacks walking infrastructure (hard surface trails/paths), especially along major roads."*
- *[We] need sidewalks. The least you can do is make it accessible. Give us a sidewalk. We will get there by bike or by walking."*

Connectivity

Connectivity issues are those that speak of how difficult or easy it is to get around the area and to reach the places residents want to go.

Traffic

Closely related to the idea of inadequate infrastructure summarized above were comments about traffic, a major concern to many in Clarksburg. Residents are also worried that additional development will make things worse. Traffic on Frederick Road (MD 355) near Rocky Hill Middle School, where the road only has two lanes, was the most common example of bad traffic cited by residents. A small number do not think traffic is a problem.

- *"Both I-270 & 355 are getting congested, please improve."*
- *"There is rush hour seven days a week – more traffic on the weekends as a result of work from home."*
- *"With development, traffic will become worse."*
- *"There's lots of traffic in the morning around the middle school."*
- *"There's not much traffic so I don't think we need another lane added."*

Connectedness

Many residents commented on how connected their neighborhood or Clarksburg in general felt to them. Some remarks indicate people are happy with the current situation and feel that it is easy to get everything they need relatively close by. Many, on the other hand, complained of having to travel long distances for basic needs, entertainment options, or to work. Comments here spoke more generally about connectivity than specific infrastructure comments captured above.

- [Notes from listening session] *"Younger person mentioned how long it takes to get from Milestone to Black Hill Regional Park because there's no connectivity."*
- *"Easy drive to a lot of different cities."*
- *"We want our own little hub, our own little oasis, but we really need the infrastructure and the connections to brand ourselves as a community."*
- *"Easy access to roads for better flow of traffic."*
- *"Multi-use path connections from the middle school and high school areas through Comsat and down to Black Hill Regional Park (along the stream) and to Observation Drive for linkage to Milestone, and over or under 270 at north end of Comsat to the outlet mall and Cabin Branch neighborhood."*

Distance: Too Far

One of the subcategories with the most responses were the 95 comments expressing dissatisfaction with how far away everything is. Shopping options are limited in Clarksburg, so most residents drive to other communities, such as Germantown, Rockville, and Urbana, for shopping, restaurants, recreation, entertainment, and employment.

- *"Nice sit down restaurants are definitely a need! Now we have to go to Germantown, Urbana, Frederick, Mt Airy."*

- *"Most importantly, No proper shopping center for groceries available. Will always have to drive to other city (Germantown) to shop."*
- *"Family with children generally drive long way to other cities to join the outside school activities, which is inconvenient."*
- *"Create Clarksburg as sustaining community without residents needing to go to Damascus as Germantown for practically everything."*
- *"Shopping is a bit far. We need to drive about 16 - 20 minutes. We need more stores nearby."*

Distance: Convenient

On the other hand, 43 comments from people who find stores and other destinations to be convenient provide a counterbalance to those unhappy about the distance. A fair number of people described some destinations as convenient and others as far away, showing it depends strongly on individuals and their everyday needs.

- *"Enjoy the easy access to the shopping at 355 and Ridge."*
- *"There's great access to the freeway. Here to Shady Grove is about 15 minutes. Commute is fine by car."*
- *"I don't mind driving 5 -7 minutes to get any food that I want."*
- *"I feel good about distance of shopping and schools."*
- *"The stores are convenient, and the urgent care is close."*
- *"With a 20-minute drive, I can get to anything from here: I'm satisfied."*

Safety

The 33 comments we received about safety, as it relates to modes of transportation, are about unsafe drivers, unsafe sidewalks, lack of crosswalks, and unsafe bicycling conditions. We also received 17 comments specifically about inadequate street lighting.

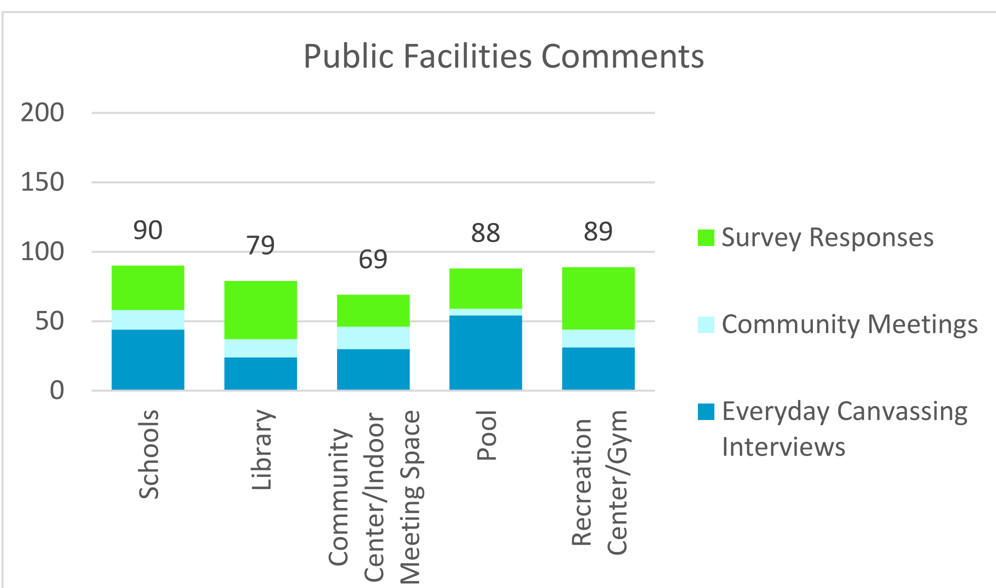
- *"Increase safe walking conditions for students; more crosswalks."*
- *"Biking to stores is unsafe, particularly on West Old Baltimore Road."*
- *"Very dangerous to walk/bike on Clarksburg Road."*
- *"Walking gets dangerous in the few poorly lit areas and the exit ramp."*
- *"Especially in the night, it's too dark and unsafe. I wish there were more streetlights right outside of the community on this road that connects to 355."*

PUBLIC FACILITIES

Public facilities are entities that serve the greater public, such as police stations, fire stations, schools, and community centers. The word cloud below is based on the 219 comments we received about public facilities. The comments were more or less evenly distributed across the five subcategories, with comments about schools just edging out comments about a rec center or gym, a pool, a library, or a community center.

Figure 7. Word cloud highlighting the terms we heard in comments related to public facilities

Chart 9. Public facility comments by subcategory



Schools

The 90 comments we received about schools can be divided into the following issues.

School Capacity Adequacy

The main concern expressed about schools by the community overall was the longstanding capacity overutilization of their schools. While some acknowledged the relief provided at the elementary school level by the opening of a new school, there were still lingering concerns over the status of the middle and high schools.

- *"Had kids at Clarksburg Elementary School when it was overutilized, school overcrowding not as bad with opening of Cabin Branch Elementary School – school had portables."*
- *"I don't know why it took so long to build more schools. They still need another middle school and another high school."*
- *"The biggest concern about the future of Clarksburg is… that it'll fall on deaf ears. That overcrowding will continue without needed infrastructure in place. That our schools will again be allowed to be packed, with no near=term future solutions. As is, Clarksburg HS is overcrowded, even with the Cabin Branch community districted to Seneca Valley."*

Getting to and from School

A number of people also shared their thoughts on the way students in their community are able to get to school, albeit with contrasting views. While some wanted to see sidewalks and crosswalks provided so that students can walk or bike to school, others, especially in communities where safer routes were already provided, lamented the fact that their students were not being served by school buses.

- *"Lacking school crossing signs for the student crossing the road from Gateway Commons to Clarksburg ES."*
- *"Something the county did is they created a sidewalk that goes to Clarksburg HS, which is a mile walk to school. Now that there's a walkway, there's no school bus!"*
- *"My son can't get a school bus. He's in middle school and we drive him to school every day with a neighbor."*

School Site/Facility Conditions

There was also a desire to see the facility conditions of some existing schools improved.

- *"Clarksburg Elementary school needs renovations, very dated facility."*
- *"Clarksburg Elementary School is old and cramped and uses portables. It's an 100 year old building."*

School Perception

Several people mentioned that they or their neighbors moved to Clarksburg because of the schools, but there were also many who were concerned of the perceived diminishing quality of schools serving the area.

- *"We moved here because of the school district."*
- *"I think everything is good in general and this area is good for me. What I don't like is that the public schools are not good so I have to send my kids to private school."*
- *"I think the school ratings here are better."*

Other Public Facilites

This section highlights comments we received about other public facilities. We did not receive many comments about fire stations or police departments, indicating most people are satisfied with these public safety services, but we heard loudly and clearly that residents want the other facilities discussed here.

Library

One of the things we have heard the most since the outset of this planning effort is that the residents of Clarksburg want a library in their community. Seventy-nine of the comments we received stated a desire for a library in Clarksburg, and many people believe they should have gotten one a long time ago. They would appreciate it if the library came with a variety of programs for the children and the greater community, and it needs to be conveniently located. The county is planning a library in the town center not too far from the sector plan area, but the project is still in the planning stages.

- *"We definitely need a library."*
- *" I want a library and playground closer than going to Germantown."*
- *"I'm generally happy here but I want a library!"*

Community Center/Indoor Meeting Space

Sixty-nine comments mentioned a need for a "community center," but it was not always clear from context whether they they were looking for an indoor meeting space for classes, group activities, and events, or if they were more interested in a recreation center with fitness equipment; sometimes they probably meant both. Some communities in Clarksburg have a clubhouse available for residents' use, while others do not, and some residents seemed to be refering to this type of building as a "community center." When context made it clear they were looking for something like a fitness center, the comment was assigned to the "recreation center/gym" category, but if they wanted an indoor meeting space or if it was difficult to tell which was meant, the comment was categorized under "Community Center/Indoor Meeting Space."

Typical comments in this category indicate a desire for a space that the community can rent out for birthdays and similar events, that allow for socialization and educational programs, or that provide a formal space to hold community meetings.

- *"When you think about a community center, you have to consider all that's in a community. Would be nice to have different classes like cooking classes, and dance like salsa."*
- *"When I want to go to a community center, pool, or library, I have to drive to Germantown or Frederick since there are none here."*
- *"A community center would be good too so we can rent it out sometime for family functions and events."*

Pool

Eighty-eight comments mentioned a swimming pool. While some communities have a private pool for residents, most developments within the plan area do not. And private pools are only available for use during the warmer months, so do not provide a yearlong opportunity for exercise. Those who currently use a public pool would like one closer to where they live. Numerous residents also expressed a desire for a splash park, which can be part of a pool complex or included in a park or other public space. The "splash park" comments were categorized under park uses.

- *" I would like a public pool in the area -- some communities have private pools, but I need to go to Germantown or Gaithersburg."*
- *"I would like a pool close to here --I have to go to Montgomery Village for the pool."*
- *"[T]here's nowhere for kids to play, no pool, nothing; I don't want to have to leave Clarksburg for recreation."*

Recreation Center/Gym

Eighty-nine of the comments specified a desire for a fitness center, either as part of a larger public community center or a commercial gym. Several also provided the YMCA in Urbana as an example of what they would like. Some want workout equipment, while others would like to be able to play indoor basketball. Outdoor fields and courts for basketball, soccer, tennis, etc. are included in the park uses category.

- *"If I saw the YMCA and a library come to Clarksburg I would say "yes this is home!"; I would be so proud of my community."*
- *"It would be nice to have an open gym, programs going on there, like basketball, sports, any things for kids to do."*
- *"With an unlimited budget, I'd create a town center and recreational facility for all ages that are walking distance."*

LIVABILITY/QUALITY OF LIFE

The 322 comments classified under Livability/Quality of Life cover a broad range of topics but are united in the sense that they provide a glimpse into the way people feel about living in the area or show concerns residents have for the future of the community. All the other topics in this report also affect livability and the quality of life; the comments captured here are typically more general and don't fit well in the other topic areas. The word cloud below gives a sense of the many items in this category.

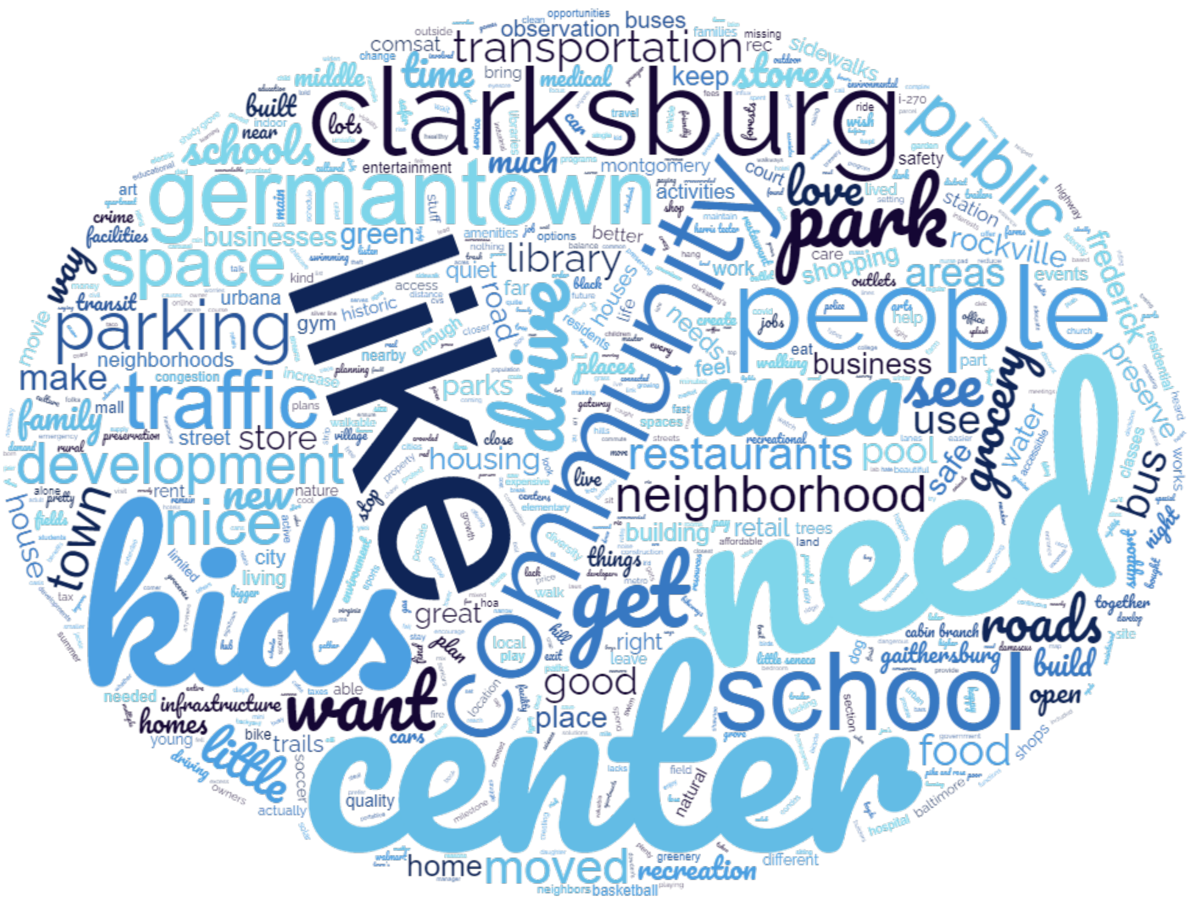
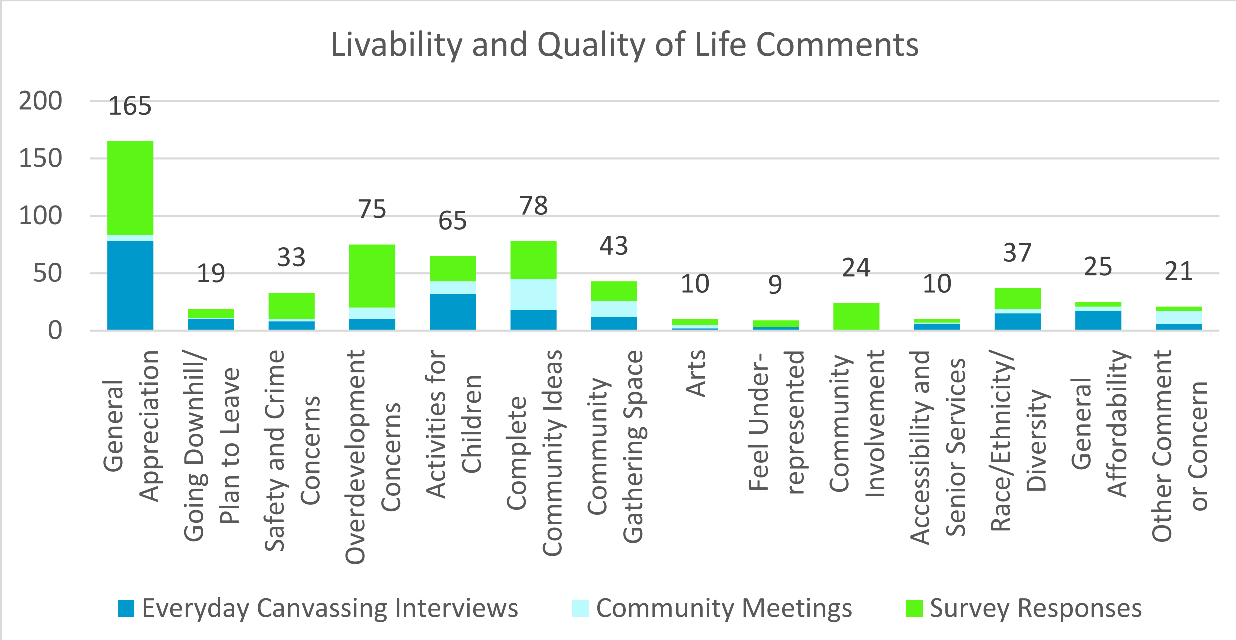


Figure 8. Word cloud highlighting the terms we heard in comments related to livability and quality of life

Chart 10. Livability and quality of life comments by subcategory



General Appreciation

As can be seen in the chart above, we received 165 comments that expressed a general appreciation for the area. Some of the qualities we heard most often show that people value the peace, quiet, a feeling of safety, and small-town feel of Clarksburg or their neighborhood. On the other hand, we received 19 comments from people who feel like Clarksburg is "going downhill," in some cases because it doesn't have the infrastructure and amenities that they were expecting, and at others, because they feel it is becoming overcrowded.

- *"The small-town feeling, quiet streets and lots of outdoor space."*
- *"The wide-open spaces, walking trails, being surrounded by beautiful landscape, the cleanliness of streets."*
- *"I like the diversity, the scenery, the peace & quiet the access to major roadways, the schools. I love that there are so many kids in the area and there is space for them to play. I love the historical places, parks, and nature trails."*
- *"What makes this a great community is that it's calm and peaceful-- we see no fights or arguments."*
- *"I liked the fact Clarksburg wasn't developed. Too much development and it is ruining Clarksburg. We do not have the roads, retail, or a high school to have more development. Leave Clarksburg alone."*
- *"Lack of retail and restaurants makes it unappealing. I think the trend is walkable communities, close to retail, restaurants, coffee shops, fitness centers, dog parks, grocery stores, etc.*

Clarksburg is seriously lacking in that department, making people move on. I've known 5 people who have moved out of Clarksburg for this reason."

Safety and Crime Concerns

Thirty-three comments indicated a concern that criminal activity is increasing in the area, and they don't feel safe or are worried that they won't feel safe as the population grows.

- *"Crime rates increasing. Educational school rankings go down."*
- *"[Completing Observation Drive] will also create a bridge to a lot of the criminals that live in Germantown to come into Clarksburg. Clarksburg is one of the last places that hasn't been victim to crime. Gaithersburg has fallen victim to this then it happened to Germantown. Now Clarksburg will fall victim."*

Overdevelopment Concerns

Seventy-five comments were from people who either believe Clarksburg is already overdeveloped or that it will become overdeveloped soon, perhaps because of the sector plan.

- *"Used to be a quiet town. Modern and well planned. Recently there has been too many constructions, over-populated high school, added traffic. We need to preserve green spaces, parks, avoid overpopulation of neighborhoods and schools."*
- *"Biggest concern is that it would be over-developed like Gaithersburg without many recreational options for families. Also, better public transportation would be beneficial to prevent traffic in the future."*
- *"As a resident of Clarksburg, my biggest concern is overdevelopment and the potential impact it might have on our natural atmosphere. While growth and progress are essential, we must be mindful of maintaining the unique charm and beauty that drew us to this town in the first place."*
- *"We grow our population faster than our roads and infrastructure. We need to provide the current tenants and homeowners a better quality of life before we allow more housing built."*

Activities for Children

We received 65 comments that indicated a desire for more activities for children from toddlers all the way through teenagers. This is a reflection of the large percentage of households in the area with school-age children at home. Residents want more after-school programs, outside-of-school activities, recreation centers, and better parks and playground for children.

- *"Family with children generally drive long way to other cities to join the outside school activities, which is inconvenient. Clarksburg should have built complex for education, groceries, and restaurants all together so that parents can do something while waiting for their children to finish the activities."*

- *“I am also concerned that youth do not have enough to do around here to keep out of trouble. I think they would benefit from places like skate park, and nature centers. Places where they can hang out and work/intern in the summers.”*
- *“There's a lot of kids in this area so a big park with swings and slides is needed.”*
- *“A community center where you can, kind of, just hang out. Something skewed towards younger people because there are a lot of families in Clarksburg.”*
- *“There needs to be more after-school programs for little kids.”*

Complete Community Ideas

Compact growth, 15-minute living, and complete communities are concepts critical to the success of *Thrive Montgomery 2050*, and 78 comments touch on what makes such communities. According to *Thrive Montgomery 2050*:

> Complete Communities are places that include the range of land uses, infrastructure, services and amenities that allow them to meet a wide range of needs for a variety of people. They include housing suitable for different household types, income levels, and preferences, helping to support racial and socioeconomic integration.
>
> …
>
> The related concept of 15-minute living has emerged as a way of reimagining existing communities to maximize their attractiveness and efficiency by mixing housing, offices, and retail uses so services, infrastructure, facilities, and amenities to serve the daily needs of people who live or work there are within walking distance.

Additionally, the COMSAT site at the center of the sector plan is called out in *Thrive Montgomery 2050*:

> Existing suburban office parks in locations such as Rock Spring or Clarksburg’s COMSAT site have large existing buildings that can accommodate employment but lack the integration of uses, services, and amenities necessary to succeed in an increasingly competitive office market. Complete Communities strategies can help reposition these employment centers through infill and redevelopment to incorporate a variety of housing, restaurants, retail, public facilities, and parks and public spaces along with better transit service, making them more attractive to both residents and employers.

Several residents provided examples of places they think of as more complete than Clarksburg: Downtown Crown, Rio, Pike and Rose, Kentlands, and Rockville Town Center were all mentioned, in addition to others.

- *“I would like to see the COMSAT facility be redeveloped into a mix-use development that has some shops, restaurants, and homes. It should also link to the current neighborhoods and build off what we have now.”*

- *"I fear the only thing that will get built is more houses. It's turning into a commuter city where you only sleep here because you have to do everything else in a different area (work, shop, eat, play)."*
- *"The closest place to visit with my family and hang out is RIO. Would like to see the town center concept completed at the Crown in Clarksburg."*
- *"It would be great if we could have something like Kentlands, Pike and Rose or Rockville town center, so it's not like here where we have to shop at different plazas."*
- *"I'm not saying turn it into Pike and Rose, but have more opportunity for boutiques. We want our own little hub, our own little oasis, but we really need the infrastructure and the connections to brand ourselves as a community."*

Community Gathering Space

Many comments (43) spoke to the idea that they would like to have a community space, either for community events or just a place where people can gather. Some said they want a place where they are likely to run into someone they know, which typically does not happen when you have to travel outside the community to take care of everyday needs.

- *"Community hang out area like in Urbana. The community needs a place to come together… Comsat has an abundance of space. Maybe a splash pad for the summer?"*
- *"Create a park, pool and a greenery for the community come together and enjoy what Clarksburg has to offer."*
- *"More focus on community and places to gather."*
- *"My friends come here and hang out but there is nothing close by to do with them. Maybe having a small-town center with restaurants and nice bars for us to go out to eat and hang out."*
- *"If we wanted to hold a cultural event it just doesn't happen around here. There's nowhere to do it!"*

Race, Ethnicity, and Diversity

Thirty-seven responses mentioned the diversity of the population as one of the most positive aspects of living in Clarksburg, most frequently in response to the survey question asking what they like most about living in Clarksburg. Several respondents specifically mentioned their country of origin and the language they speak when talking to Everyday Canvassing. Many people specifically stated a desire for more ethnic grocery stores and restaurants.

Several of the Everyday Canvassing interviewees mentioned where they were from (the Caribbean, Guyana, Dubai, Philippines, Cameroon, Brazil, Iran, Romania) or what language they speak (Tamil, Swahili, Tagalog, Portuguese, Farsi).

- Survey prompt: What do you like most about living in Clarksburg?
    - *"The diversity of the neighborhoods."*

- *“Diversity and people.”*
- *“The diversity in Clarksburg is amazing!”*
- *“I love the diversity of the area. We have so many nations in one place. It is as if the world has come to Clarksburg.”*

General Affordability

This subcategory captures the twenty-five comments about the affordability of various things (other than housing) according to residents. Comments about housing costs are covered under the housing topic in the following section; comments here are about other expenses.

- *“Clarksburg is struggling for the very poor, few community assets.”*
- *“Taxes are so high, including property taxes. Instead of buying food for my family, I am caught paying high tax prices.”*
- *“I'm on a fixed income so I can barely afford to live here. I'm trying to spend as little of my savings as possible because that's gotta last me until I die and social security can't keep up with inflation. It's frustrating.”*
- *“Living in this area is very expensive and I can't afford to shop here because of the prices.”*
- *“Before and After School programs are expensive. Daycare is also so expensive.”*
- *“I moved here from Arlington because medical services were affordable.”*

Additional Comments

This section summarizes some of the other comments we heard from community members.

Arts

Ten comments mentioned wanting opportunities to enjoy the arts in their community.

- *“There is no option for community to enjoy cultural events - an art complex with library would be a valued addition.”*
- *“Mixed use community, small business, science space that address sustainability, art, and community. Example: Rotating exhibitions, walking/meditation gardens, boys and girls club, rental space for events, community education spaces (healthy cooking, wellness, etc.)”*
- *“An art district with community creative spaces to meet, to socialize, and provide environmental learning.”*

Feeling Underrepresented

Nine responses expressed a feeling that Clarksburg and the rest of the Upcounty area “do not get a lot of love” from elected representatives and government agencies.

- *“A lot of the resources get funneled down-county and not upcounty.”*
- *“Clarksburg feels like it is the stepchild of the county at times.*
- *“By size and location, upper Montgomery County is left out of a lot of decision making.”*

Community Involvement

In answer to the prompt "This plan will be a success if...", twenty-four comments implored planners to really listen to what the residents have to say. A few also wanted to make sure we keep them informed and involved in the planning process.

- *"It focuses on what the community needs not what some business needs."*
- *"Individuals within local communities feel heard and included in the future decisions.*
- *"Community considerations are taken seriously and community is treated as important stakeholder."*
- *"The community is involved and political leaders listen to the community and not just to developers that may have financial interests in mind."*

Accessibility and Services for the Elderly

Ten comments spoke of creating more opportunities and services for seniors or making things accessible.

- *"Transportation for elderly people would be great, too."*
- *"There's also no activities for old people, or jobs for old people."*
- [The plan will be a success if…] *"Universal pedestrian access."*

HOUSING

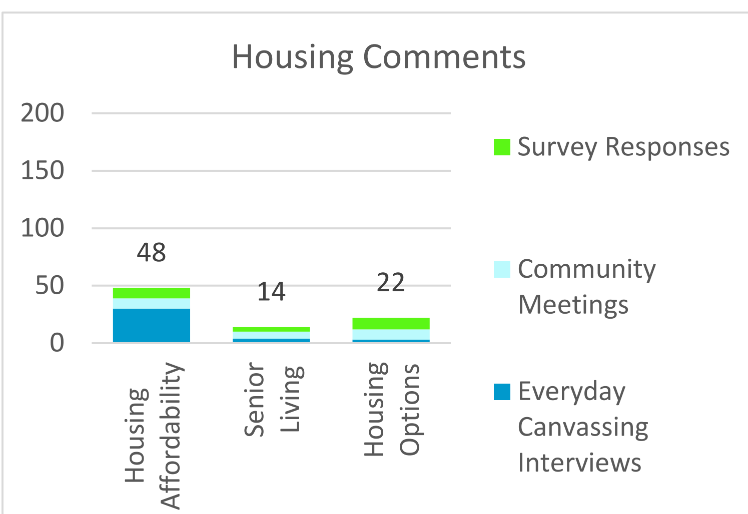
There were 73 comments that touched on housing and residential development, although several other subcategories contain elements related to housing. The primary comments touched on the following issues:

- Housing Affordability
- Diversity of Housing Options and Types (including issues specific to senior housing)
- Housing Quality, Property Management, and Homeowners Association (HOA) Concerns
- Disproportionate Residential Development

Housing-related comments reviewed in this report under other topic areas include such things as the balance of residential development and accompanying infrastructure, public services, and commercial facilities (see Overdevelopment Concerns). Most of the comments noted that there is too much residential development, and they would like to a reduction in housing development. There were also several comments that expressed concern about the lack of accompanying development of public services and facilities as well as infrastructure such as roads. The lack of retail and commercial services in the area in comparison to housing was also noted frequently throughout the comments. See the Transportation, Public Facilities, and Jobs and Economy sections of this report for more details.

Figure 9. Word cloud highlighting the terms we heard in comments related to housing

Chart 11. Housing comments by subcategory



Housing Affordability

There were 48 comments related to housing affordability. Most of these comments emphasized the lack of affordable housing and the high cost of housing in the area, while some of the comments highlighted the relative affordability of the area compared to other places in Montgomery County. Some of the affordability concerns were specific to senior housing, covered in the next subtopic.

- *"I've been here for 5 years because it's the most affordable place in this area."*
- *"My biggest concern about the future of Clarksburg is that residents will be priced out of housing."*
- *"Rent is killing me; I pay $3,000 a month. I will leave if the rent increases."*

Housing Options and Types and Senior Housing Issues

Varieties of housing options and types in the area came up in 22 comments. While some people highlighted the large number of single-family homes and the need for more dense housing types, there were also a few comments that indicated the need to preserve single-family housing with larger lot sizes. Fourteen additional comments were specific to the housing needs of seniors, such as the need for more housing without stairs and opportunities to age in place. Five residents commented on the need for more affordable senior housing in particular. Other comments expressed frustration with zoning and the process for development of missing middle housing and Accessory Dwelling Units (ADUs).

- *"Difficult to build rental units on own property, difficult to provide ADUs"*
- *"We need bigger yards and more space between housing."*
- *"In the short term, the council needs to approve amendments to the zoning code to allow for greater density for affordable housing."*
- *"I would like to see units with fewer stairs."*
- *"Would like to see more 55+ community so I can retire where I spent most time of my adulthood."*

Disproportionate Residential Development

The balance of residential development and accompanying infrastructure, public services, and commercial facilities was a prominent theme among residents, with 29 comments. Most of the comments noted that there is too much residential development, and they would like to a reduction in housing development. There were also several comments that expressed concern about the lack of accompanying development of public services and facilities as well as infrastructure such as roads. The lack of retail and commercial services in the area in comparison to housing was also noted frequently throughout the comments.

- *"Community feels stuck in housing; sense that all money goes into housing" (Listening Session Participant)*

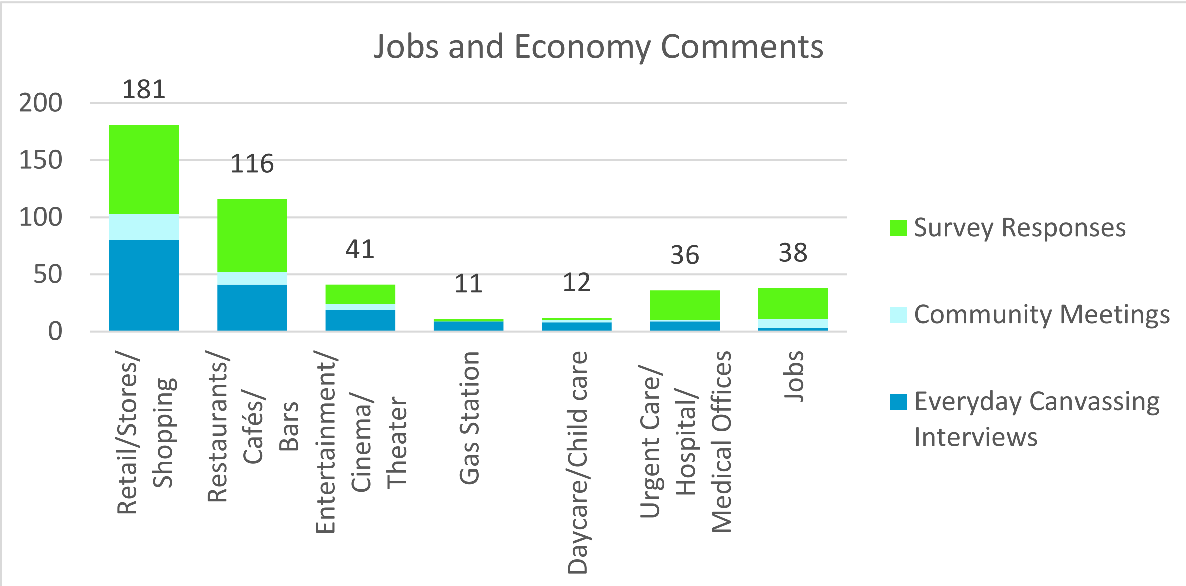
- *“Pubs and restaurants are lacking given the explosive growth of Clarksburg.” (Survey Respondent)*
- *“Outside of houses, Clarksburg has no amenities. There are limited long distance sidewalks and trails. Limited to no shopping centers and restaurants. There are no county facilities (libraries, community centers, gyms).” (Survey Respondent)*
- *“This plan will be a success if housing is limited to less than 5% of the plan.” (Survey Respondent)*

JOBS AND ECONOMY

The third highest number of comments (237) from Clarksburg area residents fall under the Jobs and Economy topic, or economic development in general. Most comments indicated a desire for more stores (181) and restaurants (116). We received a small number of comments (11) indicating satisfaction with gas stations. Twelve comments (12) felt childcare options were missing or unaffordable in the Clarksburg area. The word cloud below provides a hint about what is on people’s minds.

Figure 10. Word cloud highlighting the terms we heard in comments related to jobs and the economy

Chart 12. Jobs and economy comments by subcategory



Retail/Stores/Shopping

The greatest number of comments received (181) refer to the lack of stores in the Clarksburg area. Residents stated a need for more retail in the area, in particular grocery stores and more convenient stores in general. In conversations with residents, there were very few people who did not wish for closer stores and restaurants.

- *"A shopping center we can walk to would also be great; one that serves the residents' immediate needs."*
- *"We need grocery stores, more places to eat, having to keep driving to Germantown to go to Target and get essentials."*
- *"There needs to be more international stores; they just closed down a Lotte. We don't have a dollar store either. We have to go further into Germantown, like the Montgomery Village area."*
- *"Definitely grocery stores!!! I'm hoping to see more grocery stores like Trader Joe's, Whole Foods, etc. in Clarksburg."*

Restaurants/Cafés/Bars

The economic development category with the second highest number of comments (116) was for restaurants, cafés, and bars. Residents articulated their desires for more local establishments to eat out given that many travel to Germantown and Urbana for restaurants. There was a lot of overlap between those asking for more stores in general and those asking for more restaurants.

- *"I'm looking for more restaurants, all kinds too. If I want to go to a restaurant, I have to drive down to Germantown… It would be great if we could have something like Kentlands, Pike and Rose or Rockville town center, so it's not like here where we have to shop at different plazas."*

- *"It would be so great to get a franchise restaurant like Subway or Taco Bell here—just something that many people like and can give us some variety."*
- *"Nice sit-down restaurants are definitely a need! Now we have to go to Germantown, Urbana, Frederick, Mt Airy."*

Entertainment/Cinema/Theater

Many residents in Clarksburg (41) expressed interest in having more entertainment spaces in their community, most often a movie theater specifically. Several travel to Germantown and Urbana to access these recreational needs.

- *"I would love to have more entertainment like restaurants, a movie theater, and gathering spaces. The closest place to visit with my family and hang out is RIO."*
- *"I would love a movie theater nearby, too– I travel to Germantown for this."*
- *"Would be nice to have a movie theatre here actually. Also adding some place to do activities because Rockville town center has ice skating in winter, for example."*

Urgent Care/Hospital/Medical

We received 36 comments related to medical needs from the community. As with retail, restaurant, and entertainment amenities, residents reported traveling far to access healthcare.

- *"The closest medical facility is in Germantown. There are no urgent care facilities, hospitals, clinics or the such in this area when you have an emergency it's tough. It's a struggle."*
- *"There are no hospitals either. The nearest one is Germantown too."*
- *"Right now with Covid, we have to drive to Germantown for the flu vaccine too. This is a big neighborhood, so it would help us to have a health center or a community center."*

Jobs

There were 38 comments that directly referenced jobs and employment in the Clarksburg area. Residents noted a lack of current employment opportunities in Clarksburg with many commuting in the direction of D.C. for work. However, several saw the potential for future economic growth in the area.

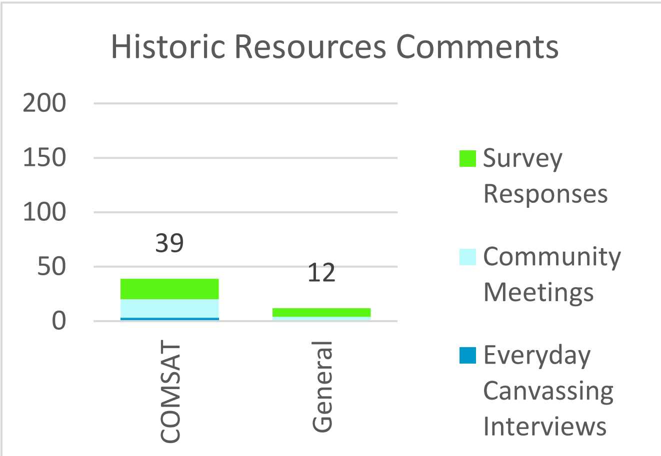
- *"Clarksburg is essentially a bedroom community. The plan has little related to economic development – it's all about housing. That will need to change."*
- *"Maximize economic potential of I-270 Corridor! Especially COMSAT, Linthicum, and new interchange."*
- *"We need more stores and economic development, though. Every time we go out, we go all the way to Frederick. I love Clarksburg Village, but we need to have economic development here. There needs to be shopping, drinks, restaurants. We just wanna have options here like in Columbia, PG, and Frederick. As well as some family businesses that are cheap."*

HISTORIC RESOURCES

Property owners of potential historic sites, residents within the plan boundary, and interested parties provided 48 comments regarding historic resources. Most comments related to the evaluation of the COMSAT property for listing in the *Master Plan for Historic Preservation* and its potential adaptive reuse as it remains a major component of the plan, although a few comments also touched on other historic preservation issues in the area.

Figure 11. Word cloud highlighting the terms we heard in comments related to historic resources

Chart 13. Historic resources comments by subcategory



COMSAT Property

Property owners, residents, and interested parties who attended the kick-off meeting and listening sessions or responded to our survey provided an array of opinions for the COMSAT site, from preservation of the building and landscape and its adaptive reuse as a mixed-use complex to demolition of the building. Most of those who provided comments on the COMSAT building supported its designation as a Master Plan Historic Site or its adaptive reuse, and several individuals expressly opposed designation of the property. Several comments recognized the opportunity for economic development that the property offered, but neither supported nor opposed the preservation or reuse of the building as part of a development scheme.

- *"General agreement among attendees that the COMSAT building "absolutely" deserves historic designation."* (Listening Session #4)
- *"COMSAT should be saved and the main building used as an adaptive reuse. There is a lot of room for housing and businesses on the site too. All can happen in a compatible way!"*
- *"Don't make COMSAT historic site."*
- *"Comsat is a great opportunity for a mixed-use, high density-plan. Don't miss the opportunity!"*
- *"Historic designation of COMSAT must go away so the property will be more business-friendly."*
- *"Save the Pelli [COMSAT] building! Part of the Clarksburg legacy and identity."*

The online survey included a prompt directly related to the COMSAT site:

> *The former COMSAT facility located along I-270 is one of the focus areas of this plan. What do you want to see happen at COMSAT facility site in the future and why?*

One hundred of the survey respondents answered this question related to the future of the COMSAT property. The 39 responses indicated by the chart above include only the responses from the various sources that had specific comments on the building itself, versus the majority of survey respondents who were speaking more generally of what could be done with the land.

Over thirty-five (35) participants noted the need for a recreational facility, library, park, athletic fields, and other public amenities or retail opportunities at the site. Approximately thirty (30) participants expressed desire for new shopping, restaurants, and other retail. Fourteen (14) responders supported the preservation or adaptive re-use of the COMSAT building and six (6) recommended demolition of the building. Note that responders listed their suggested use of the site absent an explicit opinion on the retention or demolition of all or parts of the building.

- *"Optimally, the main parts of the building and the open meadow should and deserve to be protected, whether via historic designation or some other method. Positioning new development beside and behind it will allow its potentially multiple uses to be a hub of the community."*
- *"Instead of housing, there should be recreation centers for the community or even better shopping experiences other than outlets."*
- *"I had heard the facility was going to become a recreational building, like the Germantown Rec Center. That would fit nicely, along with a library. Leave a lot of that open space at COMSAT open for a park. Black Hills and Ovid Hazen are very congested."*
- *"Library, Open Park, Ball fields for local sports, Job Center/Trade Schools for students that are not interested in college (trades pay 6-figure incomes & are in high demand) with no loans at the end of their training."*
- *"Build technology sector or center, along with hotels and restaurants."*
- *"It would be nice is the building is preserved and repurposed for commercial use. The surrounding land would be great for a recreational area if possible."*
- *"I want the main building as seen from I-270 to be preserved, perhaps as an adaptive reuse of the building. An environmental setting should also be maintained around the building especially the groves of trees at the south end of the main building. The meadow between I-270 and the building should also be preserved."*

Other Historic Preservation and Equity Issues

The evaluation of the COMSAT property dominated discussions related to historic preservation, but there are a few other sites that will be evaluated for historic preservation as part of the sector plan. We received 12 comments overall about non-COMSAT historic preservation issues. Comments included concerns related to property maintenance for the existing historic resources and inadequate public awareness regarding historic preservation tax credits and financial incentives within the Clarksburg Master Plan Historic District. Residents also noted the lack of interpretation of the district, public art derived from cultural and environmental resources, and other engaging mediums that could enhance heritage tourism and community identity for downtown Clarksburg.

- *"Create a historical trail (walking) interpreting landmarks in Clarksburg's neighborhoods."*

- *“The ‘Clarksburg Colored School’ needs a proper historic marker outside on 355.”*
- *“Community sees the historic district as ‘dumpy old houses’”*
- *“Historic significance: The town has a rich history, and there is a desire to preserve its historical landmarks and architecture to maintain the town's unique character.”*
- *“Historic preservation is also important to me. COMSAT and other historic buildings and sites should be preserved because of their importance to the identity of Clarksburg.”*

PARKS

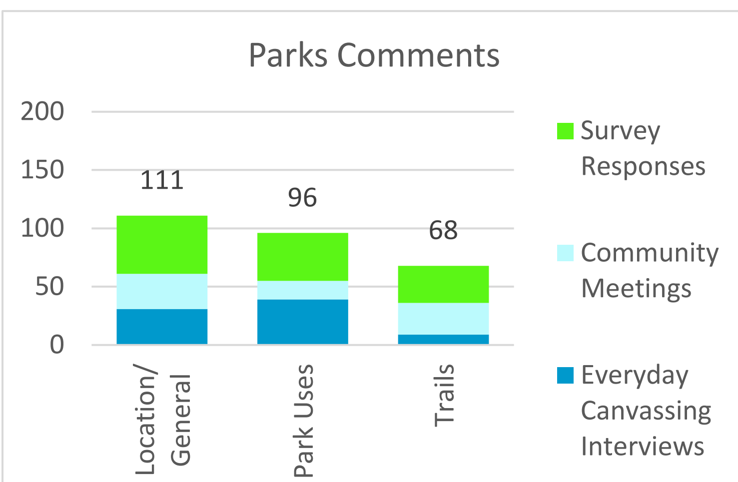
We received 207 comments that we coded as park related. Some comments didn’t specifically mention parks, but mentioned activities that often happen in parks, even though some of these could also be accommodated on common HOA land within individual residential communities.

Overall, we heard that nearby large parks (Black Hill and Little Bennett Regional Parks) and forested “green” open spaces are popular and there is a strong general sentiment that they should be protected. However, many people would like to have better connectivity and access to those large parks and better connections among the trails/sidewalks and open spaces and other existing parks within the plan area and nearby. Many people would like there to be more activities in the parks within the plan area—especially for children.

The few parks maintenance concerns we heard from residents are included in the Maintenance section of this report.

Figure 12. Word cloud highlighting the terms we heard in comments related to parks

Chart 14. Parks comments by subcategory



Location/General

We received 111 comments that were very generally about parks—commenting on the distance or location of parks or simply stating they wanted more parks.

- *"Regional parks have much to offer."*
- *"The park in Cabin Branch is the best park ever! There's usually about 200 people, food trucks on Fridays, events, great playground equipment."*
- *"I don't think there are any nearby parks in walking distance around here either. Sometimes our team does community service days and we would love to help clean up a park, but there is nothing really around here. A park seems needed!"* [Outlet mall employee]

Park Uses

A lot of comments (96) mentioned activities that frequently, though not always, take place in parks. Some of these facilities could alternatively exist on school properties, within private communities, or as part of commercial developments. Besides the typical athletic fields there were a number of park uses people cited they wanted to see in Clarksburg that ranged from more playgrounds, dog parks and a community garden.

Athletic Fields

- *"Baseball fields & Tennis court."*
- *"Basketball court & Multipurpose fields."*
- *"People in the community don't always have access to the track at Clarksburg High School – the school prioritizes high school students. We use space at the Clarksburg Church for our preschool soccer league sometimes because other leagues book up recreational spaces in nearby areas."*
- *"My dream city would have more courts and fields. There isn't a lot of space to play games and sports here; most of the time we gotta be in the street– we'll go down into the townhomes areas of the community to play sports."*
- *"More functional fields would be nice, except for little Bennett and Aurora Hills which are fine. We need somewhere open to the community where people can play soccer and baseball."*

Splash Park and Other Amenities

We received seven comments indicating a desire for something like a splash park. This could be part of a town center development, such as the one found in Silver Spring, or could be part of a public pool, which wouldn't necessarily need to be on parkland. We also received comments requesting a skatepark, ice skating rink similar to Rockville Town Center and parks with rock climbing features.

- *"Maybe a splash pad for the summer?"*
- *"Maybe a water fountain for the kids to play in the summer."*
- *"The pool is perfect how it is but maybe add more fountains to it and stuff like that."*

Trails

Many comments related to walkability were already covered in the section on sidewalks under the Transportation topic, but 68 comments were more directly about park trails.

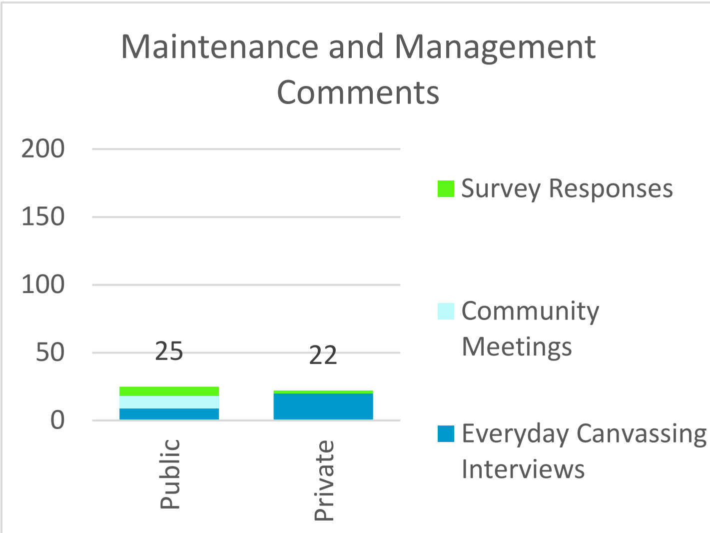
- *"Little Seneca Greenway should be extended north to include the stream valley running through the middle of the plan area."*
- *"Would like to see a nice scenic bike loop over the entire area."*
- *"People liked the existing bike and walking paths, but wanted to see a more complete network so you can really get to all the places you'd like to go."*
- *"We need some more walking trails."*
- *"We need trails for bike rides. I would ride about two to three times per week."*

MAINTENANCE AND PROPERTY MANAGEMENT

Some residents (46) expressed concerns about maintenance issues or issues they have had with the developer of their property or their homeowners association. Some of these are related to the public realm, while others apply to a specific residential community, which we are referring to as private concerns. A few people praised some of the maintenance.

Figure 13. Word cloud highlighting the terms we heard in comments related to maintenance and property management

Chart 15. Public and private maintenance, management, and HOA concerns by subcategory



Public Maintenance Issues

Public maintenance comments (25), which relate to areas and facilities maintained by public entities, fall under the following categories:

- Road conditions
  - *"Roads are often poorly maintained."*
  - *"Some streetlights don't work."*
  - *"The water [collects] in the road and the drains are not good. When a tree fell, it was some nice neighbors who helped to remove the tree, which fell in the road."*
- Vegetation
  - *"Please water the trees and county plants. Clean up the weeds on the medians."*
  - *"Being new to the area we rely on road signs, but they are often obscured by trees and brush. The county and state agencies responsible should be sure to make sure these signs are visible."*
- Park facilities
  - *"Well maintained restrooms at parks, trails, etc."*
  - *"More garbage and recycle containers that do not require lifting a lid with hands."*
  - *"In this area, there is just one basketball court, and all of it is cracked."*
- Schools
  - *"The middle schools nearby are not clean; they need to do a better job on maintenance."*

Public Maintenance Praise

- [What do you like most about living in Clarksburg? Or what do you want to make sure is preserved?]

- *“The cleanliness and organization of the area.”*
- *“The wide open spaces, walking trails, being surrounded by beautiful landscape, the cleanliness of streets.”*
- *“I like about Clarksburg that is a nice community, safe and clean.”*

Private Maintenance Issues

Nineteen residents noted frustration over quality issues with their newly developed homes as well as lack of transparency from developers. Multiple residents commented on the high cost of HOAs and difficulty in communicating with HOAs and property managers. Residents also cited property management issues related to lack of adequate maintenance and sanitation issues. Specifically, residents mentioned issues with inadequate trash and sanitation services. A couple comments relate to problems with a single home. Private maintenance issues fall under several categories:

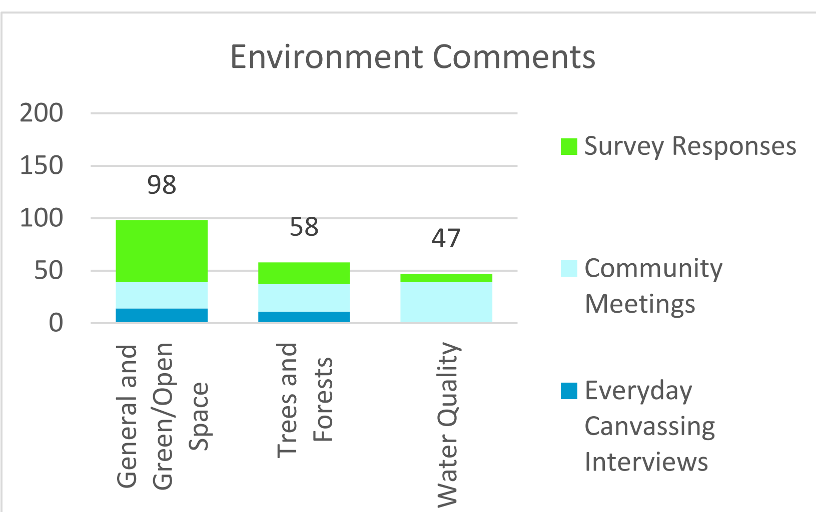
- *“The roads and lighting should be fixed here too because the community promised to fix those things and they never fulfilled their promises.”*
- *“Basically, there is a dumpster that's filling up. … Now it's to the point where there are rats and mice and I'm not expecting to see that.”*
- *“The management company is not taking care of our properties. There is trash and the property looks bad because it’s not being maintained.”*
- *“With excessive number of houses and condos here why do we still have condo fees increasing every year? … Condo fees should have a limit on its max hike for residents occupying the place for 5 or more years.”*
- *“[My] HOA is not receptive; they are deceptive about meetings; they're unreceptive at office; they're over aggressive and punitive in their use of towing for cars slightly in street-- I've been wrongly towed. I know this isn't on the county level, but I want to record this. I really feel like the towing situation is exploitive.”*

ENVIRONMENT

Residents within the plan boundary and surrounding area provided 161 comments regarding the environment and nature.

Figure 14. Word cloud highlighting the terms we heard in comments related to the environment

Chart 16. Environment and nature comments by subcategory



General Environmental Comments, Green Space, and Open Space

This subcategory was used to capture general statements about nature and the environment, or specific statements about green space and open space. We received 98 comments that fall into this subcategory.

General appreciation of the environment and the green and open spaces

Residents expressed a general appreciation for the stream valleys that have been preserved in the Clarksburg plan area.

- *"Protect the natural spaces, keep them beautiful."*
- *"[The developers] can't do anything with natural reservation in the middle of the community and it's so cool. We see deer and foxes and buck."* (Dowden's Station resident)
- *"I love the peaceful and nature-filled communities. … The area around Clarksburg boasts picturesque landscapes, including lush greenery, scenic mountains, and tranquil lakes, which appeals to nature lovers."*
- *"Preserve as much open green space as possible."*
- *"Preserve the greenery and the land for kids to play and people to hang out."*

Environmental protection

While appreciating the natural environment in Clarksburg, some residents also expressed concerns with how potential infrastructure improvements to the area may adversely impact the environment.

- *"Don't think all natural areas are adequately protected. Stream valleys cannot have roadways paralleling them, like on Observation Drive."*
- *"Westward expansion of Little Seneca Parkway may impact easements if they are compensated/traded for in other areas. How good are the easements if this can happen?"*
- *"Whatever we do we shouldn't damage the environment. Not cutting the trees. Whatever we construct, as possible, we should keep in mind to not cut this greenery. It's for future generations."*
- *"By implementing thoughtful planning and sustainable practices, we can strike a balance between development and preservation, ensuring Clarksburg remains a place we all love to live in and appreciate."*
- *"[This plan will be a success if…] We can get more stores and fast food restaurants while preserving the nature/forest areas."*

Trees and Forests

We received 58 comments that expressed an appreciation for trees and forests in the Clarksburg area.

General appreciation of trees, forests, and street trees

In conjunction with comments on environmental protection, many stakeholders felt that the best way to preserve the environment would be to preserve forested areas and plant street trees. Also, forested areas should not be fragmented by new development.

- *"Clarksburg is good, keep the greenery, trees are nice… Keep it green, it what makes MC valuable. People want to be here for that."*
- *"Best land use in terms of climate and water quality is forest cover. Maintaining the forest is extremely important. Tree canopy helps cool the environment."*
- *"Important to have access to forest areas, biodiversity, and streams for well-being of people and community."*
- *"I wish there was more shaded area and trees along the sidewalks and places around, though."*
- *"Observation Drive extension would devastate forests and degrade streams and fragment forests. It should not be built as currently planned, if at all."*
- *"I want to preserve the remaining forest cover and find opportunities to increase forest cover whenever possible."*

Imperviousness, Stormwater, Streams, and Special Protection Areas (SPAs)

For many residents, protection of water quality in the area is paramount. There are two Special Protection Areas within and surrounding the plan boundary: Clarksburg SPA and Ten Mile Creek SPA. All of the water in the plan area eventually flows into Little Seneca Reservoir, which is one of the back-up drinking water supplies in the region. We received 47 comments that fall into this subcategory.

Water Quality

The streams and tributaries in the Plan area drain into Little Seneca Lake, which serves as the one of the backup water supplies for the region.

- *"Protecting streams and water quality is very important to me, especially to protect water flowing to Little Seneca Lake Reservoir, the backup water supply for millions of people."*
- *"Protect Little Seneca Creek and Little Seneca Lake by not building more highways and maintaining forest cover."*
- *"This area was a special protection area in water quality. In 1997, the quality was good to excellent – 2015-2011 it fell to fair. Very concerning with declining water quality."*
- *"Development is affecting the water quality of streams in the area, see them degraded over a period of time."*
- *"Lower the intensity of Observation Drive to reduce its impact on the stream valley and environmental features."*
- *"Preserving the [COMSAT] building would help protect stream quality on the property."*

CONCLUSION AND NEXT STEPS

CONCLUSION

As the above comments show, residents of Clarksburg care deeply about the community and want to make it better. Some love it as it is, some want to see more amenities, while others feel that it is already overcrowded. Our challenge is to find a balance between what we have heard from community members, the concepts in *Thrive Montgomery 2050*, the desires of major landowners in the plan area, and mandates from the county for more housing, more equity, safer streets, and continued environmental protection.

NEXT STEPS

The planning team is developing a series of “visioning sessions” to take to the community in the next couple of months to work together with the community on how best to achieve this balance and build a better community for all.

APPENDIX E: EQUITY FRAMEWORK

Preparation of this plan followed an equity framework based on guidance from Montgomery Planning's internal Equity Peer Review Group (EPRG), which is a part of the department's Equity Agenda for Planning initiative. The EPRG is a group of staff that stays informed of equity best practices to provide feedback on staff recommendations, planning policies, and community engagement strategies. The EPRG applies an equity tool to its review of ongoing master and sector plans based on recommendations from Government Alliance on Racial Equity (GARE). The tool involves working through a series of steps and answering questions, including an analysis and evaluation of:

- Desired Results
- Analysis of Data
- Community Engagement.
- Strategies
- Implementation
- Communication and Accountability

These steps are critical to ensuring that the growth and development in the Sector Plan Area are inclusive and benefit historically underrepresented communities.

1. Desired Results

Vision for Equity and Inclusive Growth

The primary vision of the Clarksburg Gateway Sector Plan is to create a more complete, connected community, and equity is central to this sense of connectedness. An equitable community where all residents—regardless of race, ethnicity, gender, geography, income, or immigrant status—can thrive is dependent upon factors such as: access to affordable housing, transportation, services, and green spaces. Desired outcomes to realize this vision include:

- Increased housing diversity, including affordable & attainable housing, to accommodate residents of all income levels.
- Improved transportation access through facilitating future Bus Rapid Transit (BRT) and multimodal networks, ensuring equitable mobility for all residents.
- Enhanced environmental sustainability, addressing urban heat islands, and increasing access to green spaces in concurrence with the County's Climate Action Plan.
- This vision ensures that historically disadvantaged communities are included and acknowledges in the planning and decision-making processes.

2. Analysis of Data

Who is Most Impacted?

To achieve equity in the Sector Plan, it is essential to understand who is most negatively affected by current conditions and development trends. While there are limits to collecting and analyzing data on race, ethnicity, gender, geography, income, and immigrant status (REGGIIA), staff worked to reach out to the community during the plan's preparation through various means. Disaggregated data from a questionnaire and door-to-door interviews indicate that the outreach efforts have successfully reached a relatively representative sample of the population. (see Appendix X: Community Feedback Report)

- In the last 20 years, the Clarksburg community shifted from majority non-Hispanic White to a far more racially diverse community. In 2023, Asian residents comprised the largest racial group in Clarksburg, accounting for 40 percent of area residents, compared with 15 percent for the county's Asian population
- With large household sizes, incomes on a per capita-basis lag countywide per capita income.
- Certain neighborhoods in the Sector Plan Area face limited access to essential amenities, including parks and retail establishments. This geographic disparity is exacerbated by a reliance on public transportation, particularly among lower-income residents. The impact is notably more severe for individuals with disabilities, such as those who use wheelchairs for mobility.

3. Community Engagement

Inclusive and Intentional Engagement

The Clarksburg Gateway Sector Plan's equity approach is grounded in meaningful and continuous community engagement, ensuring that those most affected by development decisions are actively involved in shaping the plan. The outreach and engagement efforts included in-person meetings and workshops held in the community and virtual meetings, as well as attendance at community events organized by others to 'get the word out'. Between June and August 2023, the planning team collaborated with the non-profit organization Everyday Canvassing to interview the community to gain an understanding of what the people of Clarksburg think about their community today and what they would like to see in the future. Everyday Canvassing attempted to knock on every door within the five large residential neighborhoods within the Sector Plan Area and a random sampling of residences surrounding the plan boundary.

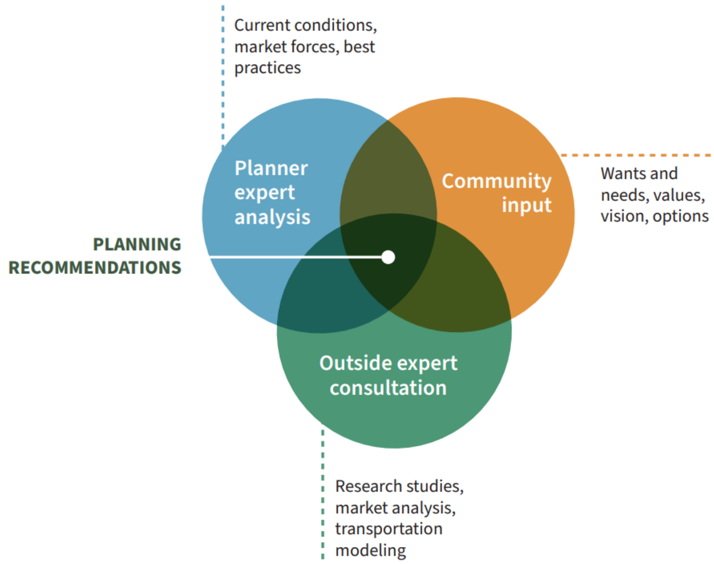


Figure 1: Community Input as a crucial piece along with Expert Consultation and Planner expertise.

Efforts were made to engage underrepresented communities through public meetings, surveys, and workshops. The recommendations that follow, reflect this engagement effort since community input is foundational to the planning practice in Montgomery Planning.

4. Strategies for Advancing Equity

Recommendations to Mitigate Burdens and Maximize Benefits

The Clarksburg Gateway Sector Plan outlines recommendations that are directly informed by the desired results, data analysis, and community engagement. These recommendations are designed to ensure that the community benefits from the plan while minimizing potential negative impacts. While plan's recommendations provide more detailed descriptions and explanations the text below highlights equity implications of key recommendations:

- Land Use and Zoning: Rezone residential properties to facilitate mixed-use development with varying densities and heights. This approach ensures that existing zoning regulations do not hinder the development of affordable and attainable housing, while also promoting mixed-use projects that can drive economic growth.
- Urban Design: Provide design guidance for the Sector Plan Area that builds on its unique residential, institutional, and commercial context. Higher design standards will also make multimodal access to existing facilities more likely. The plan's Community Design recommendations are geared towards fostering a sense of place and connectedness by encouraging vibrant and engaging spaces for community interactions.
- Housing: Provide for a mix of housing options to accommodate households with differing income levels, family compositions, and accessibility needs. Plan

recommendations also include promoting inclusive communities by removing barriers that restrict access to housing and opportunities based on protected characteristics, supporting equity by ensuring all residents have fair access to affordable, attainable, and diverse housing options in the area.

- Parks, Recreation, and Open Space: Create new parks and open spaces with redevelopment and enhance connections to existing parks to promote a livable environment. Retain current parks and explore the potential for their expansion and improvement to add more recreational amenities. These actions support equity goals by ensuring accessible shared spaces for all residents fostering inclusion and overall well-being.
- Environmental Sustainability: Protect and expand the tree canopy with native species, protect water quality by minimizing impervious surfaces and implementing innovative and effective stormwater management, and create a 'green', 'cool' built environment with sustainable features. These recommendations support equity by ensuring all communities benefit from environmental sustainability, improved walkability, and access to shaded comfortable public spaces that enhance quality of life.
- Transportation: Provide guidance for the Sector Plan Area as a multimodal corridor with bus rapid transit. Additionally, advance Complete Streets and Vision Zero principles to create safe, walkable, and accessible environments for users of all ages and abilities. Equitable access to safe crossings, micro-mobility, and low stress bicycle and pedestrian facilities ensures meaningful transportation equity.
- Community Facilities: Promote co-location of community facilities to reduce costs and use land efficiently, ensuring equitable access to essential services.

5. Implementation

Communities in Implementation

The implementation of the Sector Plan's equity objectives focuses on embedding racial equity into all aspects of planning. It also outlines the key strategies and action steps required to ensure equitable outcomes in all future initiatives. The aim is to mitigate historical inequities in the recommendations. Also, the planning process tried to ensure inclusive participation for all residents. Finally, the goal is to ensure greater accessibility and benefits for all residents (current and future) in the Plan Area.

Key to accomplishing this is ensuring that the recommendations mentioned above see meaningful action. However, plans do not directly lead to development or specify all development possibilities. Plans make development possible by managing regulations, envisioning a better future, and providing guidance.

Montgomery Planning offers consultation and research support to county agencies responsible for executing plans. However, Montgomery Planning does not implement these plans. Once a plan is adopted, the Montgomery County government coordinates its implementation with relevant county agencies, partners, community members, and developers as needed.

6. Communication and Accountability

Tracking Progress

The sector plan relies on systems of accountability to ensure that the goals of racial equity and social justice are advanced through the planning and any future development process.

As mentioned earlier, Montgomery Planning does not implement the plan, however it can play a crucial role in monitoring progress, coordinating stakeholders, and fostering transparency in any future decision making. To this end assessments about whether policies and projects align with equity goals can be led by Montgomery planning in the future.

Publicly available reports on these assessments foster transparency and provide opportunities for communities to hold decision makers accountable. Additionally, Montgomery planning frequently collaborates with various county agencies, private developers, and community organizations; these collaborations and relationships can be used to track progress and outcomes.

APPENDIX F: COMSAT ADAPTIVE REUSE FEASIBILITY REPORT

Memorandum

To:	Montgomery County Planning Department
From:	HR&A Advisors, Inc.
Date:	9/12/24
Re:	COMSAT Financial Feasibility Study

The Montgomery County Planning Department engaged HR&A Advisors to assess the financial feasibility of different development scenarios at the former COMSAT building site (the Site) adjacent to Interstate 270 in Clarksburg. The primary goal of this analysis was to evaluate whether adaptive reuse of the historically significant existing structure was feasible under current market conditions and the extent to which new development at the site could generate additional value to subsidize historic preservation/adaptive reuse.

This analysis assesses the feasibility of several adaptive reuse and new development scenarios and provides key financial metrics to help inform future decision making as part of Clarksburg Gateway Sector Plan implementation. The analysis first estimates the costs to develop each private development scenario and then considers the overall feasibility of the development by determining the residual land value (RLV) of the property, calculated by subtracting total costs from the value of the project. This report is separated into three sections:

1) **Development Scenarios:** *overview of development scenarios evaluated and program considerations*
2) **Financial Feasibility Analysis:** *detailed analysis of scenario feasibility and key assumptions*
3) **Recommendations:** *potential approaches to improving development feasibility*

An appendix is also provided, which includes additional site information, existing development incentives, and an alternate retail scenario requested by Montgomery County Planning.

For the COMSAT building site, HR&A analyzed adaptive reuse and three new development scenarios:

- **Scenario 1 –** low-density buildout of site with mix of apartments and townhomes
- **Scenario 2 –** medium-density buildout of site with mix of apartments and townhomes
- **Scenario 3 –** low-density buildout of site with townhomes only

Key takeaways are provided on the next page and followed by the full report.

Key Takeaways

- **There is a feasibility gap of $28 million for adaptive reuse of the COMSAT building.** Historic tax credits are insufficient to fully offset development costs, and parking and infrastructure requirements widen the feasibility gap (Figure 1).

Figure 1 | Adaptive Reuse Residual Land Value

	Adaptive Reuse
	COMSAT Adaptive Reuse
Total Value of Private Development	-$23.0M
Historic Tax Credit Benefit	$14.4M
Less: Parking Cost	-$14.6M
Less: Roads and Open Space Costs	-$4.7M
A. **Total Residual Land Value of Adaptive Reuse** *(negative value indicates feasibility gap)*	**-$28.0M**

- **Under current market conditions, there is also a feasibility gap for new development,** with the exception of for-sale, townhouse-only construction (Figure 2).

Figure 2 | New Development Residual Land Value (excluding Adaptive Reuse)

	New Development		
	Low Density	**Medium Density**	**Townhouse Only**
Total Value of Private Development	$22.1M	-$39.2M	$114.4M
Less: Parking Cost	-$31.2M	-$84.2M	-
Less: Roads and Open Space Costs	-$30.9M	-$30.9M	-$30.9M
B. **Total Residual Land Value of New Development** *(negative value indicates feasibility gap)*	**-$40.1M**	**-$154.3M**	**$83.4M**

- **While new development in the low- and medium-density scenarios both contribute to the feasibility gap, the high value created by townhouse development may be sufficient to cross-subsidize adaptive reuse (Figure 3)**. It is estimated that a townhouse program of approximately 400 units is required to offset this feasibility gap (Figure 15).

Figure 3 | Total Site Residual Land Value (*A* + *B*)

	Development Scenarios (Adaptive Reuse and New Development)		
	Low Density	**Medium Density**	**Townhouse Only**
A. **Total Residual Land Value of Adaptive Reuse**	-$28.0M	-$28.0M	-$28.0M
B. **Total Residual Land Value of New Development**	-$40.1M	-$154.3M	$83.4M
A+B **Total Site Residual Land Value** *(negative value indicates feasibility gap)*	**-$68.1M**	**-$182.4M**	**$55.4M**

- **Internal roads, open space, and parking are major cost drivers that hinder feasibility**. However, feasibility may be improved if certain components are led by the county as part of Sector Plan implementation and future transit improvements reduce parking need.
- **Current market conditions pose challenges for multifamily development.** High construction costs and interest rates diminish the feasibility of a multifamily program that could have been viable pre-pandemic. Multifamily development may be prioritized in the medium- to long-term, when market conditions improve and other investments are made at the site.
- **The COMSAT site is strongly positioned for development in the longer term.** Despite short-term development challenges, the site benefits from adjacency to major transportation routes such as I-270 and MD-355, and is well-positioned to benefit from enhanced transit connectivity through the 355 Flash Bus Rapid Transit (BRT) service and a planned Corridor Connector enhanced bus service between Germantown and Clarksburg.
- **A mix of property tax abatements, development incentives, infrastructure subsidies, parking reductions, and strategic tenant placements should be considered** to improve project feasibility and long-term success. Figure 4 consolidates the impacts of various policy tools with improved market conditions and demonstrates the potential future feasibility of a low-density scenario. Additional detail on the impact of improved market conditions, developer incentives, and policy changes on financial feasibility are included in Section 3 of this report.

Figure 4 | Potential Impact of Development Support and Improved Market Conditions

	Low Density	Medium Density
Initial Baseline RLV	**-$68.1M**	**-$182.4M**
Potential Benefits		
Abatement Benefit	$7.4M	$7.4M
Parking Reconfiguration Development Cost Savings	$40.8M	$59.3M
Cap Rate Reduction*	$23.2M	$38.8M
RLV with Potential Benefits by Scenario	**$3.3M**	**-$76.8M**
Viewshed Development	$9.4M	$9.4M
Total Site Residual Land Value with Potential Benefits and Viewshed Buildout	**$12.7M**	**-$67.4M**

1. Development Scenarios

Overview

Montgomery Planning engaged the architecture and urban design firm Fu Wilmers to determine the development capacity of the site for future new development and adaptive reuse of the historic COMSAT building. The Fu Wilmers design concept that forms the basis for the HR&A economic analysis recognizes COMSAT as a unique asset that can serve the Clarksburg region as a hub providing retail, restaurant, civic, recreational facilities, community gathering and social spaces with a mix of housing types in a high-quality urban environment. The organizing principle for each of the Fu Wilmers new development scenarios on the Comsat property is a series of residential blocks, street-fronting retail and multifamily development along a central north-south main street, with active and passive parks and open spaces distributed throughout. The Floor Area Ratio (FAR) for development scenarios ranges from 0.35 to 0.51, consistent with a low-density suburban setting. Additional detail on FAR is included in the Appendix C.

Development Scenarios

HR&A used program details from the Fu Wilmers concepts to develop 3 development scenarios.

The **Low-Density Scenario** locates 3- to 5-story multifamily residential buildings (either above street retail or on their own) along a narrow corridor of the main spine street, with 3-story townhouses and small apartments and detached cluster homes located on development blocks away from the main street.

The **Medium-Density Scenario** increases the extent of 3- to 5-story multifamily buildings to additional and larger areas of the low-density development blocks.

The **Townhouse-Only Scenario** assumes that all new residential development on the COMSAT property, other than the 112 multifamily units located within the COMSAT building, is constructed as attached residential townhouses.

The development scenarios summarized below and subsequent feasibility analysis are illustrative and intended only to serve as “test-fits” to determine the buildable capacity of these sites. They are not intended to suggest a final development configuration for the site, and it is expected that a private developer would consider these among other possible configurations.

HR&A assessed the feasibility of adaptive reuse and new development as separate components to determine the independent feasibility of each under current market conditions and to understand a breakeven point where new development returns could fully subsidize the rehabilitation of the former COMSAT building. HR&A also evaluated several different new development scenarios reflecting multiple uses and varying levels of density.

Figure 5 | Overview of Development Components

	COMSAT Adaptive Reuse	New Development		
		Low Density	*Medium Density*	*Townhouse Only*
Total Multifamily Units	112	818	1,471	0
Total Townhouse Units	0	722	972	1,188
Retail GSF*	61k	136k	136k	0
Office GSF*	23k	0	0	0

**Gross square feet, equal to the total area of the building inclusive of common areas, mechanical rooms, stairwells, and other non-usable spaces.*

HR&A’s analysis only considers property currently owned by Lantian Development and excludes parcels to the south owned by Linthicum Properties. Additionally, portions of the COMSAT property were excluded from projected development, including a viewshed zone of the COMSAT building from I-270 (approximately 23 acres), a 200-foot setback 'no development' buffer from I-270 (approximately 16 acres), and other sensitive environmental features, such as existing mature forest, steep slopes, and stream buffer areas (approximately 41 acres).

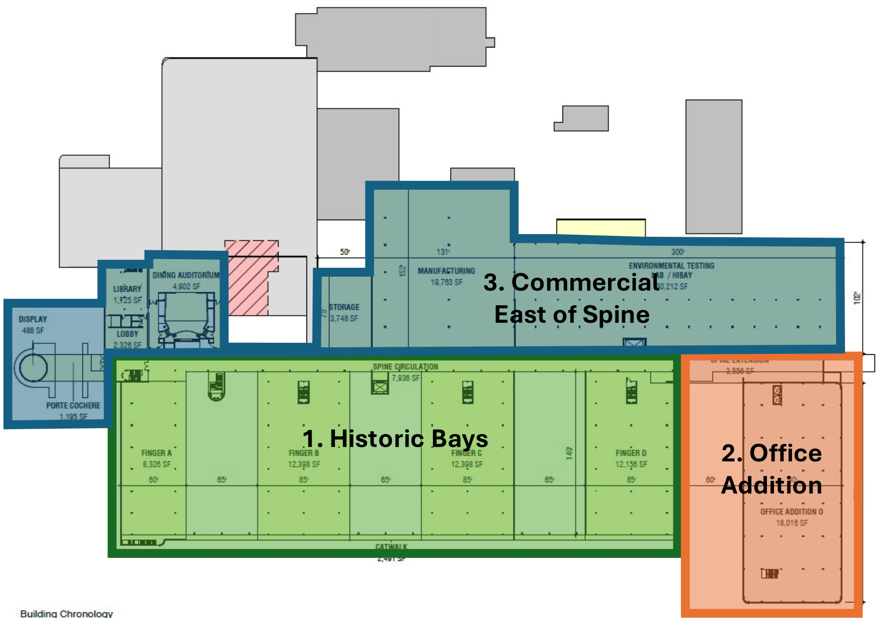
This report considers the potential for additional development within the Comsat building viewshed zone as a possible enhancement to its overall financial feasibility (see Section 3). However, adding residential development within this viewshed zone would diminish the visibility of the Comsat building from I-270 and, therefore, its historic setting and ability to otherwise receive historic tax credits. Figure 6 below identifies development scenario locations and areas excluded from analysis. All development scenarios also include required levels of affordability to support Montgomery County mixed-income housing priorities.

Figure 6 | Development Components and Excluded Areas

Adaptive Reuse

For the adaptive reuse analysis, HR&A evaluated the redevelopment potential of the former COMSAT building, analyzing three separate building sections based on architectural significance, ease of conversion, and use. This approach provided the flexibility to evaluate individual portions of the building to inform future decisions that balance the financial feasibility of each section with its relative historical significance. Figure 7 below illustrates the three different components of the building that were evaluated. Section 1 and Section 3 are part of the original structure of the building, while Section 2 is a newer addition.

Figure 7 | COMSAT Building Components



Note: The areas shaded in gray are not believed to be historically significant and represent utilitarian additions that are not original to the building. These areas are not likely to be preserved.

- **Section 1: Historic Bays.** This section is the most defining component of the original structure and, and it holds the most architectural and historical significance due to the unique exterior treatments and visually striking layout. The 2-story historic bays are the primary building area visible from 270 and the structure's most identifiable component. This portion of the building has the greatest potential to be maintained for preservation purposes, and its preservation is likely a condition to receive preservation-related incentives.
- **Section 2: Office Addition.** This building component was added in 1981 and replicates the notable design elements of the historic bays. The addition is 4 stories and the tallest section of the building. Its larger size offers more concentrated redevelopment potential, although the large floorplate requires larger residential unit sizes. Preservation of the office addition is not required to qualify for historic preservation incentives.
- **Section 3: Commercial/East-of-Spine Section**. Most of this section is part of the original building, although it is recessed and lacks the distinguishing features of the historic bays. As such, this section has historical significance and must largely be preserved to ensure eligibility for historic tax credits.

Figure 8 | Summary of Adaptive Reuse Program Components

	Historic Bays	Office Addition	Commercial East	Total
Uses				
Multifamily GSF	89,951	65,157	-	155,108
Office GSF	-	-	22,670	22,670
Retail GSF	-	-	61,244	61,244
Total GSF	**89,951**	**65,157**	**83,914**	**239,022**
Building Efficiency*	77%	86%	72%	78%
Average Apartment (NSF**)	962 NSF	1,406 NSF	-	1,120 NSF
Total Multifamily Units	72 Units	40 Units	-	112 Units
Total Residential Units	**72 Units**	**40 Units**	**-**	**112 Units**
Parking				
Multifamily Parking Ratio (spaces per unit)	1.0/unit	1.0/unit	1.0/unit	1.0/unit
Office Parking Ratio (spaces per 1,000 SF)	1.0/1000 sf	1.0/1000 sf	1.0/1000 sf	1.0/1000 sf
Retail Parking Ratio (spaces per 1,000 SF)	5.0/1000 sf	5.0/1000 sf	5.0/1000 sf	5.0/1000 sf
Total Surface Parking Spaces	0	0	0	0
Total Structured Spaces	72	40	239	351
Total Parking Spaces	**72**	**40**	**239**	**351**

**Weighted average building efficiency across uses, equal to the ratio of net square feet to gross square feet in the program.,*
***Net square feet, equal to the usable area within a building, excluding spaces like corridors, lobbies, restrooms, and other non-usable areas.*

New Development

HR&A also evaluated the feasibility of new apartment and townhouse development on undeveloped land adjacent to the former COMSAT building. The largely undeveloped 210-acre site has the potential to accommodate significant ancillary residential development that could help catalyze additional development in the surrounding areas and support increased density and ridership around the planned BRT corridor.

New development scenarios were informed by the Clarksburg Gateway Sector Plan, which envisions increased residential density to support I-270 corridor activation. Development scenarios prioritize residential development over other uses due to continued regional demand and the current market environment. The proposed new development programs include a mix of both rental and for-sale units.

HR&A evaluated two different density scenarios for new development based on conceptual site capacity plans from the design team. The low-density scenario provides a baseline level of buildout comparable to what has recently been developed in Clarksburg. The medium-density scenario increases development intensity to reflect 3- to 5-story buildings, which are more common regionally in transit-accessible nodes and represents a more aggressive buildout. The low-density scenario provides 1,540 dwelling units, while the medium-density scenario provides 2,443.

In addition to the development programs created by the design team, HR&A also evaluated a third new development scenario consisting of only for-sale townhomes. This scenario was added to reflect current market conditions that favor townhouse development. Additional program details are included in Figure 9.

Figure 9 | New Development Program

	Low Density	Medium Density	Townhouse Only
Uses			
Multifamily GSF	981,600	1,765,200	-
Townhouse GSF	1,732,800	2,332,800	2,851,200
Retail GSF	136,376	136,376	-
Total GSF	**2,850,776**	**4,234,376**	**2,851,200**
Building Efficiency (Rental Uses)	80.0%	80.0%	*N/A*
Average Apartment (NSF)	960 NSF	960 NSF	-
Average Townhouse Size (NSF)	2,400 NSF	2,400 NSF	2,400 NSF
Total Multifamily Units	818 Units	1,471 Units	-
Total Townhouse Units	722 Units	972 Units	1,188 Units
Total Residential Units	**1,540 Units**	**2,443 Units**	**1,188 Units**
Parking			
Multifamily Parking Ratio (spaces per unit)	1.0/unit	1.0/unit	1.0/unit
Retail Parking Ratio (spaces per 1,000 SF)	5.0/1000 sf	5.0/1000 sf	5.0/1000 sf
Townhouse Parking Ratio (spaces per unit*)	2.0/unit	2.0/unit	2.0/unit
Total Surface Parking Spaces	682	0	0
Total Structured Spaces	682	2,017	0
Total Parking Spaces (Rental Uses)	**1,037**	**1,690**	**0***

**Townhomes include a 2-car garage, which is not reflected in total parking spaces*

2. Financial Feasibility Analysis

HR&A tested the financial feasibility of development scenarios described in the previous section using a residual land value (RLV) analysis.

Residual Land Value Overview

Calculating residual land value is a widely accepted method for estimating the value of property or development rights that are attached to a property. RLV is equal to the total value of a given development program minus hard and soft development costs, financing costs, and the developer's required profit (Figure 10).

Figure 10 | Residual Land Value Overview

$$\textbf{Residual land value} = \textit{project value} - (\textit{development cost} + \textit{financing costs} + \textit{developer fee})$$

A residual value greater than $0 indicates market feasibility, while a negative value indicates that additional support is required to reach feasibility. Higher RLVs also indicate a development concept's potential ability to support public benefits, such as affordable housing, community facilities, and public realm improvements. In the case of Clarksburg, a positive RLV could be used to subsidize adaptive reuse. RLV is dependent on the development planned for a site. The more valuable a given development program, the greater the amount the developer can afford to spend on the land and therefore the greater the RLV.

HR&A performed financial feasibility testing on the scenarios detailed previously to understand the scale of new development that would be required to support adaptive reuse of the COMSAT building. The purpose of evaluating multiple scenarios of varying densities is to identify the development program that optimizes residual land value (i.e., the potential subsidy for adaptive reuse) while balancing Montgomery County planning priorities and Clarksburg Gateway Sector plan objectives.

Key Assumptions

HR&A evaluated the financial feasibility of different scenarios based on program assumptions provided by the Fu Wilmers design team, inclusive of roads and open space. In addition to this, HR&A assumed that historic tax credits available at the county, state and federal level would be used to enhance the financial feasibility of the adaptive reuse program. These tools are both widely used for adaptive reuse projects and less competitive than other potential incentives. In addition to this, utilizing historic preservation incentives helps to ensure that the key architectural features of the site are preserved and rehabilitated.

HR&A reviewed existing market conditions in the Clarksburg market and used key metrics to inform analysis assumptions related to rents, vacancies, and operating expenses for proposed uses. Detailed assumptions reflecting HR&A's market scan and local development projects are provided below. HR&A also engaged Preservation Maryland and Montgomery Planning Historic Preservation staff to understand development barriers for adaptive reuse projects and inform other factors that influence feasibility. HR&A cross-referenced these assumptions internally across different projects in the region. All figures are represented in 2024 dollars.

Figure 11 | Residential Unit Mix and Affordability Assumptions

	Adaptive Reuse	Low Density	Medium Density
Multifamily			
One-Bedroom	38	-	-
Two-Bedroom	43	715*	1287*
Three-Bedroom	15	-	-
Affordable Share	12.50%	12.50%	12.50%
Affordability Level (% of AMI**)	65%	65%	65%
Townhouse			
Affordable Share	12.50%	12.50%	12.50%
Affordability Level	*Based on DHCA Pricing Standards****		

**New development scenarios are based on an average unit size, and it is expected that units would comprise a mix of sizes*
***Area median income*
****Per Montgomery County website for-sale MPDU development guidance*

Figure 12 | Operating Assumptions

	Multifamily (Market-Rate)	Multifamily (Affordable)	Office	Retail
Rent	$2.30/SF/Month*	$1.93/SF/Month*	$35.00/SF/Year	$30.00/SF/Year
Vacancy	5%	5%	5%	5%
Operating Expenses	35% of EGI**	35% of EGI	NNN Lease***	NNN Lease

** Rent is weighted to reflect unit mix in the adaptive reuse program*
*** Effective gross income, equal to gross potential rent and other income less vacancy costs*
****Triple net (NNN) lease, where operating expenses are paid by tenant rather than landlord*

Figure 13 | Cost and Financing Assumptions

Construction Cost Assumptions	Multifamily	Townhouse	Office	Retail
Hard Cost ($/GSF)	$187-$220	$165	$220	$198-$220
Soft Cost ($/GSF)	$42-$48	$40	$48	$44-$48
Financing Cost ($/GSF)	$19-$22	$25	$22	$20-$22
Total Cost	**$247-$290**	**$230**	**$290**	**$262-$290**
Parking Cost Assumptions ($/space)				
Surface	$4,000			
Structured	$42,000			
Financing Assumptions				
Loan to Cost Ratio	65%			
Interest Rate	7.50%			
Term (construction)	24 months			
Fees	1.50%			

Note: Construction Cost category figures above do not include parking or additional infrastructure costs. Range reflects cost differences between scenarios.

Figure 14 | Total Private Development Cost

	Adaptive Reuse	Low Density	Medium Density	Townhouse Only
Hard Costs	$72.9M	$554.6M	$883.9M	$494.9M
Soft Costs	$15.M	$112.8M	$178.M	$103.3M
Financing Costs	$7.1M	$51.7M	$82.5M	$43.7M
Total Development Cost	**$94.9M**	**$719.1M**	**$1144.4M**	**$642.M**

Financial Analysis Overview

Total residual land value for all conceptual scenarios is negative, except for the townhouse-only program. The feasibility of initiating development at the COMSAT site is dependent on development value being greater than the associated costs of development. HR&A calculated the RLV based on the difference between the gross project value and the costs associated with development and sale. The remaining value represents the total potential value that a private developer would be willing to offer in return for the right to develop. Residual land value analysis is agnostic of site ownership and intentionally does not account for the $11.5 million previously paid by Lantian in 2015 for the property.

A detailed summary of project value is provided in Figure 15 below. The last row in the table estimates the number of townhomes required (in addition to those included in each scenario, if applicable) by each scenario to fill the gap and make the project feasible.

Figure 15 | Net Operating Income and Total Value of Adaptive Reuse and New Development Components

	Adaptive Reuse	Low Density	Medium Density	Townhouse Only
Total Net Operating Income	$3.9M	$16.6M	$27.5M	-
÷ Blended Cap Rate*	6.01%	5.58%	5.55%	-
Total Project Value (rental uses)	**$65.6M**	**$298.0M**	**$495.8M**	**-**
Townhouse Sales	-	$550.8M	$741.8M	$906.7M
Total Project Value (all uses)	**$65.6M**	**$848.8M**	**$1,237.6M**	**$906.7M**
Total Project Costs	-$108.1M	-$888.9M	-$1,391.9M	-$823.3M
Historic Tax Credit	$14.4M	-	-	-
Total Residual Land Value (gap)	**-$28.0M**	**-$40.1M**	**-$154.3M**	**$83.4M**
Net Value per Townhouse		$70,200		
Additional Townhomes Needed to Subsidize Gap *(RLV ÷ Value per Townhouse)*	**400**	**571**	**2,198**	**-**

**Blended cap rate is weighted to the uses included in the planned development*
*** Development fee is assumed to be 15% of total development cost*

Prior to the pandemic, high residential demand combined with relatively low construction costs and interest rates supported significant new multifamily and townhouse development in Clarksburg and across the county. Recent increases in construction costs and interest rates have negatively impacted multifamily development feasibility and pose challenges to apartment programs at the site. However, multifamily remains the highest performing commercial use currently, and continued demand for housing is evidenced by significant new multifamily and townhouse development on the periphery of the site, reflecting the historical feasibility of low- to mid-density residential construction in the region.

Adaptive Reuse Value

Under current market conditions, there is a feasibility gap for adaptive reuse that requires a subsidy of $28 million. However, more than half of the funding gap is driven by the commercial building component located east of the building spine. Current market cap rates for office and retail are significantly higher than for multifamily, which yields a lower value per square foot of commercial uses relative to multifamily. If the development team were to prioritize redevelopment of the historic bays and office addition, the total gap would shrink to roughly $11 million. Additionally, structured parking is required to support the development program envisioned for the COMSAT building, and accounts for nearly $15 million in additional cost. If the Commercial East portion were instead converted to surface parking in the short term, the funding gap for adaptive reuse of the historic bays and office addition would shrink to roughly $6 million. Additional detail on the impact of parking adjustments is included in Section 3 of this report.

Figure 16 | Net Operating Income and Total Value of Adaptive Reuse Scenarios

	Historic Bays	Office Addition	Commercial East	Total Adaptive Reuse
Net Annual Residential Income	$1.2M	$1.0M	-	$2.2M
Net Annual Office Income	-	-	$0.5M	$0.5M
Net Annual Retail Income	-	-	$1.2M	$1.2M
Total Net Operating Income	$1.2M	$1.0M	$1.8M	$3.9M
÷ Blended Cap Rate*	5.50%	5.50%	6.81%	6.01%
Total Project Value	**$22.2M**	**$17.6M**	**$25.7M**	**$65.6M**
Less: Total Development Cost	-$26.0M	-$18.9M	-$30.6M	-$75.6M
Less: Parking Cost	-$3.0M	-$1.7M	-$10.0M	-$14.6M
Less: Roads and Open Space Cost	-$1.5M	-$1.4M	-$1.6M	-$4.7M
Less: Developer Fee**	-$3.3M	-$2.6M	-$3.9M	-$9.8M
Less: Cost of Sale	-$1.1M	-$0.9M	-$1.3M	-$3.3M
Historic Tax Credit	$6.7M	$2.9M	$4.6M	$14.4M
Total Residual Land Value (gap)	**-$6.1M**	**-$5.1M**	**-$16.9M**	**-$28.0M**

**Blended cap rate is weighted to the uses included in the planned development*

*** Development fee is assumed to be 15% of total development cost*

New Development Value

Under current market conditions, there is a feasibility gap for both the low-density scenario and the medium-density scenario due to multifamily components that offset the positive value created by townhomes. Market conditions in Montgomery County and nationally pose significant challenges for commercial development. Rising interest rates and construction costs have made apartment projects that would have been feasible in 2020 infeasible today. However, for-sale residential projects offer significant value potential due to strong regional demand and comparably lower construction costs. With that being said, the feasibility of all development scenarios is expected to improve if the market recovers to prepandemic levels. Additionally, this analysis does not account for additional accommodations or incentives that could further improve project viability.

Based on the low-density site capacity potential, HR&A modeled a townhouse-only scenario that eliminates rental uses. While this scenario is not aligned with the site vision, it is financially feasible and demonstrates the market preference toward for-sale products. This scenario also indicates the number of townhouses required to cross-subsidize adaptive reuse of the former COMSAT building, detailed in Figure 15.

Given the intensity of development, approximately six miles of internal roads are required at full buildout to support access across the site. Additionally, nearly 500,000 square feet of open space is envisioned across the site to support corridor vibrancy and residential appeal. Based on high-level cost estimates, roads and open space infrastructure are expected to account for more than $30 million in costs and nearly 90% of the feasibility gap in the low-density scenario. Public funding support for primary roads that could serve a future BRT route would help increase feasibility and advance the underlying goals of the sector plan.

In addition to site infrastructure, parking also represents a large cost, especially under the medium-density scenario, which requires a significant amount of structured parking for rental uses. Considering planned BRT and other transit improvements in Clarksburg, future development may require lower parking ratios, which could help improve feasibility. Additional detail on the impact of parking adjustments is included in Section 3 of this report.

Figure 17 | Net Operating Income and Total Value of New Development Scenarios

	Low Density	Medium Density	Townhouse Only
Net Annual Residential Income	$13.6M	$24.5M	-
Net Annual Retail Income	$3.0M	$3.0M	-
Total Net Operating Income	**$16.6M**	**$27.5M**	**-**
÷ Blended Cap Rate*	5.6%	5.6%	0.0%
Total Project Value (rental)	**$298.0M**	**$495.8M**	**-**
Townhouse Sales	$550.8M	$741.8M	$906.7M
Total Project Value (all uses)	**$848.8M**	**$1,237.6M**	**$906.7M**
Less: Total Development Cost	-$657.0M	-$1,029.2M	-$611.0M
Less: Parking Cost	-$31.2M	-$84.2M	-
Less: Roads and Open Space Cost	-$30.9M	-$30.9M	-$30.9M
Less: Developer Fee**	-$127.3M	-$185.6M	-$136.0M
Less: Cost of Sale	**-$42.4M**	**-$61.9M**	**-$45.3M**
Total Residual Land Value (gap)	**-$40.1M**	**-$154.3M**	**$83.4M**

Note: totals may not sum due to rounding
**Blended cap rate is weighted to the uses included in the planned development*
*** Development fee requirement is assumed to be 15% of total development cost*

Sensitivity Analysis

While RLV provides a reasonable estimate based on current market conditions, it is particularly sensitive to three significant factors: capitalization rate, construction cost, and rental rate/condo price. Therefore, small changes in these variables can greatly affect the total value and, therefore, the feasibility of development.

Capitalization ("Cap") Rate

RLV is highly sensitive to changes in the cap rate, as shown in Figure 18 The cap rate is a market-determined real estate metric that indicates the value of a property per dollar of net operating income (NOI) it generates. For example, if cap rates are 5% and a property generates $100 in NOI, then an investor would be willing to pay $100/5% = $2,000 for the asset. Cap rates can fluctuate significantly over time and are determined by market conditions, including interest rates, local supply and demand, and other factors. Between 2021 and 2024, suburban multifamily cap rates in Montgomery County have increased more than 1%. This change equates to a nearly 16% decrease in value between 2021 and 2024 for a given multifamily property.

If market conditions improve in the next several years, it is likely that cap rates will decrease toward 2021 levels. In the adaptive reuse scenario, a 0.5% decrease in cap rate would generate nearly $5 million in additional value, nearly 25% of the existing feasibility gap of $21.7M.

Construction Cost
Changes in construction costs and rent also play a large role in RLV and project feasibility. HR&A's rehabilitation cost estimate represents a conservative estimate based on cost information from Lantian as well as comparable projects in the region. In the context of Clarksburg, this sensitivity demonstrates that continued investment and a market recovery could dramatically increase the feasibility of development in the medium- to long-term as Clarksburg is built out and becomes a more attractive place to live.. Similarly, if updated cost estimates for building rehabilitation are lower than those modeled, feasibility would also be improved. Construction costs have increased nearly 20% since 2021[1] but are beginning to stabilize after several years of high growth.

A change in hard costs would have a large impact on the feasibility of new development for both the low-density and high-density scenarios. If hard costs for both multifamily and townhouse development were to increase by $10 per gross square foot, the feasibility gap for low- and high-density development would increase by $37.8 million and $57.2 million, respectively.

Rental Rates and Townhouse Pricing
In addition to development costs, development revenues are an essential component of program feasibility and inform the availability of surplus profit that might be allocated to adaptive reuse or other sector plan goals. While rental and for-sale pricing is lower in the Clarksburg market compared to transit-accessible employment nodes elsewhere in the county, strong growth has defined both residential product types since 2020 and helped to offset rising construction costs.

Transit, roadway, open space, and other area improvements envisioned as part of the Clarksburg Gateway Sector Plan will help to create value and support continued revenue growth that will increase feasibility in the medium- to long-term. Townhouse and rental rates modeled are for top-of-market product. A $10 change in sale price per square foot for townhomes would improve low- and medium-density scenario feasibility but would be insufficient to offset multifamily costs. A 10-cent increase per square foot in monthly multifamily rents would also benefit all programs; however, it would be insufficient to materially improve feasibility under current conditions.

Figure 18 | Sensitivity Analysis Summary

	Adaptive Reuse	Low Density	Medium Density	Townhouse Only
Baseline Private RLV	**-$28.0M**	**-$40.1M**	**-$154.3M**	**$83.4M**
0.5% Increase to Cap Rate	-$4.0M	-$19.6M	-$32.8M	*NA*
0.5% Decrease to Cap Rate	$4.8M	$23.5M	$39.3M	*NA*
△$10 Hard Costs/GSF - Multifamily	+/- $1.9M	+/- $13.7M	+/- $24.6M	*NA*
△$10 Hard Costs/GSF - Townhouse	*NA*	+/- $24.1M	+/- $32.5M	+/- $39.7M
△10¢ Rent/RSF - Multifamily	+/- $1.2M	+/- $7.7M	+/- $13.8M	*NA*
△$10 Sale Price/SF - Townhouse	*NA*	+/- $12.1M	+/- $16.3M	+/- $19.9M

Figure 19 below provides an example of how compounding effects can dramatically increase or decrease development feasibility. Each row and column represent a 5% change from a base multifamily assumption of the low-density scenario (hard construction costs of $170 and monthly market-rate rent of $2.23/sf). Therefore, if rent were to increase by 15% (approximately 30 cents per square foot) and development costs were to decrease by 10% (approximately $20 per square foot), residual land value would be positive and indicate project feasibility.

[1] *Turner Building Cost Index, Q2 2024*

Figure 19 Example: Low Density Scenario Rent and Construction Cost Sensitivity

			Construction Hard Cost / SF						
Rent	△%		*-15%*	*-10%*	*-5%*	*0%*	*+5%*	*+10%*	*+15%*
			$145	$153	$162	$170	$179	$187	$196
	-15%	$1.90	-$30.93M	-$42.53M	-$54.14M	-$65.75M	-$77.36M	-$88.96M	-$100.57M
	-10%	$2.01	-$22.37M	-$33.98M	-$45.59M	-$57.19M	-$68.80M	-$80.41M	-$92.01M
	-5%	$2.12	-$13.82M	-$25.42M	-$37.03M	-$48.64M	-$60.24M	-$71.85M	-$83.46M
	0%	$2.23	-$5.26M	-$16.87M	-$28.47M	-$40.08M	-$51.69M	-$63.30M	-$74.90M
	+5%	$2.34	$3.30M	-$8.31M	-$19.92M	-$31.53M	-$43.13M	-$54.74M	-$66.35M
	+10%	$2.45	$11.85M	$0.24M	-$11.36M	-$22.97M	-$34.58M	-$46.18M	-$57.79M
	+15%	$2.56	$20.41M	$8.80M	-$2.81M	-$14.41M	-$26.02M	-$37.63M	-$49.24M

While this is a simplified example, it demonstrates the impact of several small changes on a project and provides a helpful starting point for policy decisions that support community goals, county objectives, and housing needs.

3. Recommendations

As noted in Section 2 above, current market conditions are drastically different today than they were prior to the pandemic, which poses significant challenges for development. HR&A's analysis reflects the current real estate market, and scenario feasibility will improve if market conditions recover to historical levels. Lower interest rates projected over the next several years combined with stabilized construction costs will reduce cap rates and drive value, which will likely improve the feasibility of multifamily and other commercial uses.

HR&A modeled state, county, and federal historic tax credit incentives for the adaptive reuse scenario, which enhance the financial viability of a project by increasing the equity available to a developer. While historic tax credits alone do not provide sufficient value to offset project costs and make the project feasible, they can be combined with other tools and incentives to further close the gap. Several alternative tools and approaches to improve development feasibility are provided below. Together, these measures have the potential to create a conducive environment for sustainable growth and profitability.

- **Property Tax Abatement and Development Incentives**: *reduce initial costs and attract investment*
- **Parking Reconfiguration:** *reduce minimum parking requirement or explore surface alternatives*
- **Development in a Preserved Viewshed Area:** *increase development potential and potential subsidy*
- **Public Infrastructure Subsidy:** *support essential services and connectivity*
- **Large Anchor Tenant Identification**: *enhance property value and residential*
- **Stacked Townhouse Typology***: support "Missing Middle" housing goals*

A snapshot of the potential benefit of a combination of tools and a market recovery to prepandemic levels is included in Figure 20 below. This table is provided solely to demonstrate how feasibility may be improved by a combination of market and policy decisions and is not intended to be a guarantee of future outcomes. The data presented is for illustrative purposes only and should not be relied upon as a forecast or assurance of results.

Figure 20 consolidates the impacts of various policy tools with improved market conditions and demonstrates the potential feasibility of a low-density scenario with adaptive reuse. The property tax abatement, parking alternative, and viewshed development line items are explained in further detail below. Additional information on market conditions and cap rate impacts can be found in the Sensitivity Analysis section of this report.

Figure 20 | Potential Impact of Development Support and Improved Market Conditions

	Adaptive Reuse	Low Density	Medium Density
Initial Baseline RLV	**-$28.0M**	**-$40.1M**	**-$154.3M**
Potential Benefits			
Abatement Benefit	$7.4M	-	-
Parking Reconfiguration Development Cost Savings	$13.8M	$27.0M	$45.5M
Cap Rate Reduction*	$3.6M	$19.6M	$35.2M
RLV with Potential Benefits by Component	**-$3.2M**	**$6.5M**	**-$73.6M**
New Development Scenario RLV with Adaptive Reuse Component	**-**	**$3.3M**	**-$76.8M**
Viewshed Development	-	$9.4M	$9.4M
Total RLV with Potential Benefits and Viewshed Buildout		**$12.7M**	**-$67.4M**

**Assumes a multifamily cap rate reduction from 5.5% to 5%, consistent with historical market averages*

Property Tax Abatement and Development Incentives

Tax abatements are commonly used to support development feasibility by reducing expenses (thereby increasing NOI), thus increasing project value. HR&A modeled the impact of a 15-year, 100% tax abatement (aligned with Montgomery County's WMATA PILOT program) on the adaptive reuse scenario to determine the positive benefit to RLV. A tax abatement would contribute roughly $7.4 million to the adaptive reuse scenario, closing the gap by more than 30% (Figure 21). While this tax abatement is not currently available to the project, it is a valuable tool that could be established for Clarksburg and other adaptive reuse projects aligned with Montgomery County goals.

Figure 21 | Adaptive Reuse Tax Abatement Impact

	Historic Bays	Office Addition	Commercial East	Total Adaptive Reuse
Base Value	-$12.8M	-$8.0M	-$21.6M	-$42.4M
Historic Tax Credit	$6.7M	$2.9M	$4.6M	$14.4M
Residual Land Value without Tax Abatement	-$6.1M	-$5.1M	-$16.9M	-$28.0M
Tax Abatement	$2.5M	$2.0M	$2.9M	$7.4M
Residual Land Value with Tax Abatement	**-$3.6M**	**-$3.1M**	**-$14.0M**	**-$20.6M**

Additional tools and incentives that are currently available to support development are summarized in Appendix D and should be considered as potential funding sources.

Parking Reconfiguration

Parking accounts for a large share of costs due to both the high cost of structured parking development and the total number of required spaces under current zoning. Given the large size of the site, it may be feasible to transition a portion of structured parking spaces to surface parking, which is substantially less expensive to construct than a garage. Additionally, lower parking ratios may be justified in the future as the area evolves into a transit-accessible suburban district. Based on the size of the site and anticipated district profile, HR&A developed a parking alternative with surface parking for the adaptive reuse and low-density components and with a 50/50 split of surface and structured parking for the medium-density component. The alternative also reduced the retail parking requirement from 5 spaces to 2 spaces per 1,000 square feet to account for accessibility improvements and local-serving retail that would serve residents and workers who may not require parking.

Figure 22 demonstrates the cost savings potential of an increased share of surface parking and a reduction in retail parking minimums. While the cost savings of the parking alternative alone are not sufficient to drive feasibility, it does provide a meaningful shift toward positive value and could be combined with other policy development tools and initiatives to enhance viability and align with broader planning objectives.

Figure 22 | Alternate Parking Scenario

	Adaptive Reuse	Low Density	Medium Density
A. Baseline Scenario			
Share of Surface Spaces	0%	50%	0%
Share of Structured Spaces	100%	50%	100%
Retail Parking Ratio	5.0/1000 sf	5.0/1000 sf	5.0/1000 sf
Surface Parking Spaces	0	682	0
Structured Parking Spaces	351	682	2,017
Total Parking Spaces	351	1,364	2,017
Parking Costs	-$14.6M	-$31.2M	-$84.2M
Average cost per space	*$41,700*	*$22,900*	*$41,700*
Other Development Costs	-$13.4M	-$8.9M	-$70.1M
A. Residual Land Value	**-$28.0M**	**-$40.1M**	**-$154.3M**
B. Reduced Parking with Surface Transition Scenario			
Share of Surface Spaces	100%	100%	50%
Share of Structured Spaces	0%	0%	50%
Retail Parking Ratio	2.0/1000 sf	2.0/1000 sf	2.0/1000 sf
Surface Parking Spaces	218	1,037	845
Structured Parking Spaces	0	0	845
Total Parking Spaces	218	1,037	1,690
Parking Costs	-$0.9M	-$4.1M	-$38.6M
Average cost per space	*-$4,000*	*-$4,000*	*-$22,867*
Other Development Costs	-$13.4M	-$8.9M	-$70.1M
B. Residual Land Value	**-$14.3M**	**-$13.0M**	**-$108.8M**
Number of Structured Parking Spaces Transitioned to Surface	218	355	845
Retail Spaces Removed	133	327	327
Total Cost Savings *(B-A)*	**$13.8M**	**$27.0M**	**$45.5M**

Viewshed Development

Initial development concepts created by the design team preserved views of the COMSAT building from I-270 as a means of showcasing the historic structure and retaining original conditions. However, development in this viewshed should be considered if it would guarantee preservation of the historic structure. To that end, HR&A estimated the buildout potential of the viewshed area (Figure 6) for townhomes based on density assumptions from the design team. Total units in the table below reflect 14 townhouses per acre and an estimated 8 acres of developable space, which maintains the required 200’ setback from I-270.

Townhouse development within the I-270 viewshed is estimated to produce a positive RLV of $9.4 million, approximately 40% of the gap required to fund the adaptive reuse scenario.

