Old Ivy Road Residential Development

Sustainable Urban Development with a Focus on Affordable Housing

A Thesis Prospectus
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Introduction

As the world's population grows to a projected 10 billion people by 2050, 6.3 billion of them are expected to be living in an urban environment – an increase from 3.6 billion in 2011 (Gan et al., 2017). As the urban population grows, it'll be increasingly more important to have housing capacity for all these people, especially for it be affordable and sustainably built in a way to reduce resource consumption. For our uses, affordable housing is defined as "when rent or mortgage, plus utilities, costs no more than 30% of a household's pre-tax income" (Affordable Housing | Albemarle County, VA, n.d.), while sustainable housing is defined as "meeting the needs of the present generation without compromising the ability of future generations to meet their own needs" (Gan et al., 2017).

My technical project takes a closer look at designing and developing an affordable and sustainable, mixed use residential and commercial development for a 36-acre parcel along Old Ivy Road in Charlottesville, Virginia. Our client has requested 250 to 300 housing units, with set percentages being either single family homes, townhomes, or apartment buildings with the required parking and amenities. There is to be a minimum of two commercial buildings incorporated into the development. The goal of the project is to fully flesh out through the design phase and pre and post construction phases. The technical project is currently being advised by Professor T. Donna Chen from the University of Virginia Department of Civil and Environmental Engineering. Our Professional Mentor is Maria Minnick, PE along with others from Dewberry who are assisting us in this project which is based off a real-life project which they are working on. The remaining group members are Reese Hertel, Alexander Lindsay, Matthew Taylor, and Grey Webbert. By the end of this semester, we anticipate finishing a preliminary site plan, preliminary grading plan, and preliminary storm management plan while

having a finalized traffic plan, Rivanna Trail plan, as well as a construction timeline. For next semester, we plan on going more in depth into the grading and stormwater management of the site.
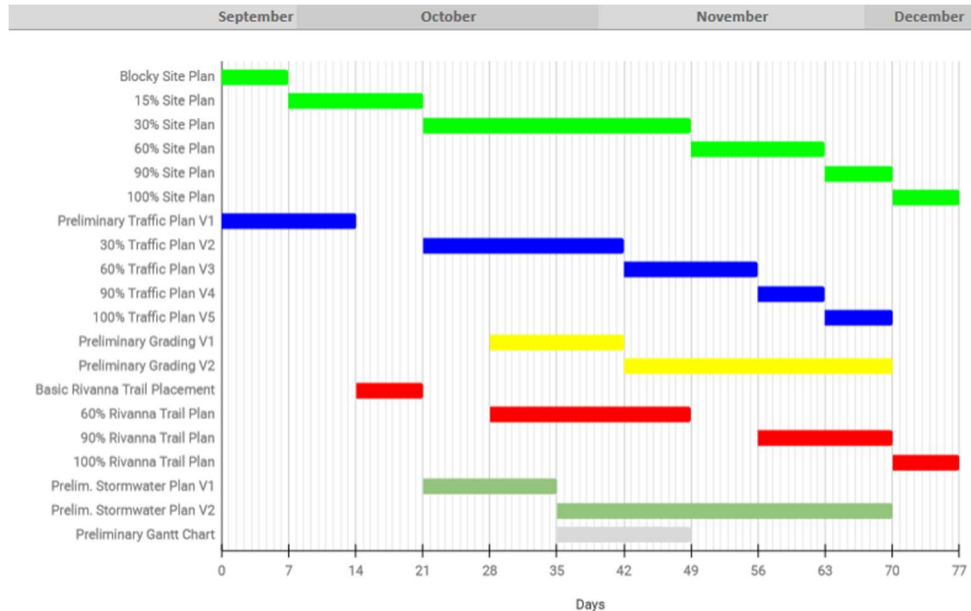

Figure 1: Gantt chart showing a detailed schedule of the work to be finished this semester along with the project scope (Gurung, 2023).

The Science Technology and Society (STS) portion of the project involves how the design and implementation of a new residential development can promote environmental sustainability, community integration, and affordability while meeting regulatory requirements. This project is to be done individually with the guidance of Professor Pedro Augusto P. Francisco of the University of Virginia's Department of Engineering and Society. I will be analyzing this topic from both an international perspective as well as on a more national scale, here in the United States, and finally in the local area of Charlottesville, Virginia.

