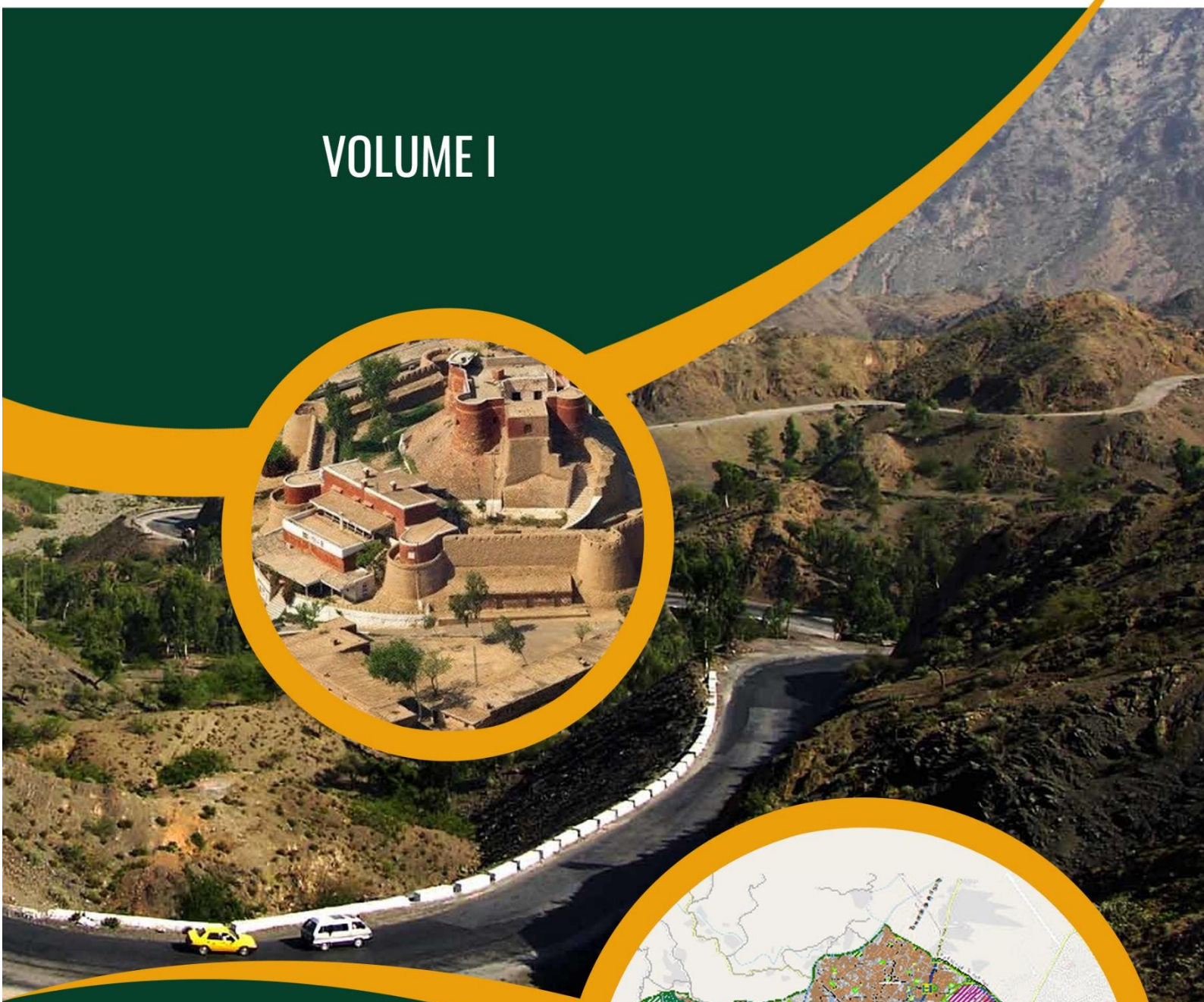
MASTER PLAN OF JAMRUD URBAN CENTER, DISTRICT KHYBER, 2024-42

VOLUME I



MASTER PLAN PROJECT (MPP)
URBAN POLICY AND
PLANNING UNIT
DEC, 2024

URBAN POLICY UNIT
Planning and Development Department
GOVERNMENT OF KHYBERPAKHTUNKHWA

LUBCA

The Urban Unit
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.

HP Consultant Planners (SMC-Private) Limited

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MESSAGE FROM THE CHIEF MINISTER KHYBER PAKHTUNKHWA

Khyber Pakhtunkhwa, the third most populated province of Pakistan, is experiencing rapid urbanization due to various push and pull factors. Lack of proper planning has resulted in overcrowding of all major urban centers coupled with traffic congestion, environmental pollution and ribbon development along main roads. Insufficient investment in urban infrastructure, lack of trained human resource and poor management of key infrastructure are the causes of weak coverage and low service quality. A significant proportion of the urban population continues to live in dilapidated environment and urban slums. The current provincial government has introduced a policy shift from “containing urbanization” to “managing urbanization”, adopting an integrated approach that capitalizes on the potential of cities and that can convert this constraint into an opportunity and transform the cities to be engines of economic growth.

The provincial government is aware of these challenges for which it has prioritized an innovative planning approach that would bridge the gap between urban and rural development. Through coordinated efforts, district land use plans for districts and master plans for urban centers across the province have been developed. These master plans are designed to address core urban issues such as traffic congestion, provision of affordable housing, traffic & transportation problems, unemployment, lack of education and healthcare facilities and environmental degradation. These plans provide clear and actionable road maps for decision-makers to guide them towards sustainable development ensuring that both urban and rural areas can meet the needs of growing populations while safeguarding natural resources for future generations.

These achievements wouldn’t have been possible without the dedicated and untiring efforts of the Master Plan Project, Urban Policy and Planning Unit (UPU) of the Planning and Development Department, Government of Khyber Pakhtunkhwa. I would like to extend my gratitude to all stakeholders, community members and local government officials whose contributions have been instrumental in shaping these comprehensive plans.

Looking ahead, these master plans stand as a testament to our government’s unwavering commitment to fostering sustainable, inclusive and resilient urban development. Together, we will ensure that Khyber Pakhtunkhwa’s cities and towns continue to thrive as hubs of economic activity, cultural heritage and community well-being, securing a prosperous future for all generations to come.

Ali Amin Khan Gandapur
Chief Minister,
Khyber Pakhtunkhwa

MESSAGE FROM THE MINISTER OF LOCAL GOVERNMENT, ELECTIONS, AND RURAL DEVELOPMENT DEPARTMENT

The Government of Khyber Pakhtunkhwa is committed to fostering a well-planned, resilient, and sustainable urban future for our cities. Recognizing the rapid pace of urbanization and its associated challenges, we have taken a proactive approach to urban planning and development that aligns with national priorities and international commitments, including the Sustainable Development Goals (SDGs).

Through the Master Plans for Cities, we are laying the foundation for balanced regional development, economic growth, and environmental sustainability. These plans will guide future investments in infrastructure, housing, transportation, and public services to ensure that our cities remain inclusive, competitive, and climate-resilient. Our focus is to bridge the urban-rural divide by ensuring equitable resource allocation and extending modern infrastructure.

The Master Plans represent a vision for progress, prosperity, and sustainability. With strong political will, coordinated action, and community participation, we are determined to transform our cities into hubs of opportunity, innovation, and well-being for all.

The Urban Policy and Planning Unit (UPU) of the Planning and Development department played a pivotal role in preparing these master plans. These master plans truly reflect the collaborative efforts of a wide range of stakeholders including provincial line departments, district administration, NGOs, local political leadership, and the public at large. I extend my sincere gratitude to UPU and all those who have contributed their expertise and efforts toward creating plans that will not only tackle present challenges but also lay the foundation for a sustainable urban future.

Mr. Arshad Ayub Khan
Minister Local Government
Khyber Pakhtunkhwa

MESSAGE FROM THE ADDITIONAL CHIEF SECRETARY PLANNING AND DEVELOPMENT DEPARTMENT,

GOVERNMENT OF KHYBER PAKHTUNKHWA

The rapid urbanization across Khyber Pakhtunkhwa has created both opportunities and challenges. On the one hand, urbanization is transforming the socio-economic landscape of the province while on the other, it has caused economic issues such as unplanned expansion, inadequate infrastructure, traffic congestion and increased pressure on public resources. To enhance the economic vitality of urbanization and reduce its negative impacts, there is an urgent need of structured and sustainable urban planning to fully realize the potential of our urban centers.

The formulation of master plans for the towns and cities is a crucial step toward achieving this goal. These plans will provide comprehensive frameworks to guide towards the planning of towns and cities, optimize land use, improving economic productivity and ensuring the equitable distribution of resources. Sustainability remains a key priority in the plans emphasizing environmental protection while aligning resources to meet the growing needs of the urban population. The master plans will serve as structured guidelines for local authorities, district administrations and municipalities to systematically undertake and implement future development initiatives. These plans support the achievements of core urban needs such as housing for all, transportation and public facilities ensuring that cities evolve into resilient, liveable and economically viable centers that can meet the aspirations of residents.

The Urban Policy and Planning Unit (UPU) of the Planning and Development department played a pivotal role in preparing these master plans. The plans truly reflect the collaborative efforts of a wide range of stakeholders including line departments, district administration, NGOs, local political leadership and the community. I extend my sincere gratitude to UPU and all those who have contributed their expertise towards developing master plans that will not only tackle present challenges but would also lay the foundation for a sustainable urban growth.

As we move forward with implementation, I am pleased to announce that the projects identified in these master plans shall be included in the upcoming Annual Development Programmes (ADPs) to ensure their timely execution and alignment with provincial priorities. I am confident that these master plans will serve as benchmarks for urban development. They are testament to the government's commitment to foster well-planned and thriving urban centers that support the prosperity and well-being of citizens for all the times.

Mr. Ikram Ullah Khan
Additional Chief Secretary
Planning and Development Department
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE SECRETARY LOCAL GOVERNMENT DEPARTMENT GOVERNMENT OF KHYBER PAKHTUNKHWA

The Jamrud Master Plan of 2024-2042 represents a significant milestone in our efforts to foster sustainable urban development and shape the future of the city. As Jamrud continues to grow, there is an increasing need for structured, sustainable and visionary planning to accommodate rising population, promote economic growth and ensure equitable access of all citizens to essential services and resources.

At the Local Government Election & Rural Development (LGE&RD) Department, we are committed to undertake initiatives that contribute to the overall prosperity of Khyber Pakhtunkhwa. The aim is to ensure that each part of the province shall benefit from development strategies. This master plan is a reflection of that vision — offering a comprehensive framework that addresses immediate urban challenges while laying the foundation for a long-term resilient growth.

The Jamrud Master Plan of 2024-2042 has been designed to maintain an equilibrium between urban expansion and the preservation of valuable cultural heritage and environmental resources including prime agricultural land in the peri urban limits. The plan will create investment and employment opportunities and will generate revenue for further development and enhance the overall quality of life for the people of Jamrud. Moreover, it underscores the importance of collaboration among public institutions, stakeholders and residents in shaping an inclusive, sustainable and prosperous urban centers.

I would like to commend the Urban Policy & Planning Unit (UPPU) of the Planning and Development Department and all stakeholders for their dedication and hard work in developing this master plan. The successful implementation of the plan will not only transform Jamrud but would also serve as a model for other cities throughout the province.

We resolve our commitment to fostering inclusive growth, ensuring that development opportunities are accessible to all and contributing to a brighter and more prosperous future for the people of Khyber Pakhtunkhwa.

Dr. Amber Ali Khan
Secretary Local Government
Government of Khyber Pakhtunkhwa

Acknowledgements

First of all, I am extremely grateful to almighty Allah who enable me and my team to successfully complete gigantic work of the preparation of Master Plan of Jamrud. The preparation of Jamrud Master Plan 2024-2042 has been a collaborative and dedicated effort aimed at ensuring the sustainable development of Jamrud, the vibrant urban center of District Khyber, Khyber Pakhtunkhwa. This report reflects the collective commitment of all stakeholders toward the rational, balanced, and systematic use of resources to address the city's challenges and guide its future growth and development. This master plan forms an integral part of Khyber Pakhtunkhwa's broader initiative to promote sustainable urban development across the province. It addresses critical aspects of urban management, including housing, transportation, socio-economic development, and environmental sustainability, providing a comprehensive framework for sustainable growth of Jamrud.

I extend my sincere gratitude to the Urban Policy & Planning Unit, P & D Department, Government of KP for entrusting my team with this significant initiative. Special thanks to my existing and former Executive Directors, UPU including Mr. Zubair Asghar Qurashi, Mr. Adeel Shah (current Secretary, P and DD), Mr. Inayatullah Waseem, Mr. Shah Mehmud, Mr. Abdul Basit, Mr. Ifthikhar, and Mr. Fazal Khaliq (current ED, UPU) for their insightful leadership and support throughout the planning process. I am also thankful to all my colleagues in UPU and MPP especially Dr. Muhammad whose expertise and efforts during the conceptualization, data collection, analysis, and review phases were instrumental in shaping this detailed master plan. I am deeply thankful to the officials of the District Administration, including Commissioner and Deputy Commissioner Jamrud District Khyber, and other key officials for their cooperation, guidance, and active involvement during the course plan making. Their local insights, support, and valuable feedback have greatly enriched the plan, ensuring its relevance to the unique context of Jamrud.

Special recognition is due to Urban Unit Punjab for their dedicated efforts in preparing this report. The team's technical expertise, unwavering commitment, and hard work were instrumental in successful completion of this master plan. Finally, I express my appreciation to everyone who contributed to this plan in various capacities. This Plan represents a shared vision for a sustainable, prosperous, and resilient future Jamrud.

As this master plan is the first of its kind and will not be free from errors, however, I am fully optimistic about the successful implementation of this plan. In due course of time the plan be reviewed and necessary changes will be made in future revisions. Together, let us work toward building a thriving and sustainable Jamrud for generations to come.

Adnan Salim,
Project Director, Master Plan Project
Urban Policy Unit, P & DD

Executive Summary

Located in the north-west, Khyber Pakhtunkhwa (KP) is the third-largest province of Pakistan by population. It has an average annual growth rate of 2.89% that is relatively higher than the national average of 2.40% estimated by the Pakistan Bureau of Statistics in 2017 whilst the urban population stood at 5.7 million, with the Newly Merged Districts (NMDs) accounting for 13% of the provincial population—contributing around 4.6 million people. This extensive urban growth has been driven by the province's complex socio-political dynamics, including the influx of Afghan refugees and persistent law-and-order challenges in districts bordering Afghanistan. Subsequently, the urban centres in KP are growing rapidly in haphazard and unplanned manner, mainly promoting ribbon development owing to lack of comprehensive planning initiatives by the Provincial and Local Governments.

Considering the challenging scenario, the Prime Minister of Pakistan directed the provincial and local governments to prepare Master Plans of cities and towns that would inform and direct the urban growth, encourage high-density development while protecting the prime agricultural and environmentally significant land. The Urban Policy & Planning Unit (UPPU) of the Planning and Development Department, Government of KP commissioned the preparation of Master Plans of Provincial, Divisional and District Headquarters of KP province. This initiative includes the preparation of Jamrud Urban Center Master Plan 2042 that would inform and direct the future growth of Jamrud in a sustainable way to efficiently enhance its productivity and functioning whilst improving the quality of life of its residents. The Urban Unit and HP Consultants were in a joint venture hired as the Project Consultant by UPPU to carry out the extensive exercise of the preparation of the Jamrud Urban Center Master Plan 2042. The primary objective of the plan is to develop sustainable, compact, and environmentally sound proposals to guide Jamrud's future development. The plan serves as a strategic roadmap for the city's growth up to the year 2042, aiming to enhance productivity, improve quality of life, and ensure spatial equity for its residents.

Jamrud is anticipated to undergo substantial population growth over the next two decades. Population projections suggest an increase from 63,728 in 2017 to approximately 146,506 by 2040. This growth is influenced by multiple factors, including socio-cultural dynamics, cross-border migration, and the ongoing security situation in

Afghanistan-adjacent districts. However, due to longstanding institutional neglect, the former FATA region, including Jamrud, has faced limited economic opportunities and minimal formal planning. Consequently, the city is now grappling with unregulated urban expansion, fragmented development, substandard road networks, and poor enforcement of building regulations, posing significant challenges to integrated infrastructure development and service delivery.

To respond to these challenges, this Master Plan for Jamrud has been formulated that outlines a sustainable urban development strategy for Jamrud. It seeks to accommodate population growth while promoting a resilient, inclusive, and functionally efficient urban environment. A collaborative and inclusive approach was taken to develop a vision for the Jamrud Urban Center, engaging with the local community and diverse stakeholders including government officials, city administrators, NGOs, local elders, and community members. Through this extensive engagement, a shared vision statement for the Jamrud Master Plan was crafted, reflecting the aspirations and needs of the community.

"A peaceful city with increased awareness, multiple employment opportunities, better education, health facilities, vertical development with transit connectivity and planned industrial growth with all the municipal services necessary for a comfortable and prosperous life keeping the social and cultural norms of the society intact along with the preservation of the heritage."

Building on this shared vision, the plan establishes a clear set of goals and objectives for Master Plan of Jamrud 2042. To address the complex challenges faced by Jamrud, the master plan has adopted a multifaceted and forward-looking approach to development. Central to this strategy is the adoption of scenario-based planning, aimed at assessing the city's strengths, weaknesses, opportunities, and constraints. Three future growth scenarios were formulated, Business as Usual, Sectoral Planning, and Multi-Nuclei Development. Following a thorough evaluation of their respective implications, the Multi-Nuclei Development scenario was selected as the preferred strategy. This approach promotes decentralized and diversified growth by establishing multiple nuclei centers, providing the flexibility to accommodate a range of economic activities and land uses. It offers a balanced framework for spatial expansion and

resource allocation, minimizing urban sprawl while enhancing connectivity and service delivery.

The project area encompasses seven neighborhood councils covering a total area of 48.18 sq. km., the urban center currently accommodates 63,728 residents across 17.14 sq. km. of built-up space, with an average household size of 8.05. Recognizing the need for future expansion, the total extent of the proposed additional land use area including livestock and dairy development zone is 100 acres for a population of 146,506 by 2040.

This Master Plan for Jamrud Urban Center aims to transform the city into a sustainable urban hub by focusing on compact development, improving public services, stimulating economic growth, and promoting tourism. This comprehensive plan envisions Jamrud as a regional hub for social and economic services, catering to the needs of local and regional communities, and setting a benchmark for sustainable development.

The Plan seeks to provide and ensure adequate housing availability spatially as well as in terms of affordability. By 2042, the demand for housing is projected to surge to 8,097 units. To address this, a residential area of 5.14 sq km., has been proposed with housing distribution catering to diverse income groups. The plan allocates 67% of residential areas for low-income groups, 23.6% for middle-income, and 9.4% for high-income groups. Moreover, infill residential zones have been proposed on 2.64 sq km area to revitalize urban areas, increase efficiency, attract new investment and residents within Jamrud urban center.

Enhancing the urban environment, the plan proposes a significant increase in recreational spaces by proposing parks covering 0.15 sq.km by 2042. These spaces are strategically located throughout the urban center, aimed at promoting environmental sustainability, community interaction, and improving the overall livability of Jamrud. This development intends to create vibrant community hubs that foster social cohesion, recreation, and ecological balance.

To support economic growth and commercial vibrancy, the Master Plan strategically expands the commercial areas within Jamrud, building upon the existing commercial footprint of 0.68 sq.km with highest density being observed in Jamrud Town-1, Jamrud

Town 2 & Jamrud Town-4 over the last decade. These markets serve as vital commercial centers, offering retail and wholesale goods. In order to enhance convenience and reduce travel time, proposed commercial areas will be situated near neighborhood units, following the self-sufficient neighborhood planning concept. This will decrease travel time, fuel consumption, and costs. Moreover, a Declared Central Business District (DCBD) along National Highway-5 is designated to centralize high-value economic activities, enhance regional commerce, and stimulate local investment. These developments will not only improve commercial opportunities but also streamline urban mobility and economic dynamism in the region.

Addressing industrial growth, the Jamrud Master Plan introduces substantial industrial zones in areas previously devoid of industrial infrastructure. These zones, accounting for 0.35 sq. km, strategically placed near the Regi Model Town Road and Frontier Road. Additionally, specialized timber and warehousing zones have been proposed each comprising of 0.10 sq km. The strategic positioning near critical transport infrastructure aims to catalyze industrial clustering, maximize efficient resource utilization, and spur regional employment and economic prosperity. This approach parallels successful industrial strategies elsewhere in the region, fostering a robust economic foundation for sustainable growth.

To bolster educational infrastructure, the Master Plan prioritizes accessibility and capacity enhancement. Complementing the existing network of 195 primary schools (111 for boys and 84 for girls), 33 middle school (16 for boys and 17 for girls), and 15 high schools (10 for boys and 5 for girls)., the plan recommends new primary, middle, and high school facilities strategically distributed throughout Jamrud's urban center. These additions ensure that educational resources are within manageable distances for children, substantially improving accessibility, attendance rates, and educational outcomes. Such expansion aligns closely with established best practices aimed at achieving educational equity and optimizing land-use efficiency.

The existing health infrastructure in Jamrud, comprising Health Units, Community Health Centers, District Headquarter Hospital, small hospitals, and private clinics, is insufficient to meet the needs of the growing population. Recognizing current healthcare service shortfalls, the Master Plan significantly augments Jamrud's healthcare infrastructure by proposing area around 0.07 sq.km. Comprehensive

proposals include the establishment of new healthcare facilities across the urban center, supported by the recruitment of specialized medical staff, technical personnel, and well-equipped laboratories. The goal is to develop an autonomous and resilient healthcare system capable of addressing existing and future needs, thus enhancing community health resilience and well-being comprehensively.

In alignment with sustainable agriculture and food security goals, the plan designates 1.16 sq.km for reserved agriculture areas, green spaces and plantation. These areas will utilize sustainable agriculture practices such as organic farming, conservation agriculture, and climate-resilient cropping systems, while allowing for ground water recharge and improving the air quality of the urban center. Adjacent to this, a Livestock and Dairy Development Zone covering 0.41 sq.km has been proposed on Southwest side of Jamrud, near to located on the Doctor Sarfraz Road. Additionally, slaughter house having an area of 0.002 sq.km has been proposed near the Doctor Sarfraz Road. These proposal aims to strengthen local agricultural economies through enhanced dairy production and livestock management practices. This integrated agricultural development approach ensures food security, promotes economic diversification, and supports environmental sustainability.

Transportation and connectivity within Jamrud will undergo transformative improvements through detailed infrastructural enhancements proposed for implementation by 2042. The Master Plan includes widening/rehabilitating along with the allied infrastructure in the south and north of the city and dualization of Jamrud primary road. N-5 is experiencing heavy traffic congestion especially near Jamrud bazaar. Jamrud Southern Bypass is proposed to bypass the traffic from national highway N-5. Presently Jamrud southern bypass is under construction and 2km patch is remaining including bridge. It is recommended that is should be completed early to relief the traffic on national highway N-5. In addition to the widening of the secondary road network, it is also proposed to Dualize the Jamrud primary road to maintain the through traffic flow. The plan also includes paving off-street parking lots, establishing a traffic management system, initiating bus services for intracity travel, and providing infrastructure for non-motorized transport, ultimately enhancing the overall transport and connectivity in the area.

The provision of civic amenities also receives targeted attention, with a dedicated Civic Amenities Zone spanning 1.57 sq.km along National Highway-5. Strategically placed to ensure optimal accessibility, this zone will accommodate essential public services and governmental facilities, thus enhancing the efficiency and effectiveness of municipal service delivery. Its strategic location ensures seamless public access, thus reinforcing urban functionality and community convenience.

Furthermore, recognizing the importance of slum rehabilitation, the Master Plan outlines comprehensive slum improvement initiatives designed to substantially uplift living standards in informal settlements. These improvements include paved streets, upgraded water supply and sewerage networks, improved street alignment, and the addition of critical public facilities and open recreational spaces. This targeted approach mirrors effective urban renewal programs, significantly boosting quality of life and integrating marginalized areas more fully into the urban fabric of Jamrud.

Collectively, these comprehensive proposals reflect a coherent vision aimed at transforming Jamrud into a sustainable, economically vibrant, and inclusive urban center. The plan leverages strategic spatial planning, infrastructure investments, and targeted community enhancements to deliver lasting socio-economic benefits, resilience, and sustainable urban development for its residents.

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Abbreviations

ADP	Annual Development Program
BAU	Business as Usual
BHU	Basic Health Unit
CBD	Central Business District
CHC	Community Health Center
CBD	Central Business District
CCTV	Closed-circuit Television
CHC	Community Health Center
CPTED	Crime Prevention Through Environmental Design
DRR	Disaster Risk Reduction
GDP	Gross Domestic Product
GIS	Geographic Information System
GoKP	Government of Khyber Pakhtunkhwa
HIS	Household Information Survey
KP	Khyber Pakhtunkhwa
MCA	Multi-Criteria Analysis
NC	Neighborhood Council
NGOs	Non-Governmental Organizations
NMDs	Newly Merged District
NRM	National Reference Manual
OD	Origin Destination
PDWP	Provincial Development Working Party
MCHC	Mother Child Health Care
QoL	Quality of Life
SDGs	Sustainable Development Goals
SMEDA	Small Medium Enterprise Development Authority
UPPU	Urban Policy & Planning Unit
UTM	Universal Transverse Mercator
VPD	Vehicles Per Day

Definitions

- **Eco Sustainable:** It refers to actions and practices that maintain or enhance environmental well-being while ensuring the ability of future generations to do the same.
- **Ribbon Development:** Linear urban development along transportation routes.
- Leapfrog: Urban development that skips over intermediate areas to expand outward.
- **Vacant Land:** Land that has no buildings on it and is not being used
- **Infill Land:** Infill sites are tracts of empty or under-utilized land in urban and built-up areas. These sites are ripe with opportunity because of their location.
- **Range Land:** Rangeland is any extensive area of land that is occupied by native herbaceous or shrubby vegetation which is grazed by domestic or wild herbivores.
- **New Town:** New Towns are cities or towns that are designed from scratch and built in a short period of time.
- **Revitalization:** Renewal and improvement of a place or community
- **Compact Development:** Dense urban development with minimal space between buildings.
- **Commercialization:** The process of introducing and promoting a product or service for profit.
- **Permitted Use:** The land use, which is allowed in each land use class.
- **Allied Permissible Use:** The land use, though not permitted, may be allowed by the authority subject to the payment of the fee.
- **Prohibited Use:** The land use, which is neither permitted nor permissible.
- **Sustainable:** Sustainability is the practice of meeting present needs without compromising the ability of future generations to meet their own.
- **Sporadic Growth:** Sporadic growth refers to irregular or unpredictable patterns of expansion or development.

Project Introduction

Project Scope

The Province of Khyber Pakhtunkhwa (KP) is located in the northwest region of Pakistan with an area of 101,741 km². It is the third most populous province, with a population of 35 million with 52% males and 48% females, comprising of 11.9% of Pakistan's total population. In 1998, its population was 17.7 million, showing an annual growth rate of 2.89%, which exceeds the national average of 2.40%. Factors such as a high fertility rate and both temporary and permanent internal migration have contributed to this population growth.

KP has the third-largest provincial economy in Pakistan, contributing 10% to the country's overall GDP and 20% to its mining output. The province contributes 10% of Pakistan’s GDP and 20% in mining output. The major sectors contributing to the national and provincial economy are hydel electricity, mining, forestry and agriculture by generating sufficient revenue.

The urban centers in KP have been neglected in the past. This has resulted in unregulated urban growth, with less than optimal infrastructure, inefficient institutions and poor quality and outreach of civic services, which has led to low quality of life.

In Khyber Pakhtunkhwa the process of urban development is being carried out with no proper planning mechanism and is confronted with various basic hurdles. The urban areas of the province are lacking integrated urban planning that has resulted in tremendous strain on urban land, civic infrastructure and services. Lack of proper planning has been raising several issues in every urban center including divisional headquarters; such as urban sprawl, lack of institutional reforms, unregulated and unplanned growth, traffic congestion, air pollution, poor investment and weak management of key infrastructure.

Encroachment is one of the many serious issues in almost all cities and towns causing severe congestion on roads, bazaars and streets. Vendors and shopkeepers place products in front of their shops on footpaths and pavements. These encroachments on major sites of the cities need to be removed through effective enforcement. On the other hand, the trend of road-widening and constructing under/overhead passes is only a short-term plan to fix the problem. To overcome such problems there should be

long term Master Plans that technically cover all aspects of urban planning in major cities under the supervision of a single government entity.

Another critical feature of our cities is the lack of proper city limits or boundaries. Our cities are continuously growing in all directions causing the emergence of slums and squatter settlements. The formation of slums is one of the biggest challenges faced by urban centers of Khyber Pakhtunkhwa. The slums are usually characterized with the lack of services, narrow streets, illiteracy, unemployment, high rates of poverty, and low socioeconomic status of its inhabitants. These slums are commonly seen as “breeding grounds” for social problems such as crime, drug addiction, alcoholism, high rates of mental illness and extremism.

For resolving issues in the urban areas of Khyber Pakhtunkhwa, the Urban Policy Unit has taken important steps to tackle the problems of inefficient land-use planning, lack of zoning regulations, ineffective building bylaws, growth of urban sprawl, lack of institutional reforms, identification and up-gradation of slums, encroachment, lack of clear urban boundaries, unavailability of civic facilities and ineffective urban legislation & enforcement. The most significant initiative of the Urban Policy Unit is to prepare long term Master Plans for all the divisional and district headquarter cities of Khyber Pakhtunkhwa including the provincial capital Peshawar, Divisional HQs Mardan, Abbottabad, Kohat, Mingora, Bannu and DI Khan and other major cities of KPK including NMDs. The Provincial Working Development Party (PDWP) has recently revised the ADP Scheme for the Master Planning with a total cost of Rs. 537.051 million. The Master Plan is vital for the integrated and sustainable urban development of the province.

The overall objective of the Master Plan is to ensure equity and social inclusion, economic productivity, quality of life, environmental sustainability and finally infrastructure provision. Collectively these objectives will create a perception of a prosperous city. Other important features of the study are building urban growth centers, high rise development areas within the cities and new expanding areas. The Master Plan is a futuristic plan containing the best model of urban planning in the world. Beside the seven divisional headquarters (Peshawar, Mardan, Mingora, Abbottabad, Kohat, Bannu and DI Khan), the Project will also prepare Master Plans for major urban centers of NMDs of KP.

For the Jamrud Master Plan 2042, the services of The Urban Unit and HP consultant have been hired through a competitive bidding process.

Jamrud, located at the entrance of the historic Khyber Pass in Khyber District, Khyber Pakhtunkhwa, holds strategic and historical significance. It acts as the gateway between Pakistan and Afghanistan, especially through the Torkham border. Surrounded by rugged hills and ancient forts like the Jamrud Fort, the town has long been a key military and trade post. Dominated by Pashtun tribes, particularly the Afridis, Jamrud reflects a deep-rooted cultural identity visible in its language, dress, and customs. Its proximity to Peshawar and location on the Peshawar–Torkham Road (N-5) make it a critical link for cross-border trade, regional security, and connectivity under initiatives like the Afghanistan–Pakistan Transit Trade Agreement (APTTA). With its unique blend of tribal heritage and strategic positioning, Jamrud plays a pivotal role in the region's geopolitics and economic development.

This master plan was completed under the following TORs:

i. Mapping of the Historical Growth Trends of the City

To understand the pattern and direction of the spatial growth of Jamrud the consultants conducted extensive research on the historical urban growth trends and drivers of urban growth over the period of last twenty years. To identify trends and direction of spatial growth the consultant used various sources for mapping the trends over the last 20 years period including municipal records, population census, libraries and archives, Arial photographs satellite images and other published and unpublished data and records. Latest GIS techniques were used for plotting historical growth trends on GIS maps of the city-region and articulating the drivers of urbanization and urban spatial growth.

ii. Housing Trends and Needs Assessment through Projected Population Growth Estimates

The provision of housing for all is a basic objective of the Jamrud Master Plan, therefore, the growth pattern and projected growth needs over the next 20 years (2042) were properly analyzed and mapped.

iii. Density Maps

The conservation of prime agriculture land located around the city is another important aspect of the Jamrud Master Plan. Therefore, to reduce urban sprawl and horizontal development, there is a need to promote high-density mixed-use development. To achieve this objective the master plan devised policy guidelines for the establishment of high-density mixed-use development within the existing urban boundaries including the future growth areas. The consultants carried out an extensive mapping exercise to showing the existing and proposed high-density mixed-use development.

iv. Development of Land Use Base Map

For all kind of spatial planning including master plans the preparation of a comprehensive base map is a pre-requisite. Beside other mapping techniques the consultants also used open source satellite imageries (fresh and archives) to develop an up to date map of Jamrud including its surrounding areas in order to support suitability analysis of existing and proposed land uses for urban development and other ancillary uses. After preparation of land cover map then extensive field surveys were carried out to identify the specific use of each parcel of land. The consultants prepared Base map with the following details:

a. Counter lines drawn at counter interval of 5 meters.
b. Boundaries (District, Tehsil, City, Neighborhood)
c. All major and minor streets, roads, railway lines and airports (including encroachments)
d. Water supply, sanitation, sewer, and telephone networks
e. Water bodies (river and other water bodies)
f. Residential areas
g. Commercial and Mixed areas
h. Industrial areas
i. Amenities (education, health, religious, police stations, libraries, and community halls etc.)
j. Parks and playgrounds
k. Brown fields (for re-development)
l. Open spaces (agriculture all types, vacant, and graveyards etc.).

v. Taxation and Revenue Generation

It is of key importance that urban planning and associated work should be sustainable over long time. To ensure that the entities (Land Use and Building Control Authority, Development Authorities and TMAs etc) responsible for implementation of the Jamrud Master Plan the consultant conducted a detailed study of the current urban taxation structure and sources including property tax, land tax, capital value tax, stamp duty and proposed suggestions for improvement. Implementation of the master plan proposals regarding municipal taxation will increase revenue of LU&BCA and TMAs many folds and will ensure sustainability of these organizations.

vi. Governance and Institutions

Good governance and efficient institutions is a key to the successful implementation of polies and plans. To ensure that for implantation of the Jamrud City Master Plan required legal and institutional framework are in placed the consultants objectively analysed and assessed the existing relevant laws/byelaws and institutional capacity of relevant organization responsible for implementation and monitoring of the Master Plan. The consultant also proposed improvements in the existing laws & byelaws and institutional structure(s) for better implementation of the Master Plan.

vii. Land Use Regulations and Plans

The consultants also studied and analysed all existing urban planning, development and environment-related national, provincial laws and regulations (byelaws) and proposed a new set of zoning regulations for each land use zone. The consultants provide extensive input in formulation of Building Regulation 2024 and Housing Schemes Regulations 2024.

viii. Environment

To reduce pollution and create healthy living environment for the residents of Jamrud, the consultant studied various sources of air, noise, soil and water pollution. The consultants use state of the art techniques and equipment for identification of the level of air, water and noise pollution at various points of the city. The consultant carried out the following surveys:

a. Air quality survey at various points of the city Water quality analysis (drinking water supply and water courses)

b. Soil contamination surveys
c. Soil and geological survey/data
d. Analysis of Noise level at various points of the city
e. Identification of environmentally sensitive areas

On the basis of scientific analysis of these surveys the consultant proposed various policy measures for enhancing environmental quality of the city.

ix. Demography, Livelihood and Housing

The successful implementation of the master plan proposals mainly lies on accurate assessment of the city's demographic pattern, livelihood sources and housing conditions. For the purpose of analysis, the consultants divided the city into various zones, calculated its population densities, identified major economic activities and studies housing and related facilities in each zone. Based on these assessments the consultant formulated proposals to revitalize the existing economic base and socioeconomic structure of the city. The consultant conducted the following surveys:

a) Housing surveys including house age, height, occupancy and condition surveys.
b) Accessibility surveys for emergencies and other vehicles
c) Household economic conditions/Livelihood surveys,

The consultants also identified areas with lack of municipal services (slums) and formulated proposals for its rehabilitation/up-gradation.

x. Urban Transportation, Mobility & Accessibility

One of the major issue of Jamrud is traffic congestion and lack of reliable public transport. To resolve the urban transport, mobility and accessibility issues of the city the consultants thoroughly studied the existing traffic and transportation system of the city. To have better understanding of the existing situation the consultant conducted various transportation surveys explored the possible constraints and available opportunities and proposed viable solutions for easing traffic and transportation issues within the city the consultant conducted the fallowing surveys:

- Developed a detailed roads and parking inventory
- Origin, Destination, and Cordon Surveys
- Traffic counts at various roads and junctions of the city and identified the bottleneck areas to determine roads and junction capacities

- Conducted Public Transport User Interview Surveys and Household Information Survey (HIS)
- To improve internal accessibility in the city the consultant carried-out a comprehensive Traffic Signage Survey The consultant also conducted a detail study on the parking issues of the city and identified suitable areas for the development of on-street and Off-street parking lots.
- Through mobility surveys the consultant devised strategies for the establishment of synergy between land-use and urban transport.

xi. Historical/Social/Culture Heritage Development

One of the key objectives of the Jamrud Urban Center Master Plan 2042 is to preserve and enhance the city's historical and socio-cultural landscape. Jamrud holds immense cultural significance and is deeply rooted in the heritage of the region. As part of the planning process, all existing historical monuments, culturally significant places, and socio-cultural landmarks were thoroughly studied and mapped. This assessment informed the development of context-sensitive guidelines aimed at conserving heritage assets while integrating them into the urban fabric. The Master Plan seeks to capitalize on these historical and cultural assets to establish vibrant social and cultural hubs across the city, enhancing its identity, strengthening community engagement, and unlocking opportunities for tourism, heritage-led regeneration, and local economic development.

xii. Urban Design and Public Realm

Urban Design and Public Realm is an integral part of the master plan. Through various surveys and techniques, the consultant analyzed the existing building lines, identified all public spaces, studied in detail vistas, sidewalks, street lighting, monuments, and parks etc. and formulated actionable proposals for improvements. and identified potential areas for new parks, playgrounds and public open spaces. To make the city more attractive and beautify the consultants proposed various urban beatification projects.

xiii. Water Supply, Sanitation and Solid Waste Management

In Jamrud, PHED is responsible for the provision of water supply, sanitation and solid waste management services. The consultants in close coordination with the with the

support of PHED and other relevant stakeholders (TMAs and PHED) did profile of all Municipal services including the identification of new and existing sources of water supply and existing solid waste management practices. Based on this assessment, multiple proposals focusing on rehabilitation of non-operational and establishment of new tube-wells, overhead water tank, replacement of old pipelines, extension of water supply lines to new zones, solid waste management practices such as segregation at source, collection and transportation, operations and maintenance, etc.

xiv. Citizens Behaviour

BCC is the strategic use of communication approaches to promote changes in knowledge, attitudes, norms, beliefs and behaviours. The provision of physical infrastructure without associated BCC strategies may not be able to achieve the desirable goal of sustainable development. For development of the BCC strategies to ensure that the master plan will be sustainable for a long run the consultants conducted Perception and Behavioural Surveys of local population focusing on issues of urban responsibility using Knowledge, Attitude, and Practice (KAP) methodology based on a valid statistical sample. The purpose of the KAP surveys was to investigate the reasons for and incentives and disincentives of citizens to behave responsibly while utilizing municipal services especially their behaviour towards solid waste management, public transport usage, use of public spaces and other social services.