Figure 23 | I-270 Viewshed Estimated Buildout and Value

	Viewshed Development
Townhouse GSF	268,800
Townhouse Units	112
Project Value	$85.5M
Project Cost	-$76.1M
Residual Land Value	**$9.4M**

Public Infrastructure Subsidy

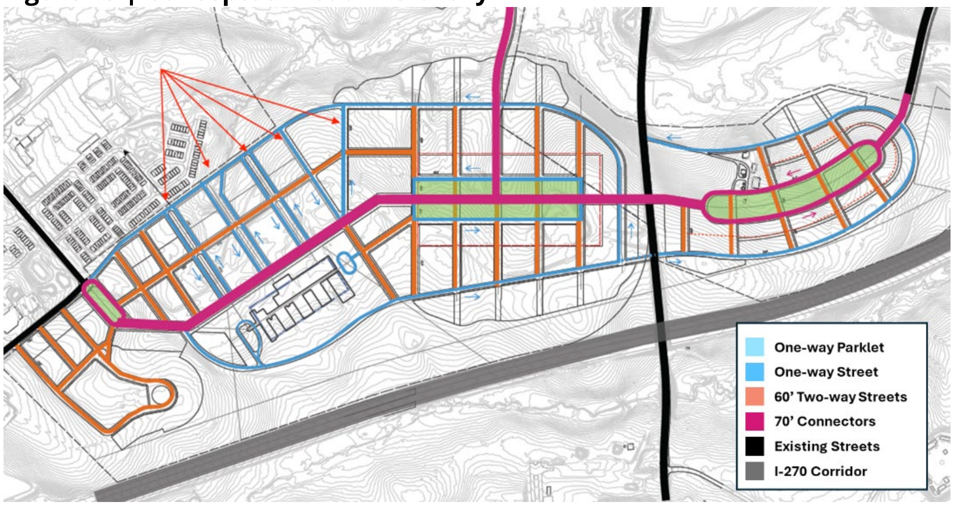
All scenarios assume developer-led road and open space infrastructure, which drives significant cost and hinders feasibility. Financial analysis reflects conceptual plan infrastructure estimates, including six miles of roads (1.7 million square feet) and 490,000 square feet of open space across full buildout (Figure 25excludes Linthicum property). HR&A’s analysis allocated these costs based on share of gross square feet and applied a high-level cost estimate to each to determine a rough order of magnitude cost for all site infrastructure.

Figure 24 distills the scale of anticipated infrastructure costs by scenario and demonstrates the impact of road and open space components on project feasibility. In the case of the low-density scenario, roads and open space costs account for 85% of the feasibility gap. Some level of support for a portion of roads and open space, especially those that will serve the adaptive reuse project or be operated and maintained by the county, could help improve feasibility and should be considered in the next Capital Improvements Program or budget cycle.

Figure 24 | Public Infrastructure Impact on RLV

	Adaptive Reuse	Low Density	Medium Density	Townhouse Only
Residual Land Value (no infrastructure)	-$23.3M	-$9.1M	-$123.4M	$114.4M
Roads and Open Space	-$4.7M	-$30.9M	-$30.9M	-$30.9M
Total Residual Land Value	**-$28.0M**	**-$40.1M**	**-$154.3M**	**$83.4M**

Figure 25 | Conceptual Road Hierarchy



Large Anchor Tenant or Amenity Identification

Retail and amenity uses can significantly enhance the value of real estate developments by creating vibrant, attractive environments that draw both residents and businesses. The development team should look to leverage a strong anchor tenant to complement residential development and drive value across adaptive reuse and new development uses.

Current market conditions make most office and retail development infeasible, largely due to the high cost of development combined with high cap rates that favor multifamily development over other rental uses. However, commercial uses like retail, recreation, and entertainment contribute significantly to placemaking and generate positive value both to real estate assets and quality of life. Identification and recruitment of a large, commercial anchor tenant has the potential to improve feasibility both directly through long-term leases at above-market rents and indirectly through value generation to the future residential community and by reduced developer risk. Conversely, development uses that are misaligned with site vision (e.g., self-storage, warehouse, etc.) may negatively impact demand, value, and overall feasibility.

HR&A interviewed a local developer specializing in large-scale, high-quality recreation spaces to better understand the potential of the adaptive reuse scenario to accommodate a regional-serving, alternative use. The developer underscored the strong market in Montgomery County, the appeal of adjacency with a large residential community, and the added value of future transportation connectivity envisioned in the sector plan. To the extent that the county or another third party could facilitate engagement and recruitment of a large anchor user—or perhaps a public use—adaptive reuse feasibility would likely be improved.

Stacked Townhouse Typology ("2-Over-2")

A 2-over-2 housing product offers a compelling alternative or complement to traditional townhouses at the site. The housing typology consists of vertically stacked townhomes, typically featuring two levels per unit with one unit above the other, and it offers higher density and cost-efficiency compared to traditional townhouses while maintaining a similar footprint. Although not included in the Fu Wilmers design, this stacked townhouse model aligns with the long-term goals of the Clarksburg Sector Plan and the Montgomery County Attainable Housing Strategies (AHS) Initiative, which prioritizes increasing "Missing Middle" housing types—such as townhouses, duplexes, and small multifamily options—that fit into existing neighborhoods and offer more affordable market-rate choices.

While preliminary analysis was limited to townhouse and multifamily configurations, a 2-over-2 typology could combine the feasibility benefits of owner-occupied townhouses with the density benefits of multifamily homes. This approach could support higher density development at a lower net cost per square foot than traditional townhouses. In addition to net positive development value compared to townhouse-only new development, this approach aligns with AHS goals to diversity and enhance attainable housing options, while complementing other planned development and transportation improvements at the site.

Appendix A – Site Details

Site Context

Location

The COMSAT building, situated at 22300 Comsat Drive in northern Montgomery County, occupies a largely undeveloped parcel within the Clarksburg Sector Plan. This 200-acre site is part of the Clarksburg Gateway Plan and is adjacent to I-270, providing easy access and visibility from the highway. While the site is currently only accessible by car, it is proximate to a planned MD355 BRT route.In addition to the MD355 BRT Route, the site would also be well connected to the planned Corridor Connectors, which is a planned bus route that would connect the COMSAT site to the planned MD 355 BRT corridor and other nearby activity centers.

Figure 26 | Site Map

Source: Montgomery Planning Corridor Forward: The I-270 Transit Plan, Spring 2022.

The site remains largely vacant. However, a portion of it is currently being leased out to a landscaping company, and the roads within the property have been used for autonomous driving testing. Aside from these smaller-scale uses, the site remains vacant.

Historical Use

Completed in 1969, the COMSAT building was constructed as a research facility and headquarters for the Communications Satellite Corporation (COMSAT). The building was designed by the world-renowned architect Cesar Pelli, famous for designing the Petronas Towers in Kuala Lumpur and the World Financial Center in New York City. COMSAT Laboratories is an early and iconic example of the High Technology design that became common in research technology corridors in Montgomery County and across the nation.

COMSAT Laboratories hosted the Research & Development branch function of COMSAT. Throughout the time that COMSAT owned and occupied the building, major scientific breakthroughs took place in it, including the invention of real-time international phone communication, and live television broadcast. COMSAT owned and occupied the building entirely until 1997, when it sold the property. Despite the sale, COMSAT continued leasing space in the building until it became completely vacant shortly thereafter. In 2015, Lantian Development purchased the 204-acre COMSAT Campus and has since continued to own and perform routine maintenance on the building.

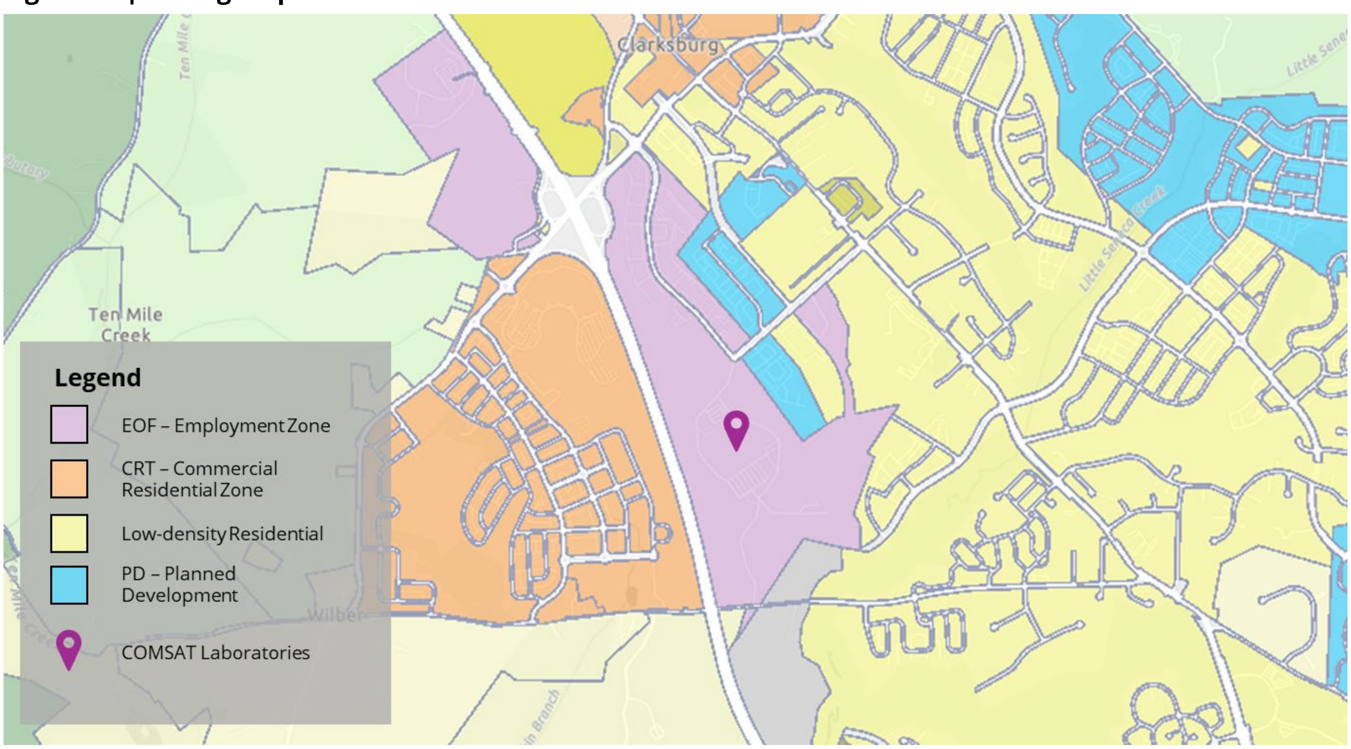
Since 1969, the COMSAT laboratories stands as an icon of avant-garde local research and the harbinger of the "high technology corridor" that came to define upper Montgomery County. This building's architectural and historical significance make it one of the purest "high technology" statements in Maryland.

Planning and Land Use

The COMSAT Laboratories building is identified in the Clarksburg Gateway Sector Plan as an opportunity for historic preservation in the county. The Plan assesses trends and conditions within the plan area and formulates strategies to align its vision, recommendations, and overall staging requirements with the county's adopted plans, policies, and priorities. COMSAT is located in an "EOF" zoned area, which comprises the majority of the area within the Sector Plan Area as illustrated in Figure 27. The EOF zone is intended for office and employment activity, with flexibility in building, circulation, and parking lot layout and only limited residential and neighborhood commercial uses. Specifically, the site is zoned as EOF-0.75 H-100 T, which indicates a FAR of 0.75, and a maximum building height of 100 feet. Additionally, the site has a "T" special designation, which allows for additional density and building height for workforce housing development.

The COMSAT building is surrounded by low density residential areas on the east side of the site, and commercial residential zones on the western side of the site, across from I-270. The PD designated areas shaded in blue correspond to "Planned Development" which has been developed into townhome communities.

Figure 27 | Zoning Map



Appendix B – Alternate Retail Scenario

In addition to the development scenarios included in Section 2 of this report, HR&A also separately evaluated the feasibility of a 120,000 square foot shopping center, which would be located at the southern edge of the site adjacent to West Old Baltimore Road. While the scenario demonstrates feasibility based on the input assumptions used, current demand for a standalone retail center may be limited due to several big-box (Walmart, Target) and grocery store (ALDI, Wegmans, Giant, Harris Teeter) offerings within 2 miles of the site, which likely meet local need. However, a retail center or large-format store may perform better in the medium- to long-term when the site is fully built out with new housing.

A summary of HR&A's key assumptions and residual land value for a successful retail center are included in Figure 28 below. Based on initial estimates, a shopping center has the potential to generate a positive residual land value of $3.6 million.

Figure 28 | Shopping Center Development Scenario

	Shopping Center Development
Retail Center RSF	100,000
Rent/RSF/Year	$25.00
Net Operating Income	$2.3M
Retail Cap Rate	6.00%
Total Development Cost/GSF	$226
Program Value	$38.4M
Project Cost	-$34.8M
Residual Land Value	**$3.6M**

Appendix C – FAR Calculations

Figure 29 | FAR Calculations for Development Scenarios

	Low Density	Medium Density	Townhouse Only
Multifamily	0.13	0.22	0.02
Townhouse	0.20	0.27	0.32
Office	0.00	0.00	0.00
Retail	0.02	0.02	0.01
Total FAR	**0.35**	**0.51**	**0.35**
Commercial	*0.03*	*0.03*	*0.01*
Residential	*0.33*	*0.48*	*0.34*

Appendix D – Existing Development Incentives

County Incentives

Montgomery County Historic Preservation Tax Credit

Montgomery County provides for a tax credit against County Real Property Taxes based upon the amount expended by a taxpayer for restoration and preservation of any historic resource. The amount of the tax credit is ten percent (10%) of the amount expended by the taxpayer for restoration and/or preservation of any structure or building located on property classified as an historic site or an historic resource located within an historic district as defined in this regulation.

Payment In Lieu of Taxes (PILOT)

The County is permitted to structure lowered local property taxes, including special area taxes, that would otherwise be levied on a qualifying development. PILOTs are generally geared toward supporting the development of affordable housing and are structured for a tax reduction period of ten years.

Tax Abatements and Tax Credits

The County's Department of Finance administers tax credit programs to encourage businesses to invest in targeted geographic areas or industries, and to support overall business growth in the County. Tax credit programs that may be relevant include:

- **Rent Reduction Tax Credit** – The Rent Reduction Tax Credit combines affordable housing and economic development incentives by granting credits to landlords who provide reduced rent to elderly (65 or over) or disabled tenants who meet certain income- and asset-based eligibility requirements.
- **Energy and Environmental Design Property Tax Credit** – Introduced as the "Green Building" tax credit, this tax credit may be granted based upon a building achieving one of ten qualified ratings for energy efficient buildings.

Grants and Loans

The Montgomery County Economic Development Corporation administers a variety of grant and loan programs, designed to provide financial assistance to private employers to retain and/or create jobs in the County, with a priority for companies in the high technology and manufacturing sectors, as well as companies that locate in urban revitalization areas.

Relevant MCEDC grant and loan programs include:

- **Green credits and exemptions:** On-site solar installations provide businesses with exemption from the County's fuel energy tax. Businesses can also claim rebates for installing rain gardens, planting trees and other green stormwater management controls.
- **Small Business Revolving Loan Program (SBRLP):** The SBRLP is a revolving loan program structured to provide support to small businesses. The program primarily targets small businesses with annual gross revenue below $5 M and fewer than 75 employees.
- **Small Business Plus!:** Small Business Plus! is a collaboration between the County and community banks headquartered within Montgomery County. The County invests $50 million in participating community banks, with a total of $100 million lent to local small businesses to encourage job growth.

Montgomery Housing Initiative Fund (MHIF):

The MHIF serves as Montgomery County's housing trust fund and provides loans to the Housing Opportunities Commission (HOC), developers, and experienced rental property owners. The fund is used to build new housing units, renovate deteriorated multi-family housing developments, preserve existing affordable housing, and provide special needs rental housing. The fund currently receives about $40 million in funding annually.

Montgomery County Historic Preservation Tax Credits

Owners of property listed in the Montgomery County Master Plan for Historic Preservation are eligible to receive a 25% tax credit for documented expenses for exterior maintenance, restoration or preservation work.

State Sources

Catalytic Revitalization Tax Credit

The Maryland Department of Housing and Community Development administers the Catalytic Revitalization Tax Credit (up to $15 million) to be used for the rehabilitation of properties formerly owned by the State or federal governments, for the purposes of driving economic and community development. An eligible project must be a formerly State or federally-owned college or university, K-12 school, hospital, mental health facility, or military facility or installation, and may no longer be in service. The rehabilitation of the property must help to support economic, housing and community development in the community where it's located.

HOME Investment Partnerships Program

HOME is the largest federal block grant to state and local governments aimed to create affordable housing for low-income households. This program provides grants to states and localities that communities may use to fund building, buying, and/or rehabilitating affordable housing for rent or homeownership.

National Capital Strategic Economic Development Fund

Provides competitive funds in support of commercial and residential activities in areas targeted for revitalization, focusing on areas where modest investment and coordinated strategy will have an appreciable neighborhood impact. Projects must be located in designated areas within Prince George's or Montgomery Counties. Eligible residential and commercial projects include: down payment assistance for homebuyers to purchase and rehabilitate homes, programs to acquire or rehabilitate vacant or blighted properties, programs to improve existing residential and business properties, programs to achieve energy efficiency through weatherization and energy retrofits, development of affordable housing, development of mixed-use projects that combine housing, retail, and office space, development or enhancement of community open space or public infrastructure, and strategic demolition.

Advantage Maryland (MEDAAF)

Advantage Maryland (also known as MEDAAF) funds conditional grants, loans and investments to assist economic development initiatives. Uses include business attraction and retention, infrastructure support, brownfield redevelopment, arts and entertainment districts, daycare, revolving loan funds and local strategic planning.

Jane E. Lawton Conservation Loan Program

The Maryland Energy Administration ("MEA") offers Fiscal Year 2024 Jane E. Lawton Conservation Loan Program ("FY24 Lawton Program") to Maryland Nonprofit Organizations, Local Governments, Maryland Businesses, and State Agencies for the implementation of cost-effective energy efficiency and conservation improvements for existing or to-be-constructed facilities.

Maryland Energy Administration – Residential

MEA administers grant and loan programs to encourage clean energy technologies in all sectors of Maryland's economy: residential, commercial, agricultural, and transportation.

Maryland Department of Housing and Community Development (DHCD)

The Maryland Department of Housing and Community Development (DHCD) works with partners to finance housing opportunities and revitalize great places for Maryland citizens to live, work and prosper. DHCD has programs for homeowners and renters, businesses and business owners, communities, and investors.

Community Legacy Program

The Community Legacy program provides local governments and community development organizations with funding for essential projects aimed at strengthening communities through activities such as business retention and attraction, encouraging homeownership and commercial revitalization.

Maryland Historical Trust (MHT)

The Community Legacy program provides local governments and community development organizations with funding for essential projects aimed at strengthening communities through activities such as business retention and attraction, encouraging homeownership and commercial revitalization.

Maryland Historic Revitalization Tax Credit Program

Owners of income-producing properties have the opportunity to earn a state income tax credit (capped at $5 million) that is equal to 20 percent of eligible rehabilitation expenses for substantial rehabilitation projects.

MEDCO Tax Exempt Bond Financing

MEDCO's bond financed projects encourage business activities, retain businesses, relieve unemployment, promote the welfare of State residents, and generally promote economic development in the State.

Federal Sources

Historic Tax Credits

The Federal Historic Preservation Tax Incentives program encourages private sector investment in the rehabilitation and re-use of historic buildings. Owners and developers may potentially receive a 20% federal income tax credit.

RAISE Grants

RAISE grants are awarded on a competitive basis. Eligible projects include surface transportation capital projects (highway, bridge, and other roads; public transportation; passenger and freight rail; intermodal projects; culvert/stormwater runoff projects; any other surface transportation infra. project the secretary deems necessary, including public road and non-motorized projects, TOD projects, and mobility on demand projects), and planning projects.

Congressionally Directed Spending Requests

Multiple historic preservation projects have submitted requests for congressionally-directed spending requests (earmarks). Congress may be able to approve grants to support projects that promote the adaptive reuse of historic assets and help to promote economic vitality and revitalization. A few projects that applied for funding in 2023 include: Baltimore's historic Uptown Mansion, the Baltimore Pumphouse, and the Historic Belair Mansion.

General and Limiting Conditions

- In preparing this Report, HR&A has used its independent professional judgment and skills in good faith, subject to the limitations, disclosures and disclaimers herein.
- This Report is based on estimates, assumptions and other information developed by HR&A based upon data provided by other parties. Every reasonable effort has been made to ensure that the data contained in this Report are accurate as of the date of this Report; however, factors exist that are outside the control of HR&A and that may affect the estimates and/or projections noted herein.
- HR&A reviewed the information and projections provided by third parties using its independent professional judgment and skills in good faith, but assumes no liability resulting from errors, omissions or any other inaccuracies with respect to the information provided by such third parties referenced in this Report.
- In addition to relying on data, information, projections and forecasts of others as referred to above, HR&A has included in this Report estimates and assumptions made by HR&A that HR&A believes are appropriate, but HR&A makes no representation that there will be no variances between actual outcomes and such estimates and assumptions.
- No opinion is intended to be expressed and no responsibility is assumed for any matters that are legal in nature or require legal expertise or specialized knowledge beyond that of a real estate and economic development consultant.
- This Report is qualified in its entirety by, and should be considered in light of these General and Limiting Conditions. By use of this Report each party that uses this Report agrees to be bound by all of the General and Limiting Conditions stated herein.

Montgomery Planning
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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Floor 13
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MontgomeryPlanning.org

MEMORANDUM

To: Historic Preservation Commission

From: John Liebertz, Cultural Resource Planner III, Countywide Planning and Policy Division, Montgomery Planning

Date: January 22, 2025

Re: An Amendment to the *Master Plan for Historic Preservation*: COMSAT Laboratories, 22300 Comsat Drive, Clarksburg, MD (M: 13-59)

Description: The Historic Preservation Commission (HPC) will receive public testimony, hold a worksession, and provide recommendations to the Planning Board and County Council on the evaluation of COMSAT Laboratories for listing in the *Master Plan for Historic Preservation*.

Summary:

- The COMSAT Laboratories property is approximately 205 acres and zoned EOF-.75H-100T, Employment Office.
- In 2024, the Maryland Historical Trust found the property to be eligible for listing in the National Register of Historic Places.
- Historic Preservation staff reaffirms the Historic Preservation Commissions (HPC) findings in 2005 that COMSAT Laboratories satisfied six of the nine designation criteria as outlined in 24A-3(b), Historic Resources Preservation, Montgomery County Code.
- Staff recommends that the HPC finds that the property continues to meet the designation criteria, proposes an environmental setting of 33.47 acres, and transmits their recommendation to the Planning Board.
- Montgomery Planning and the Historic Preservation Office will not be recommending the listing of COMSAT Laboratories to the *Master Plan for Historic Preservation* as part of the *Clarksburg Gateway Sector Plan*.

Recommendation:

Staff recommends that the Historic Preservation Commission (HPC):

1. Finds that COMSAT Laboratories satisfies six designation criteria as listed in 24A-3(b), Historic Resources Preservation, Montgomery County Code;
2. Proposes an environmental setting of 33.47 acres; and,
3. Transmits their recommendation to the Planning Board.

Attachments:

Attachment A: Environmental Setting

Attachment B: MIHP Form (2004)

Attachment C: Letter from the Maryland Historical Trust

Attachment D: COMSAT Laboratories: 1985 Annual Report

Overview

As part of the *Clarksburg Gateway Sector Plan*, Montgomery Planning evaluated several potential sites and districts for listing in the *Master Plan for Historic Preservation*. This included the review of the COMSAT Laboratories (M: (#13-59) at 22300 COMSAT Drive. COMSAT Laboratories, built in 1969, is an early work of world-renowned master architect Cesar Pelli that epitomized "high-technology" architectural design which became prevalent along the I-270 corridor. The research and development advances at COMSAT revolutionized communication technology.

In 1994, the County Council adopted the *Clarksburg Master Plan* (1994) that envisioned the property as a major employment and transit center. At that time, the 24-year-old building remained actively occupied by COMSAT with no threat of demolition. The building's age paired with its active use and a lack of realization of its significance led to no evaluation of the site for historic designation as part of that plan.

In the early 2000s, COMSAT Laboratories was considered for listing in the *Master Plan for Historic Preservation* absent an area-wide sector plan due to discussions of redevelopment and demolition of the building. Between 2004 and 2006, the Historic Preservation Commission (HPC) and Planning Board held public hearings and worksessions to evaluate whether COMSAT Laboratories satisfied designation criteria as outlined in §24A-3: Historic Resources Preservation, Montgomery County Code. The HPC found that COMSAT Laboratories satisfied multiple designation criteria and recommended the resource be listed in the *Master Plan for Historic Preservation* with a proposed environmental setting of 33.47 acres. While the Planning Board forwarded the designation to the County Council with a negative recommendation, the County Council never scheduled a public hearing or worksession on this matter leaving the question of its preservation unclear. COMSAT Laboratories has been largely vacant since 2007.

The *Clarksburg Gateway Sector Plan* intends to address the preservation of the building as part of a comprehensive analysis of the plan area. The Planning Board approved the evaluation of COMSAT Laboratories for listing in the *Master Plan for Historic Preservation* as part of the Scope of Work in June 2023. After recommendations by the HPC and Planning Board, the designation process ultimately will conclude with a vote by the County Council on whether or not the property should be listed to the *Master Plan for Historic Preservation*. This decision will provide a definitive answer to the property owner, preservation advocates, and county residents on the question of historic designation.

Historic Preservation Commission and Planning Board's Roles in Amendments to the Master Plan for Historic Preservation

The Historic Preservation Commission (HPC) has an important and defined role in the designation process. The HPC's responsibilities include the research and evaluation of historic resources, and recommendations to the Planning Board for the listing of certain sites and districts to the *Master Plan for Historic Preservation*. These recommendations are, by law, advisory in nature. The HPC's recommendation must be based on the designation criteria outlined in §24A-3(b), Historic Resources Preservation, Montgomery County Code.

After receiving the recommendation from the HPC, the Planning Board holds a public hearing and worksession to make its own determination, using the same designation criteria, and balancing the importance of the historic property with other public interests. The Planning Board forwards their recommendation to the County Executive and County Council for their consideration. The County Council ultimately decides if a property is listed to the *Master Plan for Historic Preservation*.

Administrative History of the Designation Process for COMSAT Laboratories (2004-2006)

On November 1, 2004, the Historic Preservation Commission (HPC) received a nomination to list COMSAT Laboratories by Professors Isabelle Gournay and Mary Corbin Sies of the University of Maryland. Between February and April 2005, the commission held public hearings and worksessions on the proposed amendment to the *Master Plan for Historic Preservation*. On April 13, 2005, the HPC found that COMSAT Laboratories met six designation criteria as outlined in §24A-3(b), Historic Resources Preservation, Montgomery County Code. This included the following criteria for historical and cultural significance and architectural and design significance:

- 1.A: The historic resource has character, interest or value as part of the development, heritage, or cultural characteristics of the county, state or nation;
- 1.D: The historic resource exemplifies the cultural, economic, social, political, or historic heritage of the county and its communities;
- 2.A: The historic resource embodies the distinctive characteristics of a type, period or method of construction;
- 2.B: The historic resource represents the work of a master;
- 2.C: The historic resource possess high artistic value; and
- 2.E: The historic resource represents an established and familiar visual feature of the neighborhood, community or county due to its singular physical characteristic or landscape.

The HPC recommended an environmental setting (historic site boundary) of 33.47 acres. The proposed setting intended to preserve important viewsheds of the COMSAT Laboratories from I-270 and retain views of the surrounding open greenspace from the building. The commission recommended that the entire building be designated, but that non-historic additions be identified as non-contributing elements to facilitate demolition and/or alterations. In addition, the HPC noted that the relationship of the building to I-270 as the primary historic feature and classified the non-public portions of the building that faced away from the interstate as secondary with the potential for a higher-degree of alteration and redevelopment. All other smaller and detached buildings and structures on the property were not included in the environmental setting.

The Planning Board held a public hearing and worksession on the proposed designation of COMSAT Laboratories in May and July 2005, respectively. On July 7, 2005, the Board voted against the proposed designation and found that listing the property in the *Master Plan for Historic Preservation* had the potential to impair the implementation of the *Clarksburg Master Plan* (1994). Specifically, the Board stated preservation would inhibit the intensification of development for the site. The Board shared two other secondary concerns: 1) the consideration of the proposed designation outside the context of a comprehensive master plan created unpredictable scenarios for property owners; and 2) the designation of resources less than 50 years old was unusual albeit not prohibited by code. As noted in the *Planning Board (Final) Draft Amendment to the Master Plan for Historic Preservation: COMSAT Laboratories, 22300 Comsat Drive, Clarksburg, MD*:

> …, the Planning Board finds that, while the COMSAT Laboratories Building does have architectural significance, this is not a sufficient or compelling reason to support historic designation. The Board finds that this is especially true when balanced with the importance of the property in achieving goals of the Clarksburg Master Plan to provide signature sites along I-270 for major employment centers.

After the Planning Board voted to deny designation of the property, the Board did not send an amendment recommending against listing the property in the *Master Plan for Historic Preservation* to the County Council. The Board held an additional public worksession on February 16, 2006, to address this issue and voted to forward the amendment to the County Council. On March 7, 2006, the Board transmitted the *Planning Board (Final) Draft Amendment to the Master Plan for Historic Preservation: COMSAT Laboratories, 22300 Comsat Drive, Clarksburg, MD* to the County Executive and County Council. The County Council never held or scheduled public hearings or worksessions to address the proposed amendment.

Current Evaluation of COMSAT Laboratories and New Information

On June 22, 2023, the Planning Board approved the scope for a new master plan for the Clarksburg Area. This new *Clarksburg Gateway Sector Plan* is an amendment to the *Clarksburg Master Plan* (1994). This Sector Plan focuses on a portion of the adopted Master Plan's Transit Corridor District and surrounding areas. The boundary of the Sector Plan is part of the I-270 corridor—a significant employment resource for the county and the region. The Sector Plan will examine undeveloped areas—specifically, the eastern side of I-270—that have remained largely unchanged in the last 30 years. Alongside extensive engagement with residents, business owners, and other interested parties, Montgomery Planning staff will research existing conditions and trends, evaluate land use, zoning, housing needs, transportation, environmental conditions, and historic resources, and propose recommendations to achieve a new vision for this section of Clarksburg. The Planning Board approved the evaluation of COMSAT Laboratories for listing in the *Master Plan for Historic Preservation* as part of the Scope of Work for this Sector Plan in June 2023.

Montgomery Planning staff reaffirms the findings of the Historic Preservation Commission and Planning Board in 2005 that COMSAT Laboratories has historical and architectural significance as outlined in §24A-3(b), Historic Resources Preservation, Montgomery County Code. Historic Preservation staff conducted limited new outreach and documentation to augment the wide breath of existing documentation.

As part of this effort, Staff requested that the Maryland Historical Trust (MHT, State Historic Preservation Office) provide a determination of eligibility for COMSAT Laboratories for listing in the National Register of Historic Places. The National Register is the official Federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture. National Register properties have significance to the history of their community (local level), state, or the nation. Professors Isabelle Gournay and Mary Corbin Sies of the University of Maryland submitted a National Register nomination form to MHT in 2005, but the documentation had been prepared for inventory purposes only and was never formally reviewed for eligibility by MHT. While the National Register designation criteria are different than the criteria for listing in the *Master Plan for Historic Preservation*, the MHT's expertise, evaluation, and assessment of the property stands as an important measure for the architectural and historical significance of the resource. Their assessment confirms the significance of the property at the local, state, and national levels.

MHT determined that COMSAT Laboratories is eligible for listing in the National Register of Historic Places under **Criteria A** and **C**. Under **Criterion A**: **Event**, properties are eligible for the National Register if they are associated with events that have made a significant contribution to the broad patterns of our history. MHT found COMSAT Laboratories eligible for listing in the areas of Science, Engineering, and Communication at the national level of significance due to its role in the founding of modern communications technology. Under **Criterion C**: **Design/Construction**, properties are eligible for the National Register if they embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction. MHT found COMSAT Laboratories eligible as the work of a master at the state level of significance due to its association with Cesar Pelli and the use of architectural features that would later characterize "high-technology" design.

Please refer to Attachment C: MHT Letter for the letter from Elizabeth Hughes, Director, Maryland Historical Trust, to Rebeccah Ballo, Historic Preservation Supervisor, Montgomery Planning, dated September 12, 2024.

As part of the public outreach for the designation, Montgomery Preservation Inc. facilitated discussions between Historic Preservation staff and the COMSAT Alumni & Retirees Association (COMARA). Maury Mechanick, COMARA President, shared with the team a robust oral history project that collates the recollections of former employees. Please see the COMARA website (https://www.comara.org/i-remember-comsat/) for the most up-to-date information as the organization continues to publish new information and oral histories. In addition, the organization shared the *COMSAT Laboratories:1985 Annual Report* (Attachment D) that provides detailed information about the scientific and technical achievements. This information paired with the oral histories confirms and expands upon the vast historical significance associated with COMSAT Laboratories in the fields of science, engineering, and communications.

Designation Criteria

Staff finds that the subject property continues to satisfy six designation criteria as listed in §24A-3(b), Historic Resources Preservation, Montgomery County Code. This recommendation aligns with the finding of the Planning Staff and the Historic Preservation Commission (HPC) as part of their review of the property in 2005. The commission found that the resource satisfied the following criteria for historical and cultural significance and architectural and design significance:

1.A Historical and cultural significance. The historic resource has character, interest or value as part of the development, heritage, or cultural characteristics of the county, state, or nation.

1.D Historical and cultural significance. The historic resource exemplifies the cultural, economic, social, political, or historic heritage of the county and its communities.

2.A Architectural and design significance. The historic resource embodies the distinctive characteristics of a type, period or method of construction.

2.B Architectural and design significance. The historic resource represents the work of a master.

2.C Architectural and design significance. The historic resource possesses high artistic value.

2.E Architectural and design significance. The historic resource represents an established and familiar visual feature of the neighborhood, community or county due to its singular physical characteristics or landscape.

As noted in the *Planning Board (Final) Draft Amendment to the Master Plan for Historic Preservation: COMSAT Laboratories, 22300 Comsat Drive, Clarksburg, MD* from 2005, the HPC provided the following justification for their decision:

- COMSAT Laboratories represents the trend toward high-technology innovation in industry in Montgomery County, the nation, and international spheres.

- COMSAT Laboratories represents the advance of the commercial artificial satellite industry throughout the world. This advance was spearheaded, from a research and design perspective, in Montgomery County by the work undertaken at COMSAT Laboratories.

- COMSAT Laboratories has political origins tied to the actions of both Presidents Kennedy and Johnson. In addition, it helped define the economic heritage of the County for four decades.

- COMSAT Laboratories represents the International Style in its design esthetic and is an early example of the "high-tech" architecture that came to define the corporate "campus".

- COMSAT Laboratories is an early design by world-acclaimed architect, Cesar Pelli. He created the design as Director of Design for Daniel, Mann, Johnson, and Mendenhall (DMJM).

- COMSAT Laboratories epitomized the "machine in the garden" ideal of a futuristic building set within a naturalized setting.

- COMSAT Laboratories is one of the most easily identifiable buildings along the I-270 corridor in Montgomery County. It is a building that represents Montgomery County as an undisputed leader in high technology industry nationwide.

Please see Attachment B: MIHP Form for a detailed analysis of the resource's historic and architectural significance.

COMSAT Laboratories continues to be recognized as the setting for significant contributions to advancements in the fields of science, engineering, and technology at the national level, as well as its role in the development of the Interstate 270 corridor in Montgomery County. The building remains a self-identified and significant early work of now deceased master architect Cesar Pelli who died in 2019. Pelli stated in 2004 that "[COMSAT Laboratories] is a unique project and one of my most important designs while I was Director of Design at Daniel, Mann, Johnson, and Mendenhall (DMJM)." While the death of Pelli has no bearing on the evaluation of significance per the designation criteria, the understanding of his architectural works continues to be augmented after his death.

Planning Staff Findings — Clarksburg Gateway Sector Plan

Montgomery Planning studied the preservation and adaptive reuse as part of the *Clarksburg Gateway Sector Plan*. The Department will not recommend listing the building to the *Master Plan for Historic Preservation* after a thorough analysis of design scenarios, site development, and a financial feasibility analysis. HR&A Advisors—a real estate and economic development consultant—prepared the following report: https://montgomeryplanningboard.org/wp-content/uploads/2024/11/Clarksburg-Adaptive-Reuse-Feasibility-Report-FINAL-10.16.24.pdf.

On November 21, 2024, Planning Staff and HR&A presented their findings to the Planning Board. Video of the presentation is available online: https://www.youtube.com/live/LnCXTGQC5ho?t=875s.

Conclusion

Staff recommends that the Historic Preservation Commission (HPC):

1. Finds that COMSAT Laboratories satisfies six designation criteria as listed in 24A-3(b), Historic Resources Preservation, Montgomery County Code;
2. Proposes an environmental setting of 33.47 acres; and,
3. Transmits their recommendation to the Planning Board.

Attachment A: Environmental Setting

Figure 1: Proposed environmental setting for COMSAT Laboratories, Clarksburg, Montgomery County, Maryland. This environmental setting of 33.47 acres matches the boundary proposed by the Historic Preservation Commission in 2005.

Attachment B: MIHP Form (2004)

Maryland Historical Trust
Maryland Inventory of Historic Properties Form

Inventory No. MC-13-59

1. Name of Property

historic	COMSAT Laboratories
other	

2. Location

street and number	22300 Comsat Drive	__	not for publication
city, town	Clarksburg, MD	__	vicinity
county	Montgomery County		

3. Owner of Property (give names and mailing addresses of all owners)

name	LCOR Incorporated				
street and number	6550 Rock Spring Drive, Suite 280			telephone	301-897-0002
city, town	Bethesda	state	MD	zip code	20817

4. Location of Legal Description

courthouse, registry of deeds, etc.	Montgomery County Land Records	liber 16925	folio 574
city, town Rockville, MD	tax map EV33	tax parcel N888	tax ID number D02: 00018631

5. Primary Location of Additional Data

_______ ~~Contributing Resource in National Register District~~
_______ Contributing Resource in Local Historic District
_______ Determined Eligible for the National Register/Maryland Register
_______ Determined Ineligible for the National Register/Maryland Register
_______ Recorded by HABS/HAER
_______ Historic Structure Report or Research Report at MHT
___X___ Other: Cesar Pelli & Associates, Architects

6. Classification

Category	Ownership	Current Function		Resource Count		
				Contributing	Noncontributing	
____district	____public	____agriculture	____landscape	1	____	buildings
_x_building(s)	_x_private	_X_commerce/trade	____recreation/culture	1	____	sites
____structure	____both	____defense	____religion	____	____	structures
_x_site		____domestic	____social	____	____	objects
____object		____education	____transportation	2	____	Total
		____funerary	____work in progress			
		____government	____unknown			
		____health care	____vacant/not in use	**Number of Contributing Resources previously listed in the Inventory**		
		____industry	____other:	____		

7. Description

Inventory No. MC-13-59

Condition

___ excellent
_x_ good
___ fair
___ deteriorated
___ ruins
___ altered

Prepare both a one paragraph summary and a comprehensive description of the resource and its various elements as it exists today.

Section 7: Narrative description

Summary Paragraph

COMSAT Laboratories (1968-69) is located in Clarksburg, Maryland, 34.41 miles northwest of the White House[1], just east of and overlooking I-270. Designed by the world-renowned master architect Cesar Pelli, at that time Director of Design for Daniel, Mann, Jackson, Mendenhall (DMJM), COMSAT Laboratories was an early and iconic example of the High Technology design that came to define technology research corridors in Montgomery County and elsewhere in the nation. The building complex, a virtual "machine in the garden,"[2] popularized several elements of the High-Tech design that dominated the late twentieth century. The building's transparent, futuristic form, resting lightly upon a pastoral landscape, symbolized the necessary, but complicated relationship of technology amid nature. The building cannot be separated from a naturalistic setting, but neither can a building representing the future meld unnoticed into the landscape. The landscape is a character-defining features of COMSAT Laboratories, since it contributes greatly to the physical character of the resource. In terms of its plan, COMSAT laboratories featured lineal design with spaces deployed along a central spine for circulation, flexible planning and separation of laboratory spaces, separate mechanical penthouses providing services to each wing, and provision for expansion of the complex. Its streamlined exterior, which Pelli likened to "airline construction and esthetics," established a new design vocabulary for High Technology industries. The principal facades were enclosed by a tight, flush aluminum and glass skin, a glittering membrane that stretched continuously over and around the structure. Two kinds of windows contributed to the machine-like effect: floor to ceiling glazing along the spine and catwalk in clear glass separated by thin aluminum mullions, and, in the laboratory wings, smaller rectangular office windows of solar glass and curved corners, set flush with the aluminum skin and sealed with a neoprene gasket. Pelli designed the complex for views: with its western glass corridor, serving as a secondary connector between the administrative and laboratory wings, COMSAT Laboratories was designed to be seen from the highway, a "light-looking, high-tech form sitting on a pristine landscape," representing the future promise of the communications technology that would enable individuals worldwide to see a man walking on the moon.[3] From the interior, the principal spaces were designed to give employees the best views of the surrounding pastoral landscape. Although COMSAT Laboratories has had additions and alterations, they have occurred on the eastern and southern ends of the complex. The public facades are practically unchanged from their appearance in 1969.

8. Significance

Inventory No. MC 13-59

Period

__ 1600-1699
__ 1700-1799
__ 1800-1899
_x 1900-1999
__ 2000-

Areas of Significance — **Check and justify below**

__ agriculture
__ archeology
x architecture
__ art
x commerce
x communications
__ community planning
__ conservation
__ economics
__ education
_x engineering
__ entertainment/ recreation
__ ethnic heritage
__ exploration/ settlement
__ health/medicine
__ industry
__ invention
__ landscape architecture
__ law
__ literature
__ maritime history
__ military
__ performing arts
__ philosophy
_x politics/government
__ religion
_x science
__ social history
__ transportation
__ other: _____

Specific dates

Architect/Builder

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[1] Distance calculated by Mapquest at www.mapquest.com, (accessed 10-23-04).
[2] This idea was popularized in a major scholarly text in 1964; Leo Marx, *The Machine in the Garden*: *Technology and the Pastoral Ideal in America* (New York: Oxford, 1964).
[3] Cesar Pelli, Email communication with the Historic Preservation Section, 21 September 2004.

Maryland Historical Trust Maryland Inventory of Historic Properties Form

Inventory No. MC-13-59

Name
Continuation Sheet

Number _8_ Page 1

Construction dates 1967 (design) 1968-69 (construction)

Evaluation for:

___x___ National Register ___x___ Maryland Register _________ not evaluated

Montgomery County Master Plan for Historic Sites

Prepare a one-paragraph summary statement of significance addressing applicable criteria, followed by a narrative discussion of the history of the resource and its context. (For compliance projects, complete evaluation on a DOE Form – see manual.)

Significance Summary

The United States would not have become the world leader in artificial communication satellites were it not for the work undertaken at COMSAT Laboratories. Real-time international phone communication and international, live television broadcast - aspects of global communication technology that we take for granted today - were pioneered by the scientists, researchers, and technicians at COMSAT Laboratories in the 1960s and 1970s. The building at 22300 Comsat Drive that housed the Research and Development (R&D) functions of COMSAT since 1969 stands as an icon of avant-garde global research and the harbinger of the "high technology corridor" that came to define upper Montgomery County. The building is unquestionably one of the purest "high-technology" architectural statements in Montgomery County, a product both of the work that went on there and the aesthetic intention of its designer. Regarding the first point, the serene, futuristic COMSAT Laboratories reflects the decisive American step to not only to surpass the Russians in space, but also simultaneously to apply space technology to global, civilian communications. Regarding the second point, COMSAT Laboratories is an early work of Cesar Pelli, a living "master architect" with a worldwide practice and reputation. The building is Maryland's only commercial building by Cesar Pelli and one of only four buildings by Cesar Pelli standing in metropolitan Washington: The only other Maryland example is a Bethesda residence designed in the 1990s. Virginia is the site of Cesar Pelli's Reagan Washington National Airport structure, completed circa 1995 and an; elegant but less conspicuous office building addition was designed by Pelli for the Investment Building at 1900 K Street.[4] COMSAT Laboratories holds an important place in Cesar Pelli's body of work according both to highly respected architectural critics and to Cesar Pelli himself. After COMSAT's 1967 design, Pelli went on to make an international reputation for himself by continuing to design "High Tech" buildings that picked up on COMSAT's origins and defied current norms. Design ideas experimented at COMSAT and honed on later buildings include: 1) Buildings sheathed in newer materials that exhibited tighter building skins. 2) Buildings where the extent of glass curtain-wall technology was stretched. 3) Buildings where the core designs are focused around the standpoint of circulation. 4) Certain buildings that perpetuated the notion of the machine in the garden. In 1995, as a result of his consistently excellent architectural works, Cesar Pelli was awarded the American Institute of Architect's Gold Medal, the honor of being judged the most accomplished architect in the world. In a written response to questions posed by the Historic Preservation Section of the Montgomery County Historic Preservation Commission, Cesar Pelli stated that he felt the most significant aspect of COMSAT Laboratories is its standing as "a very early example of high-technology design; an architectural direction that has become very strong, perhaps dominant, in the last 20 years." Cesar Pelli affirmed that his design was an important, successful investigation in "esthetics, technology and building planning" and that it served as a model to him for several future projects.[5] The building not only laid the groundwork for future High-Tech architecture (which consistently employed aluminum skins and metal-based glass curtain walls) but most certainly set the stage for the development of I-270 as Montgomery County's high technology corridor.

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[4] Benjamin Forgey, "Alluring Curves: Cesar Pelli's K Street Beauty is a Welcome Sight," *Washington Post*, August 3, 1996, C 1.
[5] Cesar Pelli to Historic Preservation Section, memorandum, September 21, 2004.

9. Major Bibliographical References

Inventory No. MC-13-59

See attachment

10. Geographical Data

Acreage of surveyed property Approximately 150 acres
Acreage of historical setting Approximately 200 acre
Quadrangle name Germantown, MD Quadrangle scale: 7.5

Verbal boundary description and justification
See attached GIS map as description. It shows the associated tax parcel of the property, with its legal boundaries.

11. Form Prepared by

Name/title Isabelle Gournay, Ph.D., Associate Professor, School of Architecture, Affiliated Faculty, Historic Preservation Program, University of Maryland and Mary Corbin Sies, Ph.D., Associate Professor, Department of American Studies, Affiliated Faculty, Historic Preservation Program, University of Maryland.

organization School of Architecture
date 11/01/04
street & number University of Maryland
Telephone 301-405-6304
city or town College Park
State: Maryland

The Maryland Inventory of Historic Properties was officially created by an Act of the Maryland Legislature to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 supplement.
The survey and inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

return to: Maryland Historical Trust
DHCD/DHCP
100 Community Place
Crownsville, MD 21032-2023 410-514-7600

Site Plan and Landscaping

COMSAT Laboratories is located in Clarksburg, Maryland, 34.41 miles northwest of the White House, just east of and overlooking I-270 and north of W. Old Baltimore Road on more than 150 acres of pastoral, gently rolling land.[6] Although the original 210 acres of property was bounded to the west by a major interstate highway, it was otherwise surrounded by dairy farms and open countryside in the late 1960s.[7] The building complex was placed toward the western boundary of the site, where its striking high-tech massing would be visible from cars passing along I-270 (then I-70 S). It is accessible from Comsat Drive, which runs north from W. Old Baltimore Road about 1500 feet, then splits to form a service drive that runs along the east side of the complex, rejoining Comsat Drive north of the complex and just below where the drive curves to the east to join Shawnee Lane.

COMSAT Laboratories is situated about 1800 feet north of W. Old Baltimore Road and roughly 1000 feet east of I-270. The central spine of the complex is oriented north-south. To the south of the complex, the service drive provides access to 350 parking spaces for employees. Three additional driveways provide vehicle access to the loading docks and service areas on the east side of the complex. Another driveway, from Comsat Drive, provides a more formal access route to the main entrance, under a porte cochère motif formed by the projecting exhibition pavilion, and terminating in a visitor parking lot of 50 spaces to the north of the entrance. The land is gently rolling, peppered with maples, sycamores, and beech trees on the northern sides of the complex; when COMSAT was constructed, it was wooded with trees to the south, southeast, and southwest. The area to the east of the employee parking lot today hosts several large white satellite dishes, tilted every which way.

The landscaping, designed by Pelli and landscape architect Lester Collins, takes advantage of the natural features of the still rural site. Pelli intentionally placed the space-age design of his building in the center of a pastoral landscape, heightening the contrast between the machine-like building and the natural Maryland countryside. The minimal landscaping is indigenous to the area, consisting of small groupings and occasional strategic plantings of native trees that blend in with the surrounding farmland. No formal plantings or gardens embellish the complex. Today the large expanse of fields surrounding the complex and separating it from I-270 is tractor-mown. Additions to the south and east of the complex have resulted in a reduction in the amount of wooded acreage on the site. The four courtyards within the complex continue the theme of maintaining the natural features of the rural surrounds. They contain a sprinkling of native trees among mown field grass but are otherwise unplanted.

Original Plan

The original structure as constructed in 1968-69 included 254,000 square feet of floor space. According to current property records, the enclosed space has grown to 525,996 square feet. The original program was specified in a *Progressive Architecture* design award citation:

> "a building complex to house all functions necessary to research, develop, and produce communications satellites. Basic program elements were: laboratories, research offices, spacecraft assembly area, administration offices, building and mechanical services. Other requirements: allowance for future expansion of facilities and services; flexible laboratory spaces; flexible mechanical and power distribution

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[6] Although the original documentation lists the acreage of the COMSAT property as 210 acres, the Maryland Department of Assessments and Taxation lists the current property land area as 154.24 acres. See Maryland Department of Assessments and Taxation, Real Property Data Search4 Website at http://sdatcert3.resiusa.org/rp_rewrite/, under 22300 Comsat Drive (accessed 10-23-04).

[7] "Aluminum Membrane Envelops Satellite Laboratory," 76; "Technological Imagery: Turnpike Version," 70.

system; consideration of present and future spacecraft dimensions; parking for 350 employees and 50 visitors."[8]

As it turned out, the United States government and interested parties decided that it made the most economical and political sense to have the new satellites constructed by existing private industries, with COMSAT Laboratories providing all the research, development, and testing necessary to enable and support these production activities. The Comsat Laboratories building that fostered this global, commercial satellite industry consisted of a complex of spaces connected by a central corridor acting as a spine and facilitating circulation. The spine was oriented from north to south. Distributed to the west of the spine were four wings separated by three interior grassy courtyards. The northernmost wing contained administrative offices, as well as a mainframe computer on the first floor. The other three wings, identical from the outside, were configured similarly. Rows of office cubicles lined both the north and south exterior walls of each wing on both the first and second stories. The offices were separated from interior laboratory space by long corridors running the length of each wing. On each floor, the laboratory space--which was equipped with workbenches, sinks, and other infrastructure needed for global communications work—contained minimal permanent interior dividers so that personnel could configure the labs according to need. Because each lab wing was separated from the others by a courtyard, wings could assume different functions and work and change independently of one another. The first wing, for example, sheltered Wet Chemistry; the second hosted Microwave Communications, and the third housed the Research and Development of Spacecraft. To the west, the four wings were connected by a secondary corridor spanning on two stories the entire western façade. Five feet wide and lined with windows, these "catwalks" provided additional circulation between the wings. For security reasons, the courtyards were and are off limits to visitors.

Distributed to the east of the spine was a more complex set of spaces. From north to south, these included a roughly square wing that contained the lobby, a library, the auditorium, dining area, and a kitchen appendage to the south. This wing was divided from the next by an L-shaped courtyard. Originally open on the east side, but now enclosed by an addition, this is the courtyard that is accessible to employees. South of this courtyard was a short storage wing and loading dock. This was divided by a corridor from a longer wing that contained machine shops, plating, and maintenance facilities. Immediately adjacent was an assembly space. The southernmost wing, attached to the assembly space and configured as a long horizontal wing that paralleled the central spine, was the environmental test laboratory (ETL). The ETL was the largest space in the complex. It consisted of a warehouse with a 50-foot high ceiling and was equipped with a ten-ton crane used for the testing of satellites and antennae. The western half of the warehouse featured an enclosed second story-level balcony with windows from which the crane operators and other employees could look into the testing area. The testing space was furnished until recently with a huge vacuum chamber that simulated space conditions of 300 degrees below zero, and an anechoic chamber, a quiet room complete with cones designed to absorb both energy and satellite communications signals. Another function that took place in the ETL space involved the use of high-powered amplifiers to pump the sound of the space shuttle into the room in order to shake up the satellite components. These tests, along with tests on propulsion methods and rocket fuel efficiency, were undertaken to "space qualify" components of spacecraft and satellites.
The 10,000-pound freight elevator used to reach the ETL from the main corridor is intact.

Crucial to the organization of the COMSAT complex was the central spine, a continuous glass corridor that terminated on the northern end in a dramatic cylindrical glassed-in two-story exhibition pavilion connected to the main complex by a canopy. The southernmost end of the spine led out to the employee parking lot. Pelli conceptualized the spine as a "line or street" that would organize a whole complex of functions in rectangular masses deployed to either side.[9] In addition, the spine served as the "common room, meeting place, or room away from work" for the building's scientists and employees.[10] The long, linear glass corridor takes advantage along its length of views, both to the surrounding countryside and to the internal courtyards. The secondary glass corridor to the west completed circulation among and between the administrative and laboratory wings and unified the design linearity of the complex, making the main façade, visible

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[8] *Progressive Architecture* Design Awards 1968 Citation: COMSAT Laboratories (n.p.).
[9] Kautz, "Cesar Pelli's COMSAT Laboratories," 23.
[10] *Progressive Architecture* Citation, n.p.

from the highway, appear continuous. Future expansion of COMSAT Laboratories was planned for by extending the central spine to the south to link additional building components.

Beneath the three laboratory wings to the west of the central spine, there is a basement floor containing boiler and chiller rooms, and other mechanical services, including back-up generators for the mainframe computer, an electrical services hub, a photo lab, a print shop, and a vault. Above the second story of various wings of the building were penthouse spaces housing mechanical equipment. Each laboratory wing, for example, had an independent set of mechanical services, threaded vertically in the hollow walls separating the corridors from the interior laboratory spaces. Above the ETL, the roof was equipped with caps for anchoring satellite dishes; several crown the roof still today at the southeast corner of the complex.

Additions and Alterations

Since the original building was constructed in 1968-69, several additions and alterations have occurred. Two additions were made to the east side of the complex in the 1970s: a 6,000 square foot warehouse and an additional 1,000 square feet for the storage of hazardous chemicals.[11] In 1980, the architectural firm of Hellmuth, Obata & Kassabaum (HOK) was hired to prepare a master plan for further expansion of COMSAT Laboratories at the Clarksburg site. Following their plan, a "fifth wing" of 100,000 square feet (now known as the "fourth wing") was built in 1981-82 at the southwest corner of the complex. This four-story addition prompted the extension further south of the central spine and supplemented the office and laboratory space of the existing wings. Later on, a second phase of the HOK plan was implemented. The northeast wing was expanded and reconfigured to house a new cafeteria on two levels, the Development Engineering Division, and additional space for design and drafting, metal and carpentry, and shipping and receiving, in the Spring of 1982. A new Etching and Plating building was added to make printed circuit boards. An industrial wing was constructed adjacent to the ETL, the Model Shop building was expanded to the east, and a service court was defined on the east side of the campus, surrounded by Etching and Plating to the west, Shipping and Receiving to the east, and the new wing containing the Development Engineering Division. A 2000 square foot garage and grounds building was placed just outside the loop service road to the southeast.

Despite the fact that Pelli's original scheme for expansion was not implemented, nor was his firm called upon to design the additions, COMSAT Laboratories retains most of the integrity of Pelli's design. During the construction of the "fifth wing," Pelli's horseshoe shaped metal canopy at the south end of the central spine was removed and replaced by a new entrance. The public facades of the building, however—the north and west faces—are essentially unaltered. The west façade of the four-story HOK wing at the southern end of the building is distinct enough as a block that it does not detract from a clear reading of the original Pelli structure.

Exterior Description

Four basic ideas governed Pelli's exterior design for the COMSAT Laboratories. 1) The building was to be a "machine in the garden." 2) It featured a linear composition, with the principal spaces deployed to either side of a central spine. 3) Pelli used glass and aluminum and skin tectonics to produce the distinctive streamlined expression and shape of the complex. 4) All of these elements had practical dimensions but also projected the stated purpose of COMSAT Laboratories: "to be a place where research, experimentation, and construction of telecommunication satellites takes place."[12] The following description will touch on each of these ideas and will focus on the principal facades that give the complex its character: the north and west faces of the building.

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[11] COMSAT Laboratories, *Clarksburg Construction Program*, Hellmuth, Obata & Kassabaum, P.C., 1980.
[12] Pelli, "Architectural Form and the Tradition of Building," 29.

Linear Composition

In composition, the original COMSAT Laboratories consisted of rectangular masses deployed on either side of a central spine/corridor running north-south. Tightly enclosed in a sleek and apparently seamless glass and aluminum skin, the complex almost seems to hover above the indigenous Maryland countryside. Each mass—four regularly spaced wings to the west and four variously shaped and oriented wings to the east—was topped by a mechanical penthouse. The effect of the complex is of a space-age linear city isolated in a pastoral landscape. The contrast between the structure's mechanistic and forward-looking composition and the unspoiled fields and woods surrounding it was purely intentional. That machine in the garden motif prevailed whether viewing the complex from without or viewing the surrounding countryside through a series of transparent walls and walkways from within.

Construction Methods and Materials

The complex was constructed on "concrete spread footings with steel rigid frame construction in both directions."[13] The frame is completely internal, with concrete infill floors of metal decking cantilevering ten feet to the exterior walls."[14] The walls throughout were of a unitized construction based on a five-foot module. The principal elevations were of two types: 1) glass walls separated by thin, bright aluminum mullions for the corridors, lobby, library, cafeteria, rotunda, and northeast elevation, and 2) insulated aluminum panels with punched, rounded windows for the offices. Walls for the service, assembly, and testing spaces on the east side of the complex were of corrugated metal panels.[15]

The roof was built up with a vermiculite concrete finish. As the cross-section of the building shows, mechanical services were provided to the laboratory wings through symmetrical vertical shafts between the internal laboratories and the corridors on either side. Because each wing has its own mechanical penthouse, long ductwork runs could be avoided. All laboratories are served by a double duct system and office areas with an induction system and individual automatic temperature controls in each room. The basement area underneath laboratory wing contains equipment for 1,300 tons chiller capacity and 500 HP boiler capacity.[16]

Skin Tectonics

On the north and west facades as well as the central spine, western catwalk, and interior court elevations, glass and aluminum wall panels meld to form a tight, flush skin that appears to wrap around the roof and the corners.[17] The effect is airplane-like and it gives COMSAT Laboratories its sleek, futuristic aspect. There are three types of wall and window configurations that need to be described. The more straightforward consists of floor to ceiling glazing in clear glass separated by thin, bright aluminum mullions. The glazing is absolutely flush with the mullions. This treatment—on the northeast wing, exhibit pavilion, and central spine—affords a tremendous transparency offering excellent views to the exterior countryside and the interior courts. At the roofline, a curved aluminum parapet continues the effect of a taut skin wrapping over each element.

The second configuration—which applies to the exteriors and internal court elevations of the four western wings—is more complex. Still in a unitized design of five-foot modules, these walls consist of insulated anodized aluminum panels with smaller "punched"

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[13] Citation, n.p.
[14] Kautz, 8.
[15] Citation, n.p.
[16] "Aluminum Membrane," 77.
[17] Kousoulas and Kousoulas, *Contemporary Architecture in Washington, D.C.*, 252.

windows in 5/8 inch bronze tinted solar glass. The windows have curved corners and are set flush on the exterior side into an extruded aluminum sash. The exterior window edges where the sash member is attached to the aluminum panel are sealed by a continuous neoprene gasket.[18] On the office interiors, the openings are set back from a ledge, and resemble airline windows. These flat, glazed modules have been adapted "to accommodate special reinforcing and anchorage." Since a certain degree of thermal expansion was anticipated, "slotted panel attachment holes in the vertical steel support members provide for this movement." Each five-foot module is attached vertically, but not horizontally, to its neighboring panel; a special extruded "T" gasket seals the joint, when compressed by the panel installation. "The panels are insulated with glass fiber and internal vapor barrier."[19] Completing the effect of High-Tech skin, the walls are topped by a curved aluminum faced panel forming a parapet. Behind the parapet, the walls are continuously flashed; the parapet panels are then "set into a continuous aluminum channel."[20]

The third window and wall configuration is that of the dramatic western catwalk that stretches from the curved northwest corner of the administrative wing across all three laboratory wings. This is the façade visible from I-270 and responsible for communicating the High-Tech imagery of the complex to the public. The catwalk provides five-foot wide corridors on both the first and second stories that served as a secondary means of circulation (secondary to the central spine) for moving people and materials between the administrative and laboratory wings. Continuing the five-foot modular construction, the catwalk is comprised of two rows of ribbon windows of clear glass separated by thin, flush aluminum mullions divided by a horizontal row of aluminum panels between the stories. The top of the catwalk is crowned by the same curved aluminum parapet found on the other exterior and court facades. Below, however, the catwalk rests on a podium at each wing, but forms a bridge suspended across each courtyard space. This bridge-like effect, with curved aluminum panels reaching from the bottom of the glazing to underneath the catwalk, contributes powerfully to the High-Tech imagery of the complex and especially the sense that the structure is hovering aircraft-like and luminous over the beautiful Maryland countryside. The catwalk closed the courtyards but allowed them to remain visually open to those looking in from outside and to those looking outside from their office windows or from the glazed central spine.

Cesar Pelli was careful to specify materials and construction techniques and fittings for his window/wall configurations in order to maintain a streamlined, futuristic exterior design. To create a skinlike effect, he stipulated the direction and seamlessness of joints as well as the horizontality and continuity of line for each façade. Windows formed continuous bands while the aluminum skin turned over, under and around in a continuous wrapping of complex volumes.[21] Depending on the angle and the light conditions, one might take in the building as "a single streamlined shape and sometimes like a sequence of courts and wings."[22] The overall effect, however, was clearly a celebration of the promise of technological achievement.[23]

Interiors

Visitors not affiliated with COMSAT enter the building by walking past the glazed, cylindrical exhibition pavilion topped by a bold aluminum cornice and connected to the front entry by an aluminum canopy, forming a porte cochère. The interior of the pavilion was used for the display of global communications technology. Inside the main entrance to the complex, the lobby opens up into a two-story space, featuring a dramatic freestanding staircase to the south, fitted with a white metallic tubular railing that curves at the intermediate landing, reminiscent of an ocean liner. The lobby was originally sparsely furnished with modern chairs and tables and

[18] "Aluminum Membrane,' 77.
[19] "Technological Imagery," 74.
[20] Ibid.
[21] Special Cesar Pelli issue, *A&U*, Tokyo, July 1985, 29.
[22] McCoy, "Planned for change."
[23] Pelli, *A&U*, 29.

the occasional plant. It contains a painted wall mural (1978) by Terry P. Rogers, which shows COMSAT employees from the late 1970s undertaking the technical work of creating parts for and testing antennae and satellites. Sheer curtains protected the lobby from southern and western light streaming through the floor to ceiling curtain walls. The dominant color was white: white walls and ceiling, white staircase rails, and white 9-inch vinyl asbestos tiles. The lobby had a ceiling of acoustical tiles. Overall, the design effect was High Tech but utilitarian.

The central spine was a glass curtain wall corridor with balconies with railings designed like those in the lobby overlooking the corridor at the second story. The floors were a shiny linoleum. The corridor allowed tremendous views into the courtyards to the west and through the nearly transparent catwalk to the countryside beyond. The most dramatic design element in the glass corridor was a glazed, curved stair tower projecting into the first courtyard. These elements are all intact in the present building.

Wing 0, the first wing to the west, narrower than the other three, houses administrative offices. The principal two spaces of the administrative wing are more richly furnished than any other office spaces in the complex. The main conference room is wood paneled and furnished with high quality wooden office furniture. The overall effect is to produce a men's club-like atmosphere. Secondary and tertiary spaces in this wing are furnished with standard modular office furnishings. In the laboratory wings, the offices lining both the first and second floors were identical cell-like spaces with standard issue office furnishings: desks, chairs, shelves, and filing cabinets.

Of the wings to the east of the central spine, the most dramatic contained the Environmental Test Laboratory. A cavernous space, the ETL contained a roughly three story "high bay" on the eastern side and a lower bay to the west, topped by an enclosed second story balcony for observing activities in the high bay. An industrial space, the ETL contained a rolling crane and a freight elevator.

At the south end of the central spine is the employee entrance to the complex. The original entrance featured a long, horseshoe-shaped canopy ending from the rear entrance, past the end of the ETL wing and out toward the employee parking lot. This canopy is no longer extant.

SIGNIFICANCE

On September 10, 1969, Comsat Laboratories engineers and scientists were able to move into what was then the world's first research facility dedicated to communications satellite technology. The residents of Clarksburg, Maryland, a small village at the crossroads of the new I-270 highway and Route 121 had witnessed the construction for more than two years of what for many was a Space Age Wonder. Although the list of Comsat Laboratories accomplishments is extensive, the following . . . examples were vital: Comsat Labs personnel designed and flight qualified an experimental re-boost package on a 90-day schedule for installation in the Space Shuttle equipment bay to repair a satellite stranded in low, unusable orbit in 1990. The whole country watched as astronauts recovered the stranded satellite because of the work at Comsat Labs. The Lab personnel also developed the echo canceller, which provided the first commercially acceptable voice service over a satellite circuit. Finally, they developed the nickel hydrogen battery, which doubled the lifetime of satellites, a major economic achievement.

Recollections of Paul Schrantz, Former Vice President, Satellite Systems and Consulting, Comsat Laboratories.

The influences that were most in my mind at that time were not as much architectural, but aircraft construction and esthetics . . .. I was pushing the envelope of avant-garde ideas of the moment . . .. Perhaps the most significant aspect of this building is that it is now a very early example of high-technology design; an architectural direction that has become very strong, perhaps, dominate, in the last 20 years.

Cesar Pelli, speaking of the COMSAT Laboratories building he designed in 1967.

As stated in the Summary Paragraph of Section 8, the COMSAT Laboratories building in Clarksburg is "exceptionally significant" both from historical and architectural perspectives.[24] The fact that it exemplifies the advent of the civilian global communications age makes it exceptionally significant from an historical perspective under the themes of commerce, engineering, science and politics/government. In addition, the distinction of being a very early example of "High-Tech" architecture and a pivotal early work of Cesar Pelli's that went on to influence his future, award-winning work, make the building exceptionally significant from an architectural perspective under the same themes and that of architecture.

Pelli himself noted that the success of the design came despite the incredibly short period of time allotted for its design. COMSAT labs was designed in a month-and-a-half and construction on the building was started only five months after Daniel Mann Johnson and Mendenhall (DMJM, the firm for whom Cesar Pelli worked) was engaged. Specifically, the linear organization of the building reappeared in several later commissions (think of Washington National Airport) as did the "unitized construction" of its walls (i.e., the idea of a repeatable module, which at COMSAT, was five feet).

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[24] Language from the National Register of Historic Places, Bulletin 15, "How to Nominate Buildings to the National Register of Historic Places," a general model of preservation designation criteria.

Montgomery County Master Plan for Historic Preservation Criteria

The building meets many of the criteria for designation of historic structures according to Section 24A-3 of the Montgomery County Code. Specifically, the COMSAT Laboratories building meets the following criteria:

For Historical and Cultural Significance:

1a: Has character, interest or value as part of the development, heritage or cultural characteristics of the county, state or nation

The COMSAT Laboratories building represents the trend toward high-technology innovation in industry in Montgomery County, the nation, and international spheres.

1d: Exemplifies the cultural, economic, social, political or historic heritage of the county and its communities.

The COMSAT Laboratories building represents the advance of the commercial artificial satellite industry throughout the world. This advance was spearheaded, from a research and design perspective, in Montgomery County by the work undertaken at COMSAT Laboratories. The building has political origins tied to the actions of both Presidents Kennedy and Johnson. In addition, it helped define the economic heritage of the County for four decades.

For Architectural and Design Significance:

2a: Embodies the distinctive characteristics of a type, period or method of construction

COMSAT Laboratories represents the International Style in its design esthetic as well as an early example of the "High-Tech" architecture that came to define the corporate "campus."

2b: Represents the work of a master

COMSAT Laboratories is an early design by world-acclaimed architect, Cesar Pelli. He created the design as Director of Design for Daniel, Mann, Johnson, and Mendenhall (DMJM).

2c: Possesses high artistic values

COMSAT Laboratories epitomizes the "machine in the garden" ideal of a futuristic building set within a naturalized setting.

2e: Represents an established and familiar visual feature of the neighborhood, community or county due to its singular physical characteristic or landscape.

COMSAT Laboratories is the most easily identifiable building along the I-270 corridor in Montgomery County. It is the building that represents the fact that Montgomery County is an undisputed leader in high technology industry nationwide.

Though COMSAT Laboratories is admittedly a young resource - not yet 50 years old – the above-stated facts clearly indicate that the building exceeds the minimum requirements for becoming listed on Montgomery County's Master Plan for Historic Preservation, as well as meets the National Register of Historic Places' threshold for "exceptional significance" (Criterion Consideration G).

The Trail-Blazing Client: COMSAT and its Laboratories

The Origin of Artificial Commercial Satellites

The idea of artificial commercial satellites emerged with Arthur C. Clarke, a flight lieutenant in the Royal Air Force during World War II. In July 1945, Clarke submitted an article to *Wireless World* titled "The Future of World Communications." In it, he described the notion of artificial satellites, pointing out that if they orbited the earth at approximately 22,000 miles above the equator, they would take exactly one day to revolve around the earth. This starting point would make them appear to be stationary, or geosynchronous.[25] Clarke went on to postulate that these artificial satellites could be ferried to space by rockets. They would function there as manned space stations. Clarke suggested that just three such artificial satellites at specific longitudes could provide the capability for worldwide communication with extremely little power, most of it solar. For his thesis, Clarke received a $40 payment from the magazine. The irony of this small compensation is that Clarke accurately predicted the advent of the artificial communications satellite system, a billion-dollar industry.

Artificial commercial satellites, which Clarke dubbed "comsats," were initially developed for the American arsenal of the American-Soviet space race. Thus, comsats were a product of the Cold War. The space race began in earnest on October 4, 1957, when the Soviet Union successfully launched Sputnik I, the first artificial satellite. The United States responded the following year with its own launch of Explorer I, an artificial satellite that led to the discovery of magnetic radiation belts surrounding Earth. Building upon this success, President Eisenhower signed the National Aeronautics and Space Act in 1958, creating a government agency to spearhead these efforts. In 1959, Eisenhower announced:

> With regard to communication satellites, I have directed the National Aeronautics and Space Administration to take the lead within the executive branch both to advance the needed research and development and to encourage private industry to apply its resources toward the earliest practicable utilization of space technology for commercial civil communications requirements.[26]

President Kennedy's and Johnson's Contributions

But it was the Kennedy Administration that established the *commercial* satellite industry. In 1961, Kennedy gave a speech to a joint session of Congress outlining a three-point space program that included: 1) landing a man on the moon during the 1960s, 2) developing rocket engines to launch satellites into the outer atmosphere, and 3) creating a global communications satellite system. The latter two points were crystallized with the President's signing of the Communications Satellite Act on August 31, 1962. After much deliberation, the administration decided that a publicly initiated private corporation would best serve a global communications satellite system. COMSAT, the entity created to develop artificial commercial satellites, became the first privately owned, profit-seeking corporation chartered by Congress. During the years 1961 to 1962, President Kennedy was directly involved in

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[25] See Michael Tedeschi *Live Via Satellite* by Anthony (Washington, D.C: Acropolis Books, Ltd), 1989. The exact altitude for a three-way, geosynchronous orbit for global communications turned out to be 22,300 miles, a number intentionally used as COMSAT Laboratories' Clarksburg address. (Comsat is located at 22300 Comsat Drive.)
[26] U.S. Department of State, *Department of State Bulletin*, January 16, 1961, p. 77.

the creation of COMSAT. Even prior to the enactment of the 1962 legislation, Kennedy lobbied skeptical members of Congress insisting that global satellite communications would be most achievable through the framework of a privately owned, Congressionally chartered corporation. The President contended that a statute was "required to provide an appropriate mechanism for dealing effectively with this subject – a subject which, by nature, is essentially private enterprise in character but of vital importance to both our national and international interests and policies."[27] His brother, attorney general Robert F. Kennedy, also promoted the notion, claiming that the statute authorizing COMSAT was necessary because of the already large public investment in spacecraft and the greater assurance it provided that technology would be shared globally. Attorney General Kennedy summarized COMSAT as playing a "unique and important national role in our overall foreign relations and space effort."[28]

The 1962 Communications Satellite Act gave the President of the United States the right to continuously review all aspects of the corporation and to "exercise such supervision over relationships of the corporation with foreign governments . . . ."[29] President Kennedy was directly involved in the selection of several of COMSAT's first executives and board members. President Kennedy named as President his former Under Secretary of the Air Force Dr. Joseph Charyk, and nominated COMSAT's first Board of Directors on October 15, 1962. Directors included heads of large research-oriented companies (such as the President of California's Kaiser Corporation), attorneys, and the Vice-President of United Auto Workers-CIO in Detroit. A close friend, Philip L. Graham, the President of the *Washington Post* media group, acted as chair; in her widely read memoirs, his wife Katherine recalled her husband' s involvement with COMSAT at the President's request while Graham was publisher of *The Post*:

> In October, Phil took on a job that changed both our lives and sped us up even more. He accepted an invitation from President Kennedy to serve as an incorporator of the Communications Satellite Corporation, known as COMSAT, with the understanding that he would be elected to head it, and in mid-October he was appointed chairman of the group. COMSAT was a groundbreaking public/private organization, half government, half-telephone company. Getting it launched – in essence, translating an exciting vision into a working, financially viable organization – was a full-time job, requiring massive organizational skills, infinite tact and patience, and a huge amount of time and energy. It was not what Phil needed at that time, but it was what he wanted – an irresistible temptation to be engaged in an exciting venture that would, in fact, alter the shape of the world.[30]

One of the first tasks of the American board members, people like Leo Welch, retired chairman of the Standard Oil Company of New Jersey and Dr. Charyk, was to meet with European and Canadian business and political leaders to hammer out exactly how the new technology could be developed within the framework of a single, international system. The system was put in place to have COMSAT (the United States' agent) and INTELSAT (the international body) as the two primary entities overseeing product development that related to the United States' commercial market. By 1967, INTELSAT would be composed of 58 nations with the U.S.-owned COMSAT owning over 50% of its stock.

Well-known and politically connected people were a part of COMSAT Laboratories from the beginning. Phillip Graham would become a frequent visitor to COMSAT laboratories over the years, along with Barry Goldwater. After Kennedy's assassination, Lyndon Johnson appointed Clark Kerr (a university president), George Meany (union leader) and Frederick Conner (ex-chairman of the board of a major corporation) to the Board of Directors in September 1964. Lyndon Johnson took up the charge of overseeing the global telecommunications industry. On July 23, 1964, COMSAT announced that it would bring live television images of the 1964 Olympics from Tokyo to the United States acting on a request by the State Department. In another significant early advancement,

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27 Lloyd D. Musolf, *Uncle Sam's Private, Profitseeking Corporations: COMSAT, Fannie Mae, Amtrak, and Conrail*. Lexington, Mass.: Lexington Books, 1983, p. 18.
28 *Ibid*, p. 23.
29 *Ibid*, p. 20.
30 Katherine Graham, *Personal History* (New York: Vintage Books), 1997, 295.

President Johnson placed the first formal international commercial telephone call via the Early Bird satellite to political leaders across the Atlantic Ocean on June 28, 1965. Also known as Intelsat I, it established the first transatlantic satellite communications service, since its stationary orbit facilitated its use by stationary ground receivers. Other satellites were in orbit over all parts of the earth, resulting in the global network of satellites, which provided the worldwide coverage of the lunar landing.

A Laboratory Building Tailored to the Satellite Revolution

COMSAT was officially incorporated on February 1, 1963. Its headquarters were initially located at 3100 Macomb Street in Northwest D.C., in "Tregaron," a stately mansion designed by Charles Platt, the architect of the Freer Gallery of Art, whose previous owners included the former ambassador to the Soviet Union, Admiral Joseph Davies and his wife, heiress Marjorie Merriweather Post. In 1964, COMSAT moved its offices from Cleveland Park to a more central location, at 1900 L Street, N.W. The technical staff and satellite control center were located at 2100 L Street, N.W. In June 1968, the headquarters were once again moved, to L'Enfant Plaza. In 1967, COMSAT decided to build separate laboratories and Clarksburg, Maryland, 30-odd miles north of the city, was selected. It would be the laboratories – not the headquarters - that ultimately would symbolize the futuristic nature of the corporation.

COMSAT was responsible for developing a global satellite communications system, the acquisition and maintenance of ground stations around the world, and the development of new satellite technologies. In 1964, the company joined forces with similar organizations in seventeen countries to create the International Telecommunications Satellite Consortium, or Intelsat, in the hope of creating a global commercial communications network. COMSAT established a strong presence in other parts of the United States and in countries throughout the world. By December 1966, its tracking, telemetry and command station at the Paumalu, Hawaii Earth Station entered commercial service. Similar facilities were erected in Etam, West Virginia and Cayey, Puerto Rico (both placed in service in January 1969), as well a s in Fucino, Italy; Andover, Maine; Jamesburg, California; and Carnavon, Australia.

By 1967, the "FCC reduced COMSAT's ownership interest in the U.S. stations from 100 percent to 50 percent, with the remaining 50 percent to be divided variously among other U.S. international carriers."[31] In May 1967, COMSAT "commenced full commercial operations" and realized its first profits by the end of the year. [32] By 1970, the Intelsat system provided "much of the world's transoceanic telephone and record communications."[33]

The Board recruited the top scientists from around the world to fill key positions at COMSAT Laboratories. A huge proportion of the staff had earned their doctoral degrees in math, engineering, and physics.

From the beginning, COMSAT played a pioneering role in the advancement of the global communications industry.[34] The significance of COMSAT Laboratories' contributions to science and technology cannot be overstated. Every single satellite that COMSAT or INTELSAT contracted had, at a minimum, its design reviewed and its components tested at COMSAT. Always focused on research and development for the global communications satellite system, the company awarded the contracts to actually build artificial satellites to allied private companies from the earliest days of the venture. This arrangement proved beneficial to all involved, for AT&T, RCA, Hughes Aircraft (now Boeing) and the like all had huge stakes in the success of the commercial satellite industry. At the company's first stock offering on May 26, 1964, the following "authorized carriers" were allowed to buy stock prior to the June 2nd

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[31] *Comsat at 10*, 18.
[32] Ibid., 20-21.
[33] *Comsat at 10*, forward, no. pag.
[34] For a thorough history of COMSAT, see Anthony Michael Tedeschi, *Live, Via Satellite*: The Story of COMSAT and the Technology that Changed World Communication, Washington, D.C.: Acropolis Books, Ltd., 1989.

public offering: AT&T, International Telephone & Telegraph, RCA-Communications, Press Wireless (owned by the New York Times, New York Herald-Tribune and Time, Inc.), and General Telephone & Electronics. News reports indicate that by June 2nd, the company had "attracted so much publicity, glamour and general awe that several thousand people rushed to their brokers clamoring for the stock."[35]

COMSAT had multiple, well-organized divisions that focused on satellite design and testing. COMSAT Laboratories was responsible for transmission system design and analysis, interference analysis, system architecture development, system design evaluation, traffic and protocol modeling, network simulation, terrestrial user interfaces, and specification development. In sum, COMSAT Laboratories undertook every aspect relating to satellite design short of physically building the satellite. COMSAT's early goals were to develop high-orbit and medium-orbit artificial satellites. For the latter, COMSAT worked with AT&T, RCA, Thompson Ramo Wooldridge and ITT.

The first contract to build an experimental-operational synchronous satellite for high altitude was let by COMSAT in the spring of 1965 to Hughes Aircraft. The resulting first commercial satellite in geosynchronous orbit designed specifically for commercial use was dubbed the "Early Bird" (later known as Intelsat I). This high-orbit satellite had the capacity to provide up to 240 high-quality telephone voice circuits or black-and-white television, facsimile, and other types of messaging. The impact of the Early Bird's capacity to project live television images from around the world to Americans in their homes was enormous. On May 3, 1965, The Today Show became one of the first television shows in history to broadcast images live from the Hague, Brussels, Paris, Rome, and London via the Early Bird satellite. Because of its incredibly ambitious and successful program, the Early Bird's launch on April 6, 1965 established COMSAT as the world leader in global satellite telecommunications. Following the Early Bird there was the Lani Bird, which provided telephone circuits between the United States and Hawaii and was successfully launched in early 1967 (dubbed Intelsat II).

COMSAT needed a building for the research, development, and production of communications satellites. This program raised many challenges. The spaces had to fulfill highly specialized functions, but had to adapt to new technologies. Furthermore, the entire structure had to be able to be expanded easily to accommodate future functions. The frenetic pace of the space race required all plans to be prepared in five months. The design phase lasted only one month, with the remaining four months devoted to the preparation of construction documents. The $7.8 million budget was also fairly limited, requiring a simple, functional design. The structure was completed on time and within the budget, the original building costing $ 9,257,793, including lab equipment.[36]

COMSAT's satellites continued to make television images available to viewers from the far reaches of the globe. By 1969, COMSAT's research and testing work was all being done out of its new Clarksburg facility, which had been built to house 300 employees in 250,000 square feet of space. On July 20, 1969, both COMSAT and INTELSAT broadcast the televised image and voice of Neil Armstrong as he took his famous strides on the surface of the moon. Successes like these resulted in COMSAT's receiving an Emmy award for significant achievement in television research and development.

A continuing avenue of research for COMSAT Laboratories was the refinement of ground earth stations, or antennae, to increasingly smaller sizes. The company developed not only satellite dishes that could be stowed away in suitcases, but also flat plate antennae that could be mounted on walls or patios. COMSAT also refined the capability of one antenna to simultaneously access multiple satellite transmissions. The Torus Antenna, located today on the east lawn of COMSAT Laboratories, is an example of such an antenna.

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35 "Stock of Satellite Corporation Stuns Experts with Sharp Rise," *New York Times* (August 7, 1964), p. 33.
36 "Imagery," 71.

COMSAT Laboratories also had an entire department devoted to the creation of antennae, or satellite dishes, for space, ground and mobile applications. The mobile satellite dishes created for these purposes provide clear communications between ships to each other and ships to shore, not only for the defense industry, but also for maritime and luxury cruise industries. The most famous sea-related COMSAT satellite user was Jacques Cousteau, who used the company's products on his ship, the Calypso, in 1975-76 and came to Clarksburg to speak before COMSAT's employees.

Other signature innovations developed by COMSAT Laboratories include: videoconferencing, direct TV, the echo suppressor and echo canceller, and the hydrogen-nickel oxide battery that extended satellite battery operating power enormously. In 1997, COMSAT Laboratories was inducted into NASA's Space Technology Hall of Fame for its Advanced Communications Technology Satellite (ACTS) program. The Laboratories hold over 100 patents and have an additional 70 or so that have been filed. These patents cover the following technologies: asynchronous transfer mode (ATM), Frame Relay, and Internet Protocol (IP) via satellite; modem, coding, and encryption; voice and video encoding; voice and video encoding; flat plate and phased-array antennas; microwave filters and components; space-qualified batteries; multiple-access techniques and synchronization; C, X, and KU-band active phased arrays for reconfigurable multiple-beam satellites; and onboard digital signal processing. The Hubble space shuttle batteries were developed and tested at COMSAT and spacecraft that encounter problems were diagnosed at COMSAT via Destructive Physical Analysis, or DPA.

The significance of the Laboratories' contributions to global communications is enormous. As an indicator of the company's impact, the Library of Congress, Motion Picture Division, will be accessioning the company's video stockpiles to its archives after transferring them to film. The Smithsonian's Air and Space Museum also has expressed interest in an exhibit on the company's achievements.

COMSAT Laboratories as Harbinger of Development along the Interstate-270 Corridor

On the last day of 1973, the front page of the *Washington Post* featured an article entitled "I-70S: How Cow Country became Corridor City." The introduction read as follows:

> In the late 1940s, Maryland State Roads Commission engineers drew a line on a Montgomery County map with a new high-speed road nearly 23 miles long between North Bethesda and the Frederick County border. The land on either side of that line was then mostly a rural expanse of dairy farms broken only by a few relatively small towns like Rockville, Gaithersburg and Germantown. The strip of Montgomery County is much different today. In the more than two decades since state road engineers designated the path of their new highway - now Interstate 70 S, six lanes wide in some places - it has become the backbone of a bustling corridor city of some 130,000 residents, plus 720 private businesses and nine federal agencies with 37,800 jobs. Where cow had grazed and barns had dotted the countryside, there are now corporate offices for firms like IBM and Comsat and sprawling federal campuses for agencies like the National Bureau of Standards and the Atomic Energy Commission.[37]

COMSAT Laboratories, located at the northernmost section of the "corridor city," was a major benchmark in changing the face of upper Montgomery County. And as Montgomery County stepped into the twenty-first century, the "High Technology Corridor," the beginnings of which are discussed next, "housed more than 500 major companies, rivaling California's Silicon Valley and Boston's Route 128 in many ways."[38]

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[37] Kenneth Bredemeier, "I-70S: How Cow Country became Corridor City," *Washington Post*, December 31, 1973, A1.
[38] Jane Sween and William Offutt, *Montgomery County: Centuries of Change*, Sun Valley, California: American Historical Press, 1999, 142. Among companies which moved to the corridor after COMSAT, the authors mention the Marriott Corporation, the Food

Before it was relocated and widened (in five stages, in a southerly direction, from 1953 to 1960), U.S Route 240, from Frederick to Washington, was known as the Washington National Pike; in 1959, it was renamed Interstate 70-S. The I-70 S (now Interstate 270) corridor was designed to link Frederick in a *southerly* direction with Rockville, but quickly emerged as a way for Washington government and industry to move *northward* from the capital. Its unique strategic location was reinforced with the completion of the Beltway (I-495) in 1964.[39]

The idea of radial growth corridors for the Capital Region, separated by wedges of low density housing and open space, was expounded in the 1961 *Policies Plan for the Year 2000* prepared by the National Capital Planning Commission and National Capital Regional Planning Council. This diagrammatic proposal focused on European-style "finger plan" growth, with radial corridors of new town centers separated by undeveloped natural wedges and low density housing, was only partially implemented, and at a much reduced scale. It nonetheless informed development along I-70S.

However, Cold War policies seem to have played a more significant role in shaping the I-270 corridor than utopian planning diagrams. With the notion that a single nuclear bomb could devastate central Washington, D.C., the United States government began spreading out its agency headquarters as early as 1945. The construction of the Naval Surface Warfare Center at White Oak in Silver Spring in the eastern part of the county signaled the first of these Cold War moves. Erected for the most part before 1954, the White Oak complex employed some of the world's top scientists and was located not only for its convenient distance from the capital, but because the partially wooded site provided uniform magnetic fields.

Over the course of the next ten years, upper Montgomery County - less populated and more affordable than the Bethesda-Silver Spring-Wheaton areas - would become a highly desirable location for high-technology government agencies with either or both an interest in a campus setting and a preference for headquarters close to, but outside of the city's core. In November 1957, President Eisenhower dedicated a new $13.3 million headquarters for the new Atomic Energy Department at Germantown near the interchange between State Route 118 (Germantown Road) and Route 240. The agency, which counted 1600 employees at the time, was responsible for all aspects of nuclear research, both for weaponry and civilian industries.

The buzz around AEC's move to "cow country" triggered, and necessitated, new zoning and planning strategies, as well as provision for new sewers and public schools. In 1956-57, the County Council commissioned to Planning Consultant Dorothy A. Muncy, Ph.D., a report listing sites ranging from 100 to 300 acres that would be appropriate for "prestige" industrial compounds scattered in upper Montgomery County. Among the sites meeting "the requirements of terrain, access to transportation and to existing and planned public utilities," two were located at the Clarksburg interchange, where COMSAT would elect to build its headquarters a decade later.[40] At the request of the County Council, Hugh Pomeroy, the planning director for Westchester County, N.Y., issued a guide for a 52-square mile area north of Rockville, embracing Germantown and Gaithersburg. Pomeroy's report also called for "designated sites for possible industries" and "extensive lands for public recreation."[41]

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and Drug Administration, NOAA, the Nuclear Regulatory Commission and Computer Data Systems. An earlier, albeit far less spectacular, High-Tech concentration in the state of Maryland can be found in Howard County's tiny town of Clarksville, located approximately half-way between Baltimore and Washington and easily accessible from route 29. It is where Johns Hopkins University moved its Applied Physics Laboratory (engaged in guided missile research) in 1954, designed by Voorhees, Walker, Smith and Smith and expanded five years later. In 1958, using the same architects and a nearby location, W.R. Grace & Company (based in Florida) opened a 96,000 square-foot industrial chemical research center, consisting of laboratory buildings and supporting facilities.

[39] In the early 1960s, projects to continue I-70S beyond the Capital Beltway (I-495) toward the District of Columbia were banned by Congress.

[40] Jeff O'Neill, "'Prestige' Industry Zone Urged," *Washington Post*, November 27, 1957, A 11.

[41] "County Growth Guide Offered," *Washington Post*, May 29, 1957, B4.

In July 1956, the National Bureau of Standards (presently National Institute of Standards and Technology) purchased a large tract of land four miles south of AEC, close to the interchange between Routes 240 and 124 (presently Quince Orchard Road), just south of what was then the Gaithersburg town boundary. In early 1957, the General Service Administration announced that plans for new office and research facilities had been entrusted to Voorhees, Walker, Smith and Smith, a "firm specializing in large research centers."[42]

In the word of its director, Dr. Allen V. Astin, NBS was moving away from its once pastoral site on Connecticut Avenue and Van Ness Street in the District of Columbia "for the same reason our predecessors chose the present headquarters in 1901 - a rural area that's accessible to the city." NBS' second in command added: "We must be in an area that's reasonably free from industry … as smoke, noise and vibration would affect seriously the precise weights and standard measurements we must make."[43] Construction started in 1959, first with the nuclear radiation facility and second with laboratories to measure the weight and thrust of U.S. satellites. From 1963 to 1967, NBS gradually moved into its new 550-acre campus, which cost tax payers $ 115 million. Its presence was undoubtedly an incentive for COMSAT's purchase of acreage a few miles further north.

Slightly further south of NBS, development started at the crossing of Shady Grove Road and I-70s in the late 1950s and became the talk of the town when developer Sam Eig decided to erect a 26-story apartment tower amidst the links of the Washingtonian Golf Course. Designed by Loewer Sargent and Associates and completed in 1966, the Washingtonian Towers (a second identical structure was planned but not built) followed the model of the "tower in the park" dear to Le Corbusier, the modernist master architect. It served as a stunning (albeit architecturally unremarkable) vertical marker for sprawling low-rise commercial and corporate structures clustering on the Gaithersburg section of the I-70S corridor. In addition to the Bureau of Standards, Eig's tower was near the office building (designed by Curtis & Davis, in association with Donald B. Coupard), which the International Business Machines Corporation opened in 1966, to "unite about 1200 IBM employees scattered at nine leased sites in Rockville and Bethesda." [44] The Washington Towers was also in close proximity to sites recently purchased by the Bechtel Corporation and Eastman Kodak.[45] In 1968, while COMSAT was under construction, IBM announced the erection of an even larger adjacent office structure, designed by the Architects Collaborative, the Boston firm founded by modernist master Walter Gropius. Despite the fact it had been designed by two firms with a distinguished track record, the resulting opaque and formless compound offered none of the elegance and excitement provided by Cesar Pelli's design for COMSAT Laboratories.[46]

Prior to the erection of COMSAT Laboratories, there was only one significant industrial and corporate compound located north of the Atomic Energy Commission site. It was built for Fairchild Industries (or Fairchild-Hiller) in Germantown. While Fairchild was in the business of airplane manufacturing and, later, satellite and related electronics work, it is COMSAT Laboratories that holds the distinction of being the first private building on the corridor to use a completely High-Tech esthetic for its architecture. Fairchild's is an industrial plant largely devoid of exterior architectural interest. It consists of a pod-like development of four buildings on the west side of I-270, anchored by two surface parking lots and a private short takeoff & landing (STOL) runway of 600 feet. Unlike COMSAT, which is light and airy, the square Fairchild buildings are low to the ground and opaque.

[42] "GSA Names Designers for Standards Center," *Washington Post*, January 25, 1957, B4.
[43] Herry Kluttz, "Bureau of Standards Is Going Back to Its Pastured Peace of Early Days," *Washington Post*, November 30, 1958.
[44] "Plans Set for IBM Gaithersburg Unit," *Washington Post*, May 31, 1965, D10. IBM purchased the site in 1962.
[45] John B. Willmann, "Sam Eig Hits New Peak In Apartment Living," *Washington Post*, April 2, 1966, F7. the full-scale implementation of Washingtonian Center - a mixed-use development - was undertaken in the 1980s and 1990s.
[46] "New Area IBM Facility to Employ 1200," *Washington Post*, June 6, 1968, C8.

When COMSAT moved to Clarksburg, this unincorporated community had less than 2,000 residents and zoning prescribed minimal residential lots of two acres. In 1967, a preliminary master plan prepared for M-NCPPC by Marcou, O'Leary and Associates called for "industrial strip development along 70S, small lot subdivision zoning and garden apartments and town houses. Public Park space is to be provided by the projected Little Seneca Regional Park which takes the southern end of the planning area." Additionally the plan recommended the widening of I-70S to six lanes and the construction of "rapid transit lines at least as far as Germantown."[47] Adopted in the 1968, the *Clarksburg and Vicinity Master Plan* was more realistic: it was meant to guide Clarksburg's growth "from its present rural character to a small town rather than a Corridor City." In fact, land use recommendations in the 1968 Master Plan were not fully realized because "public policy discouraged the extension of public water and sewer service … in order to encourage development south of Clarksburg, in Germantown or Gaithersburg." Many zoning changes were not adopted, and the new master plan of 1994 is striving to preserve a "town scale of development" as well as farmland and historic resources.[48]

Suburban and Exurban Corporate Design in the United States

Pelli's Comsat stands squarely in the camp of outstanding research commissions undertaken by master architects of the Modern Movement. Architects approached these projects in a manner of ways, depending upon the program. If laboratories were located in the same compound as head offices, they could be fairly lavish and spectacular. A case in point is the research tower (1945-1949) Frank Lloyd Wright designed adjacent to the Johnson Wax Administration Building (1936-39) in Racine, Wisconsin. If erected separately, laboratories were generally built economically and adopted streamlined, mechanical forms; however, both corporate clients and designers were aware that highly qualified lab workers demanded pleasant and hospitable surroundings and decent services, such as a well-lit cafeteria. After World War II, companies involved with state-of-the-art technology started to establish office and research centers in the far suburbs or the countryside. Decentralization was dictated by security reasons; to minimize land cost ; and for the benefits of employees, who enjoyed restful surroundings and worked close to their suburban homes.

Eero Saarinen, Cesar Pelli's long-time employer, played a considerable role in giving form to the corporate and research campus. Monumental and dignified, a Versailles for high technology, his General Motors Technical Center in Warren, Michigan (1948-56) is an epochal work, which inspired many laboratory designers to group rectangular wings along open landscaped courtyards, to use angular profiles and crisp detailing in metal and glass. It included a glazed elevated breezeway, which anticipated COMSAT's catwalks.[49] At GM, Saarinen used a standard module for all the buildings, and "embraced a new thin-skin technology based on car-manufacturing techniques. Technical innovations included development of a thin, porcelain-faced sandwich panel serving as both exterior skin and interior finish … and the use of neoprene gaskets for all window glazing, modeled on the system used for the installation of car windscreens."[50]

An elegant interpretation of the GM model was IBM's Engineering & Development Laboratory in Poughkeepsie, N.Y., designed by Elliott Noyes and Associates and completed in 1956: it featured a two-story glass bridge connecting the wings. [51]Another is the research lab and office building designed by Skidmore, Owings and Merrill for Wyeth in Radnor, PA.[52] The Thomas J. Watson Research Center (1956-61), which Saarinen designed for IBM in Yorktown Heights, N.Y., was a crescent-shaped structure - one side

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[47] Thomas W. Lippman, "Clarksburg Seen Housing 75,000 Residents in Future", Washington Post, June 1, 1967, E 4.
[48] Maryland-National Capital Park and Planning Commission, *Approved and Adopted Clarksburg Master Plan & Hyattstown Special Study Area,* 1994.
[49] Reproduced in Allan Temko, *Eero Saarinen,* New York: Braziller, 1962, p. 19, fig.24.
[50] Peter Papademitriou, 'Saarinen, Eero', *The Grove Dictionary of Art Online*, (Oxford University Press, Accessed 25 October 2004), <http://www.groveart.com>
[51] See *Architectural Forum*, February 1957, 111.

entirely glazed, the other principally of stone - where circulation was rejected at the periphery. Although this extraordinary "machine in the garden" was not a direct inspiration for COMSAT Laboratories, it certainly emboldened Cesar Pelli to leave the beaten paths of laboratory design. One new direction he decided not to take was the "fortress look" adopted by some companies, out of programmatic or functional necessity or for budgetary or aesthetic reasons. Opaque, "brutalist" exteriors were rarely pleasing to the eye; one exception was Philadelphia architect Vincent Kling's award-winning Molecular Electronic Division for Westinghouse Electric Corporation, located in Maryland's Anne Arundel County, within view of the Baltimore-Washington Parkway.[53]

The Designer, Cesar Pelli, and his Associates

For its new laboratories, COMSAT hired Daniel, Mann, Jackson, Mendenhall (thereafter referred to as DMJM) headquartered in Los-Angeles, in great part because of the familiarity of this large architecture and engineering (A/E) firm with space race-related programs and its excellent track record in project management. COMSAT also gained the services of a uniquely cosmopolitan and gifted architect, in the person of DMJM's Director of Design for domestic operations, Cesar Pelli.[54]

Cesar Pelli was born in San Miguel de Tucuman, Argentina, in 1926 and earned a Diploma of Architecture from the National University of Tucuman in 1949, where his schooling was influenced by the teachings of the French architect Le Corbusier and the Congrès Internationaux d'Architecture Moderne (CIAM). [55]The following year, while in the employ of a government organization, he married Diana Balmori, a landscape architect who has achieved professional prominence in the United States. In the late 1940s, Argentina boasted a sizable number of progressive and talented architects, aware of the pitfalls of functionalism and yearning for a more humanistic and contextual form of modernism. Pelli stressed that he enjoyed the "great intellectual effervescence" surrounding his studies.[56] In the *Contemporary Architects* encyclopedia, Pelli acknowledges to have been influenced several of his professors: Jorge Vivanco (1912-1990, a member of the avant-garde Grupo Austral), Eduardo Sacriste (1905), who was the leading modernist figure in Tucuman, and the renown Italian architect Ernesto Rogers (1909-69 BBPR).[57]

In 1952, Cesar Pelli moved to the United States to study at the University of Illinois at Urbana-Champaign, from which he received a Master of Science degree in Architecture two years later. Upon graduation, he found employment as Associate Architect for Eero Saarinen and Associates, one of the country's most prestigious firms, based in Bloomfield Hills, Michigan. Pelli acted as project designer for two masterworks: the TWA Terminal (1956-62) at Idlewild (now John F. Kennedy) Airport, New York, and for the Samuel B. Morse and Ezra Stiles colleges (1958-62) at Yale University. The two designs have apparently little in common, the "expressionist" airport building reminiscent of a bird in flight; the dormitories evoking "the image of a medieval community of scholars."[58] Working for such a protean employer, Pelli learned how to be both demanding and pragmatic:

> Never directly committed to the International Style, Saarinen' s systematic, almost engineer-like insistence on analyzing the nature of a project suggested the possibility of an autonomous architecture for each building, a concept of "the Style for the

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[52] See *Buildings for Research*, New York City: F.W.Dodge Corporation, 1958, 105-110.
[53] "Miniature Circuits," *Progressive Architecture*, November 1964, 158-161. See also "Turreted Modules for Ultra-fine Manufacturing," *Architectural Record,* July 1964, 165. The design received and Award of Merit from the Baltimore Association of Commerce and Baltimore Chapter of the AIA.
[54] DMJM also had a Director of Engineering.
[55] Cesar Pelli, "Transparency - Physical and Perceptual," *A+U* 71 (November 1976), 77
[56] Pelli interviewed by Michael Crosbie, in *Cesar Pelli : selected and current works* Mulgrave, Victoria : Images Pub. Group, 1993, 7.
[57] Muriel Emanuel, ed., *Contemporary Architects*, New York : St. Martin's Press, 1980, 613.
[58] Peter Papademitriou, 'Saarinen, Eero'

Job". He sought to direct contemporary technology in diverse architectural expressions to the advancement of the symbolic and environmental content of that tradition through the exploration of special architectural vernaculars for each project.[59]

In 1961, Saarinen died unexpectedly and Kevin Roche, a longtime employee, took charge of the office, which was named after him five years later. Cesar Pelli realized it was time "to make his own architectural decisions."[60] In 1964, he moved to Los Angeles to become Director of Design at DMJM, in the company of another former Saarinen employee, Anthony Lumsden, who was born and trained in Australia and became his assistant. The pace at which essentially utilitarian projects needed to be delivered was dramatically faster than for Saarinen's prestige commissions, and construction budgets were far less generous, but Pelli rose to the challenge and enjoyed having so many in-house services, and a close relationship with DMJM's engineering department.

DMJM finds its origins in 1945, when architects Philip Daniel, a graduate of the University of Southern California, and Arthur Mann, trained at the Beaux-Arts Institute of Design and the Chouinard Art School, established an office in Santa Maria, California. They were soon joined by S. Kenneth Johnson, another USC architecture graduate. In 1947, sensing major opportunities for work in this city, the young firm moved to Los Angeles, as did one of their professional acquaintances, civil engineer and UC-Berkeley graduate Irvan Mendenhall. The Daniel, Mann & Jackson firm officially merged with that of Mendenhall in 1949.

In its first years, DMJM produced its share of public schools, necessitated by Southern California's migratory and baby boom: grouping elementary, junior and senior high schools, the sprawling plant for Culver City, illustrated by *Architectural Record* in November 1951, as well as the Seaside School in Torrance, published by *Progressive Architecture* in September 1952, demonstrate a good command of the modernist syntax. However, the multi-disciplinary A/E firm had greater ambitions and began attracting a variety of significant public and corporate clients. DMJM specialized in large scale construction, as evidenced by its "Wonder Palace" convention center in Anaheim.

DMJM's involvement with space age activities started in 1954, with the construction, in Santa Susana, Calif., of a rocket engine test stand for the U.S. Atomic Energy Commission. On the same site, the firm also built an atomic accelerator and facilities for the storage and disposal of radioactive waste. In 1958, DMJM (in joint venture with The Rust Engineering Co., Leo A. Daly Co., Architects and Engineers and Hanger-Silas Mason Co., Inc., engineers and Contractors) was asked to establish "design criteria for all U.S. training and operational bases for the Titan I missile program."[61] DMJM designed several launch pads, including at Cape Canaveral, as well as the Donald W. Douglas Engineering Development Center in Huntington Beach, a compound of nine buildings on 245 acres built for the Missile and Space Systems Division of the Douglas Aircraft Company.[62]

As "DMJM became more and more involved in the design of missile bases, it became apparent to the firm that it needed to provide itself with capabilities for research and development work in the fields of the missile themselves, and the related sciences." It decided to acquire an existing company, Systems Laboratories, Inc., which performed "research, consulting work, and development work in aeronautics, nucleonics, missile systems, automatic control and computer systems, physics, chemistry, mathematics, and similar fields." Other major commissions included master plans for several U.S. Air Force bases, urban renewal proposals for several cities in California (including Santa Monica and Sacramento) and a flood and water supply study on behalf of the Southern California Rapid Transit District. DMJM was also involved in the design of zoological parks, including the Great Flight Cage at the National Zoo in

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[59] Ibid.
[60] Cesar Pelli, quoted in Esther McCoy, "Reflections on Cesar Pelli," *A+U*, July 1985, 15.
[61] Clinton A. Page, "Names [The firm of Daniel, Mann, Johnson and Mendenhall] *Architecture and Engineering Record* 9 (June 1967), 104.
[62] "Space Industries' Demanding Criteria," *Architectural Record* (July 1964), 169.

Washington, D.C. In addition, many commissions for corporate offices and public works (road or flood control) went its way.[63] In 1960, as DMJM had "performed professional services for well over $ 2 billion of construction," the partnership was transformed into a corporation, which extended its reach to industrial engineering (statistics, electronics) and real estate activities.[64] By the time the COMSAT commission was under construction, DMJM had offices in Washington, D.C, San Francisco, Portland, Las Vegas, as well as in Hawaii, Venezuela, Vietnam, England, Thailand and Indonesia.

Before hiring Pelli and Lumsden, DMJM's reputation was based less on design excellence than on the diversity and quality of its services. Pelli's designs earned DMJM many accolades from the architectural press and profession. In 1966, the "megastructural" Urban Nucleus for Sunset Mountain Park in Santa Monica (commissioned by the Sunset International Petroleum Corporation, but never built) received a First Design Award from the magazine *Progressive Architecture* - the highest distinction granted in this prestigious, peer-reviewed competition and the only award of this kind given that year. The city's spectacular renderings found their way (with a very positive description) in the prestigious French journal *L'Architecture d'Aujourd'hui* in 1967. *Progressive Architecture* also published Pelli's and Lumsden's colorful and glamorous vaulted interiors for the Jewelers Center on Beverly Hills' Wiltshire Boulevard, Pelli's powerful entrance for the Third Street Bunker Hill Tunnel, and the Worldway Postal Center at Los Angeles International Airport, completed in late 1968 (this project received an Honor Award from AIA Southern California). The well respected Italian magazines *Lotus* and *Domus* also published Pelli's work for DMJM, as it was akin to that of young European architects they championed: issues illustrating his designs also showed work by Renzo Piano or Richard Rogers, who were to achieve international fame with their winning design for the Centre Georges Pompidou in Paris.

In the manufacturing and research facility for Teledyne Systems Co., erected in Northridge, in California's San Fernando Valley, and completed in 1967, Pelli "rehearsed" his design for COMSAT Laboratories. The Teledyne lab was reviewed by the noted California critic Esther McCoy in the July-August 1968 issue of *Architectural Forum.* McCoy praised Pelli's "controlling hand" which insured aesthetic success despite successive cost trimmings. Located in an agricultural setting (a 36-acre citrus grove, which Pelli was able to safeguard almost completely) along a highway, the structure comprised 165,000 square feet of offices and assembly labs for microelectronics elements, and was built at a cost of $ 2,850,000, including landscaping. The plan was controlled by a circulation spine, a wide corridor acting as informal meeting space, which was lined with continuous reflective glass on one side; as many of Teledyne's activities were classified, the workspaces were lit indirectly with interior corridor windows. In this project, Pelli began exploring ideas of spatial flexibility inherent to the electronic industry. McCoy quoted Pelli:

> It is seldom possible to predetermine growth, and the problem is how to plan for undetermined growth without throwing the architecture away.