These two topics are very closely linked as the STS topic takes a more theoretical approach to how affordable and sustainable housing can be implemented on various scales while the technical topic focuses in on a very real-world project where these theories can be practically applied. In both topics, there are strong themes of environmental sustainability, community integration, and affordability. Both work hand in hand with each other and will allow for a broader and well-balanced approach to the issue.

Old Ivy Road Residential Development

The technical project which my group is working on is a real life planned residential development off Old Ivy Road in Charlottesville, Virginia. The current parcel of land falls between U.S. 29 and Old Ivy Road from which you can enter the development. Of the 250 to 300 housing unit required to be in the development, 10-15% will consist of single-family homes, 20-30% will be townhomes, and 60-70% will be apartments. Each one of these buildings will require a certain number of parking spaces associated with it to fulfill the parking needs of the community. We have emphasized the need for more green ways of transportation, including walking, biking, and public transit through the additions of accessible sidewalks, walking trails, and bus stops to better connect the community with one another and the greater area. To fulfill the recreational needs of the community as pertaining to Albemarle County Code Sec. 4.16 (Sec. 4.16 - Recreation Regulations. | Code of Ordinances | Albemarle County, VA | Municode Library, 2023), the development will have two basketball courts one tot lot, one tennis court, and one swimming pool.

Figure 2: Blocky site plan of the development. Townhomes are concentrated in the northeast, single family homes in the south east, and apartment buildings in the south west (Gurung, 2023).

To fulfill the commercial building requirement, we plan on having a commercial space on the first floor of two of the apartment buildings. This commercial space will be taken up by a business which we plan on fulfilling the local needs of the community and the greater area so that there is positive revenue generated. There is also the issue of the Rivanna Trail, an important community feature, which runs through the lot and needs to be relocated. Our current plan for relocation is to move the trail so it goes mainly though the tree line between our developed area and U.S. 29. This serves the dual function of protecting the greenery in the area to reduce the ecological footprint of the development along with forming a sound barrier between the busy highway and the housing. On an environmental note, the current pond in the area will be kept and in fact converted from a stormwater retention pond to a certified wet pond that can handle the increased stormwater runoff and nutrient levels from the development.

Obviously, the addition of all these housing units will increase traffic into the area. At the moment, Old Ivy Road has a typical daily service volume of 4,800 vehicles/day (Timmons Group, 2022). After development, we believe the typical daily service volume of the development will increase by 4,326 average daily trips to a total of 9,126 vehicles/day. To service this additional load on Old Ivy Road, we're proposing that an additional right turn lane be added to it, leading to the development. While construction is being worked on, we're proposing multiple phases of road closures. While extensive work is being done to the road which will require the whole section between Huntington Village and Ivy Stacks to be closed, traffic will be diverted on a detour route onto Ivy Road and back onto Old Ivy Road. If traffic must be stopped on both sides only temporarily for large vehicles, flaggers for traffic will be posted on both sides of the sections to block traffic for that short duration.

Table 1-1: Trip Generation Comparison

LAND USE	ITE CODE	AMOUNT	UNITS	WEEKDAY						
					AM PEAK HOUR			PM PEAK HOUR		
				ADT	IN	OUT	TOTAL	IN	OUT	TOTAL
Single-Family Detached Housing	210	80	Dwelling Units	847	15	47	62	52	30	82
Single-Family Detached Housing - Duets	210	60	Dwelling Units	650	12	35	47	39	23	62
Multi-Family Housing (Low-Rise) - Apartments	220	335	Dwelling Units	2,492	35	116	150	109	64	173
Multi-Family Housing (Low-Rise) - Townhomes	220	50	Dwelling Units	337	6	19	25	20	12	32
TOTAL		**525**	**Dwelling Units**	**4,326**	**67**	**217**	**284**	**220**	**129**	**349**

Figure 3: Trip generation comparison from before and after the development is completed (Timmons Group, 2023).