The identified interventions for BCC include promoting civic sense through multi-level interventions including public campaigns, digital media engagement, school outreach, and face-to-face communications. Monitoring frameworks and feedback loops are embedded to ensure measurable improvements.

xv. National and International Best Practice (references)

The preparation and implantation of master plans in Pakistan, especially in Khyber Pakhtunkhwa is not common. In the past various types of spatial plans including structure plan and master plans were prepared but these plans were never implemented even in major urban settlements. Therefore, to prepare a rational comprehensive master plan for Jamrud, review of the international best practices was included the study ToRs. The consultants analyzed planning laws and master plans from countries with socio-economic conditions comparable to Pakistan. The lessons drawn from this review were instrumental in shaping the proposals of the Jamrud

Master Plan, particularly in formulating the Multi-Criteria Analysis (MCA) methodology used for identifying suitable sites for major zones. Additionally, targeted studies of fringe areas were conducted to discourage unplanned urban sprawl and promote the conservation of prime agricultural land within the influence area of the proposed master plan.

Task C – Master Plan Strategic Scenario Development/Mapping

a. Identified suitable land parcels based on multi criteria analysis for various activities through viable projections for housing of all income groups, space required for commercial and industrial activities and other necessary component of the city.
b. Mapped existing Land use pattern and provided options for future development;
c. Identified areas having a potential for mix use development (residential, work, leisure, services etc.)
d. Identified areas suitable for infilling, intensification and redevelopment
e. Mapped the natural eco-system and environmental resources of Jamrud city
f. A map with detail inventory of existing features including topographical and natural constraints was developed,
g. Mapped all the wetlands, agricultural lands, aggregate resources, groundwater recharge areas, floodplains, fisheries, wildlife and environmental conservation areas.
h. Mapped the existing road and transportation network including railways and airports.
i. Prepared a detail inventory of the allied infrastructure of the Jamrud to support Master Plan proposals.

Task D – Preparation of Master Plan Proposals (Action Plans)

For successful implementation of the Master Plan, the consultant developed detailed and comprehensive Master Plan proposals (action plans) for various sectors of the master plan, including the following:

i) Action Plan for zoning, intensification/densification and land management.
ii) Action Plan for future housing of all income groups.

iii) Action Plan for slum up gradation/informal settlements.
iv) Action plan for health facilities
v) Action plan for educational facilities
vi) Action Plan for Quality of Life
vii) Action Plan for WATSAN and Solid Waste Management (SWM).
viii) Action Plan for Transportation and Traffic Management as well as Parking Lots
ix) Action Plan for Municipal Services.
x) Action Plan for Environmental Management, ii. Disaster Risk Reduction and iii. Emergency Planning.
xi) Action Plan for Rural Urban Fringe and Regional Development.
xii) Action Plan for Tourism Development, Cultural and Heritage Conservation /preservation
xiii) Action Plan for Economic Development, ii. Commercialization, iii. Industrialization and investment attraction.
xiv) Action Plan for Security Measures of the city
xv) Action Plan for Legal/Regulatory and Institutional Framework implementing MASTER PLAN
xvi) Action Plan for Behavioral Change Communication (BCC)Structure composition of the Report

The Jamrud Master Plan report is structured into three volumes along with a separate detailed report:

Volume I: Master Plan – Offers a comprehensive overview of the core strategies, proposals, and planning framework for Jamrud.

Volume II: Scenario/Sectoral Maps – Presents a collection of maps illustrating zoning, infrastructure networks, environmental factors, and other key spatial elements essential for urban planning.

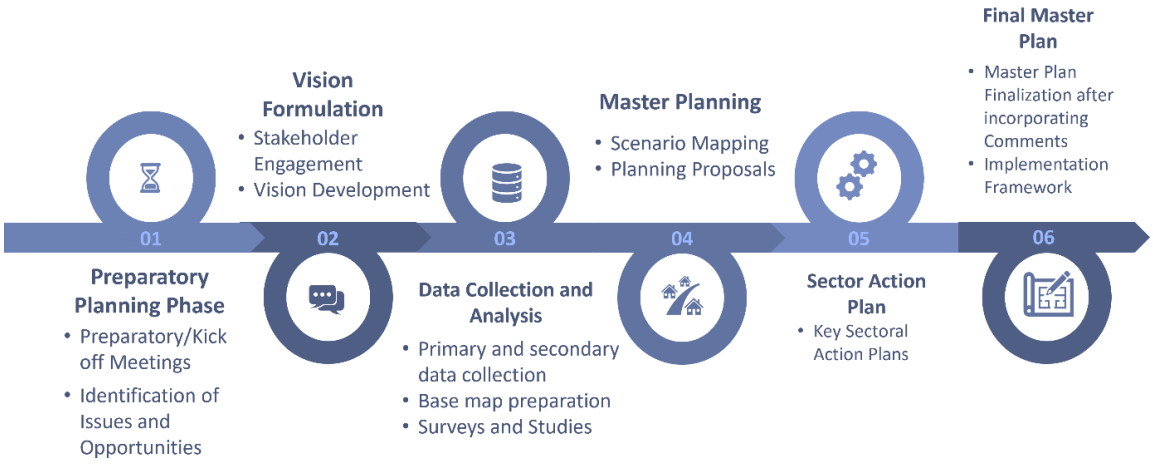
Volume III: Action Plans – Details implementation strategies, key initiatives, and step-by-step execution plans for proposed developments.

In addition, a separate Detailed Master Plan Report provides in-depth background studies, analyses, methodologies, and insights from Task C, along with relevant information from Task B.

The Jamrud Master Plan was developed through the following Five (05) phases:

- Preparatory Planning Phase
- Vision Formulation
- Data Collection & Analysis
- Master Planning/zoning
- Action Plans

Figure: Master Plan Methodology of Jamrud



Source: Devised by Consultant

Deliverables and Timelines

Sr. No	Deliverable	Timeline
1	**Inception Report** Submission of Inception Report incorporating contents and detailed methodology as well as a list of various surveys along with their questionnaires to be carried out for the MASTER PLAN preparation. The consultant has provided in the inception report a detailed work plan of all activities to enable UPU to properly monitor the activities of the consultants and ensure the completion of the project on time	At the end of 1st Month
2	**Task A: Report on Vision Development and Public Consultation** outlines the process of establishing project goals and objectives through	At the end of 2nd Month

Sr. No	Deliverable	Timeline
	stakeholder engagement. It documents consultations with public and private entities, including government agencies, political representatives, and the community. The report ensures an inclusive planning approach by incorporating technical insights, governance priorities, and public input, forming the foundation for a strategic and community-driven master plan for Jamrud.	
3	**Task B: Data Analysis and Background Studies** report was submitted, covering various surveys, secondary reports, relevant analyses, and associated maps. It included findings from socio-economic, land use, transportation, and environmental surveys, along with insights derived from secondary data sources. The report provided a comprehensive foundation for informed decision-making in the master planning process for Jamrud.	At the end of 5th Month
4	**Task C: Master Plan & Scenario Maps** The Master Plan & Scenario Maps were prepared and presented to the client and relevant implementation agencies. Following feedback received from various forums, the consultant revised the plan and provided alternative solutions where necessary to ensure effective implementation at the local level.	At the end of 9th Month
5	**Task D: Formulation of Sector Wise Action Plans**	At the end of 13th Month

Sr. No	Deliverable	Timeline
	The consultant prepares Draft Sectoral Action Plans, including preliminary designs and cost estimates, for review by the client and relevant implementation agencies. Based on feedback received from various forums, the plans will be revised, and alternative proposals will be provided where necessary to ensure feasibility and effectiveness.	
6	**Task E: Final Master Plan** The Master Planning Process followed an inclusive, iterative approach, ensuring stakeholder participation. It began with data collection through surveys, GIS mapping, and socio-economic assessments. Zoning was defined to regulate land use, including special zones for flood-prone and heritage areas. Public hearing was conducted to ensure transparency and stakeholder input, while a technical review meeting refined proposals for feasibility and policy alignment. Finally, sector-wise action plans were developed to guide sustainable urban growth.	At the end of **15th** Month

Source: Master Plan Project TORs

Methodology for Data Collection

Data was gathered from both primary and secondary sources. For Primary data collection various surveys, including Household Information Survey (HIS), Traffic and Transportation Surveys, Environmental Surveys was conducted with a structured questionnaire for each survey, and data was collected by well-trained enumerators using Android-based software. The surveys conducted for the Jamrud Master Plan encompassed various aspects, providing a comprehensive assessment of the area's

socio-economic conditions, land use, transportation, and environmental factors. The details of each survey are as below:

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- **Household Information Survey (HIS)**

A structured questionnaire was used to collect The Household Information through a structured questionnaire consisted of various aspect of the household, including household demographics, educational status, health status, employment and income, household facilities (availability and access), and access to and utilization of services and amenities (refer to the Inception Report for details). As per the Terms of Reference (ToR), data collection through various social and physical surveys was carried out for not less than 2% households. The data was collected throughout the urban center using the stratified random sampling techniques for developing a proper representative sample of the whole urban center.

- **Land Use Survey**

A GIS-based base map (1:2000 scale) was created by digitizing a raster map from Google's satellite imagery and dividing it into grids. Android-based software was used for the detailed land use survey, conducted by trained local surveyors. The survey documented land uses, administrative boundaries, contour lines (10-meter intervals), road networks, infrastructure, civic amenities, and brownfields. To ensure accuracy, the base map integrated historical maps and remote sensing imagery and was divided into sheets for ground truthing through on-site verification. Each built-up parcel was assessed for land use, building conditions, and stories, with spatial and attribute data processed in GIS labs for analysis.

- **Transportation Survey**

Various transportation surveys, including the Origin & Destination (O&D) Survey, Traffic Count Survey, Parking Inventory Survey, and Intersection Survey, were conducted across the city. The detailed methodology, maps, and questionnaires for each survey are provided in the Background Study and Analysis Report (Volume III).

- **Environmental Survey**

Various environmental surveys, including drinking water quality, noise, air, and soil assessments, were conducted at multiple locations across the city with an EPA-approved laboratory. The detailed methodology, maps, and results of each survey are provided in the Background Study and Analysis Report (Volume – III).

- **Secondary Data Collection**

Secondary data was gathered from both published and unpublished government departmental data and reports, Census data, government publications, public records, historical and statistical documents, business reports, journals, and research papers, among others.

Chapter 1: Existing Land Use Spatial Pattern and Urban Form of Jamrud

1.1. Overview

Jamrud is major town with a population of approximately 32,000 people located in the Jamrud tehsil of Khyber district of the Khyber Pakhtunkhwa province. Jamrud is bordered by the Peshawar district on the East, Yake Ghund tehsil of Momand District on the North, Landi Kotal tehsil on the West and Bara tehsil on the South.

The town of Jamrud is located at 34.0015° N, 71.3854° E with an elevation of 461m (1512.47 ft) from the mean sea level. Jamrud urban area is comprised of 8 neighborhood councils and 18 census blocks[1].

Jamrud shares a boundary with Peshawar on the main Grand Trunk Road N-5 towards the western border of Pakistan connecting the country with Central Asia through the famous Khyber Pass. Most of Pakistan's trade with Afghanistan and other Central Asian countries is carried out via this route. The National Highway (N5) is Pakistan's longest highway running from Karachi to Torkham Border. The total length of N-5 that goes through the urban area of Jamrud is 10.1 km.

Tiddi bazar is the second most important commercial hub of Jamrud. The road serving Tiddi bazar is an offshoot from the main N-5 road. Doctor Sarfaraz road lies in the west of Tiddi Bazar. Warsak road originates from Warsak area of Peshawar and culminates at the main Jamrud bazar. This is one of the main roads which feeds traffic to the urban center of Jamrud. Frontier/Shakas Road originates from N-5 near Takhta Baig Khwar and leads towards Bara. New Jamrud bypass road begins at the junction of new abadi road in front of the cloth commercial market and ends at the bypass road of Jamrud near the railway crossing.

1.2. Existing Urban Form of Jamrud

The geography of Jamrud relates to the Sector Land Use Model. The 'Sector Theory' of urban land use, promulgated by American land Economist Homer Hoyt in 1939, explains that a city develops in sectors instead of rings. This urban land use model therefore focuses on arrangement of activities in an urban area as certain areas of a

[1] Provincial Election Commissioner Khyber Pakhtunkhwa. (2020). Final List of Village/Neighborhood Councils District Khyber.

city are more attractive for various activities. As a city grows and these activities flourish and expand outward, they do so in a wedge and become a sector. For example, if a district is set up for high income housing, any new development in that district will expand from the outer edge[2].

Five types of land use zones are in this model: Five types of land use zones are in this model:

• CBD Central Business District

• Wholesale and light industry zone

• Low class residential zone

• Medium class residential zone

• High class residential zone

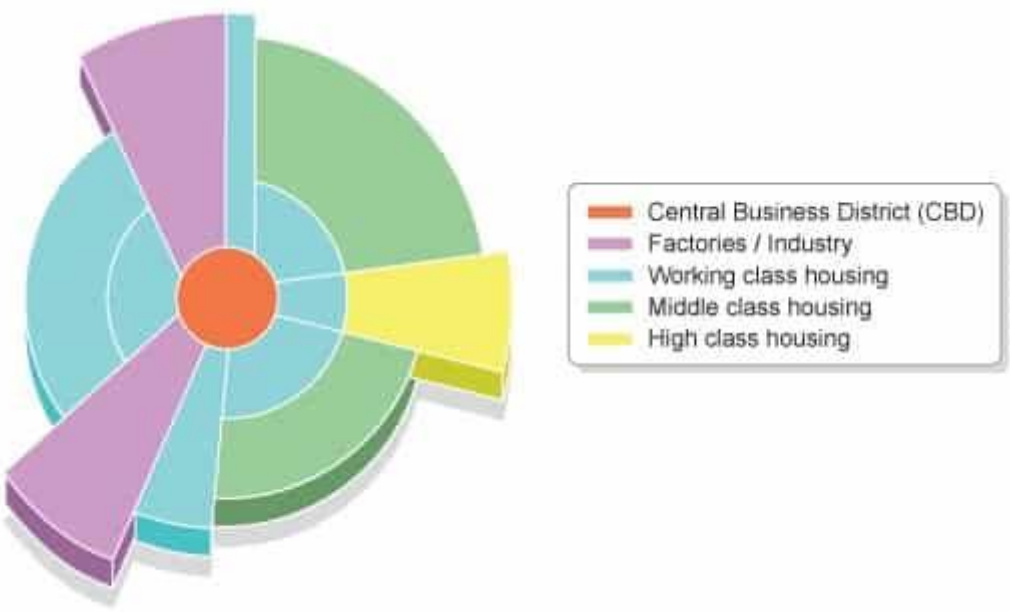


Figure 1-1: Sector Model, Homer Hoyt

Jamrud city is shaped like a floral, with a central nucleus and petals that stretch out in all directions. The main regional roadways are formed by these petals, which have a radial design. Other roads and streets have a combination of linear, grid iron, and organic patterns.

The Central Business District is in the middle with public buildings in the center of the city. Further, there is the presence of N-5 which is passing through the center of the

city. Each sector is driven by transportation to the central business district. Commercial activities are along the main arteries N-5, Jamrud By Pass road from N-5 to Warsak Dam road and Jamrud Bara Link road. The outskirt development is mainly residential areas. Hence, the urban development in Jamrud resembles sector form.

Jamrud's existing urban development can also relate to the hybrid land use model. The hybrid land use model includes the concentric, sector, and nuclei behavior of urban growth explaining urban land use. The shape of the hybrid land use model is given following:

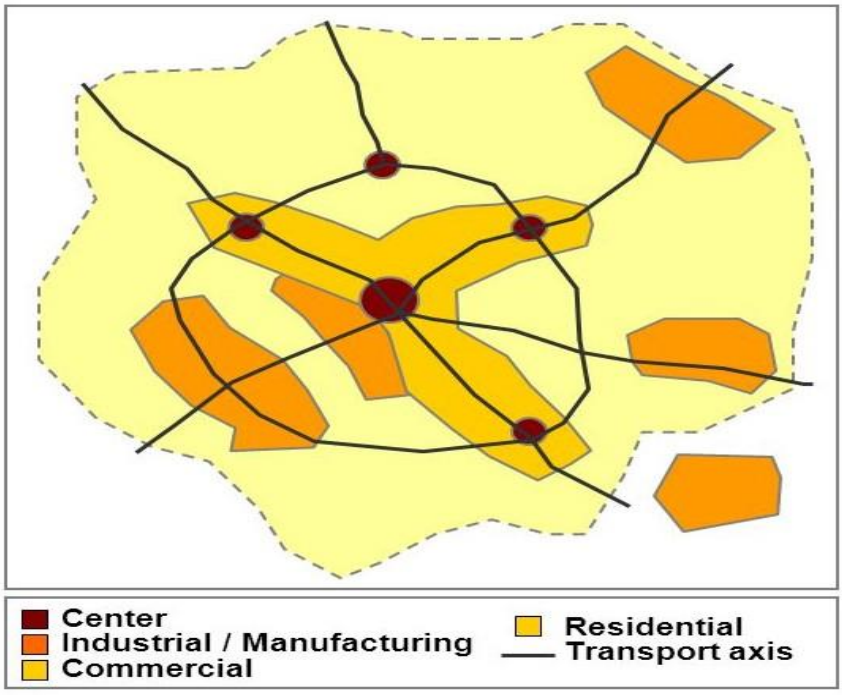


Figure 1-2: Hybrid Land Use Model

The central business district of Jamrud is located in the center of the city. The transport axes stretch out from the central area in radial form. Most of the commercial areas are located on Jamrud By Pass road from N-5 to Warsak Dam road and Jamrud Bara Link road. Residential and industrial land uses are located on the outskirts of city. Spatially, the town has been divided in the following land use zones.

1.2.1. Zone “A” Central Business District

Central Business District of Jamrud is lies at the core of the town which is the characteristic of sector and hybrid land use model. The commercial operations are taking place with full swings along Jamrud By Pass road from N-5 to Warsak Dam

Road. Jamrud Bazar is a well-known commercial area along the National Highway (NH-5) that is home to consumable food and commodities, medical, hardware and manufacturing, general store, workshops, apparel, and other similar commercial activities.

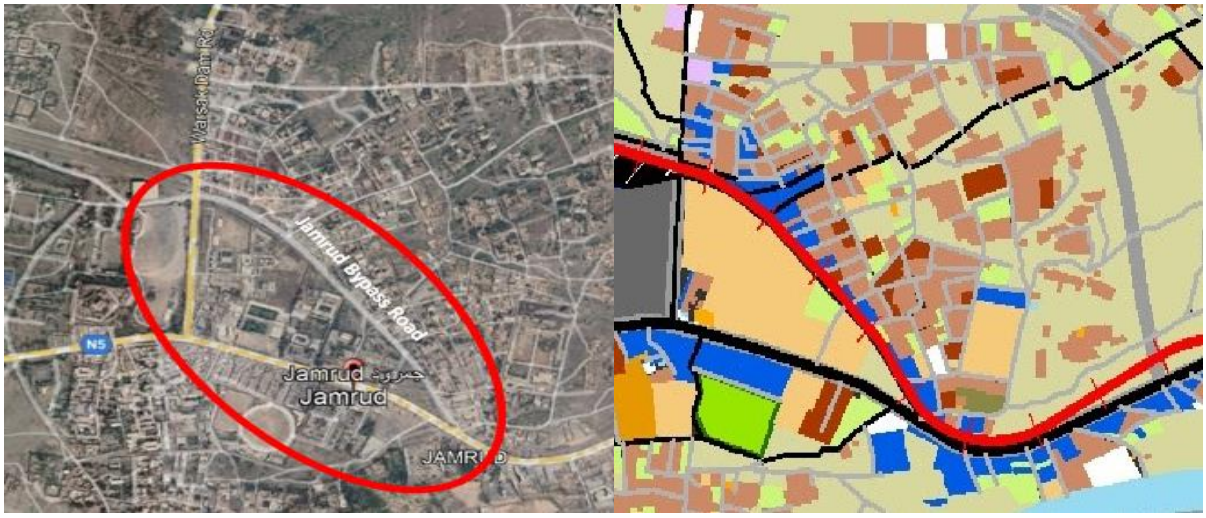


Figure 1-3: Zone A (City Center/CBD)

1.2.2. Zone “B” Residential Clusters

This zone includes housing colonies, scattered in medium and small size clusters in whole Jamrud urban area. Most of the residential clusters are located on major roads such as N-5, Warsak Dam road, Jamrud Bara Link Road, Haji Abdullah Shah kali Road and Shah Kass Road. The concentrated residential cluster is in the north side of Jamrud.

Figure 1-4: Zone B (Residential Cluster)

1.2.3. Zone “C” Institutional Zone

This zone is comprised of public land uses. These include Press Club, DHO office, Central Jail, Rescue 1122 Office, PTCL Exchange office, Social welfare, Special Education & Women Empowerment department Khyber, Citizens Facilitation Center, NADRA, Local Government Tehsil Municipal Administration, Session Court, C&W Khyber office, police station etc. Most of these facilities are located in the city center along N-5 road. This zone is in form of sector.

Figure 1-5: Zone C (Institutional Zone)

1.2.4. **Zone “D” Industrial Cluster**

The prominent industrial activities that are taking place in Jamrud are steel furnaces, stone crushing plants (Lime stone mines and crushing) and grinding units. The

industrial sectors are located along Jamrud Bara Link Road. Some industrial activities are also taking place along N-5 and Warsak Dam Road.

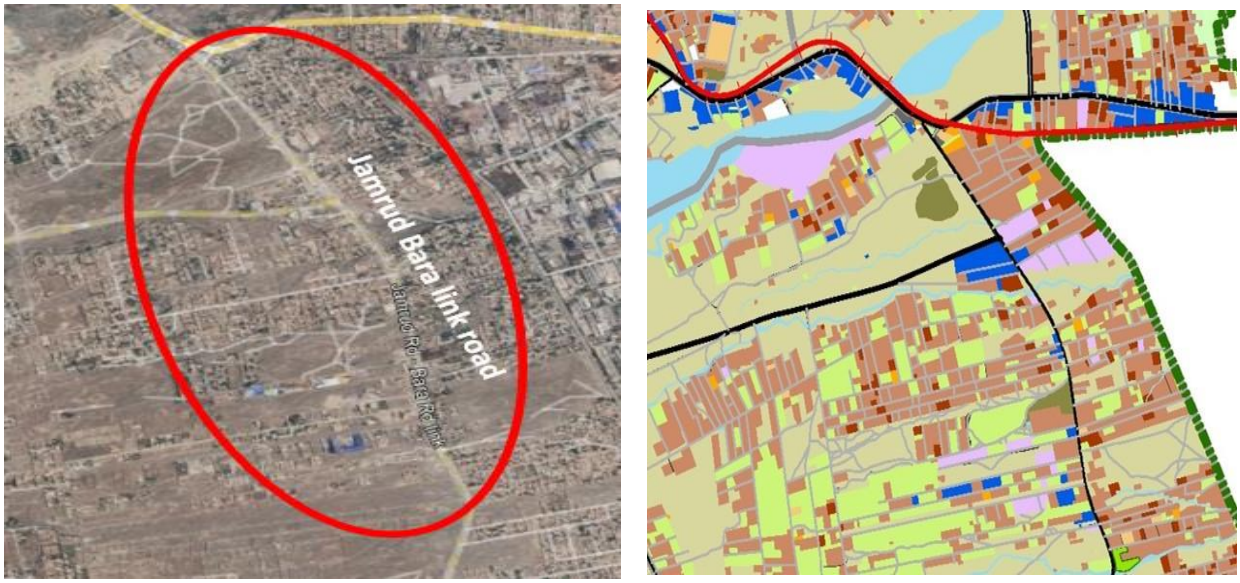


Figure 1-6: Zone D (Industrial Zone)

1.2.5. **Zone "E" Cantonment Area**

The zone includes the military controlled area and it is situated along N-5 Road and Warsak Dam Road. The whole area is high security zone and the movement of people and vehicles is generally restricted. However, these areas have markets to generate revenue and made significant contribution towards urban development. Jamrud Fort is used by army for security purposes.

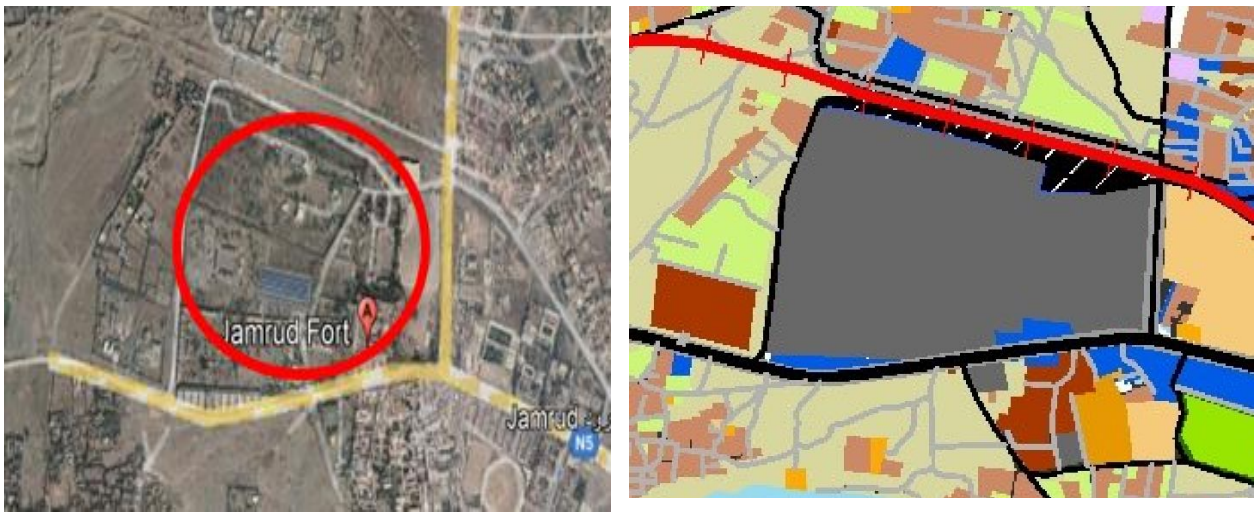


Figure 1-7: Zone E (Cantonment Area)

1.3. Pros and Cons of Sector Land Use Model

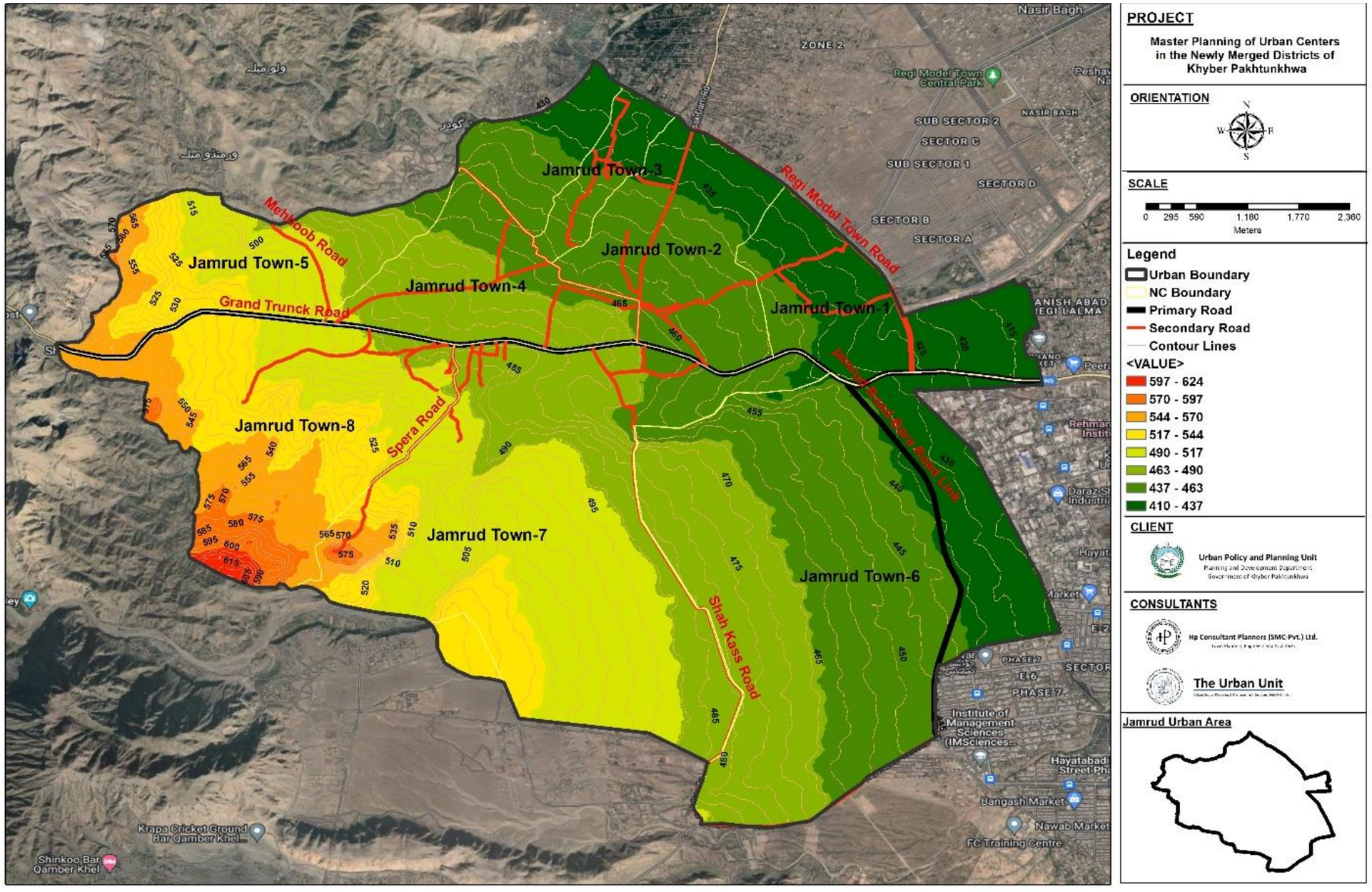
Below table outlines the pros and cons of the sector model to provide a better picture of Jamrud's existing urban form relation with the model.

Table 1-1: Pros and Cons of Sector Model

Pros	Cons
It looks at the effect of transport and communication links.	There is no reference to out of town development.
Numerous cities seem to have followed this model.	There is no reference to the physical environment.
Pie shaped wedges made by Hoyt compensated for the drawbacks of the Ring model.	The theory is based on nineteenth century transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries.
Though not perfect, it considers the lines of growth.	
It allows for an outward progression of growth	

1.4. Contour Map

A contour map has been prepared with contour lines drawn at 500-meter intervals. The general slope of Jamrud urban center is move from South-West to North-East with the highest elevation point at 624 meters and the lowest point at 410 meters. The 214- meter difference in contour levels from North to South suggests that the terrain of the Jamrud urban center is relatively mild steep.



Map 1: Contour Map (500-meter intervals), Jamrud

Source: Google Earth (2022), resolution 1000 dpi

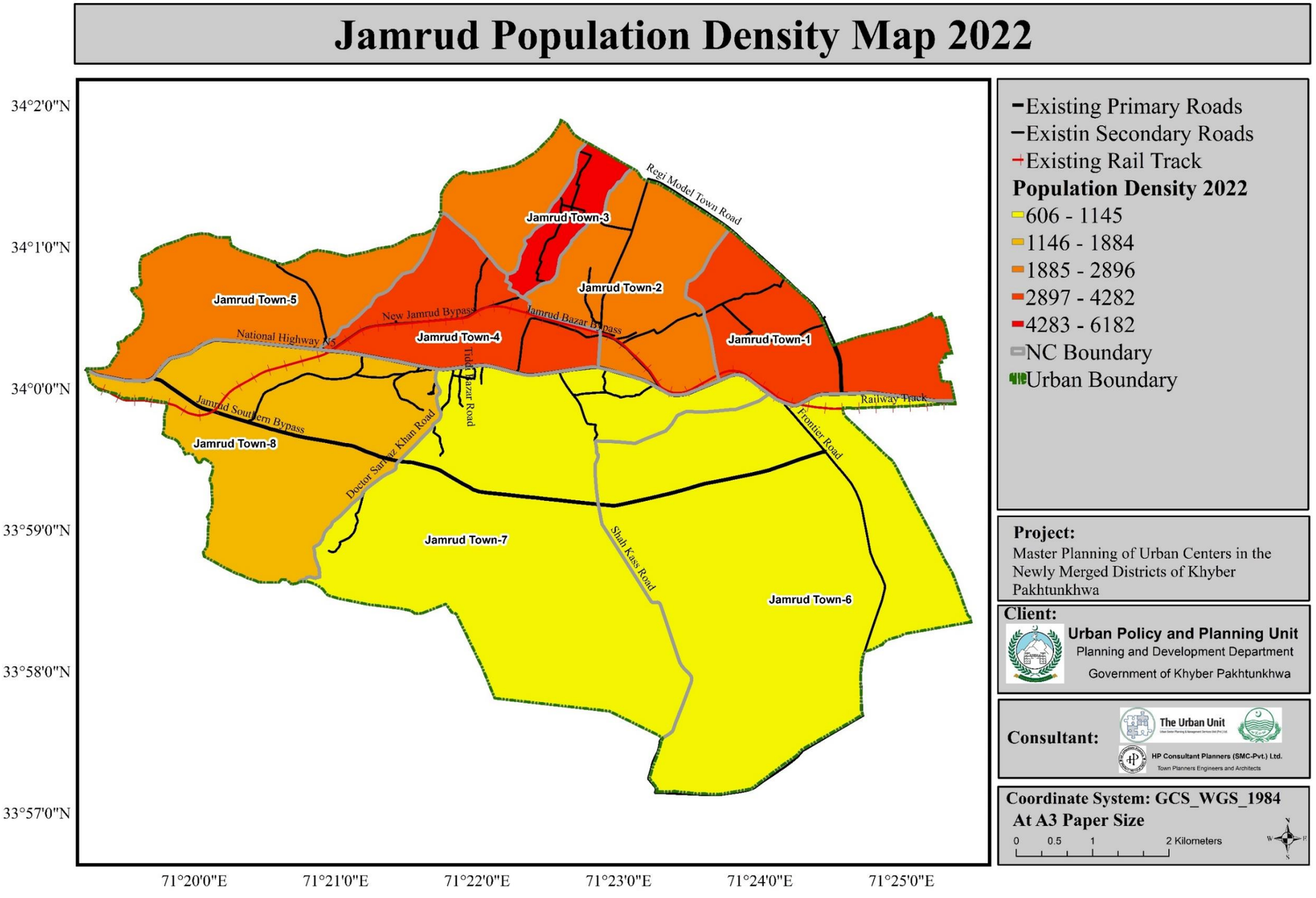
1.5. Population Density

According to the Bureau of Statistics Report 2017, the total population of Jamrud tehsil is 227,557 and out of this figure 163,829 population are declared as rural while just 63,728 population declared as urban. The average population density calculated for the Jamrud urban center is 1,332 per sq. km. Town-wise densities shown in below.