McCoy rightly perceived the lineage between ideals of pioneering modernists - such as the German architect Walter Gropius at the Fagus Factory (1911-12) in Alfeld an der Leine and Bauhaus buildings (1925-26) in Dessau - and Pelli's concern "with the development of tools for flexible solutions for the present," his differentiation between skin and support, his use of standardized parts. This philosophy and the idea of building a "complex" as opposed to a "building," Pelli confided to McCoy, was foreign to many of his U.S. colleagues. McCoy's article concluded: "Commonsense architecture is lifted above dullness and it becomes the means through which the city is refreshed."[65] In 1968, Teledyne Systems Laboratories received an Honor Award from the American Institute of Steel Construction.

[63] In 1969, DMJM prepared a study for an industrial airpark sponsored by the Commissioners of Prince George's County. See Lawrence Meyer, "Bowie Airpark Cost Pur at $ 58 Million," *Washington Post,* November 7, 1969, B4.
[64] "Office organization and procedures for present-day practice: organization for efficient practice 2: Daniel, Mann, Johnson and Mendenhall, archts. & engrs.," *Architectural Record* 127 (June 1960), 190.
[65] Esther McCoy, "Planned for Change: Cesar Pelli Designs an Adaptable Electronics Plant," *Architectural Forum* 129 (July-August 1968), 102-107.

In 1969, while COMSAT Laboratories were nearing completion, Cesar Pelli left DMJM to become partner in charge of design at Victor Gruen Associates, a Los Angeles firm internationally known for its pioneering work in shopping center design.[66] That same year, he won the International Architectural Competition for the United Nations City in Vienna, Austria (unbuilt). In his designs for the San Bernardino City Hall (1969-72) the Columbus Commons (1970-73), the US Embassy office in Tokyo (1970-75), and the Pacific Design Center in Los Angeles (1975, nicknamed the Blue Whale), Cesar Pelli perfected his "investigation of the gestural and sculptural possibilities of the cladding, particularly the nature of glass as a transparent and reflective material."[67]

In 1977, Cesar Pelli moved East to became Dean of the School of Architecture at Yale University, a coveted academic position he held until 1984. At the same time he launched his own practice in New Haven. Very large and prestigious commissions went his way at an increasingly faster pace, marking the skyline of major cities the world over: in New York City, the Museum of Modern Art extension and residential tower (1978-84), and the World Financial Center and Winter Garden (1982-87); in Charlotte, N.C., the Bank of America Corporate Center; in Minneapolis, the Wells Fargo (formerly Norwest) Center; in London's Canary Wharf district, One Canada Square (completed 1991), Britain's tallest building at the time of its construction; in the Hague, Netherlands, the Zurich Tower; in Tokyo, headquarters for NTT Shinjuku (1990-95) and the Mori Tower; in Osaka, the NHK Osaka Headquarters and Broadcast Center; in Hong Kong, the Cheung Kong Center; in Buenos Aires, the Edifico República (1993-96) and Bankboston Argentina Headquarters; and in Kuala Lumpur, the twin 1483-foot high Petronas Towers, the world's tallest buildings at the time of their completion in 1997.

Pelli's firm received many commissions for healthcare and research facilities, such as the Lerner Research Institute in Cleveland and Yale University's Boyer Center for Molecular Medicine; and for departments of physics, astronomy, mathematics, engineering and computing sciences at the Institute for Advanced Study in Princeton (1989-93), the University of Washington-Seattle (1989-94), Trinity College in Hartford, CT and the University of Houston. A recent area of expertise has been performing arts centers. Several master plans - for Bilbao, Fukuoka in Japan and Cordoba in Argentina - have also come Cesar Pelli's way. A crowning achievement of his firm has been the Washington National Airport (1990-97).

Cesar Pelli's firm was the recipient of many professional awards, including the extremely prestigious firm award from the American Institute of Architects in 1989.[68] As an individual, he was awarded the Arnold Brunner Memorial Prize from the National Institute of Art and Letters in 1978 and was elected Associate of the National Academy of Design in 1978. Receiving the Gold Medal of the American Institute of Architects in 1995 placed Cesar Pelli at the very top of his profession. In 2001-2002, his work was the subject of an extensive retrospective exhibition organized by the National Building Museum in Washington, D.C.

Other persons associated with the design and construction of COMSAT laboratories were DMJM's S. Kenneth Johnson (Partner-in-Charge) and Philo Jacobsen (Design Associate). The general contractor was J.W. Bateson (presently Centex Bateson Construction Company, Inc.) based in Dallas, which had already built a large section of the National Bureau of Standards between

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[65] Esther McCoy, "Planned for Change: Cesar Pelli Designs an Adaptable Electronics Plant," *Architectural Forum* 129 (July-August 1968), 102-107.

[66] At DMJM, Pelli's position was filled for the next 25 years by Lumsden, who brought to completion the Federal Aviation Agency Building, initially planned by Pelli, a radical exercise in "light weight sculptural surface" in reflective glass and aluminum, "where the building goes over the top, the building comes under the bottom, and also goes around the corner" (Lumsden, quoted in Ross, "The Development of an Esthetic System at DMMJ," *Architectural Record*, May 1975, 117). In the 1970s, DMJM produced striking high rise office structures in Los Angeles and bold, linear designs for a academic campuses, including the Community College of Baltimore, Harbor Campus, as well the Holyoke (Massachusetts) and Northlake (near Dallas, Texas) Community College.

[67] Gavin Macrae-Gibson, "Pelli, Cesar," *The Grove Dictionary of Art Online,* (Oxford University Press, Accessed 15 October 2004), <http://www.groveart.com>

[68] A list of awards can be consulted at www.cesar-pelli.com

1963 and 1965.[69] The landscape architect for COMSAT Laboratories was also highly accomplished and respected among his peers: Lester Collins (1914-1993) received a master's degree from the prestigious Landscape Architecture program at Harvard University in 1942, which he also directed before moving to Washington, D.C. in 1954, where he lived until 1981. His office (named for a time Collins, Simonds and Simonds) was involved with urban, campus and school design, as well as with projects for public parks and private gardens from Maine to Florida, some close to his Georgetown residence. Among his most important projects were the redesign of the sunken Hirshhorn Sculpture Garden at the Smithsonian Institution (completed in 1981), Inisfree, "a 1,000-acre public garden with oriental overtones in New York state," and the plan for the new town of Miami Lakes in Florida.[70] Mr. Collins spent time in Kyoto, Japan on a Fulbright fellowship and was elected Fellow of the American Society of Landscape Architects.

Pelli's Forward-looking Design Concepts

Cesar Pelli evaluates his design for COMSAT Laboratories as "a successful investigation in esthetics, technology and building planning."[71] He also recalls that the "influences that were most in my mind at that time were not as much architectural, but aircraft construction and esthetics (...) I was pushing the envelope of avant-garde ideas of the moment." Indeed, COMSAT Laboratories reflects Pelli's emerging, and enduring commitment to "an architecture that celebrates life," that emphasizes "perception, lightness and change," that "is not in the empty building but in the vital interchange between building and participant."[72]
Reflecting on the COMSAT commission, Pelli also confides:

> Perhaps the most significant aspect of this building is that it is now a very early example of high-technology design; an architectural direction that has become very strong, perhaps dominant in the last 20 years.[73]

According to the renown critic and historian Reyner Banham, "High Tech" is a "stylistic term applied to the expressive use of modern technology, industrial components, equipment or materials in the design of architecture, interiors and furnishings." [74] This denomination was first used in print in 1977 (a decade after COMSAT Laboratories was designed) and was popularized the following year by Joan Kron and Susan Slesin in a book entitled *High-Tech: The Industrial Style and Source-book for the Home.* Arguing that "the industrial aesthetic in design ...is one of the most important design trends today," Kron and Slesin cited a number of buildings, most notably the Centre Georges Pompidou (1971–7) in Paris.

According to Banham, High Tech finds philosophical and aesthetic roots in London's Crystal Palace, built for the Great Exhibition of 1851 and one of Pelli's favorite building. This movement is "linked to the prestige of recent advanced engineering, as represented by space-vehicles for example"[75]; it challenges concepts of compactness and pure geometry expounded by the Modern Movement's most famous exponents, Walter Gropius, Le Corbusier and Ludwig Mies van der Rohe. Instead, it borrows ideas and imagery from less well-known futurist, expressionist and constructivist architects. Banham saw High Tech as an essentially British movement, coming of

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[69] "Dallas Firm Gets Big Area Contract," *Washington Post,* August 16, 1963, B6. Bateson also built the Nimitz Library at the U.S. Naval Academy (John Carl Warnecke architect, 1970-73).
[70] http://www.jgarden.org/biographies. Patricia Dane Rogers, "Appreciation; Even Mother Nature Bowed to Lester Collins," *Washington Post*, July 29, 1993, T 10. Marion Lynn Clark, "The 10-point Lester Collins garden plan," *Washington Post*, April 11, 1971.
[71] E-mail interview with Cesar Pelli by Historic Preservation Section, September 21, 2004.
[72] Cesar Pelli, *Contemporary Architects*, 614
[73] E-mail interview with Cesar Pelli by Historic Preservation Section, September 21, 2004.
[74] Reyner Banham, "High Tech," *The Grove Dictionary of Art Online*, (Oxford University Press, Accessed 15 October 2004), <http://www.groveart.com>
[75] Cesar Pelli. "Joseph Paxton's Crystal Palace," *A + U (Architecture and urbanism)*, n.2(113), February 1980, 3-14.

age with the Reliance Controls Factory at Swindon, Wiltshire, completed in 1967 (the factory's designers, Richard Rogers and Norman Foster have become, like Cesar Pelli, internationally known and appreciated). Generally imbued with optimism, either whimsical or serene, High Tech became a viable alternative to Post-Modern Classicism, a movement often characterized by nostalgia and irony. While "PoMo" has few followers at present, High Tech has adapted to new imperatives of sustainability and still inspires many young architects throughout the world, as evidenced, for instance by the *Light Construction* exhibit held at the Museum of Modern Art, New York, in 1996.

Three major concepts associated with the High Tech ethos and esthetic inform Cesar Pelli's design for COMSAT Laboratories: first, the "machine in the garden"; second, linear composition; and, third, "skin tectonics." A fourth, superimposed, theme, is also of crucial importance: transparency.

The "Machine in the Garden"

Cesar Pelli passionately wanted the COMSAT complex "to feel as a man-made object carefully placed on a natural area."[76] He therefore interpreted and rejuvenated the modernist idea of placing a self-referential, free-standing "object-piece" in an unspoiled landscape, an idea that finds one of its most striking and endearing illustrations in Le Corbusier's Villa Savoye (1930) in Poissy.[77] In the United States, the concept of the "machine in the garden" began to take hold with the advent of suburban sprawl. An early example, albeit far from avant-garde in its styling, is Bethesda's Naval Hospital, which opened in 1942 - a pristine, mirage-like, construction on a sea of emerald grass.

Enhancing the dialectic between "nature" and "culture" - between Clarksburg's pastoral setting and the laboratories' mechanistic character - was of the utmost importance for Cesar Pelli:

> Although the structure will not blend with nature, it is set up not against it but rather working with it. The landscape will retain the existing look of the Maryland countryside with no exotic plants or manicured areas. The courts will be fully planted and each court will be different in density of trees and earth forms.[78]

Cesar Pelli specified the saving of isolated mature trees, including maple, sycamore, and beech woods. Aided by landscape architect Lester Collins, he deliberately sought to place the building halfway within a small forest so that the trees could be experienced from much of the building and screen the south parking lot and receiving yard. The landscape plan avoids long straight rows of trees or any formal plantings in favor of small groupings and strategically placed trees, indigenous to the area. Historical photographs indicate that the grass was tractor-mown from the beginning. (A test to leave part of the landscape in a more wild state did not have good results.) Despite being mown, the landscape is decidedly pastoral, not manicured.

Cesar Pelli wanted to carry into the interiors the machine aesthetic, what he called the "'advanced technology' man-made quality of the exterior," and to avoid all hand crafted elements and materials. With the exception of occasional and "carefully segregated" wall paneling in wood, as in the conference rooms, white reigned supreme inside COMSAT Laboratories: it had white walls and ceilings, white steel staircase rails, and white 9" vinyl asbestos tiles.[79] The interior has references to ocean liners, including the north lobby's white-pipe rail stair and the corridor's mezzanine railing. These types of allusions had been popularized in the 1920s by Le Corbusier.

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76 Original programmatic language from Cesar Pelli, 1967. Obtained from Cesar Pelli Associates, New Haven, Connecticut.
77 A historical landmark, this house is presently owned by the French Ministry of Culture.
78 Original programmatic language from Cesar Pelli, 1967. Obtained from Cesar Pelli Associates, New Haven, Connecticut.
79 Cesar Pelli memorandum to Ben Frank Worley, October 20, 1967. The display cases in the main corridor, fabric banners, and red replacement vinyl floor tiles are all additions from the 1980s.

Linear Composition

Cesar Pelli also explained that the "complex and differentiated functions of the laboratories are organized along a public spine that allows each of the constituting elements to take a form suitable for its need, and to grow and change independently of the rest of the building."[80] The sequence of captioned diagrams included in an original memorandum show his systematic and thoughtful consideration of programmatic and aesthetic needs. As indicated by the first diagram, the plan is generated by a "basic circulation" through a central spine, entered on one side by visitors and on the other by employees. Since COMSAT Laboratories is a "complex" as opposed to a discrete "building," this longitudinal corridor is its "most important space:

> This is the common room, the meeting room, the room away from work. It should therefore have its own life in the plan. It should not be a leftover. It deserves the best views and the better materials.

Adding rectangular unit blocks of varying sizes on either side of the spine, diagram # 2 clearly shows how "the complex is an aggregate of spaces off a main circulation line." Diagram # 3 superimposes "secondary circulation lines," including the ubiquitous catwalk that is viewed from I-270. Diagram # 4 locates mechanical services in one of the blocks and through the spine, making them "flexible, capable of growth and easy to service." Diagrams # 5 and 6 indicate the occurrence of "predetermined growth" on the lower side of the spine (visible from I-270), by repeating existing units at regular intervals, and the free development of "undetermined growth" in the back of the spine. The final diagram shows how views, both to the surrounding countryside and to internal landscaped courts, were afforded from the central spine and the catwalk.

Although the facade along I-270 is finite at its northern and more public end, with its exhibition rotunda / porte cochère motif, the overall composition rejects traditional notions of centralized spatial hierarchy. In this regard, it relates to utopian projects of "linear cities" envisioned by Soviet Constructivists in the 1920s, by Los Angeles architect Richard Neutra in "Rush City, Reformed" (1923-27) and explorations by European contemporaries of Cesar Pelli, in particular the Italian architects Giancarlo De Carlo, Vittorio Gregotti and members of the Superstudio group. The lobby is integral to the glazed spine "rather than the usual wall-in sanctuary."[81] Glass walls sheath the primary corridors, lobby, library and cafeteria. The importance of the western glass corridor, the "catwalk" that is seen from I-270, was twofold: 1) it served as a connector between all of the laboratory wings, and 2) it closed the landscaped courts, but its distinctly glazed, narrow presence allowed the courts to remain visually open from the central spine. Pelli's program noted: "From the exterior, and depending on the light conditions, the building will sometimes look like a single streamlined shape and sometimes like a sequence of courts and wings."[82] To stress linearity, Cesar Pelli specified the direction of joints: "We want to maintain continuity on the lines and surfaces (for example, the long fascia on the balcony in the main corridor should not be interrupted with any applied element or strong joints.) Long lines of light should align perfectly. Floor and ceiling tile should have the pattern direction running with the long axis of the space."[83]

Skin Tectonics

Cesar Pelli also clearly explains how he enclosed COMSAT Laboratories "in a skin of aluminum and glass" independent of the structural frame:

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[80] Special Cesar Pelli issue, *A + U*, Tokyo, July 1985, 29.
[81] McCoy, "Planned for change"
[82] Ibid.
[83] *Ibid*

> The windows of the private offices are "punched holes" in the aluminum panels. The windows in the public and common spaces form continuous bands. The aluminum skin turns over, under and around in the three dimensional planes, suggesting a continuous wrapping of the complex volume and making visible its role independent from the structure.
> I arrived at the decision to design the modular skin of aluminum and glass not only because of its intellectual and aesthetic appeal but also because of the suitability of its character to the purpose of the building: to be a place where research, experimentation and construction of telecommunication satellites takes place.[84]

While designing the project, Cesar Pelli specified:

> The glass walls should be as flush as possible. . . . The same quality of flushness, of everything in one plane, is also needed in the aluminum walls. Actually the character of tight skins is not only important in each material but also as they come together: we want the aluminum to be flush with the glass and with the concrete, avoiding all unnecessary reveals. The joints in the aluminum wall should be as tight and crisp as we can get them.[85]

In the same way as the "machine in the garden" concept and linear composition inform COMSAT's site plan and interior layout, respectively, the facades are direct expressions of the use of aluminum in thin prefabricated panels and slender, geometrical, mullions. Without aluminum, COMSAT Laboratories would not have looked so light and elegant. Using facade elements in aluminum was not unprecedented, though. Three of the most spectacular designs of the interwar period - the Cathedral of Learning in Pittsburg (Day and Klauder, 1925), the Chrysler (William van Alen, 1930) and Empire State (Shreve, Lamb and Harmon, 1931) Buildings in New York City - used "cast- or pressed-sheet aluminum spandrels (…) set in into a masonry back up."[86] A benchmark in the popularization of all-aluminum, non load-bearing, facades was a research and engineering building in Milwaukee, designed by Chicago architects Holabird and Root. Upon completion, it was published in the December 1931 issue of *Architectural Record,* with the following introduction:

> Aluminum, as one of the metals and alloys which can be easily formed into many shapes and patterns and which eliminate many maintenance items from the consideration of costs, has these characteristics to recommend its use in architecture:
> 1. Availability in quantity and in all forms known to metal working.
> 2. Uniform physical and chemical properties.
> 3. Lightness (aluminum and aluminum alloys weigh only one-third as much as the other metals commonly employed in architecture).
> 4. Workability.
> 5. Comparative low costs as a raw material.
> 6. Reasonable freedom from attacks by the elements.
> 7. Strength (…)
> 9. Finish in varying shades of gray and with different surface textures
> 10. Plating and coloring.[87]

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[84] Cesar Pelli, "Architectural Form and the Tradition of Building" A+U, 1985, 29.
[85] Memorandum from Cesar Pelli to Ben Frank Worley, 20 October 1967. Obtained from the office of Cesar Pelli & Associates, New Haven, Connecticut.
[86] Stephen J. Kelly, "Aluminum," in Thomas Jester, ed., *Twentieth-century building materials: history and conservation* (New York, 1995), 47. The Empire State Building's aluminum spandrel panels were 4 feet 6 tall and 5 feet wide.
[87] Harold W. Vader, "Aluminum in Architecture," *Architectural Record* 70 (December 1931), 459.

However, in all the above-mentioned examples, aluminum was used in conjunction with other, non-metallic, materials and/or was ornamented. The French inventor-manufacturer Jean Prouvé (1901-1984), whom Cesar Pelli credits as his source of inspiration for COMSAT Laboratories, was the first to propel this material into the mainstream of Modernism. [88] According to noted historian Jean-Louis Cohen, his plain-looking facade panels for the Maison du Peuple (Beaudouin et Lods architects, 1936–9), in Clichy near Paris, "completely revolutionized" curtain-wall techniques."[89] In his foundry in the Lorraine region, Prouvé, who was "fascinated by the thin shells used in the car and aviation industries," produced prototypes for steel and aluminum components, metal furniture and lightweight housing units. He "established a range of construction possibilities using stamped or folded sheet-metal, which allowed him to cover vast surfaces both elegantly and cheaply." Prouvé's panelized aluminum facades for the Fédération du Bâtiment (Gravereaux and Lopez, architects, 1951) and an apartment building Square Mozart (Lionel Mirabeau architect, 1953), both in Paris, and for an exhibition hall (Paul Herbé and Maurice Gauthier architects, 1951) in Lille all anticipate those used at COMSAT Laboratories.[90]

After World War II, the glass curtain wall became the signature of International style architects and many transparent facades were detailed with aluminum mullions, forming elegant patterns. A good example is the United Nations Secretariat Building (1947-53) in New York City, by Harrison and Abramovitz. Completed in 1948, the Equitable Building (Pietro Belluschi architect) employed war production surplus and borrowed from aircraft manufacturing methods to devise a minimalist but supremely elegant curtain wall of low aluminum spandrels and large glass panes. This epochal International Style design was an eye opener for many architects and manufacturers.

Indeed, the Aluminum Company of America played a crucial role in giving aluminum an architectural edge. As early as 1931, ALCOA had sponsored the revolutionary "Aluminaire House" (A. Lawrence Kocher and Albert Frey architects), "constructed with aluminum-pipe columns carrying a steel floor deck and clad with thin aluminum panels fixed to the frame with aluminum screws and washers." [91] After the war, ALCOA commissioned several designs to Harrison and Abramovitz showcasing its products. Completed in 1948, the administration building for the Davenport, Iowa, plant producing rolled sheets and plates was a "gleaming package" in a rural setting. Its facade alternated ribbon windows and cast aluminum panels, measuring 4 ft x 7f 3 ¼ in., which were bolted to the steel frame and then placed against precast concrete panels.[92] Completed in 1953, the head office in Pittsburgh was a skyscraper entirely sheathed with one-story high prefabricated panels. Each panel comprised a diamond-shaped sculptural spandrel in aluminum (anodized and pressed) and a punctured window with rounded corners, which anticipated those at COMSAT laboratories: "Rather than resting on a masonry parapet wall, the panels could be bolted to the structural frame. Aluminum's light weight meant the panels could be quickly hoisted into place and assembled with a minimum of heavy equipment."[93] At the same time, techniques to manufacture anodized aluminum "by building up the natural aluminum oxide coating in an electro-chemical bath" were perfected. Used also at COMSAT, anodic coating possessed an "outstanding resistance to atmospheric corrosion."[94]

[88] (9/21/04)
[89] Jean-Louis +Cohen, "Prouvé, Jean," *The Grove Dictionary of Art Online*, (Oxford University Press, Accessed 15 October 2004), <http://www.groveart.com> The panels were executed with the help of structural engineer Vladimir Bodi who would later collaborate with Le Corbusier
[90] "Eléments de façade en aluminium étudiés et réalisés par les ateliers Jean Prouvé," *L'Architecture d'Aujourd'hui*, February 1955, 2-3.
[91] Dennis P. Doordan, "From precious to pervasive : aluminum and architecture," in Sarah Nichols, *Aluminum by design* (Pittsburgh,] Carnegie Museum of Art ; New York : Harry N. Abrams, 2000), 97.
[92] "New Alcoa administration building at the Davenport plant is a gleaming package," *Architectural Forum* June 1949, 76-80.
[93] Doordan, 104.
[94] Kelly, "Aluminum," 48.

However, in the late 1960s, sharp angles were all the rage among American architects working for large corporations and only their most adventurous European and Japanese colleagues were venturing into sleek, High-Tech curvatures.[95]

Cesar Pelli (who also wanted aluminum on the Environmental Test Laboratory, but settled for painted corrugated steel due to budgetary constraints) explains that the purpose of the aluminum skin was not only esthetic. It certainly gave the building "an exciting technological look appropriate to its purpose," but it also "served the needs of COMSAT that required that the building be built in an extremely short time" and by keeping out signals that might interfere with the technology being developed inside.[96] COMSAT Laboratories featured other state-of-the-art technical characteristics, such as dropped ceilings sheltering large service areas and automatic temperature control in each office. In true High-Tech mode, Pelli made sure that technical, economical and aesthetic concerns harmonized and sustained each other: for instance, the separate mechanical penthouses shorten the length and width of ducts while relieving the monotony of horizontal lines and enlivening the silhouette. COMSAT was also a landmark achievement in fast track design.[97] Cesar Pelli ventured that the speed with which the building was designed accounts for at least a part of its success story:

"It's an interesting footnote that this adventurous design of the COMSAT Building was produced in an incredible short period of time. I completed the design in one and a half months and the building started construction five months after DMJM was engaged."[98]

Critical Fortune and Posterity

COMSAT Laboratories was in the limelight as early as its plans were made public. In 1968, it received a citation in the prestigious *Progressive Architecture* annual design award, which was in its fifteenth year. This was indeed an outstanding accomplishment : out of 671 submissions, only 12 were selected for awards or citations. That year, the jury was chaired by Lawrence B. Anderson, Dean of the School of Architecture and Planning at MIT, and included Gunnar Birkerts (a former Saarinen employee) and Romaldo Giurgola, two highly respected architects, as well as the maverick structural engineer Falzur Khan, the man behind Chicago's Sears Tower. Their comments were reproduced in *Progressive Architecture*:

- The wall impresses me, the skin of the building.
- It's a very rational building. The different functions in the whole building are expressed quite well by the different materials in the wall system.
- Very superior plan, organization, and a fine cross-section for providing mechanical services for the laboratories.[99]

A photogenic building, which had no parallel in the United States, COMSAT Laboratories was extensively published in magazines targeted to a specialized, but diverse, audience. In December 1968, *Architecture & Engineering News*, a technically-oriented

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[95] In particular the facades of COMSAT Laboratory are related to those of the Olivetti training school designed by British architect James Stirling in 1968 and built in 1971-72. The "wraparound" metallic look of COMSAT Laboratories is not unprecedented, as it was already present in Art Deco diners.
[96] E-mail interview with Cesar Pelli, September 21, 2004.
[97] One of the more well-known "fast-track" designed buildings in American history is the Pentagon, which was designed in just a few months. That building is not only listed on the National Register of Historic Places, but is a National Historic Landmark as well.
[98] Ibid.
[99] "Clarksburg, Maryland." *Progressive Architecture*. v. 49, January, 1968, 125. Cesar Pelli would earn another citation from *Progre* *Architecture* in 1977, for the Winter Garden at the World Financial Center and a design award, in 1987, for his extension to the Pacifi Center.

publication, gave a well informed account of its aesthetic and constructional characteristics. In August 1970, *Progressive Architecture* did not hesitate to devote a second article to COMSAT, with the attention-grabbing title "Technological Imagery: Turnpike Version." The article congratulated Pelli for devising "elements - organization, expansion, capabilities, and skin treatment - which elevate COMSAT to an 'image' building at less-than-image-price:"

> Because the plan is fundamentally quite simple, it was relatively easy to allow things to occur where they wanted to. Stairs are where stairs should be, and they are boldly expressed. The same happens for offices, laboratories or loading dock - nothing is slighted, little is in excess. There is no hint of a temple about this building, and therein lies one of its greatest strengths..[100]

The fact, as stated by *Progressive Architecture,* that COMSAT Laboratories had "broken out of supercontrolled haute architecture, within the visual tradition" led to its publication in Japan and Italy, two countries which, at the time, were at the cutting edge of architectural theory and practice.

COMSAT laboratories was the summation of Cesar Pelli's tenure at DMJM and represents an important breakthrough in his career. Dear to the heart of its designer, it has been extensively featured in the first three monographs devoted to Cesar Pelli. The special issue published in 1985 by the trend-setting Japanese journal *A+U (Architecture and Urbanism)* included an essay by critic John Pastier, with the following comments on COMSAT Laboratories:

> It is Pelli's first built example of a metal skin, and its lightness, tautness and continuity embody his views of external walls as pure enclosing membranes freed from structural duties. This was also a major concern of the architectural culture of the period, as was the notion of expandability and capacity for change, effected here by open-ended spines serving individual functional modeules. Purpose too is nicely served by a High-Tech wrapping for a High-Tech use, and by a rational layout in which the main spine articulates zones of research and production.[101]

In a 1990 monograph, Pastier maintained that the Teledyne and COMSAT laboratories "became architectural metaphors for logical planning and orderly growth." [102]

Reflecting the optimistic and experimental state of mind of the late 1960s, Pelli's design for COMSAT Laboratories anticipates that of another Modern Master, also at the beginning of his career: Richard Meier's Bronx Developmental Center, designed in 1970 and completed in 1977 boasted a linear layout and a panelized, aluminum skin (placed lengthwise, however), which had a clear anodized finish and was punctured by gasketed and rounded window. It had ocean liner details in the transparent lobby, and glazed bridges linking separate wings. The Bronx Developmental Center received many accolades when it was first completed, but was partially demolished in 2002.[103] Richard Meier, himself an AIA Gold Medal recipient, has made slick, square, panels (clad in white enamel) and large glazed surfaces, in the "COMSAT vein," his trademark. COMSAT Laboratories emboldened young architects who deemed sterile either a nostalgic return to pre-modern forms or pure "Miesian" geometry. For instance, Chicago's Stanley Tigerman used

[100] "Technological Imagery," 72.
[101] John Pastier, "Cesar Pelli: The Architect as Servant," 86.
[102] John Pastier, "The Evolution of an Architect," 15
[103] See Suzanne Stephens, "Bronx Development Center, New York, N.Y., Architecture cross-examined," *Progressive Architecture* 58 (July 1977), 43-54.

Alcoa's aluminum facade panels, and "zipper-gasketed windows" to build a space age home (completed 1975) in Glencoe, complete with a domed observatory.[104]

The sleek skin, metal and glass aesthetics reigned almost supreme in England in the 1970s, and has remained a strong direction among British architects. In his authoritative survey on *High Tech Architecture*, Colin Davies illustrates Sir Norman Foster's amenity building for the Fred Olsen shipping line in the London Docks (1971), as a "sleek skin of glass and Neoprene." Two examples of light, curved metallic "machines in the garden" comparable to COMSAT, also found in Davies' book, are Foster's Sainsbury Centre for Visual Arts (completed 1977) at the University of East Anglia, Norwich and Nicholas Grimshaw's Office and Workshop for Ladkarn Ltd. (completed 1985) in London.[105]

Cesar Pelli noted that elements of COMSAT's design were used in later buildings: "The lineal organization of the COMSAT Building reappeared in several of my buildings, and so did the unitized construction of its walls."[106] He explored the idea of lining separate and movable pavilions along a luminous corridor in two experimental house designs: one drawn at the request of the organizers of the prestigious Venice Biennale, in 1976; the other for a "Houses for Sale" exhibition presented at the trendy Max Protecht / Leo Castelli Gallery Galleries in October 1980.[107] The concept (humanized by details such as hipped roofs and trellises) became a reality in a 1979 commission for a large house in Montgomery County, one of the very few private residences ever designed by Cesar Pelli.[108] The four-story garden hall Pelli added to New York's Museum of Modern Art (1978-84), retained the luminous and linear quality as well as the ocean liner atmosphere of the COMSAT Laboratories. The corporate campus for Owens Corning World Headquarters (1994-96) in Toledo, Ohio is an "assemblage of component parts linked together by glass-enclosed connectors."[109]

One cannot understand Pelli's Ronald Reagan Washington National Airport without knowing COMSAT Laboratories. The user-friendly airport concourse was conceived like the Laboratories' spine with its views to the landscape (in this case, the airfield and the Potomac River), thus celebrating life.

In sum, one cannot study Cesar Pelli's contribution to world architecture without being fully aware of his groundbreaking work at COMSAT. The work of all master architects is an evolving process; as cultural resource historians, we have an obligation to preserve not only works of their mature years, but also their youthful, forward looking experiments – especially those that were deemed successes from a functional and aesthetic standpoint.

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104 See Joan Kron and Susan Slesin, *High-Tech: The Industrial Style and Source-book for the Home*, New York:C.N. Potter, 1978, 19.
105 Colin Davies, *High Tech Architecture*, New York: Rizzoli, 1988, 19, 58-6, 98-99
106 *Ibid*
107 Special Cesar Pelli issue, *A + U*, Tokyo, July 1985, 47-49 and 90-93.
108 Michael Webb, "Architecture: Cesar Pelli," *Architectural Digest* 47 (July 1990), 124-129, 178.
109 www.cesar_pelli.com/textOnly/projects

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Source: John Gerace, Emcor Facilities Services and Mike Smith, LCOR Incorporated

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Source: John Gerace, Emcor Facilities Services and Mike Smith, LCOR Incorporated

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Source: www.COMSAT-legacy.org

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Source: *Architectural Digest,* July 1990.

Figure 27 – Aerial View Showing additions to Original Structure, COMSAT Laboratories. Hatching shows original, 1969 structure.

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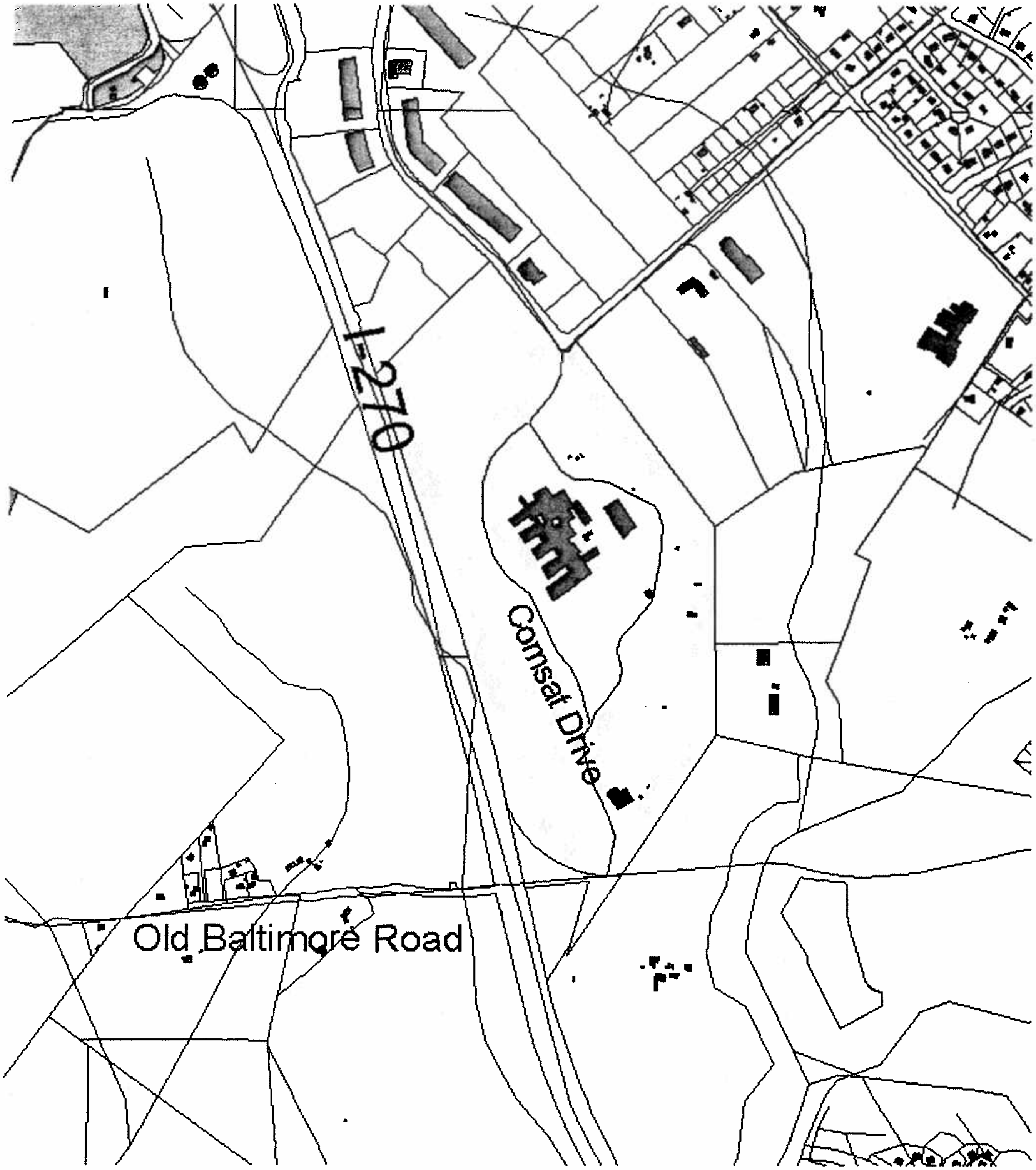
Photographs of:
Original plans
Original models
Original renderings

Correspondence

Materials from COMSAT Laboratories Building Management Company, Emcor Facilities Services

Original construction photographs taken by Stewart Bros. For Bateson Construction Company, circa 1969



COMSAT Laboratories, 22300 Comsat Drive, Clarksburg

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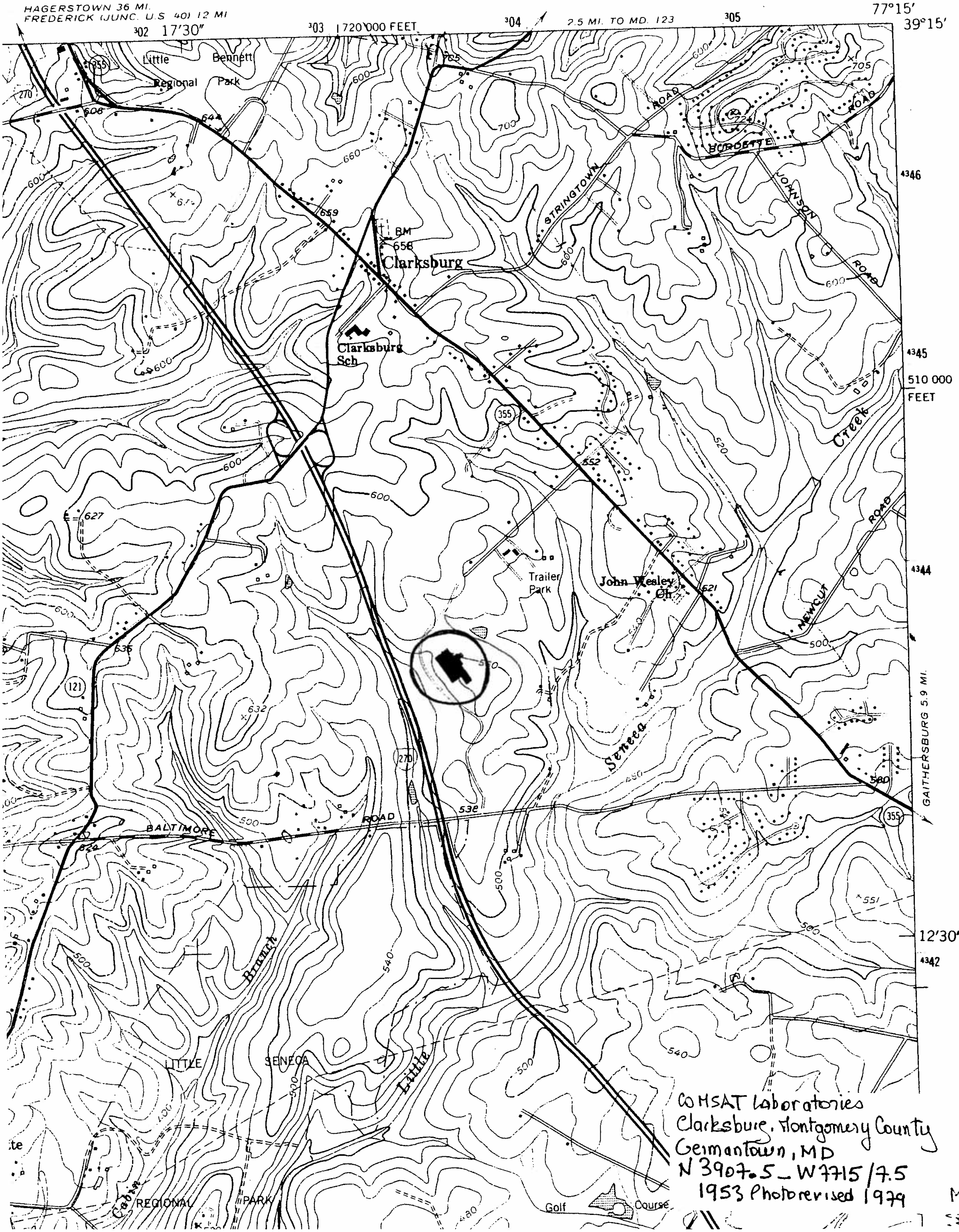
GIS Site Map

Map 1

7.5 MINUTE SERIES (TOPOGRAPHIC)



COMSAT Laboratories
Clarksburg, Montgomery County
Germantown, MD
N 3907.5 – W7715/7.5
1953 Photorevised 1979

Map:

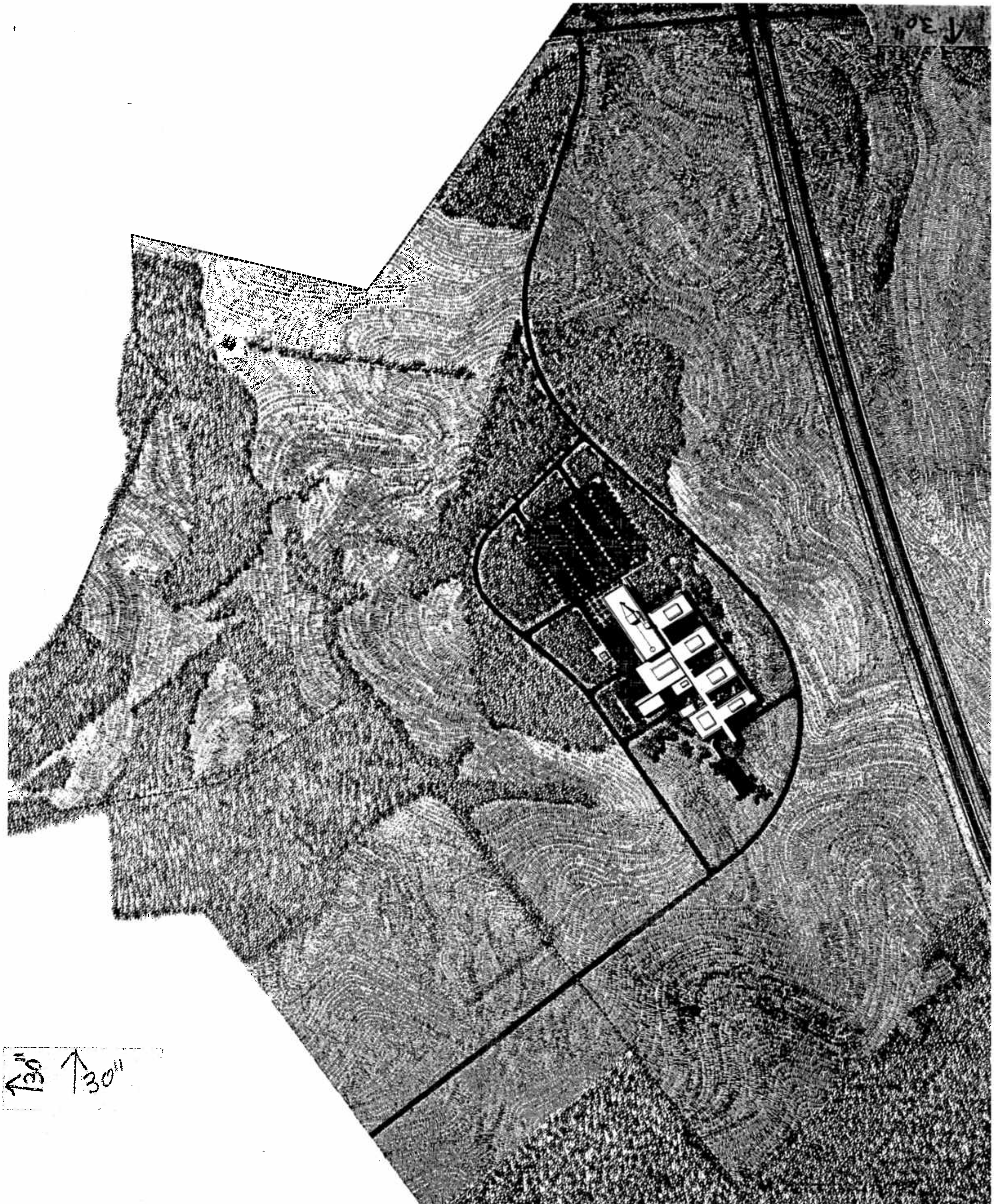


Fig. 1 – Site Plan for COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MI
prepared 1967
Source: Cesar Pelli & Associates Architects

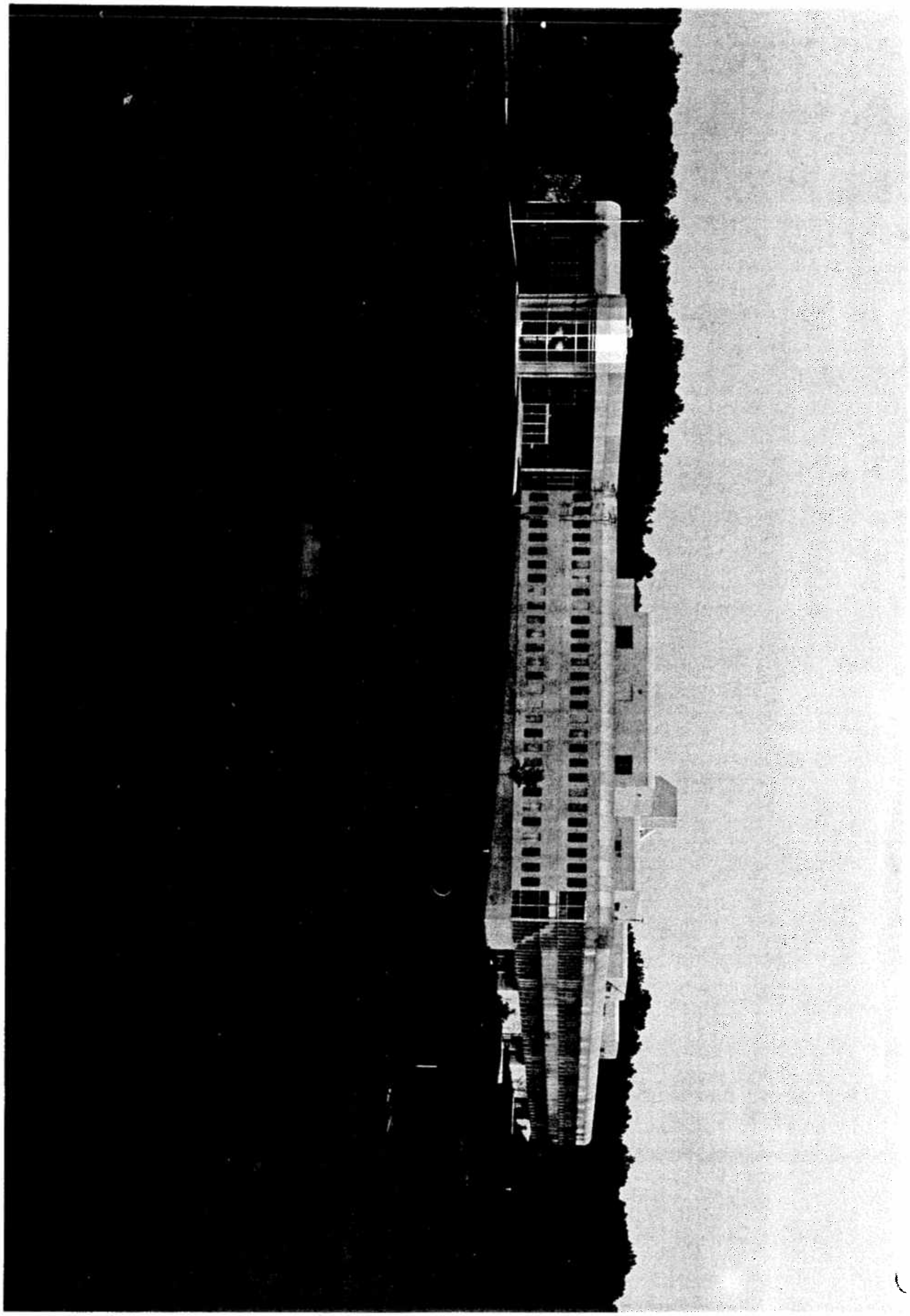


Fig.2 - View from I-270, COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MD, taken 1967. Source: Cesar Pelli & Associates Architects

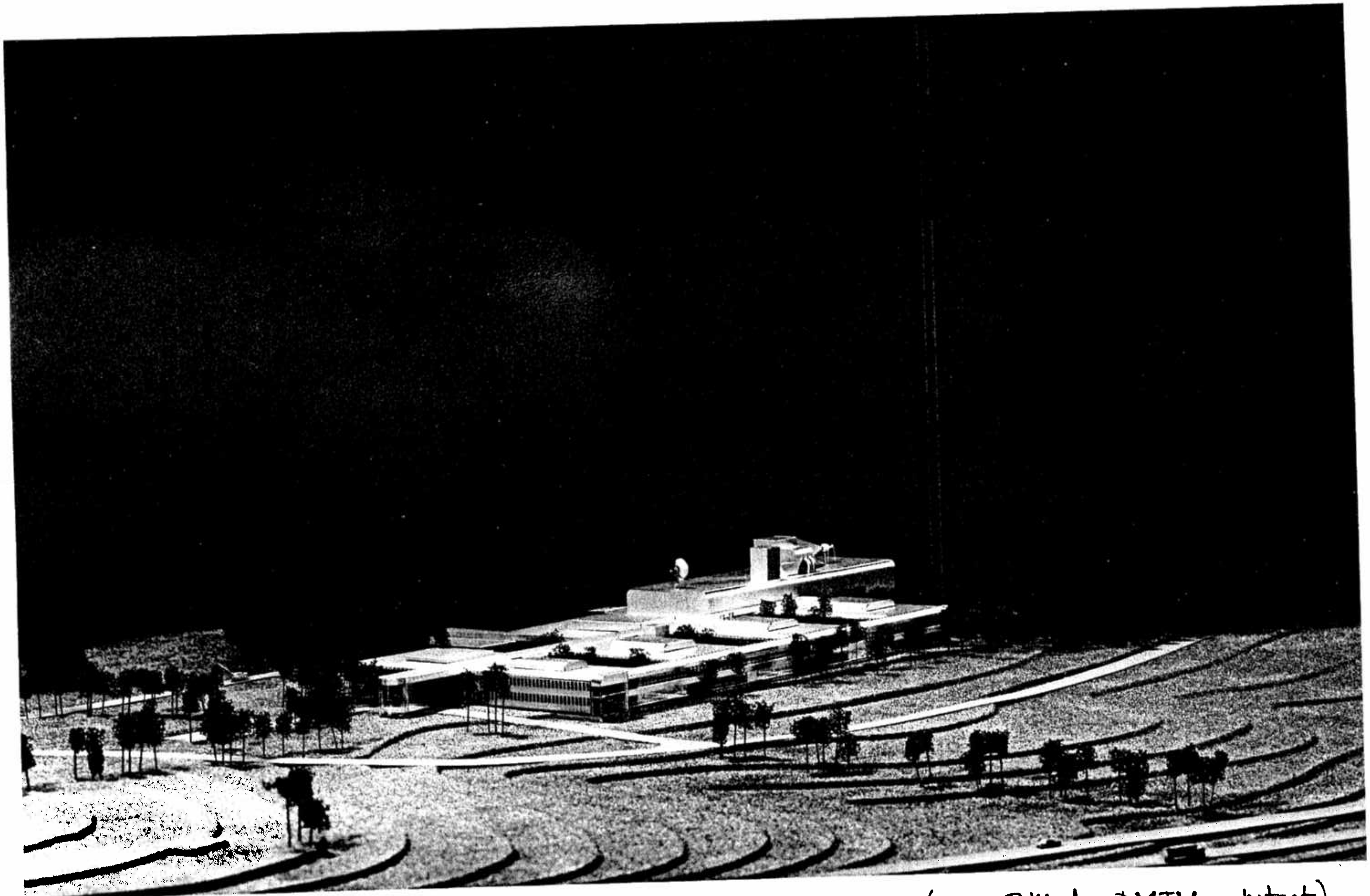


Fig.3 - Photograph of model showing topography, COMSAT Laboratories (Cesar Pelli for DMJM architect). Clarksburg, MD, taken 1967 - Source: Cesar Pelli & Associates Architects

Fig. 4_Photograph of model, COMSAT Laboratories (Cesar Pelli for DMJM Architect), Clarksburg, MD taken 1967_ Source: Cesar Pelli & Associates Architects

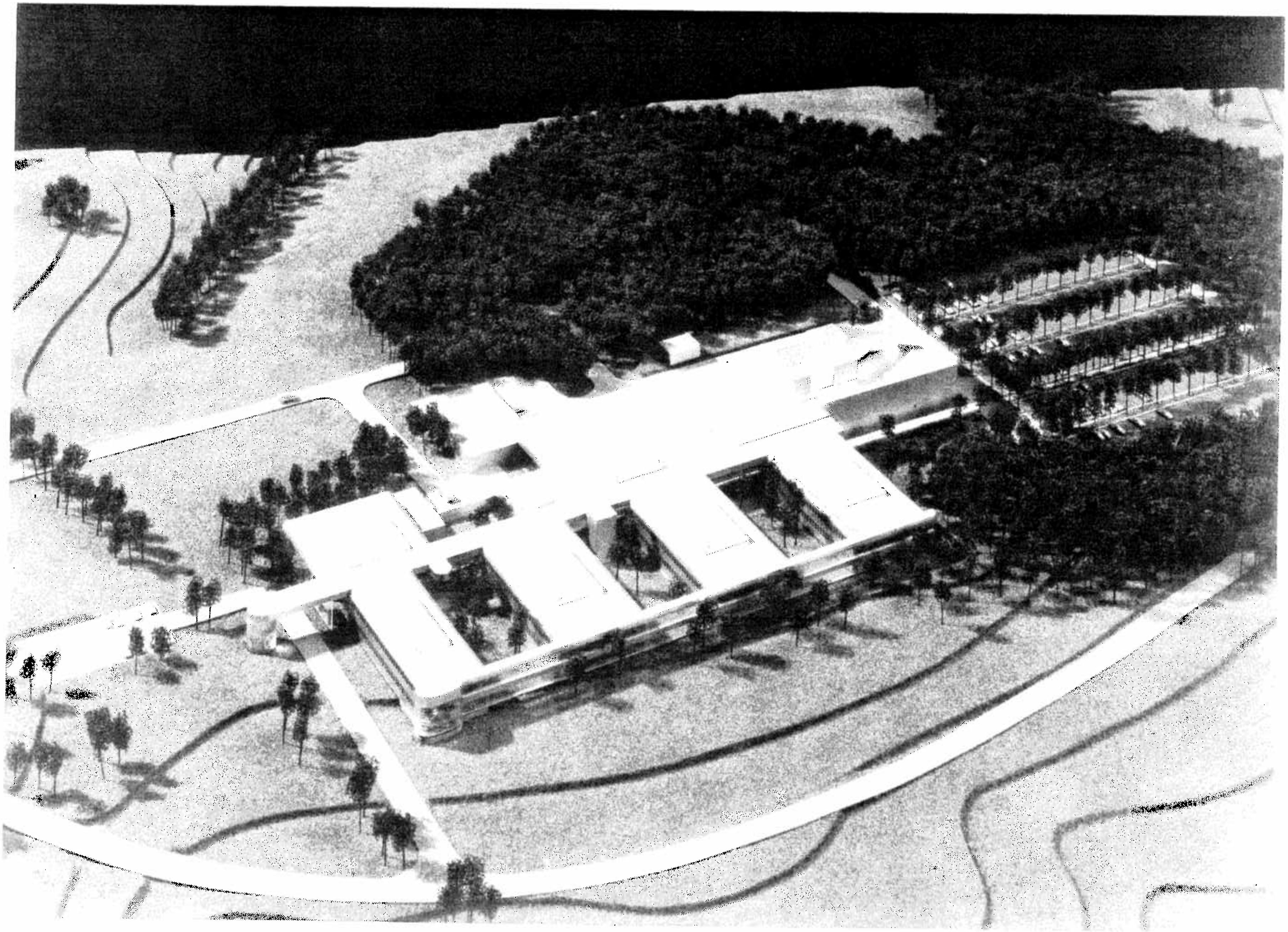


Fig.5 _ Photograph of Satellites behind the east side, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg, MD. Source: Mary Corbin Sies, 2002

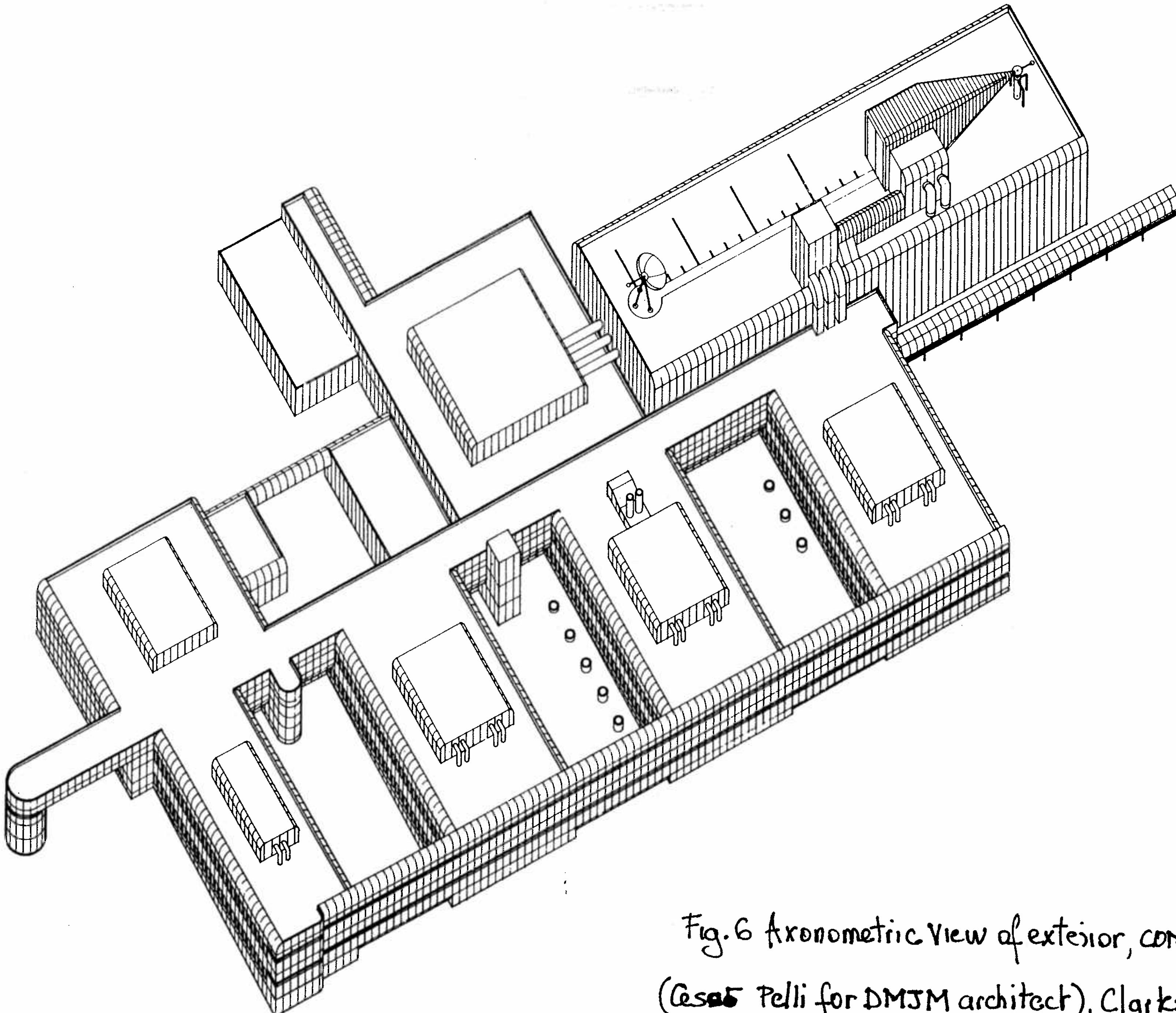
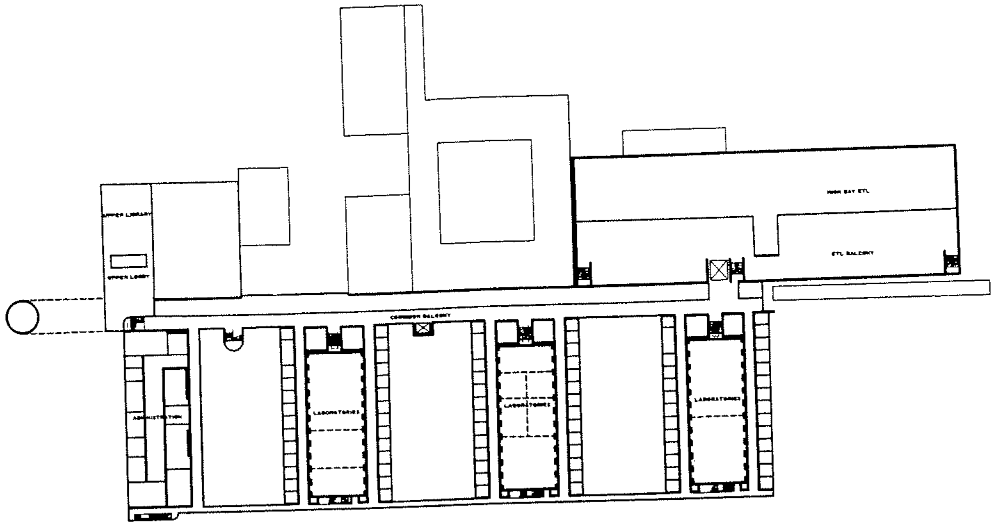
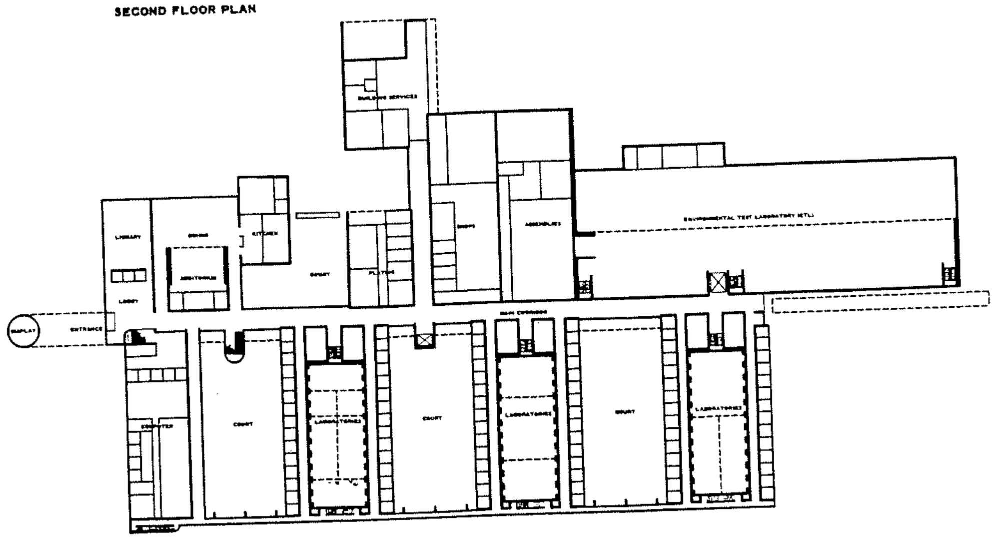


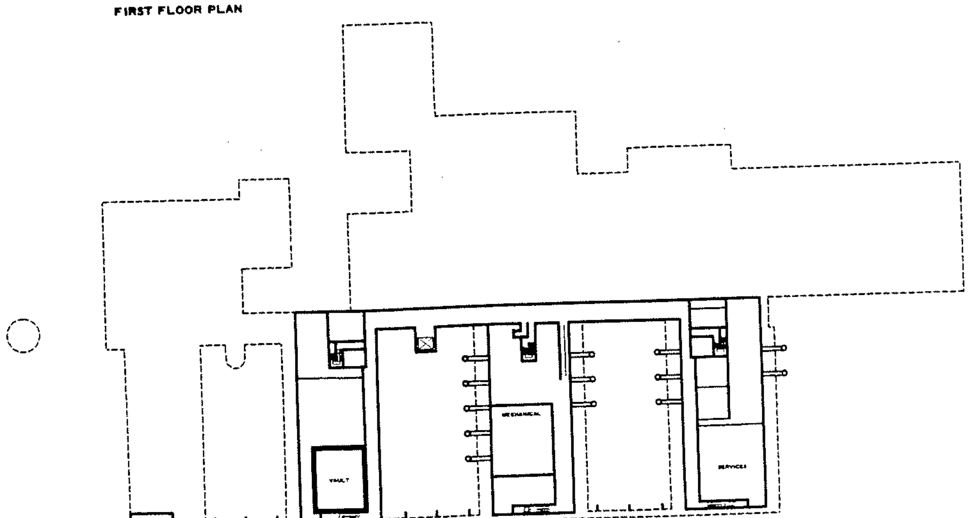
Fig. 6 Axonometric View of exteior, COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MD, delineated 1967. Source: Cesar Pelli & Associates Architects



SECOND FLOOR PLAN



FIRST FLOOR PLAN

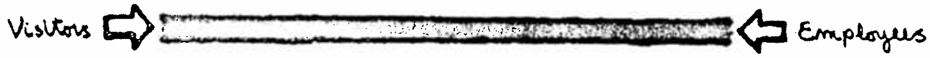


BASEMENT PLAN

Fig 7 - Floor plans, COMSAT Laboratories (Cesar Pelli for DMJM architect)
Clarksburg, MD, delineated 1967 - Source: Cesar Pelli & Associates Architects

PLAN

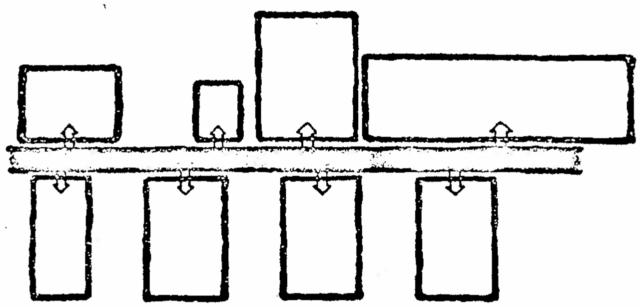
The plan is generated by the circulation.



Basic Circulation

There are spaces and there are circulation lines.

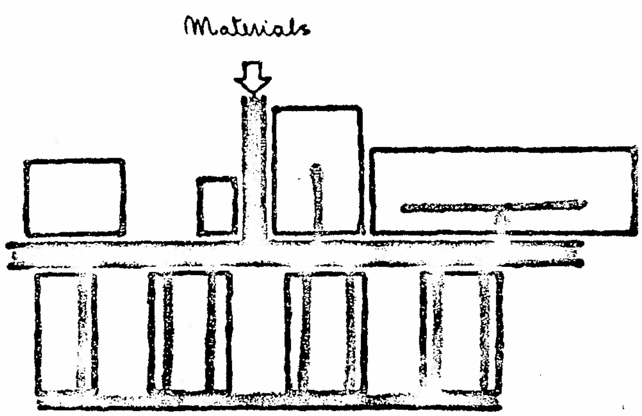
The complex is planned as an aggregate of spaces off a main circulation line.



Corridor and Spaces

Secondary circulation lines complete the network.

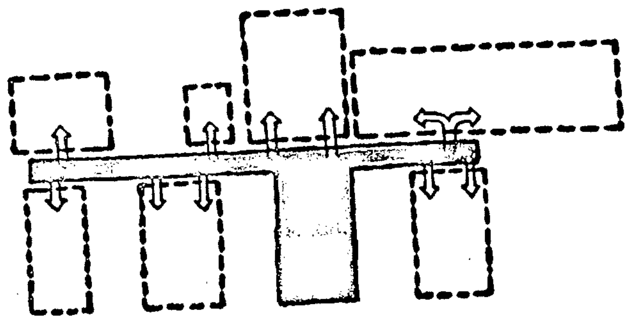
The circulation is for people and for materials.



Other Circulation

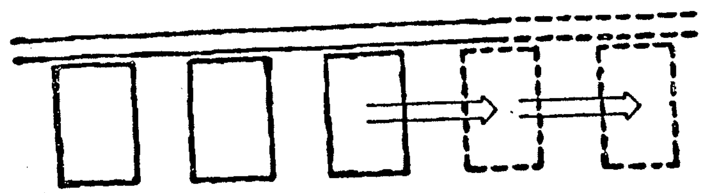
Fig. 8 a- Diagrammatic plans (from top to bottom # 1- "Basic circulation"; #2- "Corridor and spaces"; #3 "other circulation), COMSAT Laboratories, Clarksburg MD (Cesar Pelli for DMJM architect) delineated 1967 (Source: Cesar Pelli & Associates Architects

Mechanical services follow the same pattern and are therefore flexible, capable of growth and easy to service.



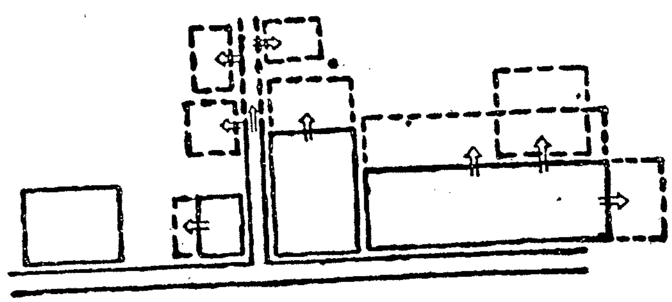
Service distribution

Some functions will expand in a predetermined order. Its needs are clear; growth can be anticipated.



Predetermined growth

Some functions will need expansion but the specific future needs cannot be foreseen. The plan is purposely not composed and it is therefore unfinished, open ended.



Undetermined growth

Fig. 8-b- Diagrammatic plans (from top to bottom #4-service distribution"; #5 "Predetermined growth"; # 6 "undetermined growth") COMSAT Laboratories, Clarksburg, MD (Cesar Pelli for DMJM architect), delineated 1967

Courtesy Cesar Pelli & Associates Architects

A complex is different from a building. In a complex, the corridor is the most important space. This is the common room, the meeting room, the room away from work. It should therefore have its own life in the plan. It should not be a leftover. It deserves the best views and the better materials.

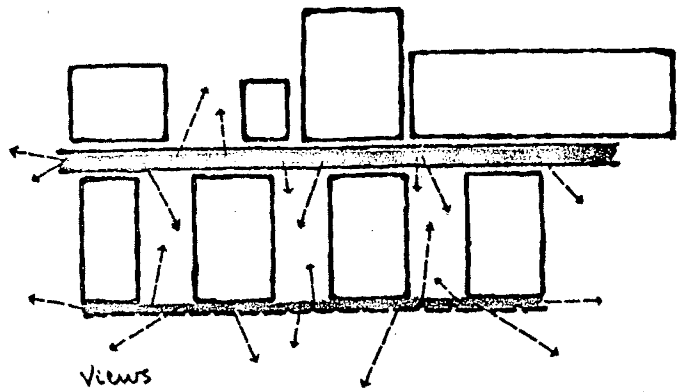


Fig. 8C_ Diagrammatic plan showing "views", COMSAT Laboratories (Cesar Pelli for DMJM architect), COMSAT Laboratories, Clarksburg, MD, delineated 1967
Source: Cesar Pelli & Associates Architects

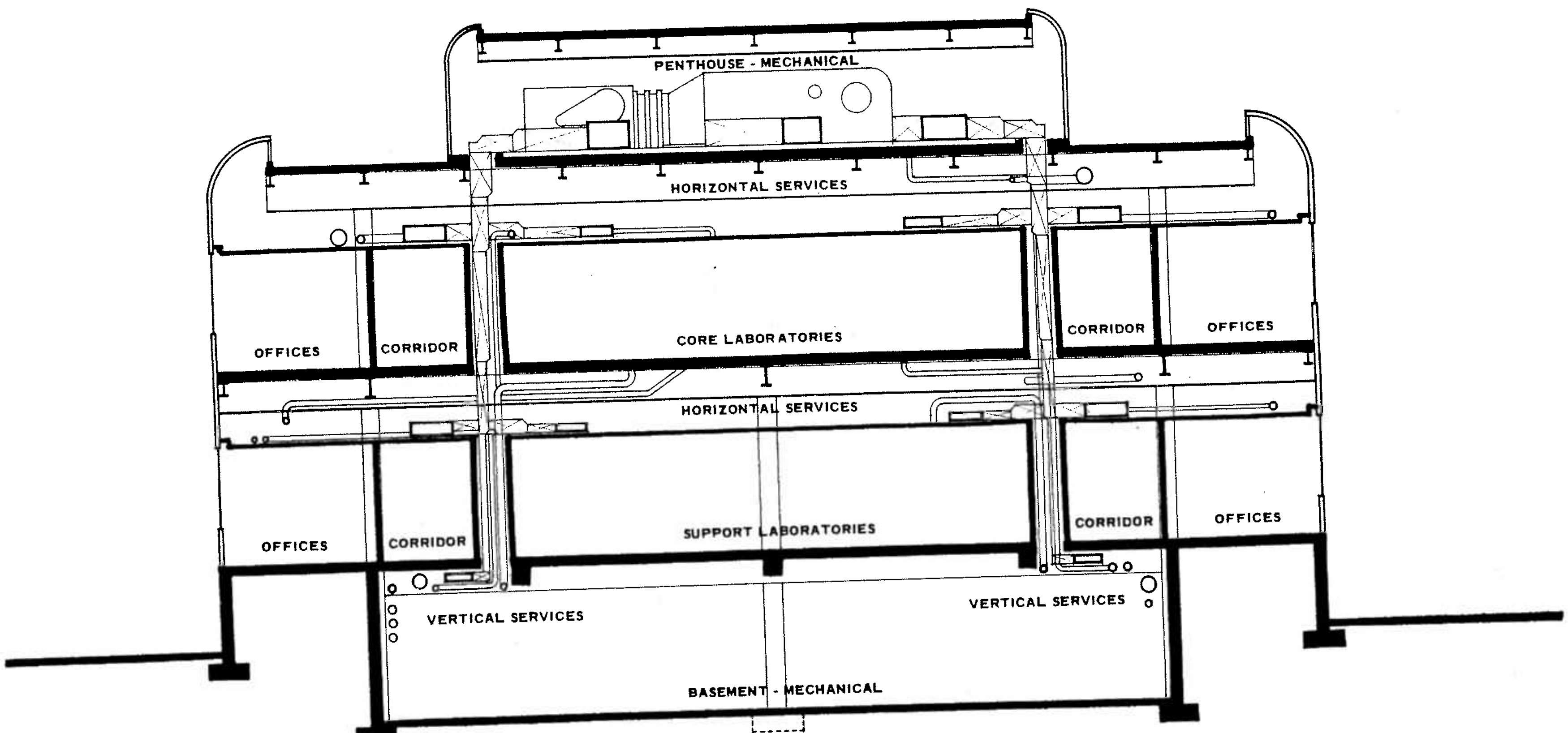


Fig. 9 _ Transverse section across laboratory wing, COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MD, delineated 1967

Source: Cesar Pelli & Associates Architects

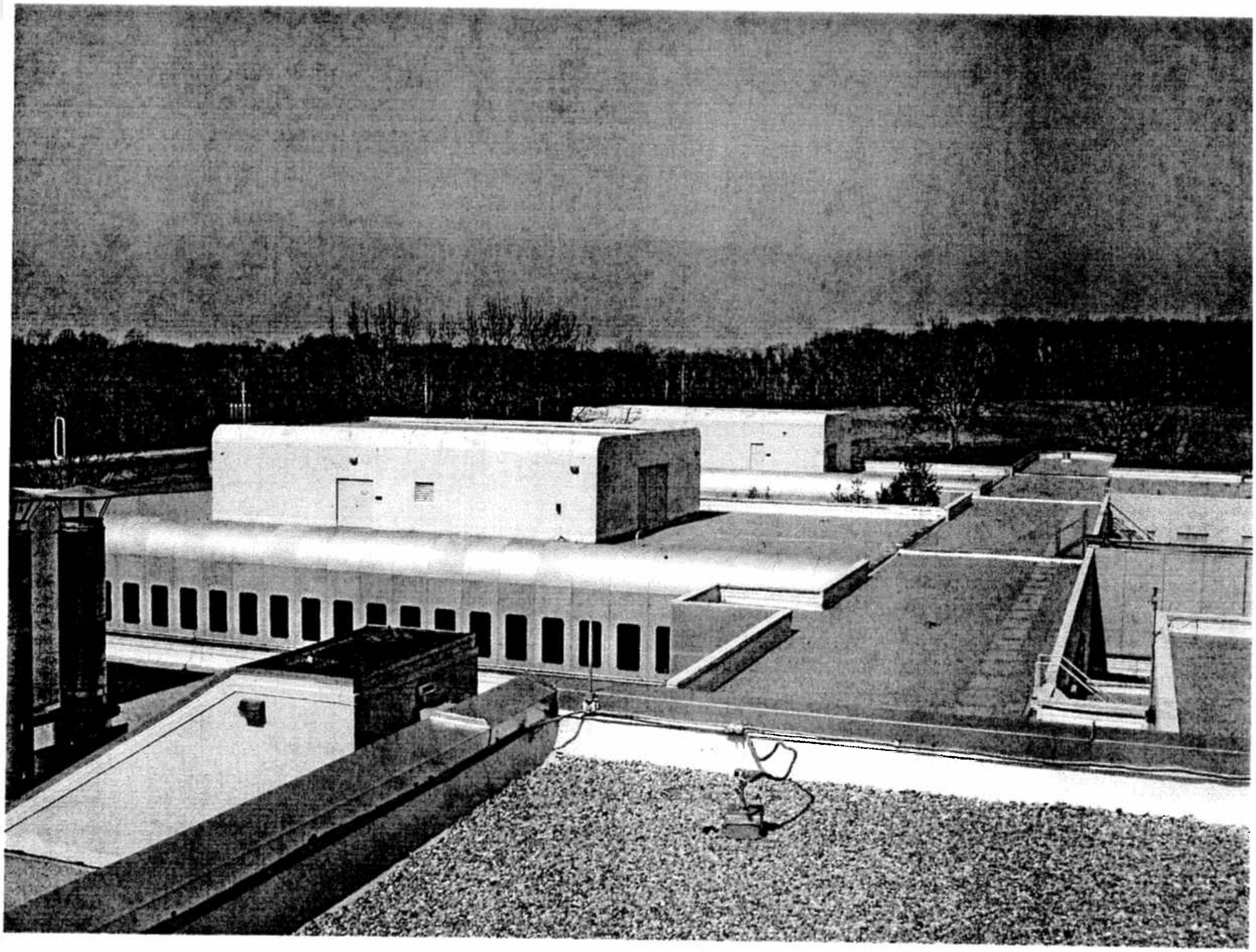


Fig. 10 – Penthouses above laboratory wings, COMSAT Laboratories (Cesar Pelli for DMJM architect, Clarksburg, MD, photograph taken 2002 – Source: Mary Corbin Sies

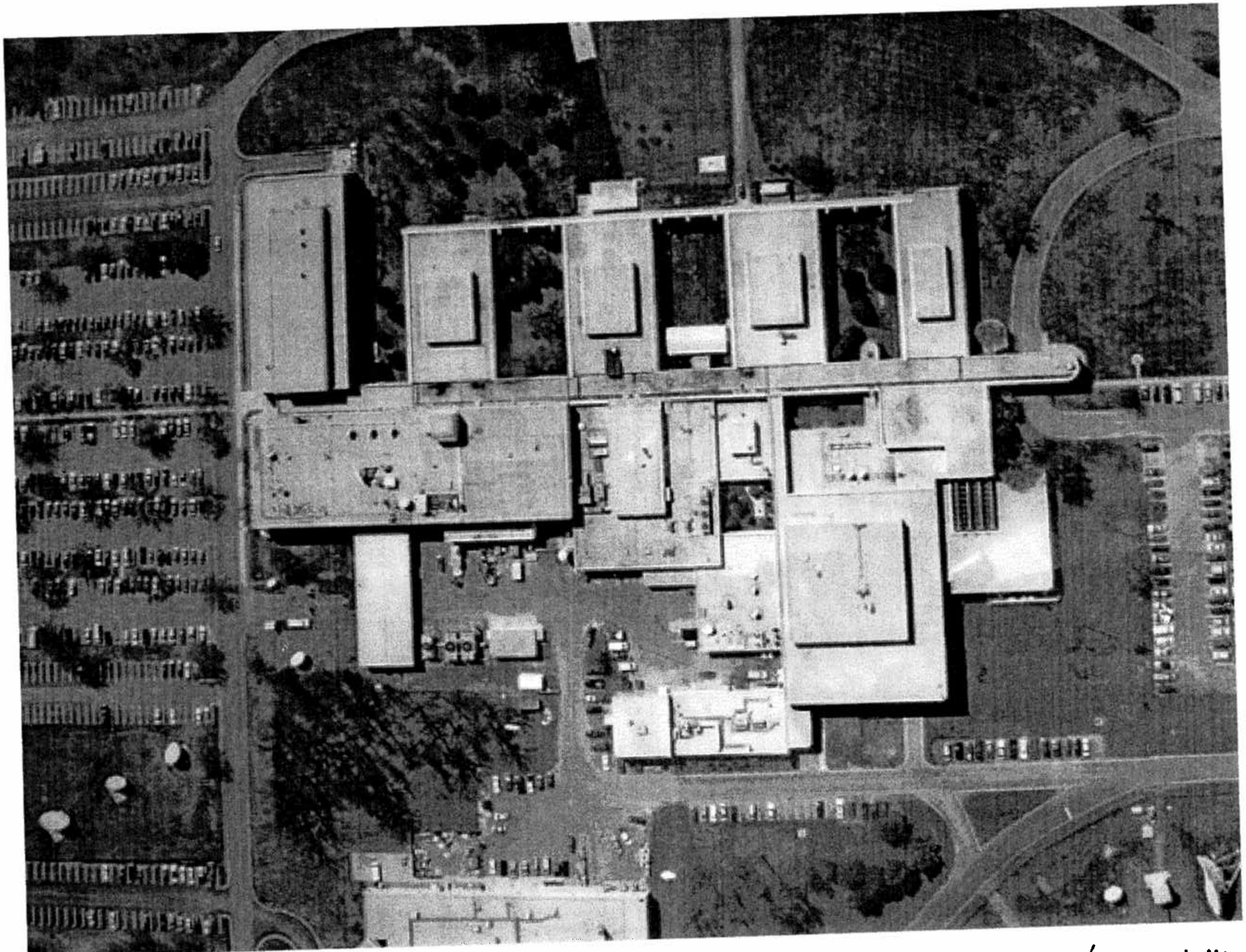


Fig. 11. Aerial view showing additions to original structure, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg MD, photograph taken c. 2004 Source: www.COMSAT-Legacy.org

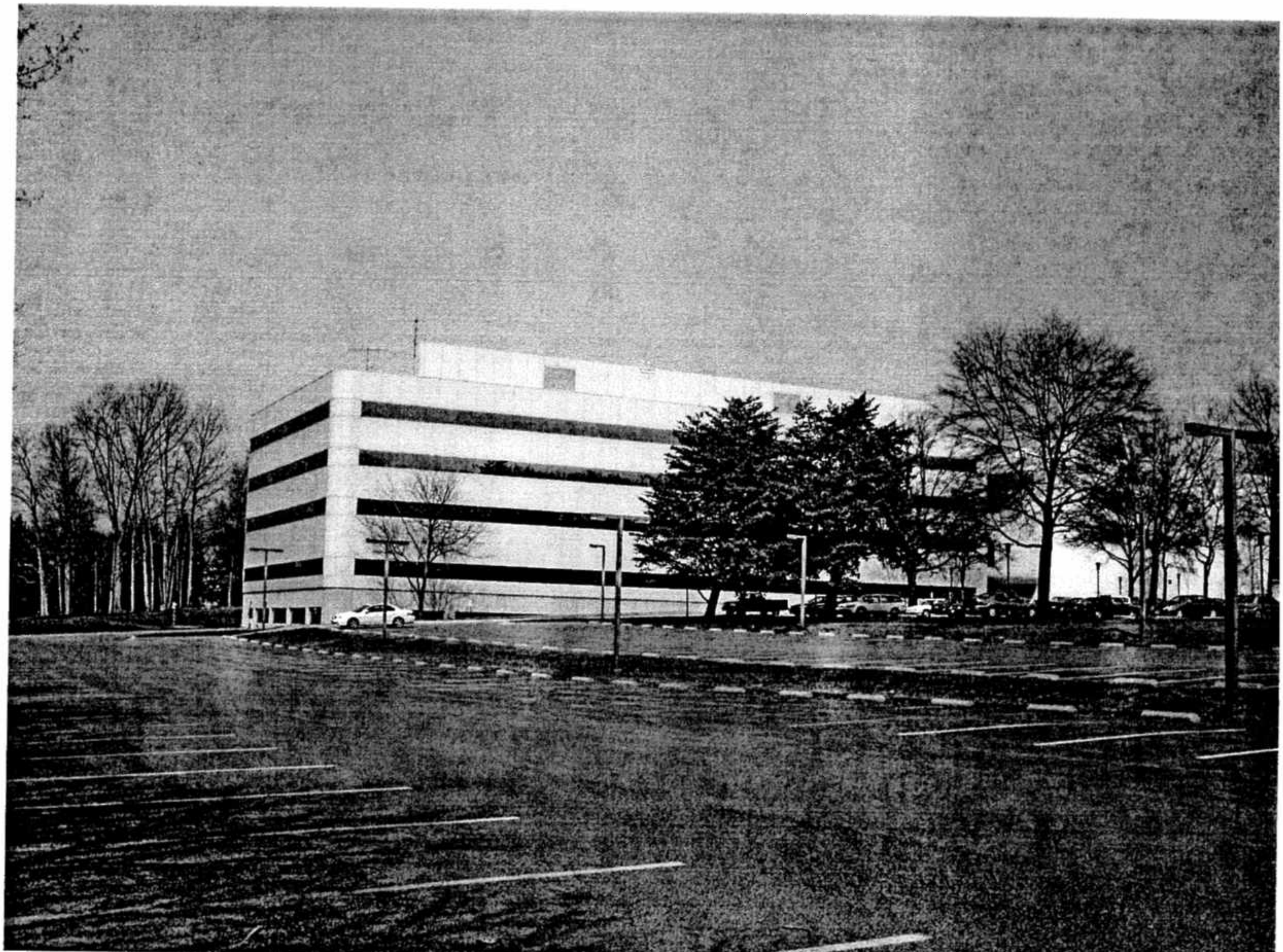


Fig. 12 - Exterior view of Wing 4, COMSAT Laboratories (Cesar Pelli for DMJM architect). Clarksburg, MD, photograph taken 2002 - Source: Mary Corbin Sies

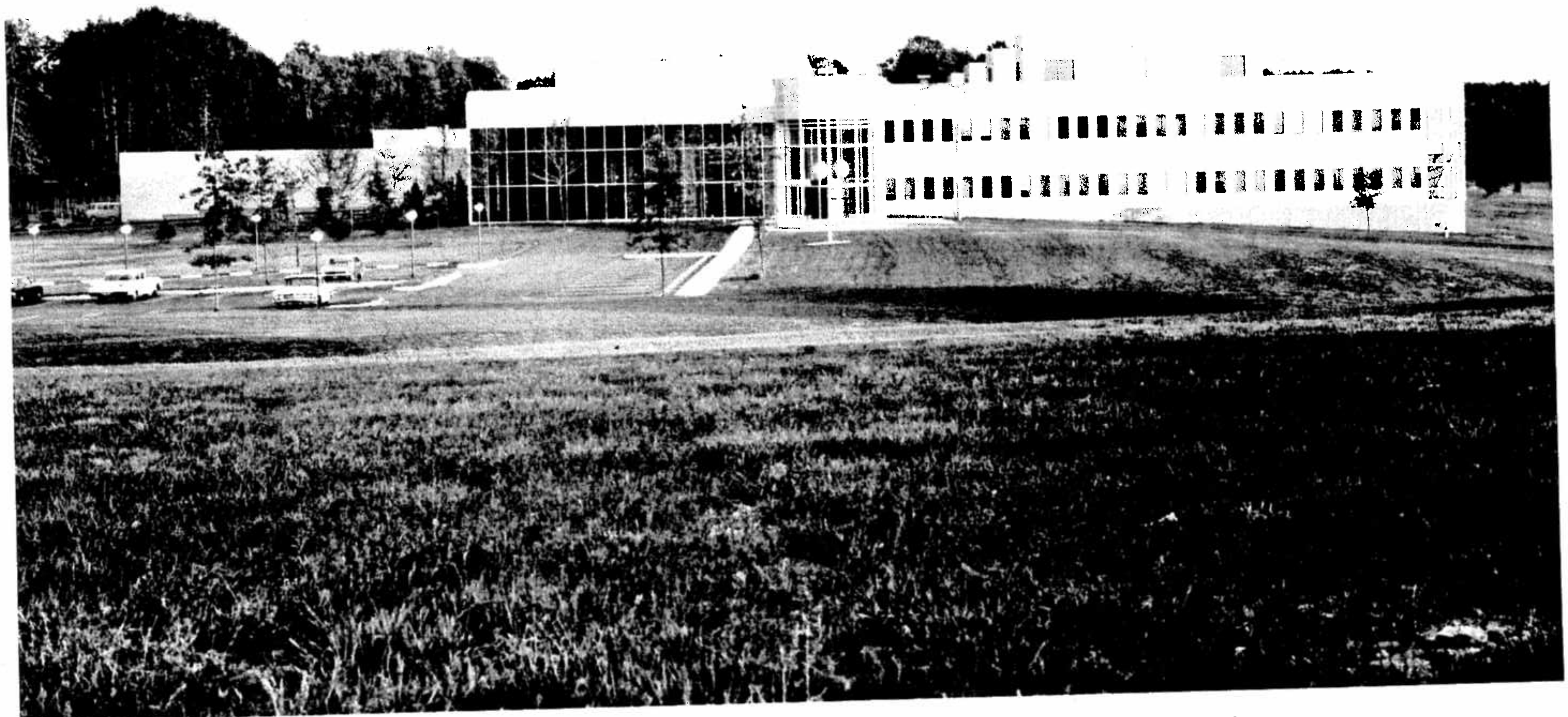


Fig. 13 - North Facade, COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MD
Photograph taken 2002 - Source: Mary Corbin Sies

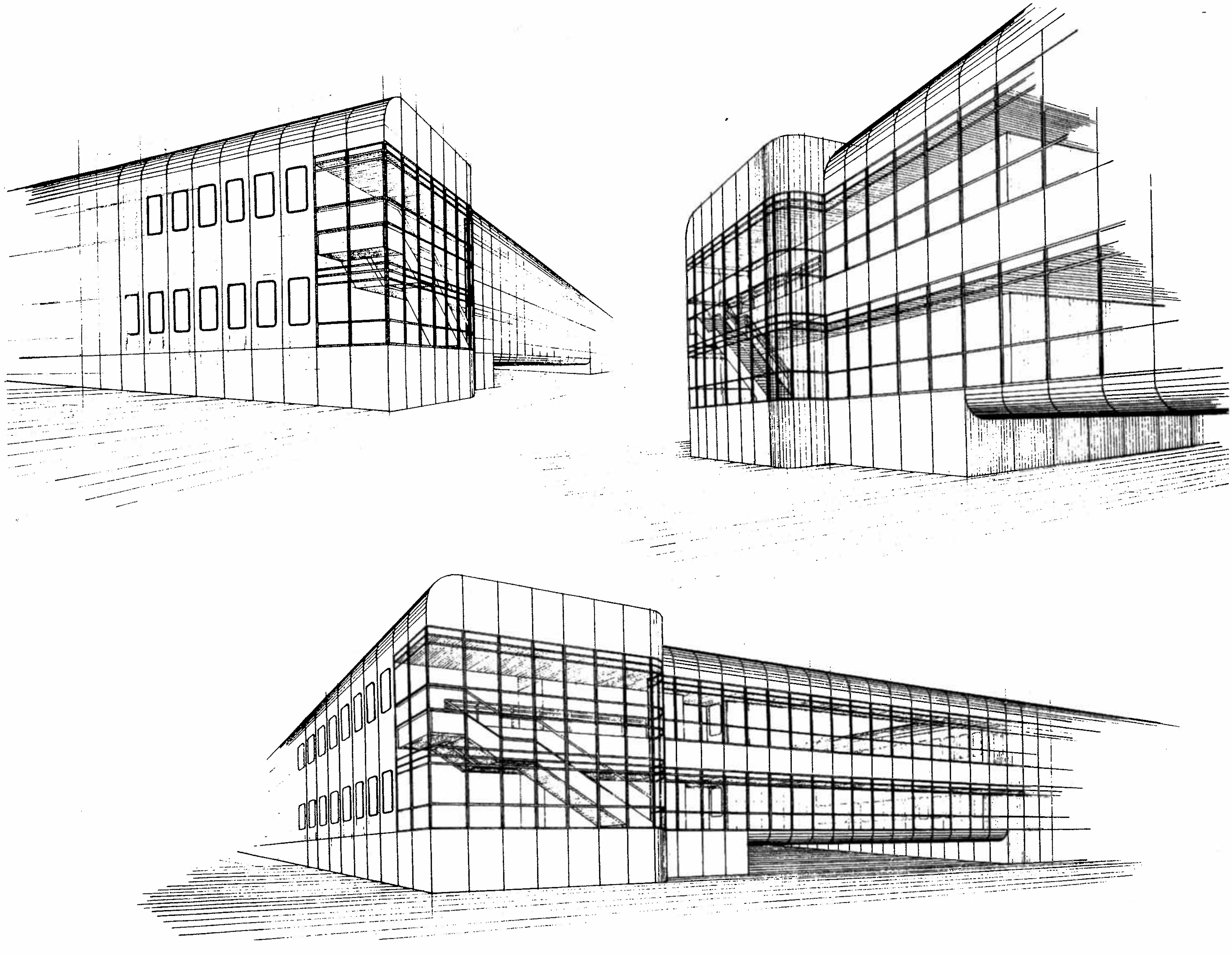


Fig. 14_Facade Studies for the office wing and the catwalk, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg, MD, delineated 1967. Source: Cesar Pelli & Associates Architects

fig. 15_ Photograph from the central spine through the landscape to the catwalk, COMSAT Laboratories (Cesar Pelli for DMJM architect), Clarksburg, MD, taken 2002.
Source: Mary Corbin Sies

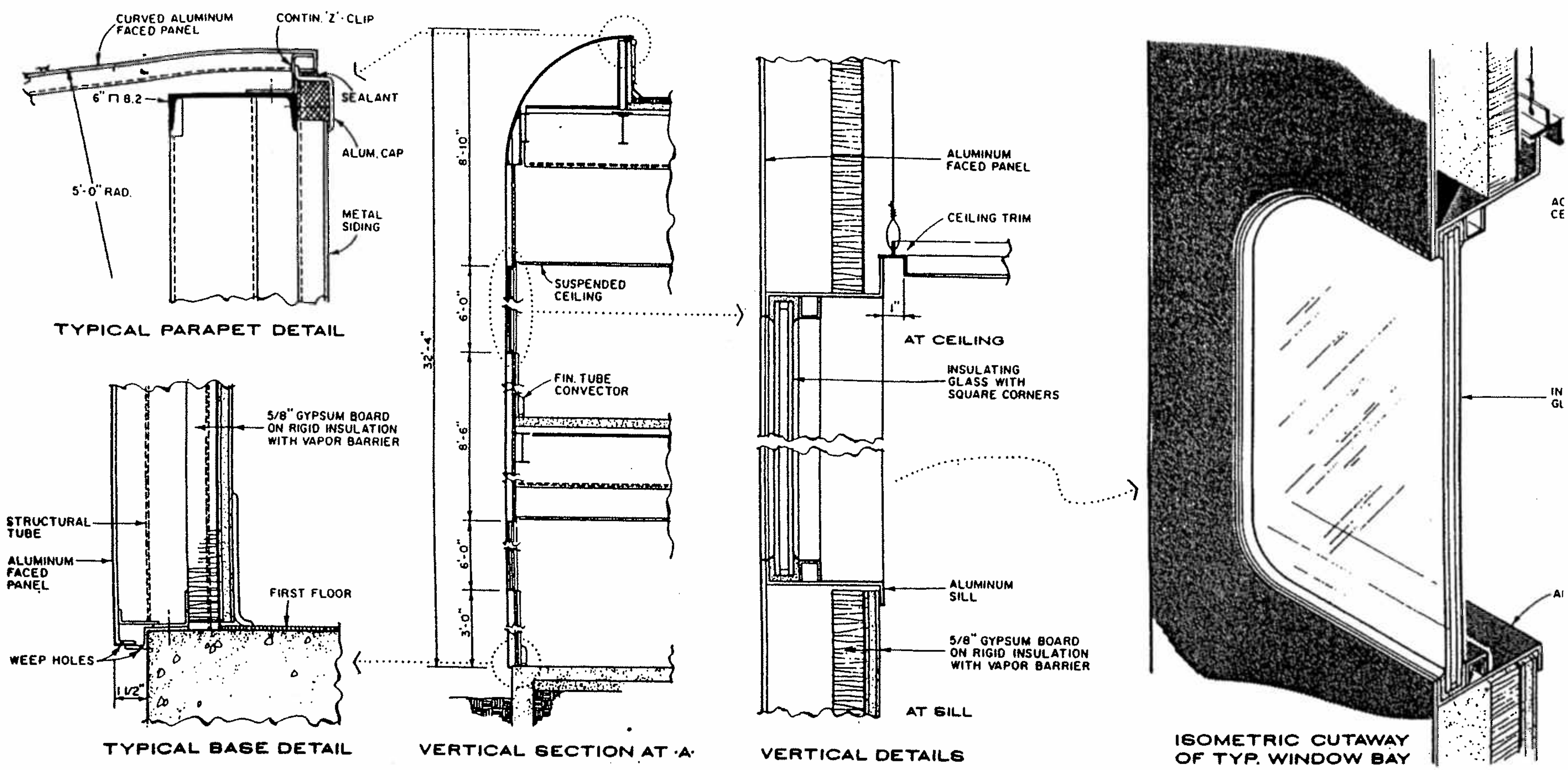


Fig.16_Constuction details for parapet, base and wall section, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg, MD, delineated 1967 Source: Cesar Pelli & Associates architects

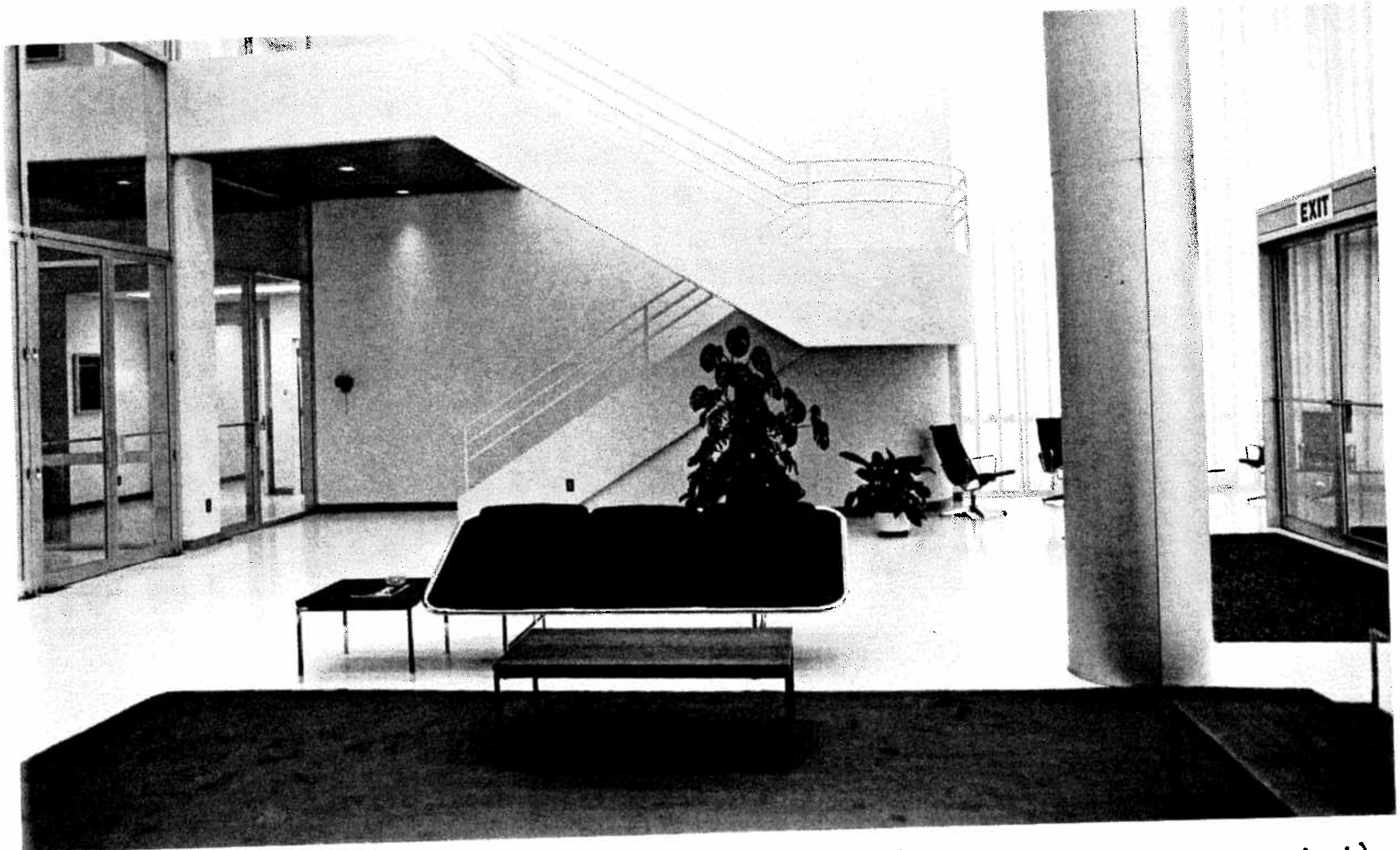


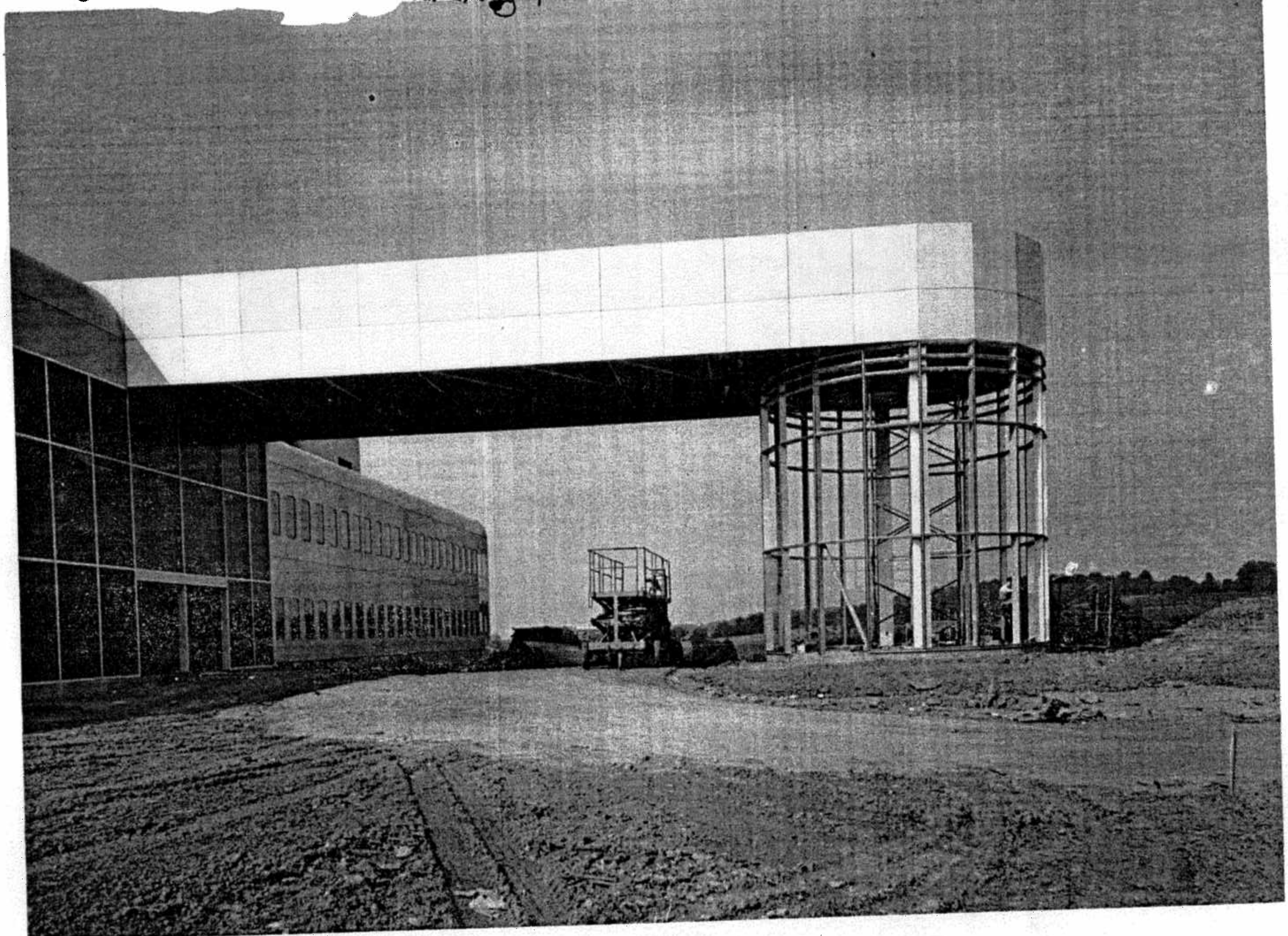
Fig. 17. Interior photograph of lobby, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg, MD, taken c. 1970 Source: Cesar Pelli & Associates Architects

COMSAT LABORATORIES
CLARKSBURG, MARYLAND
J. W. BATESON COMPANY, INC., CONTRACTOR
HIGH BAY AREA LOOKING SOUTH
OCTOBER 3, 1969

NO. 139

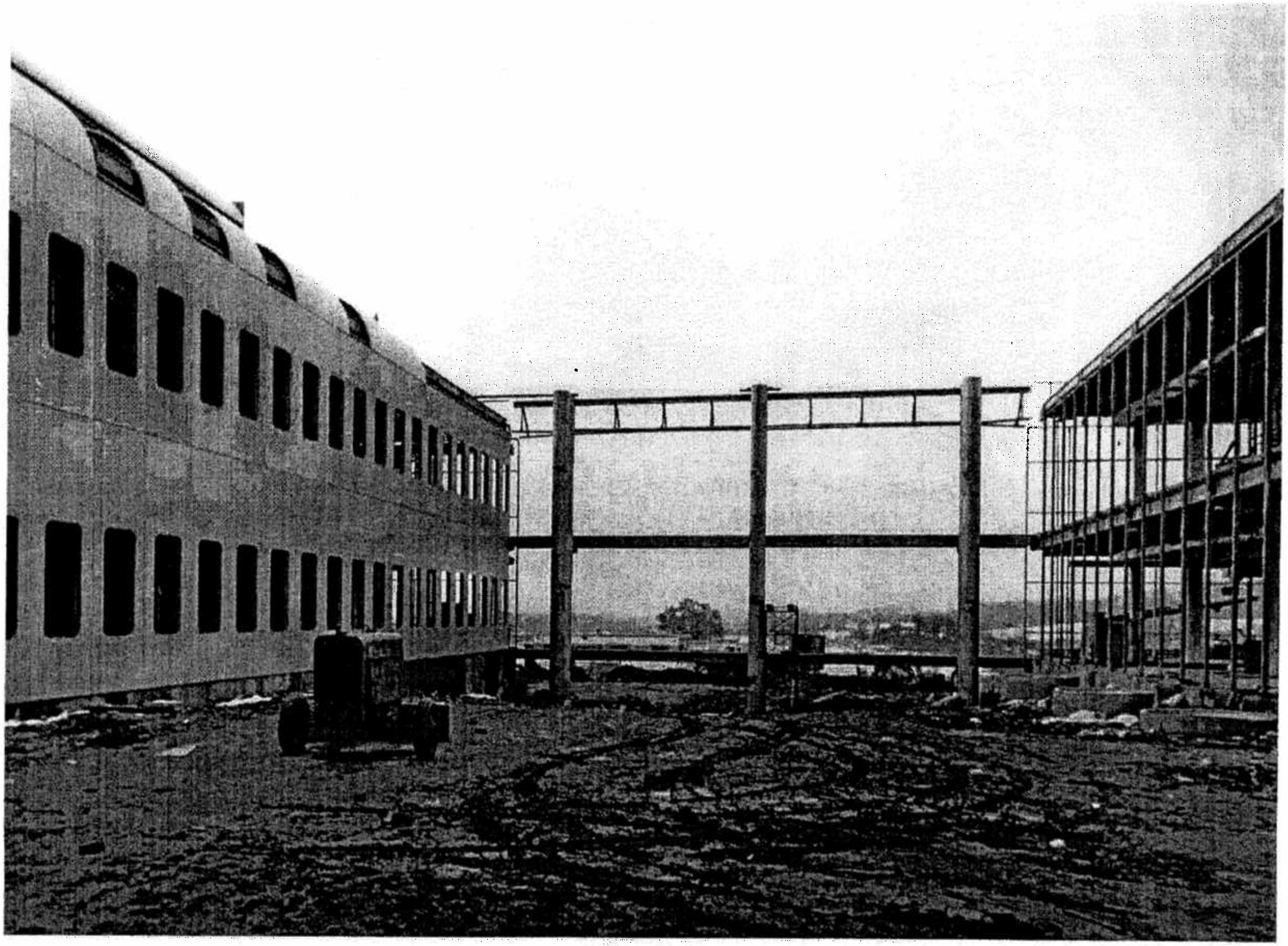
Fig. 18 - Photograph of the Environmental Test Laboratory upon completion, COMSAT Laboratories (Cesar Pelli for DMJM architect). Clarksburg, MD. take October 3, 1969 - Source: John Gerace Encor Facilities and Mike Smith, LCOR Inc.