Sustainable Urban Development with a Focus on Affordable Housing

My STS question asks how the design and implementation of a new residential development can promote environmental sustainability, community integration, and affordability while meeting regulatory requirements. As stated in the introduction, the sheer change in

dynamics of human population as it increases and takes up residence in urban areas will strain any current residential capacity to the point where housing becomes an untenable burden for many. In the United States, housing costs have been increasingly worrying issue since the Great Recession. Over 40% of renters spend more than 30% of their income on housing costs and housing prices are rising faster than wage growth in 80% of U.S. markets (Ghent, 2023). It was estimated in 2022 that four to five million more houses are needed on the market to tackle this issue. More recently, the COVID-19 pandemic and the insufficient housing supply, caused through a combination of labor and building material shortages, has made the issue even worse. In developing countries, this can take the form of living in slums and sub-standard housing of which 828 million people in 2011 live in (Gan et al., 2017) and is expected to rise with the increased urban population.

Housing instability, which includes homelessness, high cost of housing in proportion to income, overcrowding, poor housing quality, and multiple moves, can negatively affect the education of children and how successful they are in school. There tends to be greater stress and difficulty learning, which can lead to disrupted school attendance which ultimately leads to poorer school performance. Of the 1.1 million school children who experienced homelessness in 2011-12, "These children are more likely than their peers to drop out of school, repeat grades, perform poorly in school, disengage in the classroom, and suffer from learning disabilities and behavior problems. (Enterprise Community Partners, 2014)"

Instability in housing, which includes high cost of housing in proportion to income, overcrowding, poor housing quality, and multiple moves can seriously affect child and adult health in a negative way. Access to proper nutrition for children is not present typically, leading to life-long health problems. Researchers found that "For every $500 that average annual rents

increase in a region, there is a 10 percent increase in food insecurity rates among low-income families. (Enterprise Community Partners, 2014)". Looking at a local example, 16.7% of residents in Charlottesville are food insecure, compared to the national average of 12.3% (Shook, 2019). The common theory goes that if housing costs increase, households will have less money for purchasing food and if there is a lack of personal vehicles or adequate public transportation, reaching grocery stores will be more difficult.

From a sustainable standpoint, it just as important to integrate members of the community with their surroundings as the people who have the most to gain from more sustainable housing are the most disadvantaged, who typically live in communities that possess "detrimental environmental conditions that negatively affect their mental and physical health" (Pattison & Kawall, 2018). Development which includes greenspaces and parks is seen to be associated with greater social cohesion and sense of community, which along with living in a less noise and dust polluted environment would empower communities and residents. In Australia, they have a strong emphasis on limiting the physical extent of cities, preventing urban sprawl, by "intensifying development in inner areas and limiting the conversion of rural land on the urban fringe" (Gurran, 2008). This is also known as 'urban consolidation' or 'containment' and is touted to "cause less air pollution, have lower energy and water demands, result in lower biodiversity loss, and promote a more efficient and equitable use of urban infrastructure. (Gurran, 2008)" It's important to have housing near services and urban amenities such as efficient transportation which will promote further economic growth but lead to more housing demand for new workers. While housing might be more expensive due to 'good' planning, the social and environmental impacts are more positive.

Therefore, it's important to understand how new housing can be built in a way which makes it financially accessible but is created in a way that is in congruence with environmental standards so that the communities which inhabit it can live more equitably. How will these parameters be met in a way that is acceptable to all stakeholders at play? I will analyze case studies from the past which have already been implemented and studied, along with current, undergoing developments which seek to address these pressing issues.

Conclusion

There must be more research done on how the design and implementation of residential developments can promote environmental sustainability, community integration, and affordability within the framework of regulations. The rapid increase in human population, especially urban areas highlight the need to find effective solutions to the crisis that is unaffordable housing which is threatening the financial stability, along with physical and mental health of so many around the world. Through literary analysis of case studies and research papers tackling the issue, I seek to gain a broader perspective so that I can better plan the Old Ivy Residential Development in Charlottesville, Virginia. My findings, which will be implemented in my design of the development, will hopefully serve as an example of what modern, sustainable housing looks like. Only through collaboration with designers, government planners, and communities can lead to the mitigation of the affordable housing crisis.

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