Table 1-2: Population densities of all NCs of Jamrud

Neighborhood	Population 2017	Population 2022	Area sq. km	Population Density 2017	Population Density 2022
Town-1	10,780	12949	3.32	3247	3900
Town-2	7,545	9040	3.67	2056	2463
Town-3	4,874	5840	0.95	5131	6147
Town-4	8,926	10694	3.06	2917	3495
Town-5	10,680	12795	5.18	2062	2470
Town-6	6,789	8134	13.45	505	605
Town-7	7,551	9046	11.97	631	756
Town-8	6,583	7887	6.58	1000	1199

Source: The Urban Unit and HP Consultants



Map 2: Population Density Map, 2022

Source: The Urban Unit

1.6. Existing Land Use Classification

The government of Khyber Pakhtunkhwa on 24 November 2021 passed “The Khyber Pakhtunkhwa Land-use and Building control, Act 2021”. Under this, the following shall be formed:

- Provincial Land use and Building Control Council,
- Land Use and Building Control Authority

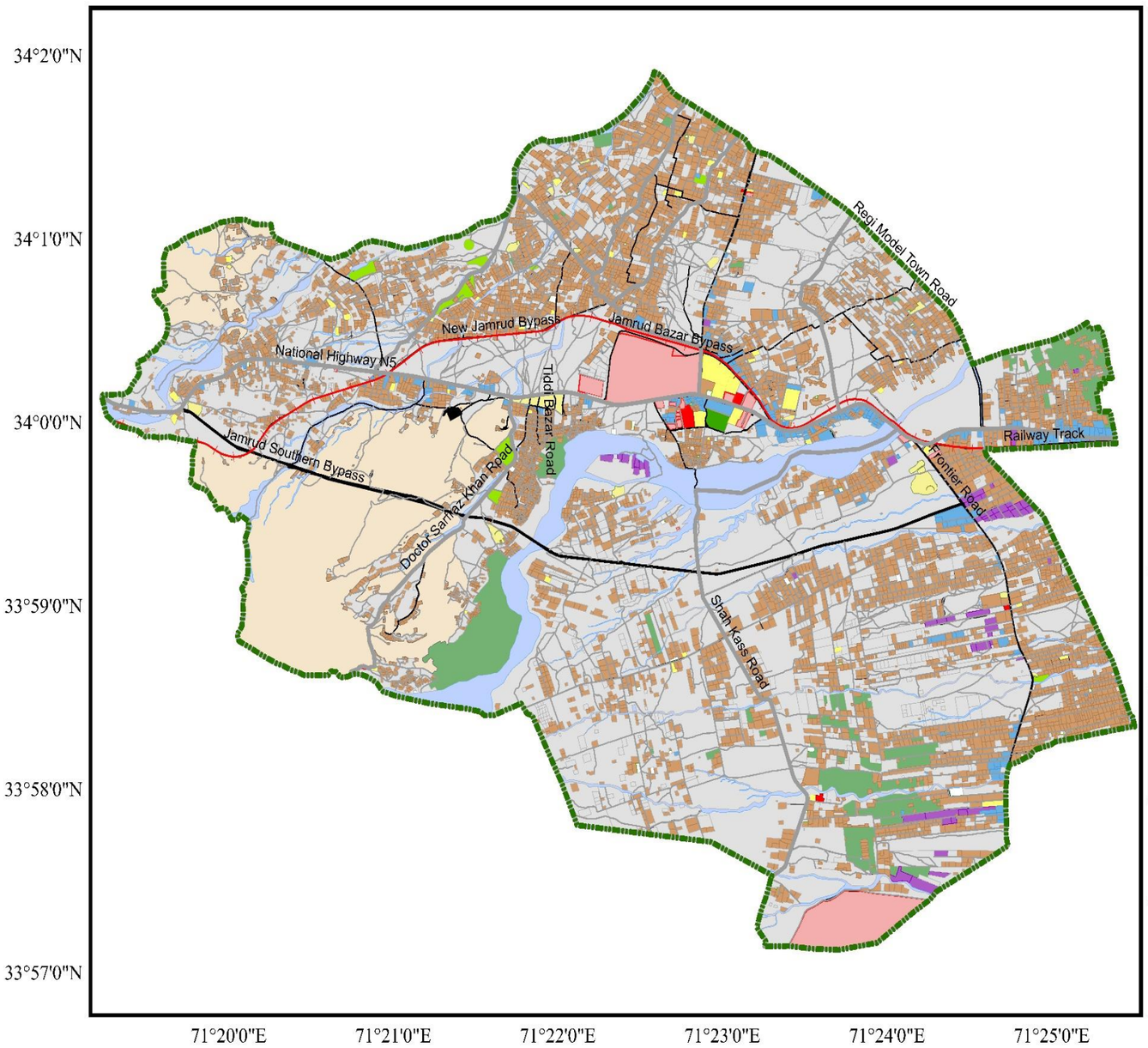
The functions of Provincial Land-use and building control council includes approval of master plans and district land use plans. Provincial land-use and building control authority shall perform the functions of supervision of district land use and management committee and proposing planning standards to Provincial land use and building control councils for the approval. The district land use and management committee will perform the functions of preparing master plans and district land use plan with the help of concerned local government. The local planning and enforcement will provide support to the district land use and management committee. The existing land uses of Jamrud are categorized as per subsection (3) of section 15 of Land use and Building Control Act 2021, which are as follows:

- Residential area
- Commercial area
- Industrial area
- Forest, national park, range land and other related areas
- Mining areas (if exists)
- Agricultural area (irrigated, barani and fallow etc.)
- Concentrated public sector area
- Recreational area
- Mixed land use areas
- Barren and vacant land (to be further classified as culturable waste land or otherwise).
- Water bodies
- Area prone to natural hazard

The land use classification is explained in the KP Land use and Building Control Act 2021; however, no specific percentages are given under which certain land use or

master plans shall be prepared. Thus, the consultants have prepared the existing and proposed land use base map Jamrud using NRM standards. Moreover, on the basis of existing land uses of Jamrud and current population, future population for 2040 is projected along with it proposed future land uses. The proposed land use map of Jamrud 2040 contains all the above-mentioned land uses calculated on the basis of existing land uses and projected land use proportion to fill the gap and fulfill the future need of the people. Below table and map shows the land use categories as per the Land Use and Building Control Act, 2021.

Existing Land Use of Jamrud



Legend

Rail Track | Primary Road | Secondary Road | Street | Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	11.19	23.23%
Commercial	0.68	1.42%
Industrial	0.35	0.73%
Public Buildings		
Education	0.28	0.57%
Health	0.04	0.09%
Religious	0.09	0.19%
Security	0.97	2.01%
Others	0.18	0.38%
Recreational Facilities		
Parks	0.15	0.31%
Sports Complex	0.03	0.07%
Agricultural	1.57	3.25%
Barren/Vacant Land	21.02	43.63%
Range Land/Forest/Others	5.22	10.84%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.19	0.40%
Water Bodies	3.08	6.40%
Transportation	3.11	6.46%
Total	**48.18**	**100%**

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Nominal Scale at A3 Paper Size
1:41,594
0 0.5 1 2 Kilometers

Map 3: Existing Land Use Base Map of Jamrud

Source: The Urban Unit

In addition to the land use classifications above, below table compares the existing land use percentages with the NRM standards in order to demonstrate the gaps and calculate future land use requirements.

Table 1-3: Land Use Classification[2]

Land Use		Area (Sq. Km.)	Percentage	NRM Standards	
Residential		11.19	23.23%	Residential	26%-48%
Commercial		0.68	1.41%	Commercial	0.5%-2%
Industrial		0.35	0.73%	Industrial	3%-8%
Public Buildings	Education	0.28	0.58%	Institutional	2%-10%
	Health	0.04	0.08%		
	Religious	0.09	0.19%		
	Security	0.97	2.01%		
	Others	0.18	0.37%		
Recreational Facilities	Parks	0.15	0.31%	Recreational	1%-7%
	Sports Complex	0.03	0.06%		
Agricultural		1.57	3.26%		
Barren/Vacant Land		21.02	43.63%	Vacant Land	3%-17%
Range Land/Forest		5.22	10.83%		
Mining Area		0.00	0.00%		
Restricted Area		0.00	0.00%		
Graveyard		0.19	0.39%	Graveyard	0.5%-4%
Water Bodies		3.08	6.39%		
Transportation		3.11	6.45%	Transportation	12%-29%
Total		**48.18**	**100%**		

It is observed that the percentages of built up land uses such as residential, industrial, institutional, recreational, graveyard and circulation are lesser. The future land use proposal proposed to can therefore address the area deficiencies in each land use classification and utilize those areas of range, vacant land, agricultural lands that are in excess. It is observed that the percentages of all built-up land use like; residential, industrial, recreational, and arterial circulation/terminals are lesser, whereas barren/vacant are higher, in comparison to the NRM standards.

Therefore, for future land use proposals, the area deficiency in each land use classification is balanced from the excess area of vacant land.

[2] Calculated from GIS base map

1.6.1. Existing Land Use Classification in NCs

Jamrud is comprised of 8 Neighborhood Councils:

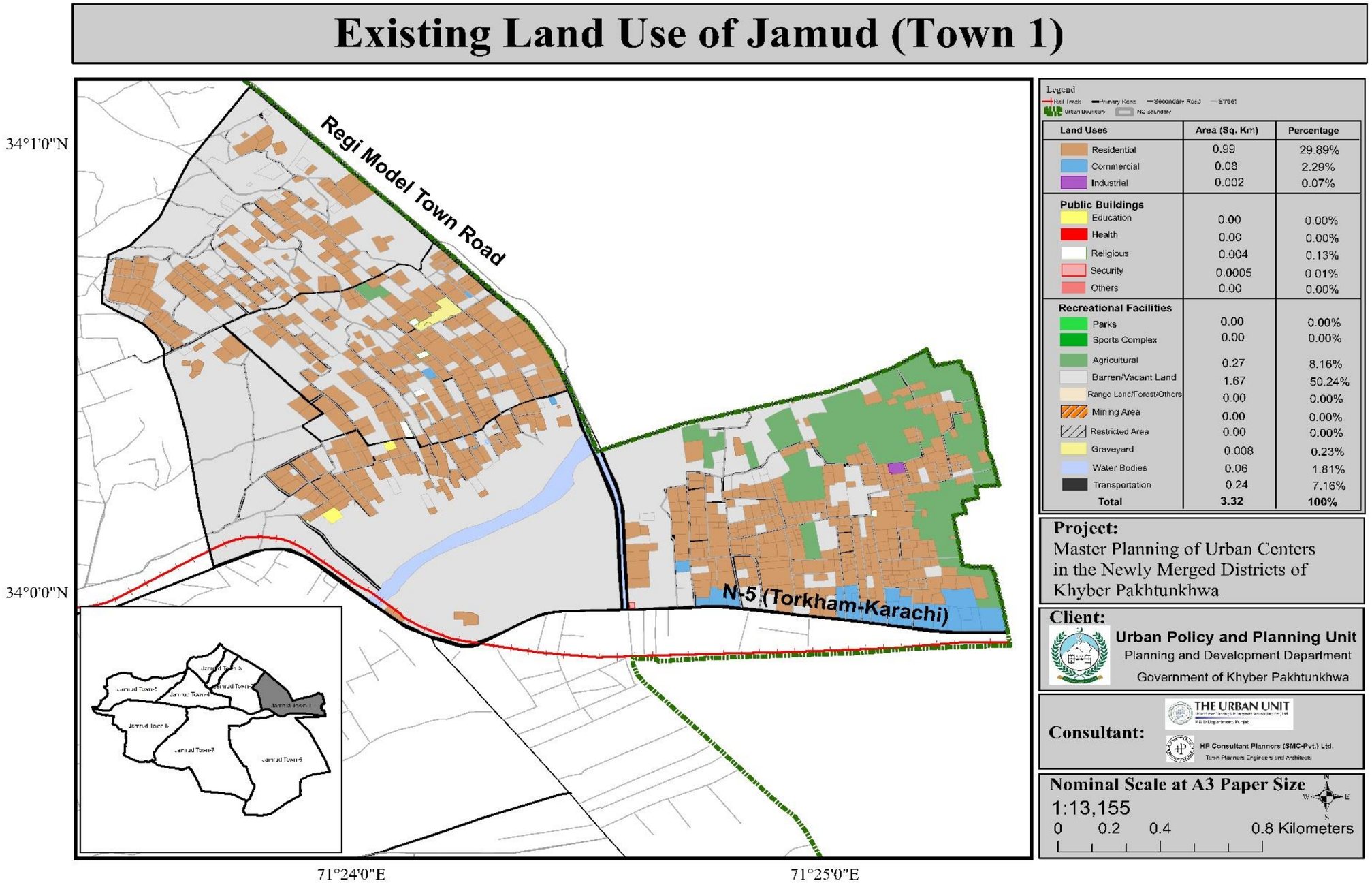
- Jamrud Town 1
- Jamrud Town 2
- Jamrud Town 3
- Jamrud Town 4
- Jamrud Town 5
- Jamrud Town 6
- Jamrud Town 7
- Jamrud Town 8

Table and Maps below summarize the existing land usage in each NC in Jamrud.

Table 1-4: Jamrud Neighborhood Council Level Land Use Statistics

Neighbourhood Council		Jamrud Town 1	Jamrud Town 2	Jamrud Town 3	Jamrud Town 4	Jamrud Town 5	Jamrud Town 6	Jamrud Town 7	Jamrud Town 8	Total
Population (People)		10,780	7,545	4,874	8,926	10,680	6,789	7,551	6,583	63,728
Census Blocks		2	2	1	2	3	3	3	2	18
Land Uses						**Area (sq.km)**				
Residential		0.99	1.11	0.61	0.73	1.41	3.80	1.95	0.58	11.19
Commercial		0.08	0.12	0.00	0.01	0.01	0.24	0.18	0.05	0.68
Industry		0.002	0.005	0.00	0.00	0.00	0.30	0.04	0.000	0.35
Public Buildings	Education	0.00	0.14	0.01	0.01	0.03	0.03	0.05	0.01	0.28
	Health	0.00	0.01	0.00	0.00	0.00	0.01	0.03	0.0002	0.04
	Religious	0.004	0.01	0.001	0.01	0.004	0.04	0.02	0.003	0.09
	Security	0.0005	0.00	0.00	0.47	0.000	0.50	0.006	0.001	0.97
	Others	0.00	0.03	0.00	0.11	0.00	0.01	0.04	0.00	0.18
	Sub-Total	0.005	0.18	0.01	0.59	0.03	0.58	0.14	0.01	1.57
Recreational Facilities	Parks	0.00	0.00	0.01	0.04	0.05	0.01	0.01	0.03	0.15
	Sports Complex	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Sub-Total	0.00	0.00	0.01	0.04	0.05	0.01	0.05	0.03	0.18
Agricultural		0.27	0.01	0.01	0.002	0.04	0.60	0.65	0.00	1.57
Barren/Vacant Land		1.67	1.88	0.18	1.36	2.24	6.30	6.14	1.25	21.02
Range Land/Forest		0.00	0.00	0.00	0.00	0.69	0.00	0.53	4.00	5.22
Mining Area		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Restricted Area		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Graveyard		0.008	0.01	0.005	0.01	0.01	0.06	0.08	0.01	0.19
Water Bodies		0.06	0.03	0.04	0.10	0.40	0.62	1.57	0.26	3.08
Transportation		0.24	0.31	0.07	0.22	0.30	0.94	0.64	0.39	3.11
Total		**3.32**	**3.67**	**0.94**	**3.06**	**5.18**	**13.44**	**11.97**	**6.58**	**48.18**

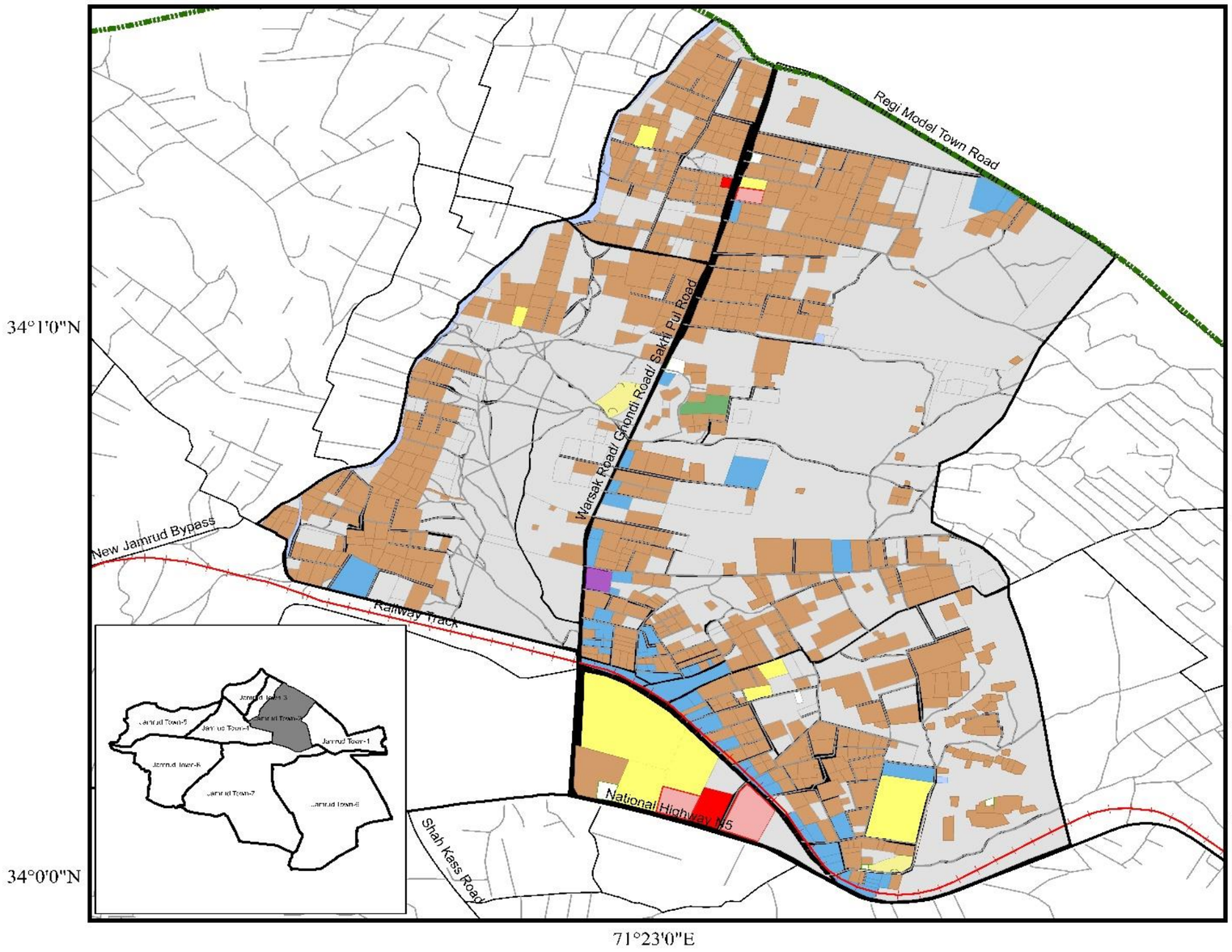
Source: Land Use Survey, 2021



Map 4: Existing Land Uses in Jamrud Town 1

Source: The Urban Unit

Existing Land Use of Jamud (Town 2)



Legend
Rail Track | Primary Road | Secondary Road | Street
Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	1.11	30.37%
Commercial	0.12	3.37%
Industrial	0.005	0.13%
Public Buildings		
Education	0.14	3.71%
Health	0.01	0.28%
Religious	0.01	0.20%
Security	0.00	0.00%
Others	0.03	0.74%
Recreational Facilities		
Parks	0.00	0.00%
Sports Complex	0.00	0.00%
Agricultural	0.01	0.17%
Barren/Vacant Land	1.88	51.39%
Range Land/Forest/Others	0.00	0.00%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.01	0.36%
Water Bodies	0.03	0.78%
Transportation	0.31	8.50%
Total	**3.67**	**100%**

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

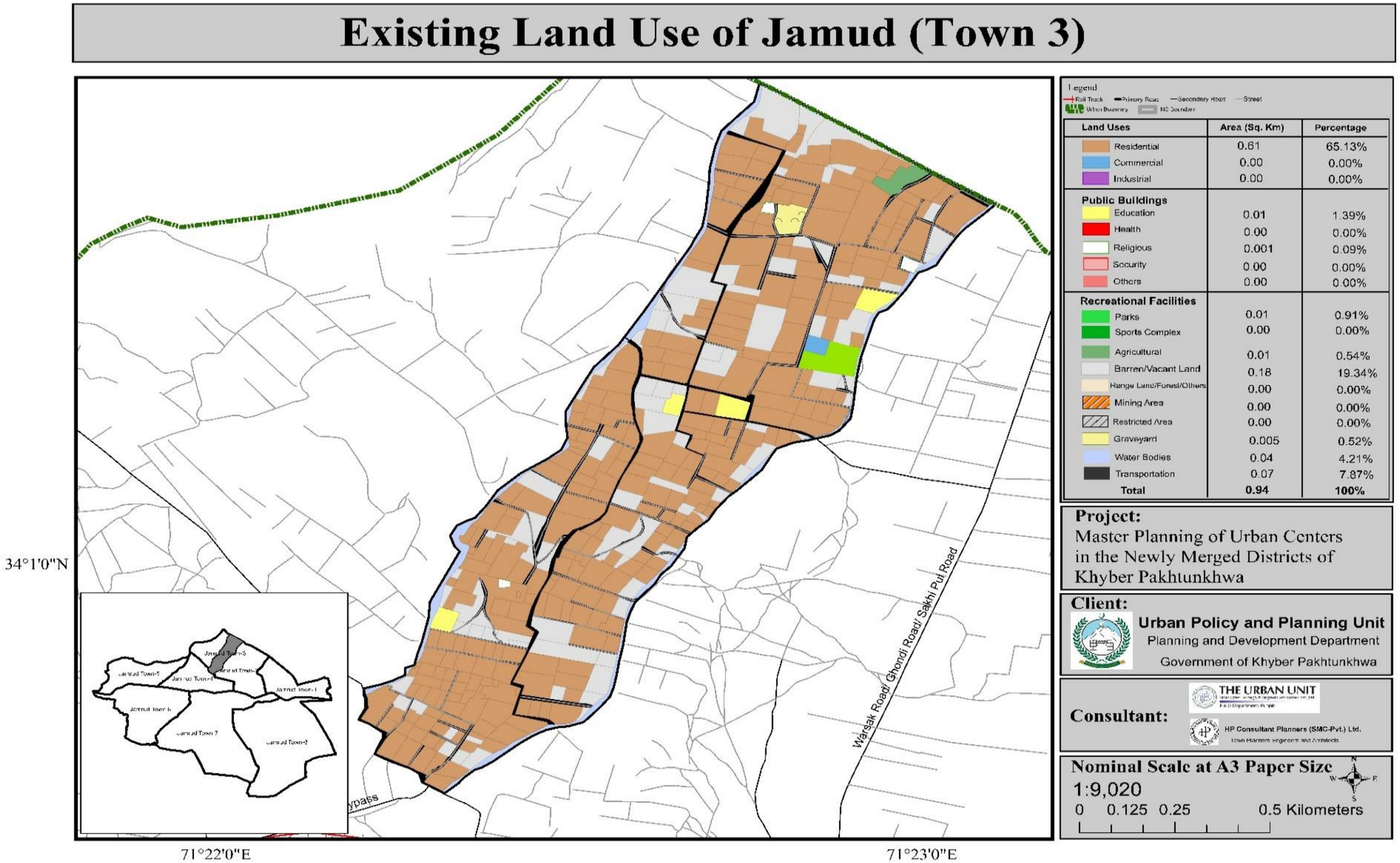
Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners, Engineers and Architects

Nominal Scale at A3 Paper Size
1:12,616
0 0.175 0.35 0.7 Kilometers

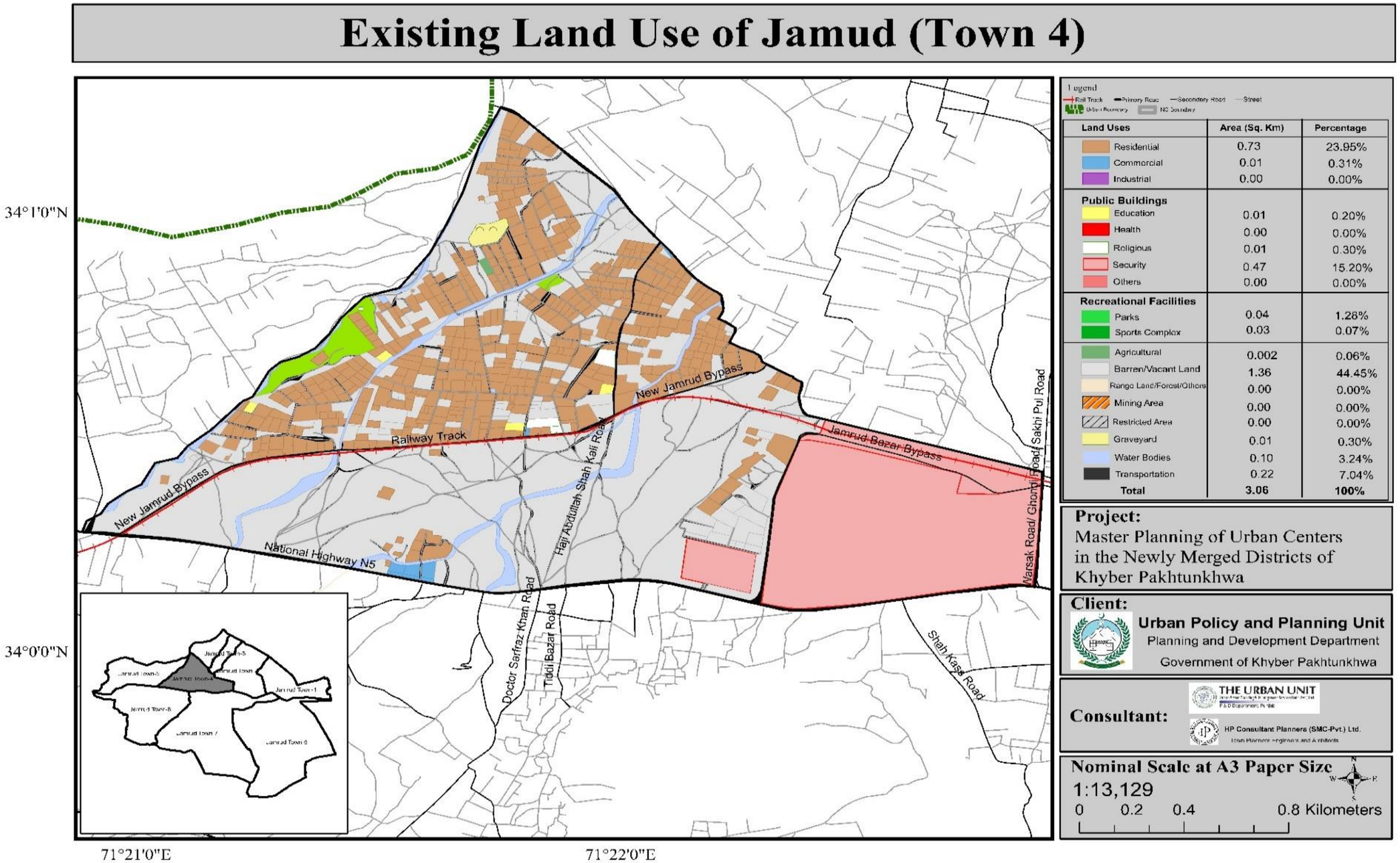
Map 5: Existing Land Uses in Jamrud Town 2

Source: The Urban Unit



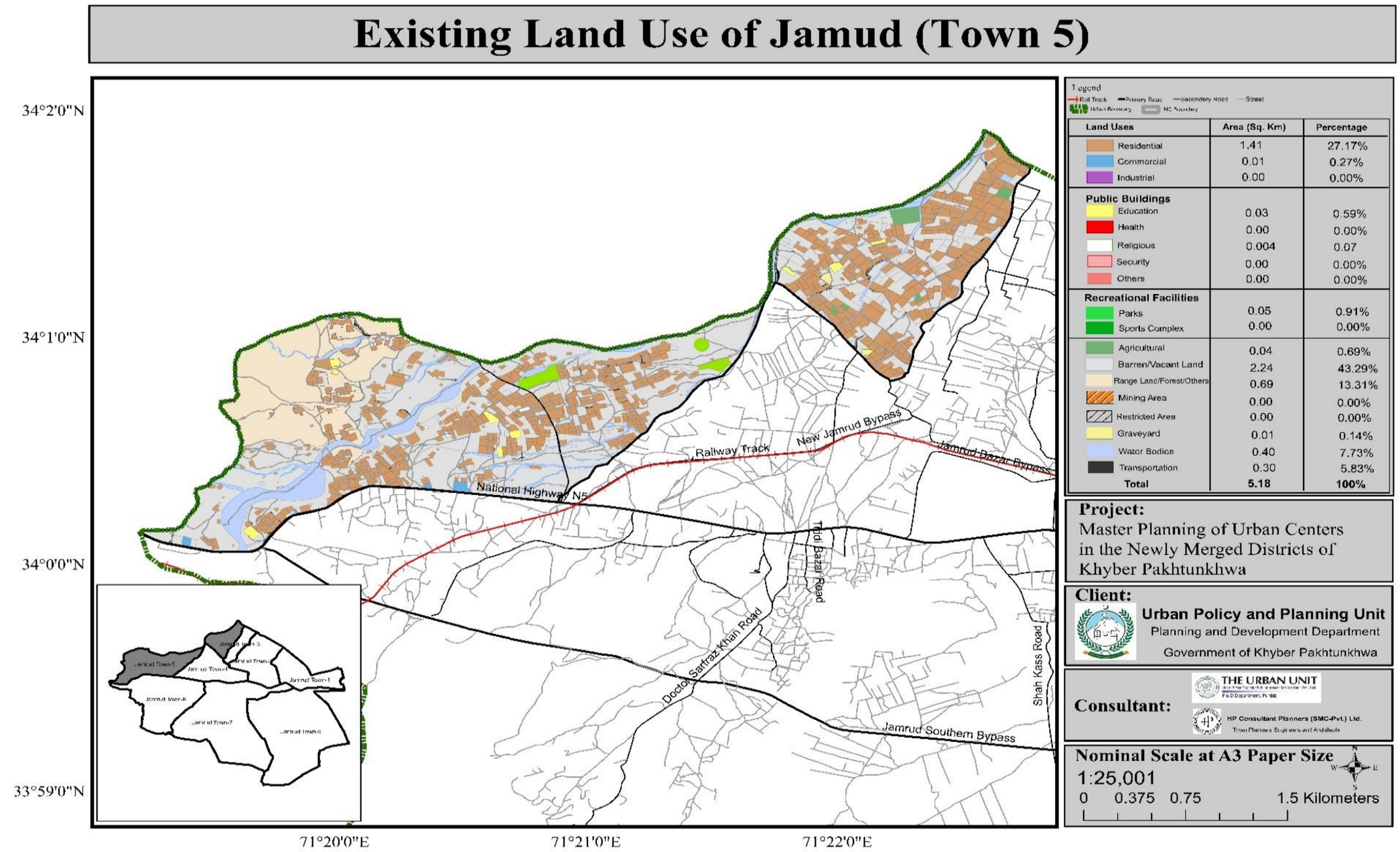
Map 6: Existing Land Uses in Jamrud Town 3

Source: The Urban Unit



Map 7: Existing Land Uses in Jamrud Town 4

Source: The Urban Unit



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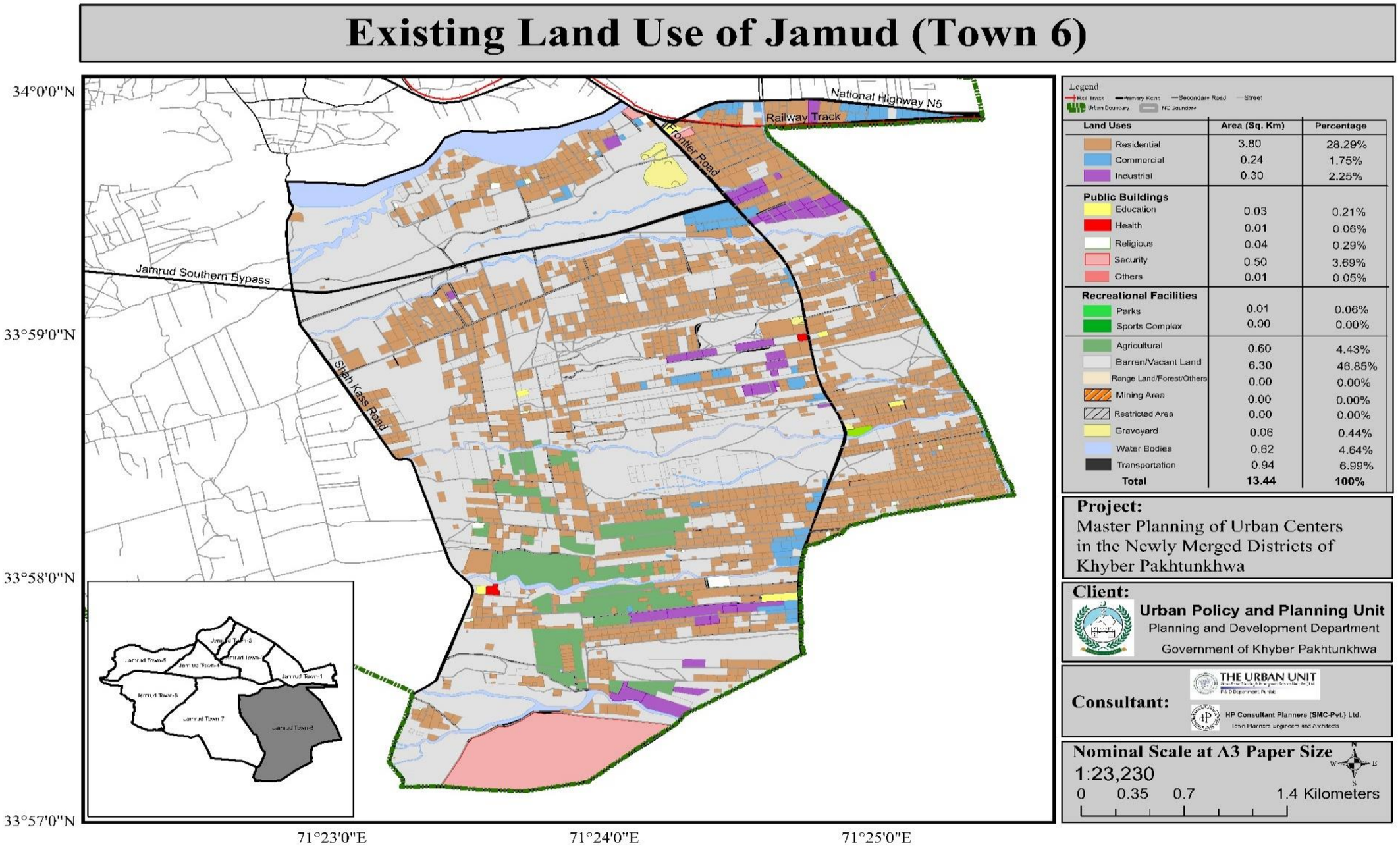
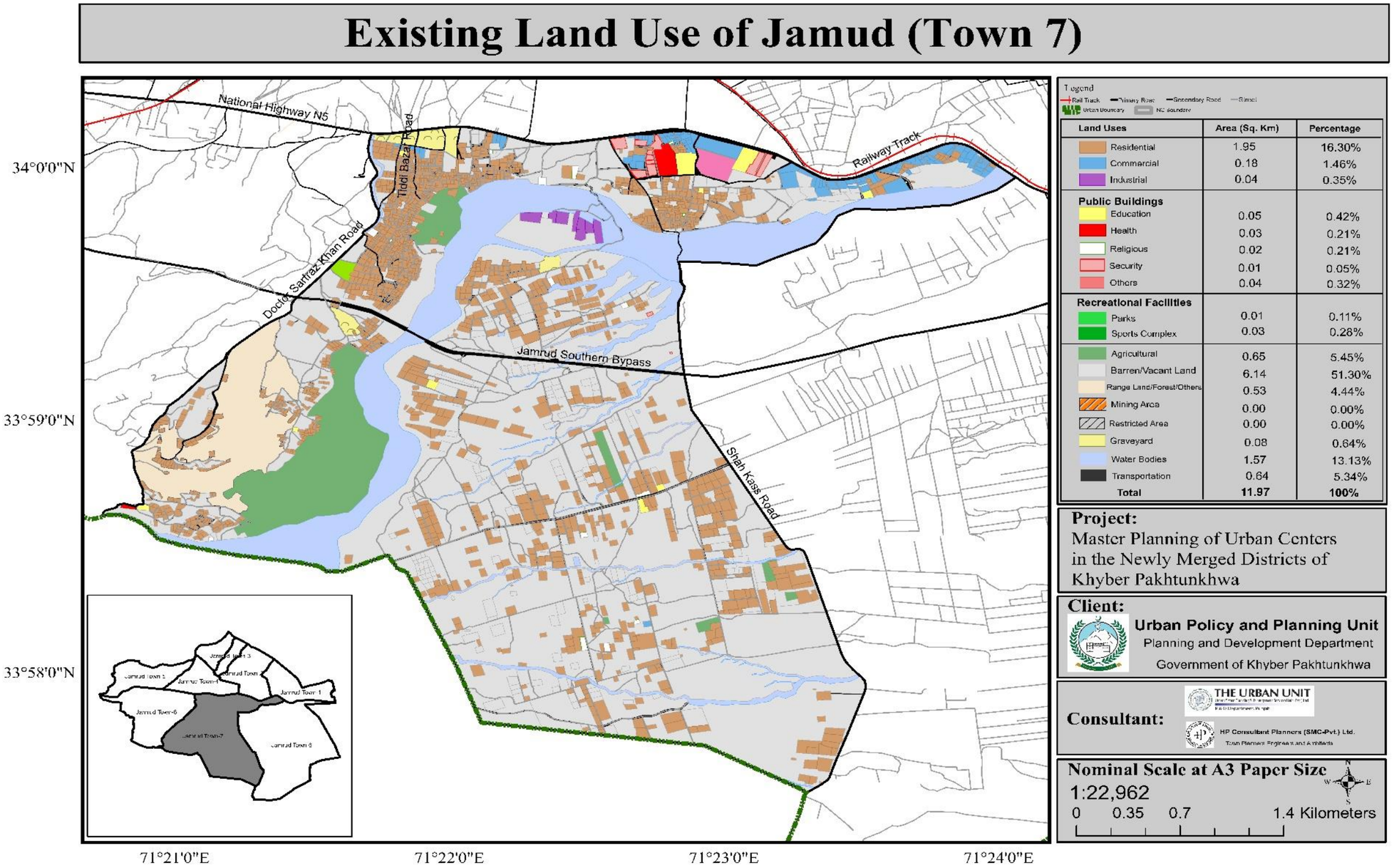
Map 8: Existing Land Uses in Jamrud Town 5