Fig. 19. Photograph of the exhibition pavilion and northern facade, COMSAT Laboratories (Cesar ...) taken July 3, 1969 Source: John GErace, Emcor Facilities and Mike Smith, LCOR Incorporated



COMSAT LABORATORIES
CLARKSBURG, MARYLAND
J. W. BATESON COMPANY, INC., CONTRACTOR
DISPLAY AREA
JULY 3, 1969

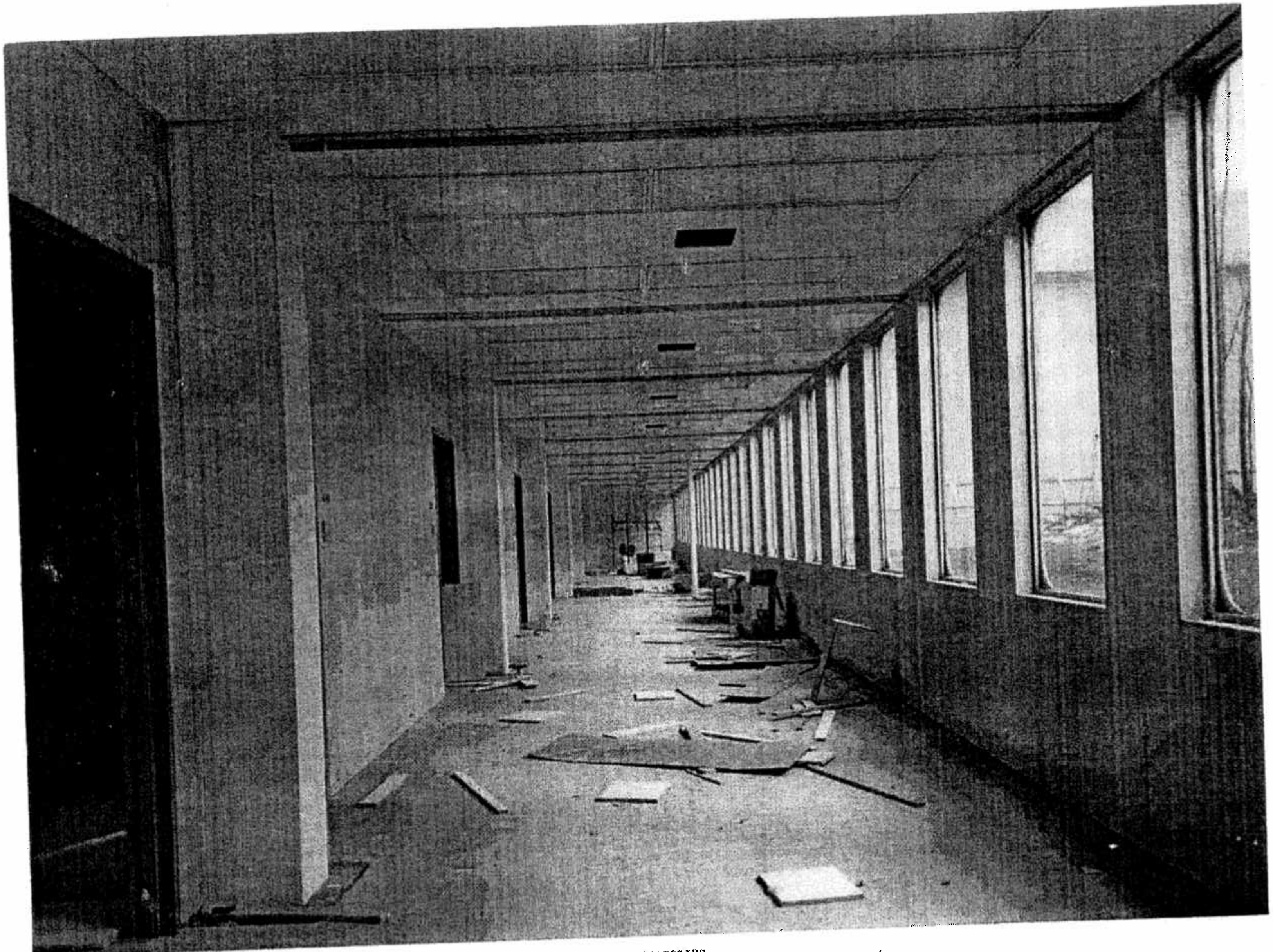
NO. 117



COMSAT LABORATORY
CLARKSBURG, MARYLAND
J. W. BATESON COMPANY, INC., CONTRACTOR
COURT BETWEEN WINGS 2 AND 3 LOOKING WEST
NOVEMBER 15, 1968

NO. 63

Fig. 20. Photograph of the catwalk and wings under construction, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg, MD, taken November 15, 1968, Source: John Gerace, Emcor Facilities and Mike Smith, LCOR Inc.



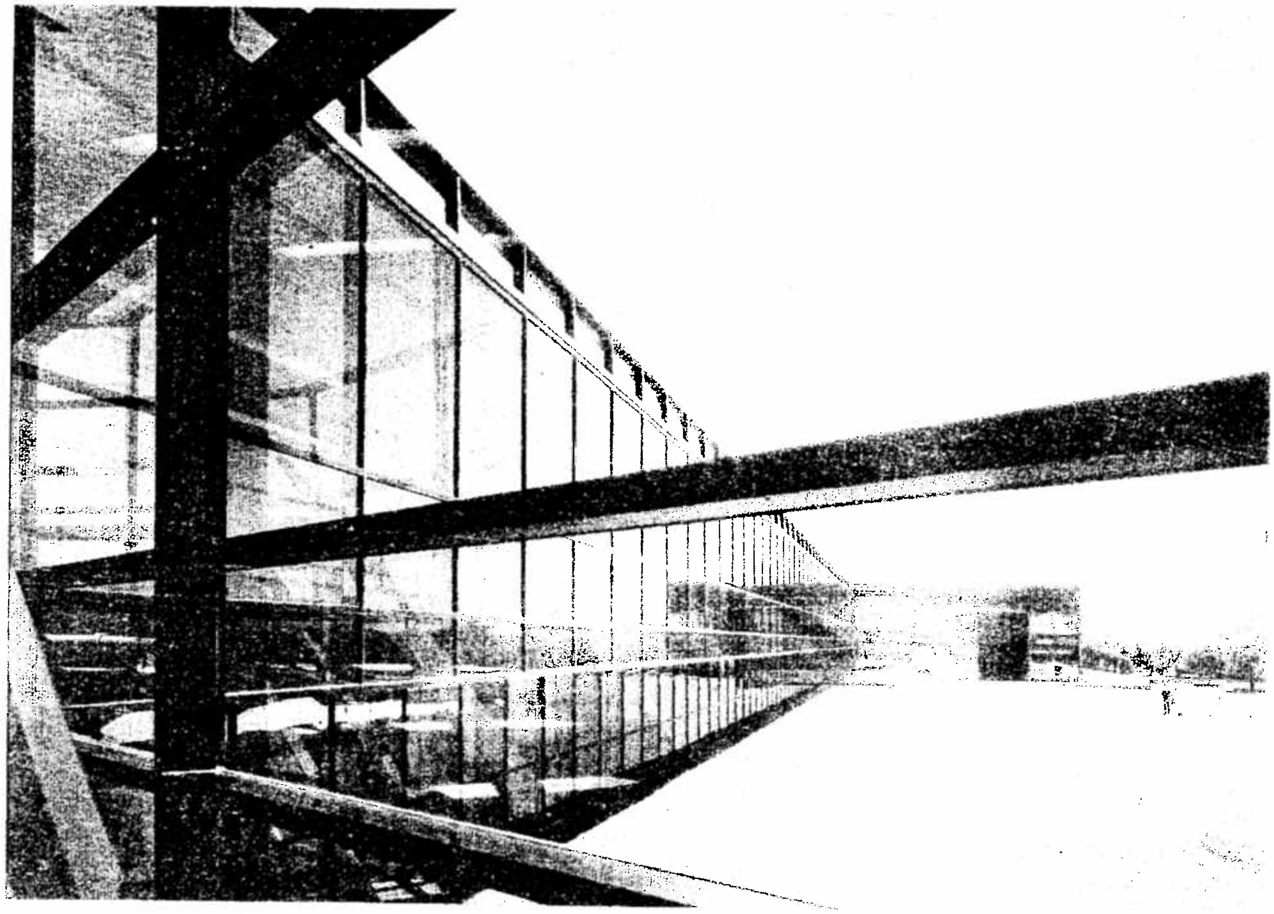
COMSAT LABORATORIES
CLARKSBURG, MARYLAND
J. W. BATESON COMPANY, INC., CONTRACTOR
WING 3, 1ST FLOOR
FEBRUARY 27, 1969

NO. 86

Fig. 21 Photograph of the office spaces under construction, COMSAT Laboratories (Cesar Pelli architect for DMJM) Clarksburg, MD, taken February 27, 1969. Source: John Gerace, Emcor Facilities Services and Mike Smith,

Fig. 22. President Kennedy signing the Communications Satellite Act in August 1962 that established COMSAT
source: www.COMSAT-legacy.org

Fig. 23. Photograph of the "Calypso," Jacques Cousteau's boat. Cousteau used mobile satellites developed by COMSAT Laboratories on his voyages. Source: www. COMSAT_legacy.org



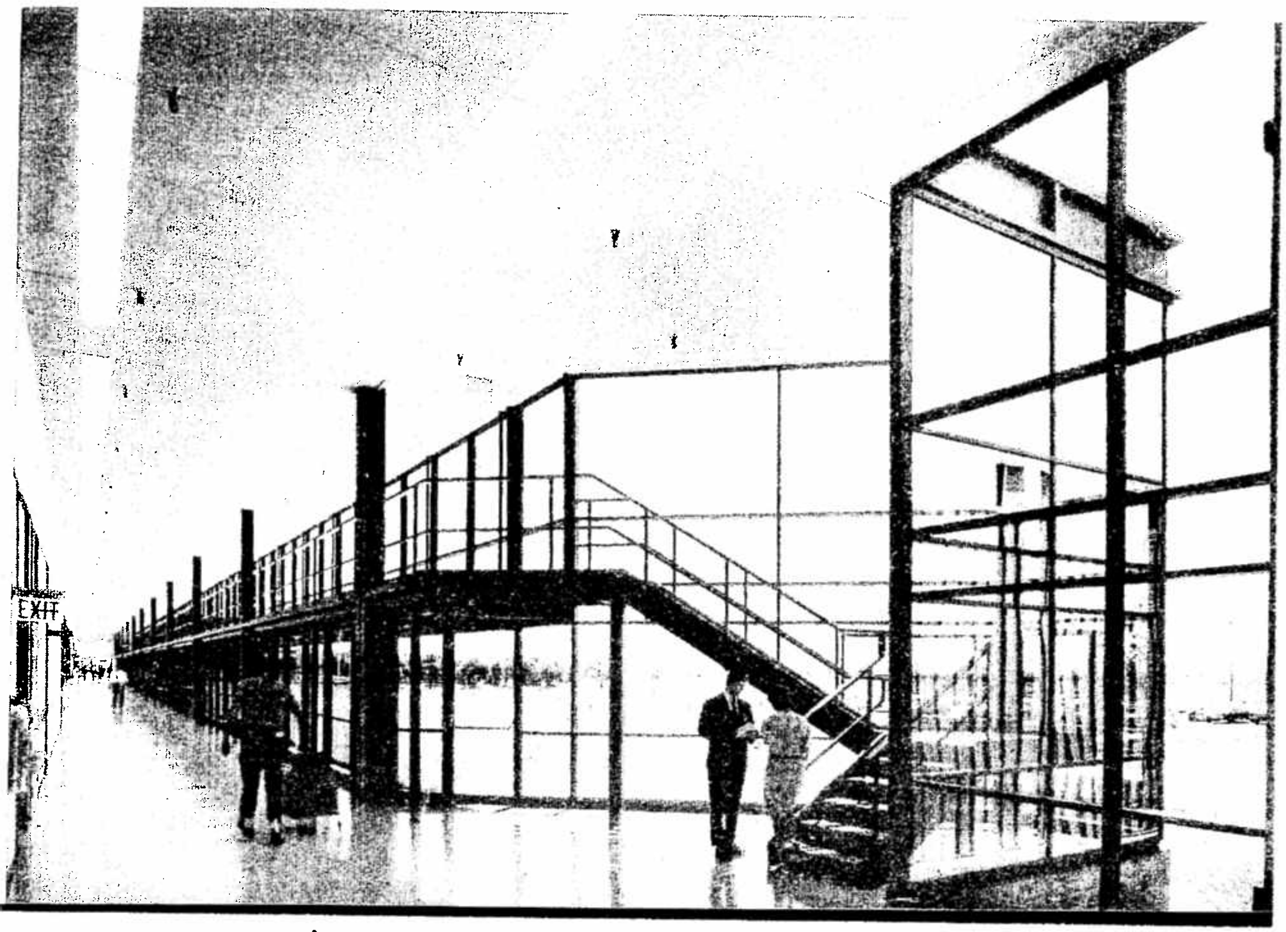
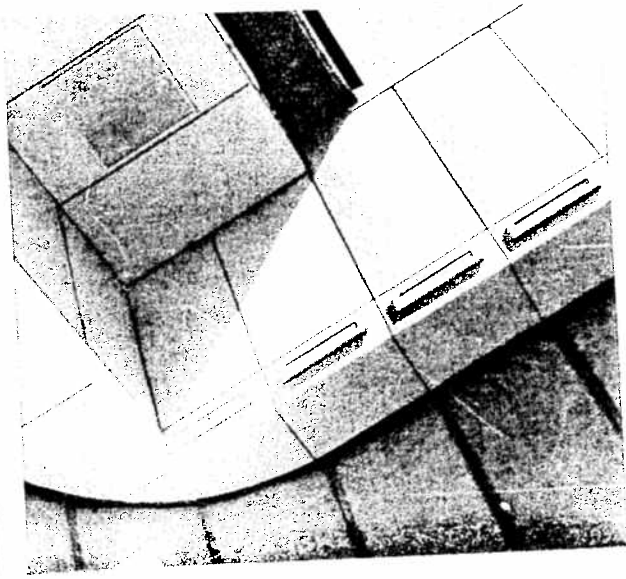
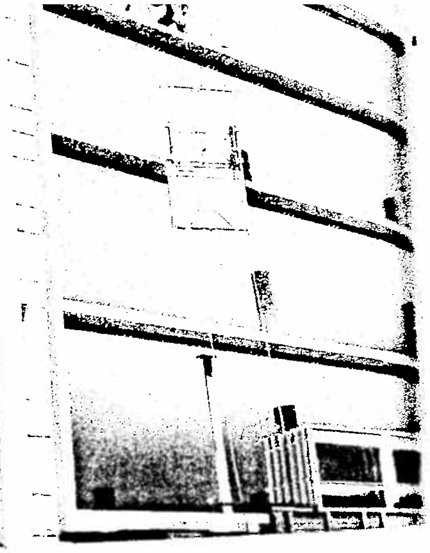


Fig. 24_ Cesar Pelli for DMJM, Teledyne Laboratories, Northridge, California, completed 1967_ Source: Architectural Forum, July - August 1968.



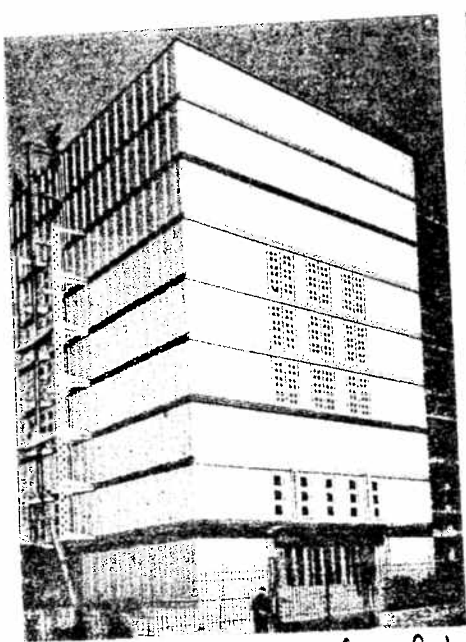


ÉLÉMENTS DE FAÇADE EN ALUMINIUM ÉTUDIÉS ET RÉALISÉS PAR LES ATELIERS JEAN PROUVÉ

1	2	3	4
			5
6	7	8	9

1 et 2. 1937. Le marché couvert de Clichy utilisé comme marché, sal[illegible] et cinéma ; façade principale et détail intérieur montrant le toit ouv[illegible] Beaudouin et Marcel Lods, architectes. 3 et 4. 1951. Fédération du B[illegible] Lapérouse à Paris ; mise en place des éléments de façades préfabriq[illegible] de la façade sur le jardin, Gravereaux et Lopez, architectes. 5. 1955 [illegible] d'habitation, square Mozart à Paris, Lionel Mirabaud, architecte. 6. [illegible] de la Foire de Lille, Paul Herbé et Maurice Gauthier, architectes. 7 [illegible] Panneaux de revêtement vus de l'intérieur et de l'extérieur, étudiés [illegible] semble d'habitation de Bron-Parilly, Grimal et Gagès, architectes, et [illegible] le groupe d'habitation de Saint-Jean-de-Maurienne, Blanc, architect[illegible] Préfecture de Nevers, M. Robert, Architecte.

Ces diverses études ont fait l'objet de publications dans nos précéden[illegible] Marché couvert de Clichy, n° 3-4, 1940, page 40. Fédération du Bâti[illegible] décembre 1951, page 58, et n° 47, février 1953, page 73. Imm[illegible] Mozart à Paris, ce numéro, page 80. Palais de la Foire de Lille, n° 3[illegible] page XXIX, et n° 38, décembre 1951, page 53.



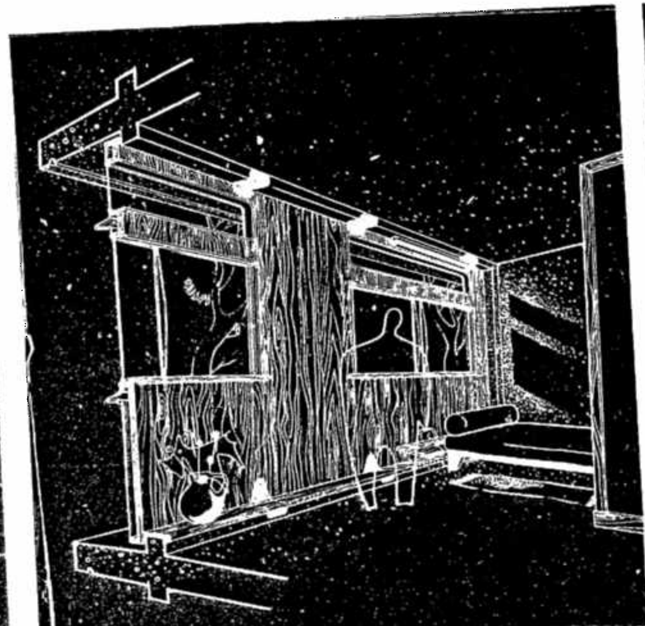


Fig. 25. Examples of prefabricated aluminum panels devised by Jean Prouvé
Source: L'Architecture d'Aujourd'hui, February 1955

1. ENTRANCE PORCH
2. LIVING ROOM PAVILION
3. GARAGE / DRESSING ROOM / MASTER BATH PAVILION
4. GALLERY
5. KITCHEN / SITTING ROOM PAVILION
6. DINING ROOM PAVILION
7. GUEST BEDROOM PAVILION
8. SCREEN PORCH

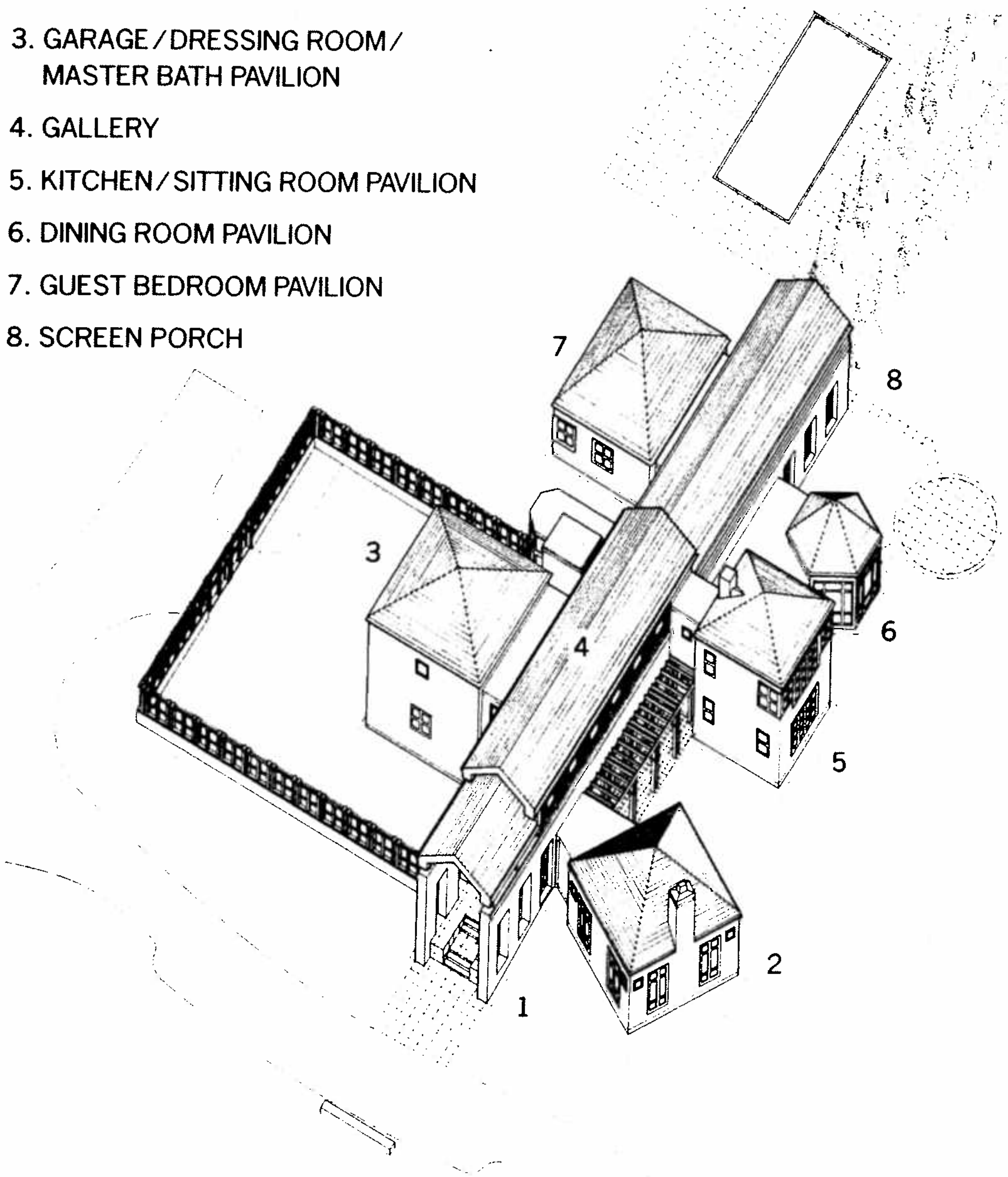


fig. 26 - Axonometric view, House (Cesar Pelli architect), Montgomery County, MD, delineated c. 1986
Source: Architectural Digest, July 1990

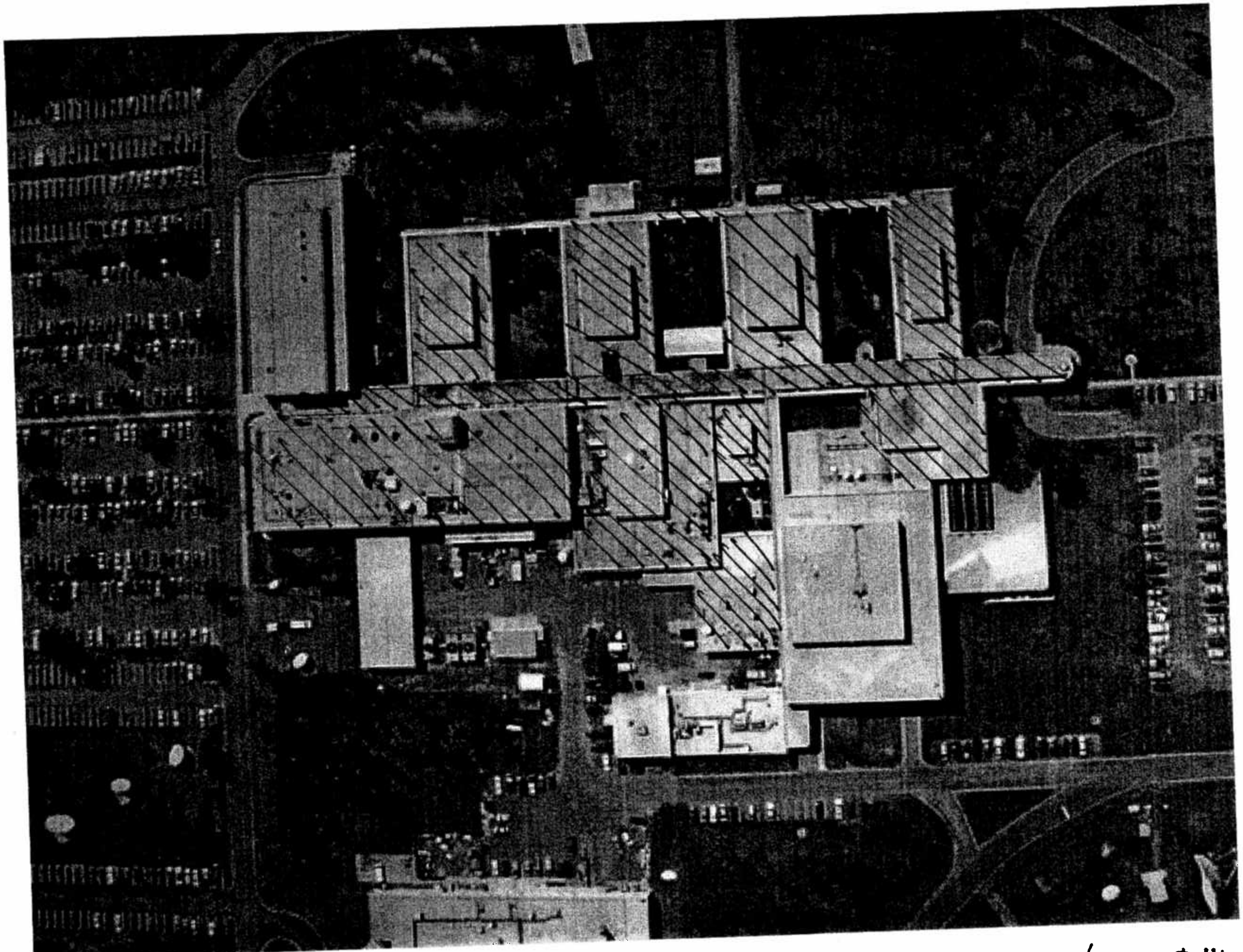


Fig. II. Aerial view showing additions to original structure, COMSAT Laboratories (Cesar Pelli for DMJM architect) Clarksburg MD, photograph taken c. 2004 Source: www.COMSAT-Legacy.org

Attachment C: Letter from the Maryland Historical Trust

September 12, 2024

Ms. Rebeccah Ballo
Historic Preservation Supervisor
Montgomery County Planning Department
2425 Reedie Drive, 13th Floor
Wheaton, MD 20902

Re: Montgomery Planning Request – COMSAT Building National Register Eligibility

Dear Ms. Ballo:

Thank you for reaching out to request assistance from the Maryland Historical Trust (MHT) regarding a determination of National Register of Historic Places eligibility for the COMSAT Laboratories at 22300 Comsat Drive, Clarksburg, MD 20871, pursuant to Title 8 of the Land Use Article, §8-205(2)b. We are responding primarily based on the draft National Register nomination you provided but would be happy to evaluate any additional information as needed.

MHT has determined that the COMSAT Laboratories building in Clarksburg (M:12-59) is eligible for listing in the National Register of Historic Places under Criterion C as the work of a master at the state level of significance. Designed by architect Cesar Pelli in 1967, the building is an early example of "High-Technology" design with many features that would come to characterize the style, particularly along Montgomery County's technology research corridor. The COMSAT Laboratories building features aluminum cladding (contemporaneously referred to as "metal skin") in the metal-glass based curtain walls set in a pastoral landscape, characteristics that are consistently repeated in other High-Tech designs. The building is one of four Pelli-designed buildings in the region and Pelli's only commercial design still standing in Maryland.
The building is also eligible for listing in the National Register under Criterion A in the areas of Science, Engineering, and Communications at the national level of significance. COMSAT Laboratories opened in 1969 as the research division of the COMSAT corporation, which was founded in February 1963, as a result of the Communications Satellite Act of 1962, to establish a commercial communications satellite system. The research undertaken at COMSAT Laboratories developed modern communication technology that was revolutionary at the time.

When the draft National Register documentation was prepared in 2005, COMSAT Laboratories held over 100 patents, with many more pending. Accomplishments by researchers at the building include the broadcast of the moon landing on television in 1969, the development of antennae that could be used for ship-to-ship communication, echo suppressor and echo cancellers that allowed for voice calls over satellite, videoconferencing, and the hydrogen-nickel oxide battery, which extended satellite battery power.

The proposed Period of Significance for the building extends from 1969 when construction on the building was completed through 1974. However, additional comparative research and documentation of the accomplishments of the COMSAT Laboratories may extend the period of significance beyond the fifty-year mark. Because of the significance of accomplishments of the COMSAT Laboratories, Criterion Consideration G will likely be met.

We hope this satisfies your request. If you have any additional questions, please contact Nell Ziehl, Chief of Planning, Education and Outreach, at nell.ziehl@maryland.gov or (410) 697-9592.

Sincerely,

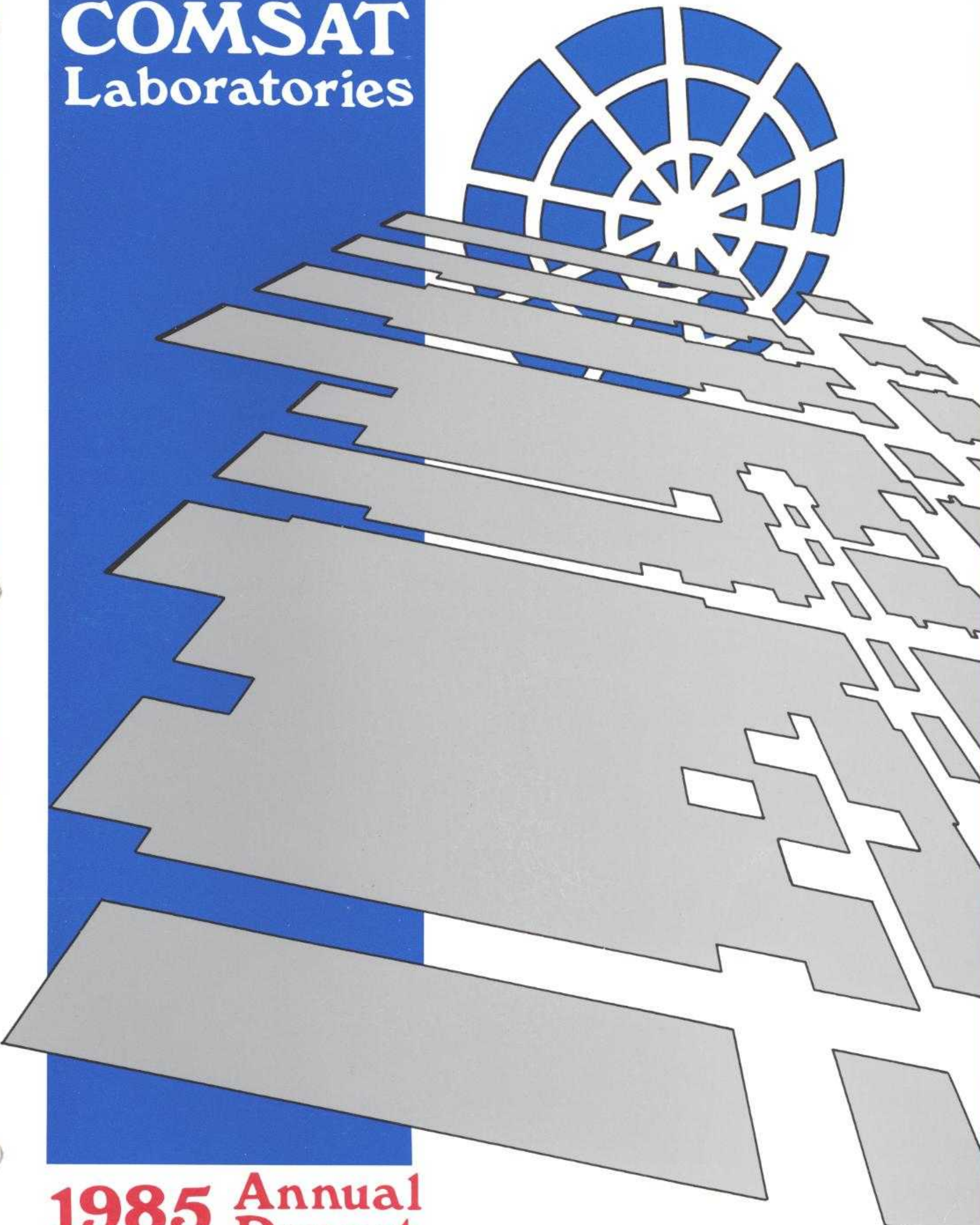
Elizabeth Hughes

Elizabeth Hughes
Director

cc: Jessica French, Administrator, National Register Program

Attachment D: COMSAT Laboratories: 1985 Annual Report

COMSAT Laboratories



1985 Annual Report

COMSAT LABORATORIES
1985 ANNUAL REPORT

August 1986

COMSAT Laboratories
Communications Satellite Corporation
22300 COMSAT Drive
Clarksburg, MD 20871

PERSPECTIVE

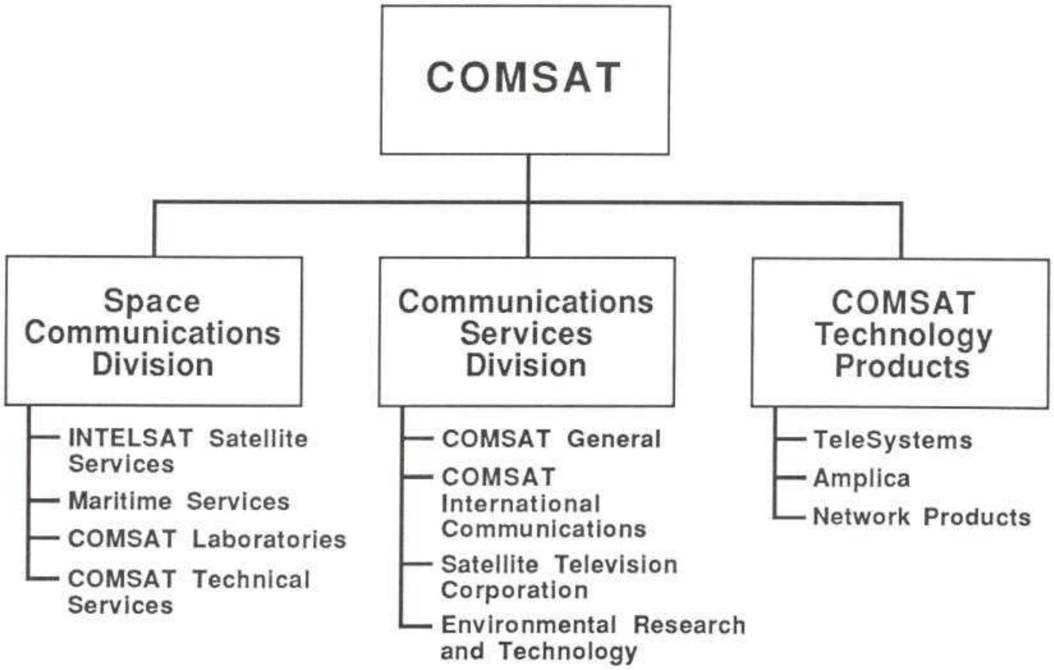
Comsat Laboratories conducts a program of basic research and development to advance satellite communications technology. Elements of the program are funded by the INTELSAT Satellite Services, COMSAT International Communications and Maritime Services divisions (all formerly parts of the World Systems Division), and as such are paid for from revenues derived from international communications services carried via the INTELSAT and INMARSAT organizations. Other work is funded by non-regulated components of the corporation. Documentation concerning jurisdictional work (that is, work wholly or partly funded by the rate-payer) is made available to the public through a catalog that announces the availability of published papers and reports. In addition, a précis is published to summarize the scope of all jurisdictional projects being undertaken in each calendar year.

During 1984 the Federal Communications Commission ruled (in its Structure Order dated April 20, 1984) that the program of basic research previously funded wholly by the rate-payer must henceforth be paid for in part by the rate-payers and in part by the Corporation's shareholders. The prescribed formula that sets the ratio between these sources results in two-thirds of the cost being assigned to the shareholders. Since this work still must be put in the public domain, it affords the shareholders no proprietary advantage. The result has been a steady decrease in the overall size of the program. In 1985 the Laboratories' funding for research fell to 20 percent of its total budget (approximately $40 million) and the balance of the effort consisted of work undertaken for Corporate and external customers approximately in the ratio 5:4. The largest effort undertaken for external customers is our involvement in the NASA Advanced Communications Technology Satellite Program (ACTS).

Commencing with calendar year 1983 we began publishing an annual report summarizing the results of our research and development program. This report provides a summary of all of the R&D work undertaken with Corporate support during 1985 and is the third in the series.

J. V. Evans

J. V. Evans
June 1986



COMMUNICATIONS SATELLITE CORPORATION

Organization Circa Mid-1985

CONTENTS

Introduction

INTRODUCTION

COMSAT Corporation was created in 1963 following the passage of the Communications Satellite Act, which President Kennedy signed into law in late 1962. Subsequently, in 1964, INTELSAT was established as a result of efforts by COMSAT and the U.S. State Department to faciltate international communications between fixed points by satellite. Initially, INTELSAT had 11 participants. This has since grown to 110 member countries, and the organization presently provides service to 170 nations. COMSAT is the U.S. Signatory and representative to INTELSAT.

Until 1978, COMSAT also acted as Technical Manager of INTELSAT. In this role, COMSAT encountered many technical problems, and COMSAT Laboratories was formed in 1966 to help meet these challenges. Initially located in Washington, D.C., the Laboratories moved to its present quarters in Clarksburg, Maryland, in 1969.

COMSAT Laboratories presently has a staff of approximately 480, and occupies buildings which afford approximately 400,000 square feet of space. These facilities are located on a 210-acre tract along Route I-270 north of Gaithersburg, Maryland.

In 1973, COMSAT formed the COMSAT General Corporation with the expectation of branching into domestic satellite communications. In 1975, in partnership with IBM and Aetna Casualty Co., the Satellite Business Systems Corporation was formed. In 1979, as a result of successful demonstrations, using the MARISAT system, of maritime mobile satellite communications, COMSAT and the U.S. State Department joined with other nations to form INMARSAT, for which COMSAT again serves as U.S. Signatory and representative. The Satellite Television Corporation was formed in 1980 to promote direct broadcast television. The Corporation exited from the SBS partnership in late 1984. During the first half of 1985, following an FCC order requiring the separation of the space- and earth-segment activities, the Corporation reorganized its divisions. The Laboratories, along with INTELSAT Satellite Services, the U.S. INTELSAT Signatory; Maritime Services, the U.S. INMARSAT Signatory; and COMSAT Technical Services, became the constituent parts of the Space Communications Division, while the international earth segment activities, COMSAT International Communications, Inc., are part of the Communications Services Division.

In 1985, the largest part of the work at COMSAT Laboratories remained that performed for the regulated activity of international satellite communications, either directly for COMSAT or indirectly for INTELSAT. Additional work was performed for COMSAT General, and COMSAT's manufacturing arm—Technology Products. Effort funded entirely by sources outside of COMSAT/INTELSAT includes activities for the Federal Government (NASA or DARPA) or for commercial companies, and in particular, a significant amount of work performed on the Advanced Communications Technology Satellite (ACTS) ground segment program.

During 1985, the Laboratories was organized into six technical divisions: Communications Techniques, Microelectronics, Microwave Technology, Network Technology, Spacecraft Technology, and System Development. Of these, the first five divisions participate in a research program funded by the Corporation. This program constituted about one-third of the Laboratories' activities and includes jurisdictional (WSD) business, as well as the non-jurisdictional activities of COMSAT. The former must, perforce, be made public while the latter can be held proprietary. The balance of the Laboratories support comes from projects performed for and directed by various corporate elements, INTELSAT, INMARSAT, or other outside organizations, each of which is separately negotiated and has specified deliverables and delivery dates. The System Development Division, which is chiefly occupied in writing computer software, works almost exclusively on such specific tasks.

This report summarizes the Laboratories' R&D activities in 1985. It is organized by technology, as defined by the six technical areas represented by each of its constituent divisions. The work is further subdivided into the following categories:

- Corporate Research (Jurisdictional);
- Corporate Research (Non-Jurisdictional);
- Work performed for various COMSAT divisions in response to specific requests;
- Work performed for INTELSAT; and
- Other work.

Of these categories the most advanced work is that undertaken as part of the research program. This program is decided upon through a process of Laboratory management review of ongoing efforts and proposed new ones leading to a tentative program that is subject to critique by the WSD and the approval of COMSAT's Corporate R&D Committee—a subcommittee of the COMSAT Board of Directors.

NETWORK TECHNOLOGY DIVISION

INTRODUCTION

The focus of the Network Technology Division (NTD) is to develop satellite networks and systems that fully utilize satellite routing flexibility to provide new services at competitive cost. This concept is implemented through COMSAT's research and development program.

The NTD is responsible for research and development activities pertaining to communications network design, satellite multiple access, network control, and protocol development. The division also operates and maintains small earth terminals, both permanently mounted and transportable, to provide satellite access for COMSAT Laboratories' development projects and to develop monitor and control techniques and equipment for unattended earth terminals. In these areas of endeavor, the NTD has been engaged in systems research and development activities in support of the Corporation and its various lines of business.

Since the early 1970s, the NTD has been engaged in the development of time-division multiple-access (TDMA) systems and equipment for satellite communications. Support was provided to INTELSAT in the development of system specifications for the 120-Mbit/s TDMA/DSI (digital speech interpolation) system currently deployed in the INTELSAT global satellite network. In addition, the NTD has been actively engaged in researching data communications protocols and techniques for efficient data transmission via satellite.

In addition to hardware and system development activities, other efforts include continued enhancement of the COMSAT multiprocessor operating system (COSMOS) that was initially developed within the NTD. This software operating system, together with both single and multiprocessor hardware architectures which form the basis for most implementation tasks carried out by the division, allow common hardware and software development for different projects.

COMSAT R&D

Non-Jurisdictional

Expert Systems

Recent developments in knowledge-based systems and expert systems hold promise for application to communications networks and their control as well as satellite systems. Currently available expert systems development environments encompass a wide range of capabilities, performance, and cost. With the use of a special-purpose LISP computer, along with the requisite software tools (including expert system shells), a concept feasibility prototype could be developed rapidly.

The required computer hardware environment was determined to be one of a number of available "LISP machines." These computers were designed using an architecture specifically developed to efficiently and effectively execute software written in the LISP programming language, which is the predominant language of artificial intelligence research and applications in the United States. The most powerful software development tools that are commercially available are compatible only with computer hardware of this category.

It was decided that NTD expert systems research and development could best be designed, applied, and supported using computer hardware of the LISP machine variety. It was also determined that the cost and delay associated with complete in-house development of the required software tools was restrictive, and would delay the implementation of useful applications. Following a detailed exploration and comparison of available LISP machines, expert systems software development tools, and the combined computer hardware and software performance, a computer and software combination was chosen and procured.

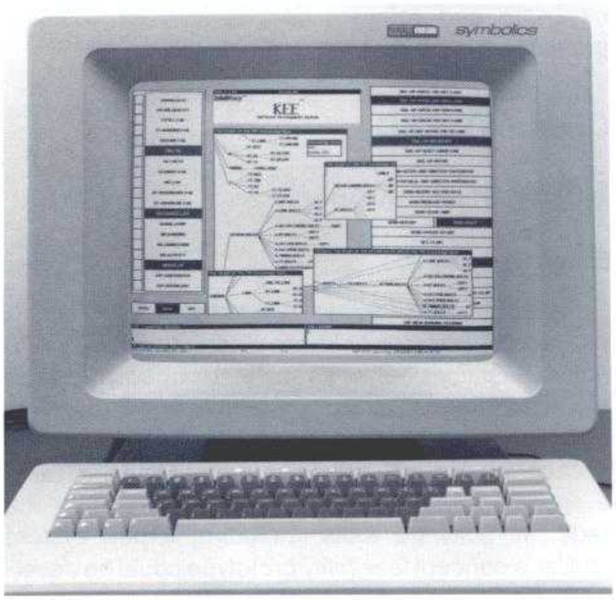


Figure 1. Expert system prototypes, such as this intelligent network-alarm management system, are developed by the NTD

Figure 1 shows an intelligent network-alarm management system, one of the expert system prototypes being developed in the NTD.

COMSAT SUPPORT

Space Communications Division

NBS/COMSAT Data Communications Experiment

Since late 1983, COMSAT and the National Bureau of Standards (NBS) have been engaged in a joint program to examine and test the performance of data communications protocols (specifically, high-level protocols) over satellite links. The first phase of the program, concluded in early 1985, focused on the normal data flow procedures of the International Standards Organization/International Telegraph and Telephone Consultative Committee (ISO/CCITT) class-4 transport protocol. The satellite experiment demonstrated satisfactory performance for computer communications via satellite transmission paths for a wide range of bit rates (32, 64, 384, and 1544 kbit/s) and bit error rates. The performance degradation of the class-4 transport protocol due to degraded bit error rate and the satellite propagation delay was shown to be alleviated by minor modifications in the current specification of the international standard of the protocol.

The above modifications were presented to the ISO/TC97/SC6 meeting in October 1985. The working group dealing with the transport protocol approved the modifications and forwarded them to all member bodies of TC97/SC6.

The second phase of the program deals with the expedited data flow procedure, duplex and multiplexed connections, and their operation over satellite links. Modifications to the expedited data flow procedures were tested over satellite links and a considerable performance improvement was demonstrated.

The remaining functions of the transport protocol and other higher level protocols and appropriate modifications will be implemented and tested over satellite links during 1986.

T1D1 Summary

The subcommittee for Integrated Services Digital Network (ISDN), T1D1, of the American National Standards Institute (ANSI) formulates ISDN standards for the North American telecommunications system and recommends U.S. positions to international standards bodies—CCITT and ISO. The 72 voting members of T1D1 represent exchange carriers (e.g., Bell Operating Companies), interexchange carriers (e.g., AT&T and COMSAT), equipment manufacturers (e.g., IBM), and general interest representatives (e.g., FCC and NTIA).

The NTD has been actively involved in the T1D1 process to safeguard satellite interests in the evolving ISDN standards. In 1985, items considered by T1D1 included ISDN access protocols [e.g., link access procedure on D-channel (LAPD)], interworking of ISDN access protocols with common channel signaling system 7, new ISDN services, and packet mode operation of LAPD for end-to-end communication.

NTD scored a major success this year. Of particular interest to COMSAT was the "Primary Rate Access Minimal Subset" for ISDN access, the first ANSI standard completed this year by T1D1 for the U.S. ISDN environment. In formulating the standard, other carriers advocated a timer value which would have precluded the use of satellite links for ISDN access. After very difficult negotiations, NTD finally won support for a value that would ensure satellite access. It has since been incorporated into the final ANSI standard, securing COMSAT's interests for the future.

CCITT

During 1985, the NTD was involved in the activities of Study Groups VII, XI, and XVIII (ISDN matters).

For Study Group VII, a report was generated on the quality of services in public data networks. The specific parameters chosen for defining the quality of service and the range of allowable values for these parameters are important in accommodating satellite transmission paths in public data networks.

The NTD was also involved in Study Group XI activities for ISDN signaling. Various procedures and parameters for ISDN signaling protocol (D-channel protocol) were chosen to ensure its successful operation over a satellite link.

The NTD has been an active participant in Study Group XVIII (ISDN matters) to ensure that satellite circuits are not excluded from ISDN and that the full range of satellite communications capabilities are utilized. Satellite services were threatened by efforts to limit certain ISDN specifications based on low transmission delays. Nevertheless, a number of specific issues were resolved in favor of satellite communications:

a. the Layer 1 ISDN interface timer for activation/deactivation procedure has been changed from 500 ms to 1 s to allow ISDN access via satellite;
b. the routing procedures do not preclude two-hop satellite links; and
c. ISDN circuits will not be categorized on the basis of transmission delays.

COMSAT Technology Products

Low-Rate TDMA

The NTD has been selected by COMSAT TeleSystems, Inc. to provide hardware and software development for the DST 2000 low-rate time-division multiple-access (LR-TDMA) system. The DST 2000 supports global and spot-beam service and as such is capable of operation both within the INTELSAT Business Services (IBS) environment and within domestic satellite systems. The system is physically compact and can be scaled to RF service between 3.0 and 20.0 Mbit/s; it utilizes quadrature phase-shift keying (QPSK) modulation and supports up to 255 TDMA terminals in the network. Network synchronization is achieved by means of centralized reference stations and network management; monitoring and control is achieved by means of a low-cost microcomputer at a network control center co-located with, or remote from, a reference station.

The terminals support synchronous or asynchronous networking with 2.4-kbit/s minimum channel spacing. Services include preassigned, reservation, and point-to-multipoint connectivity; an optional demand-assignment capability is also available. Terrestrial interface modules (TIMs) presently include the T1 (1.544-Mbit/s) TIM and the multiport variable rate (8.0-Mbit/s aggregate maximum) data TIM. Forward error correction is available for selected TDMA satellite channels. Fully redundant equipment configurations can accommodate high availability requirements; redundancy on the TIMs is provided in a 1-for-N manner.

The DST 2000, shown in Figure 2, is a hardware-programmable, low-cost TDMA terminal. It is implemented using COSMOS, the COMSAT multiprocessor operating system developed within the NTD. With this proprietary operating system, any process in any terminal in the network can communicate directly with any other process in any other terminal in the network. The network management system for DST 2000 is implemented using UNIX. Both terminal and network management software is written in C.

STARCOM Baseband Processor and Network Control Software

STARCOM is a satellite-based data communications system developed by the Network Products Division of CTP. The NTD has played a key role in the inception and development of this product. This program represents a significant commitment by COMSAT Laboratories to apply technology developed in the labs to solutions required for satellite data networks.

STARCOM is based on a star network topology, in which a central hub station is linked to numerous low-cost remote stations. Data are transmitted from the hub on multiple time-division multiplexed (TDM) outbound 256-kbit/s carriers, which are broadcast to all remote stations. Remote stations use multiple 56-kbit/s inbound carriers to send data to the hub; an in-bound carrier is either allocated to a specific remote station or shared by multiple stations in a random-access TDMA mode. Satellite transmission capacity is dynamically allocated based on requirements of the remote stations under an effective network management system.

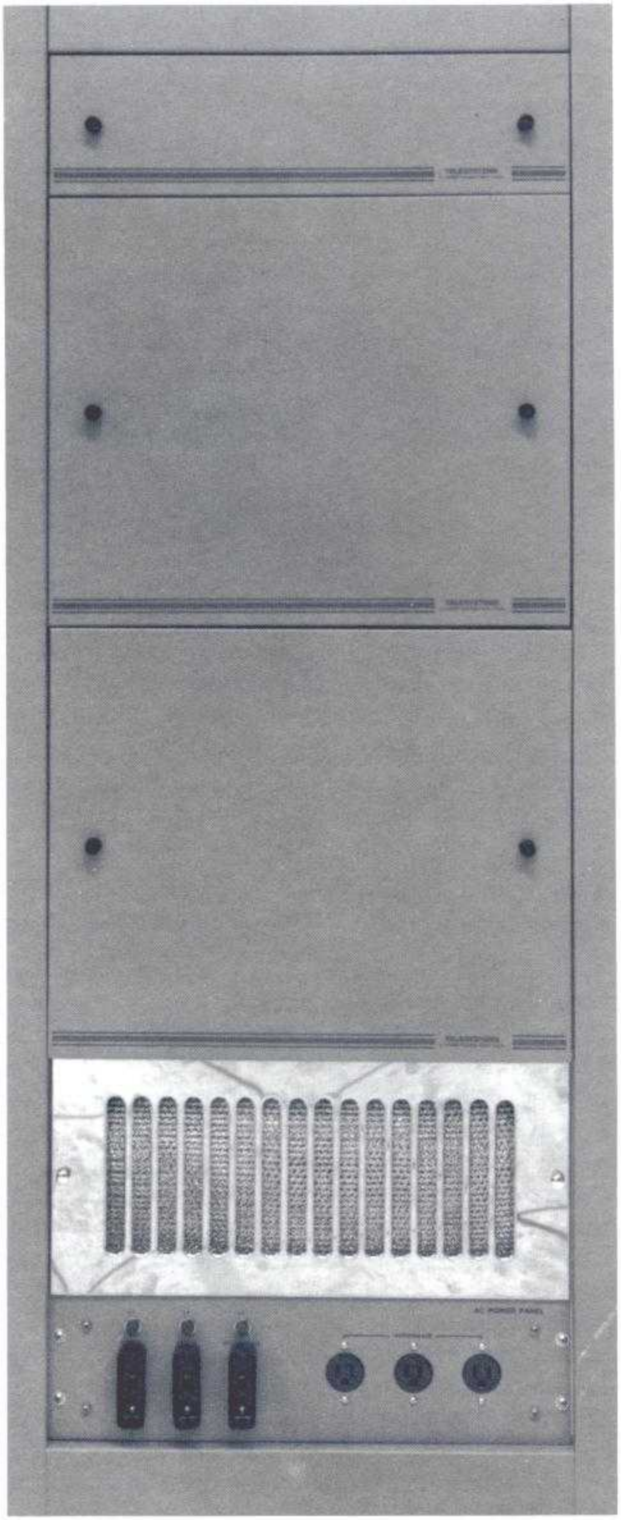


Figure 2. *The hardware-programmable, low-cost DST 2000 is implemented using COSMOS, the NTD's proprietary operating system*

User equipment interfaces to this network through standard interfaces. Currently, X.25 and IBM System Network Architecture (SNA) protocols are supported. Highly efficient protocols, developed in prior years at the NTD, are used over the satellite. These protocols are transparent to user protocols, but provide considerably improved performance.

The baseband processor and software technology for STARCOM was developed by the NTD in 1983 and 1984 as part of the research and development program in data communications. The software is based on the COSMOS operating system, which has been developed by NTD for use in high-speed, real-time control and data communications applications.

During 1985, the NTD continued to play a central role in systems and software development for STARCOM. Numerous new software functions were developed and integrated in an effort to assemble the first working STARCOM network. The SNA/SDLC (Synchronous Data Link Communications) and X.25 protocol implementations were completed and the communications protocol for efficient and reliable transfer over the satellite was designed and implemented. The network management subsystem was designed to monitor, control, and effectively allocate resources in the network. The network management subsystem, which resides in the hub, continuously monitors the entire network and automatically assigns extra capacity to stations that are carrying more traffic by allocating a dedicated inbound channel to the station for a temporary period. It also monitors the health of the network and down-line loads remote stations to bring them on-line.

The efforts culminated in a successful beta test at a customer site. The beta test consisted of a transportable hub and four remote stations. The user equipment consisted of IBM computers at the hub and IBM 3274 type cluster controllers and terminals at the remote stations. The user equipment intercommunicated using SNA/SDLC protocols. A clear circuit service was also demonstrated, providing 56-kbit/s dedicated synchronous channels between the hub and remote stations and between remote stations using double-hop transmission.

Communications Services Division

Traffic Configuration and Monitor System

Since 1984, the NTD has been involved in investigations of earth station management and control systems for interconnecting terrestrial traffic to various satellite access equipment. During 1985 work continued to focus on the development of a traffic configuration and monitor system (TCMS) for COMSAT International Communications, Inc. (CICI) that would serve both small and, with incremental units, large earth stations.

The TCMS permits terrestrial traffic to be interconnected at the individual channel level with frequency division multiplex (FDM), single-channel-per-carrier (SCPC), or TDMA equipment. As such, the TCMS is an integrated communications switching controller that offers satellite/terrestrial telecommunications interfacing and switching functions. In addition, the basic architecture contains capabilities for monitoring and control of a network of such controllers from a central location.

Service capabilities of the TCMS include multiplexing and demultiplexing functions, X.25 packet data, and other future trunk services. Satellite Doppler buffering and terrestrial clock recovery functions are also provided. Additional service capabilities include digital voice compression, companding conversion (μ-law to A-law and vice versa), and video conference control. During 1985, the bus controller, which is a key element of the modular architecture of the microprocessor-based TCMS, was designed and implemented.

INTELSAT

SUPPORT

IBS Open Network Support

The NTD has continued its support of INTELSAT's Director General in the design, development, and specification of the IBS network. The IBS network is a fully digital network designed to operate with small earth stations which may be located on or near a customer's premises, and which can carry all types of telecommunications services including video, teleconferencing, high- and low-speed data, packet-switched data, electronic mail, and telex.

Two basic classes of IBS networks have been specified. The IBS closed network characteristics are based on a standardization of data rates and RF performance. The IBS open network is intended to ensure compatibility among all of its users. It extends the closed network performance characteristics to include additional features, capabilities, and detail of specification.

Prior to 1985, the NTD played an active role in the conceptual design and development of the closed network performance characteristics and the open network design. In 1985, the open network performance characteristics were refined and formulated into documents and specifications and presented to the INTELSAT Technical Committee for review and acceptance. Specific elements of the specifications included the support of the evolving ISDN recommendations by the IBS open network. The IBS open network was designed to provide services compatible with ISDN users and networks in terms of interfaces, maintainability, alarms, and other related elements.

A detailed option to prevent degraded performance of many data communications protocols when used with satellite communications media was developed, specified, and included in the accepted IBS open network performance characteristics. This capability, known as satellite delay compensation, can be used to ensure acceptable data communications performance by the users of the IBS open network.

Also, selected refinements of previously developed portions of the specifications were added. For example, a technique to provide a supervisory communications path between IBS earth stations was developed using existing transmission overhead available in IBS transmitted channels. Techniques to provide conversion among regionally supported communications standards were also developed to ensure global capability.

The NTD played an active role in the presentation and acceptance of the IBS performance characteristics by the INTELSAT Technical Committee. The IBS open network performance characteristics were finalized at the fifty-fourth meeting of the INTELSAT Technical Committee and subsequently approved for immediate implementation at the June 1985 meeting of the INTELSAT Board of Governors.

COMMUNICATIONS TECHNIQUES DIVISION

INTRODUCTION

The work of the Communications Techniques Division ranges from exploratory investigations of communications systems and subsystems to the implementation and testing of proof-of-concept and prototype equipment for transmissions processing, video processing, and voice-frequency band processing. The advent of microelectronics components such as special purpose large-scale integration (LSI) chips and very large-scale integration (VLSI) chips has greatly extended the possibilities for the design and implementation of complex systems, providing high reliability at a potentially lower cost than previously possible. Examples of such development in 1985 include a variable low-rate time-division multiple-access (LR-TDMA) modem and forward error correction (FEC) codec, an adaptive equalizer for 120-Mbit/s TDMA, low-rate digital speech encoding, and on-board digital transmission processing.

Other significant projects in 1985 involved work toward major advances in communications system techniques to improve spectral and power efficiency of satellite transmission. These efforts to meet future international needs included coded 8-ary phase-shift keying (COPSK) modulation systems, a modified National Television System Committee (NTSC) television transmit/receive processor, and a time-multiplexed television transmission method. In addition, laboratory simulations and field measurements contributed significantly to improved understanding of the performance of 120-Mbit/s TDMA with digital speech interpolation (DSI), compressed television for transmission to small shipboard antennas, and companded single-sideband (CSSB) modulation performance in a co-channel interference environment.

Finally, in an effort to reduce end-to-end international communications satellite system costs, concepts for advanced satellite system architectures have been investigated.

COMSAT R&D

Jurisdictional — INTELSAT Related

140-Mbit/s COPSK Modem Development

The performance of the rate 7/9 COPSK modulation system was investigated and evaluated by computer analysis and simulation in 1984. This system hardware is now being implemented for sending information at 140 Mbit/s over a single 80-MHz INTELSAT transponder. With this technique, four INTELSAT 80-MHz transponders can restore the entire transatlantic telephone, version 8 (TAT-8) fiber optical cable. In addition, 140-Mbit/s trunking service for the Integrated Services Digital Network (ISDN) can be provided over a single INTELSAT 80-MHz transponder.

To achieve the 140-Mbit/s information rate over the 80-MHz INTELSAT channel, the uncoded 8-ary PSK modem must operate at 180 Mbit/s. Integral parts of the 8-ary PSK modulation system are the rate 7/9 convolutional encoder at the transmit end along with a 16-state Viterbi algorithm decoder which is used in conjunction with an 8-ary PSK demodulator at the receiver end to reproduce the data stream sent over the channel.

During the past year, a breadboard of such a modem was fabricated. Figure 1 shows the results of initial performance measurements. Also initiated in 1985, implementation of the high-speed, rate 7/9, 16-state Viterbi codec is crucial to the overall combined modulation and coding system. Completion of the equipment development phase of the project is expected in 1986.

Adaptive Equalizer Development

In 1985, the final construction and testing of an adaptive equalizer for use with 120-Mbit/s TDMA was completed. This equalizer, which can improve system performance and simplify link equalization, has the ability to compensate for amplitude and group

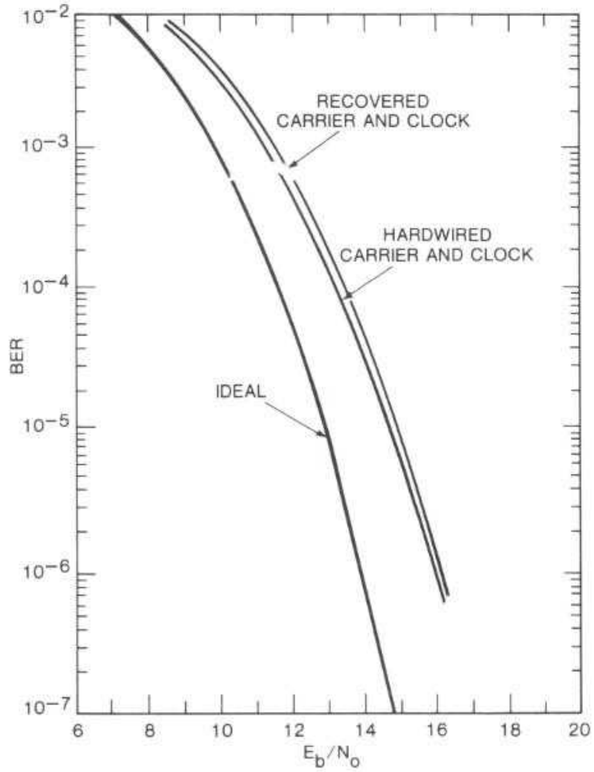


Figure 1. *COPSK modem performance*

delay distortions typically encountered in earth station and satellite environments. Analysis of on-line data provides channel distortion information so that equalization can be carried out without interruption of traffic. The equalizer functions in a burst mode, thereby providing individualized equalization for each burst, which is especially significant for future systems which may employ transponder hopping.

The equalizer was designed to be inserted into the current 120-Mbit/s INTELSAT TDMA system with a minimum impact on the existing system hardware. It performs equalization at IF just prior to demodulation, as shown in Figure 2. (A manually controlled transversal equalizer is currently in place in the U.S. TDMA traffic terminal). For operation, it requires that the baseband signals and clock be taken from the modem. In addition, timing signals, which consist of a start-of-frame and start-of-burst pulse, are needed as inputs from the present TDMA terminal.

Equalizer performance was determined by inserting known amplitude and group delay distortions in both linear and nonlinear channel test setups, and measuring bit error rate (BER) with and without the adaptive equalizer. Figure 3 displays the results of one such measurement taken over a linear channel with 12 ns of linear group delay across the 72-MHz bandwidth. This figure, which also shows the modem IF loopback performance without distortion and the INTELSAT linear channel specifications, indicates that the equalizer is capable of bringing performance back to within specification for distortion of this magnitude and type. Measurements taken in a nonlinear channel show improvements similar to those of Figure 3 when the distortion is added to the down-link. For the up-link, the amount of improvement varied with the type of distortion and the degree of nonlinearity.

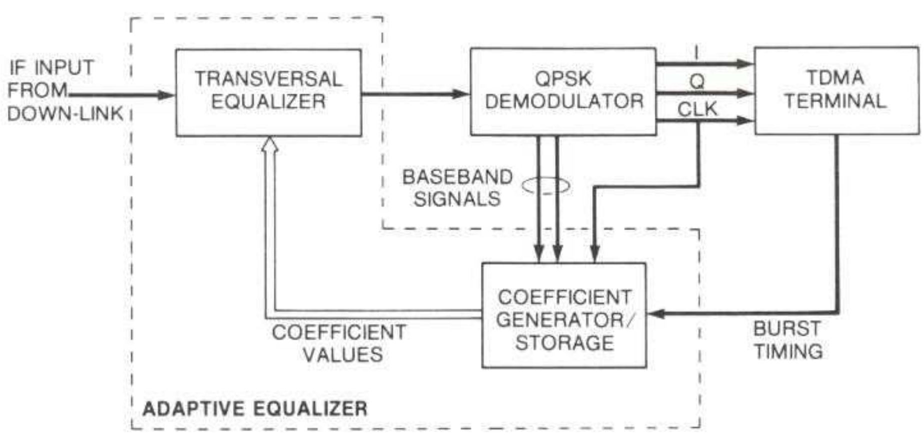


Figure 2. *Adaptive equalizer for the TDMA down-link improves system performance and simplifies link equalization*

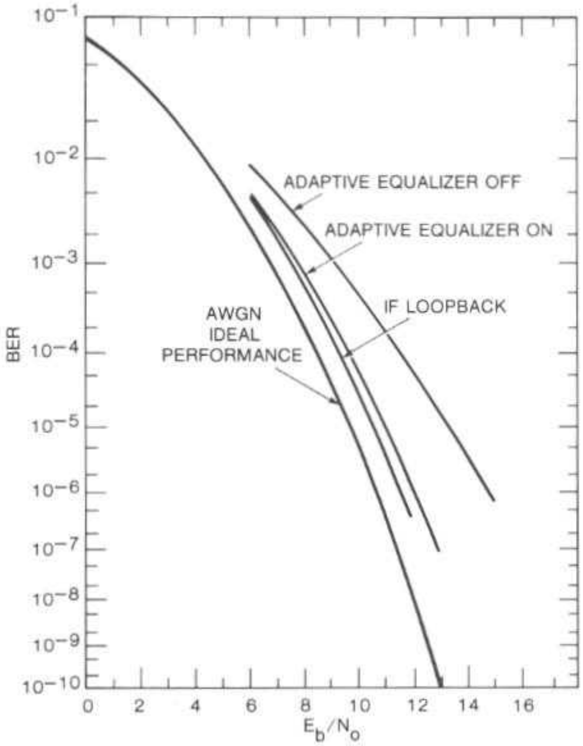


***Figure 3.** Adaptive equalizer performance*

In the operational TDMA system, differences in up-link equalization such as variation in modem filter characteristics may cause the coefficients required for each burst to vary. The down-link characteristics for each burst may also vary when transponder hopping is employed. A microprocessor controller has been designed and tested which stores the coefficients for up to 64 bursts in a 2-ms frame and loads the transversal equalizer with the proper coefficients for the upcoming burst. The coefficient memory is updated at the rate of one burst per frame, based on information obtained during that burst from the adaptive equalizer. Measurements comparing the continuous and burst mode show nearly identical BER performance.

16-kbit/s Low-Rate Encoded Voice

This ongoing research effort intends to develop codecs that achieve toll-quality speech at a transmission rate of 16 kbit/s. At present, for toll-quality transmission, speech is encoded using 64-kbit/s pulse code modulation (PCM) or 32-kbit/s adaptive differential PCM (ADPCM). The approach being pursued is based on waveform coding of speech, particularly using ADPCM codecs similar to those at 32 kbit/s. The lower bit rate is achieved by removing a greater amount of redundancy from the speech signals with sophisticated predictors which adapt to the speech characteristics more rapidly than predictors used previously. In addition to removing the short-term redundancy as in conventional ADPCM, long-term redundancy caused by pitch periodicity can also be removed, resulting in more efficient coding.

An experimental 16-kbit/s codec was developed based on a more rapidly adapting predictor known as the lattice structure. This codec was simulated in 1985 and its performance was studied by objective segmental signal-to-noise ratio (S/N) measurements as well as informal listening tests. The performance observed was superior to that of the conventional 16-kbit/s ADPCM codec and compared well with an experimental codec based on sub-band coding.

Even though the codec improved 16-kbit/s performance, toll quality speech was not achievable using the short-term predictor alone. Hence, the codec is being further enhanced by adding a second long-term predictor, which is in its early stages of simulation. Preliminary tests indicate that long-term prediction is indeed effective in achieving further improvement in voice quality.

Modified NTSC Video Transmission

The vast majority of satellite video communications employ analog frequency modulation (FM) techniques based on well-established technologies. Modifications to NTSC video transmission methods for FM satellite communications links are directed toward providing a simple, low-cost, baseband processing technique which improves both objective and subjective video performance over that of standard NTSC transmission and provides additional audio and data transmission capability. The performance improvements which result may also be translated into power and bandwidth savings.

As described in the *1984 Annual Report*, the feasibility of modifying the signal transmitted over the satellite was investigated using hardwired synchronization. During 1985, a prototype modified NTSC transmit/receive processor was constructed. This low-cost unit provides improved video and synchronization performance as well as a 1.8-Mbit/s one-way digital channel in the horizontal blanking interval. This data channel can be divided, as desired, in any fraction between program audio and other data services. Figure 4 shows the receiver hardware.

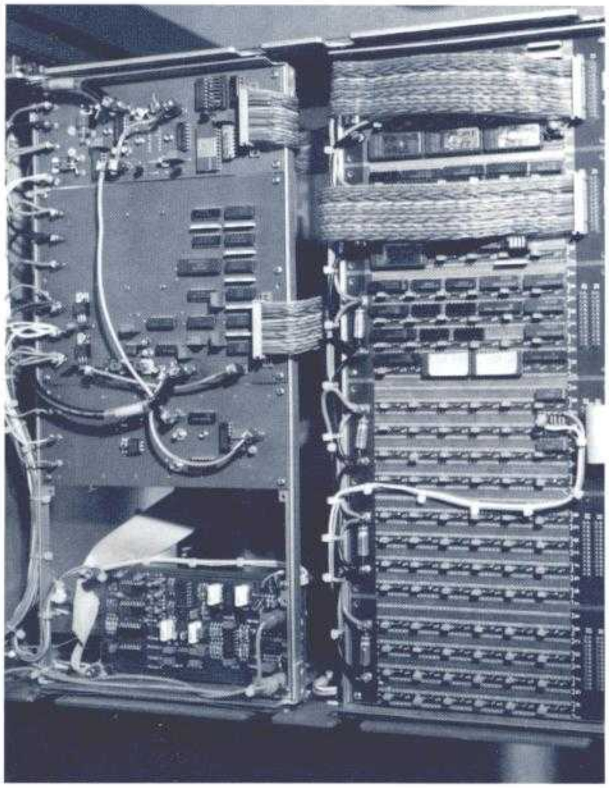


Figure 4. *NTSC receiver hardware*

Test results indicated a 2- to 3-dB improvement in objective video S/N relative to that of a standard NTSC video link operating in accordance with International Radio Consultative Committee (CCIR) standards. The system also demonstrated impressive improvement in subjective video performance at a low carrier-to-noise ratio (C/N).

In the prototype unit, a delta modulation codec at 220 kbit/s provides high-quality program audio. Up to eight channels can be accommodated. An optional rate 1/4 FEC and an interleaver are also included in the prototype for enhanced operation at low C/N. With coding enabled, the data channel provides two channels of high-quality program audio at a C/N down to 6 dB. Synchronization is extremely robust. The receiver remains synchronized at -3-dB C/N and will acquire synchronization at -2-dB C/N. This prototype unit successfully demonstrated that synchronization overhead can be reduced in the NTSC format while simultaneously achieving improved video quality and synchronization performance with a digital channel capacity close to 2 Mbit/s.

On-Board Digital Transmission Processing

On-board processing can provide additional system margins to lower the cost of earth stations and to enhance satellite capacity. With multibeam satellites, on-board baseband switching also allows efficient interconnectivity.

An on-board digital demultiplexer/demodulator that processes frequency-multiplexed carriers of mixed sizes and modulation types was studied. Two viable alternatives emerged in addition to the straightforward filtering and demodulation technique. The first method involves block demultiplexing all channels, while the second consists of a channel-by-channel demultiplexing approach. Different algorithms and architectures were investigated to determine their suitability for the on-board processing requirements. The effect of quantization and finite precision arithmetic on the overall performance was analyzed, but a more accurate assessment requires detailed simulation study, which is planned for 1986. Definition and evaluation of a base-line on-board demultiplexer/demodulator with breadboard circuit designs of critical components will be initiated in 1986.

Video Transmission Processing

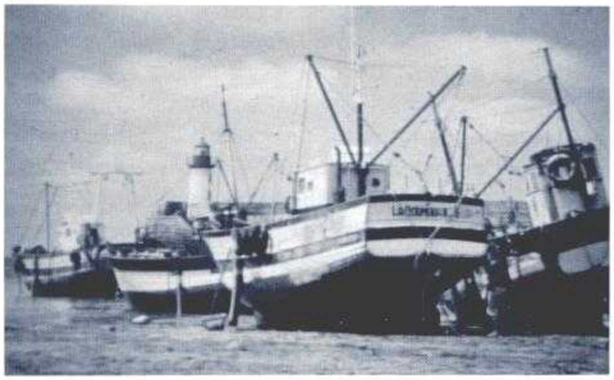
Currently the most efficient television (TV) transmission standard in the INTELSAT system consists of two TV carrier signals per 36-MHz transponder in a frequency-division multiple-access (FDMA)/FM mode, which is referred to as half-transponder TV. With this type of transmission, the transponder is typically operated with 2-dB output backoff to reduce intermodulation and other nonlinear distortions, including crosstalk effects. To improve transmission efficiency, the development of a time-multiplexed analog television (TMATV) transmission scheme was initiated in 1984.

The TMATV system is designed to allow transmission of three frequency-modulated broadcast-quality TV signals through a single 36-MHz transponder in a multipoint-to-multipoint TDMA mode. Besides improved efficiency in spectrum utilization, the received signals are free from intelligible crosstalk and other undesirable distortions inherent to FDMA/FM operation. The TMATV system also incorporates a digital channel capable of carrying more than two high-quality audio programs per video channel.

The TMATV processes the video image within a video frame to reduce the signal bandwidth for transmission. At the transmit end, the signal first passes through a spatial and temporal filter and is then time-compressed on a frame-by-frame basis before transmission. At the receiving end, the signal is interpolated and time-expanded. A field store is used for each TV channel at both the transmit and receive ends.

Computer simulations using standard test pictures (Figure 5) demonstrated the feasibility of the spatial and temporal filtering and interpolation processes. Proof-of-concept transmit and receive processors are currently under development. This technique for broadcast quality TV transmission could evolve as a near-term, low-cost alternative to digital TV for the INTELSAT system.

(a) Original



(b) Processed

Figure 5. *Spatial-temporal filtering and interpolation provides more efficient broadcast-quality TV transmission*

Future Satellite System Study

In 1985 a system study was initiated to define future satellite systems which could compete economically with fiber-optic systems for the provision of international services. A number of system architectures were examined and compared on a cost basis with the TAT-8 and other even more advanced fiber-optic systems. To remain competitive with transoceanic cables, systems which fully exploit the unique characteristics of satellites need to be developed. For example, satellites offer point-to-multipoint communications and direct interconnection of end users without long terrestrial links, capabilities unavailable with transoceanic cables.

Implementation of this type of satellite system will likely draw upon technologies such as on-board processing, multibeam antennas, digital transmission and encoding techniques, and possibly even inter-satellite links.

Multibeam satellites can reduce earth station costs. For example, Figure 6 shows that a multibeam satellite with 1° spot beams can provide satellite antenna beams with extremely high gain on the links to earth stations, enabling the use of smaller antennas and smaller high-power amplifiers (HPAs) at the earth station and thereby decreasing costs.

Beam interconnectivity on multibeam satellites may be achieved using on-board processing with baseband switching. Each carrier, regardless of size (bit rate), is demodulated on-board the satellite with all interconnection and switching done at baseband, i.e., at the channel or higher multiplexed level. Such on-board demodulation and remodulation isolates up-links and down-links, resulting in link improvements which can be used to reduce earth station antenna size and hence cost.

On-board processing also permits earth stations to operate in an FDMA mode, with a single transmit carrier per earth station. This allows the earth station's HPA to be sized proportionally to the amount of traffic carried by the station rather than by the maximum bit rate of the transmission system, leading to additional earth station savings, especially for medium- and thin-route communications links.

On-board processing can include demultiplexing and remultiplexing (baseband formatting) of the satellite baseband channels for retransmission back to the receiving earth stations. All traffic destined for transmission via a given down-link beam can be multiplexed onto a single down-link carrier, thereby providing the traffic to each earth station destination in a time-division multiplex (TDM) format. This results in reduced on-board power and additional savings in earth station antenna size because intermodulation

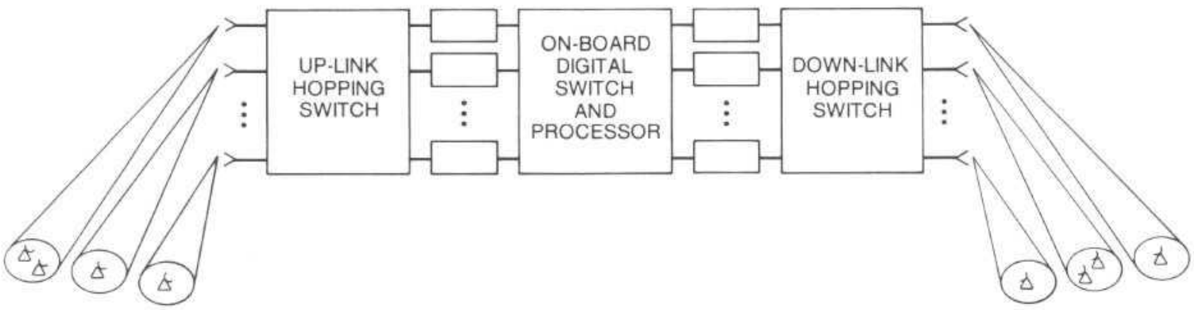


Figure 6. *Multibeam satellite with baseband processing reduces earth station costs*

noise is eliminated by the single-carrier-per-power-amplifier operation. Additionally, earth station communications hardware is simplified by eliminating the need for multiple down-chains and demodulators.

The study conducted during the past year has examined the cost benefits of employing this type of satellite system in the INTELSAT network. Significant savings can be envisaged in the earth station costs.

Jurisdictional — INMARSAT Related

FM Voice Channel Monitor System

Figure 7 shows the FM voice channel monitor system implemented at COMSAT Laboratories and

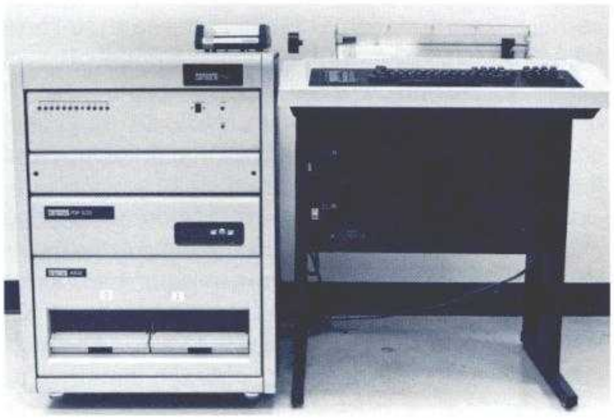


Figure 7. *FM voice channel monitor system improves accuracy of future traffic predictions*

installed at the Southbury INMARSAT coast earth station. This system monitors the traffic channels designated for voice to determine their in-band data loading. The data base created by this system will be used to improve the accuracy of predicting future traffic requirements.

The monitor system consists of a set of fixed threshold signal detectors whose output is sampled and stored in a computer file for analysis to determine whether the traffic is voice or data and to collect call duration statistics for the data signals. A variety of table and graphic outputs can be generated to help interpret the measurements.

A test scenario, loaded via a computer terminal, assigns each input channel to one of three pools and then specifies the test duration, sampling resolution, and data boundaries used in computing the call-duration histograms. Data storage is provided on a floppy disk and data within each pool may be analyzed separately or combined.

COMSAT SUPPORT

Space Communications Division

Shipboard TV Experiment for Maritime Services

COMSAT has undertaken the task of integrating and demonstrating a system to transmit television programs such as news and sports highlights to ships at sea. Initial examination indicated that it was not feasible using the INMARSAT satellites to transmit unprocessed, full-motion video to ships via conventional means. However, further examination indicated that limited-motion video programs could be transmitted to ships at sea via the INMARSAT satellite by using compressed video (i.e., highly source-encoded video) and FEC coding on the digital carrier.

COMSAT proposed, and in 1986 will conduct, an experiment using this latter technique. COMSAT Laboratories undertook a preliminary experimental investigation of the system hardware and system performance. Figure 8 is a block diagram of the system which was simulated in the laboratory. The video signal, compressed with a video codec (furnished by Compression Labs, Inc.), produced a 768-kbit/s digital stream of multiplexed audio and video. This digital stream was modulated with quadrature phase-shift keying (QPSK) after being encoded by a rate 1/2 convolutional FEC coder. The output of this modulator was then combined with thermal noise to simulate actual channel conditions and then connected to the input of the QPSK demodulator, which used soft-decision detection and sequential decoding. The resulting digital stream was connected to the input of the video decoder, which produced a composite NTSC video signal and companion audio signal for evaluation.

Laboratory results show that the achieved video performance is sufficient for shipboard use under all but the most severe operational conditions. Based upon these results, the system hardware will be installed and tested on board a transoceanic passenger ship in early 1986.

Communications Services Division

120-Mbit/s TDMA/DSI Subjective Tests for COMSAT International Communications, Inc.

COMSAT Laboratories and Martlesham Laboratories, U.K., conducted a two-way active talker subjective experiment during the preoperational testing of the 120-Mbit/s TDMA/DSI system. Full-period, unconditioned, leased circuits were used between the earth stations (Etam, West Virginia, and Madley, United Kingdom) and the Laboratories. The purpose of the experiment was to evaluate the performance of the DSI system under stressed, controlled loading conditions. Identical loading was provided in both

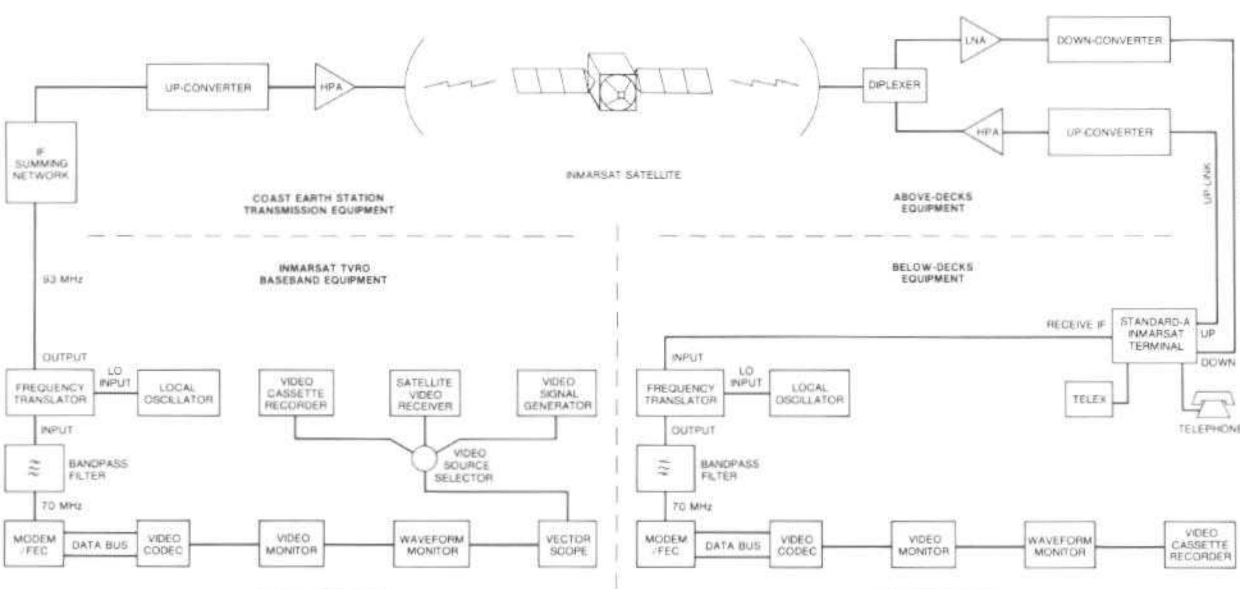


Figure 8. *COMSAT/INMARSAT shipboard TVRO experiment has been simulated at COMSAT Laboratories*

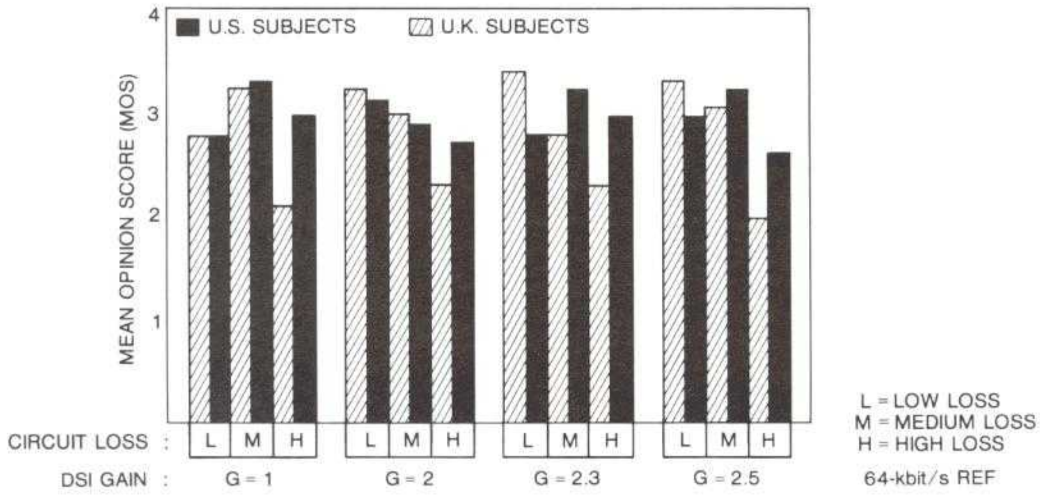


Figure 9. *Subjective evaluation indicates that TDMA/DSI quality is affected by terrestrial extension conditions more than by DSI gain*

transmission directions by a speech activity simulator located in the U.S. This simulator output, with 40-percent activity, was sent to the U.K. on a separate, noninterpolated TDMA/DSI sub-burst, where it was looped and used to load the DSI system on the U.K.-to-U.S. link.

A 12 × 12 Greco-Latin square experimental design was used where DSI gains of 2.0 (60/30), 2.3 (120/52), and 2.5 (120/48) were tested with terrestrial extensions having low, medium, and high loss. The reference circuits used were 64-kbit/s PCM digital noninterpolated channels (DNI) with the same low, medium, and high terrestrial extension loss conditions. Echo cancellers were used at the U.S. end and echo suppressors at the U.K. end.

The experimental results illustrated in Figure 9 show minor differences between DNI channels and the interpolated channels. The observed differences appeared to be associated with the terrestrial extension conditions rather than DSI gain. The tests show that the TDMA/DSI system performed well and that subjective quality is influenced primarily by factors such as terrestrial extension loss rather than DSI gain.

HI-NET System Simulation

In 1984 COMSAT entered into an agreement with the Holiday Corporation to establish the HI-NET network, a satellite transmission system to distribute video and audio program material to 1,500 Holiday Inns in the United States. HI-NET will provide entertainment programming, video teleconferencing, and teleseminar services among the Holiday Inns.

As the design of the system evolved, extensive laboratory tests were conducted on behalf of COMSAT General to provide proof-of-concept and link design information, and to evaluate equipment for potential use in the system. Of particular significance was a series of tests which measured video and audio crosstalk, differential phase and gain, and noise transmission at the HPA and transponder outputs for two carriers in the HPA and transponder. These measurements were performed for amplitude and group delay equalization optimized at the HPA and transponder traveling wave tube amplifier (TWTA) inputs.

Table 1 gives test results. The data for cases A and B were observed at the HPA and transponder outputs, respectively, for the optimized gain and delay. Table 1 indicates no major degradations in any of the test parameters evaluated.

COMSAT Technology Products

LR-TDMA Modem and FEC Codec

COMSAT Laboratories is developing a modem and codec for use in a LR-TDMA system for COMSAT Technology Products, Inc. Intended to operate in the 2-to 20-Mbit/s range, the system has been designed

Table 1. System Performance Test Results

	Case			
	A		B	
Configuration				
System	HPA		HPA/Transponder	
Equalization[a]	HPA/Transponder		HPA/Transponder	
IF Bandwidth	18 MHz		18 MHz	
HPA_{Pout} (W)	1,000	500	1,000	500
Transponder Input Backoff (dB)[b]	N/A	N/A	-1.5	-1.5
C/N (dB)	32.0	31.8	29.8	29.9
Video Measurements[c]				
Subjective Crosstalk	NM	NM	Faint	Fainter
Measured Crosstalk				
Amplitude (IRE pk-pk)	NM	NM	1.6	NM
Chromo Phase[d] (deg pk-pk)	NM	NM	2.0	1.0
Diff Phase (deg)	1.1	1.4	1.2	0.8
Diff Gain (%)	0.5	0.5	1.0	0.75
S/N_W(dB)[e]				
Theory	62.3	62.1	60.1	60.2
Measured	61.8	61.7	57.8	57.7

[a] Equalization added as needed so that amplitude and group delay as flat as possible at transponder TWTA input (HPA/transponder).

[b] Total input backoff referenced to single carrier saturation.

[c] NM indicates quantity unobservable or so small it is not measurable.

[d] Includes 0.5° present in measurement setup, exclusive of HPA and transponder.

[e] Peak-to-peak luminance to weighted rms noise.

with sufficient flexibility to handle most of the requirements that arise in the business service marketplace. Besides variable data rate, the system has frequency-synthesized channel selection and is capable of hopping between channels on a burst-to-burst basis.

By the close of 1985, the entire modem had been designed, the printed circuit board layout for the modulator completed, and the modulator debugged from baseband to its first intermediate frequency (IF) at 42.8 MHz.

Digital signal processing (DSP) techniques were used as extensively as possible in the design of the modulator and demodulator to obtain a cost-effective, manufacturable design. The DSP approach allows great flexibility as it is a digital implementation scaled with the data rate. In addition, many of the operational parameters are programmable.

Figure 10 is a block diagram of the LR-TDMA modulator. The critical spectral shaping of the transmit signal is performed digitally at baseband and channel selection synthesis is facilitated by a double frequency conversion IF. The demodulator is shown in Figure 11. Like the modulator, it also has a double conversion IF and processes the in-phase and

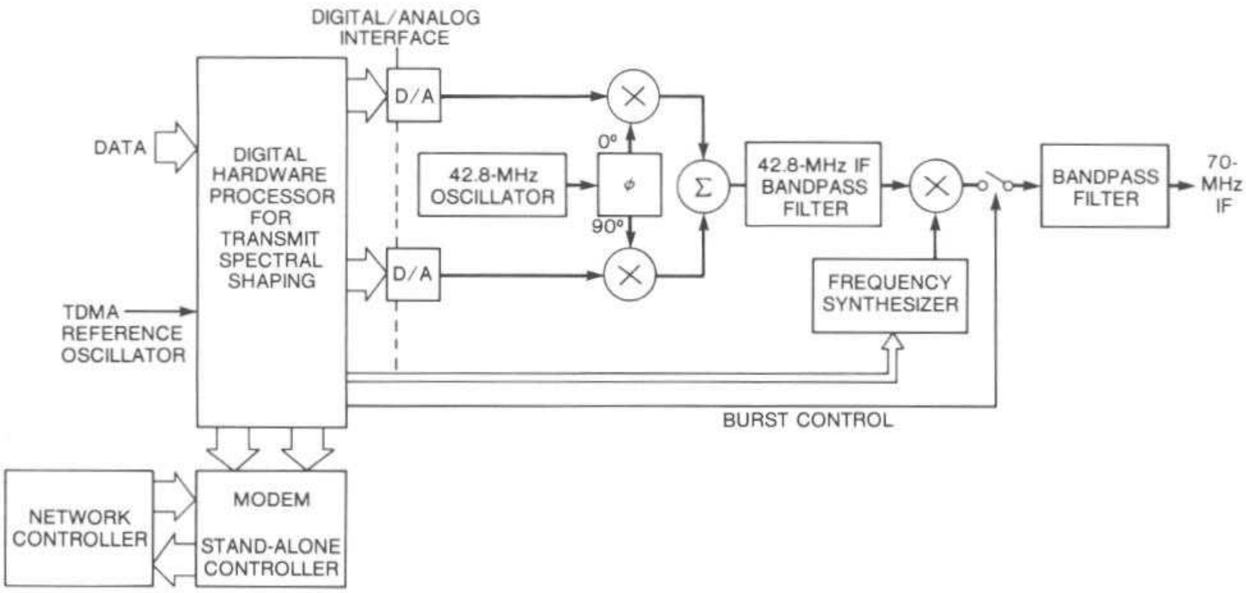


Figure 10. *LR-TDMA modulator*

quadrature I and Q channels digitally at baseband for automatic gain control and coherent carrier and clock recovery.

An FEC coder/decoder (FEC codec) for the (128, 112) Bose-Chaudhuri-Hocquenghem (BCH) code is being developed for the COMSAT Technology Products, Inc., LR-TDMA system. The low-bit-rate BCH codec employs a modified version of a unique 8-bit parallel architecture. The codec corrects all 1- and 2-bit error combinations within a code block and detects all 3-bit errors. The resulting 2.6 dB of coding gain at a BER of 10^{-6} is accomplished with only 12.5-percent redundancy in the transmitted data.

In addition to the novel parallel feedback shift register implementations of the encoder and syndrome generator, several other innovations are used in the decoder. A special pipelined structure processes both ordinary code blocks and the short blocks which occur at the ends of TDMA bursts, while minimizing the hardware. A ping-pong random-access memory requires only about one-fourth the circuitry of previous shift-register input buffers, and only four erasable programmable read-only memory chips are needed to store the 2^{14} error location numbers, corresponding to the syndrome patterns for all single and double bit errors.

INTELSAT

SUPPORT

Companded Single-Sideband Co-Channel Interference Investigation

CSSB amplitude modulation (AM) is being introduced into satellite communications as a means for transmitting a large number of voice channels in a given transponder bandwidth. Four types of co-channel interfering carriers (QPSK, FDM/FM, FM with energy dispersal frequency waveform only, and CSSB) were used to interfere with a CSSB test carrier transmitting speech or voiceband data. Measurements of S/N were made at the test channel output. BER measurements were made using a 4,800-bit/s modem.

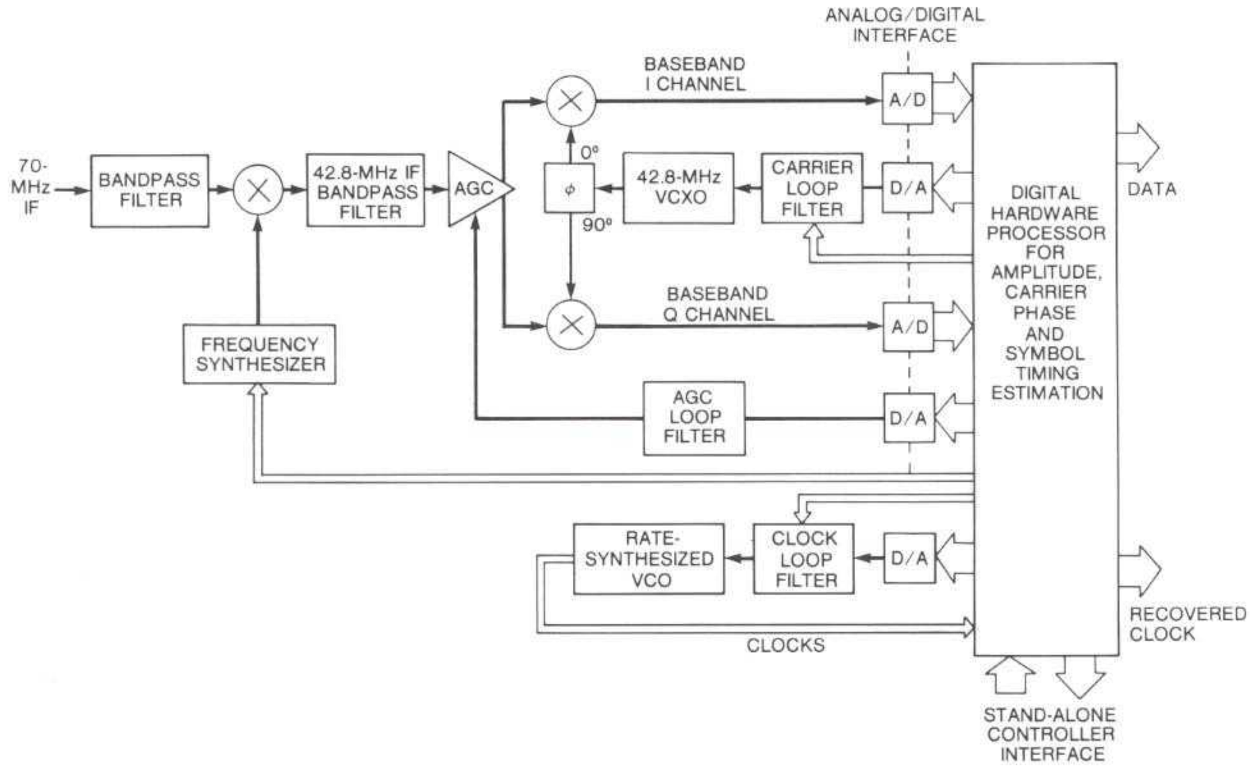


Figure 11. *LR-TDMA demodulator*

The S/N results indicate good agreement between measured and predicted performance, showing that wideband interferers affect the CSSB carrier in the same manner as thermal noise. Since narrowband interferers (i.e., CSSB voice and signaling) were more "intelligible," they were objectionable at interference levels lower than equivalent amounts of thermal noise.

The BER results on CSSB voiceband data transmission similarly indicated that the interferers resembling random noise (QPSK, FDM/FM, and CSSB voiceband data) had the same effect as an equivalent amount of thermal noise, while tonal type interferers (energy dispersal frequency and CSSB signaling tones) caused varying, and at times severe, BER degradations, depending upon the exact interferer spectrum and level.

A limited subjective evaluation indicated that the relative severity of the degradation was consistent with the S/N for the same interferer type. Interferers which resembled incoherent noise tended to blend with the background thermal noise, while those which resembled tones or speech tended to be much more noticeable. Frequency offsets and spectral inversions reduced or eliminated the intelligibility of interfering CSSB speech, although they also affected the relative noticeability of the CSSB interferer by altering the audio frequency at which the interferer appeared within the test channel.

These tests indicate that CSSB can be used for voice and data services over satellite systems in which the level of narrow-band interference is low. In satellite systems with a high degree of frequency reuse, special care may be required to achieve acceptable performance.

OTHER

NASA

MSAT-X Land Mobile System Ground Terminal Design

Various commercial land mobile satellite systems have been proposed in the U.S. and abroad to supplement the terrestrial cellular radio systems for providing services to rural and remote areas. Potential mobile satellite services include telephony, voice and alphanumeric message dispatch, paging, data broadcasting, position polling of vehicles, electronic mail, and distress and emergency messages. To accelerate the introduction of commercial mobile satellite services in the U.S. and ensure future growth, NASA has formulated the Mobile Satellite Experiment (MSAT-X) program in cooperation with the industry to develop high-risk technologies. Emphasis is on the development of space segment and ground segment technologies to efficiently utilize the limited spectrum and orbit resources allocated for land mobile satellite use.

COMSAT Laboratories, under Contract 957113 from NASA/Jet Propulsion Laboratory, is conducting a detailed system design and performance specification study effort for the UHF mobile transceiver, the SHF base station, and the SHF gateway station which interfaces with the public switched telephone network.

Major technical issues addressed by COMSAT include the following:

- frequency stability control
- modulation techniques
- error control methods
- 2,400-bit/s linear predictive coding (LPC) vocoder algorithms
- transceiver architecture and interface design.

Figure 12 shows a flexible, modular transceiver architecture designed and specified for the MSAT-X system. The transceiver consists of a microprocessor control unit, antenna, RF/IF units, modem, vocoder, FEC codec, and input/output peripheral modules. The choice of a binary FM modulation technique allows for low-cost, 2,400-bit/s information rate transmission over the land mobile satellite channel in the presence of multipath fading. Convolutional coding with Viterbi algorithm decoding minimizes the antenna size and channel degradations. The LPC vocoder is specifically designed to minimize performance degradation due to acoustically coupled background noise, channel distortion, and multipath fades.

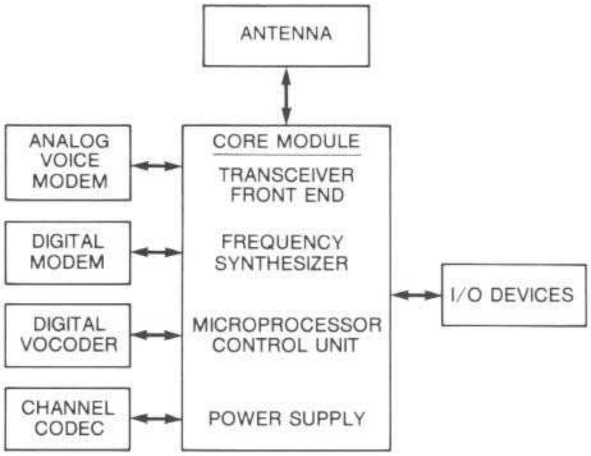


Figure 12. *Mobile transceiver features flexible, modular design*

INMARSAT

Standard-B Communications Subsystem Test Bed

INMARSAT is currently planning an all-digital transmission system to augment its current one in the 1990s. Designated as Standard-B, the system supports 16-kbit/s adaptive predictive coding (APC) voice, as well as 300- and 600-bit/s and 1.2-, 2.4-, 4.8-, 9.6-, and 16-kbit/s circuit and packet-switched data services. With efficient filtered QPSK or offset QPSK (O-QPSK) modulation, and powerful convolutional coding and soft-decision Viterbi decoding, the single-channel-per-carrier voice and data channels are modulated on 24-kbit/s carriers which will be spaced only 20 kHz apart as compared to the 50-kHz spacing in the current system. Each of these 24-kbit/s channels requires substantially lower power than the current system. With a single type of modulation at the same data rate, a single modem can transmit and receive access control and signaling messages as well as voice and data traffic, thus lowering the below-the-deck equipment cost of the ship earth stations (SESs).