Source: The Urban Unit



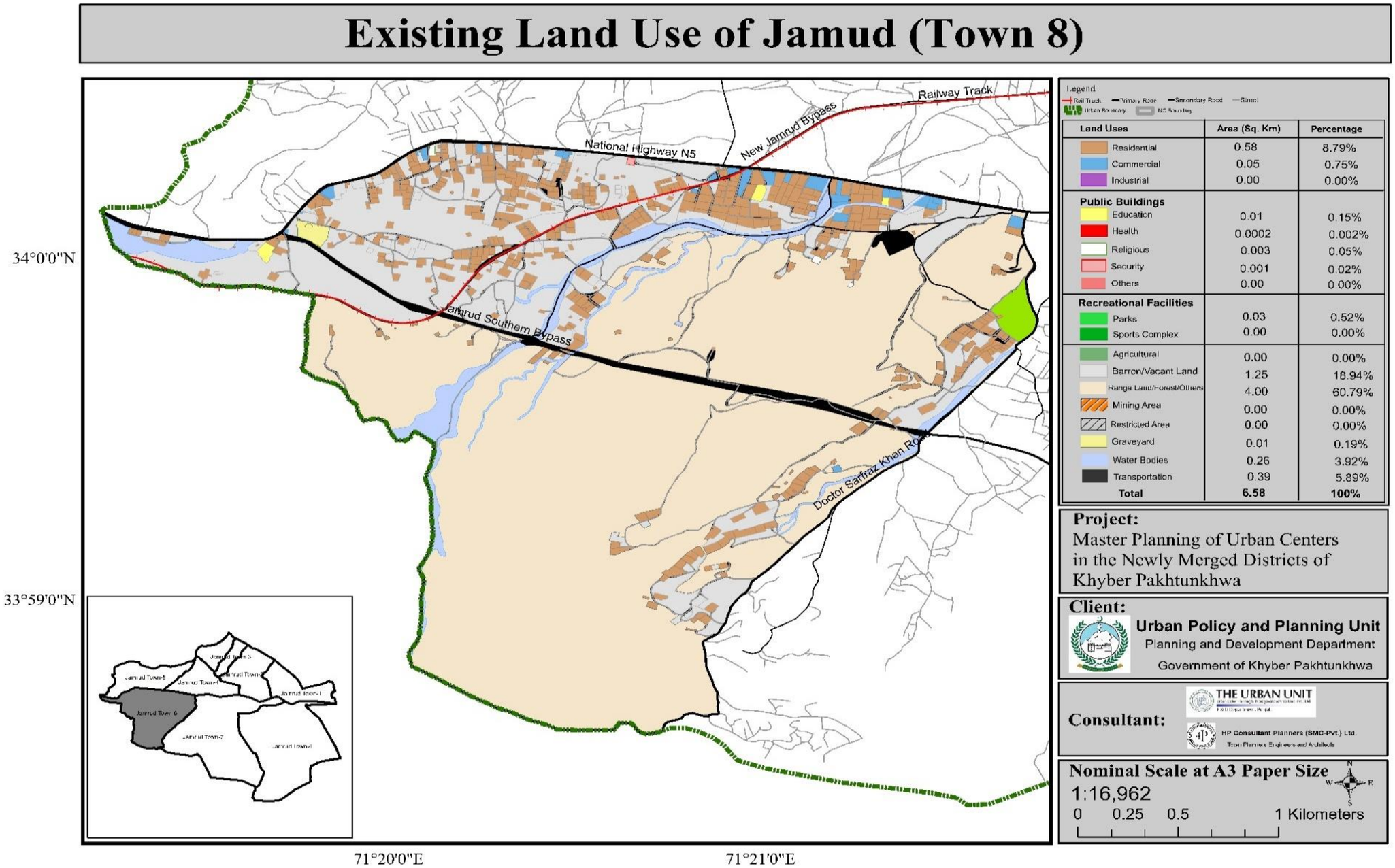
Map 9: Existing Land Uses in Jamrud Town 6

Source: The Urban Unit



Map 10: Existing Land Uses in Jamrud Town 7

Source: The Urban Unit



Map 11: Existing Land Uses in Jamrud Town 8

Source: The Urban Unit

Chapter 2: Multi-Criteria Analysis

Urban development is based on different benchmarks such as availability of resources, amenities, land uses and other services. Availability of resources are vital in the development of urban areas while amenities and land use also define the current use of land and how they can be planned for the coming years. The scenario development approach is employed for the future planning of the Jamrud Urban Center. These scenarios inform the planning and development process while exploring all potentials, weaknesses, opportunities and constraints of Jamrud.

The scenario development and suitability analyses have been prepared for different sectors including residential, commercial, industries, health and education. Using the survey-based studies as in the Background Studies and Analysis report, the suitable land has been determined for the planning horizon. GIS was used to prepare Land suitability Maps for different sectors according to the Multi criteria analysis methodology, a technique used to consider multiple criteria when analyzing an area's suitability for different uses.

For the multi-criteria analysis, all the existing land use layers were first converted to a projected coordinate system (Universal Transverse Mercator (UTM) zone 43N). Next, existing built up areas, water bodies, and preserved agriculture lands were set as constraint areas, and the remaining lands are used for proposing suitable land uses for Jamrud Urban Center. Figure below illustrates the removal of constrained areas and the resulting 26.80 sq. km. of land available for future development in Jamrud.

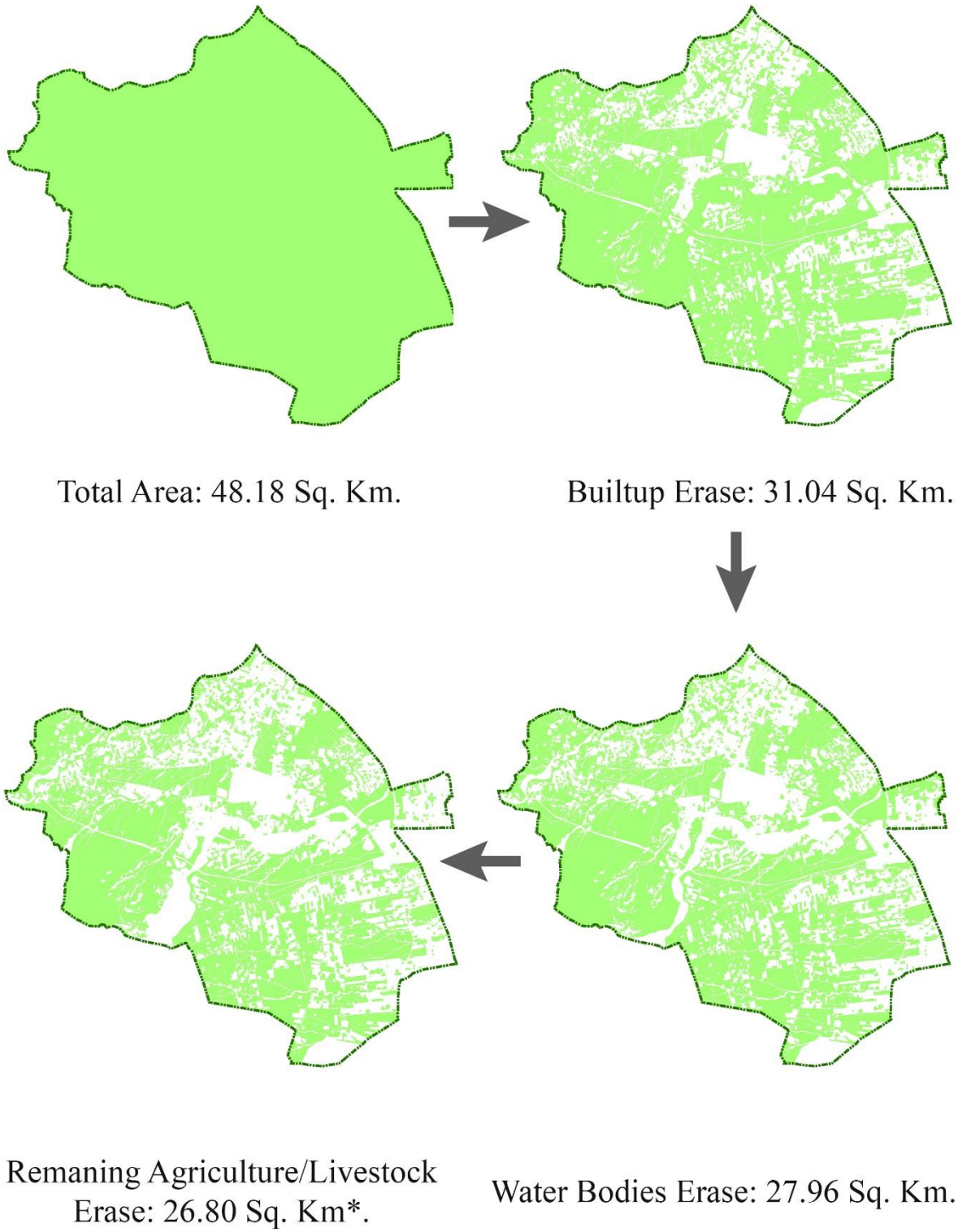


Figure 2-1: Constraint Areas in Jamrud Urban Center

Adjacent agricultural land to contiguous build-up converts to other land uses, such as residential and commercial, because 100% of agricultural land cannot be maintained for use in agriculture due to future city expansion. Therefore, by 2040, the 1.16 sq.km of remaining agricultural land will be protected and considered as a development constraint.

As finalized with the UPPU, the land suitability analysis has been conducted for the following sectors:

- Residential,
- Commercial,
- Industrial, and
- Landfill site

Each sector is described along with its suitability criteria in the following sections:

2.1. Residential

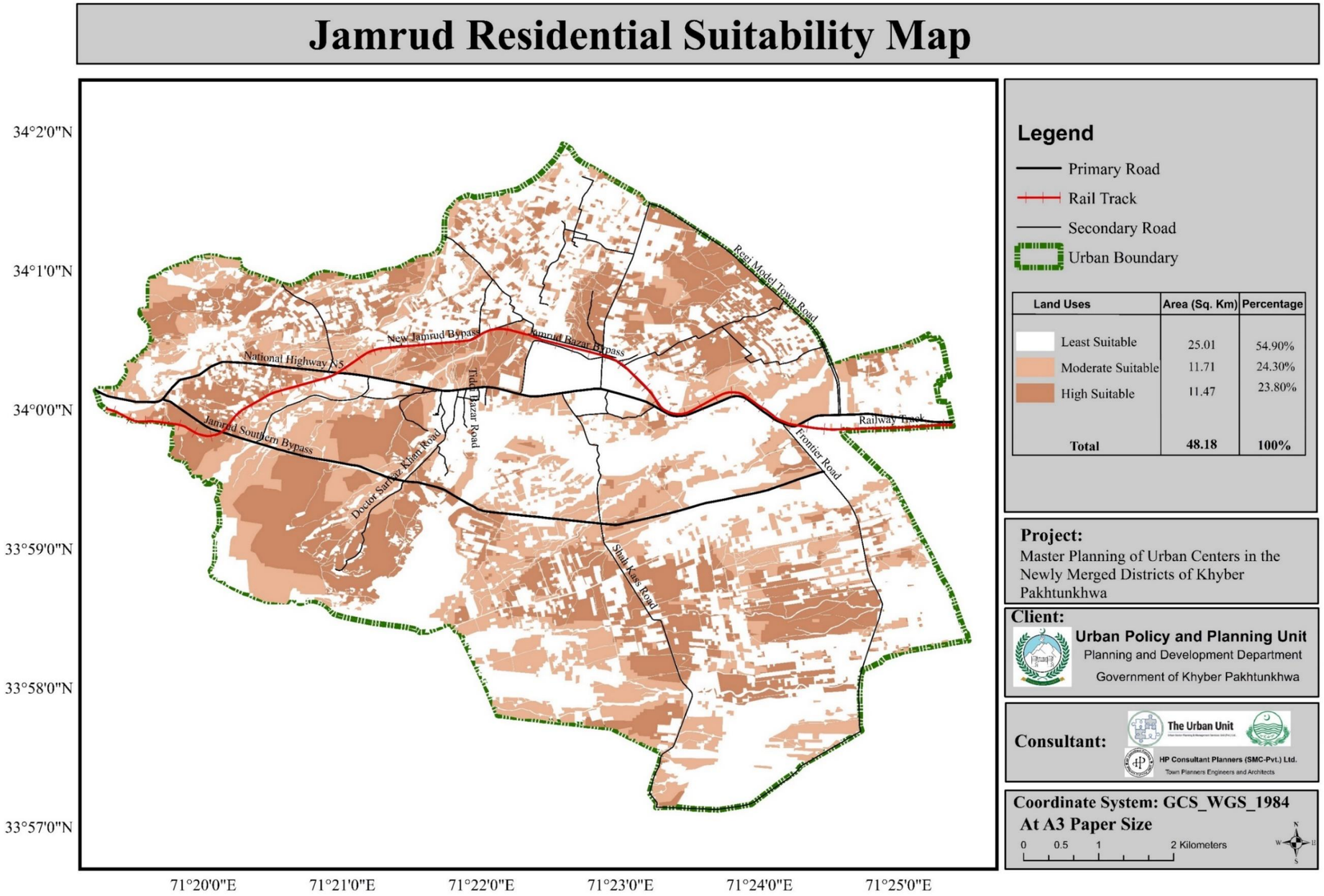
An effort was made to ensure that the projected residential area would not be too far from the current built-up area. For this purpose, the distance from built up area was calculated and zones near the existing built-up area were given higher values.

A selection of proper site for residential purpose is needed to protect the agricultural land and efforts should be made that suitable land is located on vacant land instead of farm land. To this end, agricultural lands were assigned less values and open spaces was given the highest value

Table 2-1: Multi Criteria Analysis for Residential Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters / degree / PKR / feet)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Primary Road	5	17-500	2
			501-1000	4
			1001-1500	3
			1501-2000	1
			2001-5537	0
2	Secondary Road	10	17-500	4
			501-1000	3
			1001-1500	2

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters / degree / PKR / feet)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
			1501-2000	1
			Above 2000	0
3	Land Cover	20	Vacant	3
			Barren Land	2
			Range land	1
4	Land Value Rs. Per Marla	15	20000-50000	4
			50,001-100000	3
			100001-150000	2
			151001-200000	1
			Above 200000	0
5	Slope	10	0 º -2 º	4
			2.1 º -4 º	3
			4.1 º -6 º	2
			6.1 º -8 º	1
			Above 8 º	0
6	Existing Commercial	10	0-500	2
			501-1000	4
			1001-1500	3
			1501-2000	1
			Above 2000	0
7	Existing Industry	10	0-500	0
			501-1000	1
			1001-1500	4
			1501-2000	3
			Above 2000	2
8	Water Table	10	10-50 ft	3
			51-100 ft	4
			101-150 ft	2
			151-200 ft	1
			Above 200 ft	0
9	Water Bodies	10	0-50	0
			51-100	1
			101-150	2
			151-200	3
			Above 2000	4



Map 12: Jamrud Urban Center: Suitability Map of Residential Development

Source: The Urban Unit

2.2. Commercial

First, the main commercial hub was isolated from the proposed residential areas. Euclidean tool was used for the existing built-up areas.

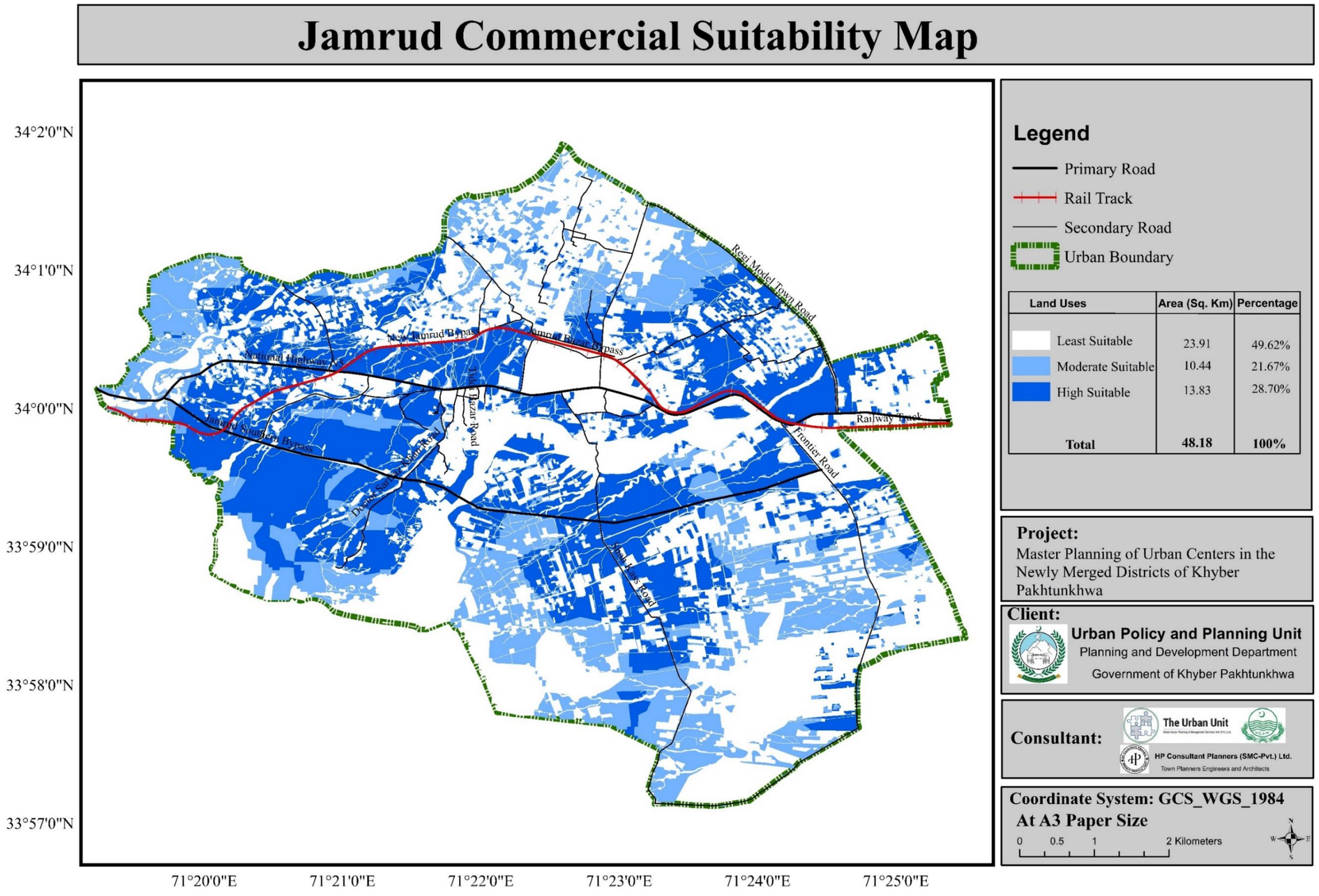
The scoring system for the land suitability for Commercial areas is provided in Table 2-2. In general, lower weights mean less considerable areas whereas higher weight values mean more considerable areas.

Similarly, the layer of existing built-up areas was reclassified. Areas within walking distance of existing built-up were given higher values and weightages while areas away from built-up areas were given lower values. The values assigned to different layers are based on the requirement of each land use.

Table 2-2: Multi Criteria Analysis for Commercial Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters / degree / PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Primary Road	15	17-500	4
			501-1000	3
			1001-1500	2
			1501-2000	1
			2001-5537	0
2	Secondary Road	5	17-500	4
			501-1000	3
			1001-1500	2
			1501-2000	1
			Above 2000	0
3	Land cover	20	Range Land	1
			Vacant	2
4	Land Value Rs. Per Marla	10	20000-50000	0
			50,001-100000	1
			100001-150000	2
			151001-200000	3
			Above 200000	4
5	Slope	5	0 º -2 º	4
			2.1 º -4 º	3
			4.1 º -6 º	2

			6.1 º -8 º	1
			Above 8 º	0
6	Water Bodies	10	0-500	0
			501-1000	1
			1001-1500	2
			1501-2000	3
			Above 2000	4
7	Existing Built-up	20	0-200	2
			201-400	4
			401-600	3
			601-800	1
			Above 800	0
8	Existing Commercial	15	0-500	2
			501-1000	4
			1001-1500	3
			1501-2000	1
			Above 2000	0



Map 13: Jamrud Urban Center Suitability Map of Commercial Development

Source: The Urban Unit

2.3. Industry

Zones close to existing built-up were given lower values for the suitability of industrial areas, while the zones farther away were given greater values. Lower values mean less considerable areas whereas higher values mean more considerable.

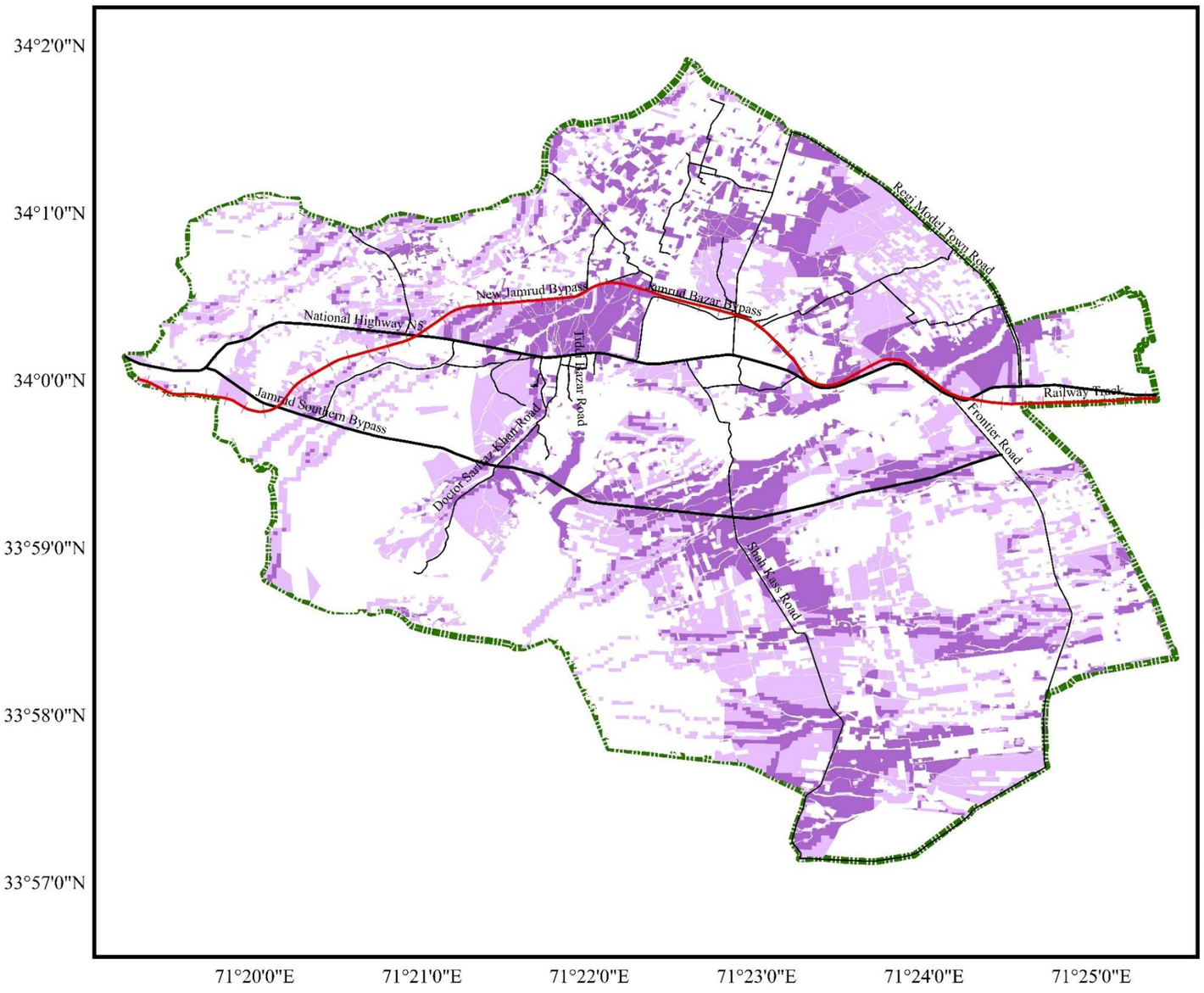
Likewise, the layer of existing built-up area was reclassified; the area near the existing built-up area was given a lower value whereas the area away from the built-up area was given a higher value. Table 2-3 outlines the important parameters for proposing a new site for industries. The values assigned to different layers are based on the requirement of each land use

Table 2-3: Multi Criteria Analysis for Industrial Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Secondary Road	15	17-500	4
			501-1000	3
			1001-1500	2
			1501-2000	1
			Above 2000	0
2	Water Table	10	10-50 ft	0
			51-100 ft	1
			101-150 ft	4
			151-200 ft	3
			Above 200 ft	2
3	Land Cover	15	Vacant	2
			Barren Land	1
			Range land	0
4	Land Value Rs. Per Marla	10	20000-50000	4
			50,001-100000	3
			100001-150000	2
			151001-200000	1

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
			Above 200000	0
5	Slope	10	0 º -2 º	2
			2.1 º -4 º	4
			4.1 º -6 º	3
			6.1 º -8 º	1
			Above 8 º	0
6	Existing Built-up	20	0-200	0
			201-400	1
			401-600	2
			601-800	3
			Above 800	4
7	Water Bodies	10	0-25	1
			26-50	2
			51-75	4
			76-100	3
			Above 100	0
8	Existing Industry	10	0-500	1
			501-1000	4
			1001-1500	3
			1501-2000	2
			Above 2000	0

Jamrud Industrial Suitability Map



Legend

- Primary Road
- Rail Track
- Secondary Road
- Urban Boundary

Land Uses	Area (Sq. Km)	Percentage
Least Suitable	29.52	61.27%
Moderate Suitable	10.94	22.71%
High Suitable	7.72	16.02%
Total	**48.18**	**100%**

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
The Urban Unit
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 2 Kilometers

Map 14: Jamrud Urban Center: Suitability Map of Industrial Development

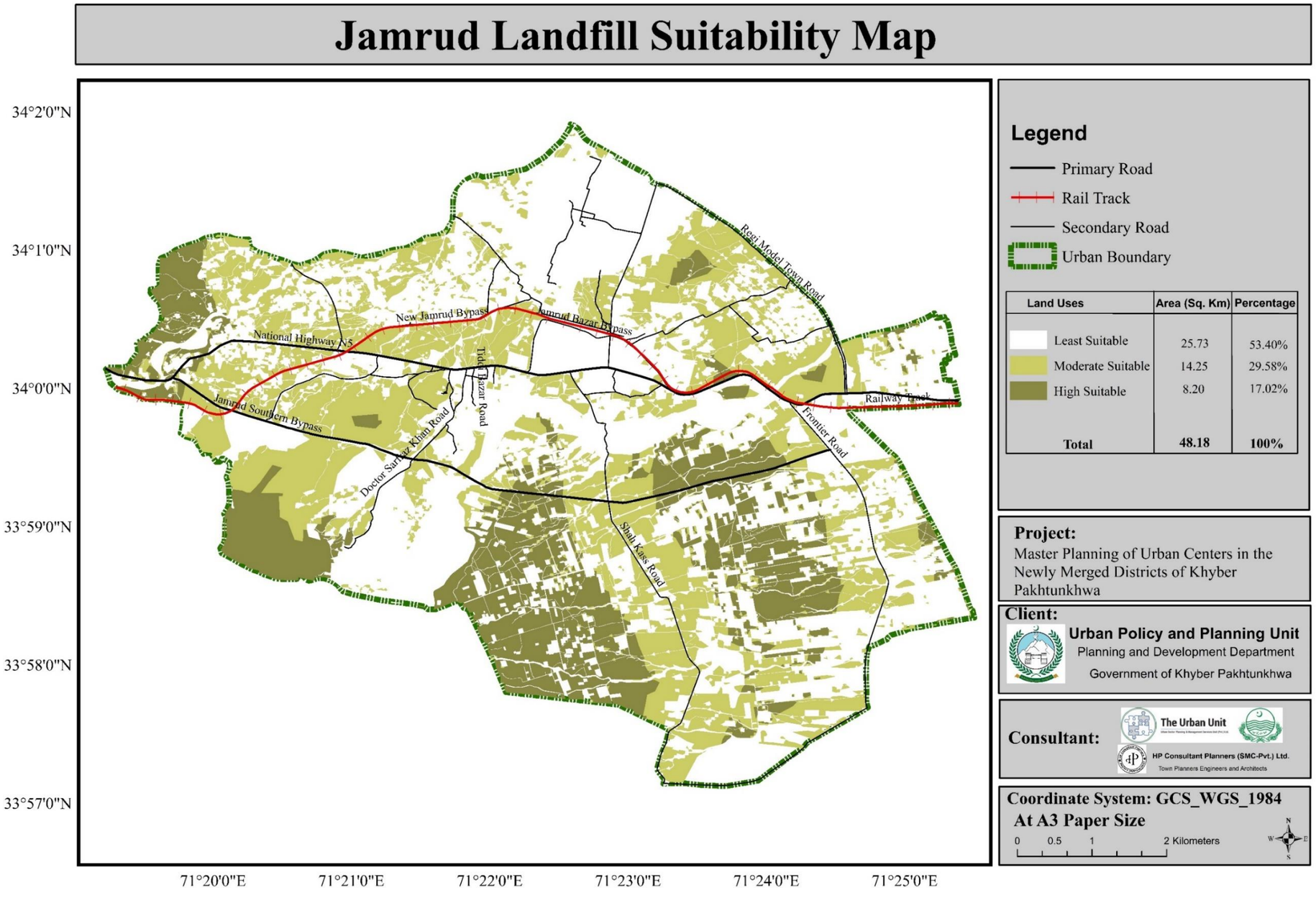
Source: The Urban Unit

2.4. Landfill Site

For Landfill suitability, most of the influence was given to secondary roads, land cover and existing built-up area. The values and layers considered to be influential to landfills are shown in Table 2-4.

Table 2-4: Multi Criteria Analysis for Landfill

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Secondary Road	20	17-500	0
			501-1000	1
			1001-1500	4
			1501-2000	3
			Above 2000	2
2	Land Cover	20	Range Land	1
			Vacant	0
			Barren	2
3	Land Value Rs. Per Marla	10	20000-50000	4
			50,001-100000	3
			100001-150000	2
			151001-200000	1
			Above 200000	0
4	Slope	20	0 º -2 º	0
			2.1 º -4 º	1
			4.1 º -6 º	4
			6.1 º -8 º	3
			Above 8 º	2
5	Water Table	10	10-50 ft	0
			51-100 ft	1
			101-150 ft	2
			151-200 ft	3
			Above 200 ft	4
6	Existing Built-up	20	0-500	0
			501-1000	1
			1001-1500	2
			1501-2000	3
			Above 2000	4



Map 15: Jamrud Urban Center: Suitability Map of Landfill

Source: The Urban Unit

Chapter 3: Approaches and Standards for Land Use Planning

3.1. Land Suitability

Land suitability is an important aspect of land use planning and helps identify the most viable locations for future development and expansion of land uses, with respect to topography, environment, demography, infrastructure, and existing urban dynamics.

Land suitability should however not be seen as static and constant throughout the planning horizon. Instead, a well-developed master plan focuses on improving the land suitability of an area through provision of infrastructure, holistic land use planning, and development of planning guidelines and regulations. The existing land suitability analysis is therefore used as a starting point for improving the development conditions of Jamrud.

In this regard, a comprehensive strategy has been developed to improve the water supply, sanitation, sewerage, and solid waste management infrastructure (see Volume II Section 14) in order to facilitate future urban development in the underserved areas of Jamrud. Furthermore, a holistic land use plan has been developed based on the future needs of the area along with planning standards based on the National Reference Manual.

This master plan therefore focuses on providing a mix of compatible land uses based on these planning concepts and standards. Applications include; separating proposed industrial and residential land uses to prevent hazards and negative health outcomes, maintaining proximity of proposed commercial and residential uses to ensure that the population is well served with commercial outlets and job opportunities, and proposing low-income housing near industrial areas to reduce travel time and costs to places of work.

3.2. Land Allocation Standards – National Reference Manual

The subject area is comprised of various land use zones with substantial uses of residential, commercial and industries. The proposed land uses include residential, commercial, industrial, educational and health facilities, an economic corridor, parking lots and logistics hub.

The National Reference Manual provides guidelines on the ideal mix of land uses in terms of the recommended percentage of land allocation for each land use, based on

the population. The projected population 2040 has been used as a basis for adopting the appropriate NRM guidelines on land use allocation. The NRM recommendations are summarized in the table below:

Table 3-1: NRM Guidelines

City/Town Population Size Class	Residential %	Industrial %	Commercial %	Institutional %	Arterial Circulation/ Terminals %	Recreational Open Spaces %	Graveyards %	Vacant %
All Size Classes	24-50	2-20	0.5-5	2-21	2-29	0.5-7	0.5-6	3-45
500,000+	24-32	2-15	1-2	3-8	13-20	2-5	0.5-3.5	9-45
100,000-499,000	**26-48**	**3-8**	**0.5-2**	**2-10**	**12-29**	**1-7**	**0.5-4**	**3-17**
50,000-99,000	27-43	2-20	1-5	3-11	3-27	1-6	0.5-6	8-26
25,000-49,000	26-50	3-11	0.5-3	2-21	2-18	0.5-2	1-4	7-31

Source: National Reference Manual, 1985

3.3. Proposed Urban Form of Jamrud

Using Homer Hoyt's sectoral land use model, the following five type of land use zones have been proposed for Jamrud:

- Commercial Zone
- Light Industry Zone
- Infill Development Zone
- New Towns (Residential Zone)
- Mixed-Use Zone/Economic Corridor

Details of each proposed land use zones to be implemented in the master plan of Jamrud are provided in the following sections:

3.3.1. Zone "A" Commercial Zone

This zone covers the proposed commercial zones in Jamrud urban center. Commercial centers are suggested in close proximity to residential and industrial zones in order to align with the hybrid model while also considering demand and accessibility. Economic development often follows major transportation arteries because these areas offer high visibility and accessibility, making them attractive to businesses and consumers. Therefore, proximity to primary roads, secondary roads, existing commercial land, industrial areas, residential areas, transit points (bus stands, railway station, shopping malls etc.) and existing municipal infrastructure services have therefore been the selected criteria for determining commercial development.

3.3.2. Zone "B" Light Industrial Zone

As per international best practices and the National Reference Manual for Infrastructure Standards, four industrial zones have been proposed in the Jamrud Town 1, 5 and 6. These locations are suitable due to their relatively flat terrain and accessibility by main roads, such as Frontier Road, Mehboob Road and Regi Model Town Road. Moreover, they are segregated from the existing and proposed residential areas with an appropriate distance in line with the NRM standards.

3.3.3. Zone "C" Infill Development Zone

Infill housing refers to the development of new residential units on vacant or underutilized land within an already built-up urban area.

According to the KP Local Government Private Housing Schemes Management and Regulations, Rules 2021, up to 50 Kanals is the minimum area for the development or declaration of new town. Therefore, the lands spanning less than 50 Kanals between built-up areas have been considered as part of the Infill Zone.

This involves utilizing the available lands within existing neighborhoods, which include spaces between buildings or vacant lots, to create additional housing options. Infill housing helps maximize land use efficiency, reduces urban sprawl, and revitalizes established urban areas. Some advantages of infill housing for areas like Jamrud are:

1. People live in closer proximity to their work;
2. Increased dependence on walking and public transportation;
3. Increased number of affordable housing units;

4. Ability to utilize existing infrastructure like roads, transit, and parks;
5. Ability to redevelop vacant or underused properties; and
6. Creates mixed-use projects i.e. urban regeneration

The land allocation percentage for infill housing and development can vary depending on the specific goals and characteristics of the urban center, existing land use patterns, and the overall development strategy. It is however common for urban planning practices to encourage a significant portion of new housing development to occur through infill projects.

While there are no universally prescribed percentages, land allocations for infill housing are influenced by factors such as:

- **Available Land:** The amount of vacant or underutilized land within the urban center. If there is limited available land, a higher percentage of development may be directed towards infill projects.
- **Revitalization Objectives:** Infill development is often used as a tool for urban revitalization and neighborhood renewal. In such cases, a higher land allocation percentage for infill housing may be prioritized to promote economic development and improve the quality of existing urban areas.
- **Zoning and Land Use Policies:** Zoning regulations and land use policies can influence the allocation of land for different types of development. If the zoning code allows for higher densities or mixed-use development in certain areas, it can encourage more infill housing allocation.
- **Community Priorities:** Community input and preferences can also influence the land allocation percentage for infill housing. It is important to consider the needs and aspirations of the local community when determining the allocation of land for infill development.

3.3.4. Zone “D” Residential New Towns

Infill development alone will not be sufficient to meet the housing needs of the Jamrud urban core during the course of the 20-year plan. Although infill housing is an option for compact development, it is suggested that the substantial unoccupied land inside the Jamrud urban area boundary be used for improved and planned housing schemes

at various sites to accommodate all socioeconomic levels. A new housing zone is therefore being proposed along National Highway-5 and Frontier Road.

3.3.5. Zone "E" Mixed Use Zone/Economic Corridor

The consultants have proposed a mixed-use/economic corridor, along the main N-5 (National Highway-5) road to promote ribbon development in an efficiently and planned manner. This results in defined sectors and partial rings of activity and land uses around this economic corridor which features a mixed zone containing public and private health and education facilities and economy generating land uses. The city's mixes of various layers and how they are kept together will enhance the existing quality of life for the people in light of its socio-cultural legacy.

With the sector land use model in mind, proposals have been made for the Jamrud urban area such that sector-based growth and development alongside transportation corridors is optimized. Given that the CBD is conveniently located in the center of the city and is highly reachable, the proposed development is in accordance with the Sector Land Use model with slight variations.

Chapter 4: Scenario Development

Scenarios are possible future conditions of Jamrud that can be predicted using models and spatial data. It assists in proactive decision-making about the many ways in the future may unfold and how authorities can be responsive, resilient, and effective in the short and long term.[3]

The scenario planning process in Jamrud begins with scanning the current reality, forming forecasts, and considering the influential internal and external factors to produce a set of plausible potential futures (i.e. scenarios). It then develops a series of initiatives, projects, and policies that may help support a preferred scenario, a component of a scenario, multiple scenarios, or all scenarios which indicate how a scenario component is likely to occur. This alerts authorities when the likelihood of a scenario becoming a reality is higher, prompting them allocate funds and moving into implementation.[5]

As land use is the foundation of all urban development, land development scenarios have been used to represent the future development in Jamrud urban center. This helps understand the potentials and constraints in the development of the Jamrud urban area for the planning period.

Three scenarios have been envisioned to provide a better look at the future proposals for Jamrud city. The details of each are explained in the sections below.

4.1 Scenario 1: Business as Usual (BAU)

The Business as Usual (BAU) scenario has been developed for the Jamrud urban center keeping in view that “things won’t change” and grow as per convenience. This focuses on the identification of problems that exists in the Jamrud urban center without any planning interventions. Future projections have been made in the *Background Study Report* to forecast the effects of the current scenario for future years.

According to the 2021 land use survey conducted by the Urban Unit and HP Consultants, the total population of district Jamrud is 227,557 persons. Its rural population is 163,829 persons while the urban population is 63,728 persons. The future population is projected for the year 2040 through the geometric growth method which is approximately equal to 146,506 persons. As the population increases, so will

[3] https://www.planning.org/knowledgebase/scenarioplanning/

the demand of utilities, services, and housing. 'Doing Nothing' means there would be lesser education and employment opportunities for future generations and the provision of amenities and services will pose a great challenge for development authorities.

Sector-Wise Problems and Future Projections

The existing problems and their impacts on each sector have been discussed in this section to foresee the future situation if no interventions are made. The BAU for each sector is given below to examine how they will unfold their respective dimension in the future.

4.1.1 Residential

Housing is an important sector as housing besides providing shelter and raising the quality of life is closely associated with the process of overall socio-economic development.

The weak structure of Local Government, overlapping of existing laws, land-use rules and regulations, local conflicts, and lack of disaster management has caused many social, environmental and economic issues which have directly affected the housing sector of Jamrud. This has resulted in housing dilapidation, shortage, and overcrowding. The quality of housing has deteriorated due to the poor economic condition of people, weak building control, and low awareness of modern construction methods.

Table 4-1: Existing Housing Structure in Jamrud

Structure type	Percentage
Katcha	29.77%
Pakka	18.02%
Semi Pakka	52.22%
Grand Total	100.00%

Source: HIS Survey, Urban Unit and HP Consultants

The existing layout of residential buildings of the Jamrud urban center is of irregular alignments and the primary building material is mud and brick stone. The trend of making new buildings using concrete is replacing the traditional environmentally friendly construction materials which will create a jungle of concrete.

As per the Background Study report, housing structures in Jamrud are not according to planning standards and the current situation of housing is highly unsatisfactory as 29.77% of the houses in the area are Katcha. If this pattern continues, there will be no development in the housing infrastructure and the katcha housing will eventually collapse following a disaster and cost the lives, economy and infrastructure of the Jamrud urban center.

Figure 4-1: Existing Condition of Residential Buildings

Owing to the tradition of the area, specifically privacy, almost 95% of the total houses are single-story. As prices are low in rural and tribal areas, most houses are single story with a maximum height of 20-25 feet from the ground. If no interventions are made, there will be insufficient land for future housing as the density is low at the current stage. With increasing population and housing demand, will aggravate this problem and cause agricultural land to be utilized to accommodate more housing. This results in urban sprawl which ultimately degrades the environment and hinders proper land utilization.

Table 4-2: Existing Size of Housing Units in Jamrud

Size of housing units	Percentage
Less than 5 Marlas	2.87%
5-10 Marlas	15.67%
11-20 Marlas	20.37%
Above 20 Marlas	61.10%
Grand Total	100.00%

Source: HIS Survey, Urban Unit and HP Consultants

The household survey reveals that approximately 61.10% of the sample housing units are greater than 20 Marla's. 20.37% of the housing units are between 11 and 20 Marlas, 15.67 % of housing units are between 5 to 10 Marlas, and only 2.87% of the total housing units are less than 5 Marlas.

Meanwhile, 67% of the population earns less than 30,000 PKR a month. The income level is low while the land ownership and area of housing is greater than required. Accommodating less population and utilizing larger plots of land will trigger problems in the quality of housing due to low income and investment on housing.

The existing scenario shows that the land utilized for housing or residential purposes is insufficient for the current population of the Jamrud urban center, with an overall shortage of 8097 housing units. The projection shows that the area required for 2040 is 5.14 sq.km. for residential zones with a proposed household size of 6.69 person. This translates to a projected housing supply 15,673 units. Details for these projections and housing demand are provided in Section 6.1: Residential Zone.

Based on current housing conditions, the situation may worsen by 2040 if the BAU is adopted. It will not only widen the gap between the demand and supply but also trigger associated problems such as lack of water supply causing decreased water levels of the area, lack of sanitation services causing health and hygiene issues, and overcrowding, which will affect the living standards and livability of the urban center.

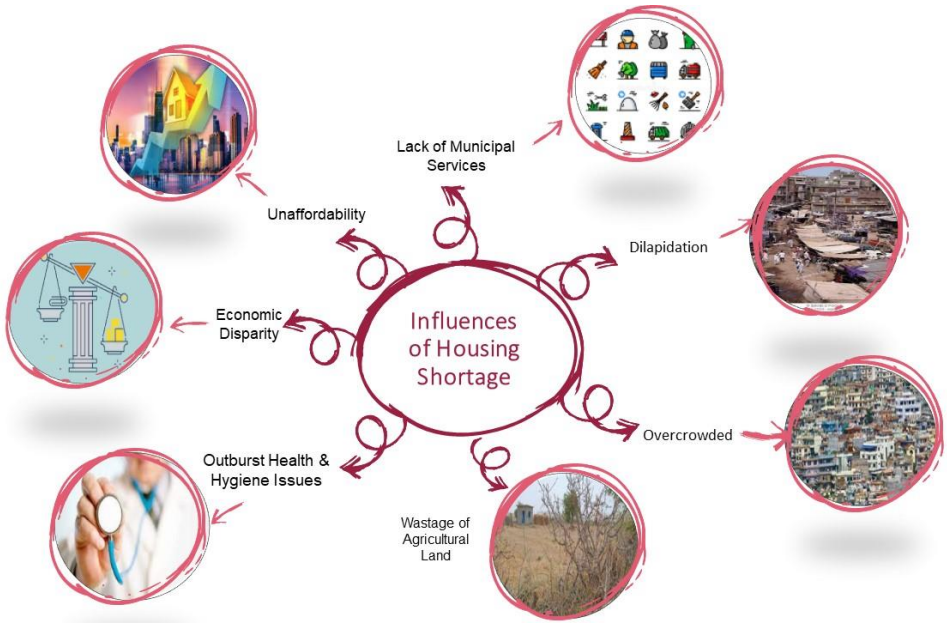


Figure 4-2: Impact of Housing Shortage

4.1.2 Commercial

Jamrud urban center has been economically underdeveloped due to the illegal conversion of land, the absence of a tax collection system, the unavailability of electricity and gas supply to markets/bazaars, the non-availability of raw materials and the lack of infrastructure. If no interventions have been made in the future, the area will not be stable enough to contribute to the overall national economy of the country.

Jamrud is close to Peshawar city and is a hub of commercial activities. As of 2021, Commercial land use occupies about 168.03 acres of land, which is around 1.42% of the total land use. The urban population of the Jamrud urban area in 2021 was 73,655 persons.

The projected population of Jamrud for the year 2040 is 146,506 persons. According to the National Reference Manual, the commercial area must be between 0.5-2 percent of the total land use for such population. While the current area is 1.42 percent, there is a need for further commercial development. If the current situation continues and the required commercial area is not provided, there will be less employment for locals, decrease marketability, less sales and purchases of commodities, reduced capital value and ultimately low productivity of the area.

The commercial buildings are deteriorated and the natural skyline of the area is not followed due to the absence of design guidelines and standards. There are apparently

no by-laws that are given or enforced by the authorities. There are no designated parking spaces. If no interventions are made, the economy, trade, visitor influx, and overall commercial fabric of the area would be ultimately degraded.

Figure 4-3: Existing Condition of Commercial Areas

Moreover, the conversion of residential land uses into various types of economic activities is a new phenomenon, particularly along major roads of residential areas and arterial roads of the urban center. This conversion has proceeded with and without official consent in a haphazard manner. In the future, this will result in parking problems, reduced traffic capacity of roads, and subsequently increased congestion, energy use, air and noise pollution, and burden on utility services.

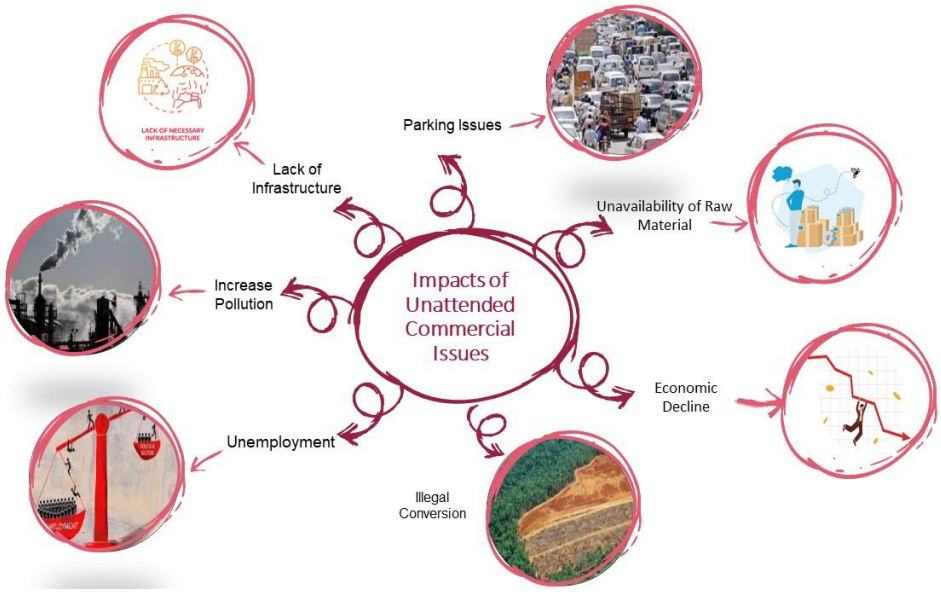


Figure 4-4: Impact of Unattended Commercial Area

4.1.3 Industry

Owning to its proximity to the Peshawar, the industrial products-related needs are not fully met. The security of the area has hampered any industrial growth and has resulted in a small base for industrial production in the area. The existing industrial development in the area has been unplanned and has mostly happened on the Frontier Road where all the urban development exists, alongside major arteries.

Lack of power is a significant issue of low industrial productivity in Jamrud. If no interventions are made, the area will lose industrial potential, and exhibit lower levels of productivity and employment, less human capital and finances, higher costs of production and substandard products, weak infrastructure, less role of public and private sector enterprise and trade policy distortion.

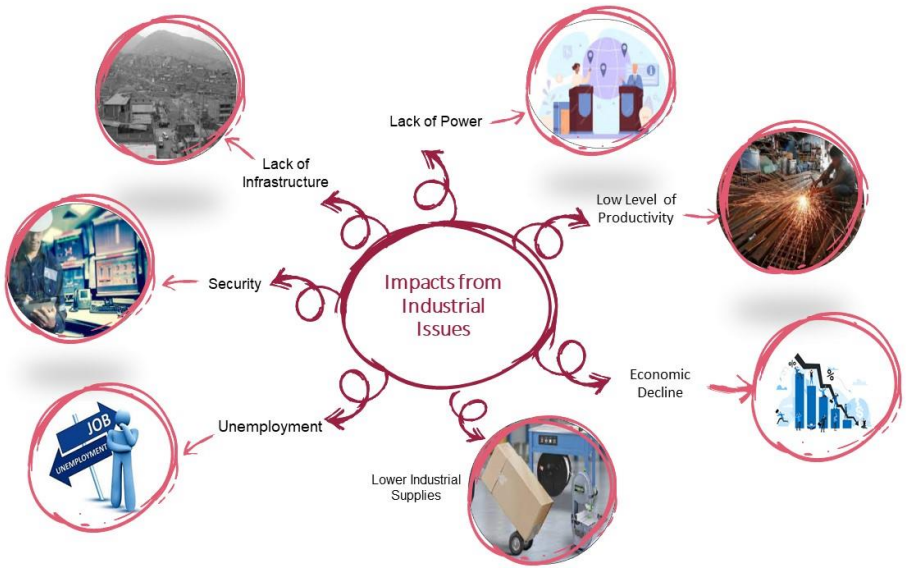


Figure 4-5: Impact of Industrial issues

4.1.4 Education

Low literacy rate, high gender disparity, and substandard infrastructure are significant issues in Jamrud urban center. Lack of schools and vocational and training centers will eventually affect the economy, employability and contribution to the GDP of the future generations.

The supply of educational facilities and gender inequality in Jamrud has an impact on a family's socioeconomic position such as uneven access to education, job segregation, absence of legal protections and religious freedom, poor medical care, and lack of political representation.

If education supply issues are not addressed by 2040, future generations of Jamrud will be unable to attain high-order life skills such as reflection, critical thinking, analysis, research and creativity, shortened human capital and lower employability.

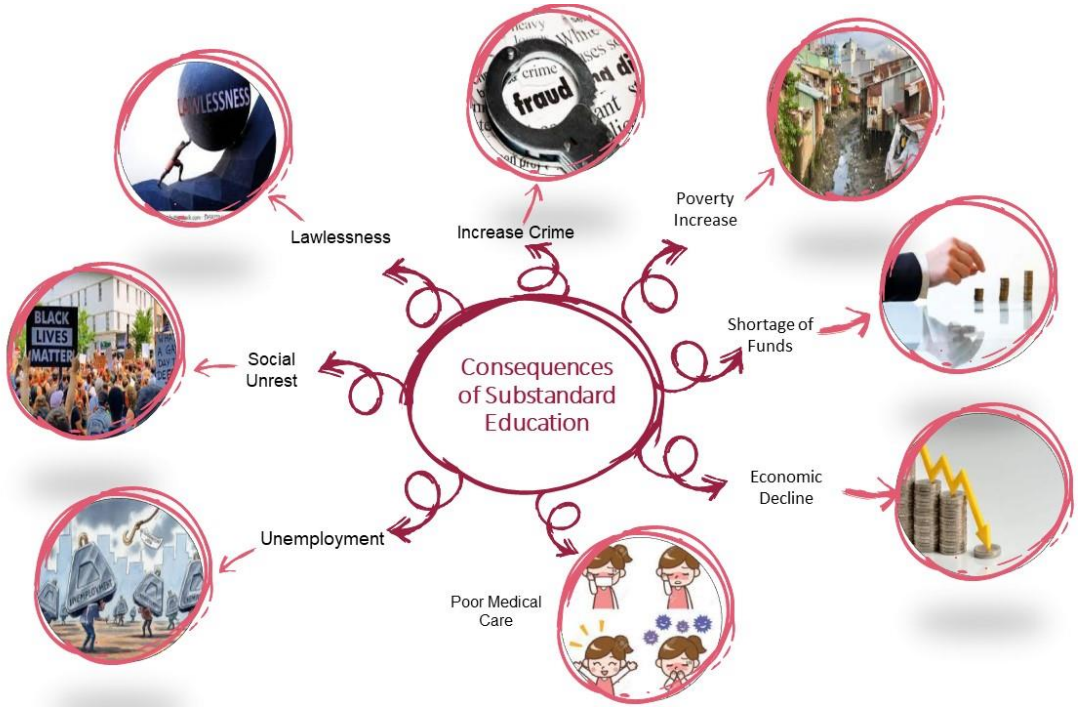


Figure 4-6: Consequences of Lack of Education

4.1.5 Health

Accessible, equitable, and quality healthcare for all people is the apparition of the Jamrud government. Health facilities available in the urban centers do not fulfil the health requirements of its people. This has resulted in inaccessibility of basic health facilities, ignorance of personal hygiene, overcrowding, and improper sanitation.

Few health clinics are operating in the area. According to the Background Studies of Jamrud, the entire urban center has only seven health units which are dispersed in the Jamrud Town - 2, Jamrud Town-6 and Jamrud Town - 7. However, Remaining NC's i.e. Jamrud Town 1, Jamrud Town-3, Jamrud Town-4, Jamrud Town - 5 and Jamrud Town - 8 have no health facilities.

By 2040, if health services will not expand and are overlooked by the authorities, health disparity will worsen. Subsequently, inadequate, inaccessible, and/or poor medical care further will exacerbate healthcare costs. The workforce will also not be robust enough to function effectively following Jamrud's requirements as health disparities increase.

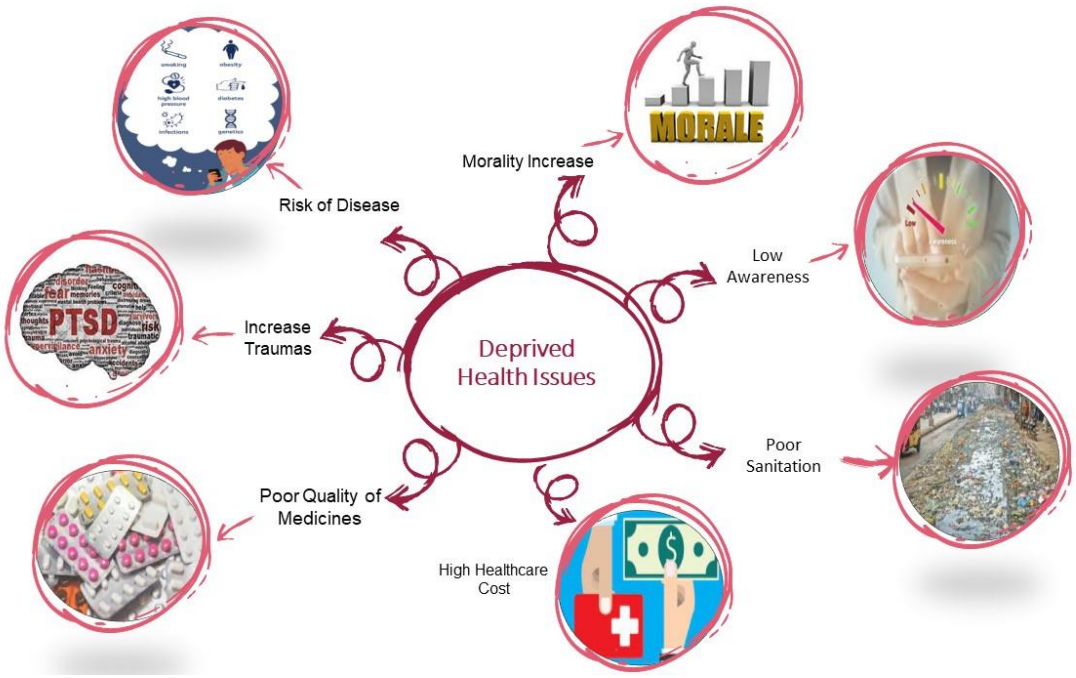


Figure 4-7: Impact of Deprived Health Facilities

4.1.6 Connectivity and Accessibility

The major problems of poor infrastructure, lack of public transport, shortage of trained police staff, absence of parking spaces, limited pedestrian movement and congestion continue to affect tourism and trade in the Jamrud urban center.

Furthermore, the lack of paved roads, shoulders, footpaths, drains, or metaled surfaces cause difficulties for the locals affect the accessibility of basic health, education, and economic activities in Jamrud.

If the road network remains in the same condition, there will be a decline in the tourist influx which will adversely affect the revenue generation and economic growth of the Jamrud urban center. Moreover, it will also burden the transport sector by damaging vehicles, increasing fuel consumption, cost of travel, and degrade the environment of the urban center. Traffic congestion in the city is causing an increase in travel costs and delays the travel time of the people which is making it impossible for outsiders to navigate in the city, eventually affecting the tourism of the city.

Absence of public transport causes accessibility issues in the urban center, motorization, irregular development of public transport systems, increase in private vehicle ownership, which ultimately burdens the environment and creates an inefficient transportation system in the future.

All parking activity in the Jamrud Urban Center is informal. People their vehicles on streets or footpath. Formal parking spaces for vehicles will be required to accommodate the future traffic and parking demand on Jamrud's road network.

The roads of Jamrud are deprived of basic traffic signage. The absence of signage complicates intersections, and puts pedestrians and vehicles at risk of collisions, during times of congestion. The low-income population will be most affected by these problems as they are more vulnerable to suffering the effects of the current transportation system.

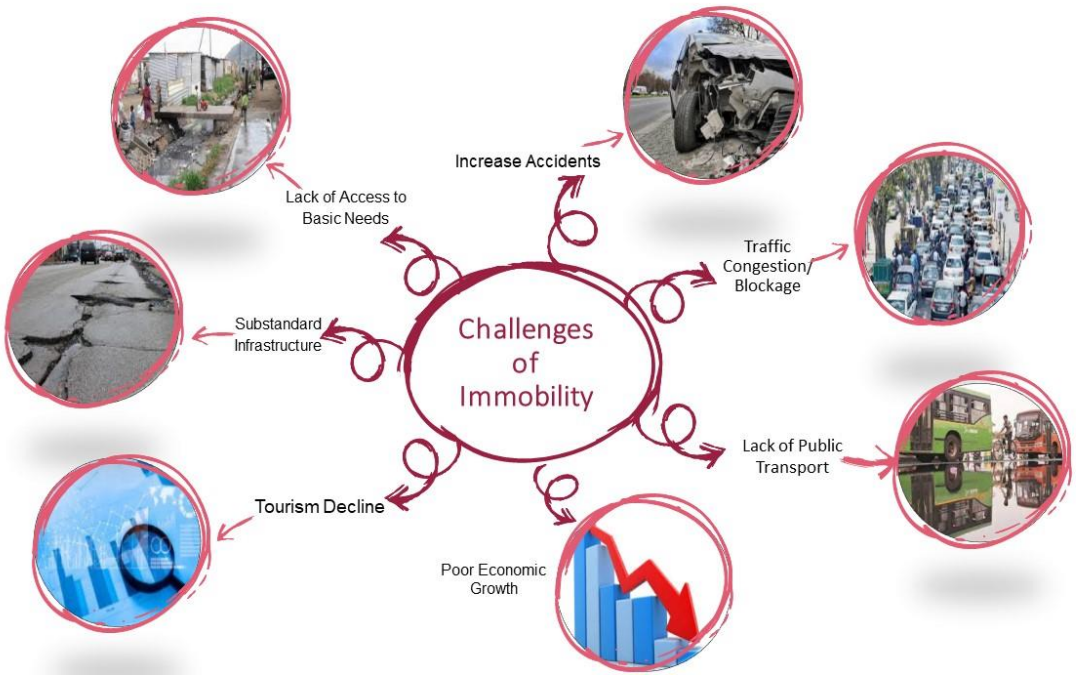


Figure 4-8: Challenges of immobility

4.1.7 Landfill Site

According to the household information survey, there is no mechanism for solid waste collection, transportation and dumping implemented by the TMA. Every neighborhood council has garbage dumps, locally called "Derans," where solid waste is disposed off. The TMA does not serve the entire area, which is a major service delivery problem in the urban center. Solid waste is left unattended in an open area and often ends up in open drains and in sewers which cause choking and overflowing of drains during Monsoon season.

An inefficient municipal solid waste management system creates serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

According to the Background Study report the waste generation of the urban center in the current scenario is 31 tons per day which is approximately 11,315 tons per year. The projections for 2040 show that it will increase to 28,105 tons per year. Under the BAU scenario, the Jamrud urban center will be filled with waste, adversely affect the environment, and eventually make it an endangered city.

Figure 4-9: Challenges of Solid Waste

4.2 Scenario 2: Sector Model

Focused on the sectoral development in order to prevent urban expansion and mushroom growth in the urban core of Jamrud. Different zoning and planning technique have been used such as infill housing, new towns, commercial, industrial, a logistic centre, and others s to meet the area's long-term demands. This will contribute to the sustainability of Jamrud's economic growth and prosperity. The below maps show the detailed sector wise scenario:

4.2.1 Residential

A compact development approach has been employed to better utilize the available land area for providing housing in Jamrud. The existing residential area is 11.19 sq.km and includes a total of 7,317 existing housing units.

The NRM suggests a housing supply standard of between 26%-48% of a subject area with population between 100,000 and 499,000. The minimum and maximum residential areas are therefore 12.53 sq.km and 23.13 sq.km respectively based on a total study area of 48.18 sq. km. The below table shows the existing housing statistics in Jamrud.

Table 4-3: Existing Housing Characteristics

Existing area (sq. km.)	11.19
Existing area (in %)	23.23%
Existing number of houses	7,317
Recommended NRM standard	26% to 48%
Recommended residential area – min (sq. km.)	12.53
Recommended residential area – max (sq. km.)	23.13
Required (Recommended (min) – Existing Land Use) sq. km.	1.34
Required (Recommended (max) – Existing Land Use) sq. km.	11.94

For Jamrud, both new housing and infill are recommended. Infill development is emphasized as it helps delineate the limits of growth for urban areas and protects undeveloped land at the periphery of the city. Locals are benefited from being nearer to social services and places of work. It also utilizes the existing infrastructure and facilities

A total of 21,898 dwelling units are required for Jamrud for the planning horizon. Detailed calculations of the housing requirements are provided in Section 6.1. The figure below illustrates the zones where housing may be provided under this scenario.

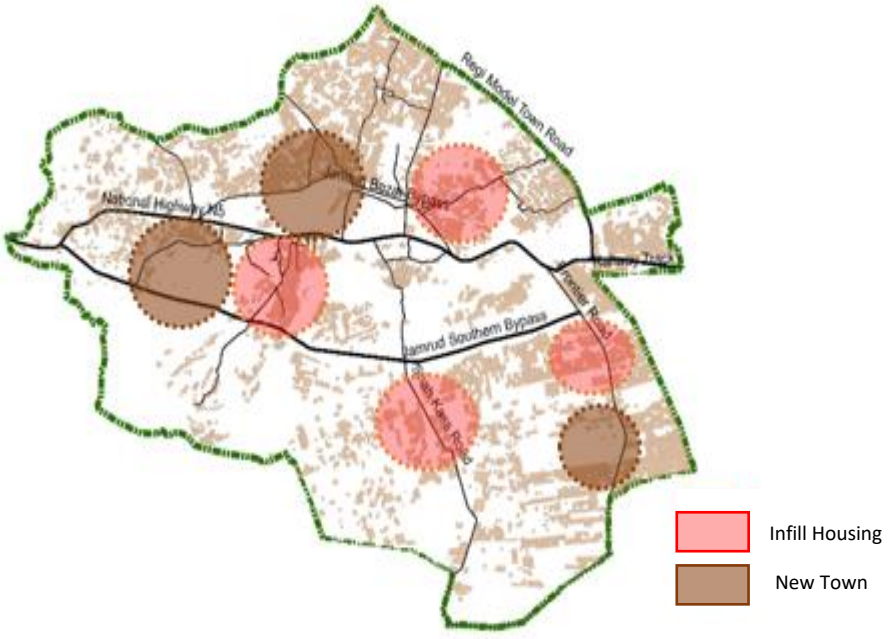


Figure 4-10: Proposed Residential Zone

Table 4-4: Key Features and Rationale for Scenario B: Residential

Key Features	Rationale
Infill housing in the strips close to the existing residential area and road to fill the vacant parcels within existing residential area.	Future housing development within existing residential area is highly feasible due to urban agglomeration dynamics, and will efficiently utilize existing space and promote denser urban form
New housing along NH5, Warsak Dam Road and on south side of Jamrud on largely vacant land	This will cater the need for new housing units and helps to overcome the housing shortage

4.2.2 Commercial

The commercial zones are proposed based on the growing population and the requirements for commercial areas. This allows businesses to identify new

opportunities, enter new markets, and expand their products or services. The existing commercial area is 0.68 sq.km.

The NRM suggests the commercial standard between 0.5%-2% of a subject area with population between 100,000 and 499,000. The minimum and maximum commercial areas are therefore 0.24 sq.km and 0.96 sq.km respectively based on a total study area of 48.18 sq. km. The below table shows the existing commercial statistics in Jamrud.

Table 4-5: Existing Commercial Characteristics

Existing area (sq. km.)	0.68 Sq. km
Existing area (in %)	1.42 %
Recommended NRM standard	0.5% to 2%
Recommended commercial area – min (sq. km.)	0.24
Recommended commercial area – max (sq. km.)	0.96
Required Area [Recommended (min) – Existing Land Use]	-0.44
Required [Recommended (max) – Existing Land Use]	0.28

Currently there are 0.68 sq.km of commercial and this indicates that Jamrud needs more commercial land to cater to the needs of its residents for the next 20 years.

Appropriate parking, loading and unloading facilities and upgraded infrastructure needs to be provided to support the commercial areas and mixed-use activities. NH-5 Road is suggested as an economic corridor to generate more commercial activities and to make this area economically sustainable. Furthermore, commercial areas are proposed near industrial areas.

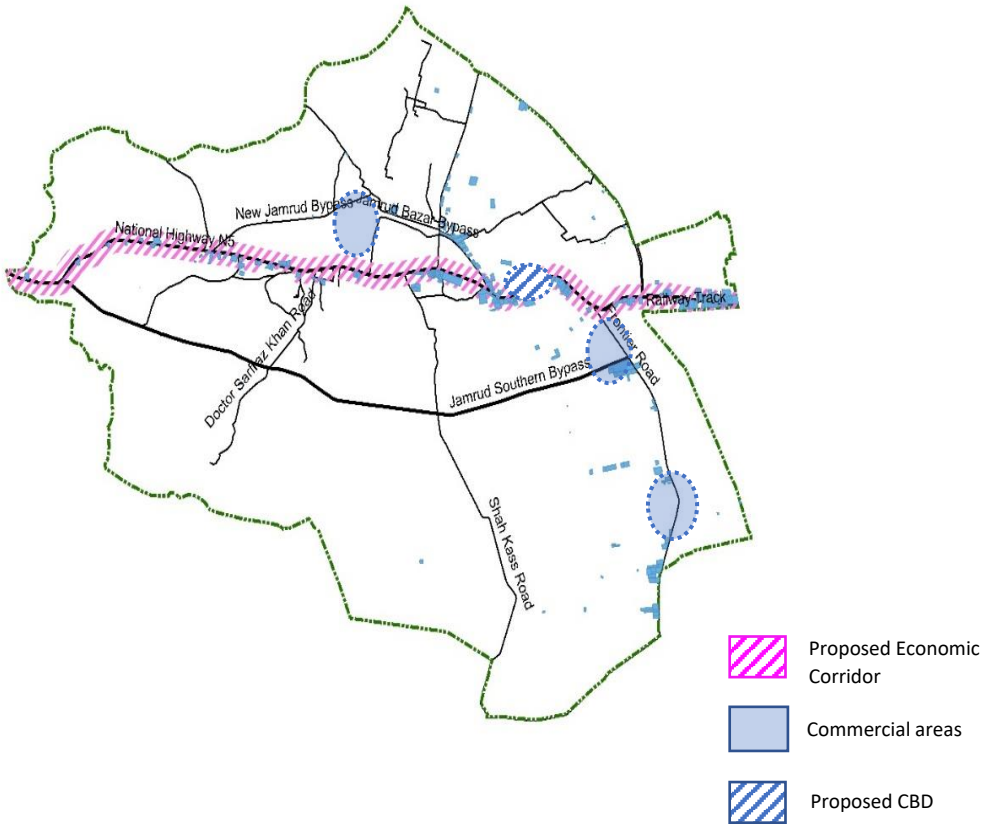


Figure 4-11: Proposed Commercial Zone

Table 4-6: Key Features and Rationale for Scenario B: Commercial

Key Features	**Rationale**
Main N-5 road to be a main economic corridor Commercial centers to be proposed near the residential & industrial zones	They will provide connection between economic nodes or hubs, usually centered on urban landscapes, in which large number of economic resources and actors are concentrated. Also, link the supply and demand sides of markets. These high-visibility locations offer opportunities for infill development for local retail, housing, and social and cultural destinations.

4.2.3 Industry

Industrial zones are proposed to capitalize on Jamrud's natural resources and subsequently strengthen the local economy in terms of GDP. The existing industrial area of Jamrud is 0.35 sq.km.

For an area with a population between 100,000 and 499,000, The NRM suggests the Industrial standard between 3%-8% utilization for industrial purposes. The range of industrial area to be provided is therefore between 1.45 sq.km and 3.85 sq.km based on a total study area of 48.18 sq. km.

Table 4-7: Existing Industrial Characteristics

Existing area (sq. km.)	0.35
Existing area (in %)	0.73 %
Recommended NRM standard	3% to 8%
Recommended industrial area – min (sq. km.)	1.45
Recommended industrial area – max (sq. km.)	3.85
Required (Recommended (min) – Existing Land Use) sq. km.	1.10
Required (Recommended (max) – Existing Land Use) sq. km.	3.50

The industrial zone is proposed on Regi Model Road and near the existing industrial area located on Frontier Road as it is reasonably distant from prominent residential areas and can be accessible by the main roads. A logistics hub is also proposed in this scenario to support the industrial area with shipment and lodging facilities.

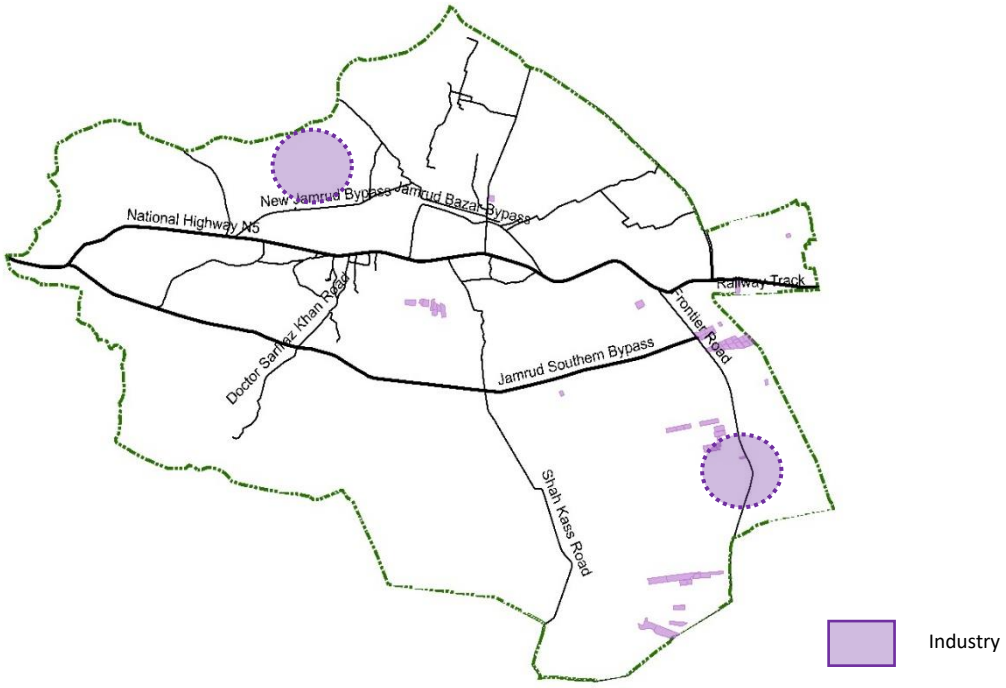


Figure 4-12: Proposed Industrial Zone

Table 4-8: Key Features and Rationale for Scenario B: Industry

Key Features	Rationale
Industry is proposed near frontier road and new by-pass road with a buffer Housing is proposed alongside of the industrial area	The productivity of an area will increase by industrial development. Alongside to this with an appropriate buffer, housing is provided which also helps to aid to provide shelter to labour. Logistic hub will help to ease the flow of goods across area.