To help determine the transmission schemes and to optimize the system parameters for the Standard-B

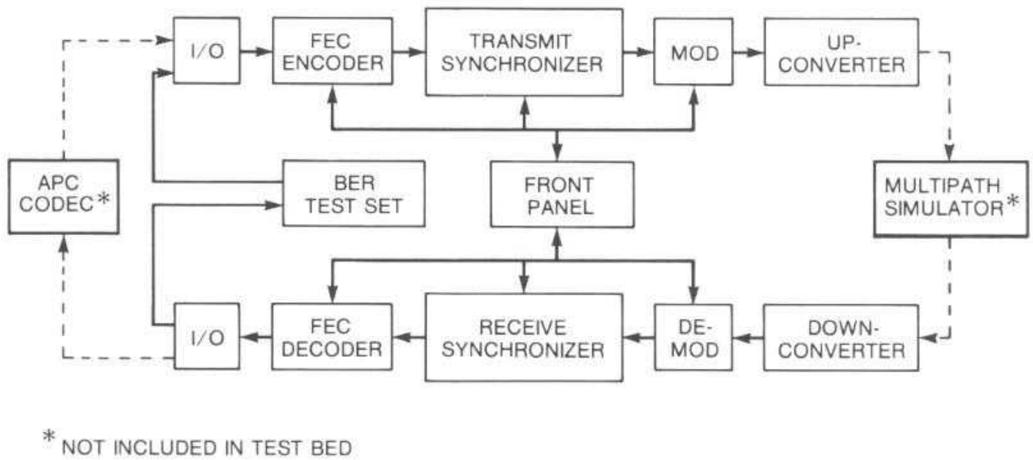


Figure 13. *Standard-B test bed unit being developed at COMSAT Laboratories*

system, COMSAT Laboratories has been studying the transmission techniques for voice, data, and signaling of the Standard-B system and is developing a test bed for INMARSAT under contract INM 84-101 to finalize the system design and parameters with measurements and tests. The Standard-B test bed (shown in Figure 13) consists of a coast earth station test bed unit and an SES test bed unit, each including a DSP-based modem, a Viterbi algorithm FEC codec, transmit and receive synchronizers, and an up- and down-converter channel selector. The DSP-based modem can be operated in binary phase-shift keying (BPSK) mode at 12 kbit/s, QPSK mode at 24 kbit/s, and O-QPSK mode at 24 kbit/s. The Viterbi decoder is capable of decoding rate 1/2, constraint-length 7 or 9, convolutional codes, or rate 3/4 punctured convolutional codes derived from the rate 1/2 codes. The up- and down-converter channel selector converts between the very low IF suitable for DSP processing and the standard IF of 21.4 MHz. The test bed units are designed to interface to a multipath simulator and APC voice codec which INMARSAT is procuring from different sources.

MICROWAVE TECHNOLOGY DIVISION

INTRODUCTION

The Microwave Technology Division (MTD) of COMSAT Laboratories performs research, development, and support functions in a wide range of technical areas encompassing all aspects of communications systems. These areas include the development of monolithic microwave integrated circuits (MMICs) for both satellite and earth station applications, MIC and waveguide filters, on-board repeater processing techniques, satellite monitoring and in-orbit testing, new earth station and satellite antennas, propagation evaluation, and fiber and free space optical communications.

In the R&D area significant progress has been made in MMICs and miniaturized microwave active circuits (MMACs), antennas, feeds and components, microwave multicoupled cavity filters, propagation modeling, optical intersatellite link analysis, and hardware development. In the support function, the MTD has participated in antenna measurements at Southbury, an aeronautical data link experiment, and studies for INMARSAT. Finally, design efforts and consultancy have been successfully performed for companies such as RCA, GTE, and Selenia Spazio.

COMSAT R&D

Jurisdictional — INTELSAT Related

Optical Transceiver Subsystems for Intersatellite Links

As in previous years, advanced communications research has continued in both hardware development and experimental demonstration of communications performance relevant to optical intersatellite links (ISLs). A bipolar temperature controller and digital thermometer circuits were developed and tested for active control of the core temperature of a diode laser. Test facilities established in-house were used to characterize a high-power single transverse mode diode laser [Hitachi HLP-1400, 30-mW continuous wave (CW) output] and a 10-diode laser array (Spectra Diode Laboratories SDL-2410, 100-mW CW output) for output power, modal (spatial), wavelength, and thermal stability. A second compact laser transmitter module was developed to test the feasibility of the laser power combining schemes. Using two orthogonally polarized lasers and beam-shaping optics, an overall power combining efficiency of ~84 percent was measured at the output of the combiner. This efficiency could be further improved by using antireflection coated optics.

A high-speed, high-current digital laser driver module capable of driving two 50-Ω complementary loads with currents up to 100 mA and data rates of 420 Mbit/s was developed and tested (Figure 1). A clock recovery circuit to relock the received data with the clock recovered from the data at 420 Mbit/s was also developed and transmission tests performed. Because of slow, homogeneous degradation in diode lasers, the output power at a fixed drive current as well as the slope of the output power vs drive current curve are reduced with aging. Thus, for long-life operation of the link, both the average and the peak output power must be maintained at their preset values. Laser drivers with active opto-electronic feedback control circuits to compensate for such aging effects were designed, constructed, and tested.

A low-noise broadband preamplifier was developed for the 4-GHz microwave high-speed analog transmission optical link, and the link was characterized with respect to amplitude and phase noise performance. The noise level of this link was measured to be 3 dB greater than that of the link containing the

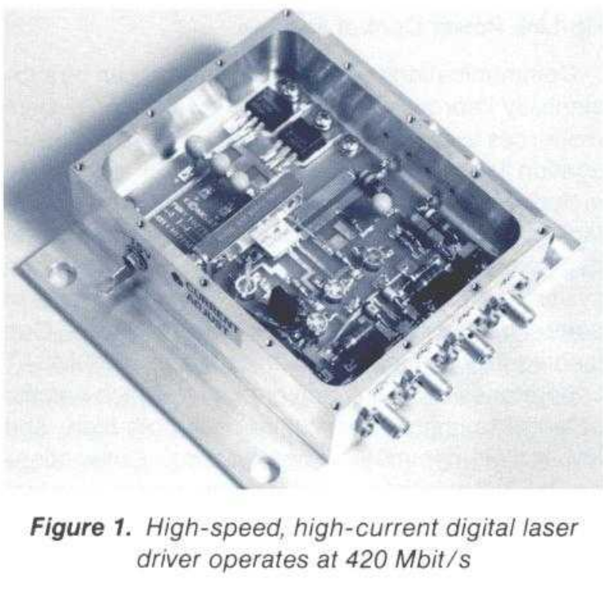


Figure 1. *High-speed, high-current digital laser driver operates at 420 Mbit/s*

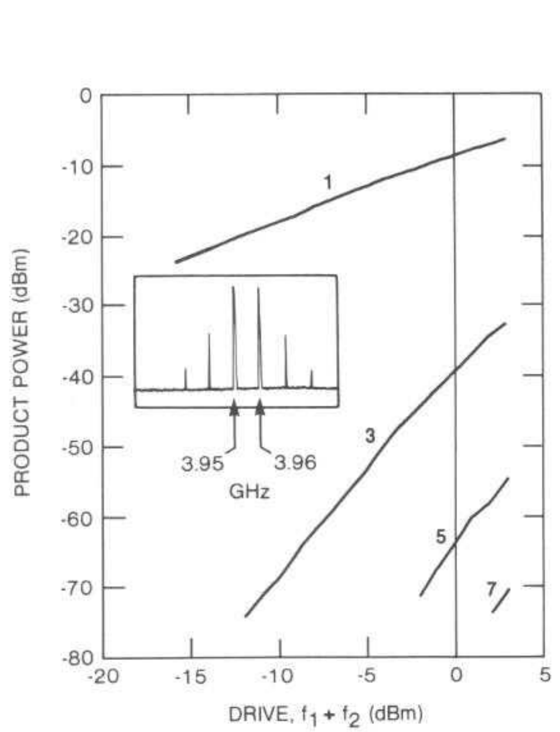


Figure 2. Two-tone intermodulation characteristics of diode lasers at ~4 GHz

Hitachi HLP-1400 diode laser. Measurements of the frequency response and two-tone intermodulation characteristics are shown in Figure 2. This link was also used at 4 GHz to test the suitability of wideband FM subcarriers vis-à-vis direct baseband analog transmission.

Up-Link Power Control Analysis

Communications system performance can be substantially improved by adaptively distributing system resources to restore performance on impaired propagation paths. Examples of mitigation techniques include transmit (up-link) power control to overcome fading, adaptive depolarization compensation to maintain polarization isolation in dual-polarization systems, and adaptive forward error correction to control bit error rates (BERs) in digital systems. One technique now under active investigation at COMSAT Laboratories is up-link power control, which has the potential to improve performance in both high- and low-margin communications systems. Conventionally, up-link power control is implemented by monitoring the down-link attenuation, and then scaling attenuation to the corresponding up-link frequency.

Measured data on the correlation of path fading at different frequencies were compiled and analyzed to estimate the attainable performance of up-link power control networks. Because down-link beacons are not permitted in the up-link (14-GHz) region of the K_u-band, concurrent 14- and 11-GHz attenuation data were collected in the loopback mode; these data are particularly sensitive to measurement errors. The most useful data were concurrent 30- and 20-GHz fade statistics, obtained, for example, from dual down-link beacons on the COMSTAR satellites. The analysis was performed by investigating the instantaneous attenuation ratio vs down-link attenuation, as illustrated with specified measurement error bounds in Figure 3.

For the 30- and 20-GHz bands, the study indicated that atmospheric rainfall variations will impose uncertainties of about 2 dB in 30-GHz attenuation scaled from 20-GHz measured fades. To achieve these accuracies, it will probably be necessary to employ an algorithm that approximately subtracts out gaseous (non-rain) path losses (i.e., by baseline removal), and to filter out most short-term ($\leq$1-s) fluctuations in down-link fade level.

MMIC Design Technology

The long-range goal of this task is the development of monolithic satellite receivers consisting of low-noise amplifiers (LNAs), fixed and variable gain blocks, mixers, and oscillators. It is conducted in close cooperation with the Microelectronics Division, which fabricates all MMAC and MMIC circuitry. These modules

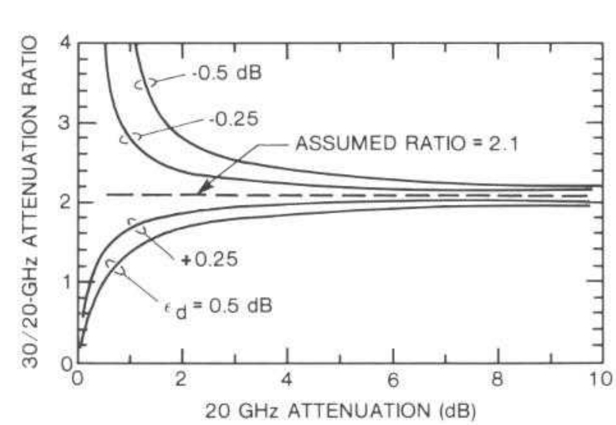
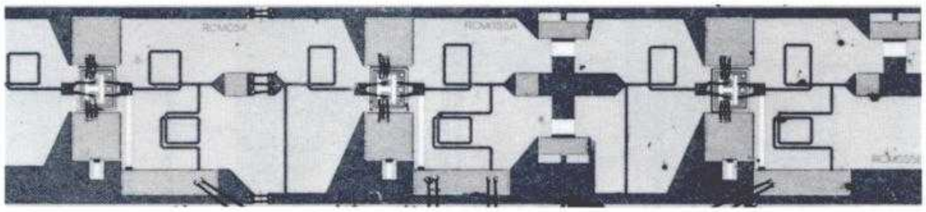


Figure 3. Effect of variation (E_d) in down-link measurement accuracy on corresponding attenuation ratio at 30/20 GHz



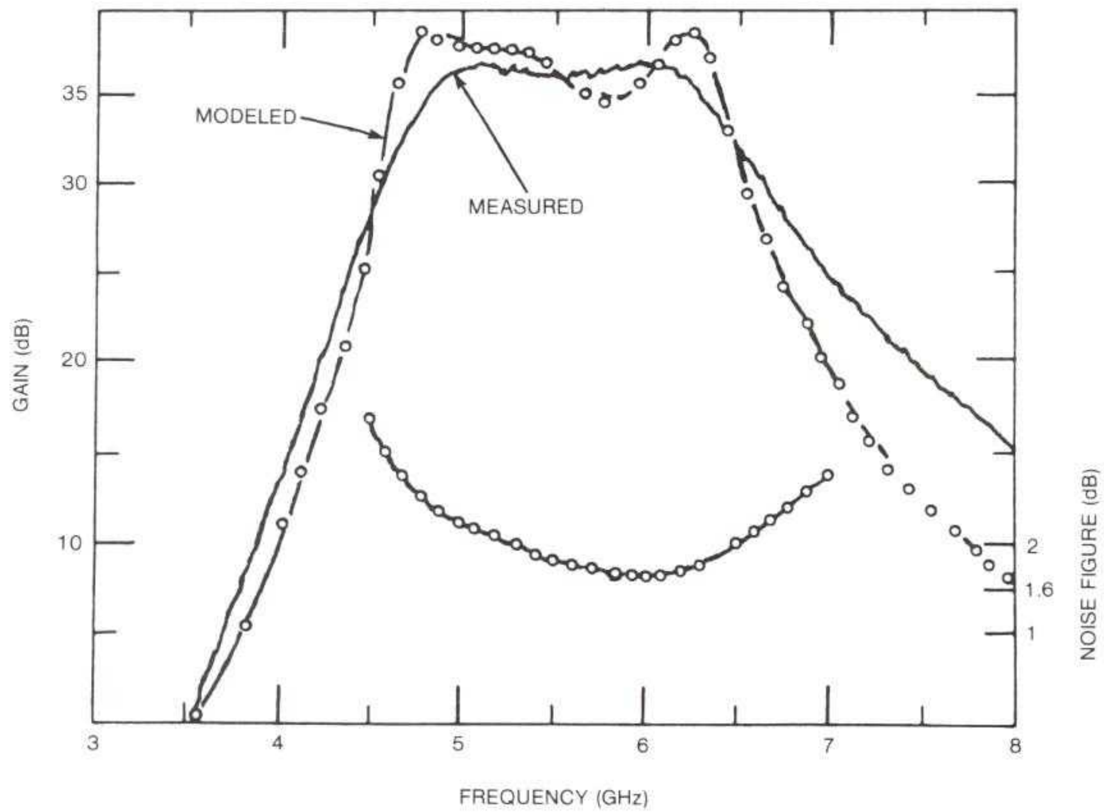


Figure 4. *Measured performance of 6-GHz, three-stage quasimonolithic amplifier exhibits close correlation with computed response*

were realized in MMAC form during 1984 and 1985; future emphasis will be on a fully monolithic realization.

In the first half of 1985, a 3-stage 6-GHz MMAC LNA having a gain greater than 35 dB and a noise figure of 1.6 dB was designed and fabricated on a gallium arsenide (GaAs) substrate. The close correlation between computer-modeled and measured responses is shown in Figure 4. This background work has led to the development of 6-GHz MMIC amplifiers such as a two-stage, 2- × 3.5-mm, 6-GHz MMIC LNA with predicted gain of 20 dB and a noise figure of 1.8 dB.

In addition, a two-stage 4-GHz MMAC amplifier was realized during 1985. Measured results from this amplifier have led to the design of a two-stage monolithic amplifier using feedback techniques. The predicted gain and noise figure are 12 dB and 3.5 dB, respectively.

Development of a highly reliable, compact, lightweight microwave switch matrix using MMIC tech-

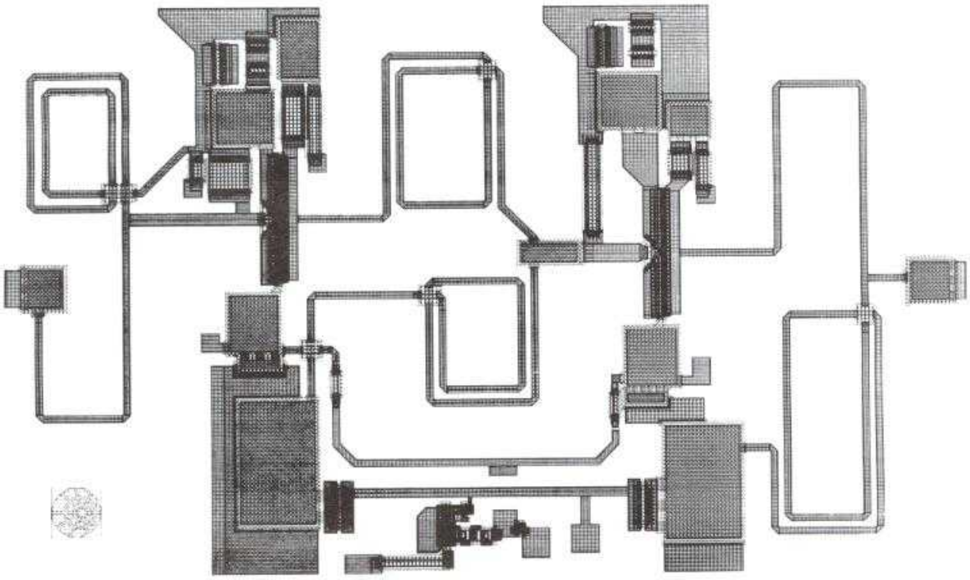


Figure 5. *Fully monolithic dual-gate FET switch operates over 3.5 to 6.5 GHz*

nology continued during 1985. Figure 5 shows a layout of a fully monolithic dual-gate field effect transistor (FET) switch circuit for operation over 3.5 to 6.5 GHz. The chip, which is compatible with transistor-transistor logic (TTL) control, is self-biased with a single positive power supply. The control logic has been integrated in the RF circuit and the chip size is 1.5 × 2.5 mm.

A novel monolithic matched switch circuit consisting of single-gate active and passive FETs has also been implemented. This circuit, shown in Figure 6, is matched over 3.5- to 6.5-GHz bandwidth in both ON and OFF states of the RF switch.

The above module designs are based on the lumped element models for the FETs (single-gate active, single-gate passive, and dual-gate FETs) developed in-house. These models have been derived from device physics and geometry and have been validated by measurements on FETs fabricated in-house.

Antenna and Feed Components

The potential for increasing the frequency bandwidth of the 4/6-GHz circular diplexer was investigated. This diplexer was originally developed for the INTELSAT V frequency bands, and design modifications are necessary to accommodate the broader INTELSAT VI bands. The conclusion of the study was that there would be no performance problems in the expanded 6-GHz transmit band, but that performance in the expanded receive band would degrade rapidly below 3.62 GHz. Additional investigation indicates that modification of the circularly polarized diplexer for use in the "Second Generation" INMARSAT bands (3.60 to 3.62 GHz and 6.425 to 6.441 GHz) also appears promising. Other diplexer developments consisted of a high-quality transmit reject filter that can be fabricated by a lower cost casting technique and an investigation of the use of thicker irises in the corrugated coupling region to reduce fabrication costs.

K_u-band diplexers were studied as an essential component of 11/14-GHz dual-polarized feeds. A "Y" junction diplexer separating 11- and 14-GHz signals from a common WR75 waveguide into separate WR75 waveguides was completed. This project included evaluation of various filter geometries that not only provide good electrical performance but also are amenable to low-cost fabrication techniques.

Microwave Filter Technology

Mode frequency degeneracy in cylindrical cavities was investigated by writing a computer program which would permit dual, triple, and quadruple mode degeneracies to be identified as a function of frequency spacings between the upper and lower

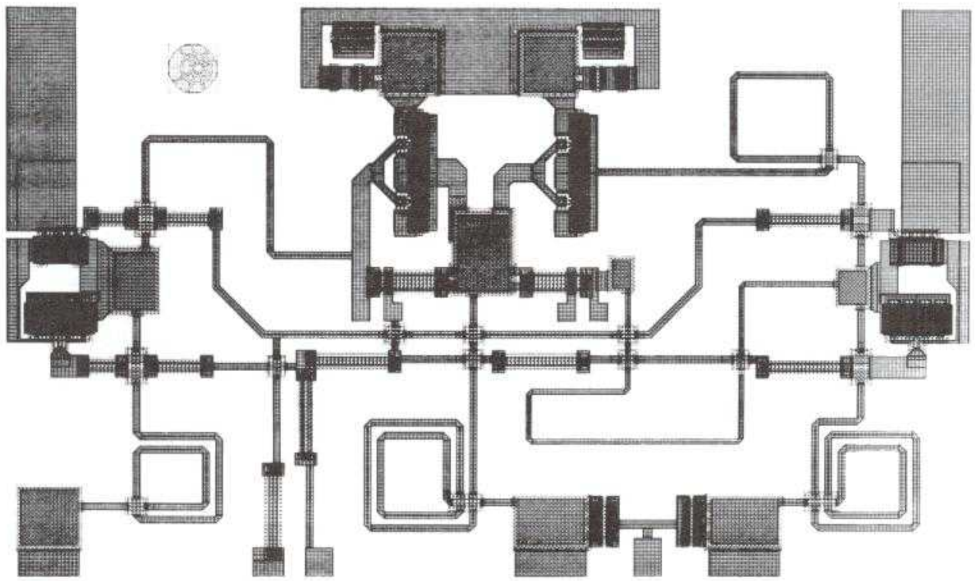


Figure 6. *Novel monolithic matched switch circuit consists of single-gate active and passive FETs*

spurious modes. Weight and volume estimates along with cavity Q's of the degenerate modes were computed. The application of this program resulted in the following fundamental conclusions:

a. The dual TE_{11n} mode is practical only for n = 1 to 4. For n > 4, the frequency width of the windows is too small to justify the small Q improvement (see Figure 7).
b. A number of triple mode degeneracies that allow practical filters to be realized have been identified. Triple mode degeneracies occur for the dual mode TE_{11n} and TM_{1mn} modes, and the fundamental triple mode degeneracy occurs for the dual TE_{111} and TM_{010} modes.
c. Dual modes can also be realized in the TM_{1mn} modes. Filters of this type have been realized although they do not seem to offer any significant advantages over the dual TE_{1mn} modes.
d. Quadruple mode degeneracy occurs when the dual TE_{11n} and dual TM_{1mn} modes resonate at the same frequency. A number of useful operating modes have been identified, for example, the TE_{112} and the TM_{110} modes. A four-pole elliptic filter function has been realized at 4 GHz using these modes and a Q of 15,000 was achieved. The filter is shown in Figure 8 along with its transmission and return loss.

Solid-State Power Amplifier Development

As part of an ongoing effort aimed at the realization of low-cost, highly reliable, miniaturized solid-state power amplifiers (SSPAs) for application in future satellites, the MTD is developing a family of MMIC amplifiers at 4, 11, and 20 GHz. Each amplifier design is intended to emphasize a unique potential or address a problem area unique to MMIC amplifiers in that frequency range.

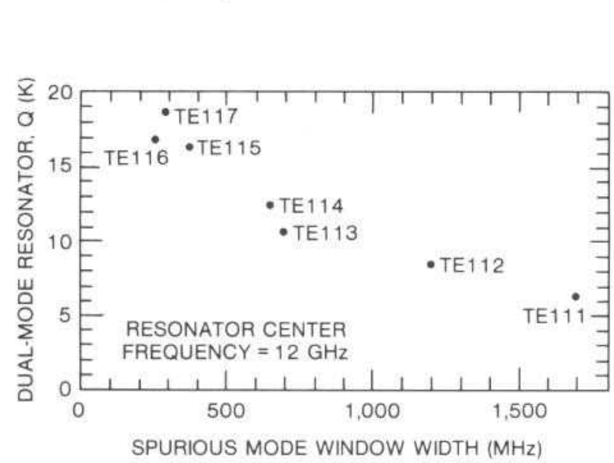


Figure 7. *Spurious mode window vs Q for various dual TE_{11n} modes*

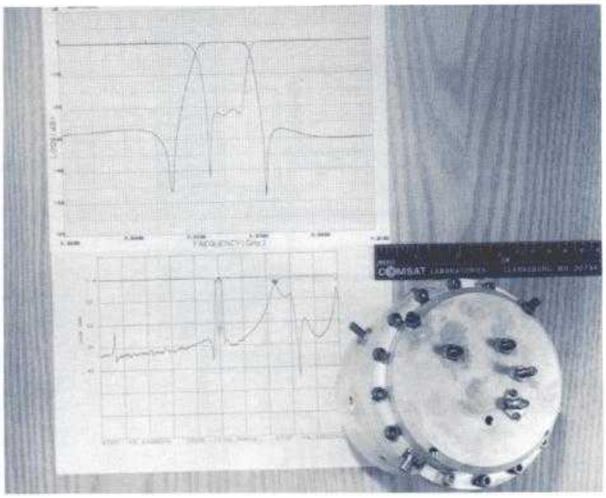


Figure 8. *Quadripole elliptic function filter realized at 4 GHz achieves a Q of 15,000*

At 4 GHz, where FET gain is relatively high, the emphasis is on increasing efficiency and linearity. To this end, amplifiers operating in class B or AB are being developed. Class B operation is theoretically capable of increasing amplifier efficiency by about 50 percent over that which is achievable with class A. To fully exploit this operating mode, both single-ended and push-pull circuits are being developed. The advantage of the push-pull version is that it is significantly more linear, especially at low input levels, than the single-ended circuit. The main disadvantage is that it requires the use of a *balun* to convert the usually encountered "unbalanced" transmission mode into a "balanced" mode. This disadvantage can be converted into a partial advantage if the amplifier is connected directly to a radiating element, which is usually "balanced." A lumped element balun has been developed which will allow a significant reduction in the size of push-pull amplifiers. Circuits have also been designed for a 0.5-W single-ended amplifier and for a 1.0-W push-pull amplifier, both for the 3.7- to 4.2-GHz frequency band.

At 11 GHz, the emphasis is on developing accurate FET and passive component models. Work in this area has focused on the measurement of COMSAT-developed FETs under well-defined and controllable circuit conditions.

At 20 GHz, the goal is to develop low-loss impedance matching techniques which will not degrade significantly the maximum available gain of the FET devices being used. Both single- and two-stage designs have been completed and masks designed (see Figure 9). The single-stage version should deliver 0.5 W with about 4-dB gain, while the two-

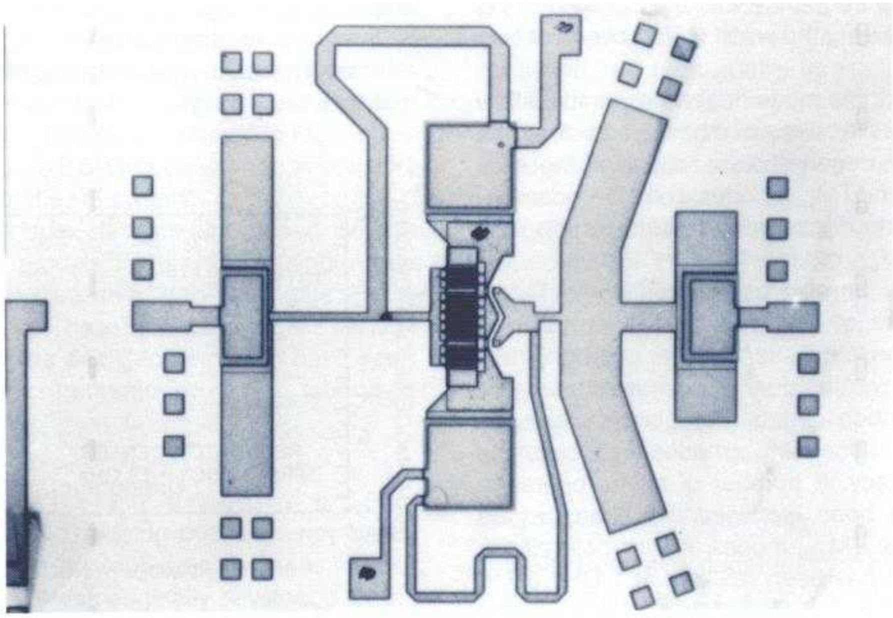


Figure 9. *Single- and dual-stage 20-GHz MMIC amplifiers deliver 0.5 W at 4- and 8-dB gain, respectively*

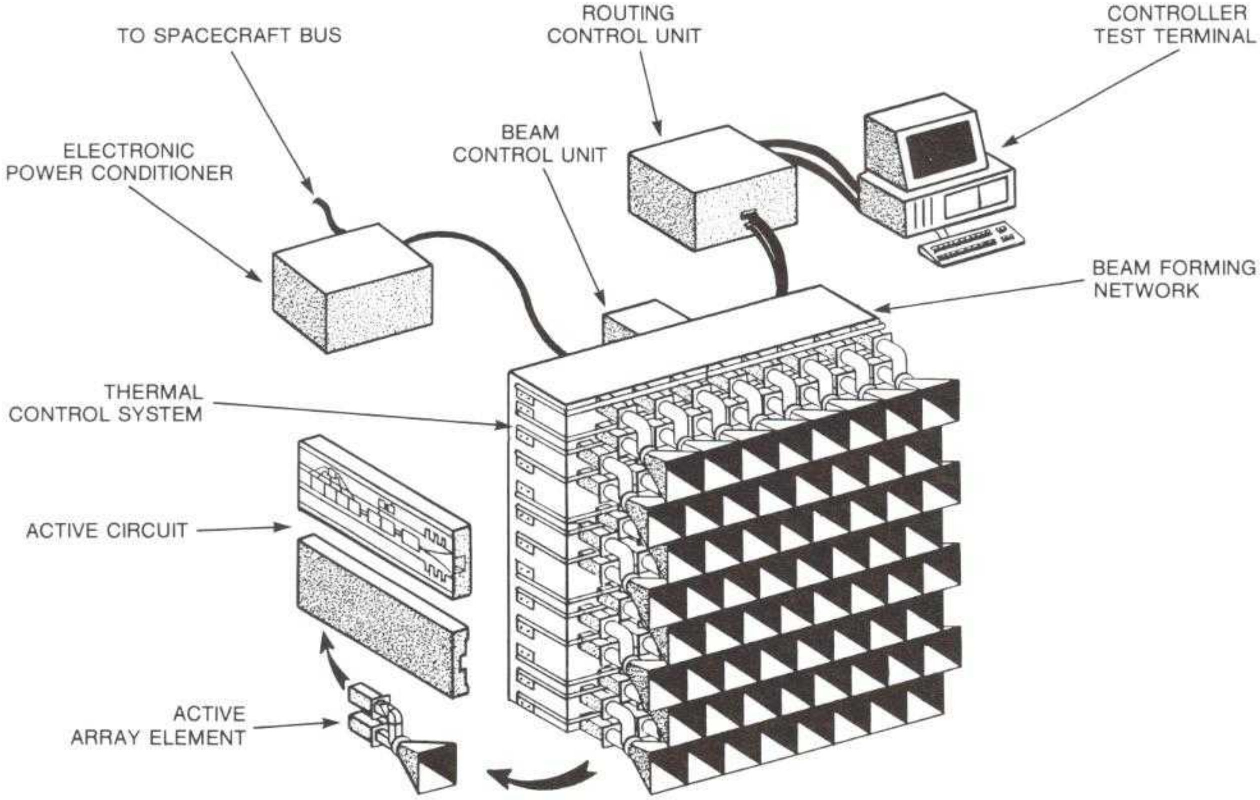


Figure 10. *Active phased array contains 64 radiating elements*

stage version will deliver the same power with about 8-dB gain.

Multibeam Phased-Array Antennas

Multiple rapidly scanned or hopping beams can be used to enhance the capacity of future satellite systems. This concept is being investigated by fabricating a high-power active phased-array antenna that can operate in a direct radiating mode or as a feed for a dual reflector system. Figure 10 is a conceptual drawing of the active phased array. This multidisciplinary effort involves building two arrays. The first is a 64-element dual-polarized low-power array fed by variable phase shifters and variable attenuators. The second is an array of 32 radiating elements, 16 of which will be fed by high-power amplifiers as well as variable phase shifters and variable attenuators fabricated with MMIC technology. The active circuits are controlled using a high-speed digital controller. Thermal and mechanical considerations constitute an essential part of the overall design. Fabrication of various elements in the array began in 1985, with assembly and testing to be completed in 1987.

Dual Reflector Optics Study

This study consisted of three phases: a configuration study, an aperture synthesis study, and a study of shaped confocal reflector systems. The configuration study was to determine the advantages and disadvantages of a confocal Cassegrain system and a confocal Gregorian system for 9° scanning. A two-dimensional ray-tracing program was written to compare the performance of these two systems in terms of feed and subreflector blockage, spillover energy loss, and physical dimensions. Since the Gregorian system was found to have less blockage and less spillover while scanning up to 9° with comparable reflector sizes, it was chosen as the antenna configuration for the aperture synthesis study.

To synthesize the aperture field on the feed plane, the General Antenna Program (GAP) has been modified so that the near field of a reflector antenna can be calculated on a specified planar surface. By using a receiving mode analysis in which a plane wave is incident on the main reflector with a given angle from boresight, the resulting near field on the feed aperture synthesizes the feed coefficients of the feed array. This array would produce a scanned beam in the opposite direction of the incident plane wave with minimum degradation, since the phase aberrations created by the reflectors have been compensated by the synthesized coefficients. However, because of the difference in the incoming and outgoing wave fronts on the feed plane, the synthesized coefficients compensate only part of the aberration errors. Still, an improvement of more than 0.5 dB has been observed in some scanned beams.

Finally, a surface-shaping technique based on the concept of bicollimated reflector designs has been investigated. With this technique, both the main reflector and the subreflector of a confocal antenna system are shaped so that the scan losses of the specified scanned beams are improved at the expense of the boresight gain. Preliminary results show that this technique indeed improves scan performance. Additional software to simulate the shaped surfaces in GAP is being developed for more accurate analyses.

Advanced Antenna Software Development

Two new computational techniques have been implemented to enhance the capability of the existing antenna analysis software package, GAP. Both of these methods allow pattern computations in a fraction of the time required by conventional direct integration techniques.

The first method improves the efficiency of antenna far-field computations by employing a sampling and reconstruction technique based on Shannon's sampling theorem. The far field is first computed along a small number of directions dictated by the theorem and then reconstructed at a number of user-specified points. The accuracy of the technique is excellent (0.03 dB). The central processing unit (CPU) usage of this technique is a factor of 15 times smaller than that of analogous computations performed by direct current integrations.

The second method involves performing a discrete Fourier transform (DFT) of the aperture distribution of a reflector antenna to obtain the far field. Software has been developed to perform this DFT efficiently through the use of fast Fourier transform algorithms. The computational advantage of this technique over other direct methods is a factor of 10 to 15.

In addition, software utilities have been added for device-independent graphics, optimization of coefficients for beam shaping, aperture field plots, and feed definition by specifying measured data.

On-Board Demodulation/Remodulation

Development of a 120-Mbit/s, coherent quadrature phase-shift keying (CQPSK), 3.95-GHz regenerative repeater for on-board satellite applications continued during 1985. The repeater receives the digitally modulated microwave signal, and without intermediate frequency conversions, demodulates the baseband information. The circuit contains carrier and symbol timing recovery loops and pulse shaping filters.

A breadboard model was successfully tested for probability of bit error, cycle slipping, and probability of burst acquisition. The BER and receiver filter transfer characteristic are shown in Figures 11 and 12. Integration of the various parts of the breadboard

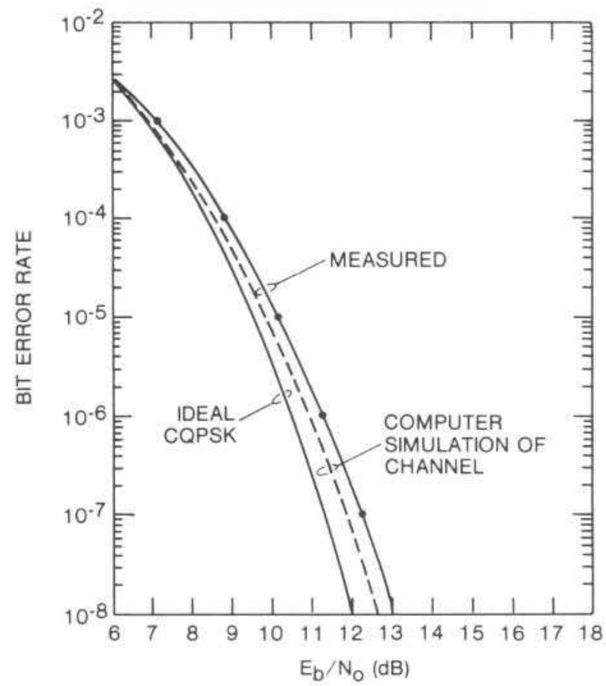


Figure 11. *BER vs E_b/N_o performance of the transmission channel is measured by the reverse modulation-loop demodulator*

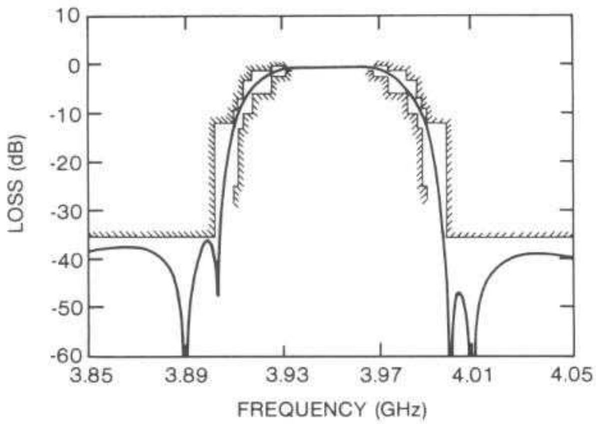
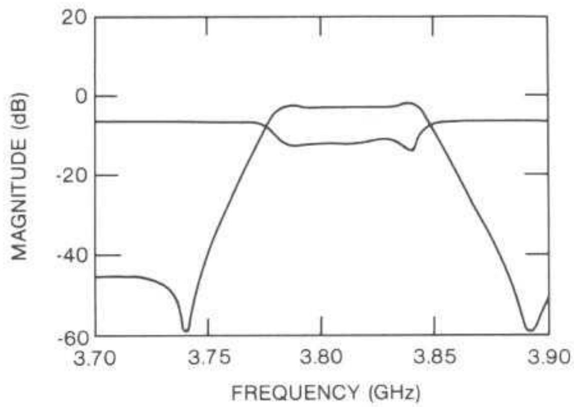
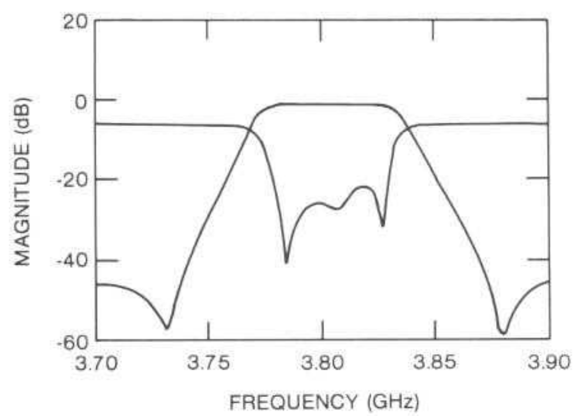


Figure 12. *Response of dual-mode dielectric resonator receive filter*



(a) *Response before error function has been minimized*



(b) *Response after error function has been minimized*

Figure 13. *Computer-assisted equipment tunes filters faster and more economically*

model into a single lightweight engineering unit is continuing.

Earth Station Antenna Technology

The Automated Antenna Measurement System (AMES) was further enhanced during 1985. The K_u-band measurement system was upgraded with an yttrium iron garnet (YIG) filter to produce a simpler receiver system, thus eliminating a cumbersome mixer system. L-band measurement software was written and used to test the Southbury INMARSAT station. An extensive set of flow charts and data subroutine descriptions were compiled in an operator's manual. To measure the performance of small aperture antennas, procedures were developed and are being implemented for the AMES to measure gain and G/T using the moon. Moon ephemeris programs have been written and are presently being installed in the AMES software. A verification program using the moon as a flux source to measure gain of C- and K_u-band antennas has also been completed.

Computer-Assisted Filter Tuning

This project consists of a system of computer-controlled test (microwave) equipment interacting with specialized computational subroutines to provide both characterization of a microwave circuit in its present state, and directions for tuning the circuit to another arbitrary state.

A prototype system has been developed to guide the tuning process, as well as to provide an estimate of the best response that could be achieved, given the constraints and/or limitations of the circuit being tuned. This will assist both in tuning filters (circuits) faster and more economically and in achieving realizations of complex structures and functions that were previously impractical.

The prototype system is presently capable of assisting in tuning a microwave filter from an untuned to a fully tuned state, given the data describing the fully tuned state. The operator adjusts the tuning screws of the filter to minimize an error function which is displayed vs frequency or as a single numeric value on the screen. Figure 13 shows the response before and after the error function has been minimized. The system is relatively easy to use with repeatable results. A patent application for this method has been filed.

Non-Jurisdictional

Circuit Development for Amplica

A novel 3-dB hybrid coupler with 50 to 20-Ω impedance transformation was developed for balanced amplifier applications over the 3- to 5-GHz band. The coupler, shown in Figure 14, was built on 10-mil-thick alumina substrate with dimensions of 0.39 x 0.16 in. and results in a significant reduction in the size of balanced amplifiers.

Low-loss and compact interdigitated hybrids for 4 to 8 GHz and 8 to 12 GHz were developed in a coplanar waveguide (CPW) configuration for application to CPW balanced amplifiers. The insertion loss and amplitude flatness of the 4- to 8-GHz CPW coupler are 0.1 dB and $\pm$0.25 dB, respectively; those for the 8-to 12-GHz couplers are 0.35 and $\pm$0.3 dB.

A feedback broadband amplifier using quasimonolithic technology has been developed. This amplifier and its measured and predicted performance are shown in Figure 15. The gain across the 2- to 6-GHz bandwidth is 15 dB $\pm$ 0.4 dB and its input and output return losses are better than 12 dB. The 2- $\times$ 3.5-mm module uses two self-biased stages and operates on a single + 3-VDC bias.

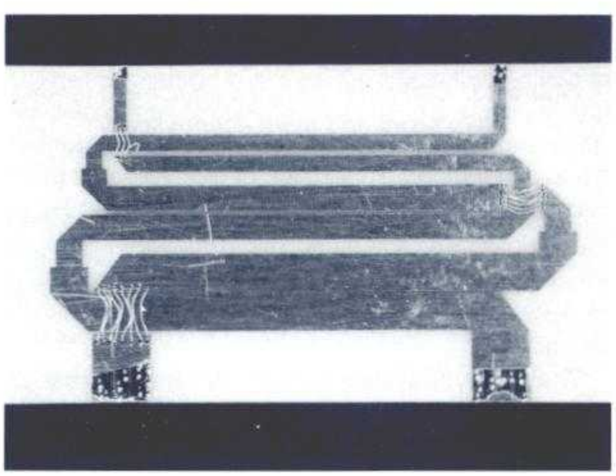


Figure 14. Novel 3-dB hybrid coupler results in a significant reduction in the size of balanced amplifiers

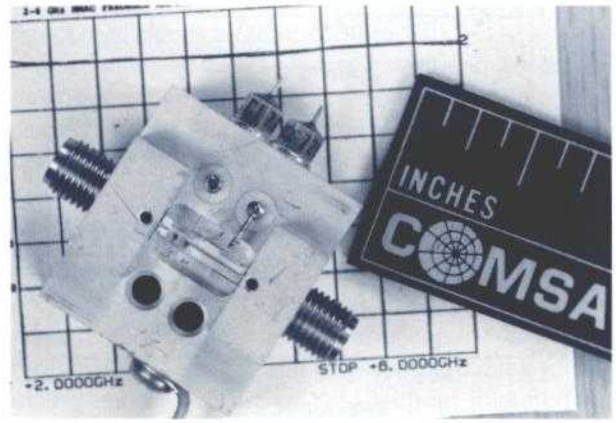


Figure 15. Feedback broadband amplifier uses quasimonolithic technology

K-Band Diplexer for COMSAT General

A dual polarized receive/single polarization transmit K_U-band feed system was designed and breadboarded. This diplexer was developed for use in the Hi-NET 4.5-m terminals, located at Holiday Inn motels. Primary design objectives for the feed system were compatibility with the existing Scientific Atlanta receive-only terminals and good performance with amenability to low-cost fabrication techniques.

The feed system design has been completed. When the schedule, quantities, and mounting requirements are defined, a tooling and fabrication study will commence. The fabrication and tuning cost of the feed is projected to be lower than the design goal.

COMSAT SUPPORT

Space Communications Division

Southbury Antenna Measurements

An extensive series of measurements was conducted on behalf of Maritime Systems at the Southbury, Connecticut, earth station complex to determine the modifications required to operate with the "Second Generation" space segment. Both the MARISAT and full performance antennas, low-noise amplifiers, and interfacility links were tested at L-band and in the 6-and 4-GHz bands. The principal intent of the measurement series was to evaluate the present operating conditions of the antennas to determine which components could be retained and which would have to be replaced or retuned. This approach, which significantly reduces costs and minimizes station downtime, is an alternative to a complete retrofit of the stations.

Many of the measurements were straightforward. However, measurement of the on-site swept frequency feed system axial ratio required the design and fabrication of a special axial ratio test fixture that mounted between the subreflector and the corrugated feed horn.

Accurate radio star gain-to-noise temperature ratio (G/T) measurements were made at both L-band and C-band, by using the COMSAT Laboratories AMES, described previously.

Aeronautical Data Link Experiment

Mobile satellite systems such as INMARSAT may be the most attractive and effective means of implementing commercial transoceanic aeronautical voice and data communications. To test the feasibility of such a system and to examine the properties of the aeronautical satellite channel, COMSAT (Maritime Systems supported by COMSAT Laboratories) participated in a joint experiment with the MITRE Corporation, Rockwell International Corporation, Ball Aerospace Systems Division, and Avantek, Inc. The general configuration of the demonstration experiment, performed during August 1985 and intended to evaluate operational performance for severe conditions at low-path elevation angles, and the actual flight test route are shown in Figure 16.

One of the most useful results was the discovery that multipath effects did not severely impair performance for most of the flight path. However, along the path segment north of Iceland, there was noticeable degradation in link performance, although communications were not lost. The BER distribution statistics indicate that the errors were uncorrelated, suggesting mostly diffuse multipath components. Other observed higher error concentrations, some of which exhibited a cyclical pattern, were attributed to inherent system impurities and differential PSK (DPSK) demodulator performance near threshold. It was also found that the system carrier-to-noise ratio was more sensitive to aircraft antenna gain pattern variations due to aircraft motions than to other experiment parameters.

The experimental results show that inexpensive low-gain modems can be practical and can serve the aeronautical community by substantially improving navigation accuracy, enhancing safety standards, and by facilitating other communications capabilities such as weather updates and public correspondence.

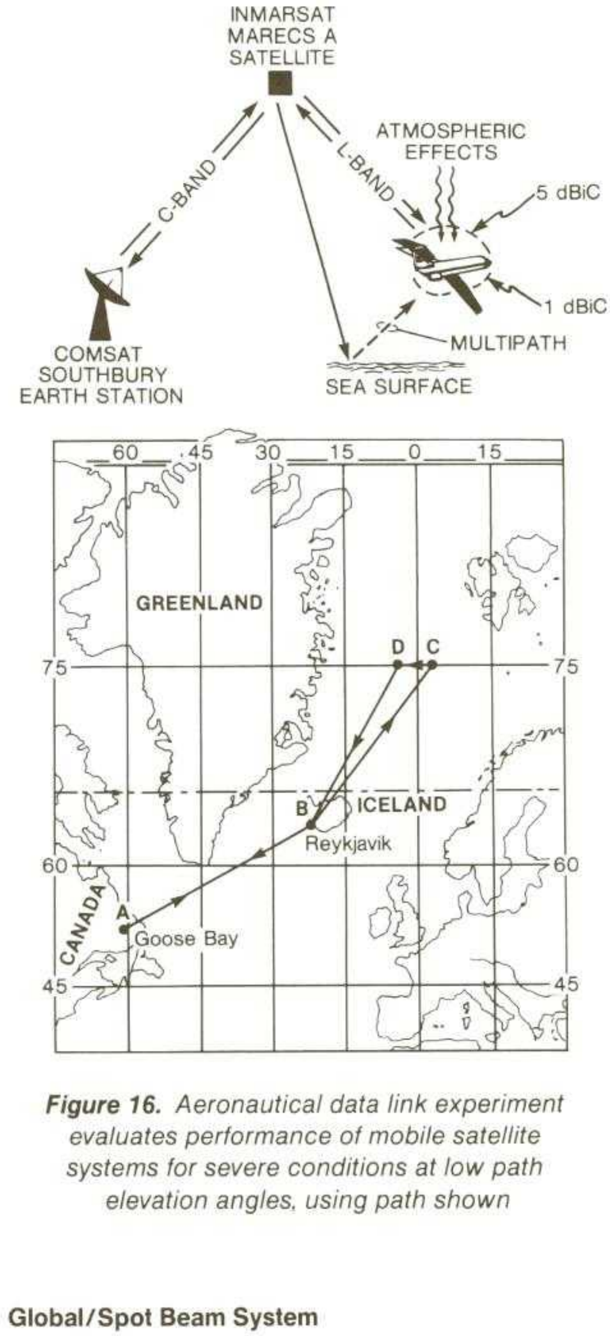


Figure 16. Aeronautical data link experiment evaluates performance of mobile satellite systems for severe conditions at low path elevation angles, using path shown

Global/Spot Beam System

The MTD investigated the techniques, feasibility, advantages and cost of modifying the INMARSAT II satellite to provide a spot-beam coverage. This investigation led to an efficient approach for modifying the present INMARSAT II antenna/transponder design. This approach, presented to INMARSAT through COMSAT's Maritime Services unit, adds spot-beam capability to the present all-global system with minimum additions to mass and power. The L-band

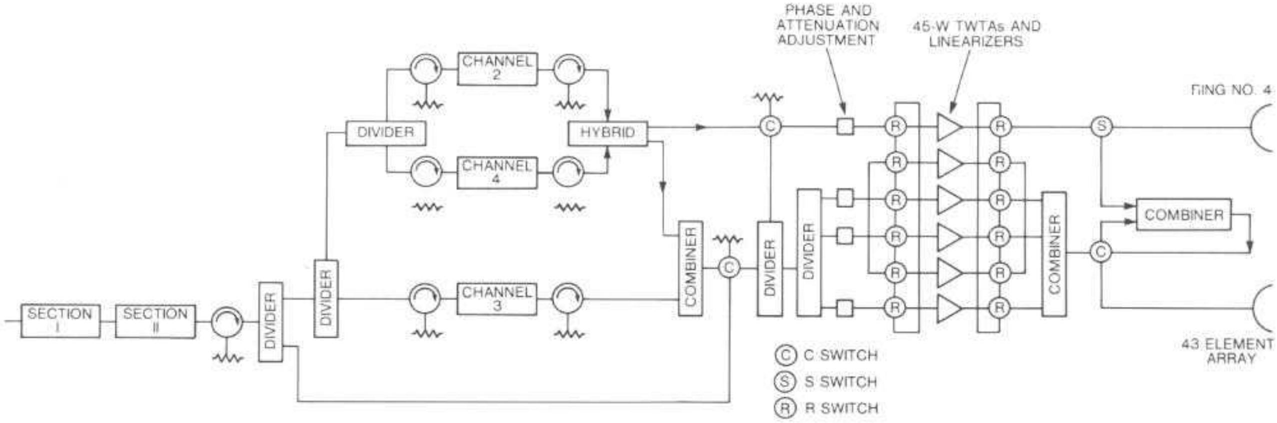


Figure 17. *INMARSAT transponder configuration increases satellite capacity by more than 50 percent*

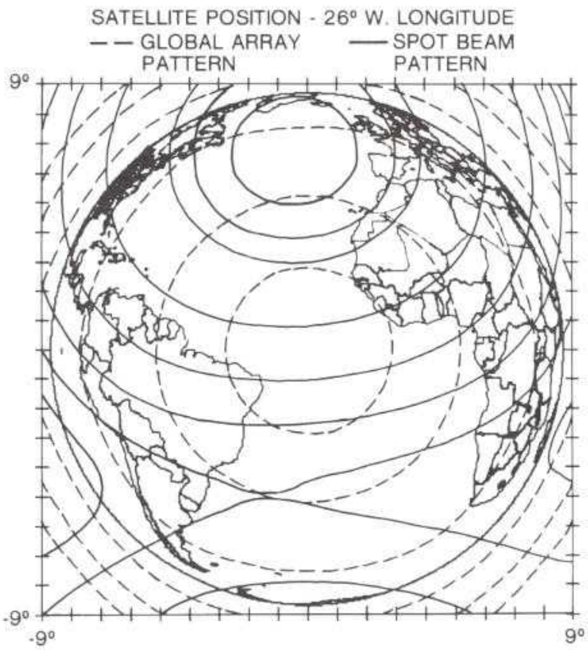


Figure 18. *Global and spot beam contours are generated simultaneously by the same array*

transmit antenna array presently used for global coverage, along with the same number of traveling wave tube amplifiers (TWTAs) in the transponder, is used to produce global and spot beams at the same time and thus increase the satellite capacity by more than 50 percent. Figure 17 is the transponder schematic, while Figure 18 shows typical global and spot-beam contours generated simultaneously by the same array.

The MTD also provided support for the monitoring of INMARSAT II communications payload fabrication by Hughes Aircraft Company.

COMSAT Technology Products

Antenna and Feed

In cooperation with the Network Products Division of Communications Technology Products (CTP), the MTD has developed a 1.8-m K_u-band offset reflector antenna system demonstrating superior sidelobe performance (see Figure 19). A K_u-band transmit and receive feed system consisting of a corrugated feed horn, halfwave polarizer, vertex orthomode transducer, and transmit bandpass and transmit reject filters was designed (see Figure 20). The feed components were specifically designed to be amenable to high-quantity/low-cost fabrication techniques such as die casting.

The superior sidelobe performance is a result of the offset reflector geometry which eliminates blockage, as well as the careful design of the corrugated feed horn illumination function and control of the rms surface tolerance of the reflector surface. Agreement between calculated and measured performance has been excellent.

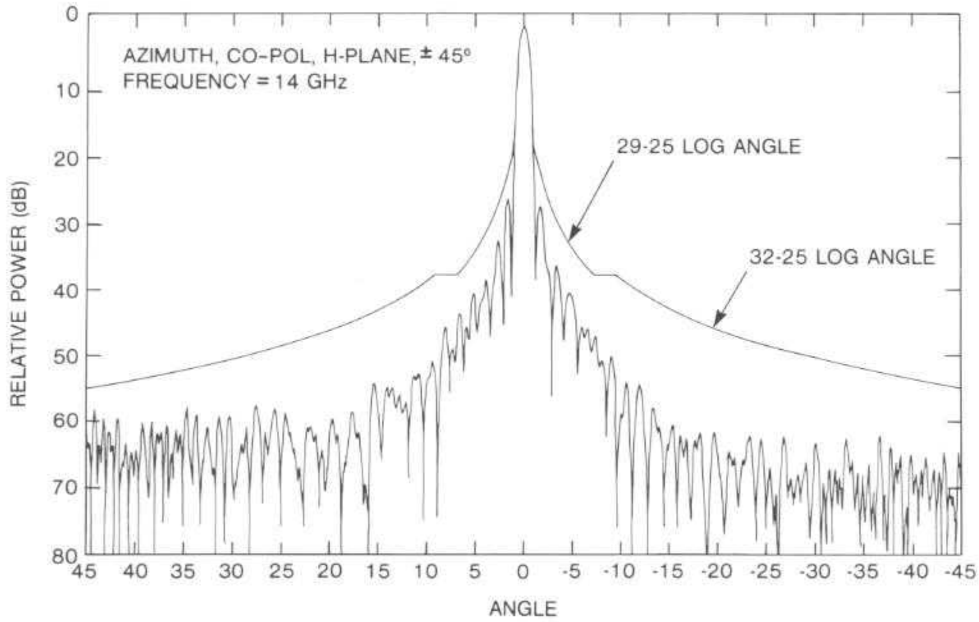


Figure 19. *1.8-m K_U-band offset reflector system demonstrates superior sidelobe performance*

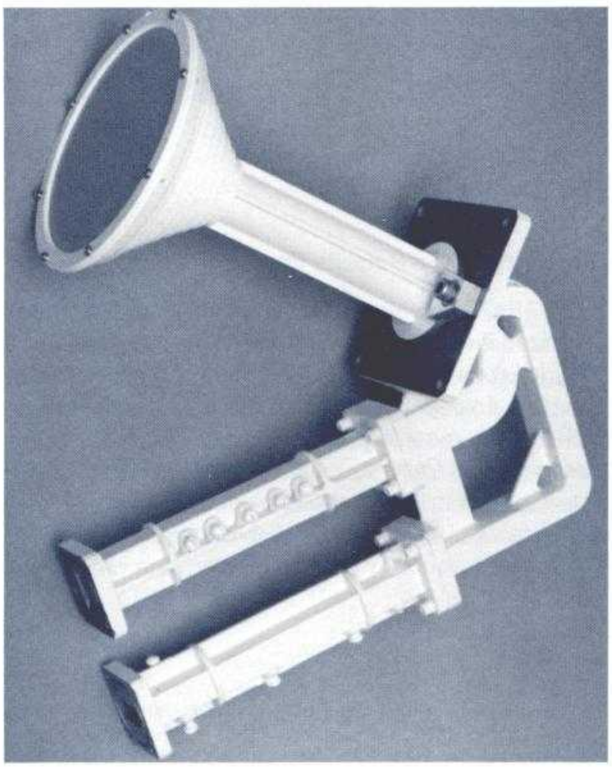


Figure 20. *K_U-band feed system components are amenable to high-quantity/low-cost fabrication*

INTERNATIONAL

Undersea Fiber-Optic Systems

The competitive position of satellite communications relative to that of fiber-optic systems in the Atlantic Regions was critically assessed. Studies of the current state-of-the-art and predictions of future trends provided the basis for cost estimates for point-to-point undersea communications and terrestrial extensions by fiber-optic cables to the International Switching Centers and the Bell operating companies. The satellite system alternatives were investigated by the Communications Technology Division.

INTELSAT

Optical Intersatellite Link

An on-board optical transceiver package for full-duplex 36-MHz analog or 360-Mbit/s digital transmission capability between two geosynchronous satellites spaced 60° apart was investigated under INTELSAT Contract INTEL-384. Six different optical systems using carbon dioxide (CO_2), neodymium-doped yttrium aluminum garnet (Nd:YAG), indium gallium arsenide phosphide (InGaAsP), and gallium aluminum arsenide (GaAlAs) lasers were evaluated with respect to their performance characteristics, and mass, volume, and prime power requirements. As indicated in the final report submitted to INTELSAT, the GaAlAs systems offer the most potential. In the near term, a direct detection system with one or a few optical carriers in each direction seems practically feasible with power combining of two orthogonally polarized lasers. In the longer term, the use of optical heterodyne detection would probably be feasible with wavelength division multiplexing. This will require development of frequency stabilized GaAlAs lasers and associated drive circuits.

In-Orbit Test Set Upgrade

The objective of INTELSAT Contract INTEL-497 is to upgrade the INTELSAT V control software that runs the in-orbit tests (IOT) on the series V satellites. Both the original hardware and software were implemented by COMSAT Laboratories for INTELSAT. The upgrade will allow INTELSAT to perform IOT for the series V and V-A, as well as the V-B business system satellites, which use an expanded frequency band. To accommodate this band, INTELSAT modified its ground equipment hardware and COMSAT upgraded existing software so that it is compatible with the modified hardware while maintaining the existing user interface and measurement strategy.

Miniaturized Solid-State Power Amplifier Modules

The purpose of the program conducted for INTELSAT under Contract INTEL-454 is to investigate various approaches to the design and fabrication of miniaturized SSPAs which have simultaneously high efficiency and linearity. During Phase I, each of three different circuit approaches is being studied and breadboards designed and built. In Phase II, one of the approaches will be chosen and several multistage versions will be built in breadboard form. Finally, in Phase III, 15 amplifiers (30-dB gain each) will be built and evaluated.

Three basic approaches are being studied in Phase I:

- class B/AB operation
- negative feedback (in the Microelectronics Division)
- dynamic bias.

In all three cases, a quasimonolithic approach in which discrete FETs are combined with an otherwise monolithic circuit is being used.

The class B/AB design has been completed and is being transferred to artwork. It is expected to deliver about 0.5 W with about 9-dB gain.

Tests are also in progress on both COMSAT-developed and commercially available FETs to evaluate the sensitivity of third-order intermodulation distortion and efficiency to DC bias levels.

Phased Array for Shaped Beams

Under Contract INTEL-428B with INTELSAT, the MTD performed analytical studies and will fabricate an experimental model to demonstrate the use of direct radiating phased arrays for reconfigurable shaped beams. The experimental model will have 64 radiating horn elements fed by active circuits consisting of variable phase shifters and variable gain amplifiers, which are in turn fed by a stripline power-dividing network. A digital controller will also be fabricated to reconfigure the shaped beam on command. In 1985, the key passive components, including orthomode transducers, radiating elements, and the beam-forming network, were built in breadboard form. Designs for the active MMIC modules (phase shifter, variable attenuator, and amplifiers) will be completed in 1986.

OTHER

RCA

Direct Broadcast Satellite Feeds

In 1984, two flight-qualified 12/17-GHz circularly polarized feed modules were built for use with a direct broadcast satellite (DBS). The inclusion of an additional up-link spot beam on the DBS satellite required building two more flight units. These units were completed and all four modules were integrated into the antenna feed array for the RCA satellite in 1985. The modules exhibited less than 0.6-dB axial ratio across the usable frequency bands.

GTE

In-Orbit Automatic Test Equipment

GTE Contract GD-83-010 for IOT Automatic Test Facilities was initiated in 1984. Work in 1985 consisted of further refining a very powerful interactive graphics

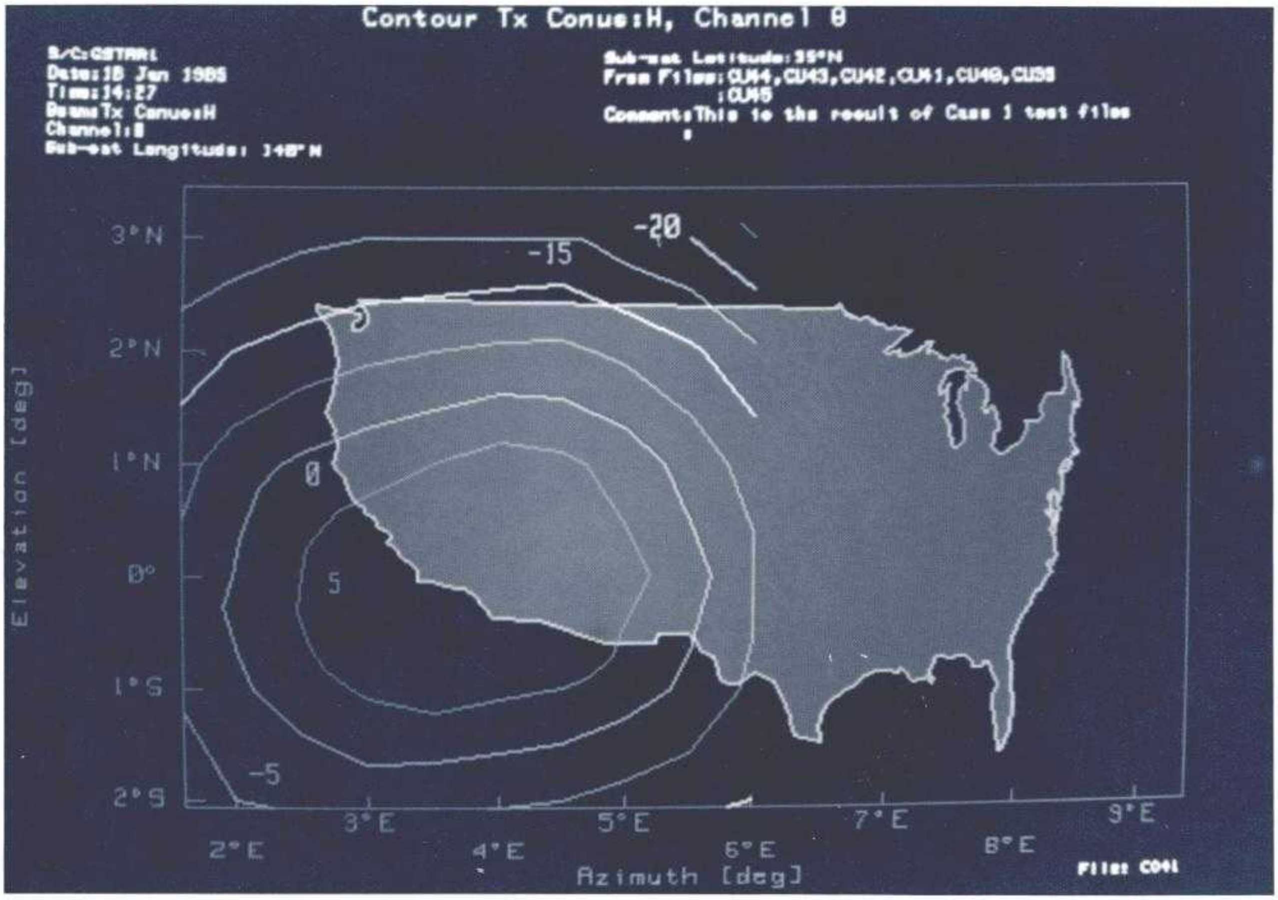


Figure 21. *Antenna pattern and coverage area can be displayed in spacecraft or geometric coordinates*

editor and implementing contour generating algorithms from sparse data. The editor and contour generator as well as database management comprise the antenna analysis package of the GTE facility, which can display antenna patterns together with the coverage region in either spacecraft (Figure 21) or geometric (earth) coordinates. Extensive documentation for both the IOT and antenna analysis packages was completed and delivered.

SBS

Antenna Measurement

An axial ratio study was performed on the Satellite Business Systems (SBS) 12.5-m IOT antenna at Castle Rock, Colorado, under Contract MTA-94. The purpose of the measurement study was to evaluate the polarization performance of the antenna and recommend the necessary modifications to upgrade it for measuring the new SBS dual-polarized satellites. Selected tests were designed to characterize the polarization performance of the antenna without requiring removal of the feed or necessitating extensive down-time. A rotating RF probe assembly and subreflector absorber shield were designed and installed at Castle Rock to measure the on- and off-axis feed system axial ratio. With this assembly, accurate swept frequency axial ratio measurements of the installed feed system axial ratio were made. The results demonstrated that the antenna is capable of 40-dB axial ratio with a new four-port diplexer and polarizer while retaining the existing tracking system and corrugated feed horn. Measurements of the gain, G/T, and antenna and low-noise amplifier (LNA) noise temperature of the SBS station were also made.

NASA

TDAS Laser Intersatellite Link

During 1985 a separate optical ISL study, "TDAS Laser Intersatellite Communications," was begun under subcontract 01232 with NASA Goddard Space Flight Center. The objectives of this study were to perform trade-off analyses of the optical power budget for various high-speed geosynchronous to geosynchronous (GEO-to-GEO) links (2 Gbit/s, satellites spaced 160° apart) and low earth orbit to geosynchronous (LEO-to-GEO) data links (1 Gbit/s) using semiconductor diode lasers, and to identify critical system parameters so that baseline configurations of the focal plane layout and complete systems designs including RF/optical interfaces could be made.

Power budget calculations for GEO-to-GEO and LEO-to-GEO forward and return links have been completed for the following modulation formats:

- on-off keying with Manchester coding and direct detection
- quaternary pulse-position modulation (QPPM) with direct detection
- quaternary frequency shift keying with heterodyne detection.

Link performance degradation due to solar conjunction on the GEO-to-GEO links and due to sunlit earth on the LEO-to-GEO links was estimated. The designs

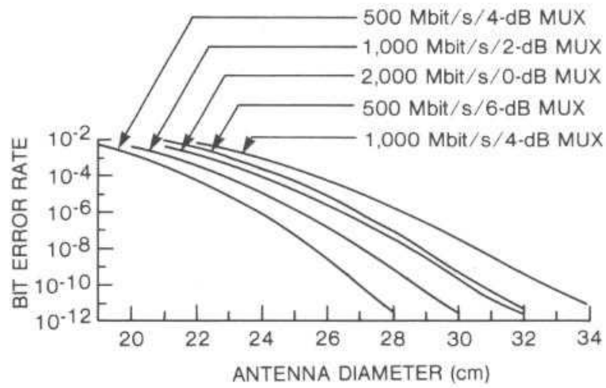


Figure 22. *GEO-to-GEO crosslink: accumulated BER vs antenna diameter*

of optical communications transceiver terminals were also completed. Figure 22 shows the typical results of optical power budget calculations for GaAlAs laser ISLs using QPPM with direct detection. A 0.85-μm, 1-W optical transmitter was chosen for the 2-Gbit/s link to allow a 4-dB margin and 0.3-μrad noise equivalent angle in the system design.

The following work is planned to be completed by the summer of 1986:

- RF/optical interface definition and technological approach
- system control and monitoring concepts
- communications and command sequence from launch through orbital operation of TDAS satellites
- in-orbit communications test scheme
- a schedule for the hardware development phase.

MICROELECTRONICS DIVISION

INTRODUCTION

The mission of the Microelectronics Division (MED) is to perform research leading to the development of state-of-the-art microelectronic components for improved and expanded satellite communications systems and services and other aerospace applications. These components consist of discrete devices such as field effect transistors (FETs), microwave integrated circuits (MICs), miniaturized microwave active circuits (MMACs), monolithic microwave integrated circuits (MMICs), and digital integrated circuits. Efforts are directed toward improved electrical performance at higher frequencies and operating speeds and, of particular importance to spacecraft applications, enhanced life and reliability. Related to reliability is the investigation of radiation effects on both active and passive spacecraft components. Because of the importance of reliability, the division maintains an analytical facility that not only supports its own development projects, but also performs analytical services for other groups within the corporation.

FACILITIES

New Class-100 Clean Room

To fabricate MMICs with submicron geometry, a new clean room facility, shown in Figure 1, has been built. This facility enables critical microlithography processes to be conducted in a controlled clean environment, with a maximum of 100 half-micron particles per cubic foot. Several pieces of microlithography equipment have been installed, including an electron beam lithography system, a deep ultraviolet (UV) and an infrared mask aligner, and automated machines for photoresist coating and developing. In addition, a scanning electron microscope (SEM) has been installed for in-line monitoring, allowing devices and MMICs with submicron features to be fabricated with high quality and good yield. An additional thin film processing clean room facility, scheduled for completion in 1986, will further enhance the semiconductor processing facility.

Figure 1. *Class-100 clean room permits fabrication of MMICs with submicron geometry.*

Submicron Electron Beam Patterning

With the completion of the new class-100 clean room, the Cambridge Instruments, Inc. Electron Beam Pattern Generator was relocated as shown in Figure 2. The programming graphics and jobfile preparation equipment were situated to improve utilization of the system and accelerate development of submicron devices and MMICs.

The patterning of wafers for development of half-micron gates has been accomplished exclusively using electron beam writing technology. This power FET and low-noise amplifier (LNA) development could not have been completed without the use of electron beam writing. Techniques were developed to provide fast turnaround (typically less than one day) for gate writing.

Development of the technology required to write 0.25-micron patterns in resist and to fabricate complete gate structures has been initiated, and integration with the remainder of device and circuit processing continues. Figure 3 shows a scanning electron micrograph of a completed quarter-micron gate structure.

Research has also begun to develop techniques for more accurately placing gates in ion-implanted

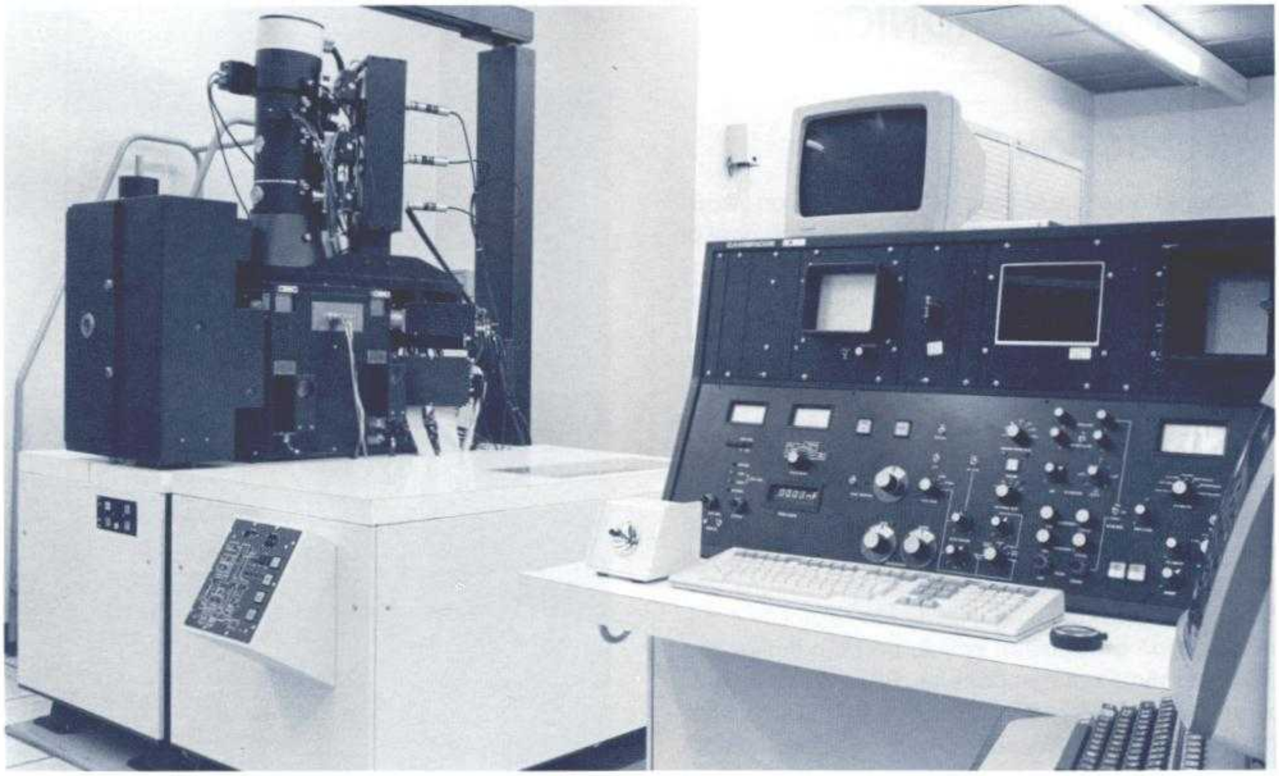


Figure 2. *Operating console of the Cambridge Instruments, Inc., Electron Beam Pattern Generator*

devices for low-noise applications without requiring electron beam writing on multiple levels. This process requires the combination of optical and electron beam technology and two layers of resist on the substrate at the same time. Initial experiments have been very promising and will permit the fabrication of better LNA MMICs and FETs. A technique is being investigated for the double exposure (optical and electron beam) of a single layer of polymethyl methacrylate (PMMA). This will significantly improve the writing time for MMICs having large area metallization on the gate level for capacitor baseplates. Experiments have proven that the double exposure and development of the single resist layer can be completed satisfactorily. Integration with the remainder of the gate formation process is under investigation.

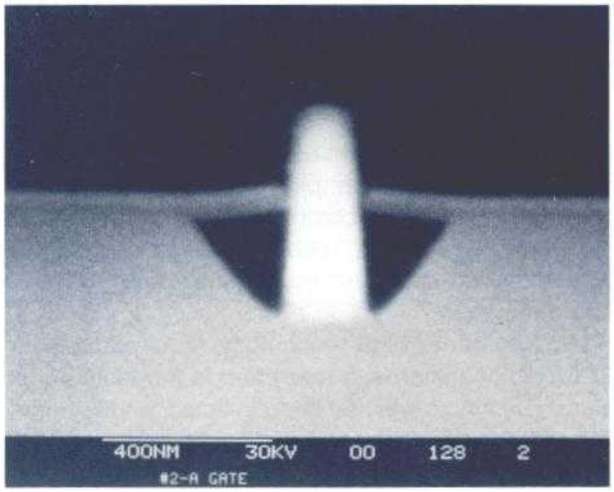


Figure 3. *Quarter-micron, recessed, metal gate structure fabricated using electron beam lithography*

Automated 50-mm-Diameter Halide GaAs Reactor

A computer-controlled halide epitaxial reactor with 50-mm-diameter gallium arsenide (GaAs) wafer capability was constructed and placed into operation during 1985. This reactor is shown in Figure 4. Wafers are processed singly with a maximum throughput of two wafers per 8-hour work day. The reactor design

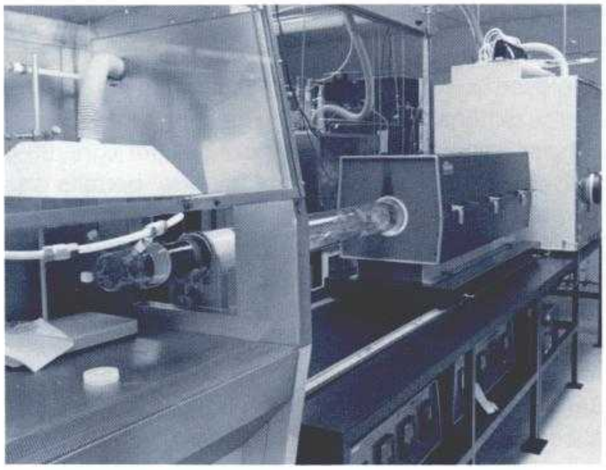


Figure 4. Computer-controlled halide epitaxial reactor for growing epitaxial layers on 50-mm-diameter GaAs wafers

permits the growth of layers with uniform electrical characteristics (I_{DSS} values vary by less than 8 percent from the average value) and reproducible and predictable characteristics from run to run. The addition of this reactor permits fabrication of state-of-the-art microwave devices and circuits from GaAs epitaxial layers on 50-mm-diameter wafers as opposed to the previously available 2 x 2-cm^2 wafers. Aside from the advantage of obtaining more devices and/or circuits for each wafer, 50-mm-round wafers simplify fabrication steps involving lithography.

Molecular Beam Epitaxy System

A Riber molecular beam epitaxy (MBE) system, shown in Figure 5, was ordered in September 1985 for delivery in June 1986. The system will permit COMSAT Laboratories to develop the next generation of microwave and digital devices and circuits. The most promising of these are based on gallium arsenide/gallium aluminum arsenide (GaAs/GaAlAs), heterostructures. The high electron mobility transistor (HEMT) and heterojunction bipolar transistors have already demonstrated performance superior to that of the GaAs metal semiconductor FET (MESFET) for low-noise application. Theoretical formulations predict such devices will perform at frequencies in excess of 100 GHz.

The MBE system is computer controlled so that the deposition process permits extremely fine control of layer thickness ($\leq$1 nm), layer abruptness (one monolayer), alloy composition, and multiple layer structures. This capability will allow the scientists at COMSAT Laboratories to produce novel materials with unique electrical and mechanical properties which are fundamental to the development of advanced semiconductor devices.

Inductively Coupled Plasma Facility

A sensitive new analytical capability was brought on line in 1985 with the installation of the Perkin-Elmer inductively coupled plasma (ICP) spectrometer. The ICP method is considered an "ultra trace" technique because its detection limit for most elements is about 1 to 100 parts per billion. The combination of an argon plasma high-temperature (8,000-K) excitation source and a sophisticated dual grating spectrometer gives higher sensitivity and speed than other emission techniques, and interference-free spectra for more than 70 elements. The instrument, shown in Figure 6, injects the liquid samples into the plasma, where they are excited to ionic species; the spectrometer measures the ionic emission intensities of elements being analyzed and compares them to standard emission intensities to yield the concentration of elements in the sample. The system operates under control of the Perkin-Elmer 7500 Series Professional Computer, which also coordinates automatic sample injection of as many as 50 samples from the autosampler. Typical applications of the ICP include analysis of trace contamination in water, chemicals, and other unknowns.

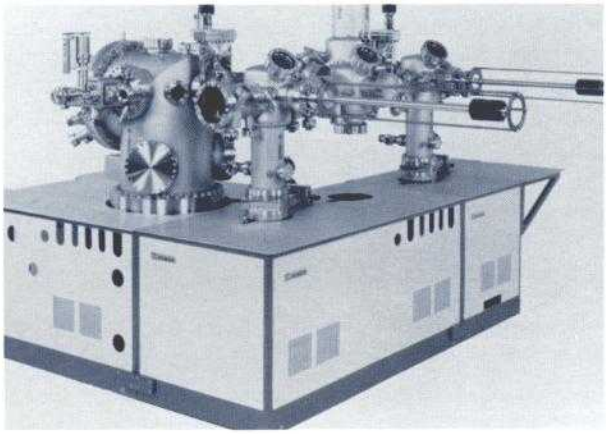


Figure 5. The Riber molecular beam epitaxy system will be used to develop the next generation of microwave and digital devices

Figure 6. *Inductively coupled plasma emission spectroscopy system used for quantitative analysis of elements in concentration down to a few parts per billion*

COMSAT R&D

Jurisdictional

Development of Millimeter-Wave Power FETs

Development of power FETs has made significant progress. In 1984, a device with a 1-micron gate length was reported. Using electron beam lithography, power FETs such as that shown in Figure 7 have now been fabricated with a nominal half-micron gate length and operated at 20 GHz. These devices have demonstrated state-of-the-art performance at 20 and 30 GHz, resulting from the achievement of 0.5-μm gate-length and epitaxial materials optimization for high power-added efficiency. The gates are fabricated using electron beam lithography directly on the GaAs wafer. Performance results shown in Figure 8 for a 1-W, 20-GHz and 4-dB-gain device represent state-of-the-art performance, greatly enhancing COMSAT's millimeter-wave capability.

Development of Millimeter-Wave Low-Noise FETS

Low-noise FETs for operation at frequencies up to 30 GHz or higher have been designed, and the lithographic maskset designed for use with epitaxial GaAs wafers has been delivered. The process for making quarter-micron, electron-beam-written gates is under development. Figure 9 shows one of the first FETs made using this maskset.

Epitaxial Semiconductor Technology Development

Halide GaAs epitaxial reactors have historically employed arsenic-saturated gallium melts as the source material from which the gallium is transported to the seed crystal. The use of pure gallium (0.999999) and equally pure arsenic trichloride permits the growth of the high-purity GaAs required for buffer layers. The epitaxial layer quality is very dependent upon the stability of the GaAs skin which floats on the arsenic-saturated gallium. Small variations in process parameters such as temperature and gas flow adversely affect the stability of this skin, and since the GaAs skin is not unconditionally stable, the characteristics of epitaxial layers deposited from it are not completely predictable.

In recent years, high-purity bulk-grown GaAs ingots have become available. As source material, these ingots are essentially insensitive to small changes in process parameters. In 1985, because of this advantage, high-purity bulk GaAs replaced the arsenic-saturated gallium source in both COMSAT's halide epitaxial reactors, as shown in Figure 10. The quality of the epitaxial layers grown using the solid source was found to be equal to or better than that grown using the gallium source. In addition, several advantages were quickly appreciated: the yield of usable material increased, the solid source material required recharging less frequently, and the solid source material is easier to work with.

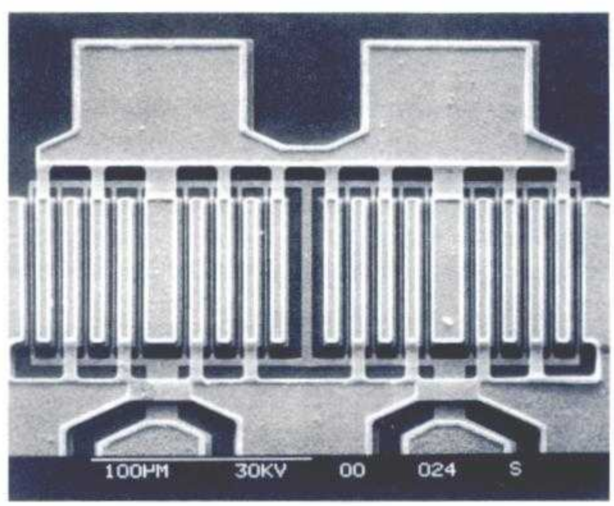


Figure 7. *COMSAT Laboratories 20-GHz power FET was fabricated using electron beam lithography*

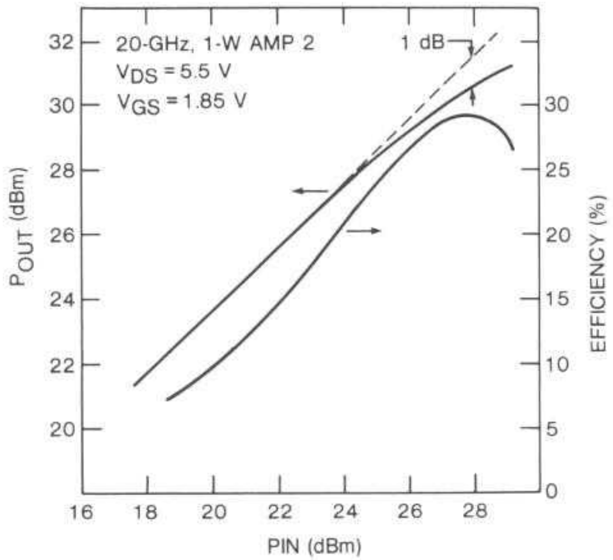


Figure 8. *20-GHz power amplifier exhibits state-of-the-art performance*

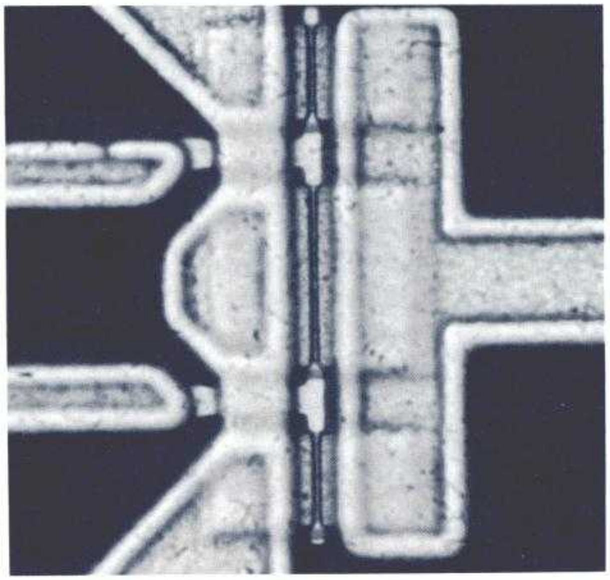


Figure 9. *One of the millimeter-wave low-noise FETs designed in the MED*

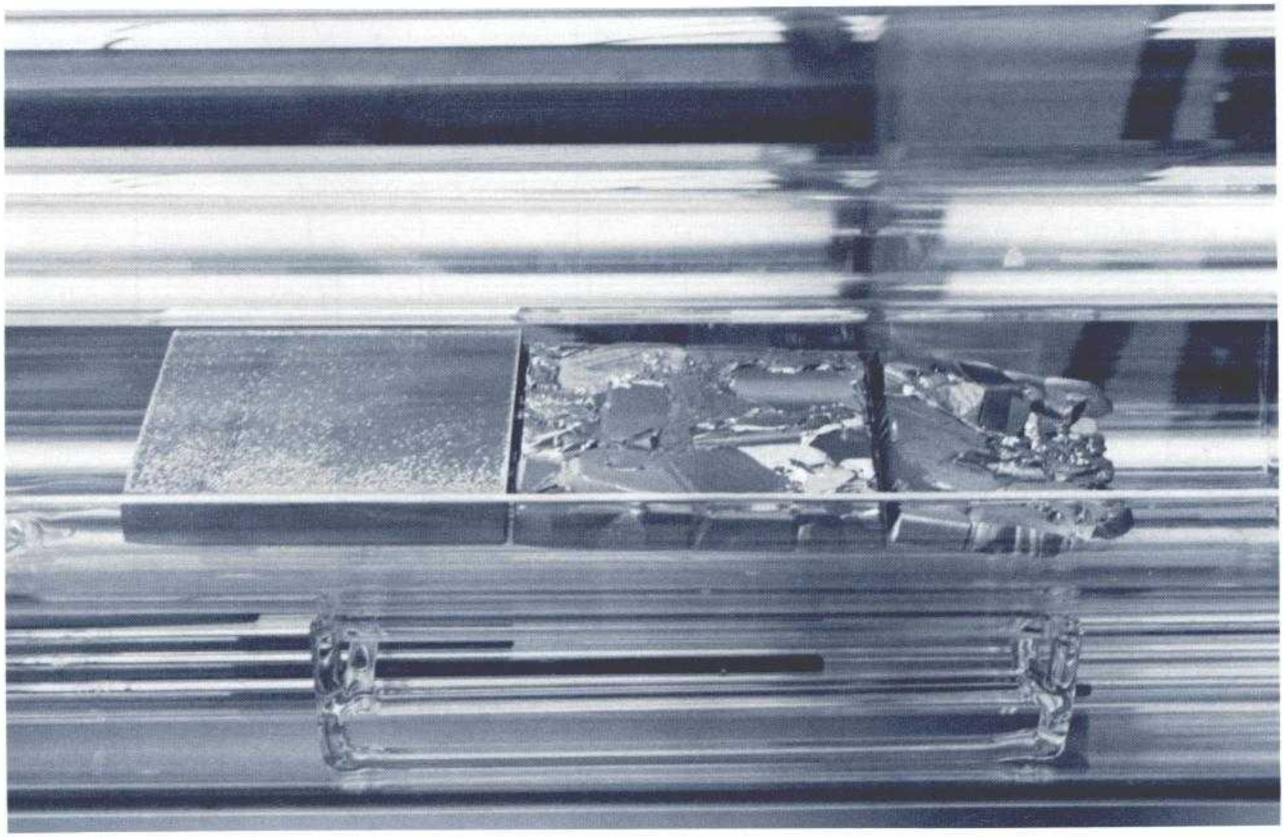


Figure 10. *Solid GaAs source material is seen through the quartz wall of the epitaxial reactor*

Ion Implant Semiconductor Technology

Fabrication of high-performance ion-implanted GaAs devices and integrated circuits requires good quality semi-insulating wafers into which the dopant is implanted. The characteristics of the active layer formed are directly related to the properties of the substrate material. An ongoing R&D effort to characterize GaAs material and qualify ingots for device fabrication has resulted in the establishment of an ion implant process that simulates many process steps used in circuit fabrication. A correlation between wafer properties and implanted layer characteristics was established. A set of wafer specifications was developed and implemented in procurement and acceptance of wafers. Important parameters in the specifications include mobility $\geq$ 5,000 $cm^2V^{-1}s^{-1}$, resistivity range of $1 \times 10^7 \leq \rho_s \leq 4 \times 10^7$ Ω-cm, and defect density $< 5 \times 10^4$ cm^{-2}.

Characterization of ion implanted layers included measurements of parameters important in device design and performance such as ungated saturation current, I_{DSO}; resistivity, ρ_s; carrier mobility, μ_H; carrier profiles; and dopant activation, η. Table 1 summarizes data obtained on representative qualified ingots. Peak carrier concentrations measured from carrier profiles are listed in addition to values for the various parameters averaged over the sample wafers. Of particular significance in the table are the high carrier mobility, saturation current, and peak carrier concentrations, N_p, all of which compare very favorably with the upper limits achievable with the ion implant schedule used. The data indicate the acceptability of the starting material and confirmation of the material specifications. These results are used to provide device grade material and device design information for circuit fabrication and process monitoring.

In addition to the formation of active layers with good electrical transport properties, ion implantation offers the ability to tailor doping profiles important to device performance. A technique was successfully developed to adjust the position of maximum carrier concentration to coincide with the wafer surface by implanting through a silicon nitride layer. This technique provides an additional means to adjust and control device saturation current, I_{DSS}, and pinch-off

Table 1. *Summary of Ion-Implanted GaAs Ingot Characteristics*

Ingot No.	I_{DSO} (mA/mm)	ρ_s ($\Omega/\square$)	μ_H ($cm^2V^{-1}s^{-1}$)	η (T)	N_p (cm^{-3})
1370 Slice 50	720	462	4,162	76	3.5E17
1370 Slice 156	736	407	4,251	82	3.5E17
3206 Slice 67	810	379	4,345	85	8.8E17
3206 Slice 168	803	412	4,184	83	3.9E17
860 Slice 9	752	398	4,257	83	3.5E17
860 Slice 140	680	407	4,227	80	3.5E17
789 Slice 9	677	471	4,065	80	3.8E17
789 Slice 105	774	392	4,273	88	3.9E17
Average Over Several Wafers	742	416	4,220	82	3.7E17

voltage, V_P, in conjunction with conventional recess etching. A typical carrier profile demonstrating this technique for a 100-keV, 6 x 10^{12} $Si^{+}cm^{-2}$ implant schedule and 700-Å-thick silicon nitride film is shown in Figure 11. Two carrier profiles are shown, one implanted into bare GaAs and the other through the silicon nitride film. This technique has been incorporated into the fabrication process for LNA circuits.

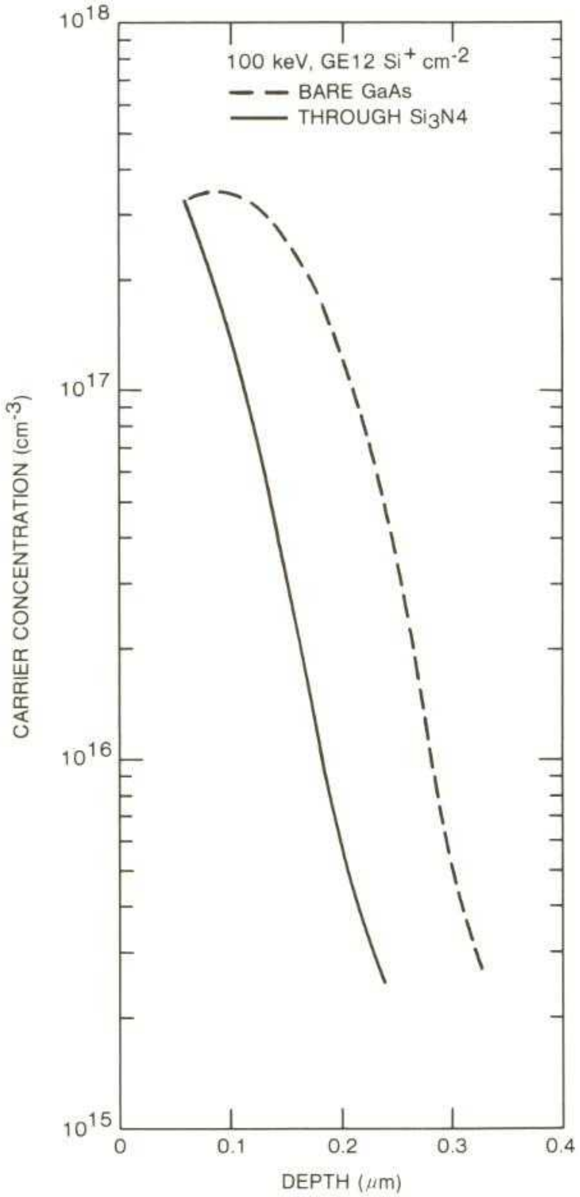
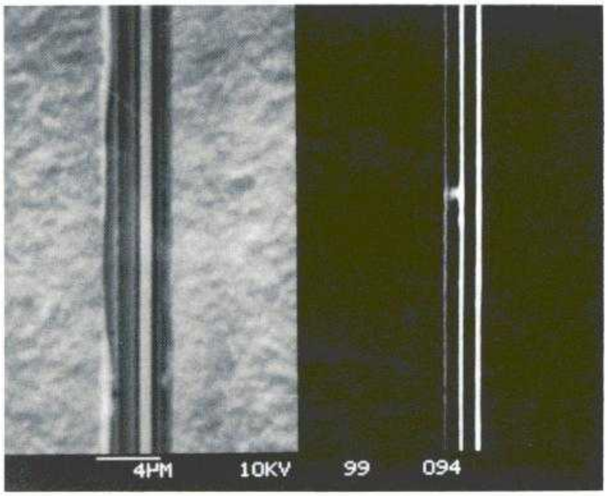


Figure 11. *Two-carrier profile shows the effect of implanting through a silicon nitride layer*



(a) (b)

Figure 12. *COMSAT-fabricated GaAs power FET operated near breakdown point*
(a) Secondary electron image
(b) Electron-beam-induced current image

Electron Microscopy Techniques

A variation of scanning electron microscopy implemented during previous research at COMSAT Laboratories has been applied to in-situ analysis of voltage breakdown phenomena in GaAs FETs. The technique is known as electron beam-induced conductivity (EBIC) imaging. As the finely focused electron beam of the SEM is scanned over a biased FET, the current resulting from carriers induced in the semiconductor is conducted out of the vacuum system via electrical feedthroughs, amplified, and displayed in real time on a cathode ray tube (CRT). By raising the bias voltage on the FET to the onset of breakdown, it is possible to observe and record the formation of microplasmas in the semiconductor gap between the electrodes of the FET, e.g., gate and drain. Once the sites of microplasmas are identified in the EBIC image, as shown in Figure 12, further details about materials and device structure can be measured by other microanalytical means such as secondary electron, backscattered electron, X-ray emission, and Auger electron spectroscopy. Fed back to the design and fabrication engineers, these data relating device performance and analytical results have led to fabrication of GaAs devices which exhibit stable operation at higher bias voltages.

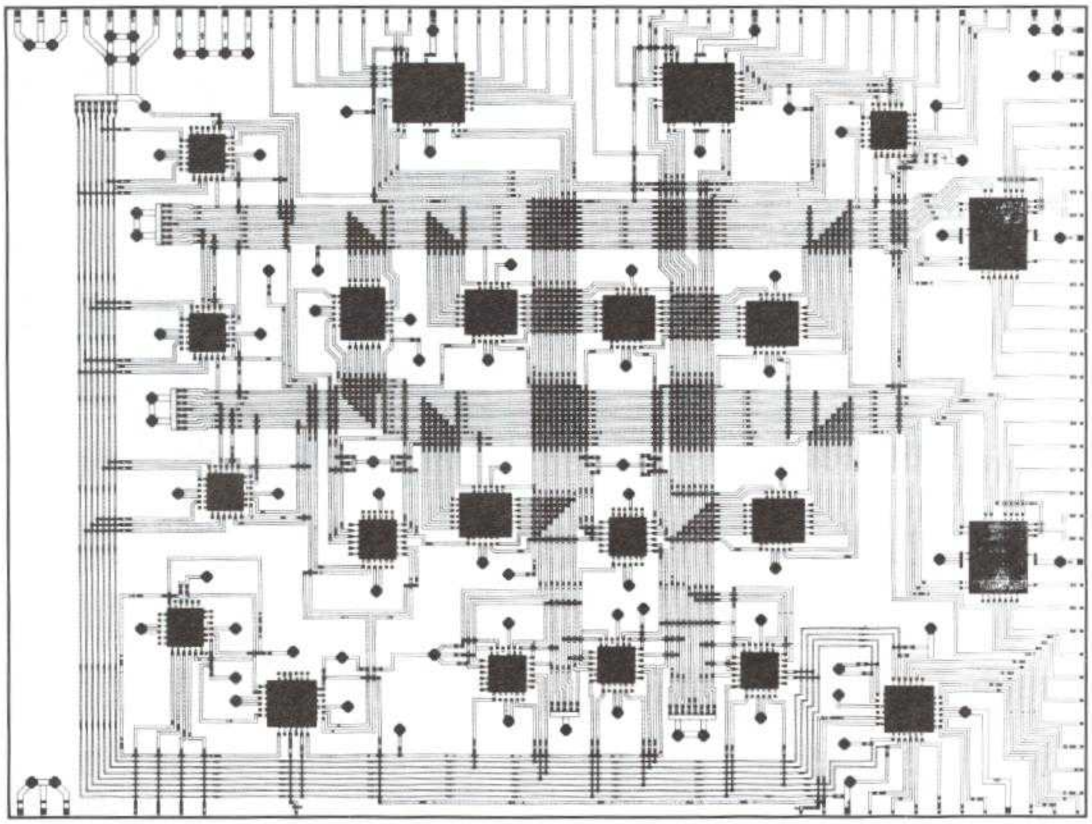


Figure 13. *Add, compare, select hybrid integrated circuit for 140-Mbit/s modem*

Computer-Aided Design

All of the masksets for the development of FET and MMIC technology for the Microelectronics and Microwave Technology Divisions were designed in-house. In particular, two masksets for five MMIC designs of 20- and 30-GHz power amplifiers and a combination of various types of switch and LNA circuits were completed for the Microwave Technology Division. The latter was particularly difficult as it contains several different size circuits on the same maskset.

A hybrid integrated circuit (HIC) has been designed for a coded octal phase-shift keying (COPSK) modem application of the Communication Techniques Division. The HIC is for the add, compare, select section of the modem and contains triple metal layer power and ground backplane, drilled and filled holes through ceramic substrate, and a double metal layer for signal interconnection on the top surface. This complex design was completed in record time with the masks fabricated and delivered prior to substrate delivery.

Figure 13 shows the front side metallization interconnections and the location of the emitter-coupled logic (ECL) chips to be bonded at assembly.

Non-Jurisdictional

Computer-Aided Device Modeling

A collection of computer programs has been developed to create a device modeling system designed to be user friendly, and flexible enough to accommodate the present and future needs of the MED. The system is invoked by running the master program named MODELSYS. The user supplies to MODELSYS the name of a specific model program (SMP), which may also call on other programs in the system. Interaction with the user is mainly through menus.

MAKEAFET is a particularly useful SMP because it is designed to predict the effects on performance of any changes in maskset design, materials parameters, and process parameters. Thus, it can be used for troubleshooting, for process optimization, and for device design purposes. To enhance its usefulness for these purposes, and to help to verify the accuracy of the modeling, input parameters and computed performance parameters have been chosen to correspond to characterization measurements which can be made in the laboratory.

During initialization, MAKEAFET allows the user to specify three program names. It then executes these as part of the initialization process. One provides the basic material constants of the semiconductor. Another defines a particular device design which will typically correspond to a FET made using a particular maskset. The third program allows the user to specify a carrier profile. This is a very important, measurable material characteristic which can be established through controlled epitaxial growth or ion implantation and activation.

Figure 14 shows the User Option Table from MAKEAFET. Option 1 allows the carrier profile to be respecified without reinitializing the device design or semiconductor constants. Option 2 is for specification of materials parameters, and options 3 and 4 are for specification of geometric parameters. The gate recess depth is a particularly important geometric parameter which depends on the fabrication process. Option 5 allows the user to specify a set of gate recess depths, and then computes important DC and RF performance parameters for each depth. The remaining options shown are still under development.

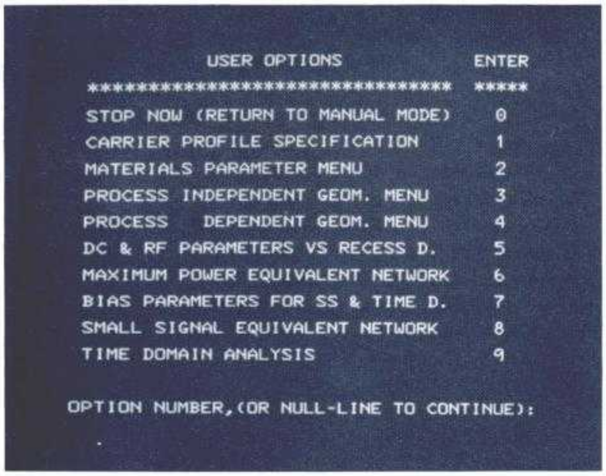


Figure 14. *MAKEAFET's User Option Menu facilitates device modeling*

COMSAT SUPPORT

Jurisdictional — INTELSAT Related

Space Communications Division

High-Energy Particle Tracks in Semiconductors

Damage from individual energetic ions has been observed in shallow junction solar cells at COMSAT Laboratories. Such damage had been considered impossible in semiconductors even though it is common in dielectrics. Cosmic rays constantly hit satellites in space; the damage track resulting from a single such collision with an integrated circuit could cause device failure and lead to loss of spacecraft performance.

Using a technique to triple the effective voltage of the MED 300-keV ion implant machine, the MED has accelerated triply ionized phosphorus to 810 keV and implanted these ions into 1-Ω-cm n/p silicon solar cells. The degradation of cell electrical characteristics was much greater than that expected from normal damage mechanisms. The electrical degradation was so great that observable damage from an individual ion was conjectured.

The COMSAT SEM, in the EBIC mode, was used to examine the implanted solar cells. Careful adjustment of the electron beam amplifiers collecting the induced current from the solar cell revealed dark spots in the induced current image (Figure 15) where ion damage

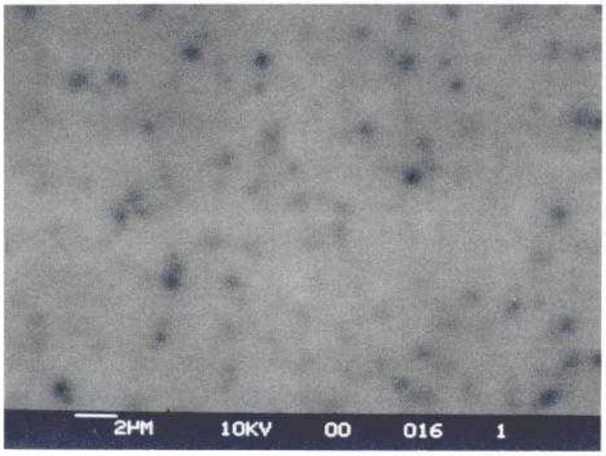


Figure 15. *Electron-beam-induced current usage of silicon solar cell shows damage from 800-keV implanted ions*

had reduced the number of carriers available for collection. The dark spots were as numerous as the implanted ions and did not appear in unimplanted samples. Surface studies using secondary electron emission showed that the dark spots were not the result of surface contamination.

The heavy damage from energetic ions (minority-carrier capture cross sections $> 0.5\ \mu m^2$) was thus confirmed by the SEM results, which also confirmed the theoretical prediction that damage would be much less in 0.1-Ω-cm material. However, a second damage mechanism observed electrically in these lower resistivity cells has not yet been seen in the SEM. Since this research impacts the reliability of future integrated circuits in space, further studies are being carried out to better define the nature and extent of this damage mechanism in silicon and to determine if it also occurs in GaAs.

Low-Temperature Radiation Hard Oxides

COMSAT Laboratories has developed a process for radiation hardening silicon dioxide films deposited at low temperatures (350°C). High-quality, radiation-resistant films are produced by etching the silicon surface prior to oxide deposition, by adding a dopant gas during deposition, and by an anneal step of 500°C after deposition. Experiments show dramatic reduction in voltage shift after radiation of COMSAT deposited oxide compared to that of typical non-radiation-hard oxides.

Oxide layers are used in most present silicon integrated circuits [not just in metal oxide semiconductor (MOS) devices]. These oxides are necessary for many of the structures being fabricated and for improved electrical characteristics. However, oxides are sensitive to radiation damage and therefore many such devices are inappropriate for space radiation environments. Oxides can be hardened by special techniques which normally require high-temperature (>1,000°C) processes. Unfortunately for spacecraft designers, these processes are not utilized for commercial devices because of the higher cost and production changes required.

The COMSAT low-temperature, radiation-hardened oxide should appeal to manufacturers as a low-cost, process-compatible development. For most purposes, the dramatically decreased radiation sensitivity would be a relatively small advantage. However, if this oxide is incorporated into commercial devices, future spacecraft designs will be able to take advantage of the variety and low cost of devices produced for a much larger market.

Further development of these low-temperature oxides in 1986 will broaden their application and better define the required process parameters. Reliability tests beyond radiation sensitivity will also be conducted.

Evaluation of Improved Radiation Shield

An engineering test on several types of semiconductor devices in several different radiation environments has demonstrated the effectiveness of a COMSAT-developed radiation shield. For devices that are very sensitive to radiation, the multimetal shield provides much better protection than presently available shields. With only a 20-percent increase in shield mass, an order-of-magnitude reduction in radiation dose has been confirmed in a space-like environment. The new shield permits the use of many commercial integrated circuits that would otherwise be unable to survive a 10-year mission in geosynchronous orbit.

Power Amplifier Development

There is an ever increasing need for K-band and millimeter-wave power amplifiers. With the 0.5-μm and 0.3-μm gate length technology within the MED, high-frequency power amplifiers were designed using both MIC and MMIC fabrication. Two MMIC power amplifiers were designed at 20 GHz (Figure 16) and 30 GHz for a variety of millimeter-wave applications.

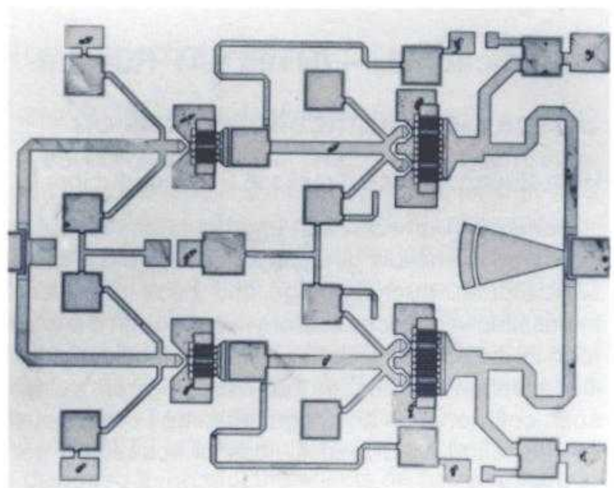


Figure 16. *20- and 30-GHz MMIC power amplifiers are fabricated on 100-micron-thick GaAs*

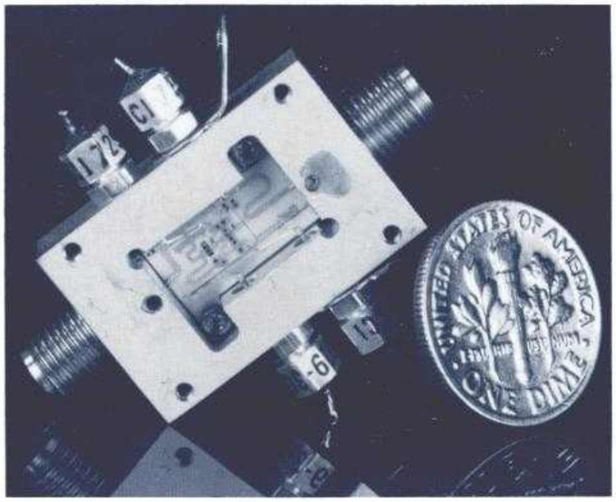


Figure 17. Proof-of-concept, C-band, feedback amplifier uses MMAC technology

These two circuits, which are being fabricated on 100-micron-thick GaAs, will achieve output power levels of 1 W at 20 GHz and 0.5 W at 30 GHz with a gain of 11 dB and 4 dB, respectively.

New circuit concepts can improve efficiency and linearity in power amplifiers. A proof-of-concept feedback amplifier is being fabricated at C-band using MMAC technology (Figure 17). This new design can improve the third-order intermodulation distortion by as much as 9 dB, which can greatly enhance the communication quality in applications requiring maximum output power for minimum possible hardware weight.

Class-B amplifiers can yield improved power-added efficiency. Computer modeling has been used to optimize GaAs FETs for Class-B operation. FETs fabricated according to the optimum parameters given by the model have in fact shown 29-percent power-added efficiency when operated Class-AB at 20 GHz. Further work is planned in this area.

Non-Jurisdictional Communications Services Division

Low-Noise Power FET Evaluation

In support of COMSAT General, commercial semiconductor devices (low-noise and medium power GaAs FETs) being considered for use in the Satellite Business Systems flight hardware program were subjected to DC and RF evaluation. Since the FETs were of a new design and were still undergoing space qualification, COMSAT Laboratories provided testing, analysis, and recommendations on the use of these devices.

COMSAT Technology Products, Inc.

MMAC Process Development

MMAC circuits allow high-quality microwave circuits, such as those shown in Figure 18, to be produced at low cost because all passive circuit elements, such as resistors, capacitors, and inductors, are deposited on ceramic substrates using photolithographic techniques, eliminating a large part of the assembly cost. The process development for Amplica has involved metal-insulator-metal (MIM) capacitor and via-hole interconnection technology. The plasma-enhanced chemical vapor-deposited (PECVD) silicon nitride has produced high Q-value dielectric with capacitance ranging from 100 to 500 pF/mm^2.

Product Development

As shown in Figure 18, several key microwave components were developed by COMSAT Laboratories for Amplica. New circuit concepts are being made possible by recently developed fabrication techniques which offer circuit designers new capabilities. A very broadband 2- to 18-GHz amplifier with a flat 6-dB gain, along with a 2-stage, 6- to 18-GHz amplifier with 8-dB gain, was developed in 1985 for Amplica. Three of these modules have been cascaded to make a 24-dB amplifier. These amplifier circuits have extremely compact dimensions (140 mils x 140 mils) and use very low-cost FETs. MMAC technology was applied to the fabrication of a 6- to 18-GHz Lange coupler, which considerably reduces the assembly time for balanced amplifiers, since the MMAC air bridges on the coupler eliminate the need for bond wires.

Other broadband components are being developed, including a 0.5-W, 12- to 18-GHz power amplifier, and a 2- to 18-GHz power amplifier. These prototype amplifiers and those to be delivered in 1986 will help to accelerate Amplica's new product development program.

Failure Analysis of Ceramic Chip Capacitors

The failure analysis expertise of the MED is available to all Corporate divisions. As an example, a failure analysis of ceramic chip capacitors used in MIC assembly was performed for Amplica. One lot of

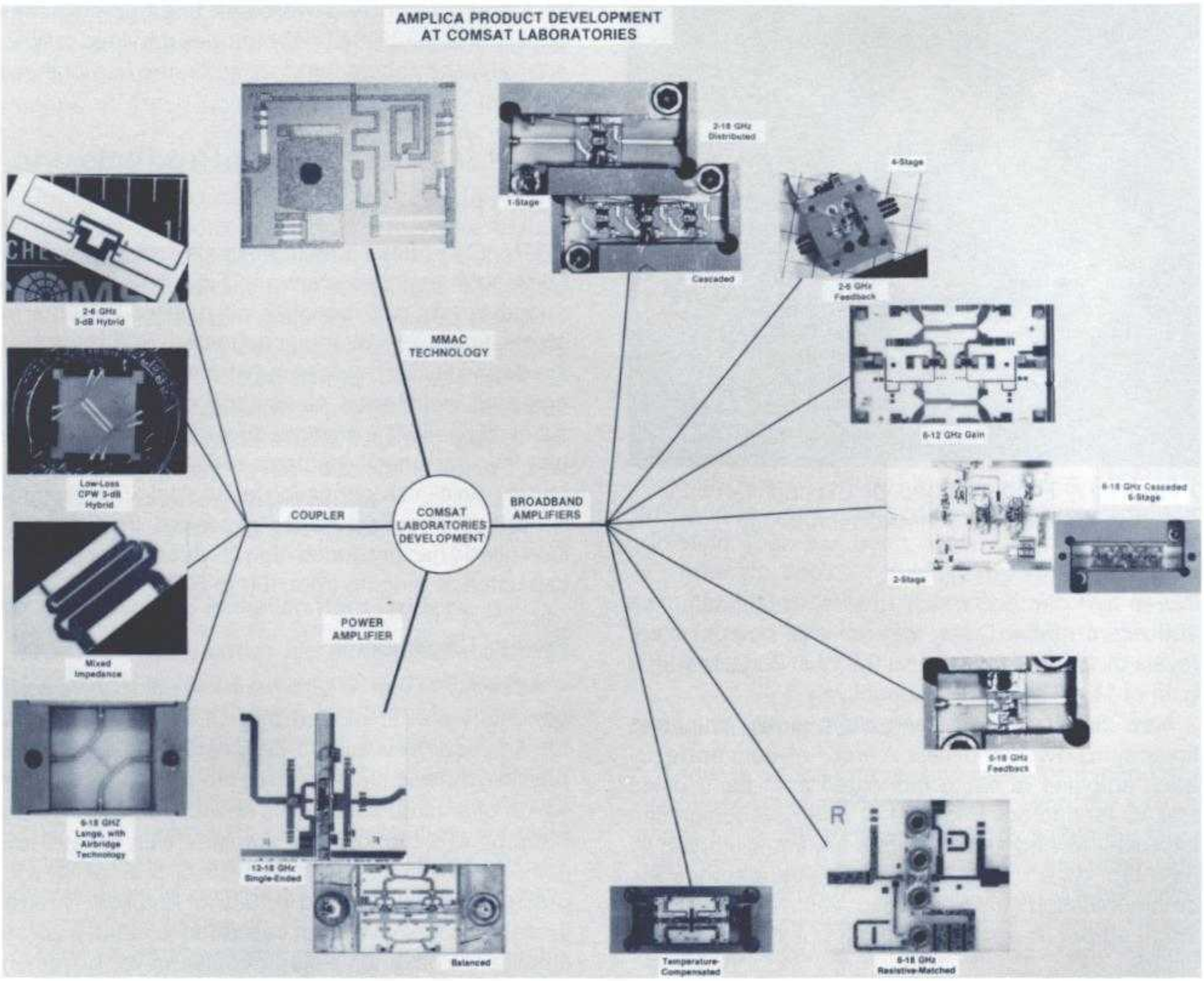


Figure 18. *Several key microwave components developed at COMSAT Laboratories for Amplica*

0.1-μF capacitors, each purchased part less than 2.5 mm in size, failed quality control inspection due to minute surface cracks 5 μm wide (see Figures 19a and 19b). Analysis of the problem by cross-sectional backscattered electron microscopy (Figure 19c) indicated that the cracks occurred during manufacturing (a vendor problem), when the ceramic/metal sandwich, while in a soft or "green" state, was coined by a punch and die. This pressure caused the outer ceramic layer to bend and fracture. Later hardening of the ceramic layer in a high-temperature operation arrested the propagation of the crack at the depth of the first electrode layer. However, MIL standards used for critical parts selection reject ceramic chip capacitors if any internal electrodes are exposed by penetrating cracks or voids. In this case, replacement parts were ordered.

INTELSAT

Special Contracts

Power FET Evaluation

C-band power FETs developed with different doping profiles by another manufacturer were subjected to RF and DC performance testing for INTELSAT under Contract INTEL-485. COMSAT conducted load-pull characterization, output power, and gain and efficiency performance testing. The FETs were divided into three categories by doping profile: flat, $1/x^3$, and spiked profile. COMSAT provided analysis of the RF performance as a function of these different processing parameters.

System Comparison of SSPA and TWTA

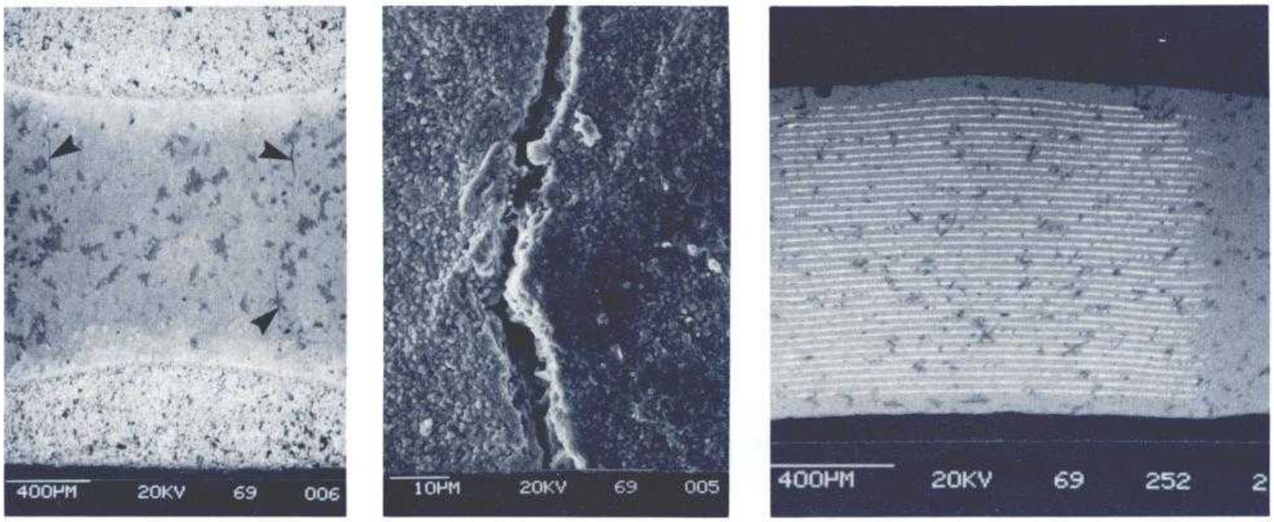
Under contract INTEL-485, a 10-W C-band SSPA was unit-level tested and then measured at the system level in cooperation with the Communications Techniques Division using the INTELSAT V simulator. The unit level RF performance data were obtained using the MED AMPAC measurement system. Nonlinear parameters, such as third-order intermodulation products, power-added efficiency, and AM-to-PM transfer, were evaluated.

System level tests included noise power ratio, modulation transfer, and companded single-sideband (CSSB) carrier intermodulation measurements. An INTELSAT V simulator transponder was configured with a traveling wave tube amplifier (TWTA) and characterized. Then the TWTA was replaced by the solid-state power amplifier (SSPA) and system performance compared. The noise power ratio results showed that the SSPA clearly provides more linearity than the TWTA. The modulation transfer measurements indicate that the SSPA can achieve equivalent bit error rate results with approximately 1.1 dB lower E_b/N_o than the TWTA. This implies that an 8-W SSPA has the equivalent communications capacity of a 10-W TWTA. The CSSB measurements show that the SSPA should provide additional channel capacity over the TWTA.

Support

Metallurgical Analysis of Ni/H$_2$ Battery Cases

During 1985, current leakage between the electrode stack and the case, resulting in cell discharge, was noted in the in-orbit performance of the INTELSAT V nickel-hydrogen batteries. In collaboration with the Spacecraft Technology Division, electrochemists and corrosion specialists at the National Bureau of Standards and materials scientists in the MED assisted in defining the failure mechanism. It was determined that unexpected cathodic corrosion of the Inconel battery case with localized dissolution and cratering of the thin metal wall had occurred.



(a) Macrophotograph: arrows show surface cracks

(b) Closeup of a 0.002-inch crack

(c) Cross section of (a) indicates that the cracks extend through the surface defect to the first metal electrode

Figure 19. *Failure analysis of 0.1-µF ceramic chip capacitor reveals manufacturing problem*

(a) Ductile (high-strength) failure resembles pulled taffy (350X)

(b) Brittle (low-strength) failure has granular appearance (350X)

Figure 20. *SEM images of the fracture surface of Inconel alloy 718 following corrosion studies of Ni/H_2 battery cases define failure mechanism*

In order to assess the potential impact of this new failure mode on spacecraft battery life, a set of experiments was devised involving a controlled exposure of the Inconel metal to chemical and electrical parameters simulating actual battery life conditions, followed by tensile tests and analyses for evidence of chemical attack that might weaken the battery case. Microscopic examination of the fracture surfaces of the experimental pull test samples identified the major failure mode as ductile fracture commensurate with high tensile strength, as shown in Figure 20a. Figure 20b shows a minor failure mode of brittle fracture associated with low tensile strength, which was limited to the surface region. As a result of this effort, revised battery management procedures were implemented on the satellites with the expectation that the batteries will now serve their original expected lifetime.

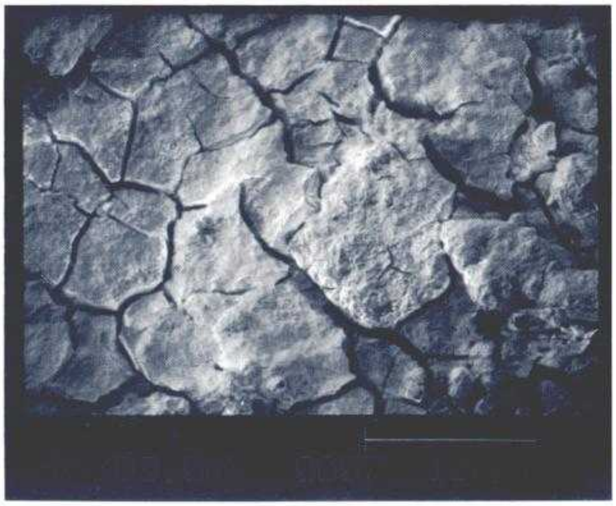
Failure Analysis of Ni/H_2 Positive Electrodes

In 1985 another INTELSAT battery materials problem was addressed, this one associated with INTELSAT VI. After a long period of storage, some of the positive Ni/H_2 battery plates developed green spots composed of an unknown, amorphous material. A combination of chemical analytical tests performed by the MED showed that the green material, which had the morphology of cracked mud (Figure 21a), consisted of an unusual form of nickel-oxy-hydroxide having a higher oxide state than nickel hydroxide, a normal constituent of the positive plate. The oxide states of the hydroxides were analytically determined by using X-ray-excited electron spectroscopy to measure the binding energies of the molecular components at various places on the plate surface.

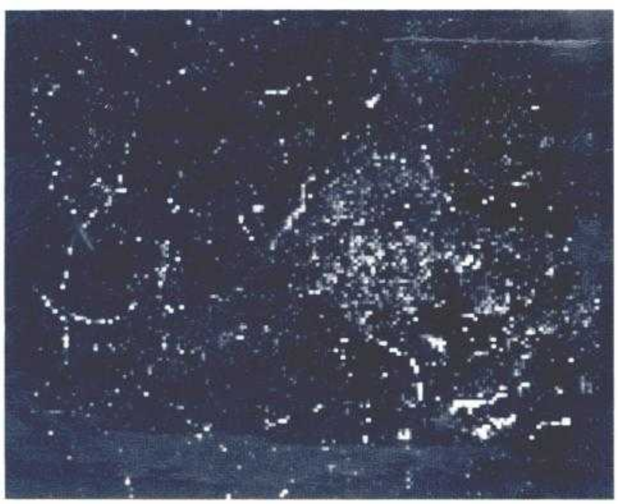
Further clues to the cause of the high nickel oxide state were revealed by Auger electron spectroscopy which indicated that there was a chloride contaminant concentrated in the microfissures of the green material (Figure 21b) and at the plate surface beneath the superficial green deposit. Under the contamination spots, corrosion of the positive plate was also documented. INTELSAT and the battery plate subcontractor have subsequently been apprised of the nature and potential consequences of the chloride contaminant problem and they are taking action to ensure that the life and performance of future INTELSAT VI batteries are not jeopardized by the effects of positive plate contamination.

INTELSAT VI Flight Hardware Evaluation

The MED's Automated Microwave Power Amplification Characterization (AMPAC) system, shown in



(a) Secondary electron image showing cracked mud appearance of green material



(b) Corresponding Auger electron map of chlorine

Figure 21. *Secondary electron image and Auger analysis reveal chlorine in the microfissures of the green material on INTELSAT VI positive Ni/H_2 battery plate*

Figure 22, consists of automated test equipment for the characterization of microwave power amplifiers and measurement control software developed at COMSAT Laboratories. In support of INTELSAT VI flight hardware development and manufacture, the AMPAC system was used to perform RF testing of INTELSAT VI SSPAs, TWTAs, and receivers. Equipment destined for the INTELSAT VI spacecraft simulation was unit-level tested for adherence to INTELSAT performance specifications. Measurements such as power, phase shift, efficiency, voltage standing wave ratio, noise power ratio, AM/PM transfer, and intermodulation products were performed. Thermally sensitive parameters such as noise figure and gain slope were obtained through temperature cycle testing. All measured data and graphics are well documented in computer files.

Reliability Analysis of INTELSAT VI Solder Joint

The long-term reliability of a miniature electrical feedthrough for INTELSAT VI spacecraft became problematical with the discovery of the potential for formation of brittle intermetallic compounds of gold and tin in the solder joint. The MED electron probe microanalyzer was used to quantitatively analyze micron sized regions of the suspect solder joint following metallographic preparation of a cross section of the part. In the fillet on the feedthrough pin, three gold-tin (AuSn) compounds were identified by the microanalysis: AuSn, $AuSn_2$ and $AuSn_4$. The quantities and distribution of the compounds were determined along the solder/pin interface, but only at the fillet were there any measurable amounts of intermetallic compounds. From these data it was concluded that, although in general it is poor practice to solder a gold-plated pin without pretinning, in this case there was an ample

Figure 22. *COMSAT Laboratories AMPAC system used for characterization of microwave power amplifiers and measurement control software*

amount of solder to completely react with the thin gold layer and, further, that there is negligible chance of any additional formation of intermetallic compounds during the future life of the component.

Failure Analysis of INTELSAT VI Thrusters

INTELSAT VI spacecraft are being equipped with bipropellant thrusters which will use hydrazine fuel and nitrous oxide oxidizer. All previous INTELSAT satellites have used only monopropellant hydrazine thrusters. During hot-fire qualification tests of the INTELSAT VI thrusters by the subcontractor, some anomalies were detected which were potentially detrimental to the integrity and reliability of the thrusters. The major concern was the increased oxidizer pressure across the oxidizer orifices. In a few cases, there was burnout of the weld joint used to secure the titanium insert into the columbium faceplate. To help resolve the problem, COMSAT assembled a team from the El Segundo office, the Spacecraft Technology Division, and the MED, which assisted Hughes Aerospace Corp. and the subcontractor in analyzing the thruster design, materials choice, and weld schedules.

Thermal and stress analyses were performed and the parameters were defined which caused corrosion and oxidation of columbium and deposits of foreign material in the oxidizer orifices. The subcontractor instituted revised weld and machining schedules for the faceplate which improved its integrity, resistance to corrosion, and thermal control. Hot-fire qualification tests with the improved design have demonstrated the success of the effort.

OTHER

Opto-Electronic Device Fabrication

Under Contract MDA904-86-M-6264 MPO to the Maryland Procurement Office of the Department of Defense, the MED has fabricated and delivered GaAs/AlGaAs solid-state laser diodes. These were made using MBE wafers furnished by the Government.

GaAs FET Chips Supplied for Evaluation

COMSAT has begun to supply a number of GaAs FET chips to potential customers for evaluation to explore the possibility of joint bidding with the established system houses on Department of Defense programs. Both X-band MMIC LNAs and power FETs have been supplied to Westinghouse, and 20-GHz power FET modules to TRW. The responses are quite positive. In fact, TRW has not only verified COMSAT's results at 20 GHz, but also in some cases claims to have seen better results on the same unit. This reflects COMSAT's conservative approach to quoting its results.

SPACECRAFT TECHNOLOGY DIVISION

INTRODUCTION

The Spacecraft Technology Division (STD) provides a broad range of engineering capabilities from controls, dynamics, and propulsion, to telemetry, tracking and command (TT&C), as well as structures, mechanisms, materials, thermal control, power systems, power electronics and solar energy storage, reliability and quality assurance, space environmental testing, and flight qualification. The division conducts R&D directed at improving satellite reliability, extending satellite lifetime, and advancing communications antenna technology. Activities include providing in-depth analysis and test support throughout COMSAT as well as under contract to INTELSAT and others.

Significant accomplishments for 1985 include R&D efforts in multibeam antenna technology, secure command systems, and momentum wheel bearing cage instability, as well as continued work on the hydrogen/nickel oxide (H_2/NiO) battery for the Department of Energy. The STD provided extensive support to both the INTELSAT VI satellite program at Hughes Aircraft and the Satellite Television Corporation satellite program at RCA. Members of the division staff carried out structural analyses and testing of the STARCOM 1.8-m antenna for COMSAT Technology Products, Inc., and completed a 600-cycle thermal vacuum test of a 220-W qualification model traveling wave tube amplifier (TWTA) for Hughes Electron Dynamics Division.

COMSAT R&D

Jurisdictional — INTELSAT Related

Spacecraft Reliability Studies

During 1985, a program directed toward improving reliability analysis techniques, developing standardized procedures for product assurance programs, and providing state-of-the-art information on parts and materials was continued. The reliability analysis techniques that were developed and implemented included a computerized MIL-HDBK-217 prediction program, a computerized block diagram plus reliability prediction curve programs, and a library of data for use in performing availability analyses. Product assurance procedures were updated and published to provide better and more cost-effective quality assurance, workmanship, and inspection requirements and programs. Data banks derived from participation in industry working groups and special tests were maintained and updated for parts radiation effects, materials properties, and parts application information.

Computerized Spacecraft Analysis

In 1984, the Computerized Spacecraft Analysis task was initiated to organize the computer software developed by the STD. A Software Library Program Catalog was produced, identifying some 76 programs used to design, analyze, evaluate, predict, and monitor spacecraft subsystems and components.

The Computerized Spacecraft Analysis task was continued in 1985 to improve the overall software capabilities of the STD. To take advantage of PATRAN-G, the capabilities of the major analysis programs were evaluated and enhanced where applicable through modification and conversion to a VAX 11/780 computer. PATRAN-G is an interactive, finite element preprocessor for creating geometric models for structural, dynamic, and thermal analyses and a postprocessor for graphically displaying the analytical results. Through this integration of programs, many labor-intensive methods were improved and made more efficient.

Several solar array and battery performance programs have been developed at COMSAT Laboratories which incorporate SPEAKEASY graphics. In addition, many industry standard computer programs such as NASTRAN, NBOD2, SINDA, TRASYS, DISCOS, and IGSPICE are in use. Some of these programs were enhanced with additional capabilities to meet specific requirements.

Through this effort an expensive software library was created as the focal point for computer program development, improvement, and maintenance.

TWT Quality Technology

During 1984, the life testing of space TWTAs was consolidated in a dedicated life-test area, and testing of six model 261H C-band TWTAs was brought under computer control. Two K_u-band TWTAs (with INTELSAT V-A TWTs, model TH 3559A) were mounted in a rack and equipped with sensors so that

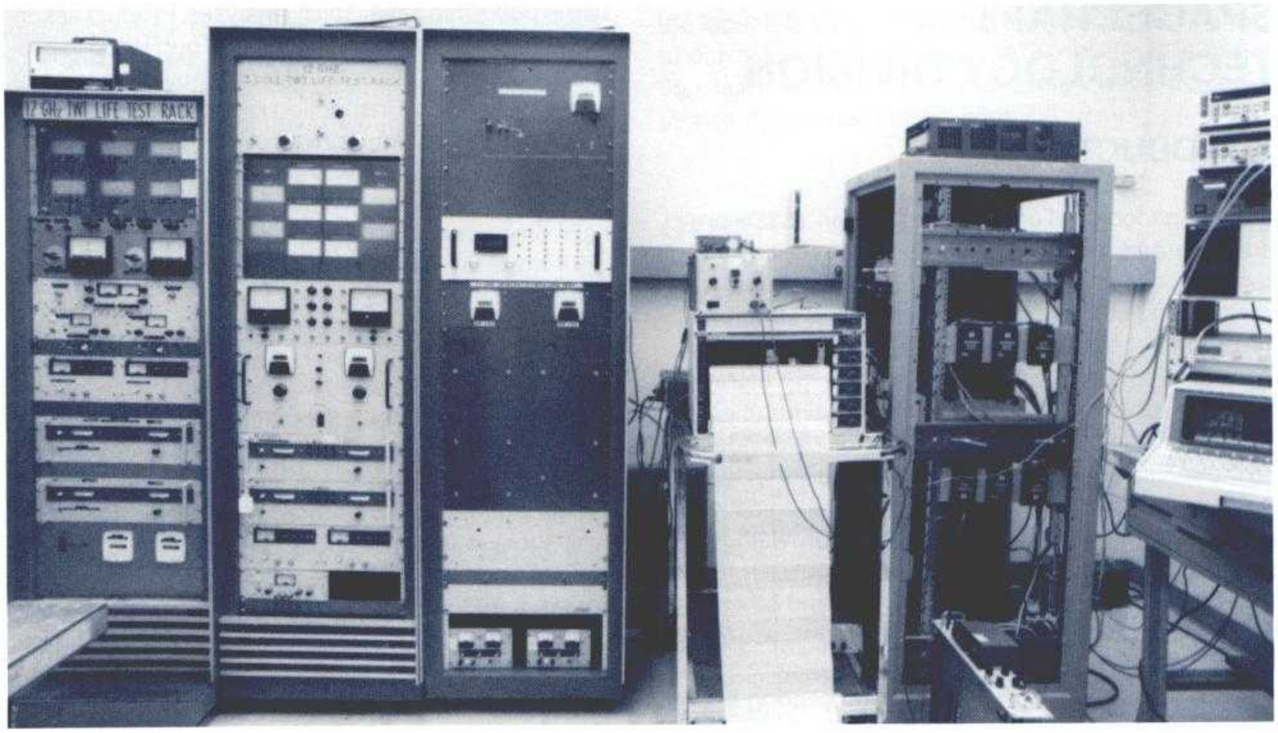


Figure 1. *TWT life-test facility operates under computer control*

measurements are made regularly under control of an HP87 computer, as shown in Figure 1.

In 1985, the C-band TWT life tests were interrupted to conduct a series of measurements on cathode activity. One of the TWTs appeared to be reaching end of life, with the cathode current starting to fall rapidly. After a series of measurements which involved varying the cathode temperature over a considerable range, the cathode current revived and the TWT is still operating adequately.

The two K_u-band TWTs are of interest since the cathodes are operated at an intermediate temperature between the value originally set for INTELSAT V operation and that determined for spacecraft F-13 through F-15. The anode voltage, which is automatically adjusted by the electronic power conditioner to maintain constant cathode current, is an excellent measure of the cathode state. In SN18 the voltage had been increasing at a rate twice that budgeted for the first 10,000 hours, which did not bode well for a 7-year life. However, at 16,000 hours, the rate of increase showed signs of leveling. Measurements such as these were useful in responding to the Ford Aerospace proposed modifications to INTELSAT V-A, which would have involved sacrificing some of the TWT redundancy to allow parallel operation of TWTs in certain channels.

Power Conditioner for Solid-State Power Amplifier

During 1984, an engineering model of a lightweight power conditioner for a 10-W RF solid-state power amplifier (SSPA) was completed. A follow-on project was initiated to investigate converter concepts utilizing very high switching frequencies to reduce power conditioner size and weight, an advantage for distributed systems which may be used in multibeam antennas. Breadboards were designed and constructed for "Class E" and "resonant buck" units operating at greater than 1 MHz. Unit efficiencies exceeded 70 percent while power density is projected to exceed 120 W/kg for a 6-W output converter for a 2-W RF output SSPA.

In addition, circuitry was designed which allows gallium arsenide (GaAs) monolithic microwave integrated circuits (MMICs) to be controlled by external transistor-transistor logic (TTL) compatible signals. This circuitry will be integrated with the microwave circuitry.

Multibeam Antenna

As part of the multibeam antenna project, the STD developed thermal and mechanical design concepts for the K_U-band satellite multibeam antenna being designed by the Microwave Technology Division for use with SSPAs. Thermal control of the multibeam antenna is critical because the SSPAs are located in the waveguide directly behind the closely packed feed horns, resulting in a high concentration of heat. The SSPA is mounted directly to a heat pipe which carries the dissipated heat to a remote thermal radiator for rejection to space, providing a mechanical solution to the problem as well as permitting removal of any element in the array without disassembling the entire feed system. In 1985, mechanical and thermal analyses were performed which analytically demonstrated the feasibility of this design, as shown in Figure 2. Heat pipe performance was measured using a heat pipe with a similar construction to that proposed for the multibeam antenna configuration. In addition, electrical power requirements were integrated into the overall design and the design and development of the digital controller was continued.

Secure Command System

In conjunction with the Communications Techniques Division, the STD performed an in-depth study of secure command systems. This study emphasized the use of various types of spread-spectrum techniques to ensure the ability to command spacecraft in the presence of significant jamming and the need for encryption to effectively counteract undesired commanding. Levels of threat, system issues, and evaluation criteria were established. Alternative systems were analyzed and compared and a hardware development program was defined which is keyed to the use of an existing demonstration model of a satellite-encrypted command system designed, developed, and tested by the STD. This system, based on a hybrid of the one-time pad and the Data Encryption Standard cipher systems method, consists of a microcomputer-based command generator/encrypter and a satellite decrypter implemented with complementary metal oxide semiconductor (CMOS) and bipolar logic integrated circuits. This general purpose data encryption system was designed to be radiation tolerant, to operate at high speed, and to consume low power.

Momentum Wheel Bearing Cage Instability

Life expectancy and reliability of bearings in rotating devices carried aboard spacecraft have long been major concerns of satellite system program managers. During 1985, design studies of momentum wheel ball bearing cages were conducted to identify factors critical to stable cage design and to determine how to optimize those factors to yield the most stable

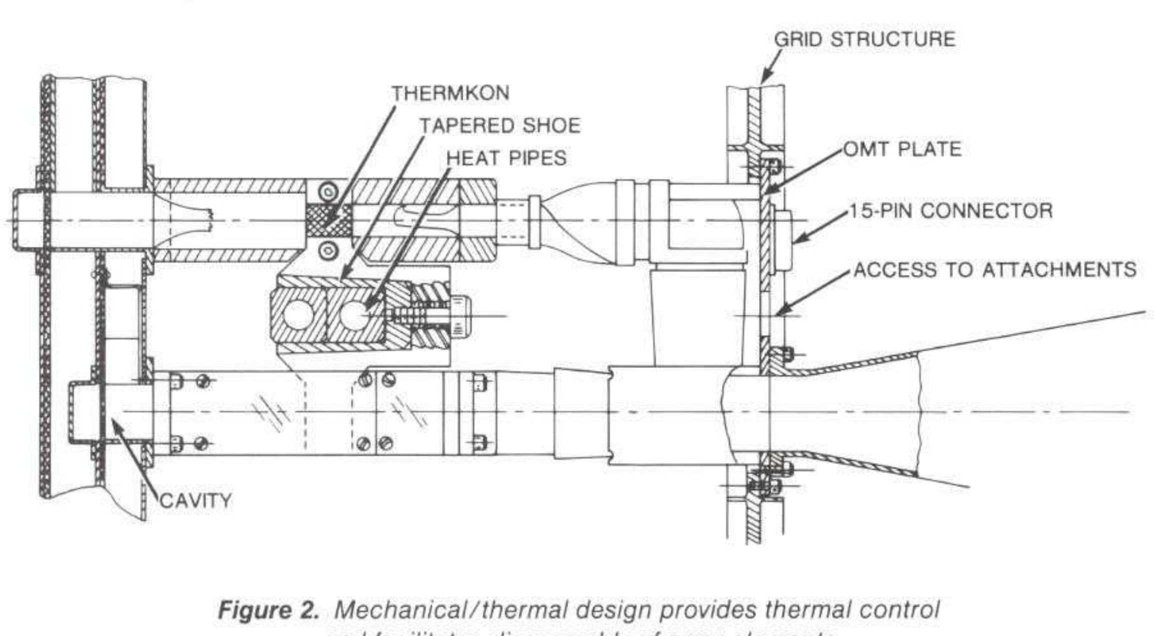


Figure 2. *Mechanical/thermal design provides thermal control and facilitates disassembly of array elements*

cages for the typical momentum wheel environment. Variables in this study included lubricant properties, temperature, number of balls, cage geometry, cage guidance, and cage balance. The computer program ADORE (Advanced Dynamics of Rolling Elements) was used to simulate the dynamic performance of the various cage designs and operating conditions. The design selected for experimentation was an 11-ball cage with small pocket and cage-to-race clearances and a slight mass offset or imbalance. Five different cages were machined in preparation for the experimental evaluation in early 1986.

Non-Jurisdictional

Sealed H_2/NiO Battery Development

COMSAT Laboratories is cost-sharing a development program with the Department of Energy for the design and development of the H_2/NiO battery under contract with Sandia National Laboratories. The objectives are to design and develop an H_2/NiO battery which is cost competitive with an advanced lead-acid battery for deep discharge, 20-year-life terrestrial energy storage applications.

COMSAT Laboratories conceived a new design approach to meet these objectives and engaged Johnson Controls, Inc. (JCI) as subcontractor for the design and development activity, utilizing JCI's expertise in large-scale battery manufacturing. Under the contract, COMSAT and JCI jointly designed and developed a sealed, 100-Ah, 6-V H_2/NiO battery for deep discharge, terrestrial application with a life expectancy of 20 years. Studies show that this H_2/NiO system can become cost competitive with advanced lead-acid batteries.

COMSAT SUPPORT

Space Communications Division

MARITIME SERVICES SUPPORT

The STD provided a team of specialists to review progress on the INMARSAT second-generation satellite program, as well as to assess the lifetimes of the first generation satellites currently being employed in the system. The division also assisted in the review of INMARSAT IIA spot beam antenna proposals as well as alternatives suggested by COMSAT Laboratories.

COMSAT TECHNICAL SERVICES

The STD provided support to the COMSAT Technical Services/Satellite Business Systems program office in El Segundo, California, where a new satellite is being developed by the Hughes Aircraft Co. An independent evaluation of the proposed satellite deployment scheme for shuttle launches revealed design risks which could be deleterious to the success of the program. Satellite Business Systems conveyed those spacecraft design concerns to the Hughes program office. The STD also participated in the spacecraft system critical design review.

Communications Services Division

COMSAT GENERAL

INMARSAT II Traveling Wave Tube Monitoring

The second generation INMARSAT spacecraft has imposed challenging efficiency and linearity requirements upon the TWTs (which provide 26 W at C-band and 80 W at L-band) to be used as down-link transmitters. A saturation efficiency of over 50 percent is required, and this has already been achieved at C-band by the manufacturer, Hughes Electron Dynamics Division. Particularly critical is the L-band TWT, which is to be operated in a unique four-TWT configuration which demands particular stability and reliability.

The STD monitors TWT developments and conducts independent evaluations of test data to obtain superior TWTs for INMARSAT. In addition, monitoring the manufacturing process ensures the highest technical performance of the TWTs.

ITALSAT Dynamics Analysis

During 1984, a dynamics analysis was conducted to determine the stability and performance of the complex ITALSAT spacecraft. During 1985, follow-on work was performed for Selenia Spazio using the spacecraft dynamics simulation program developed for ITALSAT by COMSAT Laboratories in 1984. The spacecraft includes pointing control systems (PCSs) for two reflectors and a three-axis attitude control system (ACS). The novel ITALSAT design employs high-bandwidth, two-axis antenna pointing mechanisms and associated control electronics to point the large reflectors based on errors measured by integral RF sensors, thereby creating high potential for deleterious interactions between the PCS and the ACS.

Complex analytical models were developed for the ACS, PCS, and structural flexibility of the solar arrays and the reflector deployment mechanisms. Generic models of both momentum wheel and thruster modes of the ACS were also developed. Software modules programmed from these models were integrated with the Dynamic Interaction Simulation of Controls and Structure (DISCOS) computer program which executes on the VAX 11/780 computer. DISCOS was used as the central executive program for the software modules. Simulations include stationkeeping, mode transition, momentum unloading, attitude acquisition, wheel failure, and wheel redundancy.

Product Assurance

The STD provided support to COMSAT Technical Services for the ITALSAT spacecraft program. The division contributed to several significant product assurance program documents, including a product assurance plan, a parts control plan, a program authorized parts list, and a parts, materials, and processes requirements specification. Specific questions and information requests were answered relative to parts, reliability, and product assurance. A high-reliability parts engineering and testing facility in Portsmouth, U.K., was surveyed for use in the program.

German Direct Broadcast Satellite Reliability Analysis

Space segment reliability tradeoff analyses were performed for the Federal Republic of Germany Bundespost. Seven different combinations of transponder and satellite configurations were considered for use in the 12-GHz television satellite. Variables included number of operational channels, number of satellites, transponder redundancy, time between launches, and mission duration. Results were provided for both a perfect launch and a launch with 90-percent probability of success.

A number of computer programs were used for this work. Reliability models were generated for the various Markov-approach satellite transponder configurations and a FORTRAN reliability program calculated the probability of success for each of the seven configurations. A graphics program plotted these data against mission length.

SATELLITE TELEVISION CORPORATION

During 1985, the STD provided extensive engineering support to the COMSAT Technical Services program office, which has direct technical monitoring responsibility for the Satellite Television Corporation satellite program at RCA. Personnel provided on-site support for tests of major subsystems, including structures, thermal control, power, TT&C, and attitude determination and control (ADCS) subsystems. The following sections highlight some significant contributions.

Power Systems

To aid in direct broadcast satellite (DBS) spacecraft power subsystem testing, the STD designed and RCA produced electronic solar array simulators for both the housekeeping and transponder power subsystems. These simulators produce realistic operating conditions for the spacecraft power subsystem. Power subsystem regulation, impedance, stability margin, and thermal dissipation can be accurately verified without the solar array. Comparison testing with an illuminated solar array has verified the accuracy and usefulness of these simulators, which are also used during the testing of other subsystems to provide realistic power subsystem interfaces (see Figure 3).

Product Assurance

During 1985, implementation support continued for the DBS contractual product assurance program and the solution of parts, reliability, and quality assurance issues. This support was provided at RCA and its subcontractor's facilities as well as at COMSAT Laboratories.

COMSAT Laboratories personnel participated in the Parts, Materials, and Processes Control Board, including the review of the program authorized parts list, the program authorized materials and processes list, and parts and materials specifications, and the resolution of problems relative to failures, application, and availability. Product assurance support was also provided to the program in the form of quality audits, manufacturing readiness and design reviews, reliability prediction and analysis procedures, documentation, and test monitoring.

DBS Flight Simulator

In order to train DBS satellite control center operators and to deal with on-orbit control anomalies, an ADCS simulator was developed for the Satellite Television Corporation. This equipment is similar in most respects to ADCS simulators developed for the INTELSAT V and VI programs discussed in the

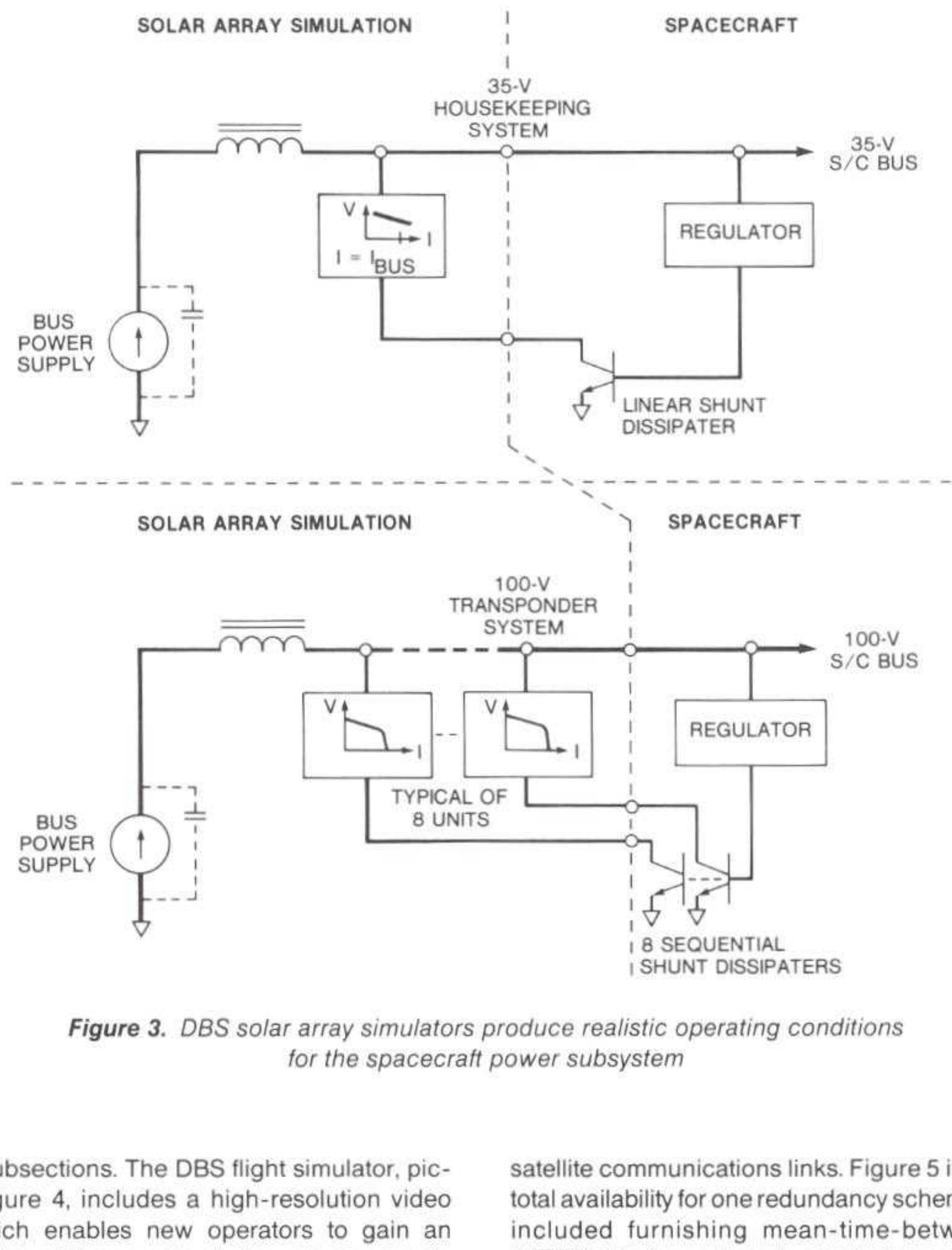


Figure 3. *DBS solar array simulators produce realistic operating conditions for the spacecraft power subsystem*

following subsections. The DBS flight simulator, pictured in Figure 4, includes a high-resolution video display which enables new operators to gain an understanding of the results of discrete commands more rapidly than has been possible in the past.

COMSAT INTERNATIONAL COMMUNICATIONS, INC.

Availability Analysis

Availability analyses were provided for various COMSAT International Communications, Inc. proposals for government and corporate earth stations and satellite communications links. Figure 5 illustrates the total availability for one redundancy scheme. The work included furnishing mean-time-between-failure (MTBF) data for earth station and microwave link functions and estimates of mean time to restore (MTTR). Tradeoff studies included calculation of system availability vs MTTR.

COMSAT Technology Products

Product Assurance for Amplica

In accordance with applicable contract requirements, reliability analyses were performed to support

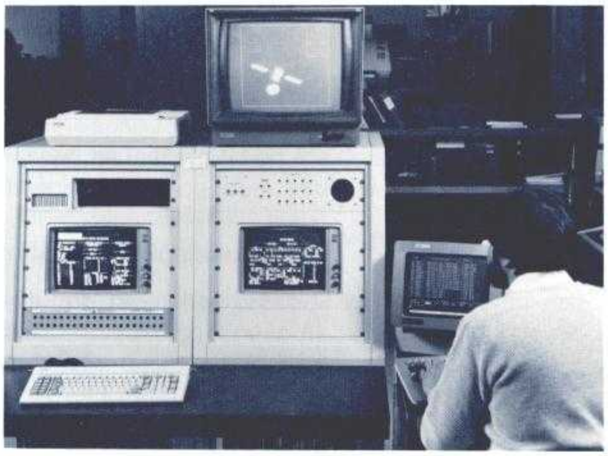


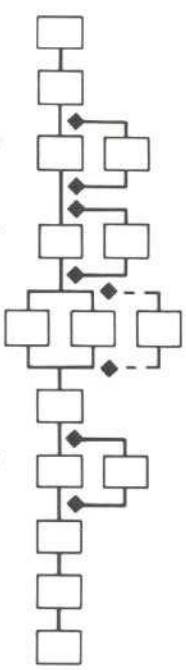
Figure 4. *DBS flight simulator featuring high-resolution video display*

Amplica equipment design and manufacture for military aircraft programs. The division also provided inspection and quality control of items being fabricated at COMSAT Laboratories for Amplica.

1.8-m Antenna Support for the Network Products Division

In response to a request from COMSAT Technology Products, Inc., the STD investigated the structural adequacy of the STARCOM antenna, a 1.8-m transmit and receive antenna system developed under a joint venture between COMSAT Technology Products and Reynolds Metal Company.

One evaluation unit and two production quality units were provided for RF and structural qualification. The RF performance was found to be excellent when tested on the rooftop range facility under low wind conditions. However, at moderate wind speeds of 25 to 35 mph, the system became dynamically unstable, with significant relative motion between the antenna primary components. Under these conditions, unacceptable motion occurred between the feed support structure and the antenna, along with excessive deflection of the primary support tube. The system had to be stiff enough to sustain both steady-state and gusty wind loads.



NO.	REDUNDANCY	ITEM	MTBF (hr)	MTTR (hr)	UNIT AVAILABILITY	FUNCTION AVAILABILITY
1	--	3-kW HPA	7,500	4	0.99946	0.99946
2	--	C-BAND UPCONVERTER	100,000	4	0.99996	0.99996
3	STANDBY	ORDERWIRE MODULATOR	50,000	4	0.99992	0.99996
4	STANDBY	WIDEBAND MODULATOR	50,000	4	0.99992	0.99996
5	6/7	15-kHz MODULATOR	50,000	4	0.99992	0.99999
6	--	C-BAND UP-CONVERTER	100,000	4	0.99996	0.99996
7	STANDBY	TV MODULATOR	50,000	4	0.99992	0.99996
8	--	FILTER/ EQUALIZER	500,000	4	0.99999	0.99999
9	--	AUDIO DISTRIBUTOR	100,000	4	0.99996	0.99996
10	--	VIDEO DISTRIBUTOR	100,000	4	0.99996	0.99996

TOTAL AVAILABILITY = 0.99917

Figure 5. *Availability analysis for standard B earth station shows system availability vs MTTR*

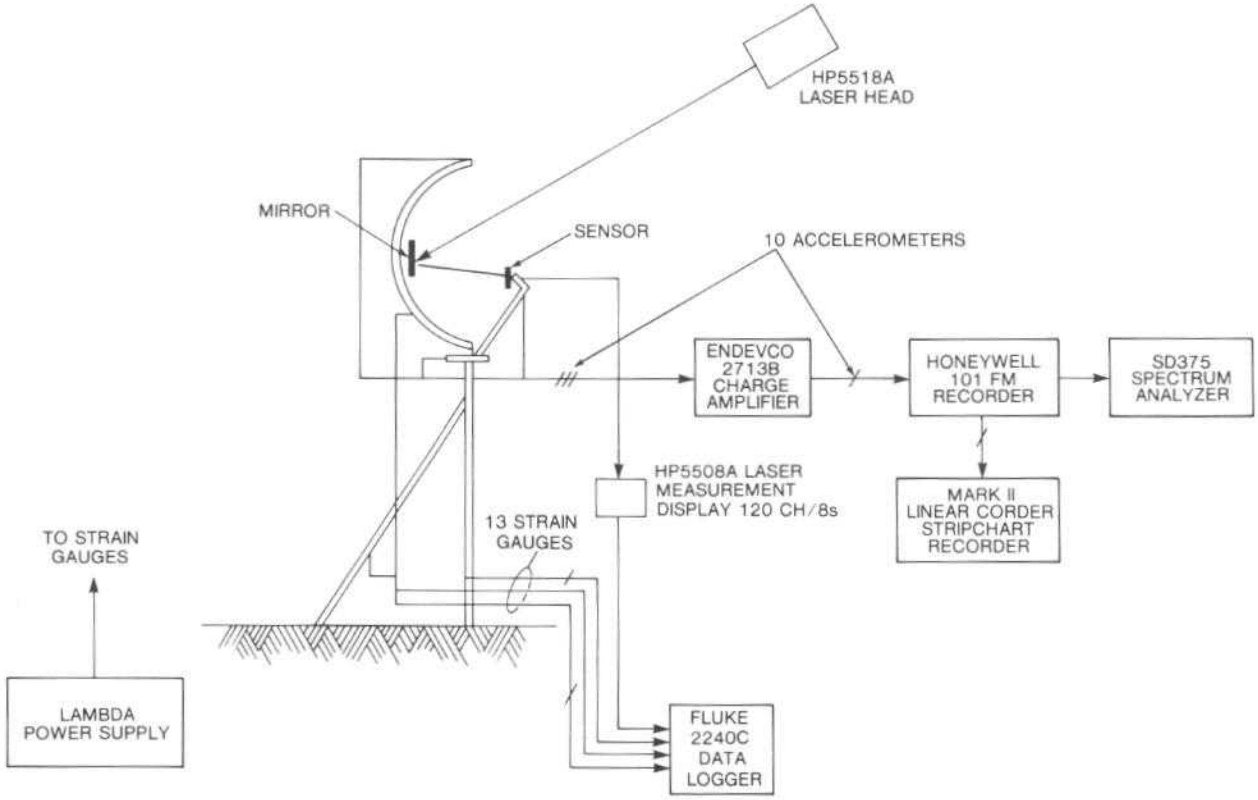


Figure 6. *1.8-m wind tunnel test setup tests performance of STARCOM antenna at 125-mph wind speeds*

A NASTRAN computer model of the system was developed by the STD to verify the antenna's structural integrity. In addition, due to the dynamic instability resulting from a low-frequency torsional and bending resonance of the overall system, a modal frequency survey test was performed. As a result of this investigation, design modifications including additional struts and increased diameter of the primary support tube were recommended, significantly increasing the stiffness of the overall system.

In order to verify the compliance of the system to the pointing requirement and the survivability of the system at 125 mph, an in-depth wind tunnel test was planned at the University of Maryland's Glenn L. Martin Wind Tunnel Test Facility (see Figure 6). This test will determine antenna pointing accuracy, antenna system component vibration, and forces at the mounting base of the antenna system.

INTELSAT

INTELSAT V/V-A SUPPORT

TWT Leak Test Investigation

During 1984 it became clear that C-band TWTs for INTELSAT V-A spacecraft were prone to develop very slow vacuum leaks due to mechanical stress at the extreme of the test temperature range. Damage to the thermionic cathodes is slow but cumulative. The tube is capable of recovering from the effect of such small gas leaks accumulated during storage by being operated for some period of time, making positive identification of leaking tubes difficult and allowing a number of tubes to reach advanced stages of integration with the satellite before their deterioration had accelerated and became evident.

In the INTELSAT V-A TWTs tested, the outgassing rate of the potting material at the leak increases rapidly with temperature. The STD showed that after a baking procedure a number of tubes which had become suspect after many RF tests could be quickly classed as leaking when the noise sidebands were observed on a spectrum analyzer.

Battery Investigation

During 1985, the INTELSAT V/V-A battery investigation included continued life testing, anomaly investigation, and sample electrode analysis. The life-test batteries for INTELSAT V consist of a Ni/Cd and a Ni/H_2 battery, which are tested in real-time by simulating the electrical and thermal parameters of the in-orbit power subsystem. The Ni/Cd life-test battery has been tested for 13 eclipse seasons (6.5 years) and the Ni/H_2 battery for 9 eclipse seasons (4.5 years). These tests provide a baseline for performance data, an early look at the effects of wear, and an opportunity to test the operational constraints of the battery. As an example, when an anomaly was detected in one of the INTELSAT V F-7 satellite batteries, the life-test battery provided the opportunity to check the capabilities of the system to accommodate the weaker of the two on-board batteries. These test data contributed to the determination of spacecraft load limits which could be off-balanced between the two batteries while maintaining operation during eclipse.

Routine laboratory testing and destruct analysis are performed on sample electrodes (prior to cell manufacture) and on sample cells. Hence the performance, composition, and structure of energy storage devices and their components can be monitored, with deviation from specification noted.

INTELSAT VI

Solar Cell Testing

The STD continues to test solar cells representative of flight hardware for the INTELSAT VI spacecraft to evaluate cell operating characteristics in synchronous orbit. These data are being used as input to the division's solar array analysis computer programs which provide INTELSAT satellite operations with long-term and short-term predictions of INTELSAT VI solar array power once the spacecraft are launched.

Figure 7 shows the predicted INTELSAT VI solar array power generated using the division's solar array analysis computer programs. Once the spacecraft are launched, similar predictions will be compared with actual performance so that INTELSAT will be able to optimize the allocation of communications traffic.

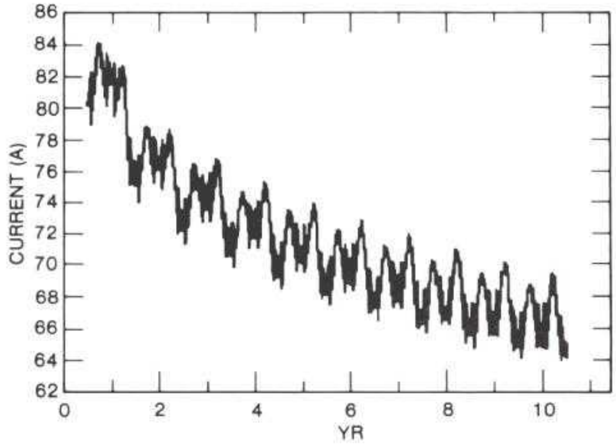


Figure 7. *Solar array analysis programs predict INTELSAT VI solar array current at 29.3 V, June 21 launch*

A long-term ultraviolet exposure test is continuing on a number of INTELSAT VI solar cells to determine the extent of solar cell degradation due to ultraviolet exposure. Figure 8 is a sample plot of percent degradation in short-circuit current vs ultraviolet exposure time for a group of INTELSAT VI Spectrolab K7 solar cells.

Ni/H_2 Battery Cells

Under the INTELSAT V support program, the STD worked with Ford Aerospace, Eagle Picher Industries, and INTELSAT to define objectives for a battery plaque improvement program, conduct the program, and review the results. The structure of the nickel plaque into which the active material is deposited is critical to the performance of the positive nickel electrode used in the nickel-hydrogen (Ni/H_2) battery cell. Therefore, a program was initiated to evaluate plaque materials fabricated by various processes and formulations. Eight different types of sample plaques, including those used on INTELSAT V and INTELSAT V-A, were characterized under Phase I of this program.

Plaque samples selected in Phase I were impregnated by both the aqueous and alcohol processes. These electrodes are presently being evaluated under Phase II of the program.

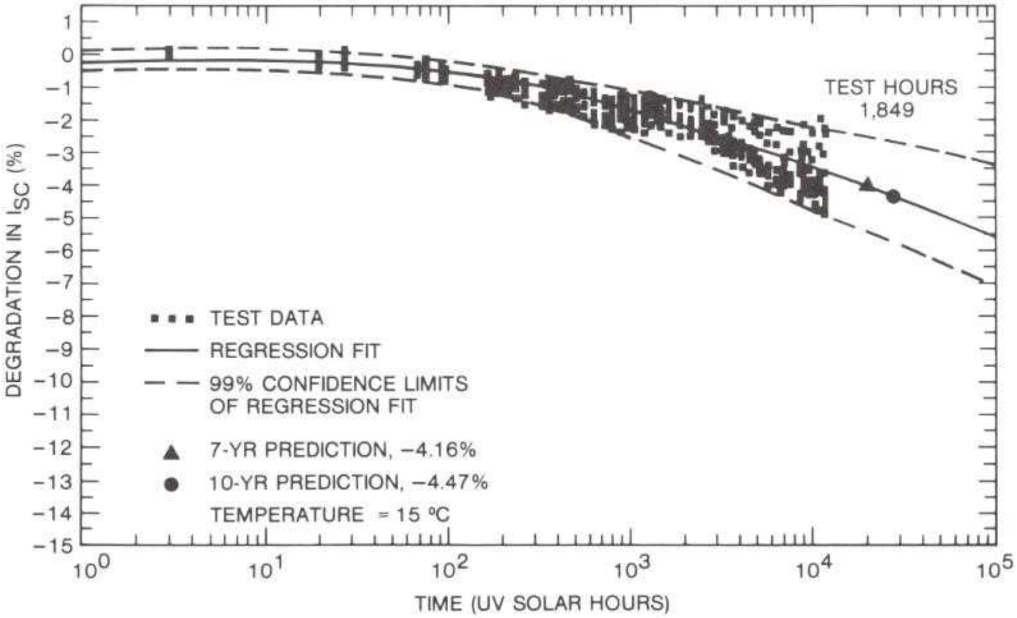


Figure 8. *Ultraviolet exposure test determines solar cell degradation for all K7 cells*

Deployable Mechanism Test Program

In order to achieve the on-orbit configuration of the INTELSAT VI satellite, the 4-GHz transmit antenna must undergo a two-stage deployment. First, the dish is deployed 223.7°, and then the boom is deployed 119.7°. The transmit boom deployment actuator is required to handle a large inertia load during deployment and to produce dynamic stability after deployment to its latched up position. The transmit boom actuator was subjected to both acceptance and qualification tests by Hughes Aircraft Company, the INTELSAT VI prime contractor. However, certain tests that are critical in terms of the satellite on-orbit operation were not done at Hughes. These tests, which were carried out by the STD, include small angle stiffness, structural response, reaction forces and torque, resonant frequency survey, and performance with offloader error tests.

A test program devised to evaluate the performance of an in-house flight unit of the actuator assesses whether the actuator would meet its design objectives and the requirements of the specialized tests. This evaluation includes procedures conducted during qualification and acceptance testing of the actuator. Figure 9 shows the actuator support structure and test fixture constructed for this program, including an inertia simulator that produces one-tenth of the inertia of the actual boom assembly.

Product Assurance

During 1985, continued support was provided to the INTELSAT VI program to implement a suitable product assurance program and resolve parts and reliability problems. Primary effort was directed toward the selection, application, and evaluation of electronic parts and their procurement, testing, and use. This included participation in decisions regarding disposition of parts presenting a reliability risk due to manufacturing problems or failures of equipment. Product assurance processes and procedures at Hughes and its domestic and foreign subcontractors were also reviewed and recommendations made for improvements in reliability and quality.

INTELSAT SATELLITE OPERATIONS

Attitude Determination and Control System Simulator

The STD delivered the INTELSAT V ADCS flight simulator to INTELSAT Headquarters in 1985 and continued the design, development, fabrication, and

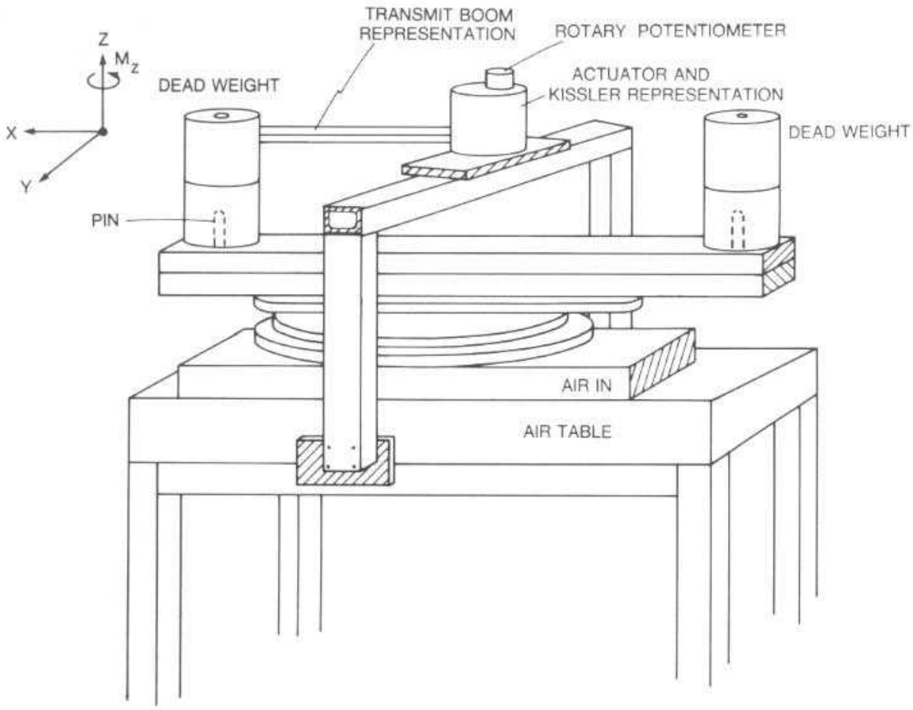


Figure 9. *Inertia simulator fixture produces one-tenth of the inertia experienced by the transmit boom assembly*

integration of the INTELSAT VI ADCS flight simulator as well as the DBS ADCS flight simulator. These devices allow operators to gain familiarity with routine maneuver sequences and engineers to develop contingency plans for dealing with on-orbit anomalies. In addition, they provide a test facility in which spacecraft operational procedures may be evaluated, practiced, or optimized. These simulators are designed to be used with external facilities such as tracking and command (T&C) data processing equipment or expert systems.

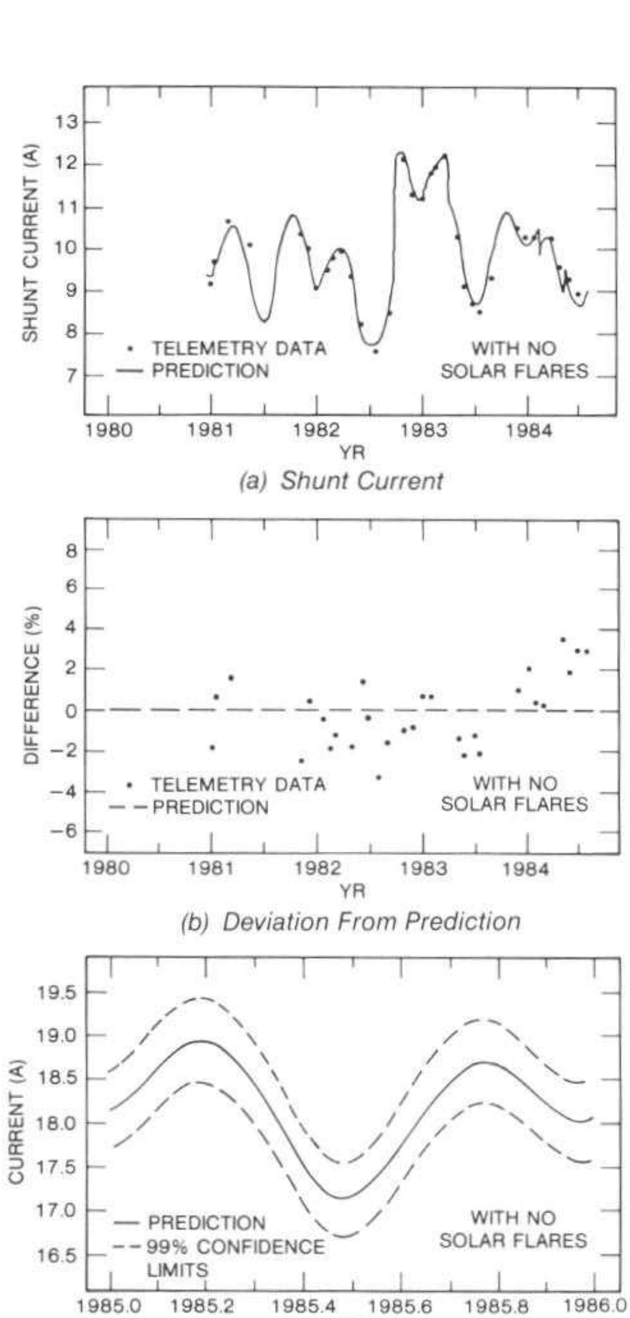
Each of these simulators operates in real time and incorporates engineering models of attitude control hardware. Their design allows the hardware to be exercised as if it were actually being used on the spacecraft. The rotational dynamics, structural flexibility, attitude sensors, actuators, and disturbance and environmental torques are implemented entirely on a 32-bit minicomputer using FORTRAN and assembly language. The simulators accommodate all mission phases except the spinning phase of the body-stabilized INTELSAT V and DBS designs. All redundancy is modeled, as well as a large number of failures which can be dynamically inserted and reset at any time during a simulation run.

The simulator operator can send commands to the simulated ACS; telemetry from the simulated ACS is displayed on cathode ray tube (CRT) monitors and stripchart recorders in the same format as at the T&C control center. In addition, a color graphics display of the spacecraft shows its attitude.

After being used for 4 years at COMSAT Laboratories, the INTELSAT V simulator was delivered, installed, and recommissioned at INTELSAT Headquarters. In 1985, it was used extensively for training engineers of the Satellite Evaluation and Control Section of INTELSAT. Both the INTELSAT VI and DBS simulator projects will be completed in the first half of 1986 after integration, validation, and acceptance test.

Solar Array Output Predictions

Solar cells of the type used on the INTELSAT VI spacecraft were tested at COMSAT Laboratories to determine their operating characteristics in space. Data from those tests are now being used as input to the COMSAT Laboratories solar array analysis com-



(a) Shunt Current

(b) Deviation From Prediction

(c) Total Current

Figure 10. *INTELSAT V F-2 solar array prediction used to optimize allocation of communications traffic*

puter programs to provide solar array power predictions to INTELSAT. With the increasing competitiveness of the communications business, accurate predictions of available spacecraft power are vital for optimizing allocation of communications traffic. Accurate predictions such as these can be achieved only by continually comparing predictions with actual performance and adjusting the model as needed. Figure 10 is an example of a solar array power prediction for the INTELSAT V F-2 spacecraft.

INTELSAT R&D

Analysis of Launch Loads

The STD has analyzed each of the INTELSAT V launch telemetry tape recordings to determine spacecraft bending loads and lateral accelerations, as well as accelerations at the launch vehicle interface. During 1985, the division statistically analyzed these flight data and compiled a data base of INTELSAT V launch loads for comparison with those predicted by the launch vehicle/spacecraft coupled loads analysis. This comparison is important in that it has identified discrepancies resulting from poor assumptions which may affect future satellite programs.

High-Vacuum Feedthrough

The incidence of breakdowns in INTELSAT V K_u-band TWTs led to occasional spurious shut-offs of the TWTAs in test and in orbit. Under Contract INTEL-327, COMSAT Laboratories studied factors which affect the resistance of a certain type of high-voltage vacuum feedthrough insulator to voltage breakdown.

Ceramic insulators of the type shown in Figure 11 were subjected to carefully chosen combinations of operating conditions in high vacuum:

- two different operating voltage levels
- exposure and nonexposure to evaporated materials such as barium from a thermionic cathode
- differing degrees of preoperation voltage conditioning
- differing degrees of high temperature bake-out processing.

Groups of four feedthroughs were continuously monitored with a high-speed waveform storage oscilloscope, usually for 30 days. Figure 12 shows typical current waveforms at breakdown. It was concluded that only the degree of preoperation voltage conditioning had an observable effect on the rate of breakdown occurrence, an important observation for guiding TWT processing in future programs.

Figure 11. Ceramic insulators typical of those tested to determine resistance to voltage breakdown

Ni/H2 Battery Cell Test and Evaluation

This Ni/H_2 battery cell test and evaluation effort is an ongoing R&D activity that started in 1980. The major objectives are to evaluate new design concepts and new electrode stack components in order to advance the state of the art of the INTELSAT/COMSAT individual pressure vessel Ni/H_2 battery technology. In addition, the test program simulates two eclipse seasons per year in real time, with daily cycling between eclipse seasons simulating battery-powered electric propulsion. Fourteen cells are presently on test; the group 1 cells have completed 10 eclipse seasons, 5 years on test, or approximately 3,000 cycles.

Cell S/N 6 (one of the group 1 cells) with the Zircar separator material is showing a loss in capacity for each of the last two eclipse seasons. The other four cells in group 1 have the standard asbestos separator material and are quite stable. The average end-of-discharge voltage for these four cells has not changed after 10 eclipse seasons. The major objective for 1986 will be to introduce a new synthetic separator material to replace the asbestos separator material.

OTHER

The STD maintains management responsibility for the Environmental Test Laboratory. Vibration, shock, temperature cycling, and thermal vacuum test services have been provided under contract to several outside customers for both ground and aerospace equipment. During 1985, these customers have included COMSAT Technology Products, Weinschel Engineering, and Schonstedt Instrument Co.

TWTA Tests for Hughes

The STD performed thermal cycling tests of DBS TWTAs for the Hughes Electron Dynamics Division during 1985 to determine whether changes in the TWT and TWTA operating characteristics would occur due to the eclipse cycling in spacecraft in geostationary orbit. To provide an accelerated simulation of these conditions, a flight-qualified TWTA was subjected to over 660 switched on/off cycles while in a thermal-vacuum environment similar to that expected in a spacecraft. Automated so that it requires no operators, the test continued for 4 months during which no significant variations were revealed in the continuously recorded input and output parameters. Safety features were incorporated to preclude test specimen damage in the event of power failure or malfunction.

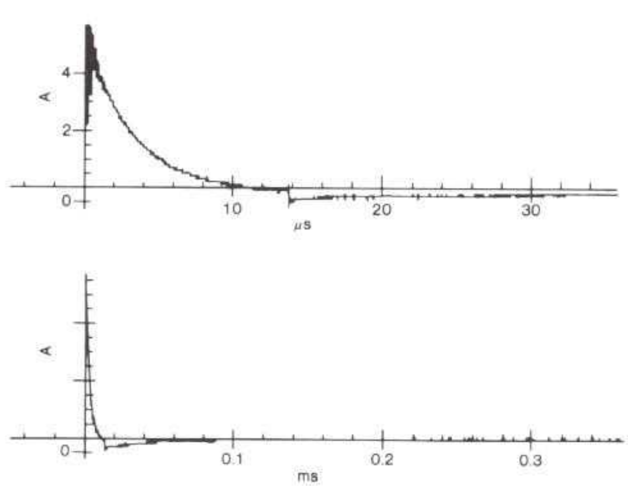


Figure 12. Typical current waveforms at breakdown provide guidance for TWT processing

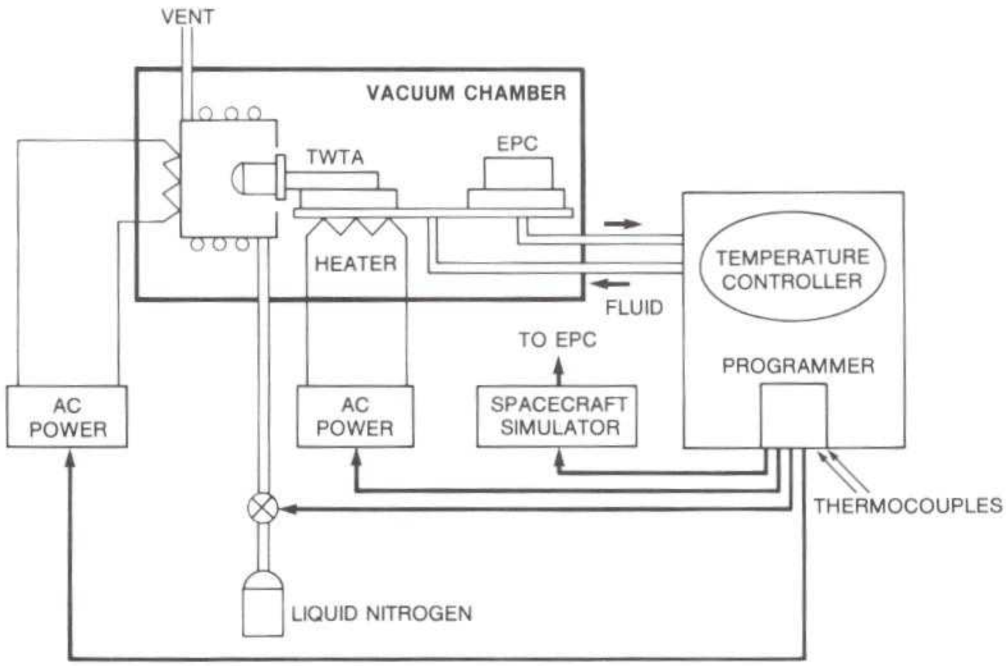


Figure 13. *TWTA test system evaluates effects of eclipse cycling in geostationary orbit*

For thermal control, two heat exchange loops were provided: one controlled temperature for the TWT and electronic power conditioner base plates, while the other established the radiation (temperature) environment for the TWT collector. Both loops were independently cooled or heated to provide maximum flexibility. Figure 13 is a block diagram of the system.

SYSTEM DEVELOPMENT DIVISION

INTRODUCTION

The System Development Division (SDD) is responsible for system design and development activities in support of the several COMSAT lines of business, INTELSAT, and other COMSAT clients. The activities of SDD encompass the development of computer-based systems including the design and implementation of software and the selection, acquisition, installation and integration of hardware. Other SDD projects involve development of digital hardware and microprocess firmware for prototype equipment produced by COMSAT Laboratories; development of analysis and simulation techniques and computer software for evaluation and optimization of satellite communications systems and subsystems; exploration of new computer hardware and software technologies and their application to distributed processing systems; systems analysis and simulation; and establishment of standards, methodologies, and tools needed for development of highly reliable, easily maintained software products.

COMSAT R&D

Jurisdictional

COMSAT International Communications, Inc.

Intermodulation Analysis Tool Development

The COMSAT Intermodulation Analyzer (CIA) is an analysis tool used to determine RF intermodulation products that occur in a multicarrier transponder as a result of nonlinear phase and amplitude characteristics of the traveling wave tube amplifier (TWTA). It is used by systems engineers to predict baseband distortion in multichannel frequency-modulated/frequency-division multiple-access (FM/FDMA) signals transmitted through a common satellite transponder.

During 1985 an interactive version of CIA was designed for use on an IBM personal computer. This version of the program will allow the user to specify the frequency plan through the use of menus and graphics. The program is expected to be completed and tested during 1986.

Space Communications Division

Transmission Impairments Analysis Tools

The Satellite Transmission Impairments Program (STRIP) is a powerful analysis program used to evaluate and optimize satellite frequency plans employing multiple frequency reuse. It is capable of calculating impairments in FDM/FM signals due to intermodulation, co-channel interference, and thermal noise. In the optimization mode, STRIP will automatically adjust each earth station's e.i.r.p. to minimize the worst-case transmission impairments.

STRIP uses an analytical model to compute baseband distortion based on the transfer characteristics of the nonlinear amplifiers, antenna gain patterns, and carrier parameters such as number of channels, IF bandwidth, rms signal deviation, and geographic location of earth stations. In each satellite transponder, all significant intermodulation products are identified, and the resulting baseband impairments are evaluated. Interference from co-channel time-division multiple-access (TDMA) transponders may also be computed.

With the planned introduction of new modulation techniques in the INTELSAT system to support new business services and with the operation of some of these carriers in the K_u-band or cross-strapped transponders, it was necessary to enhance the capabilities of STRIP to accommodate a mixture of different carrier types. SDD, together with the Communications Techniques Division, implemented models for several new carrier types, along with analysis algorithms, to determine signal impairments. An algorithm which optimizes the carrier power levels for all carrier types was also implemented.

New Antenna Coverage Program

The Antenna Coverage Program (ACP), developed in 1965, plots satellite antenna beam patterns that are superimposed on the earth's surface, as viewed from an arbitrary location. The most recent version of ACP, developed in 1985, has several new capabilities, including the ability to plot multiple-feed shaped beams or user-defined contours. Both equirectangular maps, such as that shown in Figure 1, and orthographic

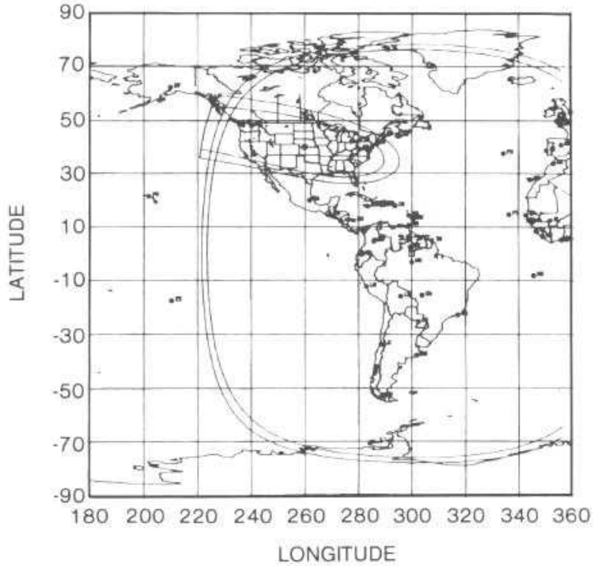


Figure 1. The new version of the Antenna Coverage Program can be used to plot an equirectangular map using the display option and gridlines

maps can be plotted. The program has been completely restructured to conform to currently accepted software standards and the analysis algorithms have been documented. The new version of ACP runs on an IBM personal computer.

COMSAT SUPPORT

COMSAT Technology Products, Inc.

Western Union Monitor and Control System

Western Union is establishing a privately operated satellite communications TDMA network. When fully configured, it will include 40 traffic terminals and 2 reference terminals. COMSAT TeleSystems, Inc. (TSI) is responsible for supplying the TDMA component of the Western Union system, using its DST-1000 traffic terminal.

The Western Union Monitor and Control (M&C) system, shown in Figure 2, is a facility allowing an operator to monitor and control an entire TDMA network. Such a network typically consists of two reference terminals and a number of traffic terminals. The M&C system executes in a PDP 11/24 microcomputer. It receives status data from all processors within each terminal. This status is made available to the operator in summary and in detail form. The M&C system is also responsible for the definition of new terminals and for the addition and removal of terminals from the network. Finally, board-level diagnostics can be run on any terminal and the results reviewed. The Western Union M&C system was completed and integrated with the DST-1100 terminal during 1985.

DFS Monitor and Control System

The Deutsches Fernmeld Satelliten (DFS) M&C system will allow an operator to monitor and control a TDMA network which will serve West Germany. It will consist of 2 reference terminals and up to 100 traffic terminals. The M&C system consists of two processors: a network control processor (NCP) based on a VAX 11/730 and a front-end processor (FEP) based on a PDP 11/24. The NCP provides monitor and control functions similar to those in the Western Union M&C system. Beyond that, it provides a DECnet interface with the central operation and maintenance facilities where reservations are booked and billing is performed. The NCP also performs reservations processing and burst time plan computation. The FEP acts as a gateway to the TDMA network.

Development of the DFS M&C system was initiated in 1984 for TSI, and a version to support the Phase I TDMA network (i.e., without reservations and demand assignment) was completed in 1985. Additional enhancements of the M&C system and integration with the TDMA equipment are scheduled for 1986.

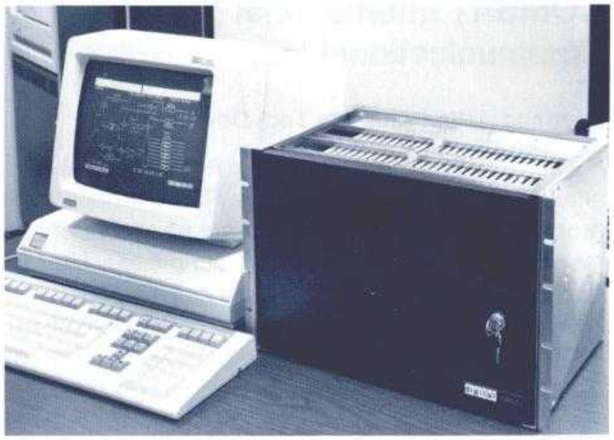


Figure 2. The Western Union Monitor and Control System allows an operator to monitor and control an entire TDMA network

Rate 7/8 FEC Codecs

A rate 7/8 forward error correction (FEC) coder/decoder (codec) was developed by SDD for installation in the TSI DST-1000 TDMA terminal. The codec employs a modified version of the double error correcting (1127, 113) Bose-Chaudhuri-Hocquenghem (BCH) code. The modification consists of the addition of one overall parity check bit and one dummy parity bit, and deletion of one data bit. The resulting (128, 112) modified BCH code provides for correction of all single and double bit errors and detection of all triple bit errors.

Relative to the theoretical uncoded bit error rate (BER) performance of an absolute encoded quadrature phase-shift keying (QPSK) modem, the codec typically provides coding gains of 1.9 and 2.6 dB at output error rates of 10^{-4} and 10^{-6}, respectively.

Quality Assurance and Configuration Management Services

SDD provided the Network Products Division (NPD) with consulting services relating to quality assurance and configuration management. The chief effort was to provide a new discrepancy reporting system which is more general and flexible than the system it replaced. This system has been successfully used on other major software.

STARCOM Operator Interface Design

A design for the STARCOM operator interface, developed for the NPD, takes advantage of the division's experience in this area. It is compatible with COSMOS, a real-time operating system developed within the Network Technology Division for high-speed computer networking applications. It supports multiscreen applications, graphics, and color on a DEC VT 240 terminal.

COMPACT

Gerber Photo Plotter Software

The GPLOT Program development, which was initiated in 1984, was completed in 1985. This program generates commands to photo-plot microwave circuit mask layouts on various models of Gerber Photoplotters. GPLOT uses as input the descriptions of the circuits generated by the AUTOART program. Operating on an IBM 370 computer or a VAX 11/780 computer, GPLOT is being marketed by COMPACT Software and has been installed at Lincoln Laboratories and Sandia Laboratories.

INTELSAT

Support

TDMA Network Integration

The SDD is under contract to INTELSAT to provide support services during the network integration phase of the TDMA program. This contract encompasses several enhancements to the INTELSAT Operations Center TDMA Facility (IOCTF) (described in a subsequent section) which will accommodate new requirements resulting from operational experience with the TDMA system.

Tasks which are either complete or are in progress include:

- support during relocation of the IOCTF to the new INTELSAT headquarters
- implementation of an improved method of distributing satellite position coefficients to the TDMA reference stations
- the ability to transmit test condensed time plans to TDMA traffic terminals during pre-operational testing
- provisions for logging, retrieval, and display at the IOCTF of message traffic from TDMA reference and monitoring station (TRMS) sites.

Enhanced Transmission Impairments Analysis Capabilities

The INTELSAT Transmission Planning software was rewritten in 1985 to include models for analyzing and optimizing the performance of the new carrier types now planned or in place in the INTELSAT system. The carrier types include digital carriers, television carriers, companded single-sideband (CSSB) carriers, and models for bands of digital and single-channel-per-carrier (SCPC) carriers. An interface to read from the current INTELSAT transponder, antenna, and standard carrier data bases was also implemented in this software.

Bit Error Rate Analysis Software

The Bit Error Rate/Error-Free Seconds (BEEFS) program calculates estimates of bit error rate and percent error-free seconds (EFS) for INTELSAT TDMA links including the effects of rain-induced impairments. The program was extended in 1985 to include the effects of interference from FDMA transponders into the TDMA links. In addition, a new user interface was implemented in the program.

Burst Scheduling Software Enhancements

The burst time plan (BTP) is a schedule that describes the allocation of communications channels in the fixed TDMA time frame. The BTP program generates burst time plans for the INTELSAT TDMA communications systems. SDD developed several major extensions to this program and its associated utility programs during 1985.

The associated utility programs generate the master time plans (MTPs) and condensed time plans (CTPs). The MTPs are operator-readable reports which contain all of a particular earth station's transmit and receive burst timing assignments, network acquisition and synchronization information, and baseband channel maps. They are sent to each administration before a new BTP is implemented. The CTPs, which are sent to the TDMA stations over the TDMA network, are machine-readable and contain a subset of the MTP which is loaded into each traffic or reference terminal.

During 1985, an error-checking system was designed and implemented in all of the programs in this system to detect inconsistencies or omissions in a BTP. The new system prints diagnostics and, in cases where a detected error will cause a TDMA system or station failure, does not allow the CTP to be generated for transmission to the network station.

Special Contracts

INTELSAT Operations Center TDMA Facility

During 1985, under Contract INTEL-213, SDD completed the delivery and installation of the IOCTF, a distributed minicomputer-based system which provides centralized monitoring and control of TDMA satellite communications networks. The division also assisted INTELSAT with using the IOCTF to perform pre-operational testing and subsequent operational support for the first two TDMA networks. The IOCTF provides around-the-clock support to TDMA operations by monitoring network alarms and status, distributing operational data for satellite position and TDMA BTPs, and controlling BTP changes and network startup. In May of 1985, the IOCTF was moved from L'Enfant Plaza to the new Van Ness Headquarters where it is now in continuous service. A third operational TDMA Network will be added in 1986. Figure 3 shows the Operations Center TDMA Facility which is in operation at INTELSAT Headquarters in Washington, D.C.

TDMA System Monitor

Under Contract INTEL-196, SDD managed the delivery and installation of the INTELSAT TDMA System Monitor (TSM) equipment for the second and third TDMA networks during 1985. The TSM serves a vital function in the INTELSAT TDMA networks by independently measuring the critical characteristics of the TDMA bursts at radio frequencies. The TSMs provide alarms at the TDMA reference stations and at the IOCTF when the TDMA parameters being monitored exceed predefined limits.

Four TDMA reference and monitoring stations with TSMs were installed for the Indian Ocean Region TDMA network. Network tests were completed for the systems at Raisting, Germany; Yamaguchi, Japan; Fucino, Italy; and Djatiluhur, Indonesia. These systems are now in operational service. Two TSMs were installed at Tanum, Sweden, and Etam, West Virginia, for the second Atlantic Ocean Region network. Figure 4 shows a TSM which will participate in TDMA network tests early in 1986.

Figure 3. *The INTELSAT Operations Center TDMA Facility provides centralized monitoring and control of TDMA satellite communications networks*

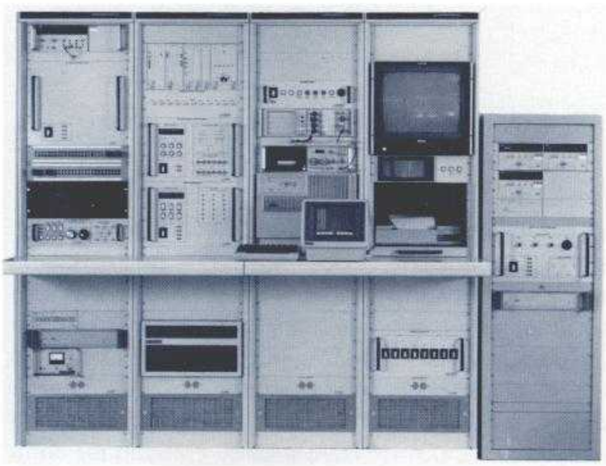


Figure 4. *The TDMA System Monitor measures critical characteristics of TDMA bursts at radio frequencies*

Traffic Terminal Simulator

The traffic terminal simulator (TTS) is a sophisticated, computer-based hardware tool that was developed under Contract INTEL-222 for in-plant verification of traffic terminals that are to operate in the INTELSAT TDMA networks. SDD developed a complete set of verification test procedures to run on the TTS. These procedures, along with a test plan for their execution, were delivered to INTELSAT in March of 1985.

OTHER

GTE

TDMA Resource Allocation and Management Program

Under Contract GTE-ES.85.01, the TDMA Resource Allocation and Management Program (TRAMP) was designed by SDD in 1985 to generate TDMA BTPs for the GTE Spacenet TDMA systems. The program accepts as input a traffic matrix or multiplex plan. It then forms T1 and T2 sub-bursts and multiple-destination digital speech interpolation sub-bursts. The sub-bursts are grouped into traffic bursts and are assigned to specific earth station transmit and receive TDMA equipment. The bursts are then scheduled in appropriate time slots in their assigned transponders. Overhead bursts (such as reference, communications, and orderwire bursts) are formed and scheduled along with the traffic bursts. The program was developed on VAX 11/780 computer and installed at GTE Spacenet in McLean, Virginia.

ACTS PROGRAM

BACKGROUND

The extraordinary commercial success of satellite communications requires improved utilization of the limited available resources of the geostationary orbital arc. The National Aeronautics and Space Administration (NASA) has been the prime mover behind major breakthroughs in U.S. satellite communications technology and has undertaken a new research and development program, the Advanced Communications Technology Satellite (ACTS) Program, to develop basic technologies to ensure the availability of adequate and affordable satellite communications beyond the year 1990.

HISTORY

NASA's role in satellite communications was prominent throughout the mid-1960s and early 1970s. However, in 1974, following the successful deployment of the ATS-6, the NASA program in satellite communications technology was phased down considerably. The communications industry did respond and make impressive contributions to improve upon that technology. However, its ability to fund the expensive, long-term, high-risk breakthrough programs was limited (particularly in the case of those involving on-board technology).

The Executive Branch directed NASA to reassume responsibility for advanced satellite communications technology in 1978. With Congressional support and close coordination with American industry, the personnel of NASA's Lewis Research Center (LeRC) proceeded to plan a program for a multitechnology effort to exploit the advanced techniques now available for development. While the ACTS program selected the test bed of these techniques to be the K_a-band (30/20 GHz), the techniques are applicable to the other satellite bands of interest. After a period of analysis and trade-off evaluations, contracts for the procurement of the system, including both space and ground segments, were let in 1984 and COMSAT Laboratories was selected to culminate the extensive part it had played in the establishment of ACTS with a major role in the ground segment development program.

THE TECHNOLOGY NEEDS OF TOMORROW

A fundamental goal of NASA's reentry into satellite communications R&D is to ensure the continued availability of the orbital arc spectrum so vital to this communications technoiogy. Ensuring the continued availability of the spectral resource requires a multifaceted effort: the development of communications techniques and equipment with which to exploit the spectrum-rich but largely unused K_a-band (which has twice the combined bandwidths of the C- and K_u-bands now being used commercially), plus the experimental investigation and verification of techniques which promise more effective use of all frequency spectrum resources allocated to satellite communications applications. The ACTS program objective is to achieve both goals by implementing its own baseline system effort, i.e., the ACTS flight segment and the NASA ground segment, as well as the experimenters' program it supports, at K_a-band.

The following component technologies comprise the baseline ACTS system:

- *Spot-Beam Technology*: Concentrating radio frequency energy into narrow beams, called spot beams, significantly enhances the ability to reuse these frequencies because the RF energy is being placed only where it is needed, and not spread over an entire continent. Further, the higher levels of power associated with spot beams can permit the deployment of lower cost terminal equipment. The use of both fixed and movable spot beams is an important extension of this technology.
- *On-Board Switching Technology*: This approach permits the interconnection of up-link spot beams with down-link spot beams in accordance with a subscriber's connectivity requirements and in coordination with an established time-division multiple-access (TDMA) timing plan.
- *On-Board Remodulation and Baseband Processing*: Such remodulation provides more effective amplification than analog repeaters as well as permitting mixed rate up-links and down-links for accommodating networks of both large and small terminals. The resultant intermediate baseband signal can then be processed and bundled by destination much in the same way as a terrestrial tandem switch.

- *Demand-Assigned (DA) TDMA Networking and Control*: The master control station (MCS) uses TDMA/DA algorithms to permit unique and effective coupling and control of the ground segment and the satellite resources. It provides cost-effective matching of the subscriber's transmission and connectivity requirements to the ACTS system performance envelope, as well as optimized allocation of the remaining satellite resources of power, spectrum, etc., to the remaining users.

The ACTS experimental flight system is designed to verify each of these critical technologies and to test their combined effectiveness in a communications satellite system, while providing a test bed with sufficient architectural and configuration flexibility to permit significant testing by the experimenter community.

THE ACTS EXPERIMENTAL COMMUNICATIONS SATELLITE SYSTEM

The ACTS Program team spent much of the past year in consolidating and refining its system-level configurations and specifications. This activity culminated with the approval of a System Design Review in July 1985, but several significant changes in the system design have been made since then. The system configuration described below is the most current one and is reflected in Figure 1.

The ACTS spacecraft features two types of spot-beam coverage, each spot beam covering an area about 150 miles wide. There are 16 fixed spot-beam regions available, each focused on a major U.S. city,

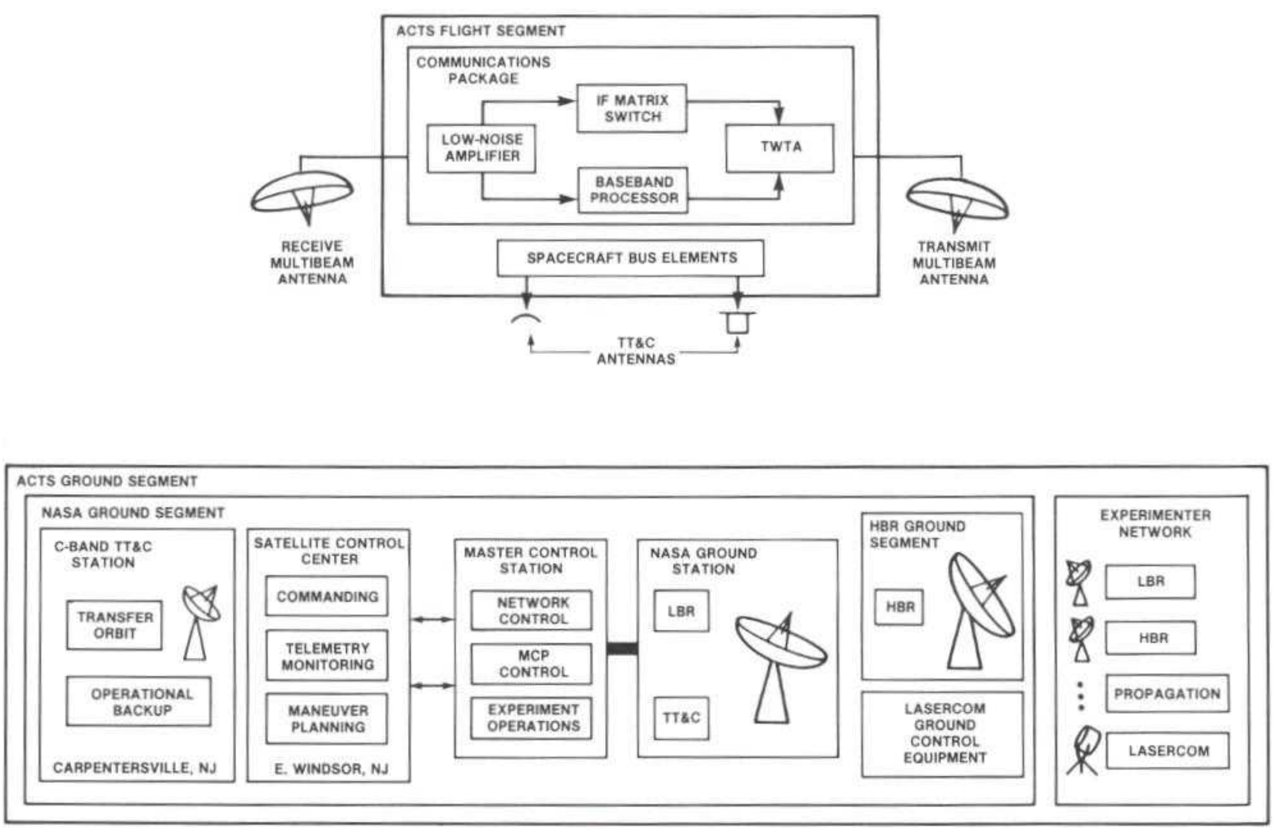


Figure 1. *The current ACTS system configuration features both fixed and scanning spot-beam coverage*

and there are two scan sectors (east and west) for high-speed selectable pointing ("scanning") of spot beams. This beam pointing is programmed from the MCS such that, over a 1-ms time frame, the transmit and receive beams "dwell" on a sequence of regions to both send and receive their transmissions; the length of the "dwell" is related to the required transmission capacity.

The up-link and down-link signals are classified as high burst rate (HBR) or low burst rate (LBR) and are carried in three very wideband "channels." The HBR signals, usually having 220-Msymbol/s burst rates, are routed through an intermediate frequency (IF) matrix switch which interconnects the up-link spot-beam signals to the down-link spot-beam signals. The LBR up-link signals, which have burst rates of either 27.5 or 110 Msymbol/s, are routed through the baseband processor, which performs demodulation, rate buffering, slot interchanging, error-control coding, and remodulation into the down-link, which has a 110-Msymbol/s burst rate.

The ACTS spacecraft bus is the responsibility of RCA ASTRO-Electronics, which is also the prime contractor for the ACTS Program. The on-board multibeam communications package is to be furnished by TRW, with the baseband processor supplied by Motorola. A novel feature of the ACTS Program is the incorporation of a laser-based communications experiment. This unit, known as LASERCOM, as well as its ground terminal, is to be supplied by MIT's Lincoln Laboratory.

Upon launch, the ACTS spacecraft will be positioned at 100°W longitude using RCA telemetry, tracking and command (TT&C) facilities in New Jersey, which will also be responsible for the usual telemetry/command and stationkeeping functions. These facilities will maintain not only their usual direct connection to the spacecraft, but also will be interconnected to the MCS, which is then linked to the spacecraft via a NASA ground station.

THE ACTS GROUND SEGMENT

There are now five distinct elements to the ACTS ground segment:

- *The NASA Ground Station* (NGS), shown in Figure 2, is to be developed by COMSAT. It consists of a single RF terminal (RFT) driven by two LBR terminals: the 27.5-Msymbol/s traffic terminal, with its terrestrial interface equipment for accommodating terrestrial traffic interconnection; and a combined reference terminal and traffic terminal (110 Msymbol/s), with the reference terminal having the responsibility for maintaining TDMA system synchronization and integrity. Within the NGS is also included some RCA-provided TT&C equipment which interfaces with the RFT subsystem. The NGS will be located at NASA LeRC in Cleveland.
- *The Master Control Station*, also the responsibility of COMSAT, controls the LBR network and the on-board multibeam communications package, is the focal point for mission and experiment operations, and provides displays and reports required to maintain orderly system operation. Figure 3 shows the computer equipment of the MCS, which will be colocated with the NGS at the NASA LeRC.
- *The Telemetry, Tracking, and Command Facilities* are related largely to spacecraft support operations such as stationkeeping: the RCA facilities in Carpentersville and East Windsor, New Jersey, will perform this function. RCA will provide the TT&C elements to be located at the NGS.
- *The HBR Ground Segment* will function in a role similar to that of the LBR NGS. It is the responsibility of NASA and will be located in the vicinity of the NGS at LeRC.
- *The LASERCOM Ground Segment* is the responsibility of MIT's Lincoln Laboratory; its interfaces into the ACTS Ground Segment are still to be determined.

In addition to the ACTS ground segment, there will be an experimenters' network equipped for both LBR and HBR operation through the ACTS spacecraft, conducting experiments and coordinated into the ACTS system via the MCS.

ACHIEVEMENTS OF THE COMSAT ACTS TEAM

The COMSAT effort in the ACTS Program is directed by the COMSAT Laboratories ACTS Program Management Office (PMO). The technical support for the ACTS PMO is coordinated through a matrix-management arrangement with several divisions of the Laboratories. Major ACTS support is provided by the Microwave Technology, Network Technology, and System Development Divisions, together with elements of the Design and Fabrication Center. At the peak of the ACTS development program, nearly one-

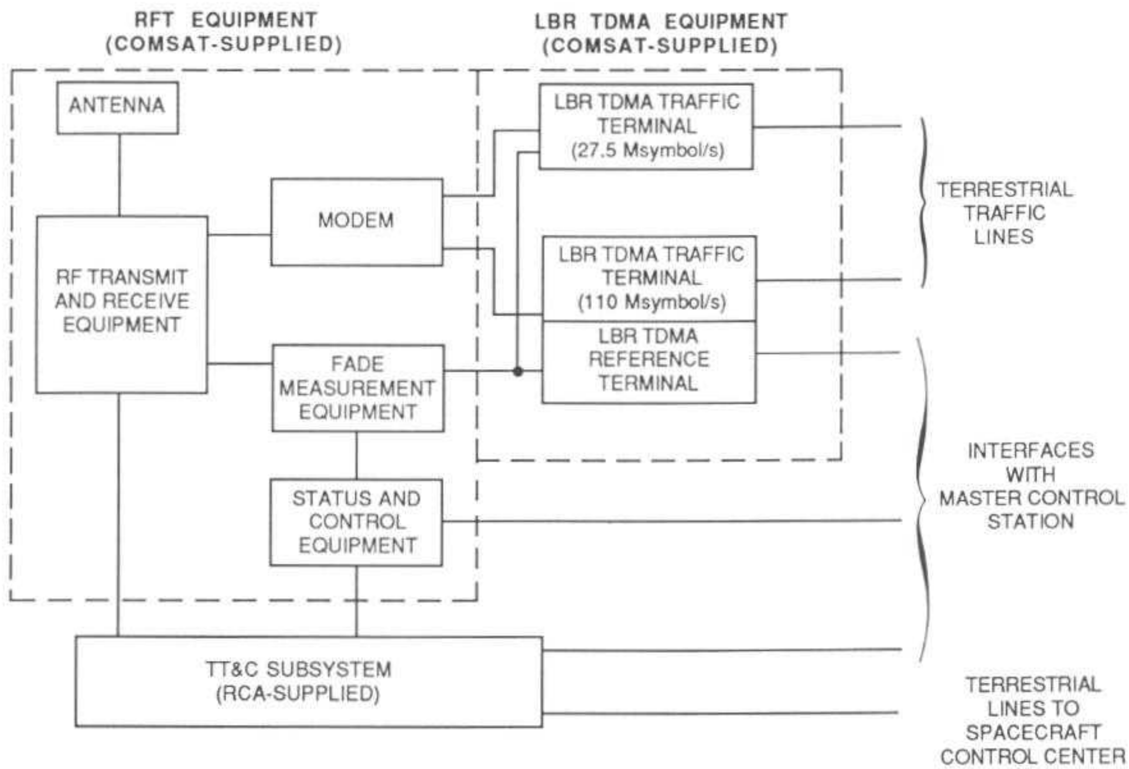


Figure 2. *The NASA ground station consists of a single RF terminal driven by two LBR terminals*

fourth of the Laboratories resources will support the ACTS program. During the past year, the COMSAT ACTS team has been actively participating as a major force in the system-level formulation of the overall ACTS architecture, as well as diligently pursuing its objectives in its own area of responsibility—the NGS/MCS. The system-level specifications of NGS/MCS function, performance, and interface have been completed, presented, and reviewed by NASA and the contractor teams at both the System Design Reviews and the Preliminary Design Reviews. Work is now progressing into the design levels, with the functional elements in terms of hardware/software being described and with long-lead-time components being ordered.

ACTS System Engineering activities have focused on the modeling of the modulation channel and the simulation of the networking, in addition to the documentation of the higher level specifications. Performance has been verified by comparing simulations using computer models with measured results. The NGS/RFT group has concentrated on translating the system-level specification into subsystem specifications for the major RFT functional elements—antenna, transmitter, receiver, modems—plus the many associated elements, such as special test equipment, status and control units, and measurements. These specifications have now reached the design level. These elements of the design stage have been substantially completed and the procurement stage entered.

Similar efforts are proceeding in the ACTS TDMA Engineering team where the designs for the major functional elements (transmit burst controller, receive burst controller, and terrestrial interface equipment) are being developed. The ACTS MCS Engineering group has been concerned with the procurement and testing of the MCS central processing unit, as well as developing and specifying its major functional areas: MCP telemetry/control, LBR TDMA networking, and RFT interface support. Further, it supports several other areas, such as experiment configuration and

Figure 3. *The master control station is the focal point for mission and experiment operations*

data processing, and the MCS executive and utilities. The ACTS Performance Assurance team has focused on the establishment of procedures for configuration control of the hardware and software, component reliability analysis and specification, procurement and production planning, and quality assurance audits. A vital role in the administration and management of the COMSAT ACTS Program is also played by the teams responsible for financial and schedule control.

1985 PUBLICATIONS AND PATENTS

PUBLICATIONS

The following is a list of 1985 publications by authors at COMSAT Laboratories. Reprints of these articles can be obtained from the authors at COMSAT Corporation, 22300 Comsat Drive, Clarksburg, Maryland 20871.

Abita, J. L., "Technology: Development to Production," *IEEE Transactions on Engineering Management*, Vol. EM-32, No. 3, August 1985, pp. 129-131.

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PATENTS

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Dr. Ashok Kaul (center) displays the 1983 COMSAT Research Award which has been awarded by Dr. John V. Evans (second from left) to (from left to right) Messrs. A. Agarwal, W. Redman, J. McKoskey, and W. Mogart. Mr. B. Hung is not shown.