4.3 Scenario 3: Multi Nuclei Model

This option focuses on compact development to control urban sprawl in Jamrud urban center and explore alternative utilizations of land for their effects on adjacent and complimentary land uses. Compact development not only preserves the environment, but also generates synergies across urban systems which provide more equitable growth. This results in smaller areas of impact, makes more efficient use of utilities

and infrastructure such as roads, reduces consumption of land, and can result in significant energy savings.

4.3.1 Residential

Residential zones are proposed based on the present and future demand of Jamrud's Urban Center. There are 7,317 dwelling units spread throughout 11.19 sq. km.

As per NRM standard, the minimum and maximum area requirements are 12.53 sq. km and 23.13 sq. km respectively. This translates to a housing requirement of 21,898 units by 2040.

Two forms of housing are suggested to fulfil these requirements: new development and infill development. In order to boost compactness and density, infill housing is suggested within the vacant lots of the current built-up area. In the city, there is 21.02 sq.km of vacant or barren land available out of 48.18 sq.km. The total proposed area for residential development is 5.14 Sq. km out of which 2.64 Sq.km is infill. 2.51 sq. km of land is allocated for new housing development. The proposed residential zones under scenario C are depicted in the figure below.

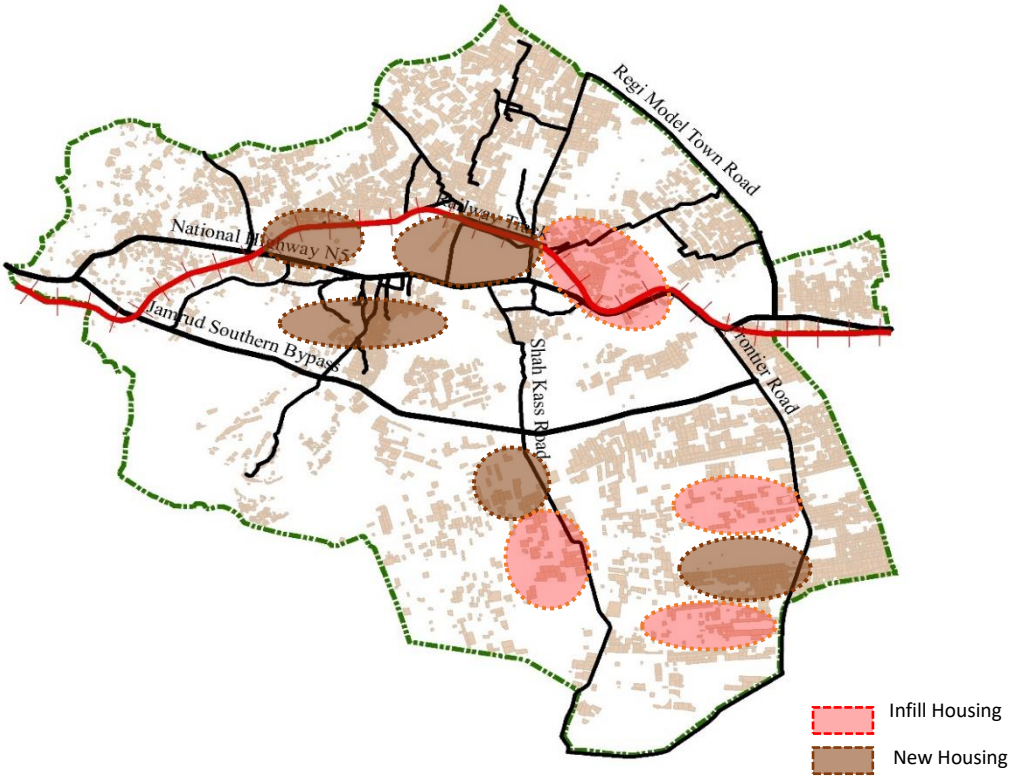


Figure 4-13: Proposed Residential Zone

Table 4-9: Key Features and Rationale for Scenario C: Residential

Key Features	Rationale
Infill housing in the center of city, near proposed industrial area and along the main National Highway-5 and Frontier Road.	Future housing development within existing residential area is highly feasible as it will efficiently utilize existing space and discourage the speculation
New housing to be proposed along National Highway-5, Jamrud Southern and near proposed industrial area.	This will cater the need for new housing units and helps to overcome the housing shortage and commute problem will be resolved for the low-income people.

4.3.2 Commercial

In line with the multi-nuclei approach, the commercial zones have been proposed to distribute the commercial activity and make it more accessible to its adjacent land uses. This is preferable to concentrating the commercial uses into a singular large nucleus which has negative effects such as congestion. In this scenario, the NH-5 Road is proposed as a commercial corridor in order to constrain future haphazard and/or illegal commercial developments in its vicinity.

There are currently 0.68 sq.km of commercial spaces. By 2040, 0.15 sq.km of land is proposed for commercial land use to fulfil the needs of locals. 1.84 sq.km is proposed for the mixed land use to enhance the livability and walkability of urban areas, by providing a mix of housing, employment, services, and amenities within a short distance.

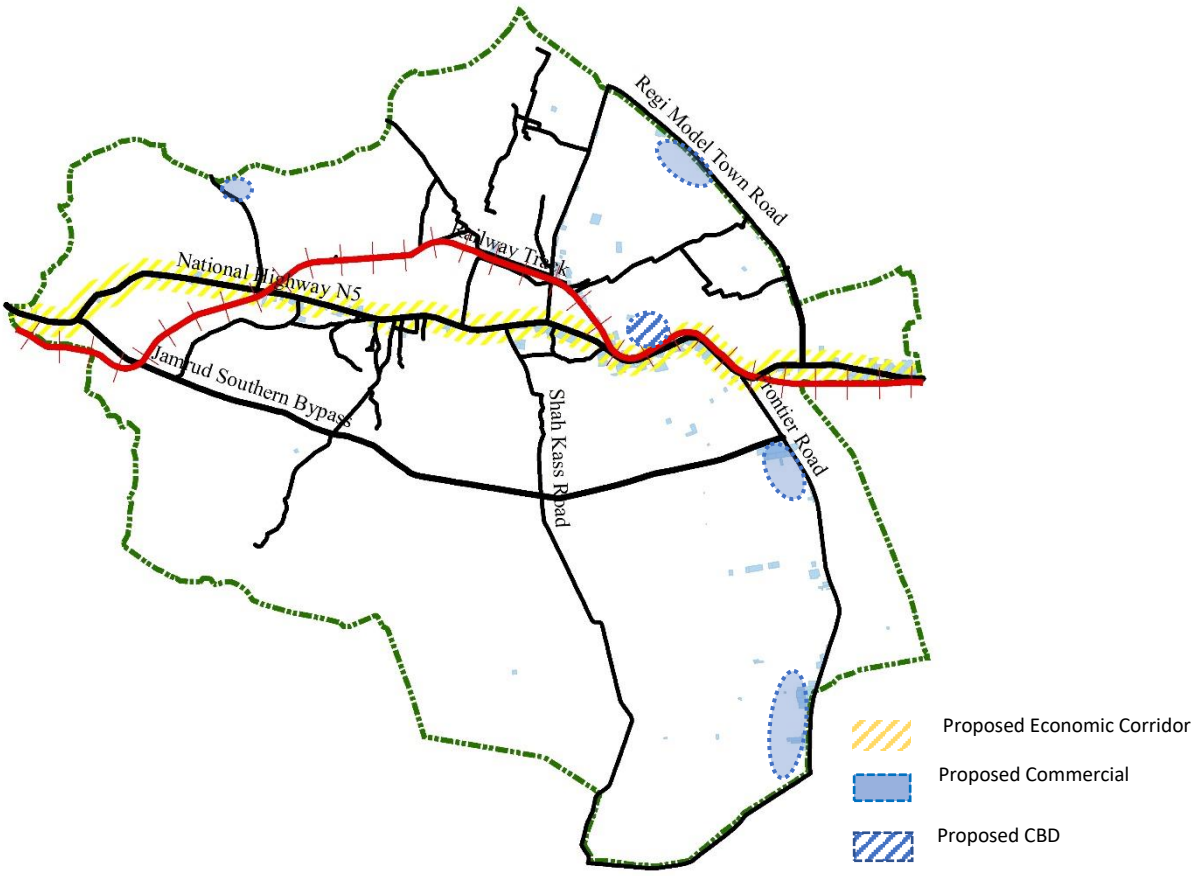


Table 4-10: Key Features and Rationale for Scenario C: Commercial

Key Features	Rationale
New commercial areas to be proposed near the proposed residential zones and industrial area	Commercial area near industrial area will give multiple benefits to residents and area in terms of economic development. Industrial goods and services are well distributed across area and it will increase overall profits by creating new revenue streams. It improves internal operations by adding services to products and enhances overall customer relationships.

4.3.3 Industry

Industrial area to be proposed keeping in view the existing and future needs of the study area. Given that the existing industrial area is 0.35 sq. km and the NRM recommended land allocation for industrial areas is between 3%–8%, the required

industrial area is between 1.10 and 3.50 sq.km. A total of 1.1 sq.km area has therefore been proposed to fulfill the industrial demand of the area. The industrial areas are proposed along the Mehboob Road, Frontier Road, and Regi Model Town Road. All locations are feasible for daily commute.

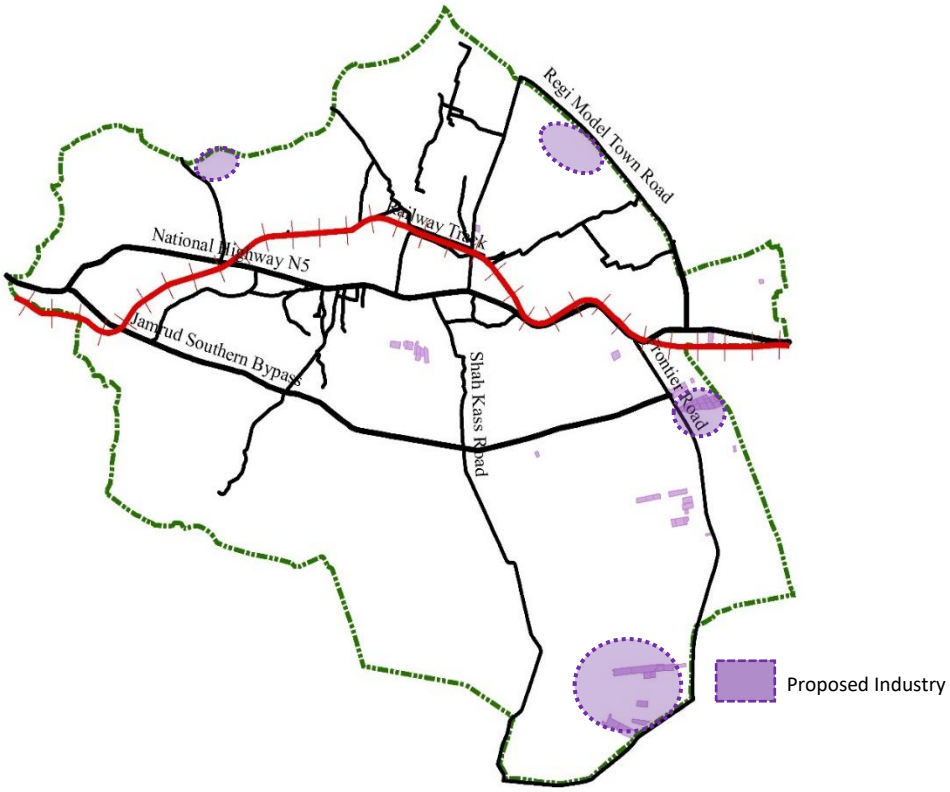


Figure 4-15: Proposed Industrial Zone

Table 4-11: Key Features and Rationale for Scenario C: Industry

Key Features	**Rationale**
Industrial area to be proposed along the Regi Model Road, Frontier Road and Mehboob Road.	Currently, industry is along the Frontier Road. To boost the economy and overcome the load four industrial zones are proposed. Industrialization offers a range of potential benefits, including more job creation, higher economic growth.

Both scenarios B and C have their own impacts on the study area. However, Scenario C is preferable due to its focus on compact development, and efficient utilization of

land resources. Compact development is often supplemented with mixed-use development to incorporate a variety of functions (housing, offices, retail, etc.). As a result, it reduces the need for driving and promotes walkability. The detailed explanation of this scenario is explained in the chapter 5.

Chapter 5: Proposed Strategies of Scenario Development

The progressive features that are shared by the different scenarios are considered and undesirable facts have been avoided.

Environmentally & Culturally Sustainable Jamrud on the Way to a Major Regional Economy

In this scenario, Jamrud urban center adopts a comprehensive and strategic approach to its development, with a focus on ensuring the long-term viability of its economic, culture & environment system, social, and security systems.

To achieve this, investments are prioritized in infrastructure, such as transportation networks, energy systems, and connectivity, to create an environment that is conducive to business growth and innovation. It also focuses on attracting and retaining businesses and skilled workers through policies that support entrepreneurship, innovation, and development.

This scenario prioritizes sustainable and inclusive economic growth, with a focus on reducing inequality and promoting equity. This could involve investments in social infrastructure, such as affordable housing, education, healthcare, and cultural amenities, to improve the quality of life for all residents.

Jamrud prioritizes environmental sustainability of an area by preserving natural resources, and fostering ecological resilience. Economic development involves raising job opportunities and living standards for people by providing affordable goods and services, investments in green infrastructure, such as renewable energy systems, green spaces, and sustainable transportation, as well as policies and programs to encourage sustainable behavior among residents and businesses.

Overall, the goal is to create a safe, resilient, livable, and sustainable urban environment that supports economic growth and prosperity for all residents, while safeguarding the planet for future generations.

5.1. Strategies

The strategies which are adopted in the scenario development of the Jamrud urban center comprise compact development, eco-tourism, environmental conversation, economic development, sustainable infrastructure and transportation, and institutionalization.

Compact development aims to create more livable, sustainable, and vibrant urban communities that support economic development, social equity, and environmental sustainability. This strategy targets the issues of large-scale horizontal development, urban sprawl, overutilization of land, single land use, and lack of interlinked road network arising in housing, commercial, land management and transportation sectors.

Ecotourism aims to achieve a balance between economic growth and the conservation of natural resources by promoting responsible and sustainable tourism practices. This addresses the issues of environmental degradation, lack of tourism infrastructure, conservation practices, awareness, local economy, and limited tourist facilitation in the tourism sector.

Environmental conservation aims to protect and preserve the natural environment and its resources for the benefit of present and future generations This helps resolve the issues of endangered biodiversity, climate change, depletion of natural resources, deforestation, absence of environmental management plans and inadequate environmental monitoring and assessment, lack of greening strategy, fragile environmental state, deteriorating quality of air, water and land pollution, and lack of sustainable practices in environment sector of Jamrud urban center.

Economic development aims to create sustainable and long-term economic growth and improvement in the standard of living in the Jamrud urban center. It mainly concerns the issues of poverty, limited productivity, low capacity of adaptation to market demand, lack of taxation rules and regulations, unemployment, regional economic disparities, and poor infrastructure in the sectors of housing, tourism, trade and commerce, transportation, taxation, revenue, quality of life and industry.

Sustainable infrastructure and transportation aim to develop infrastructure and transportation systems that minimize negative impacts on the environment and promote sustainable economic growth. It aims to resolve the issues of environmental

degradation, climate change, public health, higher consumer costs, social equity, accessibility and mobility, lack of road infrastructure, education and awareness, delipidated infrastructure, and inventory issues in the sectors of transportation, economy, housing, environment, water supply, sanitation, solid waste management, tourism, urban design and quality of life.

Institutionalization aims to establish a set of policies, procedures, and practices that ensure the long-term stability and sustainability of Jamrud urban center. This strategy will target the problems of institutional capacity, governance, public services, economic growth, scalability, stability, adequate service delivery, policy, rules and regulations in the sectors of Land use, land management, governance and institutions, taxation and revenue.

Chapter 6: Proposed Master Plan of Jamrud City

The progressive features of both sector and hybrid land use planning have been utilized to prepared the Proposed Master Plan for Jamrud City. The proposed Master Plan of Jamrud city is provided in Map below.

Given the trend of development along the main roads such as N-5, Jamrud Bypass road from N-5 to Warsak Dam road and Jamrud Bara Link road, the proposed future development intends to alleviate the pressure on the existing land uses. The areas beyond the main road are recommended to be reserved for future economic activities. The Jamrud Master Plan 2040 proposal includes the integration of the Khyber Pass Economic Corridor (KPEC), which traverses the study area, into the plan's development framework.

The total area of Jamrud urban center is 48.18 sq. km. out of which 17.14 sq. km. is covered by a built-up (including roads) serving population of 63,728 persons with an average household size of 8.05. Keeping in view the population and area occupation, the total extent of the proposed additional land use area including livestock and dairy development zone is 100 acres for a population of 146,506 by 2040.

New towns and infill development have been proposed with the proposed industrial areas as these land uses complement each other. The residential zones are proposed along the main economic corridor looking at the ribbon development pattern, however, if planned in an organic form, the ribbon development can alleviate the pressures on the existing mushroom growth. In addition, residential zones area also proposed along Frontier Road, and Jamrud Southern By-Pass Road.

The eight NCs of Jamrud comprise the project area. Outside the project's boundary is rural / agricultural regions. Development outside the project boundary is not suggested in this proposed master plan. The District Land Use Plan will include recommendations for rural regions. Table 6-1 shows the details of each proposed land use zone

Table 6-1: Land Allocation for Proposed Land Uses in Jamrud City

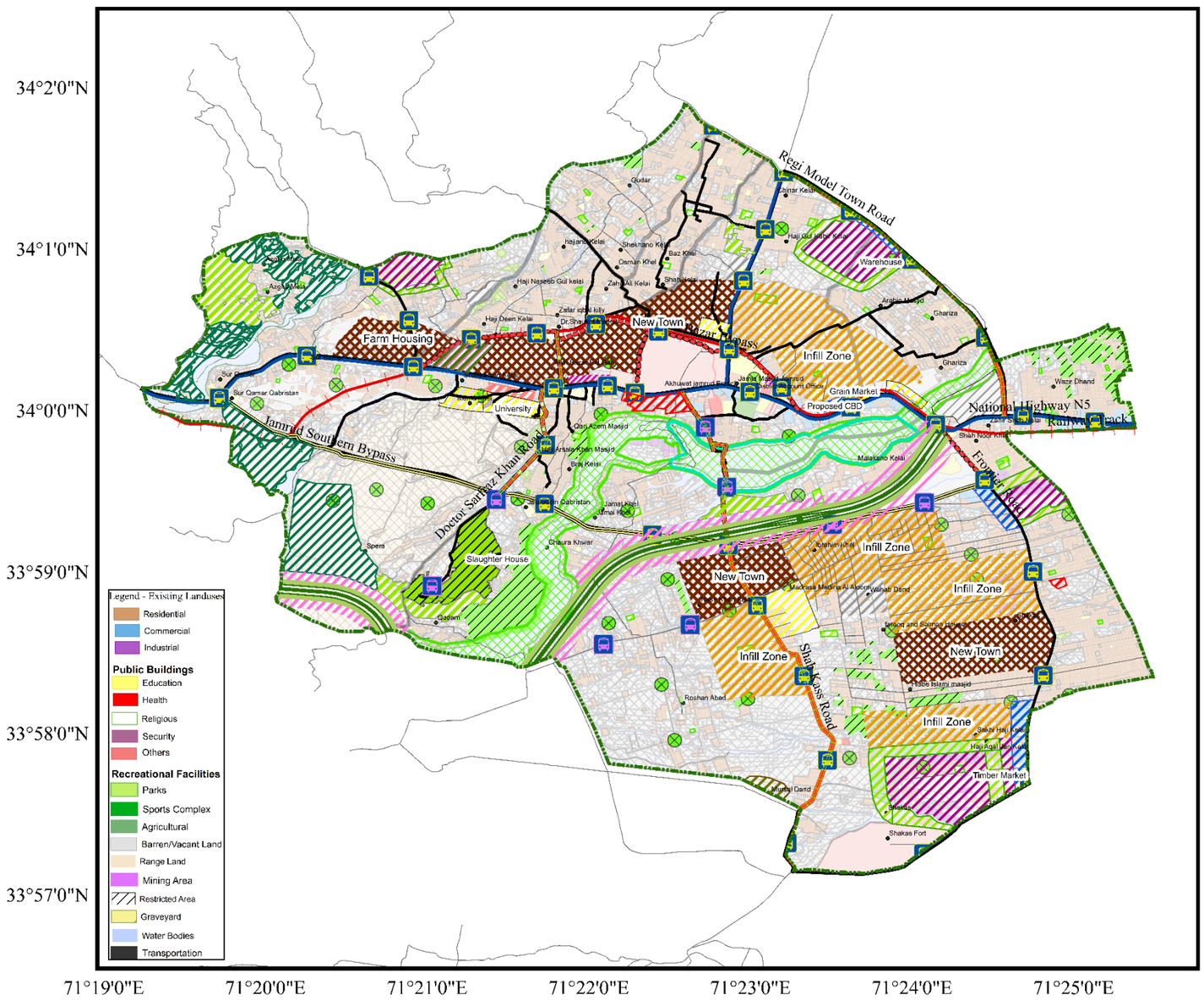
Proposed Land Use	NRM Standard (%)	Recommended Area – min (sq. km.)	Recommended Area – max (sq. km.)	Existing Land Use (2021)	Gap (Recommended Area (min) – Existing Land Use)	Gap (Recommended Area (max) – Existing Land Use)	Proposed Area (sq. km.)
Residential Zone	26-48	12.53	23.13	11.19	1.34	11.94	5.14
Commercial Zone	0.5-2	0.24	0.96	0.68	-0.44	0.28	0.15
Civic Amenities Zone	2-10	0.96	4.82	1.57	-0.61	3.25	0.04
Industry Zone	3-8	1.45	3.85	0.35	1.1	3.5	1.1
Green Space (recreational open spaces)	1-7	0.48	3.37	0.18	0.3	3.19	3.43
Economic Corridor/Mixed Use	-	-	-	-	-	-	1.76
Graveyard	0.5-4	0.24	1.93	0.19	0.05	1.74	0.21
Reserved Agriculture	-	-	-	-	-	-	1.16
Livestock and Dairy Development Zone	-	-	-	-	-	-	0.41
Landfill	-	-	-	-	-	-	0.03
Reserved for Future	-	-	-	-	-	-	17.03

Source: Recommended by the consultants

Total available area for future development is 26.8 sq.km. The total proposed area is 6.87 sq.km which includes residential, commercial, mixed use/economic corridor, etc. 17.03 sq. km. area is allocated for the future permitted extension zone.

Adjacent agricultural land to contiguous build-up converts to other land uses, such as residential and commercial, because 100% of agricultural land cannot be maintained for use in agriculture due to future city expansion. However, by 2040, the 1.16 square kilometers of agricultural land will be reserved as agriculture land. The proposed land uses do not include land reserved for agriculture and green space areas because these areas are protected and cannot be converted to other uses in the future. Green spaces are reserved to improve the livability of city as well as to help remove pollutants and improve air quality by absorbing harmful substances.

Proposed Master Plan of Jamrud



Legend - Proposed Landuses

- Transit Stop proposed in Short Term
- Future Transit Stop
- Dualization in Long Term
- Widening in Long Term
- Dualization in Short Term
- Completion in Short Term
- Rehabilitation and Widening in Short Term
- Existing Primary Roads
- Existin Secondary Roads
- Existing Rail Track
- Linear Plantation
- Commercial Zone
- Cattle Fair
- Livestock Zone
- Slaughter House
- Educational Zone
- Civic Amenities Zone
- Landfill Site
- Graveyard Zone
- Green Space
- Health Zone
- Industrial Zone
- Infill Residential Zone
- New Residential Town
- Delcared as CBD
- Proposed Parks
- Proposed Plantation
- Proposed Economic Corridor/Mixed Use
- Proposed Parking Lot
- Proposed Public Transport Terminal
- Proposed WWTP
- NHA Rightof Way
- Chaura Khwar Beautification
- Proposed Cycling Track
- Proposed Sports Complex
- Proposed Vocational Centre
- New Water Supply Scheme
- New Water Reseviour
- Reserved Agricultural Zones
- Riparian Buffer Zone
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 2 Kilometers

Map 16: Proposed Master Plan of Jamrud

Source: The Urban Unit

The sector-wise recommended proposals and their future implications on each sector have been discussed in the sections below:

6.1. Residential Zone

One of the key features of the proposed master plan is the provision of suitable housing for all income groups. The residential areas have been proposed keeping in mind the increasing population and housing needs of Jamrud.

Proposals for the housing sector include guidelines for residential development, proposals for infill housing, and new housing. These proposals with consideration to the aforementioned strategies such as institutionalization, compact development and sustainable infrastructure. As a result, structurally safe, economical and sustainable housing is to be provided in Jamrud in order to improve the quality of life by 2040.

The institutionalization strategy focuses on the guidelines for future residential development which includes permitted, permissible and prohibited uses to control urban sprawl and haphazard development. Effective regulation leads to efficient and effective delivery of better housing standards.

The compact development strategy focuses on the infill and new housing spatially distributed in Jamrud.

In 2021, the existing population of 73,655 resided in 7,317 housing units in Jamrud. The projected population for 2022 shows an increase of 2,715 people in 1 years, making a total population of 76,370 people. The housing backlog can therefore be calculated using the existing population, housing supply, and replacement demand (katcha and dilapidated and overcrowded).

The backlog calculation reveals a gap of 1,241 units between the existing housing supply and demand for the year 2022.

Table 6-2: Housing Shortage 2022, Jamrud

Year	Projected Population	Projected Household Size	Projected Housing Demand 2022	Projected Housing Supply	Backlog	Overcrowding + Dilapidated	Total Shortage 2022
2022	76,370	7.73	9,876	7,563	2,313	6,005	8,317

Source: Calculated by Urban Unit and HP Consultants

Housing backlog is relatively average in case of Jamrud city, however, any housing unit with 4 walls is considered as basis for calculations in PBS. Generally, conditions and infrastructure vary from good to worse in existing housing units. Given the conflicting nature of the project area, most of the housing units are in dilapidating condition and keeping in view the projected household size of 7.73 (2022), are mostly overcrowded. The consultants have also calculated the overcrowding units which amount up to the total housing units i.e. 2,993 houses. This 40% of the houses, which makes up total of 3,012 housing units are in urgent need of replacement to effectively accommodate the people and safeguard the social security as well as the lives of its inhabitants. Similarly, the calculations have been done for the year 2040, shown in the table below:

Table 6-3: Housing Demand 2040, Jamrud

Year	Projected Population	Projected Household Size	Projected Housing Demand 2040	Housing Supply	Backlog	Overcrowding + Dilapidated	Total Shortage 2040
2040	146,506	6.69	21,898	13,728	8,169	10,899	19,068

Source: Calculated by Urban Unit and HP Consultants

The residential areas have been proposed with regards to the increasing population and need for housing for Jamrud. The housing demand of Jamrud urban center for a 20-year planning period can be fulfilled through compact development, which provides more efficient land use, increased density, and affordability in the housing sector.

Table 6-4: Residential Zone Requirements

Existing area (sq. km.)	11.19

Existing area (in %)	23.23%
Household size (Census, 2017)	8.05
Household size rate of change	-0.8%
Estimated Household size, 2040	6.69
Existing number of houses (Land Use Survey, 2021)	7,317
Recommended NRM standard	26%-48%
Recommended residential area – min (sq. km.)	12.53
Recommended residential area – max (sq. km.)	23.13
Required (Recommended (min) – Existing Land Use)	1.34
Required (Recommended (max) – Existing Land Use)	11.94
Proposed area 2040 (sq. km.)	5.14
Proposed new housing units	21,898

Source: Recommended by Urban Unit and HP Consultants

The existing area for residential use is 11.19 sq.km. with a household size of 6.69 (Proposed 2040) with 7,317 existing housing units. The proposed area required for 2040 is 5.14 sq.km. with an estimated proposed new housing unit are 21,898.

The residential zones are proposed to be further categorized into new towns and infill development to cater the housing demand of Jamrud city.

Table 6-5: Categories in Proposed Residential Zone

Land Use Class	Categories	Area (Sq.KM)
Residential Zone	Infill Zone	2.64
	New Towns	2.51

Source: Urban Unit and HP Consultants

6.1.1. Income Group Classification

Income Groups are often categorized according to their financial standing in a country. They are generally categorized in lower, middle, or upper strata/class depending on their housing conditions, lifestyle and net worth. It is noted that the minimum wage was increased from PKR 21,000 to PKR 25,000 per month for unskilled workers in Khyber Pakhtunkhwa on 01 July 2022[1].

According to the HIS survey(2021), 67% of the population in Jamrud is categorized as low-income, while 23.6% of the population is in the middle-income class and 9.4 %

belongs to high-income class. Table 6-6 shows the different income group percentages based on the monthly income.

Table 6-6: Household Income Groups based on Monthly Income

Percentage of Household Income Groups						
Monthly earning = Below Rs. 10,000	**Monthly earning = Rs. 10,001 - Rs. 20,000**	**Monthly earning = Rs. 20,001 - Rs. 30,000**	**Monthly earning = Rs. 30,001 - Rs. 40,000**	**Monthly earning = Rs. 40,001 - Rs. 50,000**	**Monthly earning = Rs. 50,001 - Rs. 100,000**	**Monthly earning = Rs. 100,001 & above**
10.1%	32.1%	24.8%	14.7%	8.9%	6.9%	2.5%

Source: Household Information Survey, 2021

The above noted income groups have been used to segregate the housing demand into number of units to be provided for each class in Jamrud.

Table 6-7: Housing Units for Each Income Class

Types According to income level	Population (%)	Housing units for each income class (2017)	Housing units for each income class (2022)	Housing units for each income class (2040)
Low Income HH	67.0%	5,304	6,617	14,672
Middle Income HH	23.6%	1,900	2,370	5,256
High Income HH	9.4%	713	889	1,971
Total	**100%**	**7,917**	**9,876**	**21,898**

Source: Calculated by Urban Unit and HP Consultants

The housing units have also been calculated in terms of lot size (Marlas) for each income group.

Table 6-8: Marla Wise Percentage for Each Income Group

Size category	Income class (%)	Income Groups
Up to 9 Marla Units	67%	Low Income Group
9.1-17 Marla Units	23.6%	Middle Income Group
17.1-30 Marla Units	9.4%	High Income Group
Total	**100.%**	

Source: Calculated by Urban Unit and HP Consultants

Three types of housing units have been proposed in the new towns and infill development zones for each income group:

- Low Income class: Up to 9 Marla Units
- Middle Income class: 9.1 - 17 Marla Units
- High Income class: 17.1 - 30 Marla Units

The percentages allocated for each housing unit are provided in Table below:

Table 6-9: Housing Units Required by 2040 in Jamrud

Income Group Class	Size category	Percentage	Housing units required in 2040	Area in sq. km.
Low Income Group	Up to 9 Marla	**67%**	**14,672**	2.07
Middle Income Group	9.1-17 Marla	**23.6%**	**52,56**	1.84
High Income Group	17.1-30 Marla	**9.4%**	**1,971**	1.11
	Grand Total	**100%**	**21,898**	**5.02**

Source: Calculated by Urban Unit and HP Consultants

These percentages have been calculated from the existing percentage of the household income groups, and projected on the total housing units. For example, 67% of the 21,898 to acquire low income Marla wise housing units required in year 2040.

The residential density of the study area is 4,362 housing units per sq.km by 2040. The KP Urban Policy, 2023 has been consulted to use densities for future residential development. According to the policy, density targets for private housing schemes in Jamrud shall therefore be prescribed by LGE and RDD.

Farm Housing

Farmhouses located on agricultural land and designed to function around a farming lifestyle. Farm housing having an area of 0.33 sq.km is proposed on the National Highway N-5 Road to enjoy the nature and develop sense of community in the Jamrud Urban Center.

6.1.2. Rationale for Proposed Infill Development in Jamrud

The rationale for proposing the infill development in Jamrud is detailed out in section 3.3.3., however, further explanation is given in this section.

Infill development has been proposed around the city center and on the Northeast, and Northwest sides due to the availability of vacant land parcels within the existing built-up areas. Infill development encourages the usage of underutilized or vacant land in existing urban areas to increase density and place new development near existing resources and infrastructure. This helps cities like Jamrud be environmentally friendly and social sustainable. The Infill housing has been provided to fit within an existing neighborhood without significantly altering its character or appearance and control the urban sprawl in the area. The total area categorized under vacant plots is 21.02 sq.km. out of which approximately 2.64 sq. km is proposed to be used for infill development.

6.1.3. Rationale for Proposed Residential Development in Jamrud

Proposed new zones and infill zones are based on the ground realities, tribal system, cultural norms, and traditions. The proposals are distributed such that all communities of the area are served and unidirectional growth of the city is avoided. The following parameters have been used to identify residential development zones in Jamrud.

- **Proximity to Existing Residential Area**

Proximity to existing residential land provides infill zones and new residential areas with advantages such as community living which promotes social interaction and community integration by considering the mix of housing types.

- **Proximity to Primary Roads**

Residential development often follows major transportation arteries due to the precedence of ribbon development. It is however recommended to prioritize infill development in such areas. In addition, these areas offer high visibility and accessibility, making them attractive for mixed use development.

The areas along the National Highway 5, Frontier Road, Shah Khass road have been proposed as new residential zones as these areas will be filled in the future. Therefore, a restrictive land use and zoning will not only contribute to the efficient use of land but aid in the urban regeneration of the area.

- **Proximity to Secondary Roads**

Proximity to secondary roads is important they are often more accessible to people living farther from the main arteries. They are also less congested than major arteries and located in established neighborhoods.

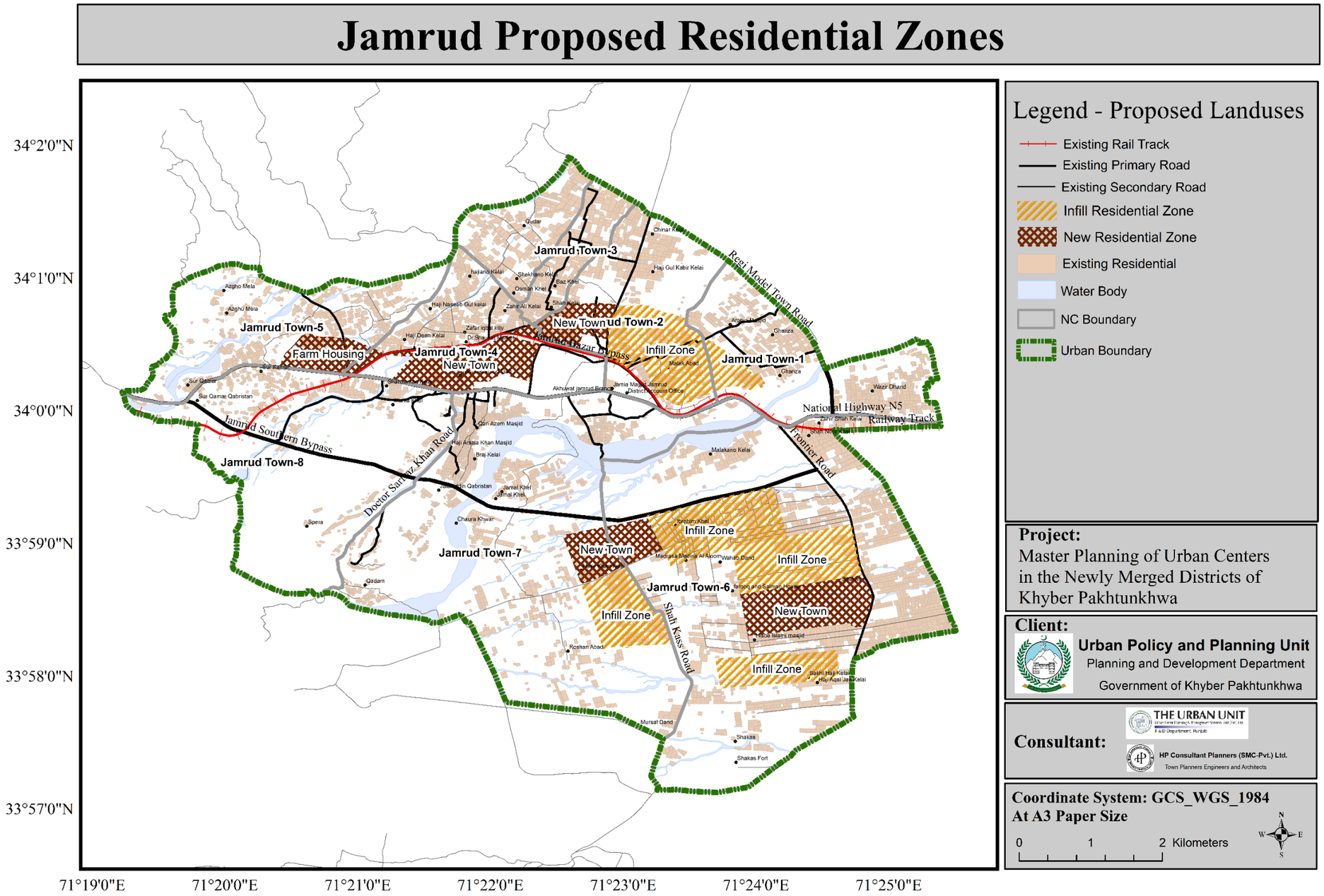
- **Proximity to Existing Commercial Land**

Proximity to existing commercial land provides new residential areas with the advantage of lesser daily commuting and accessibility to public services and amenities.