HONORS AND AWARDS

Each year a number of honors and awards are received by COMSAT Laboratories' personnel for their work in advancing the state of the art of satellite communications technology. This year, the COMSAT Research Award, which recognizes individuals who have made outstanding technical contributions to the work of the Laboratories, was awarded to Messrs W. Redman, A. Agarwal, B. Hung, J. McCoskey, and W. Morgart for conceiving and implementing the Programmable Interface Processor (PIP). The microprocessor technology which they developed integrates the operation of many individual microprocessors into a single more powerful processor, leading to the development of the PIP and the COMSAT Microprocessor Operating System (COSMOS) which formed the basis for STARCOM.

Mark Jennings, a co-op student from MIT, was selected as a Rhodes Scholar for the Fall 1985 term at Oxford University. He received his B.S. and M.S. in Electrical Engineering in June 1985.

Amir I. Zaghloul and Carey M. Rappaport were awarded the 1986 H. A. Wheeler Applications Prize for their paper entitled "Optimized Three-Dimensional Lenses for Wide-Angle Scanning." The award was presented at the IEEE AP-S Symposium.

Also honored for her efforts was Ann Tulintseff, a COMSAT Laboratories' co-op student from MIT. Her paper, entitled "Experiment and Analysis of a Circularly Polarized Electromagnetically Coupled Microstrip Antenna," received second prize in the student paper competition at the USNC-URSI National Radio Science Meeting in Boulder, Colorado.

Amir Zaghloul

Carey Rappaport

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Montgomery Planning
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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MEMORANDUM

To: Historic Preservation Commission

From: John Liebertz, Cultural Resource Planner III, Countywide Planning and Policy Division, Montgomery Planning

Date: January 8, 2025

Re: An Amendment to the *Master Plan for Historic Preservation*: Clarksburg Heights (12700-12712 Running Brook Drive) and Community of Faith United Methodist Church & Cemetery (22420 Frederick Road), Clarksburg, MD

Staff Recommendation:

That the HPC recommends that the Planning Board list the Clarksburg Heights District and Community of Faith United Methodist Church & Cemetery in the *Locational Atlas & Index of Historic Sites* and recommends that the County Council designate the properties in the *Master Plan for Historic Preservation.*

Background:

The Historic Preservation Office evaluated potential historic resources as part of the Planning Department's ongoing *Clarksburg Gateway Sector Plan* that will guide the area's future growth. The *Clarksburg Gateway Sector Plan* will focus on a portion of the 1994 Plan's Transit Corridor District and a few surrounding areas. This area is part of the I-270 corridor—a significant employment resource for the county and the region. Planners will evaluate land use, zoning, transportation, and environmental and historic resources to determine if a new mix of land uses and zoning are more appropriate for this area. The Sector Plan will make recommendations for how best to update the 1994 Plan and its 2011 and 2014 amendments, including but limited to housing needs, interchange design, staging of retail development, transportation corridors, environmental considerations, and historic preservation recommendations. Staff recommends the designation of one district and one site to the *Master Plan for Historic Preservation*.

Designation Criteria for the Clarksburg Heights District:

Staff finds that the Clarksburg Heights District satisfies three designation criteria (1.A, 1.C, and 1.D) as listed in §24A-3 of the Montgomery County Code.

1.A <u>Historical and cultural significance. The historic resource has character, interest or value as part of the development, heritage or cultural characteristics of the county, state or nation.</u>

Clarksburg Heights is a unique example of a mid-twentieth century subdivision in Clarksburg, planned, built, and owned by African Americans. In Montgomery County, African Americans faced widespread and pervasive discrimination by land developers, property owners, and the government who used or supported de jure or de facto segregation to limit housing opportunities. Between 1890 and 1960, the Black population in Montgomery County stagnated and occasionally declined, while the white population experienced exponential growth. In particular, African American educators struggled to acquire housing in the county. The NAACP estimated that ninety percent of African American teachers commuted to

Montgomery County from Washington, D.C. because of discriminatory housing practices. In 1963, F. Wilson Wims, an African American builder, and Sarah L. Wims, sought to address the housing crisis with the construction of Clarksburg Heights, a small subdivision of modern, middle-class housing in the Rocky Hill community of Clarksburg. African American purchasers included at least three Montgomery County Public School teachers including Mary E. Johnson, Katie R. Harper, and Edith J. Gregg. Clarksburg Heights represents the efforts of the African American community to expand housing options prior to the passage of Montgomery County's Fair Housing Ordinance (1967) and Fair Housing Law (1968) and the Federal government's Fair Housing Provisions of the United States Civil Right Act (1968).

<u>1.C Historic and cultural significance. Is identified with a person or group of persons who influenced society.</u>

Clarksburg Heights is significant for its strong association with F. Wilson and Sarah L. Wims, leaders of the Clarksburg community, who subdivided, planned, and built this middle-class subdivision. The Wims supported African Americans who wanted to move to the suburbs, but faced intense discrimination. Montgomery County has recognized Wilson Wims for his dedication to the advancement of the African American community, his actions to create an inclusive community through youth athletics, and his participation in civic organizations. In 2006, the Montgomery County Office of Human Rights inducted Wims into the Human Rights Hall of Fame. The following year, Clarksburg High School named their new baseball field "Wims Field" in his honor. In 2014, Montgomery County Public Schools named the new elementary school in Clarksburg "Wilson Wims Elementary" at the behest of the greater community.

The significance of Clarksburg Heights is enhanced by its association with its first and long-standing owners who influenced local affairs. This report highlights the contributions of Mary E. Johnson, Katie R. Harper, and Edith J. Gregg, three African American women who taught at both segregated and integrated Montgomery County public schools, and James R. Gregg who challenged discriminatory practices at country clubs and worked to improve conditions for African American residents.

There are no historic sites or districts listed in the Master Plan for Historic Preservation that reflects the contributions of these individuals to Clarksburg or Montgomery County.

<u>1.D Historic and cultural significance. Exemplifies the cultural, economic, social, political or historical heritage of the county and its communities.</u>

Clarksburg Heights serves as a poignant reminder of segregated life and the resilience, achievements, and contributions of African Americans residents in mid-twentieth century Montgomery County. F. Wilson and Sarah L. Wims had the knowledge, skills, and determination to counter rampant discriminatory housing practices and provide much-needed middle-class housing for African Americans. Clarksburg Heights represents the productive life of the African American community in Clarksburg. The Wims, Johnson, Harper, and Gregg families all tirelessly worked to improve conditions for African Americans who lived in Montgomery County.

Designation Criteria for the Community of Faith United Methodist Church & Cemetery:

Staff finds that the Community of Faith United Methodist Church & Cemetery satisfies three designation criteria (1.A, 1.D, and 2.E) as listed in §24A-3 of the Montgomery County Code.

1.A Historical and cultural significance. The historic resource has character, interest or value as part of the development, heritage or cultural characteristics of the county, state or nation.

The Community of Faith United Methodist Church and Cemetery represents an early twentieth century, gothic revival church attended by the residents of Rocky Hill—the earliest African American community in Clarksburg—and the surrounding region. The church reflects the development pattern associated with the formation of the Rocky Hill community and the lives of African Americans during an era of segregation in Montgomery County. Churches and schools provided parishioners the opportunity for education, social engagement, and leadership opportunities. Influential members of the Rocky Hill and Clarksburg community including the Davis, Foreman, Mason, Snowden, and Wims families are all buried at the church cemetery.

1.D Historic and cultural significance. Exemplifies the cultural, economic, social, political or historical heritage of the county and its communities.

The Community of Faith United Methodist Church serves as a visible reminder of segregated life and the resilience, achievements, and contributions of African Americans residents in the early twentieth century. After the original wood-frame church burned in 1924, the congregation pressed forward with the construction of an imposing Gothic Revival-styled brick church. The church trustees hired Charles W. Spurgeon Graves and Charles Green, highly skilled African American builders from Washington, D.C., to construct the building for $7,500 in 1925. These actions by the congregants— who worshiped more than 30 miles away from the nation's capital in a rural section of the county—reflect the prosperity of the church and its function as a religious, educational, and social center for the African American community. As noted in *Black Historical Resources in Upper Western Montgomery County, Maryland* (1979), Community of Faith United Methodist Church was one of the largest and most architecturally notable African American churches.

2.E Represents an established and familiar visual feature of the neighborhood, community or county due to its singular characteristic or landscape.

The Community of Faith United Methodist Church and Cemetery is the last public site associated with the Rocky Hill community in Clarksburg. The church and cemetery serve as a tangible link to the African American community's past, providing a sense of continuity, orientation, and place as a former center of religious, social, and educational activities. The imposing front-gable brick church with an integrated tower has stood in its original location along Frederick Road for nearly a century.

The Rocky Hill community, however, lost its other community landmark along with other significant resources. In the 1960s, Maryland-National Capital Park and Planning demolished the Rocky Hill Elementary School, a two-room segregated Black elementary school. Additionally, many homes of early Rocky Hill and Clarksburg community members identified in previous architectural surveys, such as the Lloyd and Sarah Gibbs House, Arthur and Ella Mae Gibson House, William and Mary Hackey House, Clifton and Rachel Snowden House, Benjamin F. and Elizabeth Wims House, and John Henry and Emma M. Wims House, have been demolished. Most of these individuals were buried in the church cemetery, and there are no limited sites that that reflect their contributions to the development of Rocky Hill or Clarksburg in the *Master Plan for Historic Preservation*. Therefore, the church remains as an essential feature of the built environment and its preservation would retain the legacy of the community.

Conclusion:

The subject properties satisfy the designation criteria listed in §24A-3 of the County Code and the HPC should recommend that the Planning Board list the Clarksburg Heights District and Community of Faith United Methodist Church & Cemetery in the *Locational Atlas & Index of Historic Sites* and recommends that the County Council designate the properties in the *Master Plan for Historic Preservation.*

APPENDIX I: CLARKSBURG HEIGHTS MASTER PLAN HISTORIC DISTRICT DESIGNATION FORM

CLARKSBURG HEIGHTS HISTORIC DISTRICT
CLARKSBURG, MONTGOMERY COUNTY, MD 20871

MASTER PLAN HISTORIC DISTRICT DESIGNATION FORM
JANUARY 2025

Montgomery Planning

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

Maryland – National Capital Park and Planning Commission
Montgomery County Planning Department
Master Plan Historic District Designation Form

1. NAME OF PROPERTY

Historic Name: Clarksburg Heights
Current Name: N/A
Maryland Inventory of Historic Properties #(s): 13-61

2. LOCATION OF PROPERTY

Address Number and Street: 12700-12712 Running Brook Drive
County, State, Zip: Clarksburg, Montgomery County, Maryland 20871

3. ZONING OF PROPERTY

R-200: The intent of the R-200 zone is to provide designated areas of the County for residential uses with a minimum lot size of 20,000 square feet. The predominant use is residential in a detached house.

4. TYPE OF PROPERTY

A. Ownership of Property

_X_ Private
___ Public
___ Local
___ State
___ Federal

B. Category of Property

_X_ Private
___ Public
___ Local
___ State
___ Federal

C. Number of Resources within the Property

Contributing	Noncontributing
_5_ Buildings	_4_ Buildings
___ Structures	___ Structures
___ Objects	___ Objects
___ Archaeological Sites	___ Archaeological Sites
_5_ Total	_4_ Total

D. Listing in the National Register of Historic Places: In 2019, the Maryland Historical Trust found the Clarksburg Heights subdivision eligible for listing in the National Register of Historic Places.

5. FUNCTION OR USE

Historic Function(s): DOMESTIC: Single-family dwelling

Current Function(s): DOMESTIC: Single-family dwelling

6. DESCRIPTION OF PROPERTY

Site Description:

Clarksburg Heights is located in Clarksburg, Montgomery County, Maryland. The mid-twentieth century planned subdivision is 1.25 miles southeast of the Clarksburg Historic District on the west side of Frederick Road (MD 355). Francis Wilson Wims and Sarah J. Wims platted the 4.07-acre Clarksburg Heights in 1963. The subdivision consists of six, single-family houses on ½-acre lots along Running Brook Drive. Clarksburg Heights is bounded by Frederick Road to the east, Community of Faith United Methodist Church, Inc. to the south, the Clarksburg Neighborhood Park and Activity Building and single-family dwellings to the north, and Rocky Hill Middle School to the west.

Running Brook Drive, a narrow street, provides access from Frederick Road and terminates at the end of the subdivision. The six houses are setback approximately 55' from the public right-of-way and separated from the road by manicured lawns. Minimal fencing or other demarcations in the front yards adds a sense of openness The two houses on the north side of the street are all raised 6' to 10' above Running Brook Drive which creates a pleasant rolling hill and privacy. The house at the southwest corner of the intersection of Running Brook Drive and Frederick Road similarly is raised above the street, but the remaining three houses on the south side of Running Brook Drive are all at grade with the public right-of-way. The properties are accessed via asphalt or concrete driveways. Most of the driveways terminate at one or two-car, attached garages. Outbuildings in the subdivision primarily consists of storage sheds.

Architectural Description (see App. 4 and App. 5 for current and historic photographs):

F. Wilson Wims, an African American builder, owned and constructed five of the six houses in the subdivision between 1963 and 1964. Wims built Ranch and Split-Level houses, which were popular architectural forms in the mid-twentieth century. These five resources contribute to the Clarksburg Heights Historic District. The Colonial Revival house at 12712 Running Brook Drive is a non-contributing resource to the district. While the house is in the original subdivision, it was constructed in 1974 by a different builder.

Ranch Houses — 12700, 12701, and 12705 Running Brook Drive (App. 4, Figs. 1-3)

One-story Ranch houses were a typical architectural style utilized by developers and merchant builders in the vast suburban expansion and development in the United States during the 1950s and 1960s. Three Ranch houses are located at 12700, 12701, and 12705 Running Brook Drive in Clarksburg Heights. These modest dwellings exhibit a shared aesthetic characterized by a similar form and minimalist ornamentation. Each one-story, five-bay, side-gable dwelling is clad in a running-bond brick veneer. The single-story, side-gable form, paired with off-center front doors, an overall asymmetry, and shallow-pitched, asphalt shingle roofs, emphasizes a sense of horizontality. At 12701 Running Brook Drive, Wims incorporated additional details to his future home including a projecting cross-gable—a feature typical of the style—that disrupts the horizontal roof line, a recessed covered front patio, and faux stone veneer. Typical fenestration for the Ranch houses consists of double-hung windows, picture windows, and single-leaf doors. The houses at 12700 and 12701 Running Brook Drive feature non-historic replacement doors and windows, but the house at 12705 Running Brook Drive retains its original two-over-two, double-hung windows, a large single-light picture window, single-leaf, front door with a half-elliptical light, and 4-light, 16-panel, roll-up garage door. Two of the three houses (12700 and 12705 Running Brook Drive) retain their original semi-attached garage—a character defining feature of Ranch houses—albeit with enclosed breezeways. The owners of 12701 Running Brook Drive demolished the attached garage and constructed a gable addition on the front of the house for additional living space.

Split-Level Houses — 12704 and 12708 Running Brook Drive (App. 4, Figs. 4-5)

Two Split-Level houses with Ranch-styled details are located at 12704 and 12708 Running Brook Drive. Despite the similarities between Ranch and Split-Level houses, the latter are distinguished by their two-story height with one-story wing between the first and second stories. This design results in three distinct levels within the home. The main entrance is typically found on the one-story section that commonly consisted of the living room and kitchen. A stair led to the first floor (primarily a family room) and the second floor (bedrooms) in the two-story section of the house.

The two Split-Level houses in Clarksburg Heights both reflect the form, but differ in layout. The house at 12704 Running Brook Drive consists of a two-story, hipped roof dwelling intercepted mid-height by a one-story, side-gable wing with an attached garage. The house features multi-color, running bond, brick veneer, strong horizontal emphasis, shallow pitched asphalt shingle roofs, and overhanging eaves. On the façade of the two-story section, fenestration consists of two, one-by-one, slider windows on the first story and a ribbon of four, one-by-one, slider windows on the second story. The one-story wing features a six-panel, single-leaf door with a single, one-light, sidelight, and a ribbon of five, single-light, bowed, casement windows. While the location and size of the openings remains largely intact, the original 15-light bowed window, slider windows, single-leaf front door, and garage door have been replaced. The property owners constructed a central, one-story, gable addition on the rear elevation in the late twentieth century.

The house at 12708 Running Brook Drive has an atypical floorplan which may have resulted due to its narrower lot. The two-story, side-gable section of the house has a projecting one-story, front-gable wing in lieu of the traditional side wing. The primary entrance is located at the intersection of the side-gable block and front-gable wing, but it accesses a smaller hyphen separating these two forms. This plan would not affect the traditional interior arrangements associated with a Split-Level home. Similar to other buildings of the type, the house has an asymmetrical plan, low-pitched roofs, overhanging eaves, one-by-one sliding windows, and sliding glass doors. Most of the original windows and doors have been replaced. Unlike the other dwellings constructed by Wims in this subdivision, the house never had an attached or semi-attached garage.

Colonial Revival House — 12712 Running Brook Drive (App. 4, Fig. 6)

There is a single non-contributing house at 12712 Running Brook Drive. Schulz Homes, Inc. constructed the Colonial Revival-inspired dwelling in 1974. The two-story, three-bay, side-gable house has an attached single-car garage. The walls are clad with brick veneer on the first story and vinyl lap siding on the second story. The asphalt single roof has overhanging eaves. The house is adorned with a walk-up front porch sheltered by a shed roof supported by slender turned post. Typical fenestration consists of single and paired one-over-one, double-hung, vinyl-sash windows with eight-over-eight, simulated divided light.

7. STATEMENT OF SIGNIFICANCE

A. Applicable Designation Criteria as described in Chapter 24A: Historic Resources Preservation, §24A-3, Montgomery County Code

Clarksburg Heights meets three of the nine designation criteria as described in §24A-3 of the Montgomery County Code. See Section J of this report for a detailed analysis.

B. Statement of Significance:

Clarksburg Heights is a small, but notable, mid-twentieth century subdivision planned, built, and owned by African Americans. F. Wilson and Sarah L. Wims developed this subdivision in 1963 to counter widespread discriminatory housing practices and provide modern, middle-class housing in the popular Ranch and Split-Level styles for African Americans. The Wims sold several residences to educators, allowing them to live closer to their place of employment. At that time, the NAACP estimated that over ninety percent of Montgomery County's African American educators lived outside of the county due to discriminatory practices.[1]

The subdivision further reflects the resilience and achievements of its developers and residents, notably the contributions of Wilson Wims, Katie R. Harper, Mary E. Johnson, Edith J. Gregg, and James R. Gregg. Montgomery County has recognized Wims as a central figure in Clarksburg's history by naming a baseball field and elementary school in his honor. Wims participated and led civic organizations and fostered inclusivity in

[1] United States Commission on Civil Rights, *Hearing Before the United States Commission on Civil Rights, April 12-13, 1962* (Washington, D.C.: Government Printing Office, 1962), 103.

the neighborhood through youth athletics. Katie Harper, Mary Johnson, and Edith Gregg collectively contributed over 100 years of service in the county's segregated and integrated schools. James R. Gregg's actions facilitated the integration of country clubs and similar public accommodations. Therefore, Clarksburg Heights stands as a testament to the African American community's efforts to improve the lives of residents, and is a singular resource in Montgomery County.

C. Period of Significance: 1963 - 1964

D. Significant Dates: 1963 (subdivision) and 1963-1964 (construction)

E. Significant Persons: F. Wilson Wims, Sarah L. Wims, Katie R. Harper, Mary E. Johnson, Edith J. Gregg, and James R. Gregg

F. Areas of Significance: African American Heritage; Social History

G. Architect/Builder: F. Wilson Wims (builder)

H. Narrative:

Historic Context: Francis Wilson and Sarah Louise Wims

Born on July 13, 1915, Francis Wilson Wims, often referred to as F. Wilson or simply Wilson, was the second child of James Henry and Altia Mora (nee Onley) Wims.[2] Wims first lived at the Warner and Elizabeth Wims House, the home of his paternal grandparents at 22615 Frederick Road.[3] In 1919, his parents acquired and moved the family to a 114-acre farm property near Hyattstown, now part of Little Bennett Regional Park.[4] He attended segregated Montgomery County Public Schools until 7th grade and then worked on his father's farm.[5]

Wims married Sarah Louise Spencer on May 1, 1937.[6] Born on October 18, 1918, Sarah Spencer was the daughter of William H. and Blanche E. (nee Diggs) Spencer. The Spencers raised their family in the Urbana District, Frederick County, where they acquired a half-acre of land in 1912.[7] Records suggest that Sarah Spencer attended Montgomery County Public Schools until 7th grade.[8] Following their marriage, Wilson and Sarah Wims welcomed Francis, their first daughter, in 1938. The family resided in Clarksburg where they rented a property for $10 per month.[9]

Wilson Wims left farming for the building industry and worked for the construction firm Bowling and Gardiner in the late 1930s.[10] He started with basic construction tasks and eventually ascended to building foreman. During his employment, Francis E. Gardiner, one of the white owners of the business, and Wims became friends. At the onset of World War II, Gardiner convinced Wims to relocate his family and join him to manage his new farm in Davidsonville, Anne Arundel County. The United States deferred Wims' service due to his occupation as a farmer.[11] The Wims lived in the house with the Gardiner family—an atypical arrangement in

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[2] United States Social Security Death Index, "Francis Wims," FamilySearch.
[3] Ethel Gardiner Frye, *Wilson Wims: A Remarkable Life* (Self-published, July 2014).
[4] The Maryland-National Capital Park and Planning Commission acquired the farm property in 1963. Montgomery County Circuit Court, "Bradley H. and Birdie J. Dudrow to James H. and Altie M. Wims," May 1, 1919, Liber PBR 280, Folio 52, http://www.mdlandrec.net; Montgomery County Circuit Court, "Altia M. Wims to Maryland-National Capital Park and Planning Commission," May 15, 1963, Liber CKW 3087, Folio 636, http://www.mdlandrec.net.
[5] Ethel Gardiner Frye, *Wilson Wims: A Remarkable Life* (Self-published, July 2014)..
[6] "Sarah Wims Obituary," *The Frederick News Post*, April 23, 2008, https://www.legacy.com.
[7] Frederick County Circuit Court, "John Diggs and Sarah Diggs to James and Blanche Spencer," December 11, 1912, Liber HWB 302, Folio 420, http://www.mdlandrec.net.
[8] Sarah Spencer's obituary stated that she was educated in Montgomery County, Maryland. "Sarah Wims Obituary," *The Frederick News Post*, April 23, 2008, https://www.legacy.com; 1950 United States Federal Census, "Sarah Wims," Ancestry.
[9] 1940 United States Federal Census, "Wilson Wims," Ancestry.
[10] Real estate advertisements of Bowling & Gardiner properties in Washington, D.C. and Montgomery County started in the mid-1930s.
[11] Interview with Karen Walker and Francis Wims, July 18, 2024.

segregated Montgomery County—until the completion of their own residence on the property. Wims managed the farm, but continued to serve as a foreman for Bowling and Gardiner and learned the business aspects of the building industry. In 1946, the Wims family moved back to Montgomery County and rented a house in Kensington for a year.[12]

In the late 1940s, Wilson and Sarah Wims built their first family house at 22601 Frederick Road in Clarksburg, where their second daughter, Patricia Wims, was born, and established their own construction company (App. 2, Fig. 2).[13] Wilson Wims, then a master carpenter, builder, and brick mason, led the construction efforts, and Sarah Wims managed the office and records. Notably, their new business, later named Clarksburg Construction Company, supported and employed young African American men.[14]

In 1951, the Wims purchased a 1.8-acre parcel from Ora and Iris King on the east side of Frederick Road (App. 2, Fig. 2). The couple subdivided this land into four distinct lots, which are now known as 22611-2263 Wims (previously Weems) Road.[15] On these lots, Wims constructed four houses that he rented to family members and other African American residents of Clarksburg.[16] In 1963, the Wims subdivided Clarksburg Heights and constructed their second family house at 12701 Running Brook Drive where the couple lived for the remainder of their lives (App. 2, Fig. 2). The descendants of the Wims continue to own and reside at the property.

Wilson and Sarah Wims advocated for African Americans in Rocky Hill, Clarksburg, and across Montgomery County. Stories of their generosity abound with one memorable example occurring during a snowstorm in 1951. Severe high winds, below freezing temperatures, snow, and ice marooned multiple buses in Clarksburg. The Wims sheltered and fed 30 children overnight who resided near Boyds and were unable to return home.[17] The following year, Wilson Wims served on an advisory committee to Montgomery County Public Schools to expand and improve bus service from the upper sections of the county to Carver Junior College in Rockville. Students in this area struggled with attendance due to poor transportation options. The committee advocated for better support and assisted in appropriate bus routes and employment of drivers.[18] In addition, Wilson Wims served in positions of leadership and other roles in various organization such as the Clarksburg Community Association, Montgomery County Recreation Board, and the Montgomery County Community Action Board.[19]

Beyond his civic activism, Wilson Wims participated in African American sandlot and semi-professional baseball leagues. His father, James "Jim" Wilson, who shared a passion for athletics, installed a baseball diamond on his family's farm for the African American community. Wilson Wims played on various local and regional teams including the Hyattstown Bluebirds.[20] He then managed (coached) the Maryland Wildcats—one of the most successful semi-professional teams in the region—and later sponsored the Maryland Wildcats Junior team. In Clarksburg, Wims championed integration through youth athletics and emphasized the importance of sports to ease racial tensions and create an inclusive community.[21]

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[12] Ethel Gardiner Frye, *Wilson Wims: A Remarkable Life* (Self-published, July 2014).
[13] The Wims acquired this property in 1942 (recorded in 1943). Montgomery County Circuit Court, "Elsie D. and James E. Carter to Francis Wilson and Sarah Louise Wims," July 24, 1942, Liber CKW 918, Folio 24, http://www.mdlandrec.net.
[14] Ethel Gardiner Frye, *Wilson Wims: A Remarkable Life* (Self-published, July 2014).
[15] Montgomery County Circuit Court, "Ora H. and Iris R. King to Francis W. and Sarah L. Wims," April 26, 1951, Liber 1528, Folio 115, http://www.mdlandrec.net.
[16] The Wims defaulted on three of the four properties in 1966. The couple sold the house at 22611 Wims Road to Altia M. Wims (Wilson Wim's mother) in 1966.
[17] "Mercury Tumbles to 11 for 3-Year Low; Cold to Continue Today," *Evening Star*, February 8, 1951, Newspapers.com.
[18] Other well-known African American leaders from this era served on the including Noah E. Clarke (Poolesville), Dorothy Garner (Lincoln Park), Robert Taylor (Spencerville), Inez McAbee (Damascus), Geneva Mason and Agnes Legedge (Scotland), Leslie Plummer (Stewardtown), Leslie Gaines (Sandy Spring), George Johnson (Rockville), and Dr. Webster Sewell (Norbeck). "College Students Get Bus Service," *Washington Afro American*, January 26, 1952, Newspapers.com.
[19] Rande Davis, "The House that Wims Built," *Monocacy Monocle*, March 30, 2007; Interview with Karen Walker and Francis Wims, July 18, 2024.
[20] Interview with Karen Walker and Francis Wims, July 18, 2024; "Wildcat Tour North Carolina," *Washington Afro-American*, June 20, 1953, Newspapers.com; "Maryland Wildcats Meet RM All-Stars," *Rocky Mount Telegram*, August 28, 1953, Newspapers.com.
[21] Interview with Karen Walker and Francis Wims, July 18, 2024.

The Montgomery County community has recognized the life and contributions of Wilson Wims in the past twenty years. In 2006, the Montgomery County Office of Human Rights inducted Wims into the Human Rights Hall of Fame.[22] The following year, Clarksburg High School named their new baseball field "Wims Field." He attended opening day and thew the first pitch.[23] In 2014, Montgomery County Public Schools named the new elementary school in Clarksburg in his honor at the behest of the community.[24] Sarah Wims and Wilson Wims died in 2008 and 2015, respectively. The couple were buried at Community United Methodist Church Cemetery adjacent to the Clarksburg Heights subdivision. There are no sites or districts that recognize the contributions of Wilson or Sarah Wims in the *Master Plan for Historic Preservation*.

Historic Context: Subdivision of Clarksburg Heights

In 1960, John Henning and Hattie Rebecca Mason sold a 7.75-acre parcel—located on the west side of Frederick Road just north of the Community of Faith United Methodist Church in the African American Rocky Hill community—to the Wims.[25] Wilson and Sarah Wims proceeded to sell the northern portion of the property to the Maryland-National Capital Park and Planning Commission (M-NCPPC) for a park and playground and subdivided part of the southern half. Oral histories suggest that Wims championed the construction of a community building at the M-NCPPC property and personally provided the labor to construct the $22,000 facility at no expense. The Clarksburg Neighborhood Park – Activity Building opened to the public in 1968 and continues to be utilized by residents of Clarksburg.[26]

After the sale of the northern half of the property, Wilson and Sarah Wims proceeded to subdivide the southern half.[27] On February 5, 1963, the Planning Board approved the eight-lot subdivision, with six lots marked as developable (App. 3, Fig. 1).[28] The Wims sold "Outlot B," directly to the rear of Community of Faith United Methodist Church's cemetery, to the congregation for an expansion of their burial grounds.[29] He retained Lot 6 to build his family house at 12701 Running Brook Drive, constructed and sold houses on Lots 2 and 3 and Lot 5 to African American families, and defaulted on Lots 1 and 4. Oral histories and the design of the house at 12700

[22] Montgomery County Office of Human Rights, "2006 Inductees," http://www.montgomerycountymd.gov/humanrights/outreach/halloffame.html.
[23] Rande Davis, "The House that Wims Built," *Monocacy Monocle*, March 30, 2007; Interview with Karen Walker and Francis Wims, July 18, 2024.
[24] "About Wilson Wims," http://www.inte.montgomeryschoolsmd.org/schools/wimses/about-us/aboutwilsonwims/.
[25] Montgomery County Circuit Court, "John Henning Mason and Hattie Rebecca Mason to F. Wilson and Sarah L. Wims," August 16, 1961, Liber CKW 2772, Folio 489, http://www.mdlandrec.net.
[26] In 1960, the Superintendent of Schools informed M-NCPPC that five abandoned school sites in Upper Montgomery County were available for free. These school sites were located in the vicinity of Clarksburg, Dickerson, Sellman, Stewartown, and Unity. This included the quarter-acre site of the abandoned segregated Black elementary school at the current southwest corner of the intersection of Frederick Road and Wims Road. After formal acquisition of the school property, the Montgomery County Planning Board, part of M-NCPPC, moved to acquire an additional 3.4-acres from Wims bordering the school to create a local park. The Planning Board meeting minutes record Commissioner King as pushing for the acquisition of the property due to its proximity to the "colored church in there…and colored settlement." Wims declined an offer of $1,400 per acre for the property and offered to purchase the abandoned school site from the Commission. The Planning Board valued the acquisition of the property due to its proximity to the Black community and authorized staff to offer $2,000 per acre for land. Wims continued to negotiate with the board and accepted an offer of $6,300 for 3.4-acres. In April 1962, the Planning Board authorized payment of $6,433.96 for the land and settlement costs. Soon thereafter, the Commission demolished the abandoned school to further develop the park and playground. Montgomery County Planning Board, "Land Acquisition Matter, William Wims Property," August 23, 1961; Montgomery County Planning Board, "Wilson Wims Property, Adjacent to Clarksburg" October 4, 1961; Montgomery County Planning Board, "F. Wilson Wimms Property, Adjacent to Abandoned Colored School," November 1, 1961; Montgomery County Planning Board, "W. Wilson Wins Property – Clarksburg, Maryland," November 15, 1961; Montgomery County Planning Board, "Voucher Number 620473," April 18, 1962; Montgomery County Circuit Court, "F. Wilson and Sarah L. Wims to Marland-National Capital Park and Planning Commission," April 9, 1962, http://www.mdlandrec.net.
[27] Montgomery County Circuit Court, "Clarksburg Heights, Plat No. 6950," March 12, 1963, http://www.plats.msa.maryland.gov.
[28] Montgomery County Circuit Court, "Clarksburg Heights, Plat No. 6950," March 12, 1963, http://www.plats.msa.maryland.gov.
[29] Montgomery County Circuit Court, "F. Wilson Wims and Sarah L. Wims to John Wesley Methodist Episcopal Church of Clarksburg, Maryland," September 17, 1963, Liber CKW 3135, Folio 201, http://www.mdlandrec.net.

Running Brook Drive (Lot 1) suggests that Wims built that residence as well. The five houses constructed between 1963 and 1964 reflects the prevalent architectural forms of the period including Ranch and Split Level designs. Scholz Homes, Inc. built the non-contributing house at 12712 Running Brook Drive (Lot 4) ca. 1974.

Clarksburg Heights provided ownership opportunities typically denied to African American purchasers in Montgomery County in the mid-twentieth century. Racial discrimination and unfair legally discriminatory housing practices excluded African Americans from acquiring residences in the suburbs. Clarksburg Heights represents a notable example where middle-class African American could purchase modern suburban housing prior to the passage of the County's Fair Housing Ordinance (1967) and Fair Housing Law (1968). For example, the Wims sold the house at 12705 Running Brook Drive to Mary E. Johnson, an African American Montgomery Public School teacher, for $23,500.[30]

Historic Context: Early Residents of Clarksburg Heights

Wilson and Sarah Wims recognized the discriminatory practices and obstacles limiting African American homeownership in Montgomery County. The couple strived to sell the newly constructed houses in Clarksburg Heights to African American families. In particular, African American teachers in Montgomery County long struggled to find adequate housing in proximity to their schools.

Mary E. Johnson purchased the property at 12705 Running Brook Drive (Lot 5) in 1964.[31] Johnson, the daughter of Elbert M. and Annie Laura McKearner Johnson, was born in 1915 in the Barnesville District, Montgomery County.[32] Johnson gained employment with Montgomery County Public Schools (MCPS) and joined the staff of the segregated Black elementary school in Poolesville. She later transferred to Sellman and Edward U. Taylor elementary schools. Mary E. Johnson retired from MCPS after 36 years and owned the house at Running Brook Drive until her death in 2005. In an interview with Nina H. Clarke and Lillian B. Brown, Johnson recalled her struggles with travel, building maintenance, and conditions:

> I did not have a car when I started teaching, so I rode the Rockville High School bus to get to Poolesville School. I caught the bus at 6:30 AM. I would alight [sic] at Jerusalem Road and Route 28 and trudge a half mile to my school. The road was unpaved and extremely rutty--deep ones. When it snowed the ruts were covered, so it was a "hit-and-miss" affair to walk over the road…. I had many thoughts racing through my mind about why the county officials did not grade this miserable dirt road or, better yet, why didn't they pave it?
>
> My second humorous experience was assembling the potbellied stove each morning. Any amount of pressure or any slight jar would cause the stove pipes to disjoint and the stove doors to fall off. After the ashes had been shaken down prior to building a fresh fire each morning, the 'assembly period' for the stoves begin. My principal…and I could have taken an extra job in a stove parts factory after the many times we reassembled our potbellied stoves.
>
> Lastly, I remember the 'mad dashes' my principal and I made for an undisturbed session in the outside 'John.' Every time we tried, hordes of youngsters would descend upon the building at the same time.[33]

Charles Sylvester and Katie (nee Ricketts) Harper purchased the house at 12704 Running Brook Drive (Lot 2) in 1965.[34] Katie Ricketts, the daughter of Worthington and Emma Ricketts, was born in 1932. She attended

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[30] The sale price is noted in an appraisal for another property owned and built by F. Wilson Wims. Adolph C. Rohland, "Appraisal Report and Valuation Analysis: Parcel 105, Little Bennett Regional Park," February 8, 1965, M-NCPPC Archives.
[31] Montgomery County Circuit Court, "F. Wilson Wims and Sarah L. Wims to Mary E. Johnson," August 19, 1964, Liber CKW 3260, Folio 213, http://www.mdlandrec.net.
[32] U.S. Social Security Applications and Claims Index, "Mary Ellen Johnson," http://www.ancestry.com.
[33] Nina H. Clarke and Lillian B. Brown, *History of the Black Public Schools of Montgomery County, Maryland, 1872-1961*," (Vintage Press: Washington, D.C., 1978, 159-160.
[34] Montgomery County Circuit Court, "F. Wilson Wims and Sarah L. Wims to Charles S. Harper and Katie R. Harper," March 17, 1965, Liber CKW 3335, Folio 681, http://www.mdlandrec.net.

segregated schools in Montgomery County including Lincoln High School in Rockville. She enrolled at Maryland State Teachers College, the predecessor of Bowie State University, and received a Bachelor of Science in Elementary Education. Harper returned to teach the first grade at Poolesville Elementary School and taught for 37 years in Montgomery County and Prince George's County prior to her retirement.[35] Charles Harper, born in 1933 in Montgomery County, served in the United States Air Force during the Korean War. He died in 1998 and is buried at Jerusalem Baptist Church Cemetery, Poolesville.[36] Katie Harper continues to own the property on Running Brook Drive.

James Robert and Edith (nee Jackson) Gregg acquired the house at 12700 Running Brook Drive (Lot 1) after the Wims defaulted on the property.[37] Edith Jackson, the daughter of Sarah and Smith Jackson, was born in the Rockville Election District, Montgomery County, in 1933. She attended local elementary schools and Lincoln High School in Rockville, and trained in classical piano at Howard University as a child. She then enrolled at Virginia State University where she majored in music and graduated in 1955. Edith Gregg returned to Montgomery County, started her career with MCPS, and married James Gregg. She first worked as a music teacher, returned to college, and received an advanced degree in early education. She then transitioned to an elementary school teaching position. In 1992, Gregg retired from MCPS after more than 35 years of service. She died in 2021 and is buried at Rockville Cemetery.[38] Her obituary noted the following:

> She was instrumental to the success of integration by assisting African American students, especially in her time teaching at Edward U. Taylor Elementary School in Boyds, MD, during the time of de jure segregation. Teaching at Taylor felt as though her service to her community had come full circle.[39]

James Gregg, the son of Maggie Gregg, was born in Cullen, Virginia, in 1936. He graduated from high school at 15 years old and enrolled at Virginia State University where he likely met his spouse, Edith Jackson. Gregg later continued his education at the University of Baltimore. He served in the Marine Corps and worked for various federal agencies including the Veterans Administration, Internal Revenue Service, National Institutes of Health, and Department of Energy. Gregg was active in the Montgomery County community and served on the board of the Rockville Housing Authority, President of the Rockville Citizens Association, life-long member of the local branch of the NAACP, and Worshipful Master of Pythagoras Lodge #74, Prince Hall Grand Lodge of Maryland. Gregg fought for the rights of Black residents of Montgomery County.[40] In 1976, he filed a complaint against the Montgomery Country Club with the Montgomery County Human Relations Commission (HRC). Gregg alleged that the country club owner refused Black applicants due to their race. At the time, the club had an all-white membership. The HRC ruled in his favor and ordered the club to sign a consent agreement, provide five years of free membership to the Gregg family, cease inequitable treatment of African Americans, develop written membership requirements, and advertise that memberships were available to all interested parties. The owner appealed the HRC's decision to the Circuit Court and three years later the parties settled out of court.[41]

I. Areas Exempt from Designation: There are no areas exempt from designation.

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[35] Marie Smith, "666 Plats Led to Montgomery," *Washington* Post, August 26, 1961, Proquest Historical Newspapers; "Montgomery County Chapter, Bowie State University, MCC Members," http://www.mccbsunaa.com (accessed August 22, 2024).

[36] "Charles S. Harper," http://www.findagrave.com.

[37] Montgomery County Circuit Court, "David E. Betts and Lewis R. Roberts to James R. Gregg and Edith J. Gregg," August 15, 1966, Liber CKW 3544, Folio 579, http://www.mdlandrec.net.

[38] "Official Obituary of Edith Jackson Gregg," http://www.snowdencares.com (accessed August 21, 2024).

[39] "Official Obituary of Edith Jackson Gregg," http://www.snowdencares.com (accessed August 21, 2024).

[40] "Official Obituary of James Robert Gregg," http://www.snowdencares.com (accessed August 21, 2024).

[41] "Integration Ordered for Country Club," *Cumberland News*, December 10, 1976, Newspapers.com; "Montgomery County Club Ordered to Accept Black Man," *The News (Frederick, MD)*, December 8, 1976, Newspapers.com; Brack, David, "Twenty Years of Civil Rights Progress," Human Relations Commission, Montgomery County Archives; "Official Obituary of James Robert Gregg," http://www.snowdencares.com (accessed August 21, 2024).

J. Designation Criteria:

The Clarksburg Heights District meets Designation Criteria 1.A, 1.C, and 1.D as listed in §24A-3 of the Montgomery County Code.

1.A Historical and cultural significance. The historic resource has character, interest or value as part of the development, heritage or cultural characteristics of the county, state or nation.

Clarksburg Heights is a unique example of a mid-twentieth century subdivision in Clarksburg, planned, built, and owned by African Americans. In Montgomery County, African Americans faced widespread and pervasive discrimination by land developers, property owners, and the government who used or supported de jure or de facto segregation to limit housing opportunities. Between 1890 and 1960, the Black population in Montgomery County stagnated and occasionally declined, while the white population experienced exponential growth.[42] In particular, African American educators struggled to acquire housing in the county. The NAACP estimated that ninety percent of African American teachers commuted to Montgomery County from Washington, D.C. because of discriminatory housing practices.[43] In 1963, F. Wilson Wims, an African American builder, and Sarah L. Wims, sought to address the housing crisis with the construction of Clarksburg Heights, a small subdivision of modern, middle-class housing in the Rocky Hill community of Clarksburg. African American purchasers included at least three Montgomery County Public School teachers including Mary E. Johnson, Katie R. Harper, and Edith J. Gregg. Clarksburg Heights represents the efforts of the African American community to expand housing options prior to the passage of Montgomery County's Fair Housing Ordinance (1967) and Fair Housing Law (1968) and the Federal government's Fair Housing Provisions of the United States Civil Right Act (1968).

1.C Historic and cultural significance. Is identified with a person or group of persons who influenced society.

Clarksburg Heights is significant for its strong association with F. Wilson and Sarah L. Wims, leaders of the Clarksburg community, who subdivided, planned, and built this middle-class subdivision. The Wims supported African Americans who wanted to move to the suburbs, but faced intense discrimination. Montgomery County has recognized Wilson Wims for his dedication to the advancement of the African American community, his actions to create an inclusive community through youth athletics, and his participation in civic organizations. In 2006, the Montgomery County Office of Human Rights inducted Wims into the Human Rights Hall of Fame. The following year, Clarksburg High School named their new baseball field "Wims Field" in his honor. In 2014, Montgomery County Public Schools named the new elementary school in Clarksburg "Wilson Wims Elementary" at the behest of the greater community.

The significance of Clarksburg Heights is enhanced by its association with its first and long-standing owners who influenced local affairs. This report highlights the contributions of Mary E. Johnson, Katie R. Harper, and Edith J. Gregg, three African American women who taught at both segregated and integrated Montgomery County public schools, and James R. Gregg who challenged discriminatory practices at country clubs and worked to improve conditions for African American residents.

There are no historic sites or districts listed in the *Master Plan for Historic Preservation* that reflects the contributions of these individuals to Clarksburg or Montgomery County.

1.D Historic and cultural significance. Exemplifies the cultural, economic, social, political or historical heritage of the county and its communities.

Clarksburg Heights serves as a poignant reminder of segregated life and the resilience, achievements, and contributions of African Americans residents in mid-twentieth century Montgomery County. F. Wilson and

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[42] Between 1890 and 1960, the white population increased from 17,500 to 327,736 (+1,773 %). In comparison, the Black population increased from 9,685 to 11,527 (+19 %).

[43] United States Commission on Civil Rights, *Hearing Before the United States Commission on Civil Rights, April 12-13, 1962* (Washington, D.C.: Government Printing Office, 1962), 103.

Sarah L. Wims had the knowledge, skills, and determination to counter rampant discriminatory housing practices and provide much-needed middle-class housing for African Americans. Clarksburg Heights represents the productive life of the African American community in Clarksburg. The Wims, Johnson, Harper, and Gregg families all tirelessly worked to improve conditions for African Americans who lived in Montgomery County.

K. Conclusion:

Clarksburg Heights retains its integrity as a cohesive residential neighborhood, platted and constructed between 1963 and 1964. The integrity of location and setting remain intact, with all the houses in their original locations and the property owners maintaining the open space and manicured lawns characteristic of the subdivision. The development of Clarksburg High School and Rocky Hill Middle School does not negatively affect the overall setting of the subject properties. The design, workmanship, and materials that comprise the district are sufficiently intact to reflect the vision of Wilson Wims. The five contributing resources retain the architectural style and form associated with Split Level or Ranch houses. Minor rear additions, infill, and replacement windows and doors are typical of houses from this period and do not negatively affect the overall integrity of the proposed historic district. The continued cohesiveness of the Clarksburg Heights enables the subdivision to retain its integrity of feeling and association as a successful expansion of African American suburban housing during a period of rampant discriminatory housing practices in the mid-twentieth century.

8. ENVIRONMENTAL SETTING/GEOGRAPHICAL DATA

Property Land Area: 4.42 acres
Account Number: 00020907, 00021514, 00022542, 00028708, 00022633, 00022495, and 00030952.
District: 02

Environmental Setting Description: The environmental setting incorporates the entire subdivision as platted in 1963 except for Outlot B transferred to Community of Faith United Methodist Church.

Environmental Setting Justification: The environmental setting does not include Outlot B as it was never associated with the Clarksburg Heights subdivision.

9. PROPERTY OWNERS

Name: Karen Walker
Premise Address: 12701 Running Brook Drive, Clarksburg MD 20871

Name: Thomas Lee
Premise Address: 12705 Running Brook Drive, Clarksburg MD 20871

Name: Maryland Academy of Energy and Ecology, Inc.
Premise Address: Outlot A (N/A)

Name: Kim Hall Gregg & William Daniel Gregg
Premise Address: 12700 Running Brook Drive, Clarksburg MD 20871

Name: Katie R. Harper
Premise Address: 12704 Running Brook Drive, Clarksburg MD 20871

Name: Juan Sartor & Sidvany Pedraza
Premise Address: 12708 Running Brook Drive, Clarksburg MD 20871

Name: Jaroslav Plevko
Premise Address: 12712 Running Brook Drive, Clarksburg MD 20871

10. FORM PREPARED BY

Name/Title: John Liebertz, Cultural Resource Planer III, Montgomery County Planning Department
Date: August 2024

11. MAJOR SOURCES CONSULTED

Ancestry.com [numerous].

Clarke, Nina H and Lillian B. Brown. *History of the Black Public Schools of Montgomery County, Maryland, 1872-1961*. Washington, D.C.: Vintage Press, 1978.

Frye, Ethel Gardiner. *Wilson Wims: A Remarkable Life*. Self-published, 2014.

Evening Star [numerous].

Montgomery County Land Records, http://www.mdlandrec.net.

United States Commission on Civil Rights. *Hearing Before the United States Commission on Civil Rights, April 12-13, 1962*. Washington, D.C.: Government Printing Office, 1962.

Washington Post [numerous].

APPENDIX ONE:

ENVIRONMENTAL SETTING/GEOGRAPHICAL DATA

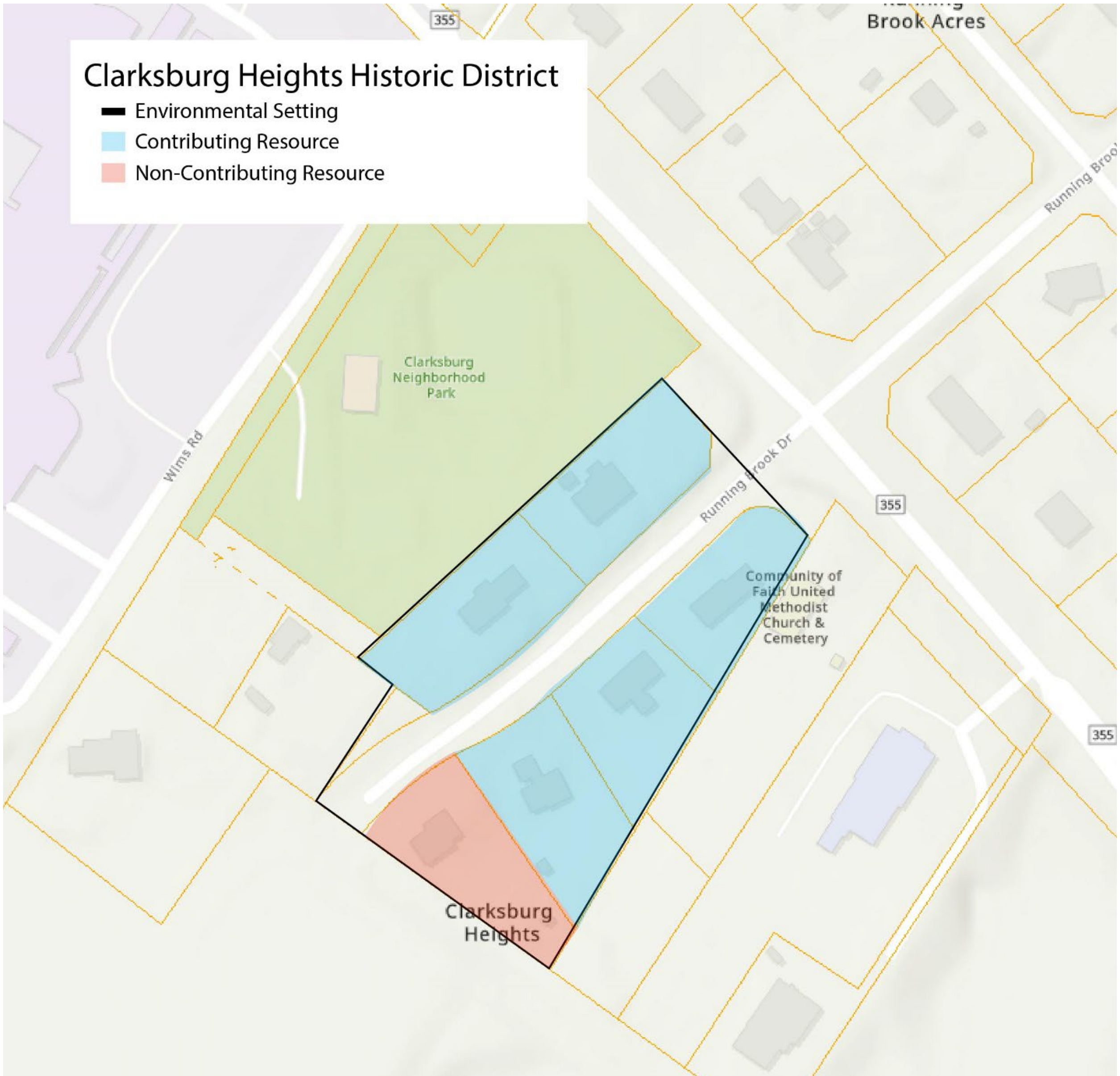


Figure 1: Proposed environmental setting for the Clarksburg Heights Historic District, Clarksburg, Montgomery County, Maryland.

APPENDIX TWO:

AERIAL PHOTOGRAPHS

Figure 1: Aerial photograph, 1970. The red outline shows the proposed Clarksburg Heights Historic District.

Figure 2: Aerial view showing the proposed Clarksburg Heights Historic District (red), 2023. The blue arrow points to the Clarksburg Neighborhood Park Activity Building, the green arrow points to Clarksburg High School, and the yellow arrow to Rocky Hill Middle School.

APPENDIX THREE:

PLAT OF THE CLARKSBURG HEIGHTS SUBDIVSION

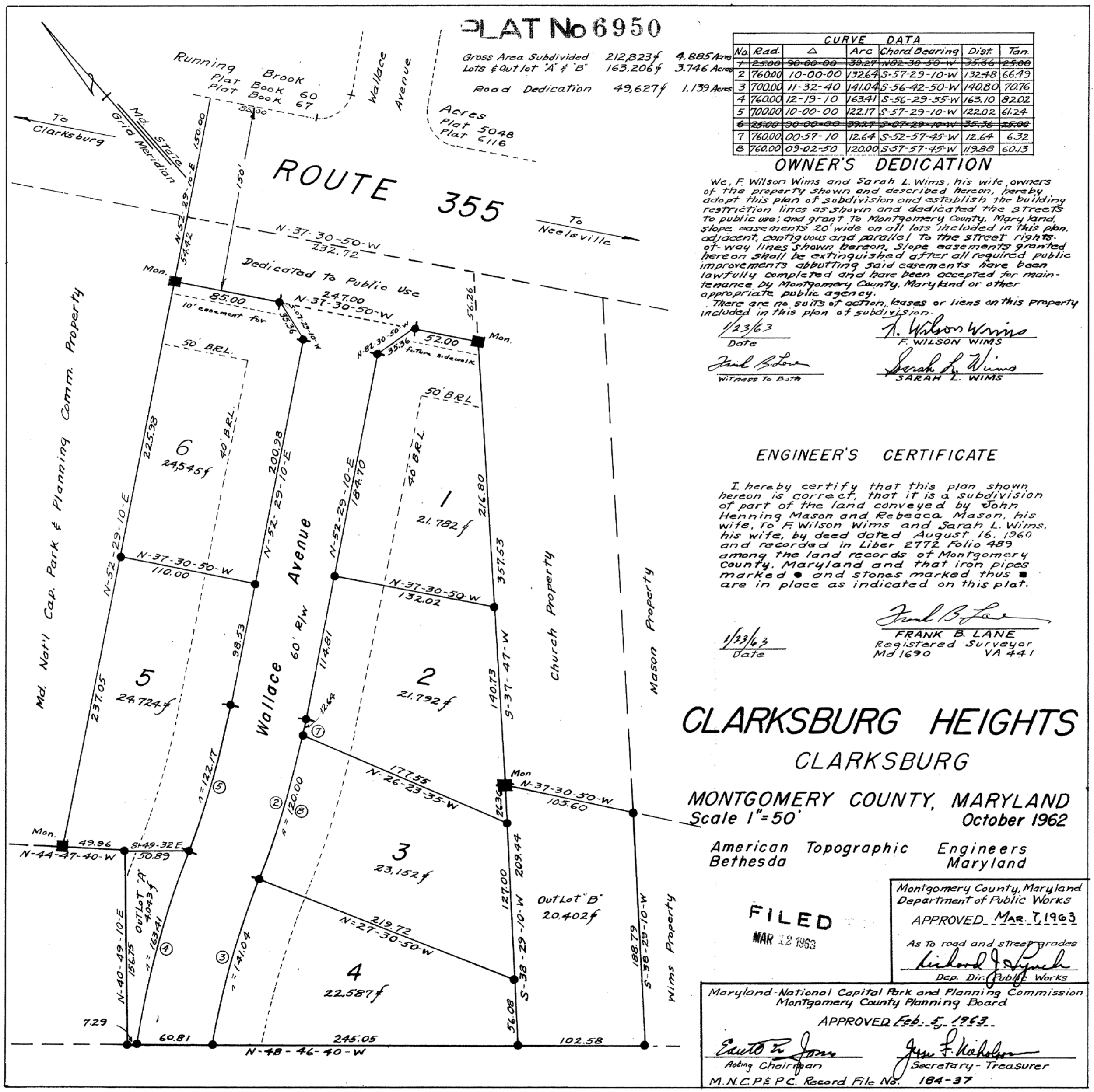


Figure 1: Plat of Clarksburg Heights, 1963.

APPENDIX FOUR:

EXTERIOR PHOTOGRAPHS OF CLARKSBURG HEIGHTS


Figure 1: View of 12701 Running Brook Drive, 2024. Note the infill of the garage (yellow arrow).

Figure 2: View of 12705 Running Brook Drive, 2024. The building appears to retain its original doors and windows.

Figure 3: View of 12700 Running Brook Drive, 2024.

Figure 4: View of 12704 Running Brook Drive, 2024.

Figure 5: View of 12708 Running Brook Drive, 2024.


Figure 6: View of 12712 Running Brook Drive, 2024.

APPENDIX FIVE:

HISTORIC PHOTOGRAPHS

Figure 1: Aerial view of 12701 Running Brook Drive (foreground), 1972. The blue arrows point to the Clarksburg Community Building in the background.
Source: Vintage Aerials.

Figure 2: Aerial view of 12705 Running Brook Drive (foreground), 1972. The blue arrows point to the Clarksburg Community Building in the background.
Source: Vintage Aerials.

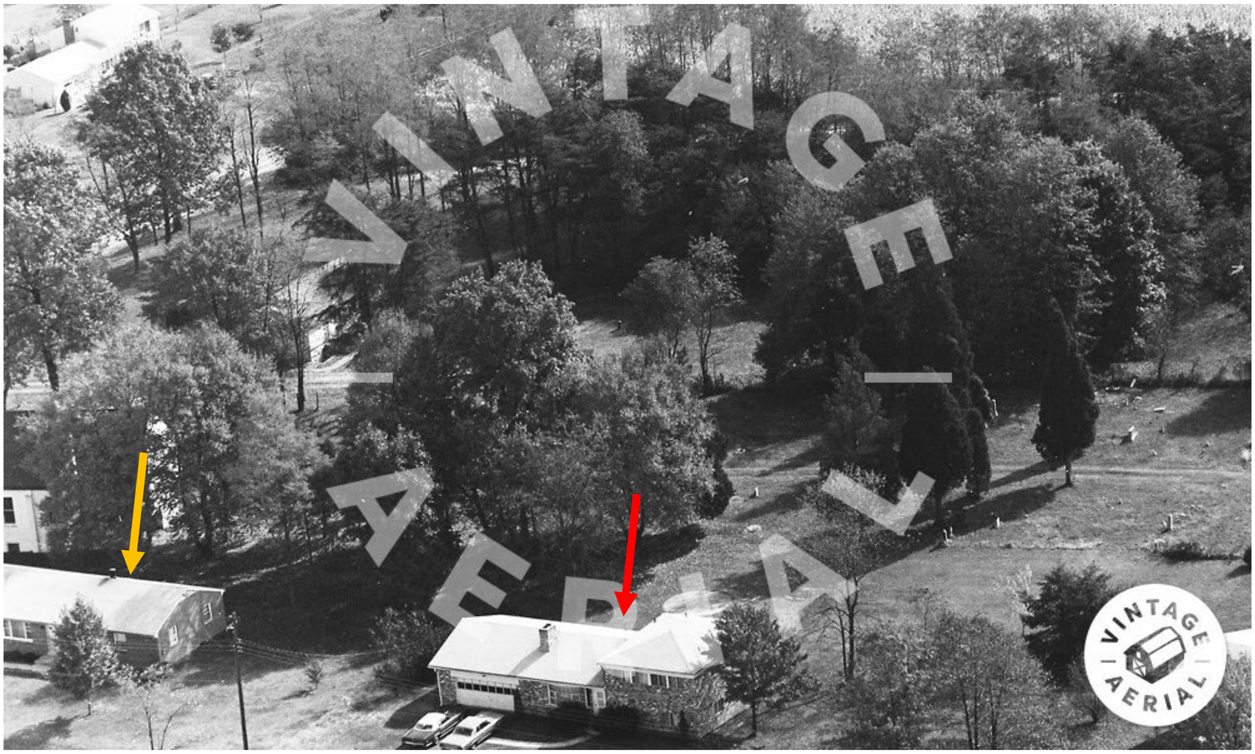


Figure 3: Aerial view of 12704 Running Brook Drive (red arrow) and partial view of 12700 Running Brook Drive (yellow arrow), 1972. The burial ground at Community of Faith United Methodist Church is visible in the background.
Source: Vintage Aerials.

Figure 4: Aerial view of 12708 Running Brook Drive (green arrow) and partial view of 12704 Runing Brook Drive (red arrow), 1972.
Source: Vintage Aerials.

APPENDIX SIX:

MARYLAND INVENTORY OF HISTORIC PROPERTIES FORM

Maryland Historical Trust
Maryland Inventory of Historic Properties Form

Inventory No. M: 13-61

1. Name of Property (indicate preferred name)

historic: Clarksburg Heights

other:

2. Location

street and number: Running Brook Drive — __ not for publication

city, town: Clarksburg — __ vicinity

county: Montgomery

3. Owner of Property (give names and mailing addresses of all owners)

name: Multiple

street and number: Multiple — telephone:

city, town: Multiple — state: MD — zip code: 20871

4. Location of Legal Description

courthouse, registry of deeds, etc. — liber — folio

city, town — tax map — tax parcel — tax ID number

5. Primary Location of Additional Data

- ____ Contributing Resource in National Register District
- ____ Contributing Resource in Local Historic District
- X Determined Eligible for the National Register/Maryland Register
- ____ Determined Ineligible for the National Register/Maryland Register
- ____ Recorded by HABS/HAER
- ____ Historic Structure Report or Research Report at MHT
- ____ Other:____

6. Classification

Category	Ownership	Current Function		Resource Count		
				Contributing	Noncontributing	
X district	___ public	___ agriculture	___ landscape	5	1	buildings
___ building(s)	X private	___ commerce/trade	___ recreation/culture			sites
___ structure	___ both	___ defense	___ religion			structures
___ site		X domestic	___ social			objects
___ object		___ education	___ transportation	5	1	Total
		___ funerary	___ work in progress			
		___ government	___ unknown			
		___ health care	___ vacant/not in use			
		___ industry	___ other:			

Number of Contributing Resources previously listed in the Inventory

______

7. Description

Inventory No. M: 13-61

Condition

X excellent
___ good
___ fair
___ deteriorated
___ ruins
___ altered

Prepare both a one paragraph summary and a comprehensive description of the resource and its various elements as it exists today.

The following information for the MIHP form is copied from the Determination of Eligibility completed by Erin Leatherbee for Clarksburg Heights as part of the MD 355 Bus Rapid Transit Improvements Project in 2018.

Introduction/Location:

Clarksburg Heights is a mid-20th century planned subdivision composed of 4.07 acres in Clarksburg, Montgomery County, Maryland. The subdivision consists of six single-family residential lots along Running Brook Drive on the southwest side of Frederick Road. The lots are addressed as 12700-12712 Running Brook Drive. The subdivision is bordered by a Methodist Church to the southeast, a middle school to the southwest, a public park and high school to the northwest, and Frederick Road to the northeast. The land on which the subdivision was developed was conveyed to F. Wilson and Sarah L. Wims by John and Rebecca Mason in 1960 (Montgomery County Deed Book [MCBD] 2772:489). In 1963, the property was subdivided into six lots, which were subsequently developed during the 1960s and early 1970s by Wilson Wims. Architecture in this subdivision consists of ranch, split level, and two-story houses with modest ornamentation and detailing. The subdivision played a role in suburbanization of Clarksburg by African-American families. In Clarksburg Heights, Wims established one of the first rent-to-own programs in the area in which he rented homes to African-American families who would otherwise be unable to afford to reside in Montgomery County. Eventually Wims sold the homes to these families when they could afford to buy. Wilson Wins is important at the local level for his role in supporting the suburbanization of Clarksburg and Montgomery County by African-American families.

Architectural Description:

According to current available tax data, five of the houses in Clarksburg Heights were constructed in 1963-1964 and the sixth house was constructed in 1974. The houses are all single-family dwellings situated on lots approximately 0.5-acre in size, though the shapes of the lots are not uniform (Maryland State Department of Assessments & Taxation [SDAT] 2018). The houses are oriented towards Running Brook Drive and have uniform building setbacks of approximately 60 feet. The houses towards the front (northeast) end of the subdivision overlook Running Brook Drive, while those at the rear (southwest) end of the subdivision are generally at road grade. Four of the lots are accessed via asphalt driveways, one via a gravel driveway, and one via a concrete driveway; most of the houses possess attached garages.

The houses represent typical architectural forms and styles of the time period in Montgomery County and include ranch, split-level, and two-story houses (KCI 1999: D-20-21). Detail and ornamentation on the houses in the subdivision are modest representation of architectural styles. The ranch houses, such as the example at 12700 Running Brook Drive, are one-story and possess either side-gable or cross-gable, low-pitched roofs. Front entrances are generally off-center and the fenestration is asymmetrical, and typically features a picture window. The split-level at 12704 Running Brook Drive features a two-story stacked unit with a single-story attached side wing and has a combination side-gable and pyramidal hipped roof. The narrow band of sliding windows on the second story is a modest expression of the horizontal emphasis of the contemporary style. The two-story house at 12712 Running Brook Drive has an overhanging second story and central entrance suggestive of the Colonial Revival style, but with a low-pitched roof, deep eaves, and an asymmetrical front porch, which is suggestive of a contemporary influence. The house at 12708 Running Brook Drive is a one-story rear-down dwelling with a side-gable roof and a front-gable front wing. The house has an asymmetrical plan, a low-pitched gable roof, lack of windows on the front facade, and an obscured and asymmetrical front entry door (KCI 1999 and MCAlester 2013).

All of the houses in the subdivision feature brick veneer siding, though some feature a combination of materials in addition to the brick including aluminum or vinyl siding and stone veneer. Primary entrances are generally on the front facade and are flush with the elevation. Two of the houses, the ranch at 12701 Running Brook Drive and the two-story house at 12712 Running Brook Drive, feature covered front porches which cover the primary entrance. On the house at 12708 Running Brook Drive, the primary entrance is located on the side of the front wing while a tripartite replacement sliding glass door faces the road. Brick chimneys, both interior and exterior, were present on most houses.

All of the houses in the subdivision have some form of alteration; replacement doors and windows are the most common alterations. Most of the primary entrance doors in the subdivision have been replaced with what appear to be metal or wood doors. Doors are generally paneled and most feature multi-light half-circle lights; the door at 12712 Running Brook Drive features a large decorative frosted-glass light. Most doors are set behind replacement storm doors. Most of the windows have been replaced throughout the subdivision with either metal or vinyl. On the two-story house at 12712 Running Brook Drive, the windows have been replaced with eight-over-eight sash windows in single and double configurations. The ranch house at 12700 Running Brook Drive possesses replacement four-over-one sash and tripartite windows on the front facade; the side and rear facades possess replacement vinyl one-over-one and awning windows. The ranch house at 12701 Running Brook Drive features a replacement one-over-one sash window and a multi-light Palladian window on the front elevation. The ranch house at 12705 Running Brook Drive appears to retain its original two-over-two sash windows and front door, though the condition of the garage door suggests it may be a replacement. Two of the ranch houses,12700 and 12705 Running Brook Drive, have what appear to be enclosed breezeways connecting the garage to the main house. At 12700, the breezeway has been enclosed with wood windows and a one-light metal door. The breezeway at 12705 Running Brook Drive has been enclosed with T1-11 siding and a two-panel, nine-light door behind a non-original wood storm door.

Rear additions appear on at least two of the houses, the most substantial of which is on the rear of the split-level house at 12704, which was added in the 1980s (NETR 1981 and 1989). This addition is clad in what appears to be hardiplank siding and has a gable roof covered with a combination corrugated plastic and asphalt shingles. Rows of wood windows are located on three sides of the addition and, in combination with the corrugated plastic roof, create the appearance of a greenhouse. A metal sliding glass door provides access to one side of the addition. The ranch house at 12701 Running Brook Drive features a rear sunroom with shed roof added sometime in the 1970s, according to aerial photographs (NETR 1970 and 1980). A large rear wood deck was also added to this house sometime after 1989. The deck features a gazebo with a pyramidal roof and is enclosed with lattice wood (NETR 1989 and 1993). Wood decks and concrete patios are extant on the rear of several other houses in the subdivision; the latter appearing to be original to the houses.

Landscaping throughout the subdivision consists of lawn, ornamental trees, foundation shrubs, and mature trees. Lots towards the front (northeast) end of the street tend to have few trees and shrubs, while the lots at the rear (southwest) end of the street have more wooded lots with mature trees. Wood fencing separating lots was observed on several properties, though it often appeared to be replacement or non-original based on the condition of the wood. Outbuildings in the subdivision generally consist of storage sheds, some of which appear to be original. A wood fence separates the southeast boundary of the subdivision from the adjacent church property, and a chain link metal fence at the end of the street separates the southwest boundary from the adjacent school property. No sidewalks or curbs were present along the road.

8. Significance

Inventory No. M: 13-61

Period	Areas of Significance	Check and justify below		
__ 1600-1699	__ agriculture	__ economics	__ health/medicine	__ performing arts
__ 1700-1799	__ archeology	__ education	__ industry	__ philosophy
__ 1800-1899	__ architecture	__ engineering	__ invention	__ politics/government
X 1900-1999	__ art	__ entertainment/ recreation	__ landscape architecture	__ religion
__ 2000-	__ commerce		__ law	__ science
	__ communications	__ ethnic heritage	__ literature	X social history
	__ community planning	__ exploration/ settlement	__ maritime history	__ transportation
	__ conservation		__ military	__ other: _____

Specific dates | **Architect/Builder** Wilson Wims

Construction dates 1963-1964; 1974

Evaluation for:

_______ National Register _________Maryland Register ____X____not evaluated

Prepare a one-paragraph summary statement of significance addressing applicable criteria, followed by a narrative discussion of the history of the resource and its context. (For compliance projects, complete evaluation on a DOE Form – see manual.)

The following information for the MIHP form is copied from the Determination of Eligibility completed by Erin Leatherbee for Clarksburg Heights as part of the MD 355 Bus Rapid Transit Improvements Project in 2018.

Clarksburg Heights is a planned development constructed at the end of the Modern Period of suburbanization (1930-1960) as described in Maryland's Suburbanization Historic Context and Survey Methodology (KCI 1999). In order to be considered eligible for listing in the National Register of Historic Places (NRHP) under Criterion A, a resource must not only be associated with important events or trends, it "must clearly be important within the associated context... and it must retain historic integrity" (Shrimpton et aal 1990: 12). To qualify for eligibility under Criterion B, a property must be associated with an individual "whose activities are demonstrably important within a local, State, or national historic context" and the property must be associated with that individual's productive life (Shrimpton et al 1990: 14-15). Clarksburg Heights is a planned development constructed in an African-American community in Clarksburg during a period of growth for the suburb. Although it was one of many mid-20th century planned subdivisions, Clarksburg Heights was unique in Clarksburg that it was constructed by F. Wilson Wims, a notable Clarksburg resident, to support African-American families who were trying to leave the more urban areas of Washington, D.C. Wims was an important individual to Clarksburg and Montgomery County, particularly for his efforts to assist African-American families with affordable housing in the growing suburban area. Through Clarksburg Heights, Wims offered one of the first rent-to-own programs for African-American families in Montgomery County, allowing those families to live in new, single-family houses in a planned suburban subdivision who would otherwise be unable to afford it. Additionally, Wims and his family resided in one of the houses in the development. While Wims constructed other individual houses nearby along Weems Road (now Wims Road), Clarksburg Heights is unique as a full neighborhood planned by Wims. Clarksburg Heights possesses a strong association with Wims' productive life and the actions through which he gained his significance at the local level. It is also associated with African American suburbanization overall in Clarksburg and Montgomery County. Although there have been alterations to the houses in the subdivision such as replaced doors and windows, the houses maintain their overall original design and footprint; additions, where present, are modest and confined to the rear of the dwellings. These alterations do not diminish the integrity of the overall neighborhood in a manner that limits its ability to convey its association. Therefore, Clarksburg Heights is recommended eligible for the NRIIP under Criteria A and B.

To be considered eligible for listing under Criterion C, the resource must "retain the characteristics of its style, type, period or method of construction and convey its role in architectural history." (KCI 1999: D-22). The houses within the subdivision only represent modest expressions of architectural styles and do not represent the work of a master or possess high artistic value. The neighborhood as a whole is a very modest planned development and does not embody an excellent example of a mid-20th century planned development. Although it features a cohesive design and architectural styles common to the Montgomery County suburbs during the Modern Period, the houses have been altered. Alterations such as replacement doors and windows as well as rear additions, though modest, prevent the houses from serving as significant examples of their architectural types and styles, as outlined in Suburbanization Historic Context and Survey Methodology (KCI 1999: D-12-14). Therefore, the resource is recommended not eligible for the NRHP under Criterion C. As an architectural resource, it was not evaluated under Criterion D.

Historic Context:

The area now known as Clarksburg began as a crossroads of Native American trails in the 1730s where a trading post was established by William Clark. In the 1750s, Michael A. Dowden opened a 17-room inn known as Dowden's Ordinary, which became a popular stop for those travelling along The Great Road (now known as Frederick Road) between Frederick and Georgetown. William Clark's grandson, John G. Clark surveyed the area and laid out lots in 1790, which spurred settlement in the area that eventually came to be known as Clarksburg. Clarksburg became a thriving commercial center of upper Montgomery County, spurred by a tanning industry and supported by related businesses. By 1879, Clarksburg had 250 residents and was the third largest town in Montgomery County. However, Clarksburg experienced a decline when the Metropolitan Branch of the B&0 Railroad arrived in nearby Gaithersburg and Germantown in 1873 . The convenience of the railroad drew business and development away from Clarksburg to the vicinity of the train depots to the south (Clarksburg Historical Society, Inc 2018; Parker and Reed 1979).

Shortly after the Civil War, small enclaves of African-Americans clustered together in Montgomery County (Walston and Reed 1979). In Clarksburg, landownership by African-Americans was achieved later than in other communities in the county, not beginning until the 1880s. However, African-American families in Clarksburg were generally more prosperous than in other communities, as evidenced by the quality of houses, churches, and gravestones still extant in Clarksburg. These landowners worked together to build churches and schools to serve their newly established communities. One of the earliest African-American enclaves in Clarksburg was known as Rocky Hill, which was a 24-acre tract of land purchased by Lloyd Gibbs in 1884. This enclave included several other dwellings, the Clarksburg Negro School (MIHP number M: 13-34), and the John Wesley Methodist Church (MIHP number M: 13-48) (MCDaniel 1979; MCGuckian 1992: 194).

The advent and increasing popularity of the automobile in the early decades of the 20th century resulted in an economic revival in Clarksburg as areas beyond the railroad axes became accessible and open to residential and commercial development. Frederick Road was improved in the 1930s, which allowed for easier travel by automobile between Clarksburg and Washington, D.C. Many tourists from Washington enjoyed driving through Clarksburg and the surrounding countryside and area homeowners rented out rooms for boarders and tourists (Clarksburg Historical Society, Inc 2018; Parker and Reed 1979). It was during this period that more middle-class white families were moving to the Montgomery County suburbs while African-American families were heading to Washington, D.C. in search of employment; the percentage of African-Americans residing in the County subsequently dropped. Construction of houses, schools, and churches for and by African-Americans in the county during this period generally occurred on lots within existing communities (MCGuckian 1992: 195-196).

F. Wilson Wims was an African-American builder and community activist whose family has resided in Montgomery County since the early 1800s. The Wims family was one of the first generations of free African-Americans to own land in the Rocky Hill enclave in Clarksburg (MCDaniel 1979: 74). In the 1940s, Wims worked as a builder, master carpenter, and brick mason in Clarksburg, first for Bowling and Gardiner Contractors and then for his own company. He constructed homes along Weems Road (now known as Wims Road), and employed young African-American workers (Frye 2014). In 1960, Wims purchased approximately 7.75 acres of land from John Henning and Hattie Rebecca Mason, descendants of another African-American family of the early Rocky Hill enclave (MCDB 2272: 489 and MCDaniel 1979: 74). Wims subdivided the land in 1963 and filed a plat called Clarksburg Heights that included six single-family lots along what as Wallace Avenue (now known as Running Brook Drive); the subdivision also included two outlots (MCPD 6950). Wims and his family resided in the one of the dwellings he built in Clarksburg Heights and established one of the first rent-to-own programs in the area. Wins rented homes to African-American families who would otherwise be unable to afford to reside in Montgomery County. Eventually Wims sold the homes to these families when they could afford to buy (Frye 2014 and The Gazette 2002).

F. Wilson Wims is also notable for his activism in the Clarksburg and Montgomery County community. Wims was involved in the establishment of the first public housing project in Montgomery County in Lincoln Park, Rockville. He was also very active in supporting youth activities. Wims established the Clarksburg Recreation Center on Wims Road, adjacent to Clarksburg Heights to the northwest. He founded and owned one of the first African American sandlot baseball teams, the Maryland Wildcats, and eventually sponsored the Junior Wildcats, an integrated youth baseball team. Wins also worked with historians in the County on projects and partnerships to ensure others can learn about Clarksburg's rich history (Frye 2014). Wim's contributions to Clarksburg and Montgomery County have been recognized though his induction to the Montgomery County Human Rights Hall of Fame in 2006. In 2008, Clarksburg High School named their baseball field, Wims Field, and after his death in 2014, the newest elementary school in Clarksburg was named Wilson Wims Elementary School (Montgomery County Public Schools 2018). Today, each lot in Clarksburg Heights has an individual owner including Wim's granddaughter, Karen F. Walker (SDAT 2018). Outlots A and B are now owned by the Maryland Academy of Energy and Ecology, Inc. and the Community of Faith Methodist Church, Inc., respectively, and are not included in the resource boundary (SDAT 2018)

9. Major Bibliographical References

Inventory No. 13-61

Maryland Determination of Eligibility Form, "Clarksburg Heights," M: 13-61, Prepared in 2018.

10. Geographical Data

Acreage of surveyed property	4.07		
Acreage of historical setting	4.07		
Quadrangle name	Germantown	Quadrangle scale:	1:24,000

Verbal boundary description and justification

Clarksburg Heights is a mid-20th century planned subdivision composed of 4.07 acres in Clarksburg, Montgomery County, Maryland. The subdivision consists of six single-family residential lots along Running Brook Drive on the southwest side of Frederick Road. The lots are addressed as 12700-12712 Rurming Brook Drive. The subdivision is bordered by a Methodist Church to the southeast, a middle school to the southwest, a public park and high school to the northwest, and Frederick Road to the northeast.

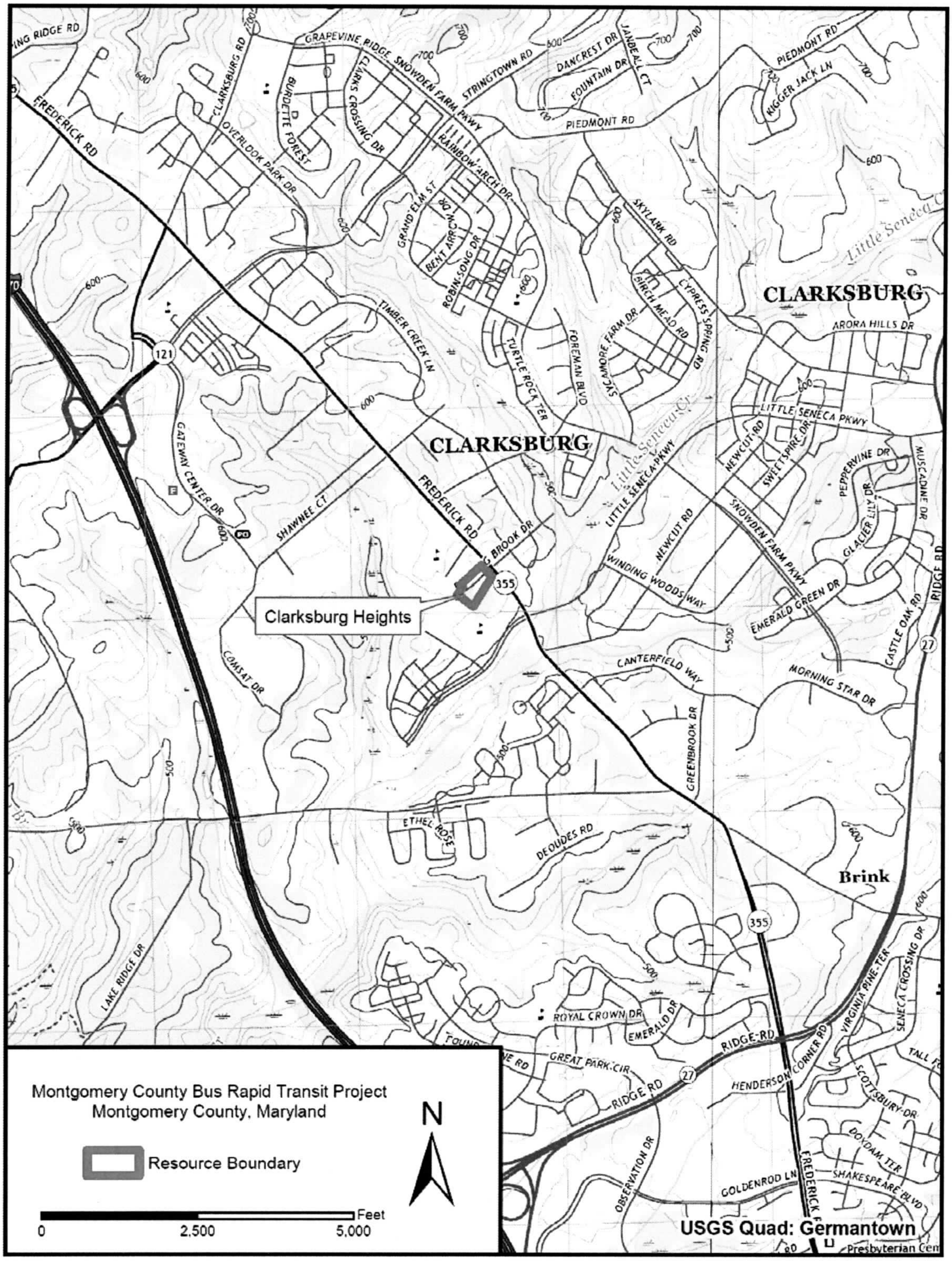
11. Form Prepared by (Reformattted 2018 Determination of Eligibilty Form)

name/title	Historic Preservation Office		
organization	Montgomery Planning	date	December 2024
street & number	2425 Reedie Drive	telephone	
city or town	Wheaton	state	MD

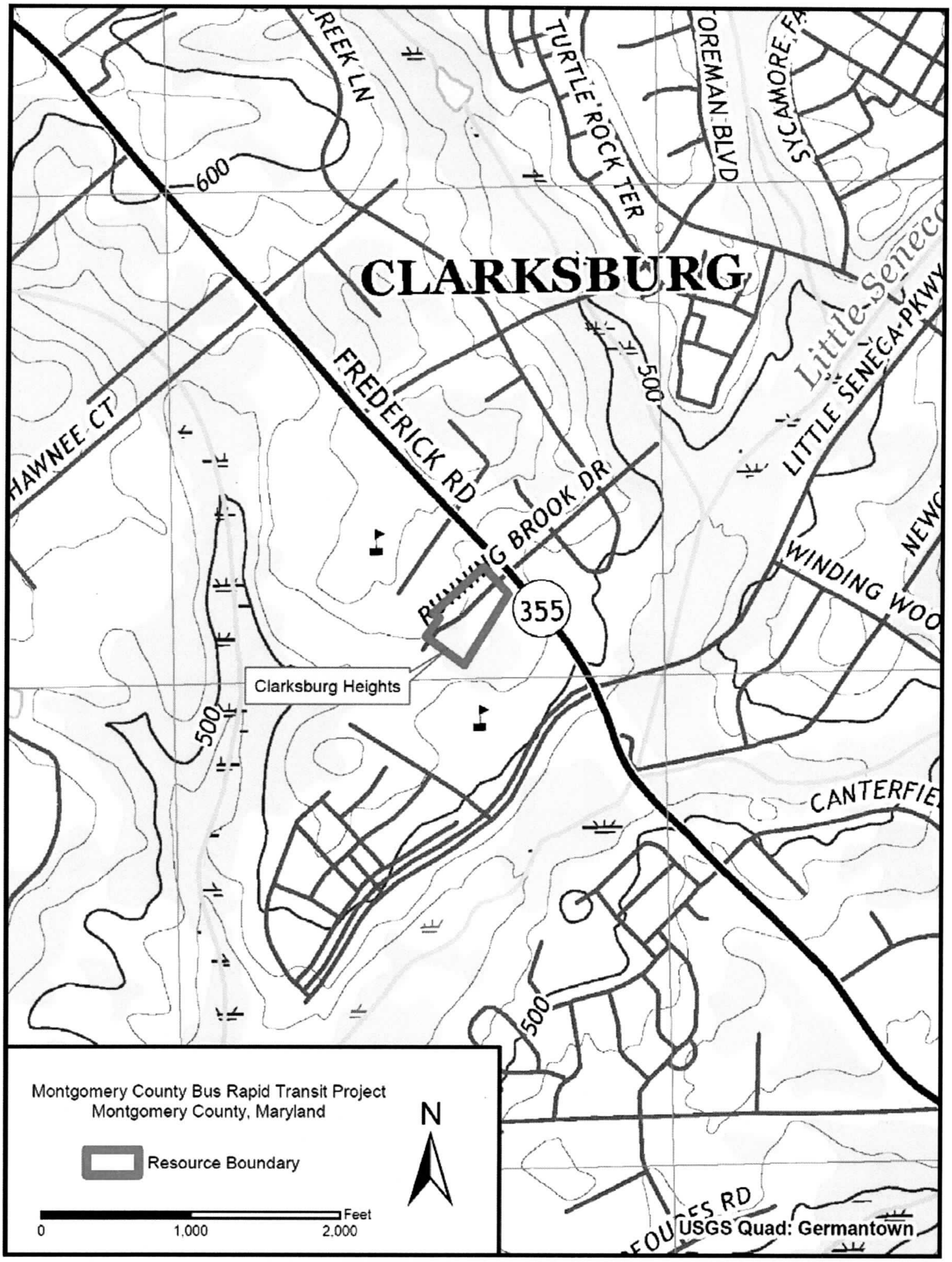
The Maryland Inventory of Historic Properties was officially created by an Act of the Maryland Legislature to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 supplement.

The survey and inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

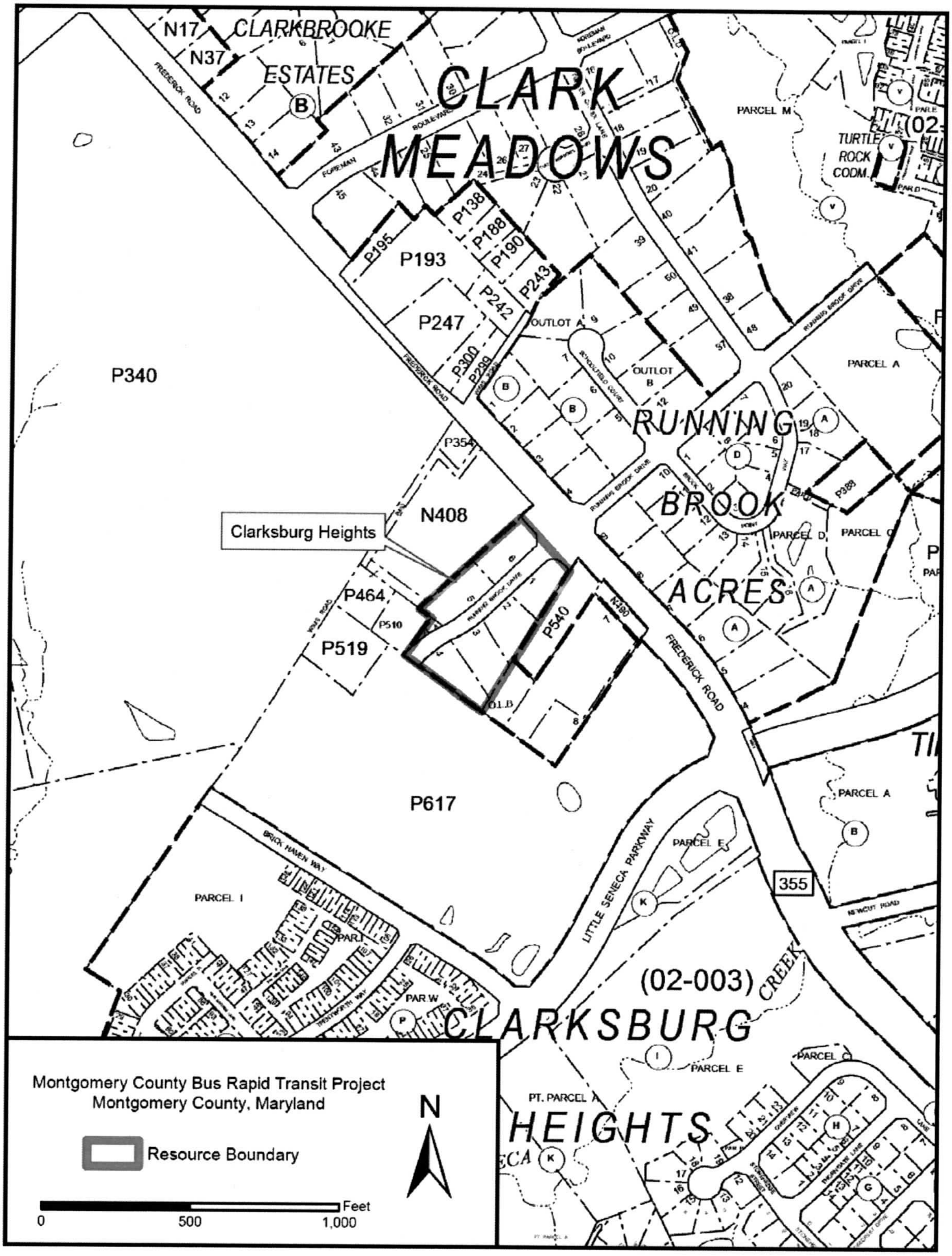
return to: Maryland Historical Trust
Maryland Department of Planning
100 Community Place
Crownsville, MD 21032-2023
410-697-9591



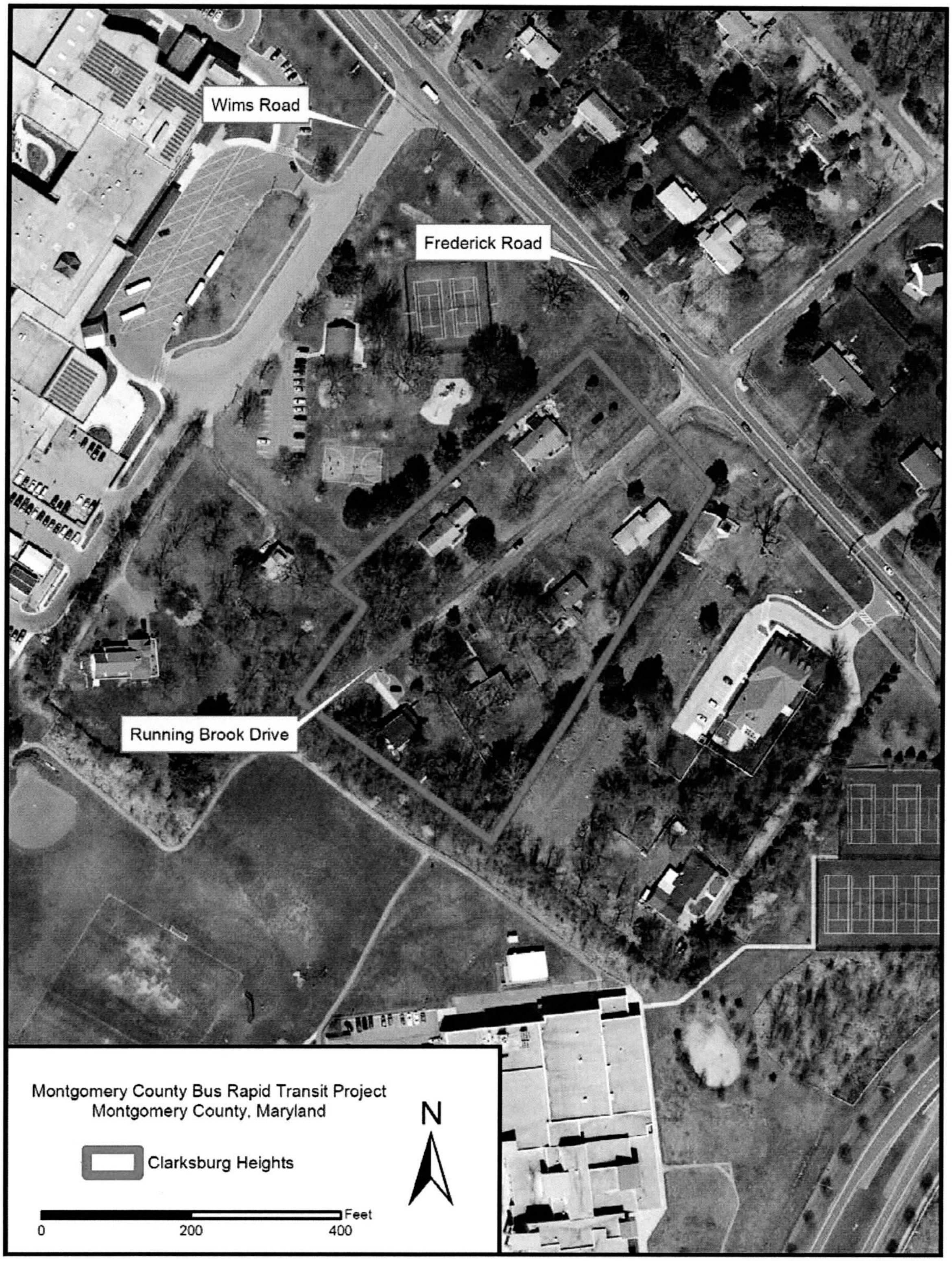
Location of Clarksburg Heights on 7.5-Minute Germantown, Maryland,
United States Geological Survey Topographic Map (USGS 2016)



Location of Clarksburg Heights on 7.5-Minute Germantown, Maryland, United States Geological Survey Topographic Map (USGS 2016)

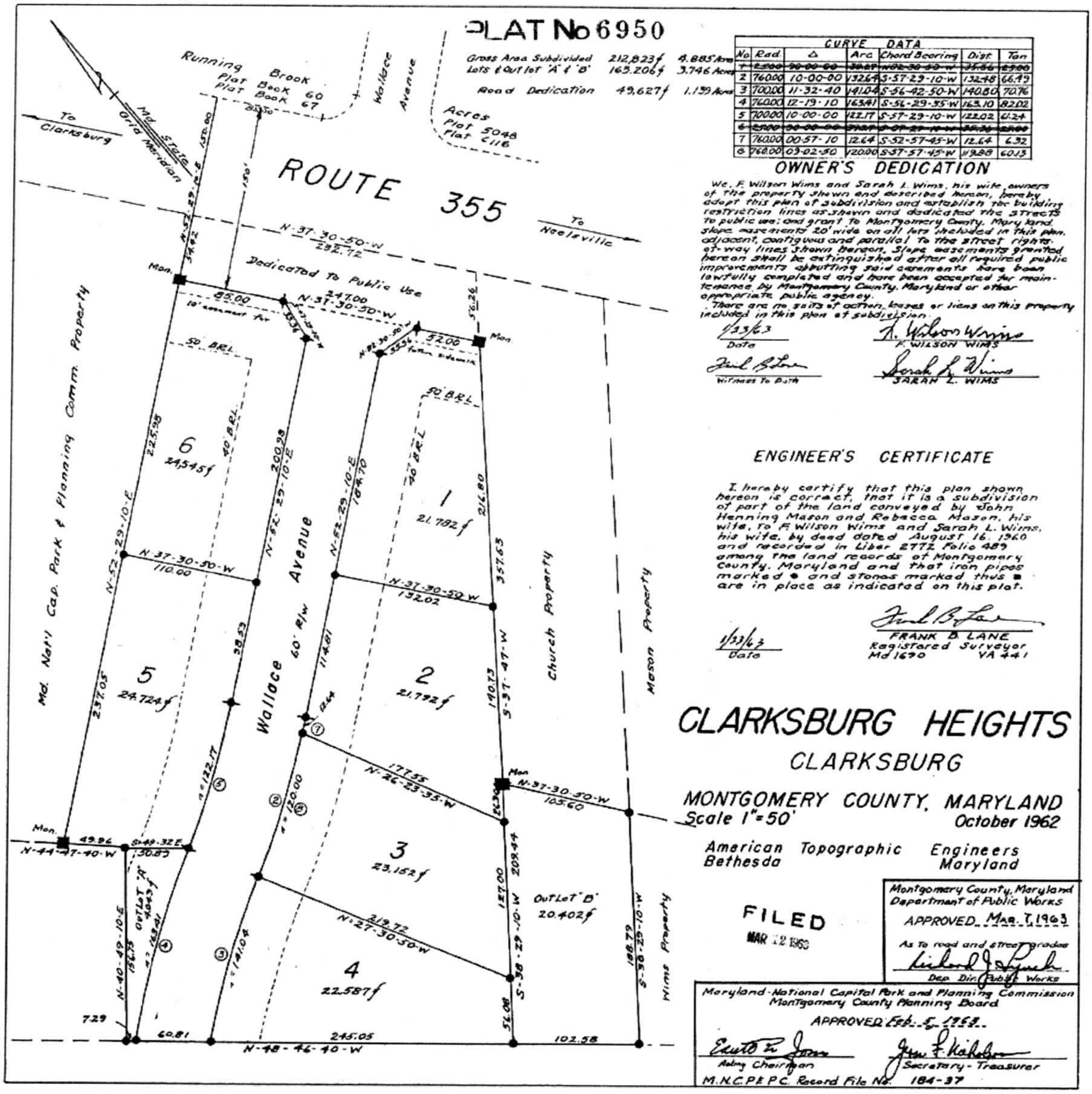


Location of Clarksburg Heights on Montgomery County Tax Map
(Maryland Department of Planning, Planning Data and Analysis 2013)



Location of Clarksburg Heights on 2017 Aerial Image
(Maryland's Mapping and GIS Data Portal 2017)

Clarksburg Heights (M: 13-61)
Clarksburg, Montgomery County, Maryland



1963 Plat of Clarksburg Heights (MCPB 6950)

TIFF Image File Name	Description	Date Taken	Ink	Paper	Brand, Make & Dye Type of DVD
M; 13-61_2018-01-24_01.tif	View of houses along southeast side of Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_02.tif	View of houses along northwest side of Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-03-13_03.tif	Front elevation of 12700 Running Brook Drive	3/13/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_04.tif	Detail of garage and enclosed breezeway at 12700 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_05.tif	Front elevation of 12704 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_06.tif	Detail of replacement front door and awning windows on 12704 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_07.tif	View of rear elevation of 12700 Running Brook Drive and rear addition on 12704 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-03-13_08.tif	Front elevation of 12708 Running Brook Drive	3/13/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-03-13_09.tif	Front elevation of 12712 Running Brook Drive	3/13/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_10.tif	Front elevation of 12705 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_11.tif	Detail of enclosed breezeway on 12705 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-01-24_12.tif	Front elevation of 12701 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R

TIFF Image File Name	Description	Date Taken	Ink	Paper	Brand, Make & Dye Type of DVD
M; 13-61_2018-01-24_13.tif	Detail of siding and replacement windows on 12701 Running Brook Drive	1/24/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-61_2018-03-13_14.tif	Side elevation and rear addition of 12701 Running Brook Drive	3/13/2018	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R


GUARDIAN
1.800.PROTECT


H

COMMUNITY OF FAITH UNITED METHODIST CHURCH & CEMETERY
CLARKSBURG, MONTGOMERY COUNTY, MD 20871

MASTER PLAN HISTORIC SITE DESIGNATION FORM
JANUARY 2025

Montgomery Planning

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

Maryland – National Capital Park and Planning Commission
Montgomery County Planning Department
Master Plan Historic Site Designation Form

1. NAME OF PROPERTY

Historic Name: John Wesley Methodist Episcopal Church and Cemetery; Pleasant View Methodist Episcopal Church and Cemetery
Current Name: Community of Faith United Methodist Church and Cemetery
Other Names: Rocky Hill Church and Cemetery; Centenary Methodist Episcopal Church
Maryland Inventory of Historic Properties #(s): 13-48

2. LOCATION OF PROPERTY

Address Number and Street: 22420 Frederick Road
County, State, Zip: Clarksburg, Montgomery County, Maryland 20871

3. ZONING OF PROPERTY

R-200: The intent of the R-200 zone is to provide designated areas of the County for residential uses with a minimum lot size of 20,000 square feet. The predominant use is residential in a detached house.

4. TYPE OF PROPERTY

A. Ownership of Property

_X_ Private
___ Public
___ Local
___ State
___ Federal

B. Category of Property

_X_ Private
___ Public
___ Local
___ State
___ Federal

C. Number of Resources within the Property

Contributing	Noncontributing
_1_ Buildings	_1_ Buildings
___ Structures	___ Structures
___ Objects	___ Objects
_1_ Archaeological Sites	___ Archaeological Sites
_2_ Total	_1_ Total

D. Listing in the National Register of Historic Places: In 2019, the Maryland Historical Trust found the Community of Faith United Methodist Church and Cemetery ineligible for the National Register of Historic Places.

5. FUNCTION OR USE

Historic Function(s): RELIGION: Religious facility, Church; FUNERARY; Cemetery

Current Function(s): RELIGION: Religious facility, Church; FUNERARY; Cemetery

6. DESCRIPTION OF PROPERTY

Site Description:

The Community of Faith United Methodist Church and Cemetery is located in Clarksburg, Maryland. The church is on the west side of Frederick Road (MD 355), approximately 1.25 miles southeast of the Clarksburg Master Plan Historic District. The congregation acquired the property in 1886, established the cemetery, and then constructed the first church by 1894. The trustees built the current church building, the second on the site, in 1925. The property is bound by the Clarksburg Heights subdivision to the north, Bennett Creek Animal Hospital to the south, Frederick Road to the east, and Rocky Hill Middle School to the west.

The Community of Faith United Methodist Church is set back approximately 100 feet from Frederick Road on a narrow, one-acre lot. A wide concrete sidewalk, installed in 2020, runs parallel to the public right-of-way. An asphalt driveway towards the southeast corner of the lot provides access to the property from Frederick Road. The driveway leads to a large asphalt parking lot that wraps the east (façade) and south (side) elevations of the church. There is a small, wood-frame, non-historic shed to the south of the church.

The cemetery is located to the west (rear) of the church. A gravel path bisects the cemetery. In 1963, F. Wilson and Sarah Wims conveyed to the church Outlot B of the Clarksburg Heights subdivision, a .47-acre parcel to the west (rear) of the cemetery, allowing for the expansion of the burial ground. The north, south, and west boundaries of the cemetery is lined with coniferous and deciduous trees and abuts various fences installed by adjacent property owners. A line of mostly coniferous trees delineates the original boundary of the cemetery from the later expansion.

Architectural Description (see App. 4 and App. 5 for current and historic photographs):

Community of Faith United Methodist Church is a Gothic Revival-styled church constructed in 1925. The one-story, front-gable church is adorned with an integrated side tower with a flat roof. The vaulted ceiling in the nave paired with the partially exposed basement accounts for the building's multi-story appearance. The wood-frame church rests on a brick foundation. The original common-bond brick veneer walls are covered with non-historic vinyl siding. The structure supports a front gable roof sheathed in asphalt shingles. Typical fenestration consists of one-over-one, double-hung, wood-sash, stained glass windows on the first story and vinyl windows in the basement. In the late 1950s, the congregation constructed a rear addition to the church. The concrete block section is clad in the same matching vinyl as the original building and ties directly into the asphalt shingle gable roof creating a seamless transition.

When constructing the building, C.W.S. Graves and Charles Green, African American contractors from Washington, D.C., articulated and divided the three-bay wide, front-gable façade using a tripartite form.[1] The front gable, which features the entrance, stands proud of the main building plane, and distinguishes itself from the substantial side-tower to the south. The northern six-foot section of the front gable is slightly setback and differentiated with a stepped gable roofline. This division creates symmetry and balance to the façade, but retains the central aisle interior floorplan.

The three-bay, facade (east elevation) is accessed by a non-historic concrete stair and ramp with metal pipe railings. The first story of the front gable features the central entrance that consists of a large, pointed arch opening divided into three parts: 1) replacement, double-leaf, metal doors with small diamond windows; 2) a transom with vertical wood siding; and 3) a wood-frame, three-light, pointed arch, stained glass window. In the upper gable end, there is a narrow, wood-frame, single-light, stained glass window. The tower features a typical stained-glass window on the first story and a rectangular louvered opening in its belfry. The original

[1] The architect of the building remains unknown.

architectural details of the tower including the brick corbelling and pointed arch, wood, louvered openings at its belfry are obscured by the non-historic vinyl siding. A cement plaque is located towards at the base of the tower and reads, "The New John Wesley M.E. Church Was Redeemed June llth 1932 Rev. J.H. Lewis, Pastor."

The side elevations consist of the four-bay wide original church and one-bay, non-historic rear addition constructed ca. 1960. In general, each bay of the original church is delineated by a buttress. Fenestration consists of a typical basement-level and first story windows. Ornamentation is otherwise limited on these elevations. The south elevation of the tower provides an additional point of access via a non-historic, single-leaf, metal door accessed via a concrete stair.

For a detailed architectural description of the building, refer to Appendix 4: MIHP Form.

7. STATEMENT OF SIGNIFICANCE

A. Applicable Designation Criteria as described in Chapter 24A: Historic Resources Preservation, §24A-3, Montgomery County Code

Community of Faith United Methodist Church and Cemetery meets three of the nine designation criteria as described in §24A-3 of the Montgomery County Code. See Section J of this report for a detailed analysis.

B. Statement of Significance:

The Community of Faith United Methodist Church and Cemetery in Clarksburg, Maryland, is a significant Gothic Revival-styled brick church built in 1925. The church represents the development of the African American Rocky Hill community and the lives of its residents during the Jim Crow era of segregation. The church trustees acquired the property in 1886, established the burial ground, and constructed a wood-frame church by 1894. After the original church burned in 1924, the congregation hired Charles W. Spurgeon Graves and Charles Green, two highly skilled African American builders from Washington, D.C., to construct this high-styled place of worship in a rural location. The building served as a center for religious activity, but more importantly, functioned as an essential location where African American residents of Clarksburg had opportunities for leadership, activism, education, and social engagement. Many of these leaders are buried in the church cemetery and no other site or resource remains to reflect their contribution to the development of the county. Community of Faith United Methodist Church and Cemetery has fronted Frederick Road for nearly a century and serves as a link to the past, preserving the legacy of the African American community in Clarksburg.

C. Period of Significance: 1886-1963

D. Significant Dates: 1886 (acquisition of the property); 1894 (approximate construction of the first church);1926 (construction of second church); 1963 (acquisition of the adjacent parcel for expanded cemetery)

E. Significant Persons: Trustees of the Church

F. Areas of Significance: African American Heritage; Social History

G. Architect/Builder: Charles W. Spurgeon Graves and Charles Green

H. Narrative:

Historic Context: Rocky Hill

Rocky Hill—a historic African American community—originated in the late twentieth century to the south of the Village of Clarksburg.[2] After the Civil War, African American homeownership in Clarksburg remained limited. In 1874, George T. Williams acquired 23 perches of land (approximately .14-acres) from Mary and William Waters. The property abutted the Clarksburg Methodist Episcopal Church in Clarksburg.[3] Williams later served as one of the first trustees of the Pleasant View Methodist Church (the present Community of Faith United Methodist Church) and the Rocky Hill segregated Black elementary school.[4] In 1880, at least two other African American families rented properties in or near the village including John H. and Emma Wims, and John and Rachel Snowden.[5] Black homeownership, however, remained sparse until Lloyd N. Gibbs Jr. and Elizabeth Gibbs (his mother) purchased 24 acres for $600 from Abraham H. and Violetta Rose in 1884.[6] This purchase propelled the development of Rocky Hill.