- **Lands Proximal to Industrial Areas**

Proximity to industrial areas can play a diversifying role in new residential zones especially for low cost housing. New towns on lands proximal to industrial areas are proposed to provide ease in daily commuting for the lower income class. These zones will have higher percentages of low-income plots to accommodate more population under the low-income category.

Additionally, close proximity industrial areas provide industries a large pool of skilled labor and subsequently more job opportunities with influx of economic activity.



Map 17:Proposed Residential Zones

Source: The Urban Unit

The land use division for New Residential Schemes in provided in the below Table. Note that this is in accordance with the KP Local Government Private Housing Schemes Management and Regulations, Rules 2020:

Table 6-10: Planning Standards for Private Housing Schemes

Sr. No	Land Use	Category-D (up to 50 kanal)	Category-C (50-100 kanal)	Category-B (100-200 kanal)	Category-A (200-500 kanal)	Mega Housing Scheme (above 500 kanal)
1.	Open Spaces	-	Min 05%	Min 07%	Min 07%	07% or above
2.	Graveyard	-	-	Min 02%	Min 02%	Min 02%
3.	Commercial	-	Max 01%	Max 05%	Max 05%	Max 10%
4.	Public Buildings	-	Min 02%	02% to 10%	03% to 10%	04% to 10%
5.	Size of Residential Plot	Max 01 kanal	Max 02 kanal	Max 02 kanal	Max 02 kanal	Max 02 kanal
6.	Internal Roads	25 ft Min	25 ft Min	Min 30 ft	Min 30 ft	Min 30 ft
7.	Site for Solid Waste	-	Min 05 marla	Min 10 marla	Min 01 kanal for 200 kanal and 10 marla for each additional 100 kanal upto 500 kanal	Min 04 kanal for 500 kanal and 02 kanal for each additional 500 kana
8.	Grid Station Exclusive of Public Buildings	-	-	As per requirements of concerned deptt. / Agency	As per requirements of concerned deptt. / Agency	As per requirements of concerned deptt. / Agency
9.	Major Roads	Min 40 ft	Min 40 ft	Min 60 ft	Min 100 ft	Min 150 ft
10.	Service Area / Scheme Office		Min 05 marla	Min 10 marla	Min 10 marla	Min 01 kanal

It is recommended to implement these private housing scheme rules in Jamrud in order to prevent mushroom and unplanned growth of residential areas. These can be slightly amended given the area of land parcels proposed for residential land uses. As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The

permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP.

Table 6-11: Residential Area Development Guidelines

Permitted Uses	**Allied Permissible Uses**	**Prohibited Uses**
Detached/semi-detached dwellings, Mosques, Primary/high schools, Clinics/dispensaries, Social/cultural institutions, Local shopping areas/retail shops, Offices of professionals with adequate parking facilities, Parks and playgrounds, Apartment buildings, Graveyard or place of burial, horticultural nursery, Urban farm, Old age home or orphanage, Urban forest, Guest houses offices of TMAs/other tiers of local Govt.	Commercial offices and service, Shops of local character, Raising of poultry for non-commercial purposes, Day-care centre, Pre-schools, Rehabilitation centres for disabled, Primary and junior schools, Petrol pump, Gas filling station, Taxi/rickshaw stand.	Heavy, large and extensive industries: noxious, obnoxious and hazardous industries, Warehousing, storage go-downs of perishables, hazardous, inflammable goods, Workshops for buses, Slaughter-housing, wholesale mandis, Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Outdoor games stadium, Indoor games stadium, shooting range, Zoological garden, botanical garden, Bird sanctuary, Picnic hut,

		International conference centre, Sports training centre, reformatory and all uses not specifically permitted or permissible

Source: Urban Unit and HP Consultants

6.2. Commercial Zone

This section focuses on the commercial activities being proposed throughout Jamrud Urban Center. Jamrud being in the closest vicinity to the provincial capital Peshawar.

6.2.1. Commercial Area Growth, Gaps and Regulations

Using the guidelines given in the NRM standards, the current commercial area gap has been calculated below:

Table 6-12: Commercial Requirements

Commercial Zone	
Existing area (in sq. km.)	0.68
Existing area (in %)	1.42%
NRM Standards	0.5%-2%
Recommended commercial area – min (sq. km)	0.24
Recommended commercial area – max (sq. km)	0.96
Gap (Recommended (min) – Existing Land Use)	-0.44
Gap (Recommended (max) – Existing Land Use)	0.28
Proposed area 2040 (in sq.km.)	0.15

Source: Recommended by Urban Unit and HP Consultants

As per the land use survey (2021), there are 168.03 acres of commercial area in Jamrud urban center.

This suggests that Jamrud requires more commercial land to cater to the needs of the residents for the next 20 years. This is further demonstrated by the fact that the housing growth over the past five years, 2016-21 has been almost 50 percent.

Additionally, there is a need to regulate commercial areas by providing appropriate parking, loading/unloading facilities and better land uses to accommodate the commercial and mixed-use activities.

Mixed Use Development/Economic Corridor

Economic corridors/ Mixed-use development is a new form of urban development that can increase the economic growth of area. It provides various benefits, such as cost saving infrastructure, increased tax revenue, property value, tax collections, and promotes tourism etc. It also strengthens infrastructure construction by establishing industrial clusters, thereby attracting investment and developing regional economy. Mixed-use zone having an area of 1.15 sq. km is suggested parallel to Jamrud Southern Bypass Road.

6.2.2. Strategy to Cope with Haphazard Commercialization

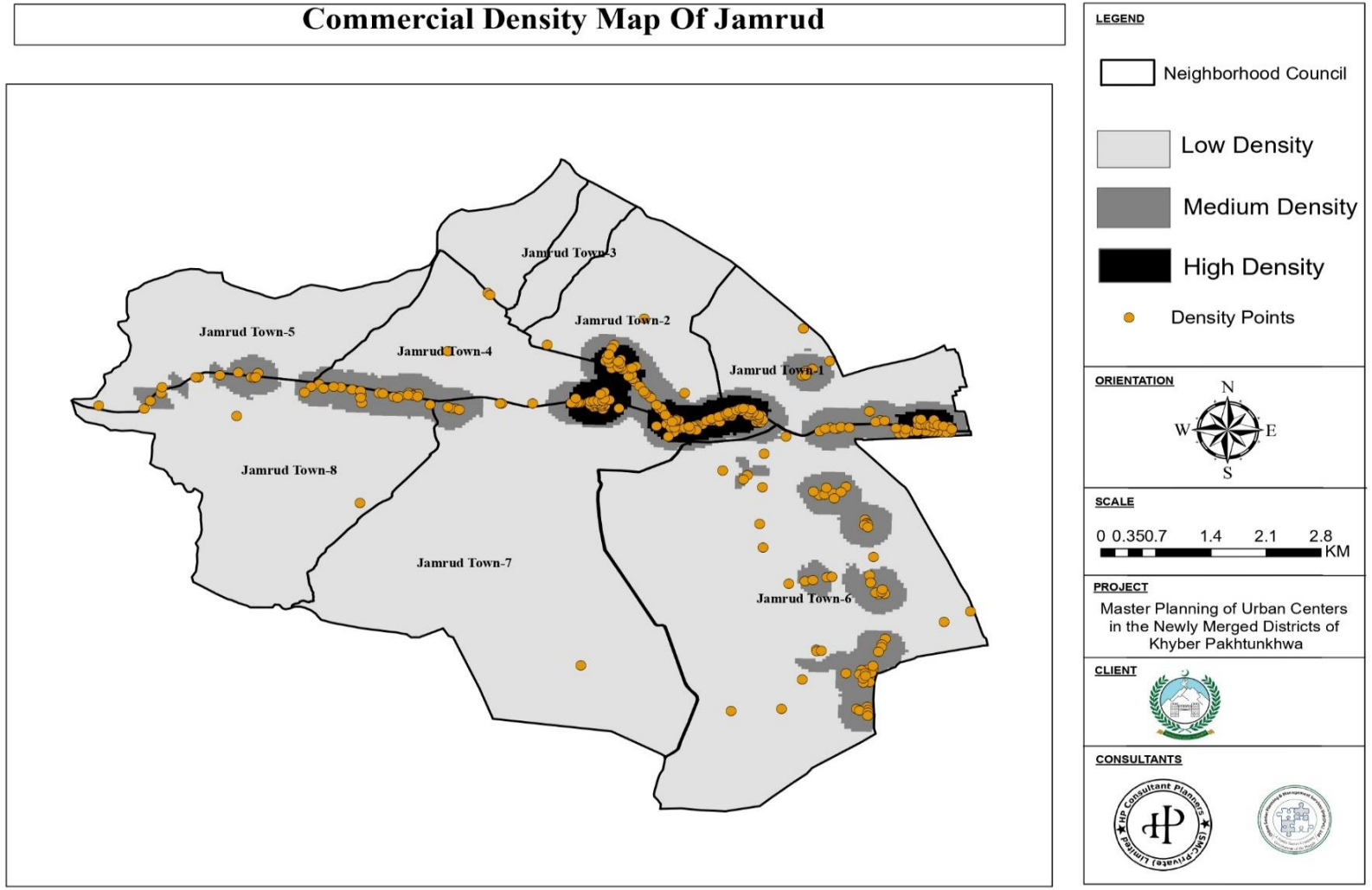
Haphazard commercialization results in acute parking problems, traffic congestion and adverse environmental impacts in the historical core & neighboring residential areas around commercial activities. To address this, it is recommended to formulate a strategy to meet the demand for commercial uses with minimal impact on the environment and quality of residential areas.

In addition, the commercialization strategy must ensure that no unplanned commercial areas are encouraged to emerge and flourish. For effective implementation, the strengthening of planning agencies in terms of trained staff and resources is required.

Commercialization along roads declared for this purpose should only be allowed if proponents meet the necessary parking demands and the provisions to manage the increased traffic load.

6.2.3. City Strategy

The provincial government and its line departments in the area should support the commercial activities of Jamrud and develop town-specific interventions (town centre) for each of its eight neighbourhood councils. The Jamrud Town-1, Jamrud Town2 & Jamrud Town-4 have the highest density and have seen the highest growth over the last decade. Below map shows the commercial density of the study area.



Map 18: Commercial Density of Jamrud Urban Area

Source: The Urban Unit

Some of the strategies to be followed in the study area are mentioned in the table below:

Table 6-13: Strategies to be Proposed in each Town of the Jamrud

Town	Strategies	Justification
Jamrud NC bazaars	Will function as sub commercial areas to share the burden of Main Bazaar in Jamrud in terms of retail commercial activities while servicing nearby commercial facilities.	Right now, the main bazaar along the road corridor has ribbon development with higher commercial density. It is focal for commercial activity that is spread across all Jamrud. Small commercial markets can be made in these areas to promote polycentric development for daily access shops i.e., retail shops. Neighborhood level commercial markets offer convenience, economic support, a sense of community and the preservation of local character. Their role goes beyond being mere retail outlets; they play an essential part in shaping the fabric of a community and enhancing the quality of life for its residents.
In all major arteries leading to Jamrud TC	Developing public transport infrastructure, while making public spaces walkable to reduce reliance on private vehicles.	Efficient public transport system is basis for any urban centric development. It enables easy accessibility to market for all. This also allows for controlling of emissions, resulting in better air quality, and making the study area environmentally friendly for the residents. This shall also result in free flow of labour improving economic opportunities for all.
Commercial Areas of all NC	Implementing strict regulations and rules for sustainable commercial development, while creating awareness and support environment to ensure such practices	Increased housing demand in the area means that the commercial density is likely to increase in the future and as such following policies like mixed-used development and vertical commercial development are sustainable. There is a

Town	Strategies	Justification
		need for designing, constructing, and operating commercial properties in a way that minimizes negative environmental impacts, promotes economic prosperity, and enhances social well-being. It involves considering the long-term implications of development decisions on the environment, society, and the economy. Following policies may be implemented based on relative density of the area: - **In high-density areas**, proposal is to implement green building technologies, renewable energy sources, and efficient waste management systems, sustainable developments contribute to the preservation of natural resources and ecosystems. - **In medium and low-density areas**, proposal is to implement features like green spaces, pedestrian-friendly designs, and access to public transportation can promote well-being, encourage physical activity, and create vibrant, walkable communities. Additionally, sustainable developments often prioritize local sourcing, supporting the surrounding economy. - **In greenfield development**, proposal is to implement resilient building design, such as natural hazards resistant structures and green infrastructure, helps businesses adapt to changing

Town	Strategies	Justification
		environmental conditions, minimizing disruption and economic losses.
In all commercial areas	Setting the direction of new commercial area growth in line with that of residential growth	These areas are where there is growth in residential built up. There is need to ensure development of commercial areas in line with the NRM standards. Neighborhood level commercial markets are promoted to ensure easy access for people. These offer convenience, economic support, a sense of community and the preservation of local character. Their role goes beyond being mere retail outlets; they play an essential part in shaping the fabric of a community and enhancing the quality of life for its residents.
Major Jamrud NCs Bazaars	Conducting regular traffic studies and implementing traffic management measures to prevent congestion and improve safety in commercial areas.	Congestion can lead to reduced accessibility for businesses and customers. Traffic studies help identify congestion hotspots, bottlenecks, and peak traffic hours in commercial areas. By understanding where and when congestion occurs, planning can implement targeted measures to alleviate traffic jams. This not only improves the flow of vehicles but also reduces travel times for commuters and customers, enhancing overall efficiency of the area. This can positively impact the local economy by encouraging commerce and promoting the success of local businesses. Implementing traffic management measures such as traffic signals, pedestrian crosswalks, speed limit

Town	Strategies	Justification
		adjustments, and improved signage can greatly enhance safety for everyone. This is especially crucial in commercial areas where a high volume of pedestrians and vehicles interact. By addressing congestion through traffic management measures, the city can encourage more people to visit, shop, and dine in these areas, boosting economic activity. This proactive approach ensures that the city's transportation system can accommodate current and future demands.
CBD Jamrud	Tax schemes to incentivize establishment of new commercial areas in the study area	Any municipal taxation in future can be delayed for implementation in relation to area to be designated as central commercial / business district. This shall ensure organized development of commercial activity.
Jamrud Town 1 and Town 5	Incentivizing vertical building design, especially in high density areas to decrease congestion and accommodate density.	Densely populated areas can move to vertical development model with higher FAR to ensure efficient use of land and resources. Promoting vertical development in a small city involves strategies and tools that focus on increasing density, improving infrastructure, and enhancing sustainability. Vertical development can be promoted through creating mixed-use zoning districts that allow for a combination of residential, commercial, and recreational spaces in the same area. Setting height limits and floor area ratios that incentivize developers to build upwards rather than outwards.

Town	Strategies	Justification
		Developing urban design guidelines that emphasize vertical development by encouraging architects and developers to create aesthetically pleasing and functional high-rise buildings that fit within the city's character and promote walkability. Guidelines can cover aspects like setbacks, façade design, green spaces, and public amenities.

In addition to the above, the following strategies and practices must be adopted to allow for sustainable commercial development in all areas of Jamrud:

- Providing incentives and support for businesses to locate in designated commercial centres, such as tax breaks and grants for building improvements. (CBD Tax incentives)
- Strengthening planning agencies and increasing their capacity to effectively regulate and manage commercial development.
    - Strengthening of local government and provision of trained staff and resources to pursue and implement sustainable development plans.
- Educating businesses and the public about the importance of sustainable and planned commercial development.
    - Encouraging sustainable expansion of commercial areas while preventing haphazard development.
    - Providing adequate parking spaces and managing increased traffic load.
    - Mandating vertical expansion of commercial areas to make efficient use of land.
    - Encouraging the use of environmentally friendly technologies and practices in commercial development.
    - Promoting mixed-use development to integrate commercial and residential areas.

6.2.4. Criteria for Declaring Roads as Economic/ Mixed Use Corridor

Economic corridors are meant to attract investments and generate economic activities in contiguous regions. Notably, the existence of an efficient transportation system plays an essential role in realizing this. Corridors are also critical components of property and sales tax revenue generation for local jurisdictions. Their success has a direct correlation with the success of municipalities as they can lead to promoting economic development in the nearby municipalities. Jamrud is close to the Peshawar and has significant potential to contribute to the national economy. Therefore, the economic corridor has been proposed based on the following Parameters.

- **Prime Location of Jamrud**

Jamrud is located at a prime location. It borders with the Peshawar district on the East, Yake Ghund tehsil of Momand District on the North, Landi Kotal tehsil on the West and Bara tehsil on the South. Jamrud shares a boundary with Peshawar on the main Grand Trunk Road N-5 towards the western border of Pakistan connecting the country with Central Asia through the famous Khyber Pass. Most of Pakistan's trade with Afghanistan and other Central Asian countries is carried out via this route. The National Highway (N5) is Pakistan's longest highway running from Karachi to Torkham Border. The total length of N-5 that goes through the urban area of Jamrud is 10.1 km. This geographical location invites regional network integration, which can be boosted through an economic corridor. Pertinently, this location can prove to be a suitable route for trade entailing the exchange of goods and services in the region. Ultimately, this will support the business ventures in Jamrud and subsequently, will lead to enhancing people's well-being, promoting domestic peace, and improving regional economy.

- **Corridor Parallel to Jamrud Southern Bypass**

Economic Corridor has been proposed parallel to Jamrud Southern Bypass and it starts from Frontier Road while crossing Shah Kaas Road as well as Doctor Sarfaraz Khan Road and ends in Jamrud Town-8. Its strategic location promotes economic development as it offers high visibility and accessibility, making it attractive to businesses and consumers.

6.2.5. Rationale for Future Commercial Development in Jamrud

The suitability of different land use parcels is based on different layers/ parameters which are discussed below.

- **Proximity to Primary Roads**

Economic development often follows major transportation arteries as these areas offer high visibility and accessibility, making them attractive to businesses and consumers. The presence of transportation infrastructure such as roads, highways, and public transit increases the mobility of people and goods, which can stimulate economic growth and development.

- **Proximity to Secondary Roads**

Commercial areas along secondary roads are more affordable for small business development as the land is cheaper. Moreover, secondary roads being located in established neighborhoods provide businesses with opportunities to tap into existing communities and local customer bases.

- **Proximity to Existing Commercial Land**

Proximity to existing commercial land can provide new commercial areas several advantages including market synergies, increased visibility, reduced competition, and eased development, which can help support economic growth and development.

- **Lands proximal to industrial areas**

Proximity to industrial areas play a significant role in commercial area as their location can give businesses access to goods and services, a large pool of skilled labor, and major transportation arteries. Additionally, the presence of industrial activities in the area can generate increased demand for goods and services, creating synergies between commercial and industrial activities.

- **Lands proximal to residential areas**

Proximity to residential areas is crucial for commercial area development as it offers access to a customer base and supports local economic growth. Nearby residential areas provide a steady flow of customers, as well as opportunities for businesses to cater to local needs. Additionally, proximity can lead to the creation of walkable communities with easy access to goods, services, and employment.

- **Lands proximal to major transit points (bus stands, railway station, shopping malls etc.)**

Proximity to transit points is beneficial for commercial area development as it offers businesses access to a larger customer base and improved transportation options. It also helps increase foot traffic and drive business growth. Additionally, transit-oriented development can encourage the creation of compact, walkable communities that support sustainable transportation and reduce dependence on personal vehicles.

- **Lands proximal to existing municipal infrastructure services**

Proximity to municipal services is important as it provides businesses with access to essential infrastructure and services that support their operations. Access to municipal services such as water and sewer systems, waste management facilities, and emergency services help reduce costs and improve operational efficiency. Additionally, proximity to municipal services provide businesses with access to local government resources and support.

6.2.6. Future development plans and key actions

In the case of Jamrud, the focus of future planning is on addressing the challenges of haphazard commercialization and promoting sustainable and planned commercial development. This can be achieved through a combination of regulatory measures, incentives, and support for businesses, as well as investments in infrastructure and other resources.

In the short term, implementing measures to regulate and manage commercial development in Jamrud should be prioritized. This includes strengthening planning agencies, developing and enforcing regulations and standards for commercial development, and providing incentives and support for businesses to locate in designated commercial centers. Additionally, traffic management measures should be implemented to address congestion and improve safety in commercial areas.

In the medium term, the focus should be on promoting sustainable and planned commercial development in Jamrud. This can include encouraging the use of environmentally friendly technologies and practices in commercial development, promoting mixed-use development to integrate commercial and residential areas, and investing in public transport infrastructure to reduce reliance on private vehicles. Regular assessments and evaluations of commercial development should be conducted to ensure compliance with regulations and address any issues.

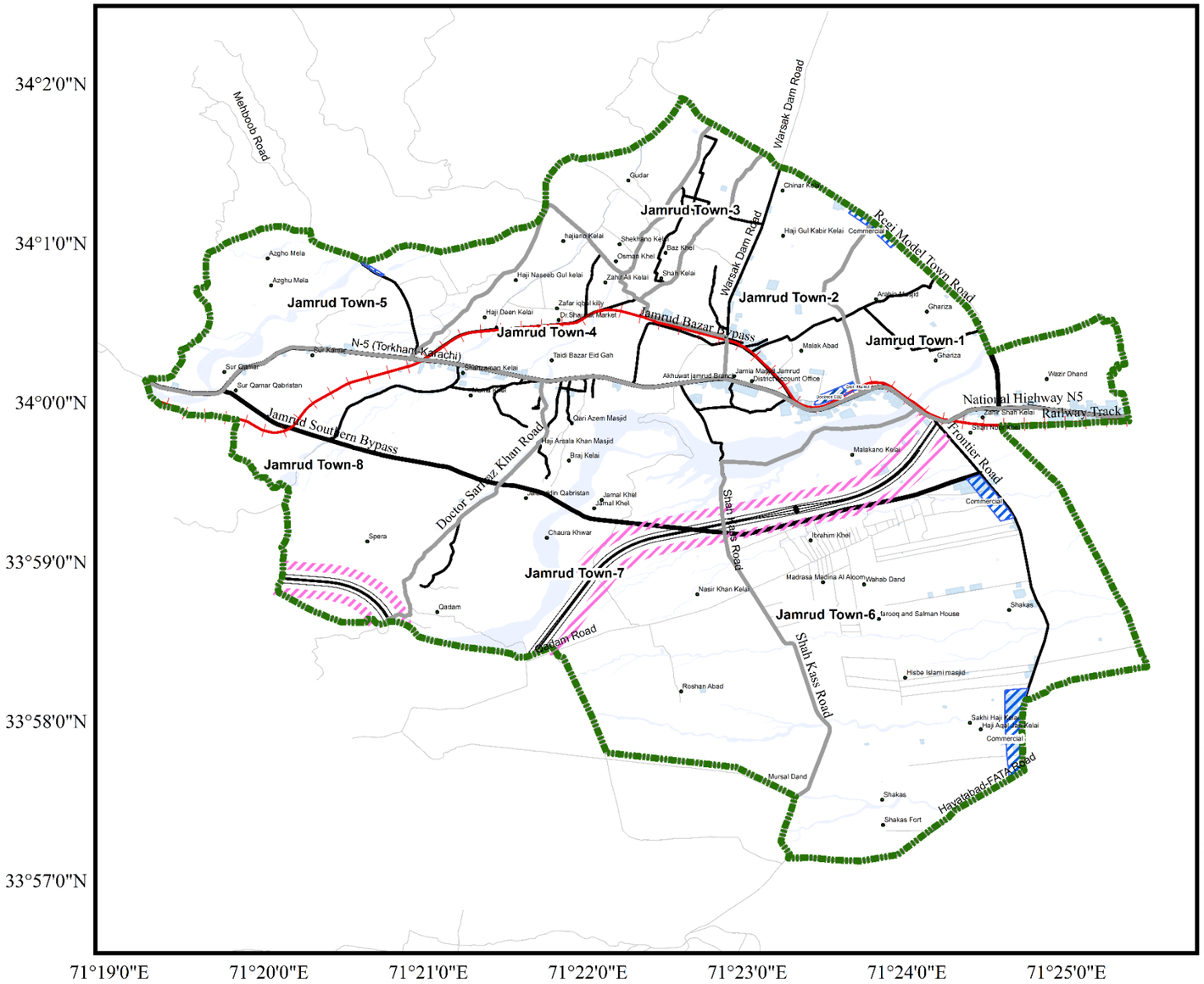
The long-term goal should be to create a sustainable and vibrant commercial environment in Jamrud. This includes implementing a comprehensive zoning plan that

clearly defines and separates commercial, residential, and industrial areas, and promotes the growth and development of commercial centers in Jamrud.

Investments in infrastructure, such as roads and public transportation, should be prioritized to support the growth of the commercial sector. Regular assessments and evaluations should continue to be conducted to ensure that the city's commercial development is meeting the needs of the community and supporting economic growth.

Map below illustrates the proposed commercial areas and grain market (0.01 sq.km) based on the suitability analysis and the organic commercial growth in the study area over time.

Jamrud Proposed Commercial Zones



Map 19: Proposed Commercial Zones

Source: The Urban Unit

6.2.7. Short Term Plan (2020-2025)

- **New Central Business District**

Based on the existing trend observed in Jamrud where the commercial development organically occurs around major commercial arteries, area along National Highway-5 should be designated as a New Central Business District as it connects to Peshawar and have the demand of the study area. It will help to increase exposure and drive more customers to businesses. Additionally, proximity to primary roads can improve access for customers and employees, making it easier to reach businesses and reducing travel times. Improved access can also attract businesses and investment to the area, supporting economic growth and development.

6.2.8. Medium- & Long-Term Plan (2022-2040)

- **Urban Area Development Authority**

Although the Tehsil administration is already in place, the urban area has been recently delineated and merged districts have become a part of the provincial government's jurisdiction. Therefore, formation of Urban Areas Development Authority Kurram under the Khyber Pakhtunkhwa Urban Areas Development Authorities Act, 2020 is eminent. The Authority must be responsible for the overall urban area with sole jurisdiction.

- **Formation of Economic Corridor**

Jamrud has a major trade route connecting Afghanistan with Pakistan through Torkham road. Due to the significance of the trade route economic corridor is proposed parallel to Jamrud Southern Bypass Road (starting from Frontier Road while crossing Shah Kaas Road and Doctor Sarfaraz Khan Road) to boost the commercial activities in the Jamrud. It can help increase exposure and drive more customers to businesses. Additionally, proximity to primary roads can improve access for customers and employees, making it easier to reach businesses and reducing travel times. Improved access can also attract businesses and investment to the area, supporting economic growth and development.

- **Formation of New Areas in Jamrud Town 2 & Jamrud Town 6 as Commercial Zones,**

New commercial areas have been proposed in Jamrud based on the existing commercial demands. Jamrud Town 2 & 6 commercial area will act as the commercial

market that will serve as the forward linkages for the industrial area proposed in Jamrud Town 2 & 6, and the new residential proposed in the same NC. This will also host activities for the warehousing and forward and backward linkages for Pak-Afghan trade through the study area.

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The following guidelines for commercial areas are provided in Table 6-14:

Table 6-14: Commercial Zone Development Guidelines

Permitted Uses	**Allied Permissible Uses**	**Prohibited Uses**
Commercial buildings, Large Markets, departmental stores and Outlets, Large Public Squares and Parks Bakery or confectionary, Clinic or polyclinic, Courier service or logistics office, Private telephone exchange or cable operation or mobile franchise offices, Park,	Pedestrian friendly streetscape, Mixed- use buildings, Technical and vocational institution, Seasonal commercial fare site, Stadium; amusement park / play land, Bus terminal, Fuel Stations, Wholesale market, Second hand goods market, Coal, wood or Timber yard.	Dwellings except those of service apartment, essential operational, watch and ward personnel, Heavy, extensive, noxious, obnoxious, hazardous and extractive industrial units, Hospitals/research laboratories treating contagious diseases, Poultry farms/dairy farms, Slaughter-houses, Sewage treatment/disposal sites, Agricultural uses, Storage of perishable and inflammable commodities,

Memorial and monument, Hotel or motel, Car showroom, Boutique or garment outlets or beauty parlour, Restaurant, Social welfare institutions such as community centre, art gallery and museum, Parking plaza or Parking site.		Quarrying of gravel, sand, clay and stone, Zoological garden, botanical garden, Bird sanctuary, Forensic science laboratory and all other activities which may cause nuisance and are noxious and obnoxious in nature.

Source: Urban Unit and HP Consultants

In conclusion, effective land use planning and the development of a comprehensive master plan for commercial and trade activities are crucial for the sustainable and prosperous growth of Jamrud region. By implementing zoning regulations, formulating sub-commercial areas, and providing incentives for businesses to locate in designated commercial centers, the local government can encourage sustainable and planned commercial development.

This Master Plan with its economic development strategy will help prevent haphazard commercialization and its negative impacts on the urban structure and environment. Additionally, institutional development and the creation of a data-driven ecosystem for the management and steering of commercial growth is crucial for Jamrud to capitalize on its strategic location and growing trade linkages with rest of the district and other neighboring districts.

6.3. Industrial Zone

Industrial zones are proposed with consideration to the locational requirements. The terrain is relatively flat and highly accessible by main roads, such as Regi Model Town Road and Frontier Road etc. Furthermore, the proposed industrial zones are segregated from the existing and proposed residential areas with an appropriate distance as per the standards.

The proposals are made in light of the aforementioned strategies of institutionalization, economic development, environmental conservation and sustainable infrastructure. The proposed industrial zones will have several positive impacts on economic growth, reduced environmental impact, improved public health, and increased social responsibility and innovation.

Owning to its proximity to the border, the industrial products-related needs can be met through industry present in Peshawar through goods from Afghanistan under the Afghanistan Transit Trade. Heavy, medium and light industries can be categorized based on indicators such as capital investment, labor requirements and level of mechanization used in a particular industry. The categorization may be as described as per the table below. [8]

Table 6-15: Criteria and Enterprise Categories for Industries

Enterprise Category	Criteria (Annual Sales Turnover)
Small Enterprise (SE)	Up to PKR 150 Million
Medium Enterprise (ME)	Above PKR 150 Million to PKR 800 Million
Start-up	A small enterprise or medium enterprise up to 5 years old will be considered as Startup SE or Start-up ME

Source: SMEDA

The next table defines the area required for Industrial cluster, Small Industrial Estate, Large Industrial Estate, SEZ and Regional I.E. According to SEZ Act of Pakistan.

Table 6-16: Required Area for Industry

Name	Industrial Cluster	Small I. E.	Large I. E
Area Required	2 Acre	50 Acre	100 Acre

Source: SMEDA

This criterion is applied for development of economic zones in this region. Following calculations are done for the master plan proposals of industrial area in Jamrud:

Table 6-17: Industrial Zone Requirements

Existing area (in sq. km.)	**0.35**
Existing area (in %)	0.73%
NRM Standards	3%-8%
Recommended industrial area – min (sq. km)	1.45
Recommended industrial area – max (sq. km)	3.85
Required (Recommended (min) – Existing Land Use)	1.10
Required (Recommended (max) – Existing Land Use)	3.50
Proposed area 2040 (in sq. km.)	1.1

Source: Urban Unit and HP Consultants

6.3.1. Rationale for Industrial Area

According to the National Reference Manual (NRM), the following parameters are of primary importance for industrial planning in Jamrud urban area.

a) Location

- The industrial zone should be located on flat land to allow large plots and buildings with large spans.
- An area having no substantial natural vegetation.
- Industries should on the downside of existing or proposed residential areas for the wind.

b) Accessibility

- The industrial zone should be located close to the primary and secondary roads.
- It should be at a distance of 220 feet (67 meters) from the middle of the highway.

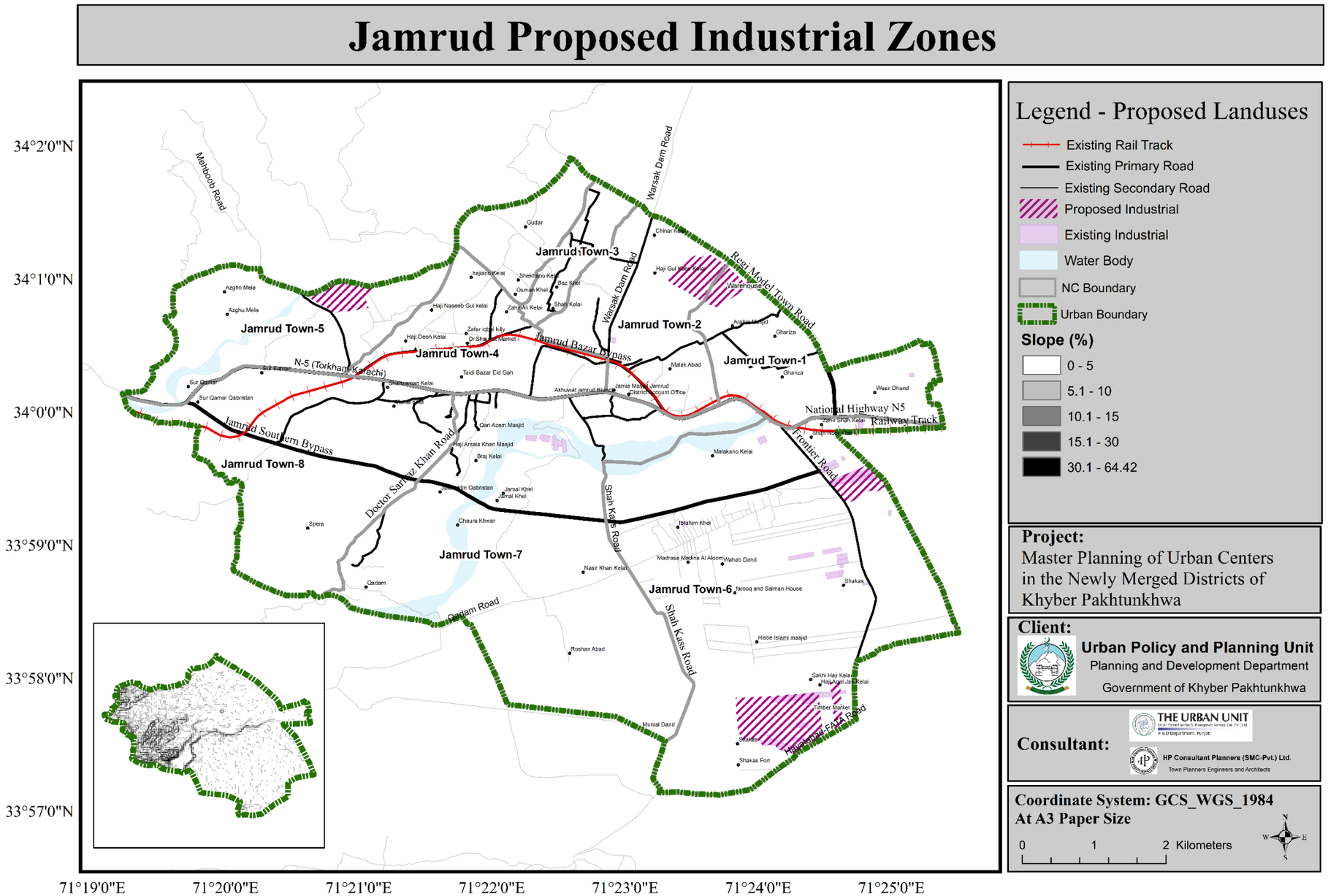
c) Segregation

- The industrial estate should be separated from the existing and proposed residential area by at least 150 meters (medium size units of light industry and warehouse) or at least 500 meters (large units of light and general industry).

According to the land use survey, open spaces contribute to almost 43.63% of the urban area of Jamrud. This implies reasonable opportunity for establishing an industrial zone as per the above noted criteria.

6.3.2. Industrial Planning

Given that the existing industrial development in the area has been unplanned and is concentrated at the center of the study area where all the urban development is occurring, a large industrial zone has been proposed in the Jamrud Town 2,5 & 6. These locations have been determined based on international best practices, the NRM Guidelines, and the local context. Timber market having an area 0.09 sq.km and warehouse having an area 0.01 sq.km are also proposed near Regi Model Town Road and Frontier Road respectively.



Map 20: Proposed Industrial Zones

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for industrial areas are below:

Table 6-18: Industrial Area Development Guidelines

Permitted Uses	**Allied Permissible Uses**	**Prohibited Uses**
Small and Medium Scale Industries Processing Units Manufacturing Activities Warehouses storage or Go-down; Workshops Cold storage and Ice factory Petro chemicals, petroleum and gas products Loading and unloading space; Parking lot Industrial park or estate Police station, fire station and post office;	Showrooms Mixed- used buildings Residence for workers Fuel stations and Oil depot; Restaurant; Hospital; Auto workshop, service garage and service station;	Private residential housing schemes Large health, recreational commercial and educational institutions The land use for storing, packing, pursing, cleaning, preparing, and manufacturing of blushing power, ammunition, fireworks, gun powder, Sutphin, mercury, gases, nitro-compounds, phosphorous, 'dynamite, explosives, bombs or any other obnoxious hazardous material shall not be permissible In a declared industrial area.

bank or automated teller machine (ATM); Industrial research institute; Treatment or recycling plant; Grid station; Vocational training institute		

Source: Urban Unit and HP Consultants

6.4. Educational Facilities

Educational facilities have been proposed as part of the institutionalization and economic development strategies described in this master plan. The proposed facilities will have several positive impacts on literacy rates and subsequent economic and social development.