The Gibbs family were held in slavery by Thomas S. Nicholls and Charles T. Purdum until the emancipation of enslaved persons in Maryland. Purdum, who lived to the south of the village, submitted evidence of ownership to the *Montgomery County Commissioner of Slave Statistics* for the following members of the Gibbs family: Elizabeth Jane (female, 37 years old), Henrietta M. (female, 11 years old), Lloyd N. (male, 9 years old), Mary C. (female, 7 years old), Flora E. (female, 4 years old), and Eliza A. (female 2 years old).[7] Similarly, Nicholls claimed that he held "Lloyd [N.] Gibbs (male, 40)," likely the husband of Elizabeth and father of Lloyd N., in slavery.[8] The *Baltimore Sun* noted that Lloyd Gibbs, enslaved by Lamper Nicholls, was drafted in 1864, but no service records confirm his enlistment.[9] After the Civil War, the Gibbs family remained in Clarksburg. In 1870, Lloyd N. and Elizabeth rented a house north of Clarksburg village (potentially as a tenant and laborer for Hanson Miles) on Frederick Road where they lived with their four children, Henrietta, Lloyd, Mary, and Eliza. After their acquisition of the Rose property in 1884, the Gibbs constructed a new house on Frederick Road.

During the 1880s and 1890s, African American homeownership increased in Clarksburg and Rocky Hill. Early landowners included, but were not limited to Benjamin F. Wims, Townsend Coats, and Thomas Snowden, who

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[2] George W. McDaniel, *Black Historical Resources in Upper Western Montgomery County* (Montgomery County, MD: Sugarloaf Regional Trails, 1979), 73.

[3] Williams acquired additional parcels in 1888 and 1893. Montgomery County Circuit Court, "William and Mary Waters to George T. Williams," October 8, 1874, Liber EBP 13, Folio 65, http://www.mdlandrec.net; Montgomery County Circuit Court, William and Mary Waters to George T. Williams," September 7, 1888, Liber JA 11, Folio 303, http://www.mdlandrec.net; Montgomery County Circuit Court, "Sarah I. Sellman to George T. Williams," February 7, 1893, Liber JA 36, Folio 376, http://www.mdlandrec.net.

[4] Montgomery County Circuit Court, "Lloyd N. and Sarah Gibbs to George T. Williams, James H. Mason, and Townsend Coats, Trustees of the Methodist Episcopal Church," October 13, 1886, Liber JA 9, Folio 399, http://www.mdlandrec.net.

[5] John Wims and John Snowden were listed as farm laborers. 1880 United States Federal Census, "John Snowden," Ancestry; 1880 United States Federal Census, "John Wims," Ancestry.

[6] After the death of his mother, Lloyd N. Gibbs conveyed 12-acres of the property to his Eliza Gibbs, his sister. Montgomery County Circuit Court, "Lloyd N. Gibbs and Sarah Gibbs to Eliza Gibbs," August 21, 1885, Liber EBP 35, Folio 385, http://www.mdlandrec.net; Montgomery County Circuit Court, "Abraham H. and Violetta Rose to Lloyd N. and Elizabeth Gibbs," August 13, 1884, Liber EBP 32, Folio 409, http://www.mdlandrec.net.

[7] Montgomery County Commissioner of Slave Statistics, "Charles T. Purdum," March 7, 1867, 145, Archives of Maryland Online.

[8] Montgomery County Commissioner of Slave Statistics, "Thomas S. Nicholls," May 29, 1867, 96, Archives of Maryland Online.

[9] Additional research should be conducted into the service of Lloyd Gibbs in the Civil War. "The Draft in Maryland," *Baltimore Sun*, November 19, 1864, Newspapers.com.

purchased properties in 1886 and 1889.[10] Warner Wims acquired properties in 1891 and Gassaway Matthews in 1897.[11]

By 1900, the United States Federal Census recorded 424 African American residents in District No. 2. Although the boundaries of this enumeration district far exceed the Rocky Hill and Clarksburg community, at least 42 of these residents, from the Davis, Foreman, Gray, Green, Hawkins, Mason, Moore, Snowden, Williams, and Wims families, were later buried at the Community of Faith United Methodist Church's Cemetery. Occupations of owners and renters primarily included day laborers, farmers, mail carriers, servants, washers, cooks, and whitewashers. These residents not only built their homes but also established or advocated for two essential community pillars: a school and church. Both institutions provided opportunities for education, social support, activism, and meeting spaces during an era of widespread discrimination in Montgomery County.

Historic Context: Rocky Hill Segregated Black Elementary School (1873 – 1962)

This report explores the establishment of the segregated Black elementary school due to its significance to the Rocky Hill community, the function of the church as a schoolhouse in the late nineteenth century as noted by oral histories, and the use of the abandoned schoolhouse as an auxiliary building in the mid-twentieth century.

Maryland's General Assembly mandated segregated public education for Black students in 1872. The legislature repealed and re-enacted the Public Education Act (first established in 1867) to provide a general system of free public schools in the state. The legislation required the Comptroller to appropriate an annual sum for the support of Black schools. The funding failed to meet the needs of the populace or proportionally match the proceeds from the public-school tax devoted to white schools. By the end of the 1870s, the Board of Education had established 20 Black schools in Montgomery County with 1,525 different students in attendance over the course of the year.

In 1878, the Montgomery County Board of School Commissioners allocated state funds to purchase a lot for a schoolhouse on the road between Neelsville and Clarksburg. The African American patrons, however, were required to construct the building themselves.[12] That same year, Abraham and Violetta Rose sold the Board of Education a quarter-acre site for $50 at the present-day intersection of Frederick Road and Wims Road.[13] It is likely that Rocky Hill residents constructed a schoolhouse on the property shortly thereafter, though the exact date of construction remains unclear.[14] George T. Williams—who would later serve as one of the first trustees of Community of Faith United Methodist Church—served as an early trustee of the school.[15]

The Montgomery County Board of Education documented the development of the Rocky Hill Elementary School in their meeting minutes. In 1887, the board allocated $10 to the Clarksburg School (then identified as School No. 1, Election District 2) to construct an outhouse.[16] The following year, the board closed and

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[10] Montgomery County Circuit Court, "George W. Hilton and Francis C. Hilton to Townsend Coates," August 18, 1886, Liber JA 3, Folio 233, http://www.mdlandrec.net.

[11] Montgomery County Circuit Court, "George F. Linthicum to Warner Wims," August 1, 1891, Liber JA 29, Folio 138, http://www.mdlandrec.net; Montgomery County Circuit Court, "James H. and Sarah E. Purdum to Gassaway Matthews," April 20, 1897, Liber JA 58, Folio 176, http://www.mdlandrec.net.

[12] Nina H. Clarke and Lillian B. Brown, *History of the Black Public Schools of Montgomery County, Maryland, 1872-1961* (New York: Vintage Press, 1978), 4. "Montgomery County Board of Education, Meeting Minutes, 1839-1927," (Maryland State Archives, TM62-1).

[13] This conveyance occurred six years prior to the acquisition of the adjacent 24-acre property by the Gibbs family. Deed

[14] Nina H. Clarke and Lillian B. Brown documented and noted the conflicting dates of construction of the Rocky Hill Elementary School in *History of the Black Public Schools of Montgomery County, Maryland, 1872 – 1961*. Clarke and Brown, 7-10.

[15] The minutes noted that rent or fuel could not be paid to the trustees of the Martinsburg school and that the same message should be conveyed to the trustees of Clarksburg. It is unclear, however, if both rent and fuel applied to Clarksburg. "Montgomery County Board of Education, Meeting Minutes, 1839-1927," (Maryland State Archives, TM62-1), November 5, 1880.

[16] The Clarksburg School, then identified as School No. 1, Election District 2, may have had a different school number prior to 1887.

combined multiple African American schools for a single year to save money for new school buildings.[17] This included the closure of the Clarksburg and Hyattstown schools in 1887-1888. The Board of Education sold the old Clarksburg (Rocky Hill) school, likely built by the residents a decade earlier, for $25.[18] On May 15, 1888, the board noted the building of a "colored school house near Damascus and one near Clarksburg [Rocky Hill]…"[19] A similar entry appeared in the meeting minutes in 1894, but evidence still suggests an 1888 date of construction, as the Rocky Hill school reopened in 1889.[20]

In the 1930s, the Board of Education closed the segregated Black elementary school in Boyds (now known as the Boyds Negro School) and transferred the students to Rocky Hill. The board constructed an addition at Rocky Hill to accommodate the increased number of students. The two-room school remained open until the mid-twentieth century when Montgomery County constructed four equalization elementary schools prior to the Supreme Court's ruling in Brown vs. the Board of Education of Topeka I (1954). African American children from Poolesville, Boyds, Sugarland, Sellman, and Clarksburg were all transferred to the new, modern Edward U. Taylor Elementary School, Boyds, in 1952. The Board of Education permitted the John Wesley Methodist Episcopal Church—a predecessor to the Community of Faith United Methodist Church—the use of the abandoned elementary school for a community hall. In 1960, the board described the school:

> One story, 2 room frame schoolhouse 22' x 70', one section built on a stone and the other on a cinder block foundation. Two brick chimneys. Galvanized iron roof. Poor condition. Three room cinder block building containing 2 pit type toilets and a coal storage room. Poor condition.[21]

The following year, the Board of Education conveyed the property, along with five other abandoned schools, to the Maryland-National Capital Park and Planning Commission for the establishment of a present-day Clarksburg Neighborhood Park and Activity Building. [22] In 1963, the commission approved the demolition of the school building.[23]

Historic Context: Community of Faith United Methodist Church and Cemetery

In 1886, Lloyd N. Gibbs and Sarah Gibbs sold to George T. Williams, Townsend Coats, and James H. Mason, trustees of the Methodist Episcopal Church, one-acre of land as a place of worship and burial ground for $90.[24] The deed stated:

> In trust that the said premise shall be used, kept, maintained, and disposed of as a place of divine worship for the use of the ministry and membership of the Methodist Episcopal Church in the United

[17] Clarke and Brown mistakenly identified the Clarksburg school as School No. 2, Election District 2. At this time, School No. 2 identified the Hyattstown School.
[18] "Montgomery County Board of Education, Meeting Minutes, 1839-1927," (Maryland State Archives, TM62-1), November 22, 1887.
[19] There are inconsistencies in the meeting minutes about acquisition of the property and construction of the building. "Montgomery County Board of Education, Meeting Minutes, 1839-1927," (Maryland State Archives, TM62-1), May 15, 1888 and July 2, 1889.
[20] Maryland Department of Education, *Twenty-Second Annual Report of the State Board of Education showing the condition of Public Schools of Maryland for the Year Ending September 30, 1888* (Baltimore, MD: Press of Thomas & Evans, 1889), 148-149; Maryland Department of Education, *Twenty-Third Annual Report of the State Board of Education showing the condition of Public Schools of Maryland for the Year Ending September 30, 1889* (Annapolis, MD: George T. Melvin, 1890), 152-153.
[21] Board of Education (Montgomery County, Maryland), "Description of Abandoned School Site," November 11, 1960, M-NCPPC Archives.
[22] Planning Board (Montgomery County, Maryland), "Meeting Minutes, December 28, 1960," M-NCPPC Archives; Montgomery County Circuit Court, "Board of Education of Montgomery County to Maryland-National Capital Park and Planning Commission," June 20, 1961, Liber CKW 2877, Folio 163, http://www.mdlandrec.net.
[23] Planning Board (Montgomery County, Maryland), "Meeting Minutes, May 23, 1961," M-NCPPC Archives.
[24] The deed for the church property was recorded in 1888. Montgomery County Circuit Court, "Lloyd N. and Sarah Gibbs to George T. Williams, James H. Mason, and Townsend Coates," October 13, 1886, Liber JA 9, Folio 399, http://www.mdlandrec.net.

> States of America…. A part or portion of said lot or land may be set apart and used as a place of burial, but so as not to encroach upon or interfere with its use for the purpose above designated.[25]

Burials at the property likely started shortly after acquisition of the property as the oldest extant monument marks the grave of John Wesley Snowdon (ca. 1847-1886).[26] Prior to the Civil War, Snowdon was enslaved with other members of his family by Lyde Griffith on a planation to the east of Damascus.[27] Oral histories suggest that the congregation first held services in the homes of nearby residents and then built a modest wood-frame church named Pleasant View Methodist Episcopal Church at the property. The precise date of construction, however, remains unclear. In 1894, the *Evening Star* reported the following:

> The colored Methodists of Rocky Hill have just completed the erection of a comfortable church edifice, which will be known as Centenary Methodist Episcopal Church. Rev. Joshua Barnes is the pastor.[28]

While the name "Centenary" does not align with "Pleasant View," this may still refer to the first wood-frame church on the subject property. Outside of Clarksburg, there are no other known areas referred to as "Rocky Hill" and the name "Centenary Church" does not correspond to a known African American church in Montgomery County. Furthermore, in 1892, Rev. Joshua Barnes served as pastor for the Clarksburg charge in the Washington District of the Washington Conference of the Methodist Episcopal Church.[29] A charge is a group of one or more congregations led by a single minister. Although the boundaries of the charges for the Washington District remain unclear, it seems likely that the congregation was part of the Clarksburg charge that contained eight churches. This made the Clarksburg charge the largest in the Washington District, likely prompting its division that created the Boyds and Damascus charges. Rev. Joshua Barnes served as the pastor of the Damascus charge and Benjamin. F. Myers as the pastor of the Boyds charge.[30] Under the pastorate of Nathan Ross, the congregation remodeled the church in 1907.[31]

In the 1920s, newspapers referenced the church as the "Rocky Hill Church" and "Pleasant View Church."[32] In 1924, the original wood-frame church burned and required replacement.[33] The *Minutes of the Washington*

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[25] Ibid.

[26] Historic Preservation staff did not conduct a comprehensive survey of the cemetery, but relied on the database collated at http://www.findagrave.com.

[27] Commissioner of Slave Statistics, "Record of Slaves in Montgomery County, 1867-1868" Vol. 761, Archives of Maryland Online, http://www.msa.maryland.gov.

[28] "Gaithersburg," *Evening Star*, May 15, 1894, Newspapers.com.

[29] Methodist Episcopal Church, *Minutes of the Annual Conferences of the Methodist Episcopal Church, Spring Conferences of 1892* (New York: Hunt & Eaton, 1892), 58.

[30] The Clarksburg charge appears to have renamed or disbanded with the creation of the Boyds charge ca. 1894. Myers, the son of Benjamin and Rebecca Myers, was born in Poolesville, Montgomery County, in 1841. His biography noted his perseverance as there were minimal educational opportunities for African Americans in the county in his youth. During his ministry, he constructed twelve churches and parsonages, but it remains unknown if he built the first church on the subject property. Barnes was born in St. Mary's County, Maryland, in 1837. He served in the civil War and was licensed to preach in 1872. Methodist Episcopal Church, *Minutes of the Annual Conferences of the Methodist Episcopal Church, Spring Conferences of 1894* (New York: Hunt & Eaton, 1894), 30.

[31] Washington Conference of the Methodist Episcopal Church, *Journal of the Forty-Fourth Session of the Washington Conference of the Methodist Episcopal Church held in the Mt. Zion M. E. Church, Washington, D.C., March 27 to April 1, 1907* (Baltimore, MD: Excelsior Printing Company, 1907), 67.

[32] The name "Pleasant View" was confirmed via the records associated with the death of eleven-year old Harold Jackson in 1925. The newspaper obituary noted his funeral service at St. Mark's Church, Boyds, but internment at Pleasant View Cemetery. There is a funerary marker for an eleven-year-old named "Harold R. Jackson" (1914-1925) at the subject cemetery. "Boyd, MD.," *Afro-American*, April 11, 1925, Newspapers.com; "Rockville, MD.," *Afro-American*, October 12, 1923, Newspapers.com.

[33] An uncited document stated that Billy Watkins, a property owner across the street, provided the congregation with worship space in his storehouse after the loss of the church. Sugarloaf Regional Trails, "Landmark Research Form: John Wesley United Methodist Church," undated, Montgomery History.

Conference noted that "this charge has been handicapped…by the loss of one church destroyed by fire…" under the Pastor W. H. Kent.[34] The *Afro-American* recorded the construction and fundraising for the new building:

> The people of Rocky Hill have begun their new church. They will build a brick church. Two years ago [1924], their church, which was of wooden frame structure, was burned by fire (June 6, 1925).[35]
>
> Cornerstone laying of John Westley [sic] M. E. Church near Clarksburg, MD., will be held Saturday, October 24th (October 14, 1925).[36]
>
> Boyd circuit is prospering under the leadership of the Rev. J. H. Lewis.* The oyster supper given by the Ladies' Aid Society at the home of Mrs. Rachel Mason, Thanksgiving night, for the benefit of the new church at Rocky Hill, was quite a success, $35.57 was realized (December 12, 1925).[37]

In 1925, the church trustees—Arthur M. Gibson, William Suggs, Warner Wims, R. P. Foreman, William H. Hackey, William Davis, R. L. Gray, and James Gray—secured a mortgage for $7,232 from Charles W. Spurgeon Graves and Charles Green.[38] Ethel Foreman, interviewed in 1979, recalled that the congregation hired two African American builders to construct the church.[39] This mortgage supports her recollection as the United States Federal Census listed Graves as a carpenter in Washington, D.C.[40] C. W. S. Graves & Sons advertised as building contractors in the *Times Herald*.[41] More importantly, the D.C. Building Permits Database identifies "C.W. S. Graves" and "Graves and Green" as active builders in 1925.[42] That year, Graves built the Haven African Methodist Episcopal at 1401 Independence Avenue, Southeast, Washington, D.C, for $30,000.[43] Renowned architect John Anderson Lankford, the first African American architect licensed in Washington, D.C., and Virginia, and Supervising Architect for the African Methodist Episcopal Church, designed the church.[44] Although the Community of Faith United Methodist Church has no direct ties to the works of John Anderson Lankford, Graves and Green collaboration with him on a high-styled brick church in the nation's capital may have influenced their work at Rocky Hill.

The congregation laid the cornerstone in August 1926. As stated in the *Minutes of the Washington Conference* and the *Afro-American:*

> The new church at Rocky Hill is near completion. The corner stone laying to be the fourth Sunday in August (July 17, 1926).[45]
>
> J.H. Lewis Pastor—two years. Here on this four point circuit a new church, built of brick, is standing at Rock [sic] Hill, consisting $7,000.00, on which has been paid this year $2,500.00. This church's cornerstone was laid by the A. F. and A. M. of Maryland. The District Superintendent J. H. Jenkins,

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[34] Washington Conference, *The Minutes, including the Official Journal of the Washington Annual Conference of the Methodist Episcopal Church, Sixty-Second Annual Session, Asbury Methodist Episcopal Church, Frederick, Md., March 25th-29th, 1925* (1925), 76, Lovely Lane Methodist Archives.

[35] "Sellman and Poolesville, MD.," *Afro-American*, June 27, 1925, Newspapers.com.

[36] Interestingly, this is the first known reference to the church as "John Wesley Methodist Episcopal Church." Records suggest that the congregation, however, remained known as the Pleasant View Methodist Church. The trustees incorporated the "John Wesley Methodist Episcopal Church of Clarksburg, Maryland" with the state in 1932 and the plaque on the church reads that the new John Wesley Church was redeemed on June 11, 1932. "Boyd, MD.," *Afro-American*, October 24, 1925, Newspapers.com.

[37] "Boyd, MD.," *Afro-American*, December 12, 1925, Newspapers.com.

[38] Montgomery County Circuit Court, "Trustees of the Methodist Episcopal Church to C.W.S. Graves and Charles Green," July 1, 1925, Liber PBR 381, Folio 62, http://www.mdlandrec.net.

[39] Maryland Inventory of Historic Properties Form, "John Wesley Methodist Church, M: 13-48," 2018, https://apps.mht.maryland.gov/medusa/.

[40] United States Federal Census, "Charles W. Graves," (1930), Ancestry.

[41] "Ready Reference Service Directory, Builders—Contractors—Materials," *Times Herald*, July 30, 1935, Newspapers.com.

[42] Brian D. Kraft, "Building Permits Database, Version 2009.2."

[43] Ibid.

[44] "Civil Rights Tour: Employment – John Lankford, Architect," DC Preservation League, http://www.historicsites.dcpreservation.org (accessed October 9, 2024).

[45] "Boyd, MD.," *Afro-American*, July 17, 1926, Newspapers.com.

conducted the service. The plans for the dedication are now ready for whomsoever this conference sees fit to send to the charge for another year.[46]

Newspaper references record individuals active at the church at the time of its dedication:

> The "Rainbow Wedding" given by the young people of Pleasant View Church, Rocky Hill, was quite a success. $57 was cleared…. There will be a Lawn Fete given at Pleasant View church, Saturday, August 25, managers being Mrs. Sarah Mason, Ms. Altie Wims, Mrs. Mozelle Robinson, and others (August 18, 1928).[47]

After the 1930s, the Community of Faith United Methodist Church and Cemetery is referred to informally as the Rocky Hill Church and Cemetery.[48] The congregation, however, officially renamed the church to the John Wesley Methodist Episcopal Church of Clarksburg, Maryland, and redeemed the building in 1932.[49] Several mortgages identified the trustees of the church as J. W. Mason, William E. Brown, John Mason, R. P. Foreman, R. L. Gray, Zelma Foreman, Martha Foreman, Rachel Foreman, William Mason, and Rachel Mason.[50] In 1963, F. Wilson and Sarah L. Wims conveyed to the church Outlot B, located directly behind the cemetery, of the adjacent Clarksburg Heights subdivision for the expansion of the burial ground.[51] F. Wilson Wims, along with Frannie Snowden, Earl Green, Zelma Foreman, James R. Green, and Rachel Snowden all served as trustees.[52]

The church changed its name in accordance with national events relating to the Methodist Church and continued to modify the building. In 1968, the merger of the Methodist Church and the Evangelical United Brethren Church created the United Methodist Church. The John Wesley Methodism Episcopal Church of Clarksburg then renamed itself the John Wesley United Methodist Church of Clarksburg.[53] After 1974, church histories listed several alterations to the building including roofing, carpeting, lights (interior and exterior), basement and kitchen improvements, heating and air conditioning systems, organs, and lecterns. Before the 49th Homecoming of the John Wesley United Methodist Church in 1989, numerous alterations occurred to the exterior of the building. This included but is not limited to the application of the vinyl siding, replacement of pointed arched louvered windows with rectangular louvered windows, and addition of the accessible ramp on the façade.[54] In 2009, the John Wesley United Methodist Church changed its name to the Community of Faith United Methodist Church.[55]

I. Areas Exempt from Designation: There are no areas exempt from designation.

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46 Washington Conference, *The Minutes, including the Official Journal of the Washington Annual Conference of the Methodist Episcopal Church, Sixty-Fourth Annual Session, Simpson Methodist Episcopal Church, Charleston, West Virginia* (1927), 71, Lovely Lane Methodist Archives
47 "Boyd, MD.," *Afro-American*, August 18, 1928, Newspapers.com.
48 "Deaths: Davis, Anne," *Times Herald*, March 16, 1931, Newspapers.com; "Foreman, Robert Perry," *Evening Star*, May 14, 1937, Newspapers.com.
49 A mortgage from that year noted that the church was incorporated in the Maryland in 1932. Montgomery County Circuit Court, "William A. Combe to John Wesley Methodist Episcopal Church of Clarksburg, Maryland," June 11, 1932, Liber CKW 536, Folio 292, http://www.mdlandrec.net.
50 Ibid; Montgomery County Circuit Court, "The Board of Home Missions and Church Extension of the Methodist Episcopal Church to John Wesley Methodist Episcopal Church of Cow Pasture or Clarksburg, Maryland," January 27, 1933, Liber CKW 546, Folio 20, http://www.mdlandrec.net.
51 Montgomery County Circuit Court, "F. Wilson and Sarah L. Wims to John Wesley Methodist Episcopal Church of Clarksburg, MD.," September 17, 1963, Liber CKW 3135, Folio 201, http://www.mdlandrec.net.
52 Ibid.
53 Montgomery County Circuit Court, "John Wesley Methodist Episcopal Church of Clarksburg, Maryland, Inc., (also known as Rocky Hill Church) and Community of Faith United Methodist Church, Inc.," August 26, 2009, Liber LEK 38188, Folio 135, http://www.mdlandrec.net.
54 The following commemorative pamphlets are available at Montgomery History: "106th Anniversary of John Wesley United Methodist Church, 22420 Frederick Road, Clarksburg, Maryland 20734," (1976): 3-4, Montgomery History; "49th Homecoming of John Wesley Methodist Church, October 22, 1989," (1989): 3-4, Montgomery History.
55 Montgomery County Circuit Court, "John Wesley Methodist Episcopal Church of Clarksburg, Maryland, Inc., (also known as Rocky Hill Church) and Community of Faith United Methodist Church, Inc.," August 26, 2009, Liber LEK 38188, Folio 135, http://www.mdlandrec.net.

J. Designation Criteria:

The Community of Faith United Methodist Church and Cemetery meets Designation Criteria 1.A, 1.D, and 2.E as listed in §24A-3 of the Montgomery County Code. The historic significance of the cemetery itself and its funerary monuments will be explored at a future date. Montgomery Planning is undertaking the completion of the "Montgomery County Cemetery Historic Context Survey" that will be used to develop an analysis of notable characteristics associated with the types of cemeteries, landscape features, marker organization, and headstone materials and design to identify means to evaluate a cemetery's historical significance and physical integrity. The outcomes of this analysis may augment our understanding and significance of the property but the proposed environmental setting would remain intact.

1.A Historical and cultural significance. The historic resource has character, interest or value as part of the development, heritage or cultural characteristics of the county, state or nation.

The Community of Faith United Methodist Church and Cemetery represents an early twentieth century, gothic revival church attended by the residents of Rocky Hill—the earliest African American community in Clarksburg—and the surrounding region. The church reflects the development pattern associated with the formation of the Rocky Hill community and the lives of African Americans during an era of segregation in Montgomery County. Churches and schools provided parishioners the opportunity for education, social engagement, and leadership opportunities. Influential members of the Rocky Hill and Clarksburg community including the Davis, Foreman, Mason, Snowden, and Wims families are all buried at the church cemetery.

1.D Historic and cultural significance. Exemplifies the cultural, economic, social, political or historical heritage of the county and its communities.

The Community of Faith United Methodist Church serves as a visible reminder of segregated life and the resilience, achievements, and contributions of African Americans residents in the early twentieth century. After the original wood-frame church burned in 1924, the congregation pressed forward with the construction of an imposing Gothic Revival-styled brick church. The church trustees hired Charles W. Spurgeon Graves and Charles Green, highly skilled African American builders from Washington, D.C., to construct the building for $7,500 in 1925. These actions by the congregants— who worshiped more than 30 miles away from the nation's capital in a rural section of the county—reflect the prosperity of the church and its function as a religious, educational, and social center for the African American community. As noted in *Black Historical Resources in Upper Western Montgomery County, Maryland* (1979), Community of Faith United Methodist Church was one of the largest and most architecturally notable African American churches.

2.E Represents an established and familiar visual feature of the neighborhood, community or county due to its singular characteristic or landscape.

The Community of Faith United Methodist Church and Cemetery is the last public site associated with the Rocky Hill community in Clarksburg. The church and cemetery serve as a tangible link to the African American community's past, providing a sense of continuity, orientation, and place as a former center of religious, social, and educational activities. The imposing front-gable brick church with an integrated tower has stood in its original location along Frederick Road for nearly a century.

The Rocky Hill community, however, lost its other community landmark along with other significant resources. In the 1960s, Maryland-National Capital Park and Planning demolished the Rocky Hill Elementary School, a two-room segregated Black elementary school. Additionally, many homes of early Rocky Hill and Clarksburg community members identified in previous architectural surveys, such as the Lloyd and Sarah Gibbs House, Arthur and Ella Mae Gibson House, William and Mary Hackey House, Clifton and Rachel Snowden House, Benjamin F. and Elizabeth Wims House, and John Henry and Emma M. Wims House, have been demolished. Most of these individuals were buried in the church cemetery, and there are no sites that reflect their contributions to the development of Rocky Hill or Clarksburg in the *Master Plan for Historic Preservation*. Therefore, the church remains as an essential feature of the built environment and its preservation would retain the legacy of the community.

K. Conclusion:

The Community of Faith United Methodist Church and Cemetery retains its integrity as an early twentieth century church constructed in 1925. The integrity of location and setting remain intact with the church and its cemetery in their original location. The adjacent Clarksburg Heights subdivision built by F. Wilson Wims (a trustee of the church) and Sarah Wims provided housing for members of the Rocky Hill community in the mid-twentieth century and is essential to understanding the development of Rocky Hill. The construction of Clarksburg High School and Rocky Hill Middle School, the Bennett Creek Animal Hospital, and other nearby modern subdivisions diminishes the integrity of location and setting, but not to the extent that it inhibits ones understanding of the property as a rural church and cemetery. The property retains integrity of design, workmanship, and materials. The church is adversely affected by the late-twentieth-century vinyl siding; however, the original brick remains intact which would allow for a restoration of the exterior of the building. The cemetery is well cared for and the extant funerary markers are maintained. Therefore, the Community of Faith United Methodist Church and Cemetery conveys its association with the Rocky Hill community in the early twentieth century.

8. ENVIRONMENTAL SETTING/GEOGRAPHICAL DATA

Property Land Area: 1.42 acres
Account Number: 00028481, 00022347

Environmental Setting Description: The Community of Faith United Methodist Church and Cemetery is located at 22420 Frederick Road, Clarksburg, Maryland. The proposed site to be listed in the *Master Plan for Historic Preservation* consists of the church and cemetery and its associated 1.42-acres identified as Account Numbers 00028481 and 00022347, District 02, as shown on the accompanying map (App. 1, Fig. 1).

Environmental Setting Justification: The environmental setting incorporates the entire two parcels acquired by the trustees of the church in 1886 and 1963.

9. PROPERTY OWNERS

Name: Community of Faith United Methodist Church
Premise Address: 22420 Frederick Road, Clarksburg, MD 20871

10. FORM PREPARED BY

Name/Title: John Liebertz, Cultural Resource Planer III, Montgomery County Planning Department
Date: October 2024

11. MAJOR SOURCES CONSULTED

Afro-American [numerous].

Ancestry.com [numerous].

Clarke, Nina H and Lillian B. Brown. *History of the Black Public Schools of Montgomery County, Maryland, 1872-1961*. Washington, D.C.: Vintage Press, 1978.

Evening Star [numerous].

Maryland Department of Education, *Annual Report of the State Board of Education showing the condition of Public Schools of Maryland* [numerous].

McDaniel, George W. *Black Historical Resources in Upper Western Montgomery County*. Montgomery County, MD: Sugarloaf Regional Trails, 1979.

Methodist Episcopal Church, *Minutes of the Annual Conferences of the Methodist Episcopal Church* [numerous].

Montgomery County Board of Education, “Meeting Minutes,” Maryland State Archives [numerous].

Montgomery County Land Records, http://www.mdlandrec.net.

Montgomery County Commissioner of Slave Statistics [numerous].

Washington Conference of the Methodist Episcopal Church, *Journal of the Washington Conference of the Methodist Episcopal Church* [numerous].

Washington Post [numerous].

APPENDIX ONE:

ENVIRONMENTAL SETTING AND AERIAL VIEW

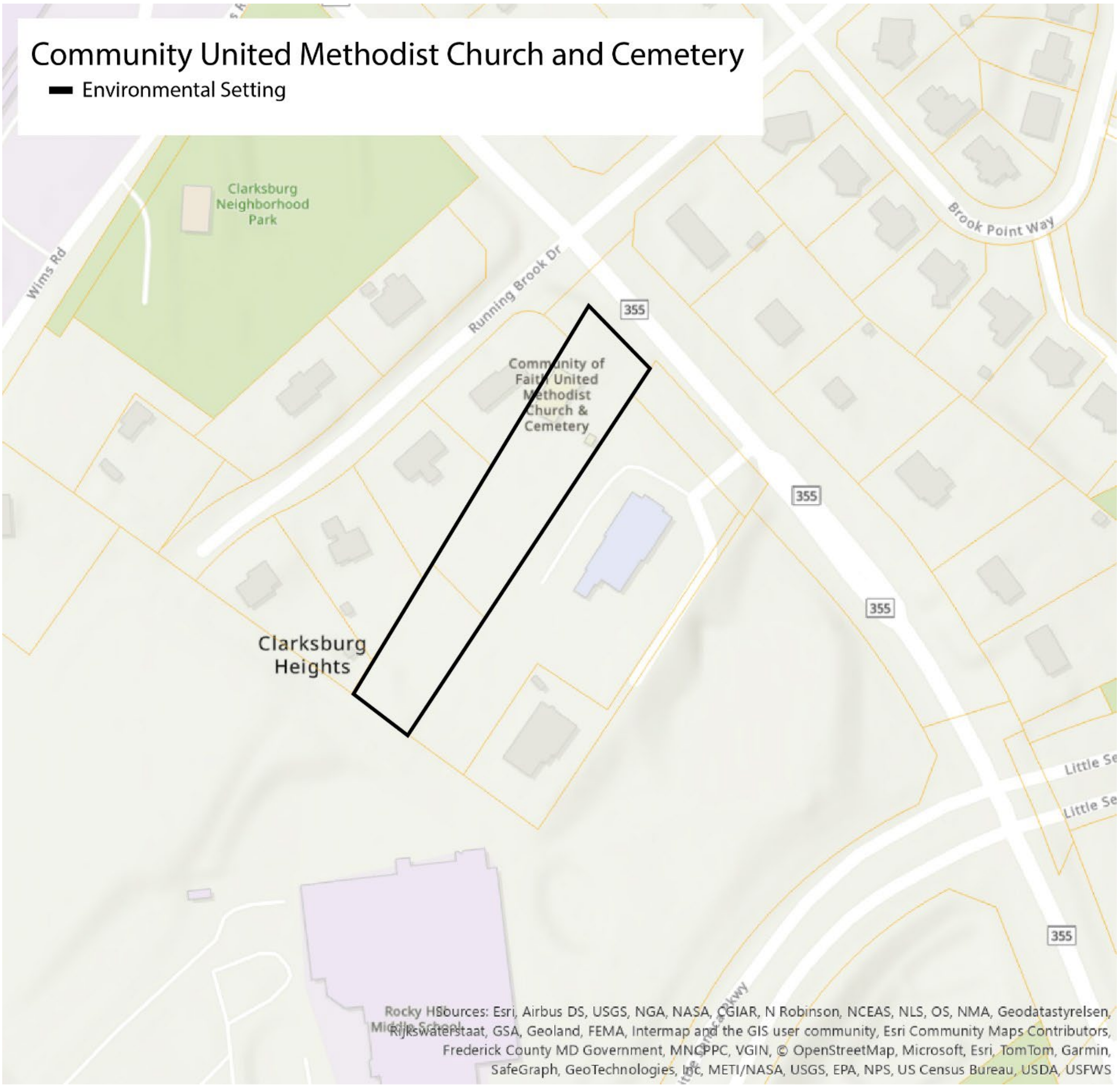

Figure 1: Proposed environmental setting for the Community of Faith United Methodist Church and Cemetery Master Plan Historic Site, Clarksburg, Montgomery County, Maryland.

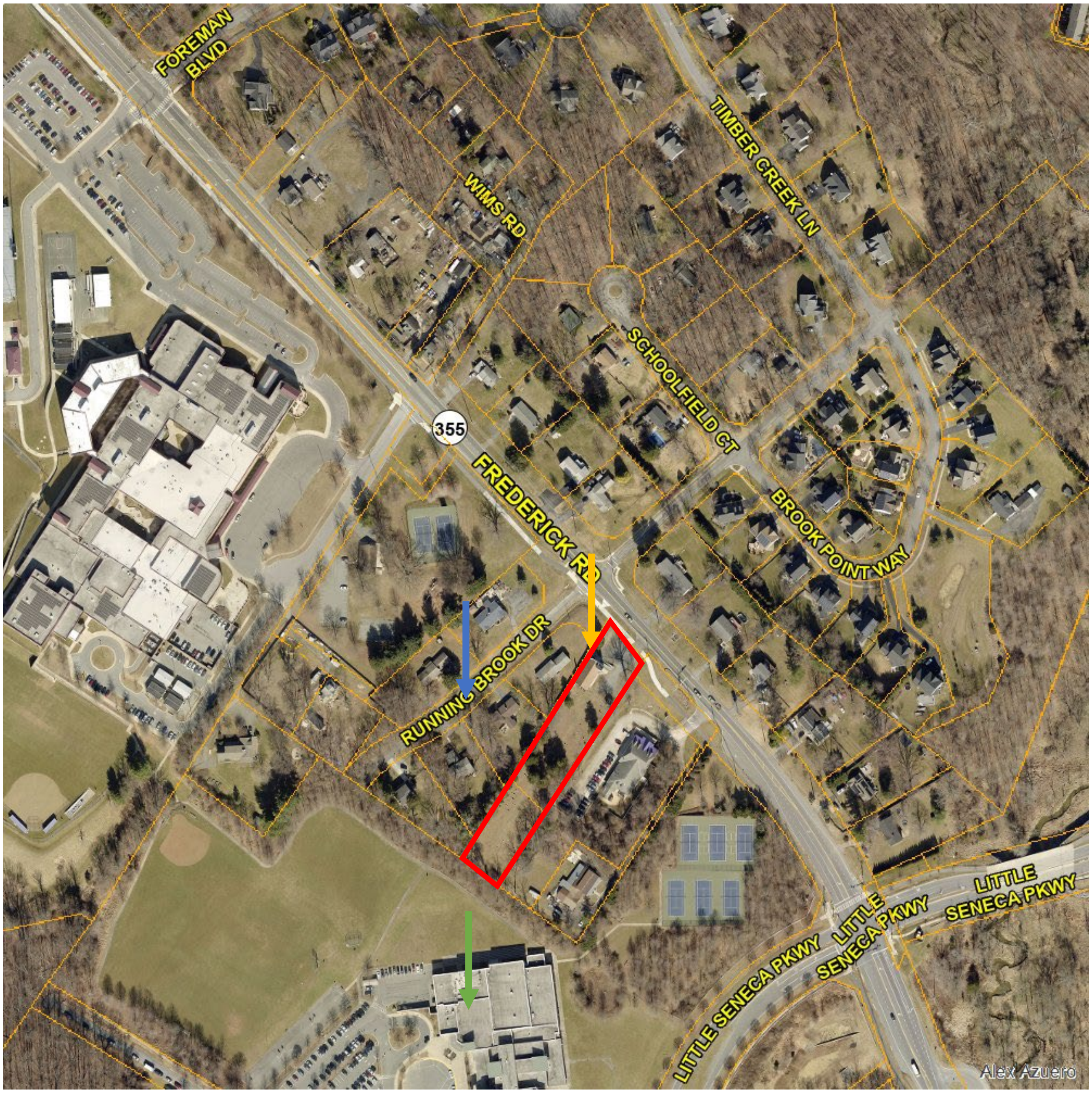

Figure 2: Aerial view showing the proposed Community of Faith United Methodist Church and Cemetery Master Plan Site (red), 2023. The orange arrow points to the Community of Faith United Methodist Church, the blue arrow points to the Clarksburg Heights Subdivision (developed in 1963), the green arrow points to Rocky Hill Middle School.

APPENDIX TWO:

EXTERIOR PHOTOGRAPHS OF COMMUNITY OF FAITH UNITED METHODIST CHURCH AND CEMETERY

Figure 1: View of façade (east elevation) of Community of Faith United Methodist Church, 2024.

Figure 2: Detailed view of the front entrance to Community of Faith United Methodist Church, 2024.

Figure 3: Detailed view of the stone plaque on the tower, 2024.

Figure 4: Detailed view of a stained-glass windows on the facade, 2024.


Figure 5: View of the side (south) elevation of Community of Faith United Methodist Church, 2024.


Figure 6: View of the rear (west) and side (south) elevations of Community of Faith United Methodist Church, 2024.

Figure 7: View of the original cemetery, 2024. Outlot B was acquired to expand funerary services in 1963 and is beyond the tree line in the background of the photograph.


Figure 8: View of Outlot B acquired in 1963 to extend funerary services, 2024.

APPENDIX THREE:

HISTORIC PHOTOGRAPHS

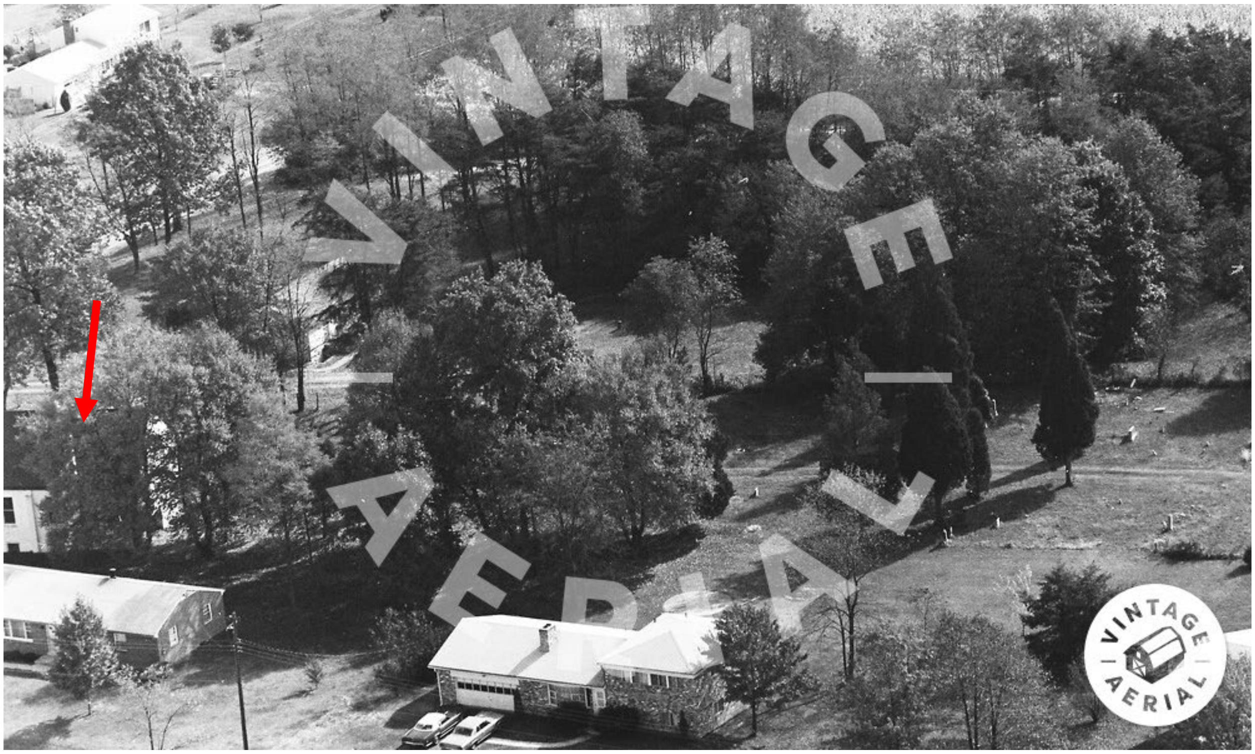

Figure 1: Aerial view of the Clarksburg Heights subdivision with the Community of Faith United Methodist Church and Cemetery (red arrow) in the background, 1972.
Source: Vintage Aerials.

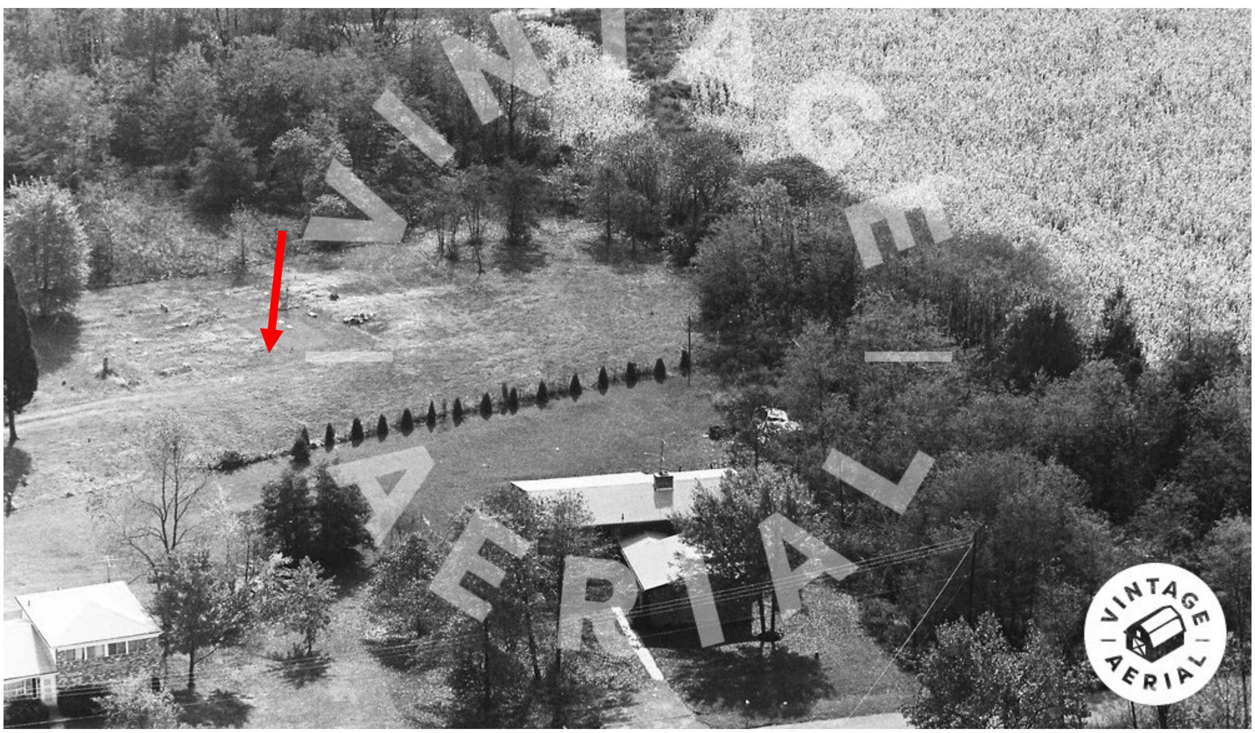

Figure 2: Aerial view of the Clarksburg Heights subdivision with Outlot B of the Community of Faith United Methodist Cemetery (red arrow) in the background, 1972.
Source: Vintage Aerials.

Figure 3: Aerial view of the tower of the Community of Faith United Methodist Church and Cemetery (red arrow), 1972.
Source: Vintage Aerials.

Figure 4: View of the Community of Faith United Methodist Church, 1978.
Source: George McDaniel, Black Historical Resources in Upper Western Montgomery County, Maryland, held by Montgomery History.

APPENDIX FOUR:

MARYLAND INVENTORY OF HISTORIC PROPERTIES FORM

M: 13-48

1925

ohn Wesley Methodist Church
Clarksburg
Private

This one and a half story brick church has replaced a small, frame church built in c. 1878 by the founders of the black communities in Clarksburg. The church combines several architectural styles, especially Gothic. The three bay principal block has lancet windows and a large portal of similar design. The church was built by hired black contractors from nearby Washington, D.C. Behind the church is a well-kept cemetery with inscribed tombstones where many of the founders of the community are buried. This brick church is one of the most imposing of black congregations in rural Montgomery County.

M: 13-48
Magi #

MARYLAND HISTORICAL TRUST

INVENTORY FORM FOR STATE HISTORIC SITES SURVEY

1 NAME

HISTORIC
John Wesley Methodist Church

AND/OR COMMON

2 LOCATION

STREET & NUMBER
West side of Route 355

CITY, TOWN
Clarksburg
__ VICINITY OF

CONGRESSIONAL DISTRICT
8

STATE
Maryland

COUNTY
Montgomery

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	__PUBLIC	X OCCUPIED	__AGRICULTURE	__MUSEUM
X BUILDING(S)	X PRIVATE	__UNOCCUPIED	__COMMERCIAL	__PARK
__STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	X RELIGIOUS
__OBJECT	__IN PROCESS	X YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	__YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
	No	__NO	__MILITARY	__OTHER:

4 OWNER OF PROPERTY

NAME
Rocky Hill Church
Telephone #: 428-0047

STREET & NUMBER

CITY, TOWN
Clarksburg
__ VICINITY OF

STATE, zip code
Maryland

5 LOCATION OF LEGAL DESCRIPTION

Liber #: JA 9
Folio #: 399

COURTHOUSE,
REGISTRY OF DEEDS, ETC.
Montgomery County Courthouse

STREET & NUMBER

CITY, TOWN
Rockville

STATE
Maryland

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
None

DATE

__FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR
SURVEY RECORDS

CITY, TOWN

STATE

7 DESCRIPTION

M: 13-48

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	__DETERIORATED	X UNALTERED	X ORIGINAL SITE
X GOOD	__RUINS	__ALTERED	__MOVED DATE______
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

This handsome church stands on the west side of Route 355 south of Clarksburg, and faces east towards the highway. It is one of the largest and most imposing of the black churches to have been surveyed in the communities of upper Montgomery County. It replaces an earlier, small frame church of c. 1878 on this site.

The brick church combines several architectural styles. The plain facade in the east gable end features a stepped gable on the north side, balanced by a tall, square bell tower on the south side reminiscent of Romanesque design. A set of seven steps leads up to a tall portal of lancet desing containing double doors. The building is three bays in depth and each of the three bays of the principal block is buttressed by brick piers.

Behind the church is a large, well-maintained cemetery in which many of the founders of the Black community in Clarksburg are buried. The graves of the Masons, of Benjamin Wims and of the Foreman family were photographed as a part of this survey and illustrate the types of stones used for grave markers by the community. The fact that they were stone markers, rather than simple wood grave markers, indicates that the Black families of Clarksburg were relatively prosperous and could afford these more costly and permanent memorials, unlike many poor people in upper Montgomery County and in Maryland. They are also indicative of the respect that their descendants felt for them.

CONTINUE ON SEPARATE SHEET IF NECESSARY

8 SIGNIFICANCE

M:13-48

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
PREHISTORIC	_ARCHEOLOGY-PREHISTORIC	X COMMUNITY PLANNING	_LANDSCAPE ARCHITECTURE	X RELIGION
_1400-1499	_ARCHEOLOGY-HISTORIC	_CONSERVATION	_LAW	_SCIENCE
_1500-1599	_AGRICULTURE	_ECONOMICS	_LITERATURE	_SCULPTURE
_1600-1699	X ARCHITECTURE	_EDUCATION	_MILITARY	X SOCIAL/HUMANITARIAN
_1700-1799	_ART	_ENGINEERING	_MUSIC	_THEATER
_1800-1899	_COMMERCE	_EXPLORATION/SETTLEMENT	_PHILOSOPHY	_TRANSPORTATION
X 1900-	_COMMUNICATIONS	_INDUSTRY	_POLITICS/GOVERNMENT	X OTHER (SPECIFY)
		_INVENTION		Black History Local History

SPECIFIC DATES 1925 BUILDER/ARCHITECT

STATEMENT OF SIGNIFICANCE

According to the history of the church published for its one hundred and sixth anniversary in 1976, the church was first known as Pleasant View Methodist Episcopal Church. Although the date of the founding of the church is not known precisely, church historians estimate that it was begun in c. 1870. The congregation probably gathered first in houses of its members as did churches founded soon after emancipation by blacks throughout rural Maryland. In 1884 Lloyd Gibbs, one of the members of the church, purchased a tract of land of twenty-four acres (deed EBP 32/409). Two years later he and his wife, Sarah Gibbs, conveyed one acre to George T. Williams and the other trustees of the Pleasant View Methodist Episcopal Church (deed JA 9/399). At that time the small frame church was probably constructed. In the late 1880s the church doubled in use as the school for the black children of Clarksburg until construction of the schoolhouse was completed. In 1924 this small frame church burned and was replaced by the present structure. In c. 1932, the name of the church was changed to John Wesley Methodist Church.

According to Ethel Foreman, the church hired two black contractors from Washington, D.C. or northern Virginia to construct the building. She believes that local men in the community may have helped haul bricks to the site but that the common laborers for the construction of the church were probably from Washington, D.C. She adds that there is a church in a black community in Spotsylvania County in northern Virginia that closely resembles this one and that may well have been built by the same contractor.

The brick construction and more architecturaly stylish design of the church indicate that blacks in Clarksburg were more prosperous than blacks in other communities in the survey area.

CONTINUE ON SEPARATE SHEET IF NECESSARY

M: 13-48

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Land Records of Montgomery County, County Courthouse, Rockville, Md.
Deed: JA 9/399; EBP 32/409.
Oral interview with Ethel Foreman (not taped) Feb-Mar. 1979 by George McDaniel, Clarksburg, Maryland.
106th Anniversary of John Wesley United Methodist Church, 22420 Frederick Road, Clarksburg, Md. 20734
Private publication.

CONTINUE ON SEPARATE SHEET IF NECESSARY

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY

VERBAL BOUNDARY DESCRIPTION

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE | COUNTY

STATE | COUNTY

11 FORM PREPARED BY

NAME / TITLE
George McDaniel, Surveyor

ORGANIZATION: Sugarloaf Regional Trails
DATE: 7/79

STREET & NUMBER: Box 87
TELEPHONE: 926-4510

CITY OR TOWN: Dickerson
STATE: Maryland 20753

The Maryland Historic Sites Inventory was officially created by an Act of the Maryland Legislature, to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 Supplement.

The Survey and Inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

RETURN TO: Maryland Historical Trust
The Shaw House, 21 State Circle
Annapolis, Maryland 21401
(301) 267-1438

M:13-48

M:13-58 (date entered 5-4-89)

ACHS SUMMARY FORM

1. Name: Boyds Charge, Methodist Episcopal Church

2. Planning Area/Site Number: 10/58; 13/48 ~~13/10~~; 18/11; 18/29

3. M-NCPPC Atlas Reference: 10/58-Map 1-J/19; 13/10-Map 7-A/4; 18/11-Map 6-G/4; 18/29-Map 13-K/2

4. Address: Hyattstown, Clarksburg, Boyds, & Germantown

5. Classification Summary

Category buildings
Ownership private
Public Acquisition N/A
Status 10/58-unoccupied; all others-occupied
Accessible yes: restricted
Present use religious

Previous Survey Recording M-NCPPC
Title and Date: 1976 Inventory of Historical Sites

Federal ___ State X County X Local ___

6. Date:

7. Original Owner:

8. Apparent Condition

a. ___ b. ___ c. ___

9. Description: St. Mark's is a 3 bay by 3 bay, 1½ story, white clapboard church on fieldstone foundations. The gable roof has a raised seam metal covering. A cemetery is behind the church.

John Wesley is a common-bonded brick church painted white with a brick foundation. The front facade presents 3 distinct, 1-bay sections, a 2-stepped roofline, a higher gabled roof and a square tower. A cemetery is behind the church.

The Asbury Church is 4 bays by 3 bays of stucco-covered cinderblock. It has 3 distinct sections, the main church, a vestibule and a front porch, each having a gable roof covered with black asphalt shingles. A cemetery is on one side of the church.

Montgomery Chapel is a frame 1 bay by 2 bay clapboard structure on stone foundations. The gable roof is covered by corrugated tin roofing.

10. Significance: Small communities of blacks clustered together in Montgomery County shortly after the end of the Civil War. They established churches separate from, yet associated with local denominations which were at that time all white. Among these was the formation of the Washington Conference of the Methodist Episcopal Church, of which Francis Asbury Church, John Wesley Church, St. Mark's Church and Montgomery Chapel were a part. These four churches came to be referred as the Boyd's Charge, or circuit. The original St. Mark's Church in Boyds, for which the circuit was named, was a one room structure, which doubled as the school. In 1892 the present building replaced the original one. The adjacent parsonage was built in 1899 and remained in use until 1968. The John Wesley Church in Clarksburg, built in 1925, replaces a small frame structure which stood on the same site in 1878 and burned in 1924. The Francis Asbury Church, in Brownstown was built in 1959 on the site of the original 1885 church which burned down. The Montgomery Chapel near Hyattstown, dated 1871, is the oldest building of the group, and is the only one now without a congregation. School was held here and community meetings as well. In 1964 the church was abandoned.

11. Researcher and date researched: Mark Walston-5/79 — Candy Reed, Arch. Description

12. Compiler: Margaret Coleman

13. Date Compiled: 10/79

14. Designation Approval ___

15. Acreage: 10/58-50 A.; 13/10-1 A.; 18/11-1 A.; 18/29-1.02 A.

Attachment Sheet A

M: 10.58
~~13/10~~
18/11
18/29

The north and south facade have four bays. The one-over-one casement windows have stained inner glass, capped by a double row of brick headers, and have cement lintels below. The windows at basement level are half size but also feature double rows of headers. The south side has a door at both ends. Dividing the bays and delineating the corners are square brick pilasters with a second level water course.

The roof is black asphalt shingle. There is a small cinder-block addition at the rear which is veneered with brick on the south facade. The rear (west) facade has a gable roof and a variety of apertures.

The treed, well-kept cemetery lies to the west of the church. The variety of stones and markers includes a round one.

IV. (18/29) The **four** bay by three bay Asbury Church faces southwest on Black Rock Road. The stucco-covered cinderblock church has three distinct sections, the main church, a vestibule, and a front porch. Each section has a gable roof covered with black asphalt shingle.

The front double-door entrance is approached by four cement steps with an iron rail, and the wooden porch sign reads "ASBURY METHODIST CHURCH". There is a central exterior brick chimney at the rear of the church.

All windows are two-over-two, double-hung, with brick lintels. Windows on **the** sides of the main building are separated by square pilasters with slightly corbelled brick at the top. A marble cornerstone reads "ASBURY METHODIST CHURCH 1959".

The well-kept, treed cemetery is to the west of the church.

M:13-49

Attachment Sheet B

M: 10/58
~~13/10~~
18/11
18/29
Magi #

church, which replaced the earlier building, is situated upon one acre of land granted to the trustees of St. Mark's Church for $50 by Mary Delauder and her husband Edward in 1892.[6] Construction was begun immediately, under the charge of Reverend Benjamin F. Myers, and the building was completed on September 24, 1893. The adjacent parsonage was constructed on the same acreage in 1899, under the pastorage of Reverend Daniel Wheeler; it remained in use until 1968. The church today remains as active a part of the community as it was at its inception.

FOOTNOTES:

1 Montgomery County Land Records, JA 9/399.
2 Montgomery County Corporation Records, Art. of Inc. PBR 2/285.
3 Land Records, EBP 33/407 (October 15, 1884).
4 Ibid., JA 9/222 (October 2, 1886).
5 Montgomery County Mechanics Lein Docket, Volume 1/34.
6 Land Records, JA 34/45 (August 5, 1892).

Name	Acreage	Liber/Folio	Number
Rocky Hill Church c/o John Wesley United Methodist Church Box 1130 Clarksburg, Md. 20734	1 acre	JA 9/399	13/10
Montgomery Chapel Maryland National-Capital Park & Planning Commission	50 acres	3361/414	10/58
Francis Asbury Methodist Episcopal Church at Brownstown and Order Gallilean Fishermen CR James Johnson Boyds, Md. 20720	1.02 acres	2327/561	18/29
St. Mark's United Methodist Church at Boyds	1 acre	JA 34/45	18/11

15-8 Boyds
13-14 Clarksburg

M: 10/58
13/~~10~~ 48
18/11
18/29
Magi #

MARYLAND HISTORICAL TRUST

INVENTORY FORM FOR STATE HISTORIC SITES SURVEY

1 NAME

HISTORIC
Boyds Charge, Methodist Episcopal Church

AND/OR COMMON

2 LOCATION

STREET & NUMBER
Hyattstown, Clarksburg, Boyds, and Germantown

CITY, TOWN ___ VICINITY OF CONGRESSIONAL DISTRICT

STATE COUNTY

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	__PUBLIC	X OCCUPIED	__AGRICULTURE	__MUSEUM
X BUILDING(S)	X PRIVATE	X UNOCCUPIED	__COMMERCIAL	__PARK
__STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	X RELIGIOUS
__OBJECT	__IN PROCESS	X YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	__YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER:

4 OWNER OF PROPERTY

NAME
See Attachment Sheet A Telephone #:

STREET & NUMBER

CITY, TOWN ___ VICINITY OF STATE, zip code

5 LOCATION OF LEGAL DESCRIPTION

Liber #:
Folio #: See Attachment A

COURTHOUSE,
REGISTRY OF DEEDS, ETC. Montgomery County Courthouse

STREET & NUMBER

CITY, TOWN
Rockville

STATE
Maryland

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
MNCPPC Historic Sites Inventory

DATE
1976 __FEDERAL X STATE X COUNTY __LOCAL

DEPOSITORY FOR
SURVEY RECORDS Park Historian's Office

CITY, TOWN
Derwood

STATE
Maryland 20855

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	__DETERIORATED	__UNALTERED	__ORIGINAL SITE
__GOOD	__RUINS	__ALTERED	__MOVED DATE________
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

I. (10/58) Montgomery Chapel is a simple frame one bay by two bay clapboarded structure built on stone foundations. The gable roof is covered by corrugated tin roofing and the gable end faces the street. Double wooden paneled doors lead into this one room chapel. A stone chimney provided heat to the chapel.

II. (18/11) St. Mark's is a three bay by three bay, one and a half story church.

Built on fieldstone foundations, the church faces south and has white clapboarded exterior walls. The south (front) porch has four poured concrete steps, flanked by a black handrail which leads to the double wooden doors. These doors are set into a gabled projective pavilion in the south elevation.

There are one-over-one double-hung marbelized lancet windows. There is a round window in the south gable. The north apse has two, two-over-one double-hung stained glass lancet windows.

The gable roof has a raised seam metal covering. The south door opens into a small entry room. This room opens into a single large rectangular room. There are narrow and random width floor boards. There is tongue and groove wainscotting around the main room and the ceiling has acoustical tile with inset lights. Double wooden paneled doors open into the main room. There are rows of folding chairs. The altar rail, altar and podium are carved wood. There is a piano in the northeast corner. There is a "Monogram" stove on the east side of the room.

III. (13/10) 4/8 John Wesley is a (beige, common-bonded) church, painted white. The church has a brick foundation below a vertical stretcher course at the above-ground entrance level. The east (front) facade presents three distinct one bay sections. From north to south, these are: a two stepped roofline with one-over-one casement window which has stained glass on the inner glaze; a higher gabled roof with rounded-arch vertically-slender window on the third level, pointed-arch mullioned stained glass window on the second level, and a double door with two diamond pane glass windows on the first level; and the tower section, which has a one-over-one casement window with stained glass inner glaze and is capped at the third level with a square tower. The tower features corbelling in an inset on all four sides and within that (on south and east sides) a louvered pointed-arch window. The cement plaque at the foot of the tower reads "THE NEW JOHN WESLEY M.E. CHURCH WAS REDEEMED JUNE 11TH, 1932 REV. J. H. LEWIS, PASTOR".

There is a cement porch with six steps and an iron rail to serve a double door.

(Continued on Attachment Sheet A)

CONTINUE ON SEPARATE SHEET IF NECESSARY

M: 3-27

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	X RELIGION
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE
__1600-1699	__ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN
__1700-1799	__ART	__ENGINEERING	__MUSIC	__THEATER
X 1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION
X 1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)
		__INVENTION		

SPECIFIC DATES | BUILDER/ARCHITECT

STATEMENT OF SIGNIFICANCE

Shortly after the Civil War, and the subsequent nationwide emancipation, there appeared in Montgomery County a number of small black enclaves. In conjunction with these communities churches were established separate from, yet peripherally associated with, the established white denominations. Among these was the formation of the Washington Conference of the Methodist Episcopal Church, of which Francis Asbury Church, John Wesley Church, St. Mark's Church and Montgomery Chapel were a part. These four churches came to be referred as the Boyd's Charge, or circuit.

The oldest of these churches appears to be John Wesley, located near Clarksburg at 22420 Frederick Road. The first church was erected upon this ites in 1878, and originally went under the name "Pleasant View." (A formal deed for the one acre church lot was not executed until 1886.)[1] A small plot of ground to the rear of the church was set aside for use as a cemetery. This church, a small frame structure, was destroyed by fire in 1924, and the following year was replaced by the present brick church building. The church was officially incorporated on February 20, 1932, and, at that time, the congregation changed the title to John Wesley Methodist Episcopal Church.[2]

The Montgomery Chapel, situated north of John Wesley Church on Frederick Road, in the vicinity of Hyattstown, is the second oldest church on the circuit, and is the oldest extant building of the four. The church, which bears the date 1871 on its main facade, is said to have been utilized by a Hyattstown congregation, at a different location. In 1884, George Butler granted to Henry Johnson, Benjmain Price, and John Gray, trustees, for the sum of $10, 46 perches of "Resurvey on Wild Cat Spring", to be used as a place of worship, and the church building was then moved to this new site.[3] Montgomery Chapel, as was common practice, doubled as a community meeting-house, and for a time was used as a school. The church closed in 1964, with the diminished congregation joining neighboring churches, and is currently abandoned.

The original Francis Asbury Church was constructed in 1885 on one acre of land on Black Rock Mill Road, near Germantown conveyed to the church trustees by William Brown. A formal deed for the property was not made until 1886 after the erection of the church building.[4] The church, a one room frame building measuring 16' x 24', was constructed by James B. Appleby.[5] The community which the church served came to be known as Brownstown, in honor of William Brown. The church burned sometime in the 1950s, and the present church was built on its site in 1959.

The original St. Mark's Church in Boyds, for which the circuit was named, was a one room structure, which doubled as the school. The present

CONTINUE ON SEPARATE SHEET IF NECESSARY

(continued on Attachment Sheet B)

M:13-49

9 MAJOR BIBLIOGRAPHICAL REFERENCES

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CONTINUE ON SEPARATE SHEET IF NECESSARY

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY See Attachment Sheet B

VERBAL BOUNDARY DESCRIPTION

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	COUNTY
STATE	COUNTY

11 FORM PREPARED BY

NAME / TITLE Mark Walston	Candy Reed Architectural Description
ORGANIZATION Sugarloaf Regional Trails	DATE May 1979
STREET & NUMBER Box 87	TELEPHONE 926-4510
CITY OR TOWN Dickerson	STATE Maryland 20753

The Maryland Historic Sites Inventory was officially created by an Act of the Maryland Legislature, to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 Supplement.

The Survey and Inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

RETURN TO: Maryland Historical Trust
The Shaw House, 21 State Circle
Annapolis, Maryland 21401
(301) 267-1438

John Wesley U. Methodist
Church

Facade

13-48
M - ~~13-10-15~~

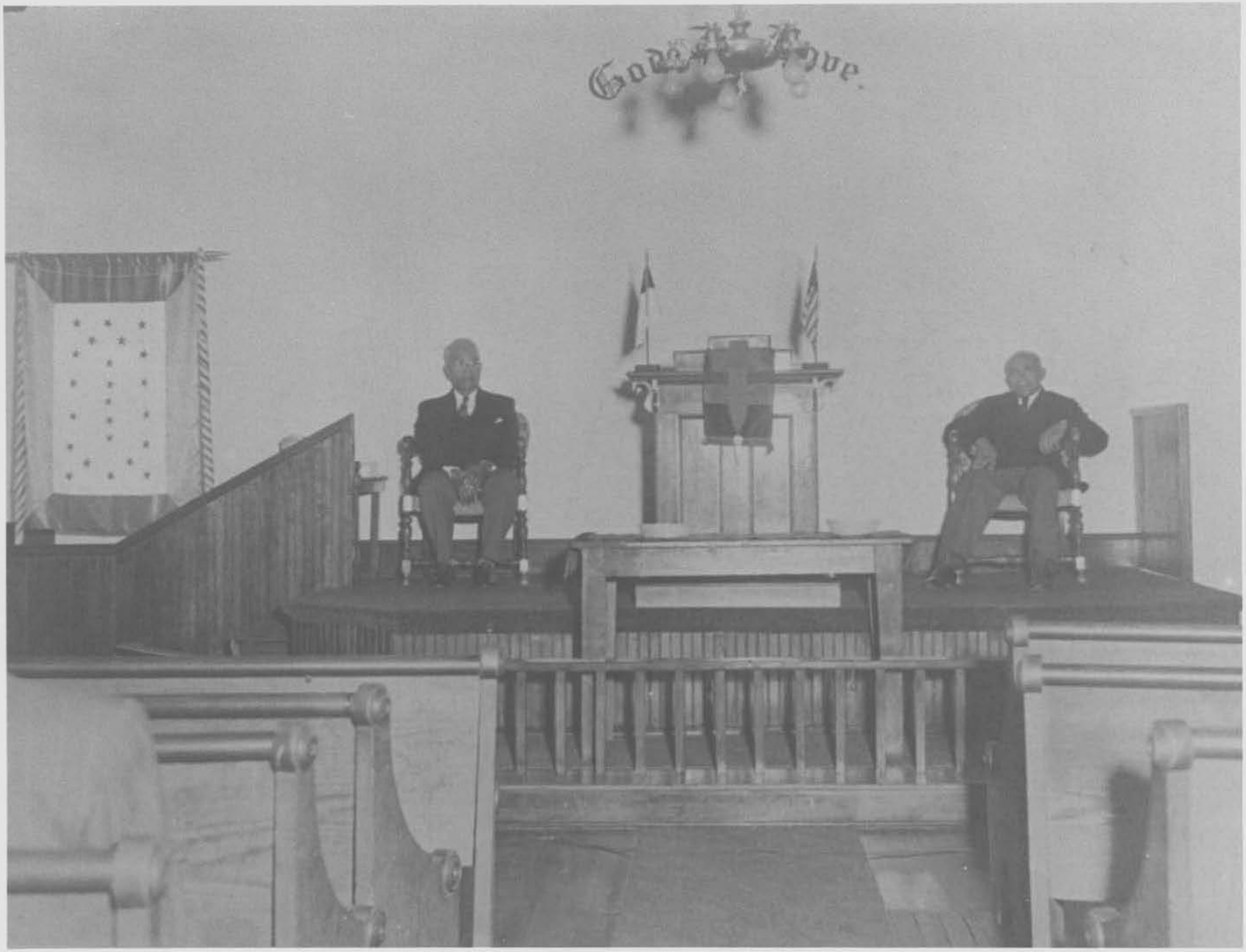
Clarksburg

11/78 GWM

Congregation of John Wesley
United Methodist Church:
Ladies of the church
Clarksburg, Md.
11/78 5mm

Mortgage burning day, 1944
13-48
M- ~~13-10-15~~

collection of Ethel Foreman
Clarksburg



Sanctuary of John Wesley Church
Clarksburg, Md.
13-48
M- ~~13-18 15~~

photo in collection of family
photos of Ethel Foreman
M-13-10-3


MASON
JOHN H.
HATTIE R.
J. WILLIAM
RACHEL E.

John Wesley United Methodist
Church Cemetery

M- ~~13-10-15~~ 13-48

Clarksburg

11/78 GWM

MARYLAND HISTORICAL TRUST
DETERMINATION OF ELIGIBILITY FORM

NR Eligible: yes ___ no X

Property Name: John Wesley Methodist Church | Inventory Number: M: 13-48

Address: 22420 Frederick Road (MD 355) | Historic district: ___ yes X no

City: Clarksburg | Zip Code: 20871 | County: Montgomery

USGS Quadrangle(s): Germantown

Property Owner: Community of Faith United Methodist Church Inc. | Tax Account ID Number: 02-00028481

Tax Map Parcel Number(s): P540 | Tax Map Number: EV53

Project: MD 355 Bus Rapid Transit Improvements Project | Agency: Montgomery County Dept. of Transportation

Agency Prepared By: VHB

Preparer's Name: Britta Tonn | Date Prepared: 8/31/2018

Documentation is presented in: MHT Maryland Inventory of Historic Places Form

Preparer's Eligibility Recommendation: ___ Eligibility recommended X Eligibility not recommended

Criteria: ___A ___B ___C ___D Considerations: ___A ___B ___C ___D ___E ___F ___G

Complete if the property is a contributing or non-contributing resource to a NR district/property:

Name of the District/Property: ______

Inventory Number: ______ Eligible: ___yes Listed: ___ yes

Site visit by MHT Staff ___ yes X no Name: ______ Date: ______

Description of Property and Justification: *(Please attach map and photo)*

Introduction:

The John Wesley Methodist Church (Maryland Inventory of Historic Places [MIHP] number M:13-48), constructed circa 1925, is located on the southwest side of Frederick Road (also known as MD 355), approximately 50 feet southeast of the intersection of Running Brook Drive in Clarksburg, Montgomery County, Maryland. The church is set back approximately 95 feet from Frederick Road on a narrow, one-acre lot (State Department of Assessments and Taxation [SDAT] 2018), the rear half of which is occupied by a cemetery. The cemetery extends into an adjacent, 0.47-acre parcel also owned by the Methodist Church (SDAT 2018). The church is located in a primarily residential area and is adjacent to single-family lots to the northwest and northeast and an animal hospital to the southeast. Rocky Hill Middle School is located to the southwest of the cemetery.

The John Wesley Methodist Church sits on a lawn with the primary façade facing northeast toward Frederick Road. A driveway from Frederick Road at the northeast corner of the property accesses a gravel parking area located in front of and southeast of the church. A gravel road emanating from the southwest end of the parking area leads through the cemetery, which is located immediately behind the church and features varying styles of granite grave markers situated amid grass lawn and mature

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended ___ **Eligibility not recommended** X

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

[signature] 5/17/19

Reviewer, Office of Preservation Services **Date**

[signature] 5/23/19

Reviewer, National Register Program **Date**

201804782

vegetation. Maintained grass lawn dotted with mature, coniferous and deciduous trees covers most of the church property. A small, non-original, wood-frame shed is located within the cemetery to the southeast of the church. A wooden fence delineates a portion of the northwest property boundary. The property is currently owned by the Community of Faith United Methodist Church Inc. and continues to be used as a Methodist church (SDAT 2018).

Architectural Description:

The John Wesley Methodist Church, located at 22420 Frederick Road, is a one-and-a-half story, wood-frame church building constructed in the Gothic Revival style. The building sits on a brick foundation and is clad in non-original vinyl siding which covers the original brick veneer. A portion of this painted, common bond brick veneer is visible in the northwest corner of the building where the vinyl siding has been removed. The front façade faces northeast toward Frederick Road and has a tripartite design. The central, gabled portion of this façade projects out from the building plane and contains the primary entrance. To the north, there is a stepped gable while to the south there is a square tower with a flat roof that extends above the height of the gable. The primary entrance consists of non-original double metal doors with small, diamond windows. Above the doors rests a transom with vertical siding and above the transom is a wood-frame, three-light, pointed arch window with stained glass featuring a cross motif. A narrow, wood-frame, stained glass window is situated in the gable above the primary entrance. The primary entrance is accessed by poured concrete steps and a non-original poured concrete ramp located adjacent to the southeast of the steps; both the steps and the ramp have non-original metal railings. A wooden, one-over-one stained glass window covered with a two-light, tilt screen window is located on each of the outer portions of the front façade. At basement level there is a vinyl, two-light sliding well window upon which rests a wooden transom. On the upper portion of the tower, a narrow, louvered window is located on each of the front and southeast sides. A cement plaque, carved with the words "The New John Wesley M.E. Church Was Redeemed June 11th 1932 Rev. J.H. Lewis, Pastor," is located on the front façade in the lower southeast corner of the tower.

The side elevations are four bays wide (five bays including a rear addition) with each bay delineated by a slender buttress. According to the 1979 Maryland Historical Trust (MHT) Inventory Form, these buttresses are made of brick, although at present they are covered with metal siding (McDaniel, Reed, and Walston 1979). On the northwest elevation, there are four wooden, one-over-one stained glass windows on the main floor of the sanctuary. At basement level below each window is a vinyl, two-light sliding well window. These windows have wooden surrounds and rest on sills composed of brick laid in a header bond. A painted brick chimney rises from the rear buttress on the northwest elevation. The southeast elevation has three of the same one-over-one stained glass windows on the main floor of the sanctuary as are on the northwest elevation. At basement level below each window is a vinyl, two-light sliding window with a wood surround and concrete sill. The southeast side of the tower has a non-original metal door accessed via poured concrete steps with a non-original metal railing. A concrete walkway runs the length of the building along the southeast side.

A gabled, cinderblock addition, likely constructed between 1957 and 1963, seamlessly extends from the rear of the building creating a fifth bay on each side (NETR 1957 and 1963). The 1979 MHT Inventory Form reports that the addition had a common bond brick veneer (McDaniel, Reed and Walston 1979); this veneer has since been covered by the same vinyl siding found on the main block of the building. A non-original metal door opens into the addition on the southeast elevation. The rear elevation of the addition contains an open garage bay at ground level accessing a storage area. Two wood-framed, fixed-light windows are located to the right of the garage bay. On the main floor of the rear elevation there are two wooden, two-over-two sash windows and within the rear gable there is a narrow, wood-frame, stained glass window similar to the gable window on the front façade.

Historic Context:

The area now known as Clarksburg began as a crossroads of Native American trails in the 1730s where a trading post was

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

established by William Clark. In the 1750s, Michael A. Dowden opened a 17-room inn known as Dowden's Ordinary which became a popular stop for those traveling along The Great Road (now known as MD 355) between Frederick and Georgetown. William Clark's grandson, John G. Clark surveyed the area and laid out lots in 1790, which spurred settlement in the area that eventually became known as Clarksburg. Clarksburg became a thriving commercial center of upper Montgomery County, spurred by a tanning industry and supported by related businesses. By 1879, Clarksburg had 250 residents and was the third largest town in Montgomery County. However, Clarksburg experienced a decline when the Metropolitan Branch of the B&O Railroad was established in nearby Gaithersburg and Germantown in 1873. The convenience of the railroad drew business and development away from Clarksburg to the vicinity of the train depots to the south (Boyd 1879: 124; Clarksburg Historical Society, Inc 2018; Parker and Reed 1979).

Shortly after the Civil War, small enclaves of African-Americans clustered together in Montgomery County (McDaniel, Reed, and Walston 1979). In Clarksburg, landownership by African-Americans was achieved later than in other communities in the county, not beginning until the 1880s. However, African-American families were generally more prosperous than in other communities, as evidenced by the quality of houses, churches, and gravestones still extant in Clarksburg. The first generation of free African-Americans bought land and constructed small log or frame dwellings in the vicinity of one another in order to support and assist one another with whatever skills, tools, and materials they had available. These landowners worked together to build churches and schools to serve their newly established communities. One of the earliest African-American enclaves in Clarksburg was known as Rocky Hill, which was a 24-acre tract of land purchased by Lloyd Gibbs in 1884 (McDaniel 1979; McGuckian 1992: 194). This enclave included the John Wesley Methodist Church, several dwellings such as the Maurice and Sarah Mason House (MIHP number M: 13-42) and the Warner Wims House (MIHP number M: 13-51), as well as the Clarksburg Negro School (MIHP number M: 13-34).

In 1887, Lloyd Gibbs sold a one-acre parcel of land in this location to George T. Williams, James H. Mason and Townsend Coat, who were trustees of a new Methodist church that was planned to serve the new Rocky Hill community (MCDB JA 9: 399-400). Before the church building was erected, Methodist congregants likely met in each other's houses for church services; however, as the community grew, the need for a dedicated church building and accompanying burial ground was evident (McDaniel, Reed and Walston 1979; McGuckian 1992). The 1887 deed specified that "the said premises shall be used, kept, maintained and disposed of as a place of divine worship... of the Methodist Episcopal Church in the United States of America" and that "a part or portion of said lot or land may be set apart and used as a place of burial..." which suggests that the first church on this location was erected soon after 1887 (MCDB JA 9: 399-400).

This first church was probably a frame structure known as Pleasant View Methodist Episcopal Church, reportedly built by local African-American carpenter-builders known as the Howard Brothers (McGuckian 1992; McDaniel, Reed and Walston 1979). This church also served as a school for the African-American children of Clarksburg until the one-room Clarksburg Negro School (MIHP number M: 13-34, demolished) was built nearby in about 1890 (McDaniel, Reed and Walston 1979; McDaniel and Sewell 1979). This first Pleasant View Methodist Episcopal Church was destroyed in a fire in 1924; in 1925, the existing church building was erected (McDaniel, Reed and Walston 1979). According to a carved cement plaque in the southeast corner of the church's tower, the church was officially redeemed and renamed John Wesley Methodist Church on June 11, 1932. The 1979 MIHP inventory form for John Wesley Methodist Church documents that Ethel Foreman, a congregant of the church, claimed that two African-American contractors from Washington, D.C. constructed the building with the help of local men in the community (McDaniel, Reed and Walston 1979). Hiring experienced and more highly-trained contractors from Washington, D.C. to construct the stylish building, instead of using a local builder, suggests that the community which attended the Pleasant View Methodist Church was relatively prosperous, and that the church itself served as an important center of the surrounding community's religious, educational and social life (McGuckian 1992).

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

The advent and increasing popularity of the automobile in the early decades of the 20th century resulted in a revival in growth in Clarksburg as areas beyond the railroad axes became accessible and open to residential and commercial development. Frederick Road was improved in the 1930s, which allowed for easier travel by automobile between Clarksburg and Washington, D.C. Many tourists from Washington enjoyed driving through Clarksburg and the surrounding countryside and area homeowners rented out rooms for boarders and tourists. The construction of I-270 in the 1950s preceded a period of rapid suburban growth in northern Montgomery County, spurred by the ease of commuting into Washington, D.C. (KCI 1999; Parker and Reed 1979).

In 1963, F. Wilson Wims and Sarah L. Wims sold an approximately 0.47-acre parcel of land adjacent to the southwest of the church property to the John Wesley Methodist Church to be used as an expansion to the existing cemetery located to the southwest of the church (MCDB 3135: 201). This parcel was designated as Outlot B of the subdivision known as Clarksburg Heights, which Wilson Wims developed in the mid-1960s with rent-to-own homes built for African-American families who would otherwise be unable to afford to reside in Montgomery County (MIHP number M: 13-61). The cemetery associated with John Wesley Methodist Church is the resting place for multiple generations of many of the influential families of the African-American community at Rocky Hill, including the Wims family, the Mason family, the Williams family and the Foreman family.

In 1968, after The Methodist Church and The Evangelical United Brethren Church were merged to form The United Methodist Church, the church was officially renamed the John Wesley United Methodist Church of Clarksburg, Inc. (MCDB 38188: 135). Sometime after the building was first surveyed in 1979, several significant alterations were made to the building. Most conspicuous is the application of vinyl siding over the brick façade, which obscures the original recessed corbeling at the top of the tower and has resulted in the replacement of the tower's pointed arch windows with smaller, rectangular louvered windows. The vinyl siding has also covered the slightly arched lintel profile of the sanctuary's side windows, and metal siding has been applied over the brick buttresses. In addition, the basement windows have been replaced with vinyl sliding windows, and the rear doorway on the southeast elevation has been replaced with a modern metal door. Finally, a large, poured concrete ramp with a metal railing has been installed along the front façade in front of the tower.

In 2009, the John Wesley United Methodist Church of Clarksburg, Inc., which was also commonly known as the Rocky Hill Church, changed its official name to the Community Of Faith United Methodist Church through a transfer of property (MCDB 38188: 135-136, 145). Today, the Community Of Faith United Methodist Church shares its building with a congregation known as Iglesia de Cristo Pentecostes.

Evaluation:

The John Wesley Methodist Church is an early 20th century, Gothic Revival-style church that was built to replace an earlier Methodist church attended primarily by African-American residents in one of the earliest African-American enclaves in Clarksburg. In order to be considered eligible for the National Register of Historic Places (NRHP), a religious property's significance "must be judged in purely secular terms" and must derive its significance from "architectural or artistic distinction or historical importance" (Shrimpton et al 1990: 26).

To be considered eligible for listing in the NRHP under Criterion A, a building must not only be associated with important events or trends, it :must clearly be important within the associated context... and it must retain historic integrity" (Shrimpton et al 1990: 12). The John Wesley Methodist Church is important for its association with the early African-American community in Clarksburg known as Rocky Hill, which developed following the Civil War. The John Wesley Methodist Church was attended by residents of this African-American community, who built the first church at this location in about 1887. Influential members of these communities, such as members of the Mason family, the Foreman family and the Wims family, are buried in the cemetery on the church property. The church remains in its original location in the vicinity of other buildings associated with the Rocky Hill

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

community, such as the Warner Wims House (MIHP number M: 13-51) and the Maurice and Sarah Mason House (MIHP number M: 13-42). The church is also adjacent to the Clarksburg Heights subdivision (M: 13-61), a mid-20th century subdivision developed by Wilson Wims with rent-to-own homes built for African-American families who likely attended services at this church. However, modern development in the vicinity of the resource, including Rocky Hill Middle School, the adjacent Bennett Creek Animal Hospital, and the nearby Clarksburg High School, as well as the loss of other properties of the Rocky Hill community, such as the Clarksburg Negro School (MIHP number M: 13-34) and the Lloyd & Sarah Gibbs House (MIHP number M: 13-38), have resulted in a diminished integrity of setting and feeling. Additionally, the church building has been substantially altered since its original construction and many of the original, character-defining features of the exterior have been lost. The character-defining features which are no longer visible due to the application of vinyl siding include the brick corbeling at the top of the tower, the original pointed arch windows of the tower which have been replaced with smaller, rectangular windows, and the slightly arched lintel profile of the sanctuary windows. The loss of these architectural elements has greatly altered the exterior appearance of the church building as these important features conveyed the building's stylish, Gothic Revival appearance. As such, these alterations limit the resource's ability to convey its association with the growth and relative prosperity of the Rocky Hill community in the early-20th century and have resulted in the loss of integrity of design and materials that are required for eligibility under Criterion A as discussed in Maryland's Suburbanization Historic Context and Survey Methodology (KCI 1999: D-56). Therefore, the John Wesley Methodist Church is recommended not eligible for the NRHP under Criterion A.

To qualify for eligibility under Criterion B, a property must be associated with an individual "whose activities are demonstrably important within a local, State, or national historic context" and the property must be associated with that individual's productive life (Shrimpton et al 1990: 14-15). Although many residents who were well-known in the predominantly African American community of the area attended and supported the John Wesley Methodist Church, such as members of the Mason family and the Wims family, the resource has no direct association with any particular individual who is considered significant within the historic context. Therefore, the John Wesley Methodist Church is recommended not eligible under Criterion B.

To be considered eligible for listing under Criterion C, the resource should "represent distinctive characteristics of its type, period, or method of construction" (KCI 1999: D-57). The John Wesley Methodist Church portrays some elements of the Gothic Revival style which was popular for church architecture in the early 20th century. However, although the church retains its general form and some of its Gothic Revival elements, such as a pointed arch window above the entrance, a tripartite design and stained-glass windows in the sanctuary, it has been substantially modified since its construction. Vinyl and metal siding have been applied over the brick veneer and brick buttresses, obscuring the tower's original corbelled brickwork and the original, slightly arched lintel profile of the sanctuary's side windows. In addition, the tower's original, character-defining pointed arch windows have been replaced with smaller, rectangular windows with no arches. Finally, the basement windows have all been replaced with vinyl windows and the original doors have been replaced with metal doors throughout. These alterations have resulted in a diminished integrity as outlined in the Suburbanization Historic Context and Survey Methodology, which states that to be eligible under Criterion C, "all character-defining elements must be intact" because "late-nineteenth and twentieth century government and public buildings will require greater architectural integrity and distinction due to an increased frequency of property type" (KCI 1999: D-57). Therefore, the resource is recommended not eligible for the NRHP under Criterion C. As an architectural resource, it was not evaluated under Criterion D.

In sum, the John Wesley Methodist Church at 22420 Frederick Road is recommended not eligible for listing in the NRHP.

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

______________________________ ______________________________

Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

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MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

______________________________ ______________________

Reviewer, Office of Preservation Services **Date**

______________________________ ______________________

Reviewer, National Register Program **Date**

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MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended ______ **Eligibility not recommended** ______

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

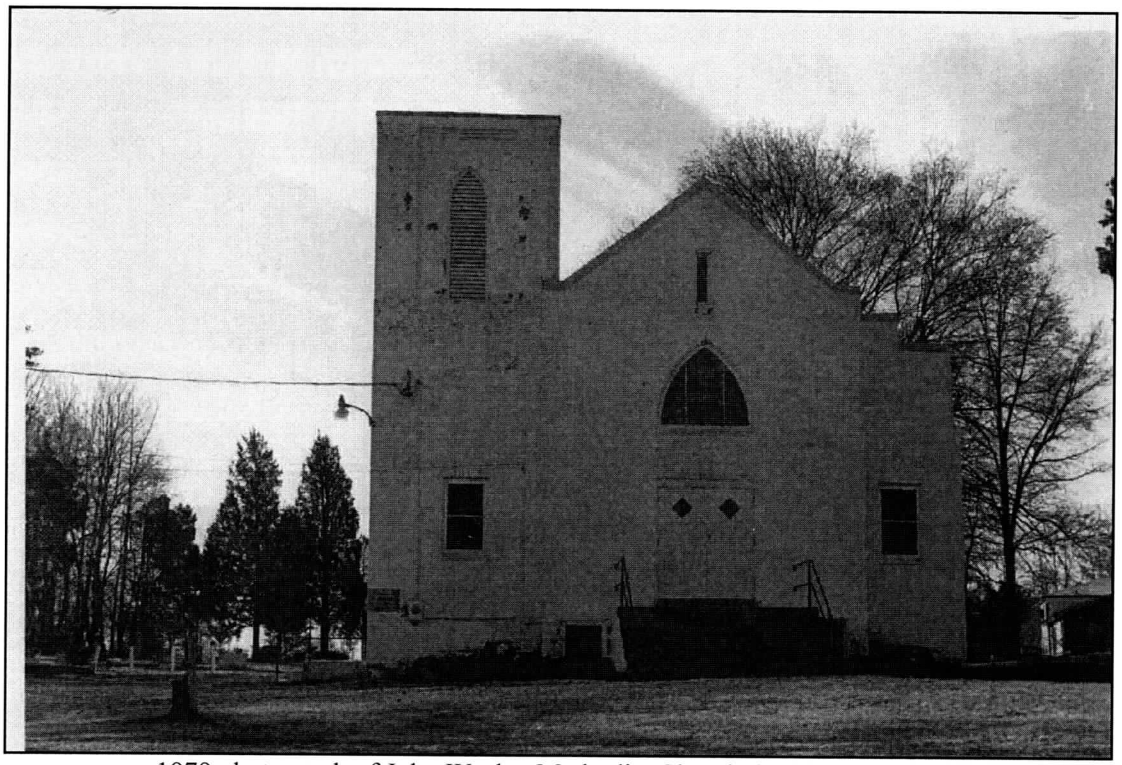
_______________________________ _______________________

Reviewer, Office of Preservation Services **Date**

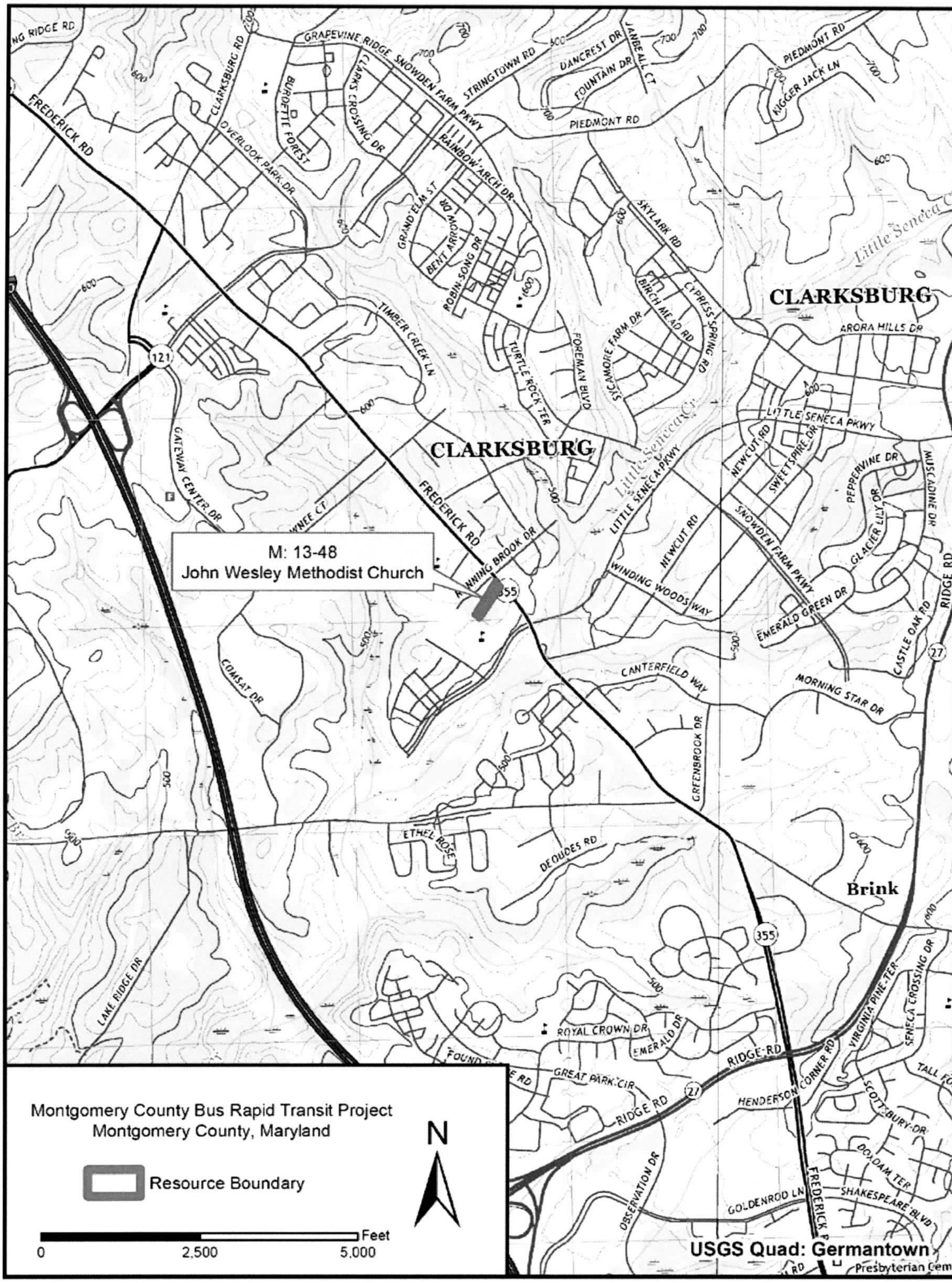
_______________________________ _______________________

Reviewer, National Register Program **Date**

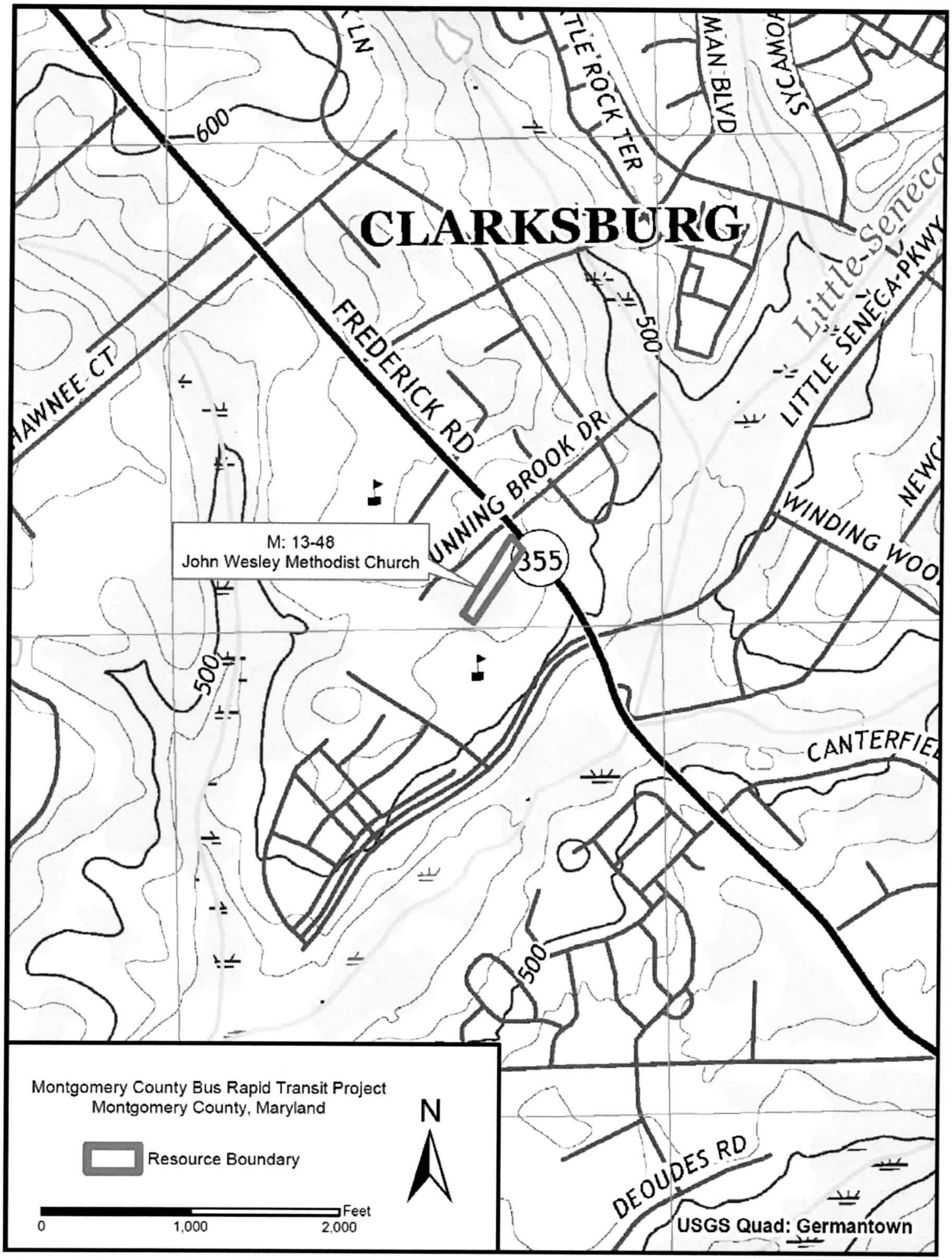
Circa 1979 photograph of John Wesley Methodist Church, looking west
(Montgomery County Historical Society 2016)



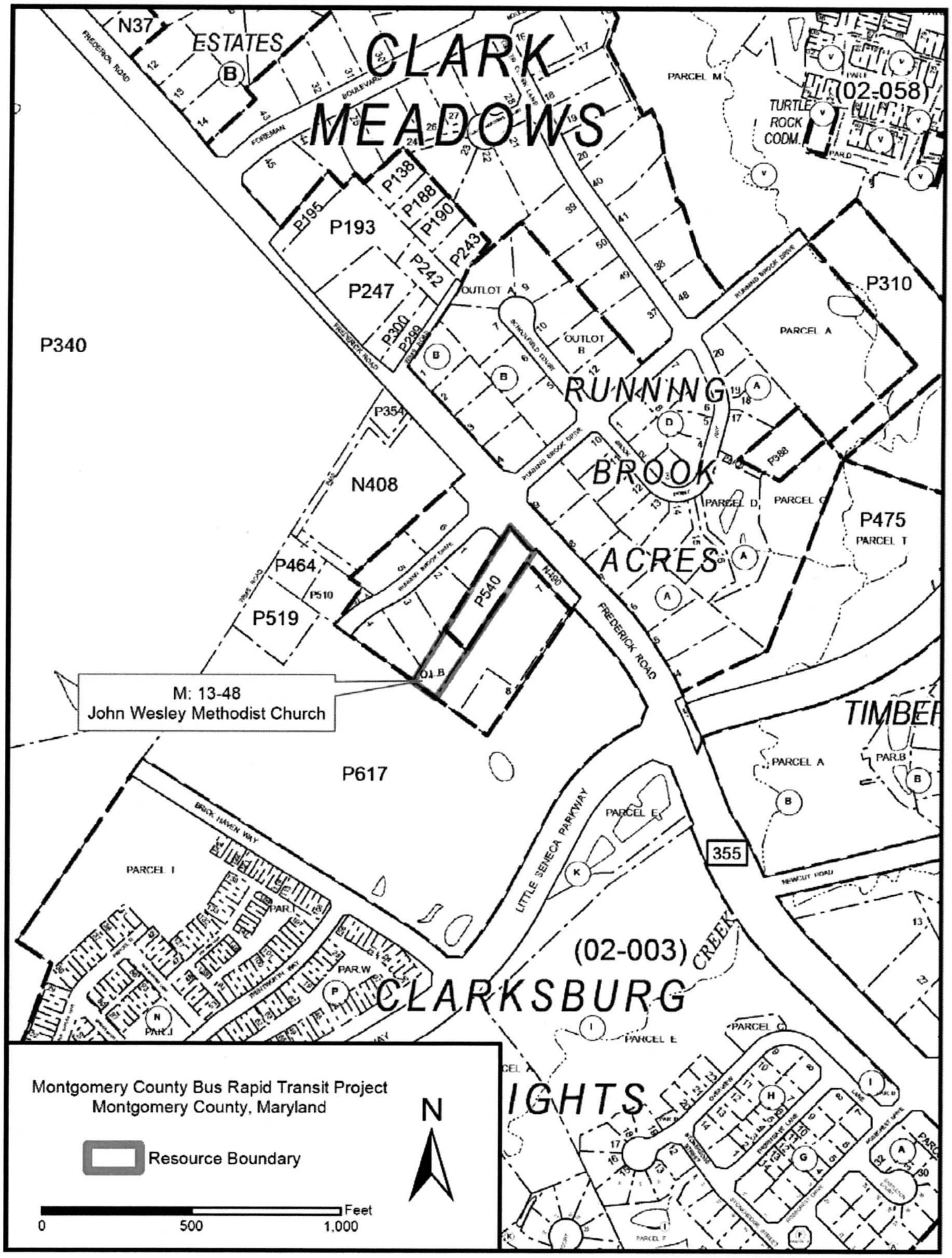
1979 photograph of John Wesley Methodist Church, looking southwest
(McDaniel, Reed, and Walston 1979)



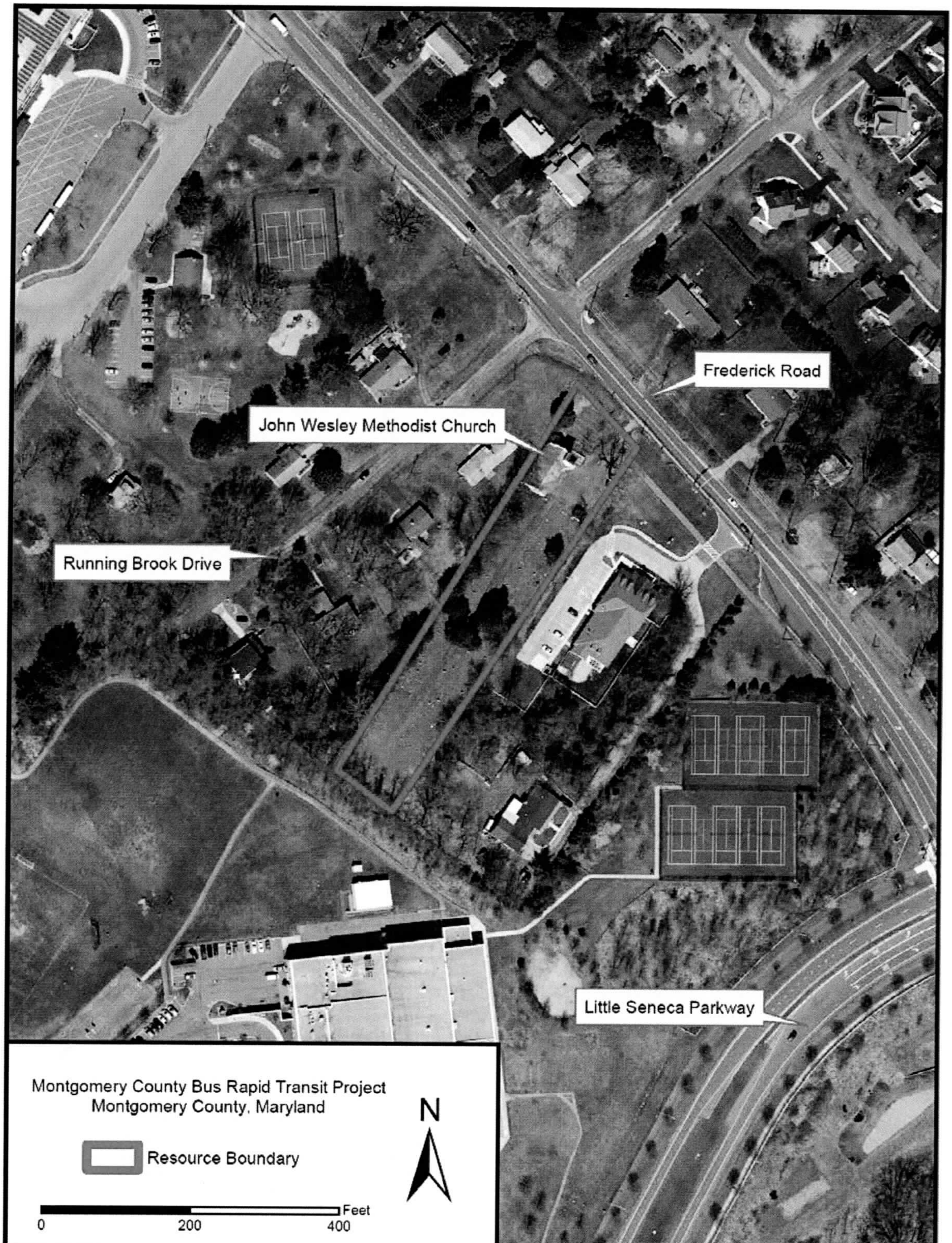
Location of the John Wesley Methodist Church on 7.5-Minute Germantown, Maryland, United States Geological Survey Topographic Map (USGS 2016)



Location of the John Wesley Methodist Church on 7.5-Minute Germantown, Maryland, United States Geological Survey Topographic Map (USGS 2016)



Location of the John Wesley Methodist Church on Montgomery County Tax Map
(Maryland Department of Planning, Planning Data and Analysis 2013)



Location of the John Wesley Methodist Church on 2017 Aerial Image
(Maryland's Mapping and GIS Data Portal 2017)

John Wesley Methodist Church (M: 13-48)
Clarksburg, Montgomery County, Maryland

TIFF Image File Name	Description	Date Taken	Ink	Paper	Brand, Make & Dye Type of DVD
M; 13-48_2018-01-24_01.tif	Overview of the church from Frederick Ave, looking southwest	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_02.tif	Northwest and partial front elevations with exposed brick veneer visible at center	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_03.tif	Primary façade, looking southwest	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_04.tif	Front and southeast elevations	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-03-13_05.tif	Southeast elevation	03/13/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-03-13_06.tif	Rear and southeast elevations	03/13/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_07.tif	Rear addition of church building viewed from cemetery	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_08.tif	Detail of stained-glass window above primary entrance	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_09.tif	Detail of doorway and windows on southeast elevation	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_10.tif	Detail of concrete plaque installed in 1932	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R
M; 13-48_2018-01-24_11.tif	Overview of cemetery behind church building	01/24/18	Canon Chromalife100 CLI-271 Inks	Cannon Photo Paper Plus Glossy II	Verbatim UltraLife 4.7GB 8x Gold Archival Grade DVD-R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M.E. CHURCH
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REV. J.H. LEWIS, PASTOR


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