6.4.1. Rationale for Proposed Educational Facilities

Demography, connectivity and environmental factors are major contributors in spatial policy making, especially for matters concerning optimal locations for the provision of public services to ensure service accessibility and making its coverage more efficient and equitable. For the establishment of new schools: flood zone proximity, earthquake zone proximity, air and water quality and influential factors.

6.4.1.1. Locational Criteria

A study on educational facilities' guidelines in Saudi Arabia revealed that a Primary or Elementary school should serve a neighborhood of 3,600 residents, with a service buffer zone of 500 meters. In addition, it suggested an elementary school should be 500 meters away from another elementary school; 150 meters from the closest highway or main road; 75 meters from the nearest road intersection or gas station; 150 meters from power transmission lines and 500 meters from any power transmission plant; 150 m from factories and warehouses; 100 meters from water catchment areas; and the land slope must be less than 18% .

Transport and connectivity are another key factor impacting student participation rates in formal education. The findings of a study conducted by Canadian Department of

Public Policy showed that distance to school may act as a deterrent to attending by virtue of relocation costs, especially if the student is from a low-income family. Moreover, increased distance to an educational facility from an individual's residence is associated with an access gap, leading to low student attendance accompanied with a high likelihood of dropping out 10. Another study highlighted individuals residing more than 8 kilometers from an academic institution are 27 percent less likely to participate in post-compulsory education, compared to those who live less than 2 kilometers away.

6.4.1.2. Population and Demographics

Population density is another key determinant in the establishment of new facilities as it is directly proportional to accessibility; Areas with a lower population density of school-age population have lower access while areas with a higher density of school-age population have higher access.

It is also noted that gender disparity in education in Jamrud is high, particularly at the higher education and secondary level. In case of district Khyber, literacy rates of 41.97% – 65.08% for males and 18.10% for females[4].

Table below shows all the population groups of age 10 and above by literacy, and sex. It implies that around 88% and 12 % of male and female population have an education level of matric respectively.

Table 6-19: Education level in Jamrud

Level	Male	Female	Transgender
Below primary	58%	43%	0%
Primary	68%	32%	0%
Middle	84%	16%	-
Matric	88%	12%	0%
Intermediate	89%	11%	0%
Graduate	88%	12%	-
Master and above	94%	6%	-
Diploma	83%	17%	-
Others	23%	77%	-

Source: Household Information Survey, 2021

4 https://en.wikipedia.org/wiki/Khyber_District#:~:text=Khyber%20district%20had%20a%20sex,%25)%20lived%20in%20urban%20areas.

Table 6-20: Education Level in the Urban area of Jamrud

Level	Male	Female	Transgender
Below primary	52%	48%	-
Primary	59%	41%	-
Middle	72%	28%	-
Matric	81%	19%	-
Intermediate	83%	17%	-
Graduate	82%	18%	-
Master and above	91%	9%	-
Diploma	84%	16%	-
Others	43%	57%	-

Source: Household Information Survey, 2021

Table 6-21: Government Education Institutes in Urban Center of Jamrud

Schools	Boys	Girls
Primary	111	84
Middle	16	17
Higher	10	5
Higher Secondary	2	-

Source: Household Information Survey, 2021

Table 6-22: Town-Wise Number of Primary Schools and Gender Split

S.no	Neighborhood councils	Boys	Girls	Total	Population estimates 2022	Population per school
1	Town 1	2	4	6	12939	2156
2	Town 2	2	4	6	9056	1509
3	Town 3	3	1	4	5850	1462
4	Town 4	2	4	6	10713	1785
5	Town 5	5	7	12	12818	1068
6	Town 6	7	10	17	8148	479
7	Town 7	12	10	22	9062	411
8	Town 8	2	1	3	7901	2633
Total		35	41	76	76487	1006

Source: Land Use Survey, 2021

As per Table 6-21 and Table 6-22, the urban center of Jamrud is well served in terms of educational facilities. However, at least 7 middle schools, 4 high schools and higher secondary schools will be required and need to be established by the end of 2040, as the population is expected to increase.

6.4.1.3. NRM Standards for Educational Facilities

The area required for different level of educational facilities with respect to population and the NRM guideline are provided in Table 6-23:

Table 6-23: NRM Standards for Educational Facilities

Population (2017)	Projected Population (2040)	School level	Criteria for 1 school @ per Population[5]	Criteria for Required area @ per School[6] (Hectares)	Schools required by 2040	Required area in Hectare
63,728	146,506	**Primary**	7500	1	20	20
		Middle	3900	1.5	38	57
		High	23000	2.1	6	13
		Higher Secondary	30000	5	5	25

Source: National Reference Manual, 1985

Table 6-24: NRM Standards-Based Criteria for Educational Facilities

Level of Educational Facility	Types	Population Served	Required Area Per School (Hectare)
Primary	Boys Urban	7,500	1
	Girls Urban	8,200	
	Boys Rural	7,500	
	Girls Rural	10,200	
Middle	Boys Urban	3,900	1.5
	Girls Urban	15,000	
	Boys Rural	3,900	
	Girls Rural	17,000	
High	Boys Urban	23,000	2.1
	Girls Urban	30,000	

[5] National Reference Manual on Planning & Infrastructure Standards, Chapter 6,
[6] National Reference Manual on Planning & Infrastructure Standards, Chapter 6,

	Boys Rural	27,000	
	Girls Rural	31,000	
Colleges	Male Rural	200,000	8
	Male Urban	400,00	
	Female Rural	250,000	5
	Female Urban	750,000	

Source: National Reference Manual, 1985

6.4.2. Middle schools (Current status and proposed)

There are 8 Government Middle school, 2 for boys and 6 for girls in the urban center of Jamrud. The allocational criteria recommended by NRM is that a boy's Middle school should serve a population of 3,900 people whereas a girl's middle should serve a population of 17,000 people. This indicates a deficiency of at least 6-8 middle schools. Thus, 6-8 more schools will be required to meet the needs of 2040.

Table 6-25: Town-Wise Number of Middle Schools and Gender Split

S.no	Neighborhood councils	Boys	Girls	Total	Pop estimates 2022	Pop per school
1	Town 1	-	1	1	12939	12939
2	Town 2	-	1	1	9056	9056
3	Town 3	-	-	0	5850	-
4	Town 4	-	-	0	10713	-
5	Town 5	-	2	2	12818	6409
6	Town 6	1	-	1	8148	8148
7	Town 7	1	1	2	9062	4531
8	Town 8	-	1	1	7901	7901
	Total	2	6	8	76487	9560

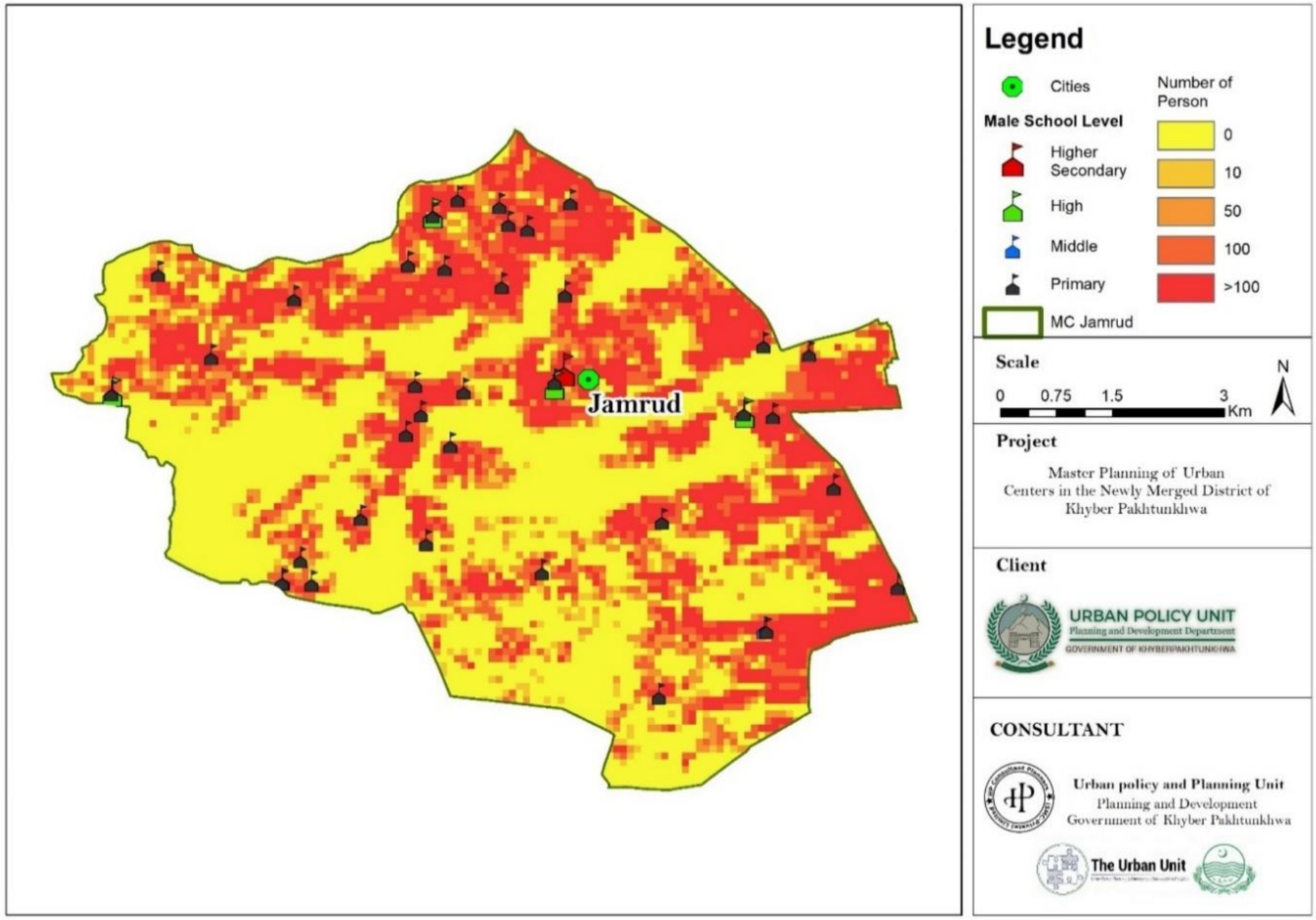
Source: National Reference Manual, 1985

6.4.3. High schools and Higher secondary schools (Current status and proposed)

There is a total of eight high schools in Jamrud, of which five are for males and three are for females. There is only one Higher secondary school operating in the urban center of Jamrud. The National Reference Manual recommends a 3-4 sections High School (Classes V-X) for a population of 23,000 in case of boys, and 31,000 in case of girls. These statistics imply that the number of high schools are sufficient for the current period. However, by 2040, at least one high and one higher secondary school

and one higher secondary school would be required for both males and females to meet the standards.

It should be noted that the standards set by the NRM during the 1980s are not compulsory to follow in current conditions and the educational needs can be updated through consultation with representatives of all sectors.



Map 21: Spatial Analysis of Educational Facilities in Jamrud

6.4.4. Technical and vocational centers for skills development

A detailed inventory of technical and vocational institutes is not available for Jamrud urban center. However, as per the record of the local population, few yet inadequate technical and vocational centers are available.

It is therefore proposed that technical and vocational centers for skills development be established in each NC by the end of 2040. In addition to global best practices, the following table highlights NRM guidelines for optimal site location for the establishment of new facilities.

Table 6-26: Rationale for Educational Institutions based on NRM Standards

Sr. No	Educational Institutions	Locational Guidelines
1	**Primary School**	▪ Near to existing and planned housing schemes areas in which they will be serving. ▪ Located at walking distance from the houses. ▪ Commonly situated centrally in a residential area and away from the busy roads. ▪ Catchment area for urban schools 0.5-1km. ▪ Catchment area for rural schools 2.2kms.
2	**Secondary School**	▪ Must have easy and good vehicular availability and safe walking access. ▪ Away from schools of opposite gender. ▪ Far away from the main busy roads which carrying fast and heavy traffic. ▪ Must situated on roads with favorable linkages to their catchment area. ▪ Catchment area for urban schools 1.25-2.45km. ▪ Catchment area for rural schools 5-10km.
3	**Intermediate Colleges**	▪ Catchment area for urban school boys 2.75-4km. ▪ Catchment area for rural school boys 10-15km. ▪ Catchment area for urban school girls 3.25-5km.
4	**Degree College**	Large city.
5	**University**	Metropolitan city area.

Source: National Reference Manual, 1985

University having an area 24.7 acre is proposed along the national highway 5. It will serve the population of Jamrud and nearby areas. As the society is moving towards global dynamics, diversified fields of education will be a prerequisite. It could include upcoming need of the job market like; engineering, business, management, finance, media, IT and software, artificial intelligence, robotics etc.

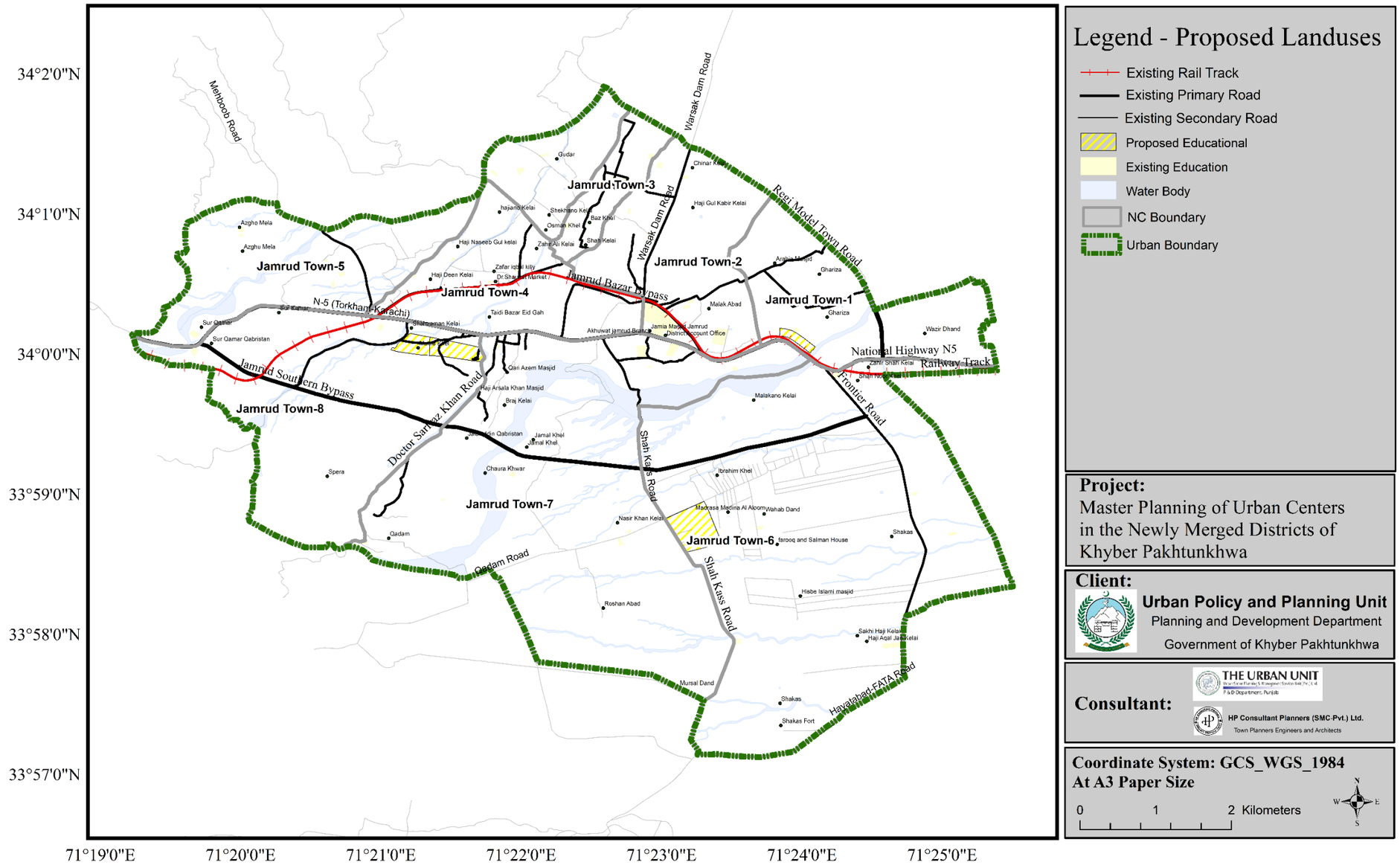
6.4.5. Proposed Educational Sites

Based on the international best practices, NRM guidelines, and population growth trajectory in Jamrud, sites for additional schools have been identified. The following criteria have been used for site proposals:

- Based on the current need and areas, zones for educational sites have been recommended in those particular localities where the population is currently unserved.
- The future population projection for the year 2040 was the main determinant in site identification. In zones that hasving a population exceeding 3,000 people, a primary school is recommended, while zones with an aggregate population exceeding 20,000 have been marked suitable for establishing Elementary and Secondary [High and Higher Secondary] schools.
- Furthermore, it is ensured that educational zones, based on the future need, are proposed in residential sites – both current and future sites.

Three education zones have been proposed to fulfil the present and future need of the study area. The proposed zones are located along the Shah Kass Road, National Highway-5 and Dr. Sarfraz Khan Road. Below map show the location of proposed education zones in Jamrud.

Jamrud Proposed Educational Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Proposed Educational
- Existing Education
- Water Body
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 1 2 Kilometers

Map 22: Proposed Educational Zones

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for educational facilities are below:

Table 6-24: Educational Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Large Scale educational areas General education universities Scientific research institutes IT and Media institutes City Level libraries, book banks, data and information centres	Staff residences (teaching and non-teaching) Separate hostels for Boys and Girls Auditoriums, seminar halls, workshop spaces, Community facilities (Parks, Playgrounds, clinics, schools and neighbourhood commercial)	Large scale commercial, industrial activities Large scale Slaughterhouses, Large scale Workshop for servicing and repairs.

Source: Urban Unit and HP Consultants

6.5. Health Facilities

Accessible, equitable, and quality healthcare for all people is the vision of the Khyber Pakhtunkhwa government. However, few health facilities are currently available in the urban centers of Jamrud which do not fulfill the health requirement of the people.

Issue No. 1: Access to Health Facilities

Table 6-28 shows the total number of health facilities currently available in the urban center of Jamrud. Give that the current population of the urban center according to the Census 2017 is 63,728, a total of four health facilities is insufficient to serve the urban population.

Table 6-25: Town-wise Number of Health Facilities in Jamrud City

Sr. No	Neighborhood Council	CHC	CD	Hospital	MCHC
1	Town 1	-	-	-	-
2	Town 2	-		-	-
3	Town 3	-	-	-	-
4	Town 4	-	-	-	-
5	Town 5	-	-	-	-
6	Town 6	-	-	-	-
7	Town 7	1	1	1	1
8	Town 8	-	-	-	-
	Total	1	1	1	1

Source: KP Tribal Districts Health Facilities Registry

The accessibility of health facilities, based on the household survey data findings, is shown below:

Table 6-26: Distance to the nearest Health facilities

Distance from the nearest HF	Town 1	Town 2	Town 3	Town 4	Town 5	Town 6	Town 7	Town 8
Less than 1Km	22.5 %	6.3%	-	21.7 %	-	5.3%	22.9 %	4.2%
1-2 Km	2.5%	33.3 %	-	26.1 %	-	47.4 %	57.1 %	62.5%
2-3 Km	27.5 %	36.5 %	-	34.8 %	18.2 %	10.5 %	8.6%	29.2%

3-4 Km	15.0 %	3.2%	-	13.0 %	36.4 %	10.5 %	5.7%	4.2%
4-5 Km	20.0 %	1.6%	16.7 %	-	9.1%	-	5.7%	-
More than 5Km	12.5 %	19.0 %	83.3 %	4.3%	36.4 %	26.3 %	-	-
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: HH Survey Conducted by the Consultant (The Urban Unit & HP Consulting)

The household Survey Conducted revealed that Health facilities available in Jamrud include HU, CHC'S, DHQ, a few small hospitals, and private clinics. Above 30% of the total sample population confirmed that health facilities are available in the range of 2-3 km from their homes.

Table 6-27: Cost per Visit to Health Facility

Cost per Visit	Percentage
Less than Rs. 100	18.18%
Rs. 100-500	63.64%
Rs. 501-1000	18.18%
Grand Total	**100.00%**

Source: HH Survey Conducted by the Consultant (The Urban Unit & HP Consulting)

The analysis of the household survey shows that 18.18% of the respondents spend less than 100 rupees on transport mode per visit to travel from home to the health facility. Approximately 63.64% of the respondents confirmed that they spend 100-500 rupees per visit while 18.18% of the respondents reported the amount in the range of 500-1000 rupees.

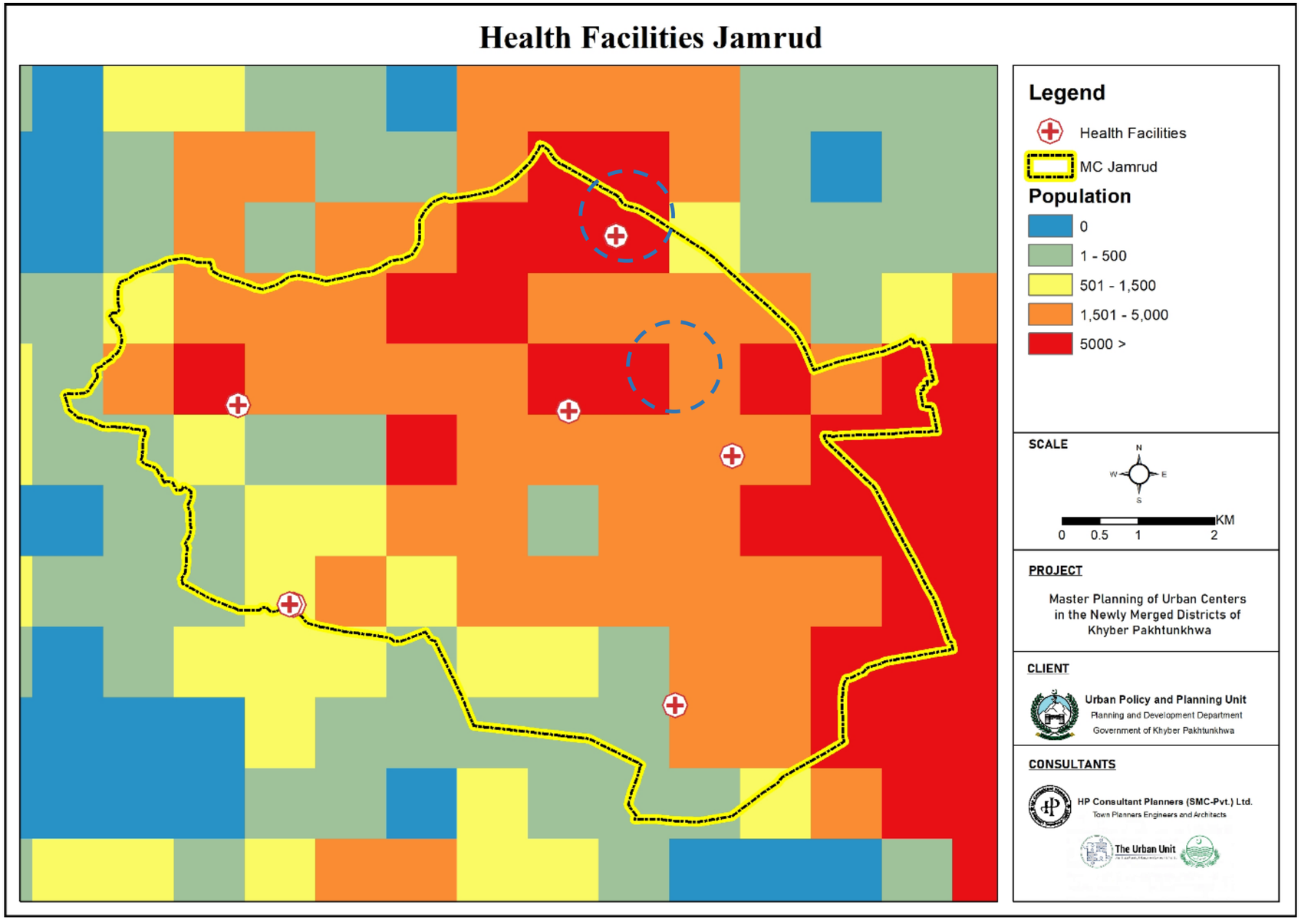
6.5.1. Rationale for Proposed Health Facilities:

Factors considered for proposed health facilities sites are:

1. High population density areas
2. Proximity to other health facilities
3. Unserved existing and new residential areas
4. Proximity from road infrastructure

The Map below shows the distribution of health facilities, along with population densities of the region. A Hot spot analysis is done to identify the population clusters in the region and overlaying the existing health facilities on the map help to identify the unserved areas.

It can be seen that the health facilities are clustered in the center of the region. Most of the population is lying in the center, north and south east of the region. Similarly, major facilities are located in town center while other populated areas such as the north of the region has limited or no health facilities, thus highlighting the gaps in the region. The blue dotted line indicates the unserved area.



Map 23: Distribution of health facilities and population density in Jamrud

Source: The Urban Unit & HP Consultants

The NRM guidelines have been consulted for the provision of new health facilities. Obtained parameters include certain guidelines for geographical distribution and plot sizes of the health facilities.

For further location and siting of the new health facilities, the NRM guidelines has identified certain guidelines for geographical distribution and plot sizes of the health facilities which can be seen form the below table:

Table 6-28: Allocation criteria of health facilities as per NRM

Sr. No.	Type	Allocation criteria	Covered/Site area
1	Basic Health Unit (BHU)	10,000	1,250 – 2,500 m2
2	Dispensary (Urban)	One per large school/factory	2 rooms
3	Community Hospital / Polyclinic	-	1 hectare
4	Tehsil Hospital	One per tehsil	2 hectares
5	District Headquarter Hospital	One per district	5-8 hectares
6	General Hospital	In large cities	3-7 hectares
7	Teaching Hospital	On provincial/regional basis	20-40 hectares
8	Specialized Hospital	In metropolitan cities	55-75 m2 / bed

Source: National Reference Manual on Planning and Infrastructure Standards

In addition, the following spatial factors have been considered when selecting a suitable site for constructing a new health facility:

- **Catchment:** Health facilities should be situated in the vicinity of dense areas or population built-up which includes both residential and commercial areas[7].
- **Complimentary Land Uses:** As per the NRM guidelines, health facilities should be located on a route which is adjacent to other facilities such as other health facilities, police station, ambulance and fire services. Numerous studies

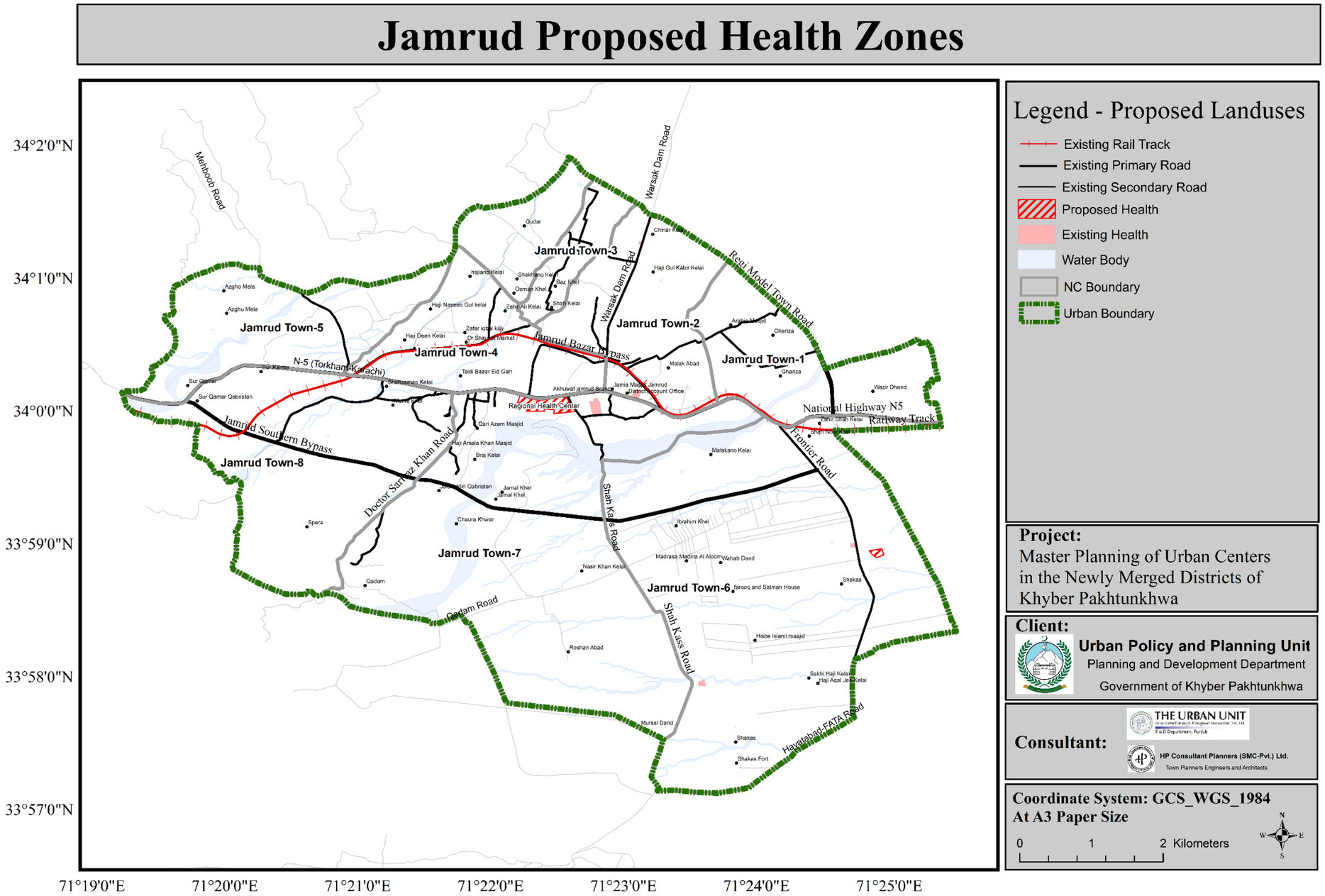
[7] Zhou & Wu (2012). GIS-Based Multi-Criteria Analysis for Hospital Site Selection in Haidian District of Beijing

on site suitability for health facilities show that health facilities should be within proximity to each other [8].

- **Environmental factors**: As per the NRM, the health facilities should be located in pleasant surroundings among trees and plants, and there should be minimum environmental pollution including noise and dust.

The map below shows the areas identified for the construction of public or private health facilities. Mainly primary facilities are proposed to cater to the needs of population. In the long term, these facilities can be upgraded to secondary level facilities, depending on the health needs of the people in the region.

[8] Sharmin and Neema (2013). Appropriate Locations of Hospitals in Dhaka City in Bangladesh.



Map 24: Proposed Health Zones

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Health facilities are below:

Table 6-29: Health Facilities Development Guidelines

Permitted Uses	**Allied Permissible Uses**	**Prohibited Uses**
Large Scale Health Institutions; Hospitals, Scientific research institutes, Clinics, Clinical Laboratory, BHUs and RHCs, Maternity Care Centres.	Staff residences, Community facilities (Parks, Playgrounds, schools and neighbourhood commercial), Banks or Automated Teller Machine (ATM), Departmental Store, Taxi or bus stand.	Large scale commercial, industrial activities Large scale Slaughterhouses, Large scale Workshop for servicing and repairs.

Source: Urban Unit and HP Consultants

6.6. Connectivity and Accessibility

Cities of today rely on transportation systems for socio-economic sustainability. Housing patterns, land use, and commercial hubs are all influenced by the transportation system which facilitates the movement of people and goods between these areas.

Jamrud, a Tehsil of the newly merged District Khyber, has remained underdeveloped, with no special attention paid to its socioeconomic development. It shares boundary with Peshawar on the main Grand Trunk (GT) Road or N-5 in the east and towards west it connects the country with Central Asia via the famous Khyber Pass. This route carries a large portion of Pakistan's trade with Afghanistan and other Central Asian countries. An efficient transportation infrastructure is required to develop Jamrud as Economic and Urban Centre.

6.6.1. Mobility Problems in Jamrud city

Jamrud city faces traffic congestion issues caused by encroachments, on-street parking, poor pavement conditions, inadequate road geometry, lack of traffic control devices, and aggressive driver behavior. These problems were reported by the Consultant's team during the field studies and are depicted in Figure below.

Figure 6-1: Traffic problems in Jamrud

6.6.1.1. Existing public transport services

A survey was conducted to evaluate local public transportation user's perceptions of the importance they attribute to various attributes of the city's current public transportation service, as well as their level of satisfaction with these attributes. Table below shows a qualitative assessment of both variables, namely importance and satisfaction, with color grading. To determine the cumulative effects of both variables, the weighted average score method was used, with varying scores based on the degree of importance and satisfaction. The weight to three level is assigned as:

- 3 (or 50%) for important and satisfied,
- 2 (or 33.33%) for Neutral in both cases and
- 1 (or 16.67%) for not important /not satisfied

The net score of both variables is shown in descending order against the respective attribute in the last column of Table below**.**

Approximately two-thirds of respondent value life safety and are happy (satisfied) with the current public transportation service in this context. Similarly, network coverage of existing public transportation services is regarded as important by the majority of respondents, despite the fact that nearly half of them are dissatisfied with its coverage of the entire road network.

The respondent's main concern is the travel attributes that are perceived by the majority, but the level of satisfaction is not as high. This includes the cost of travel as well as the time spent waiting. However, only about one-third of respondents consider noise and crowding to be important, and nearly the same number are dissatisfied with these attributes. This also suggests that the level of awareness is important in identifying problem areas.

Table 6-30: Public Transport perceptions

Travel Attributes	Importance			Satisfaction			Weighted average score		Net score
	Important	Neutral	Not Important	Satisfied	Neutral	Not Satisfied	Importance	Satisfaction	
Safety of Life	68%	12%	20%	82%	11%	7%	2.48	2.75	5.23
Staff Behavior	60%	17%	23%	65%	25%	11%	2.37	2.56	4.93
Network Coverage	77%	5%	18%	54%	17%	29%	2.59	2.25	4.84
Cleanliness of vehicle	52%	23%	26%	64%	23%	14%	2.28	2.52	4.8
Journey Time	51%	25%	24%	60%	24%	16%	2.27	2.44	4.71
Waiting Time	65%	17%	18%	47%	24%	29%	2.47	2.18	4.65
Cost of travel	63%	26%	11%	31%	31%	38%	2.52	1.93	4.45
Noise	29%	53%	19%	37%	35%	28%	2.12	2.09	4.21
Crowding	26%	54%	20%	42%	29%	29%	2.06	2.13	4.19

6.6.1.2. Encroachment

Intrusion of businesses, vendors and street hawkers onto the ROW of the main road in Jamrud Bazaar is one of the main causes of traffic delays and congestion. It is a common practice to rent out shop fronts to vendors and street hawkers. The main Jamrud Bazaar has a service road along the entire length of the road but this (service road) is occupied by illegal encroachers. The Tehsil Municipal Administration lacks the capacity to stop encroachment which leads to traffic jams and severe congestion particularly during peak hours. Pedestrian infrastructure is also affected by encroachment causing severe inconvenience.

6.6.1.3. Illegal parking on road

Due to unavailability of facilities for parking vehicles in Jamrud Bazaar, most of the vehicles can be observed parked along the main road. This decreases the usable length of road to be used for vehicular travel. Vehicles are parked on both sides of the road, during peak hours when traffic load on the road increases significantly. The side effects of such parking can be seen as they cause delays and congestion on the road. Most of the parking on roadside is illegal since unofficial signs are displayed to not do

parking on the main road. But due to the absence of enforcement of traffic laws, illegal parking is present along the roads.

6.6.1.4. Use of water streams (dried khwar) as roads

Due to unplanned and haphazard growth of the Urban area particularly in the last 10-20 years, shortage of road network persists to provide public accessibility to the main Jamrud bazaar. This leads to the public adopting waterways and dried Khwars as their access routes and some of these routes are currently being developed as metalled roads. During rain or floods these water channels are supposed to provide path for water to flow downstream (that would save residential and commercial buildings from flooding) but due to encroachment of these water channels the water flows onto main roads and damages buildings in its path. Such events can lead to serious hazards for the urban population.

6.6.1.5. Unpaved secondary roads/streets in majority of the urban area

Most of the urban area of Jamrud remained rural until 2020. As a result, the city infrastructure carries many characteristics of rural areas including unpaved roads. Secondary roads in the urban jurisdiction are not well-maintained and lack footpaths and drains. This causes a main accessibility problem for the public in terms of their accessibility to basic facilities of life like health and education.

6.6.1.6. Non-Existence of proper transport terminal

Transportation terminals are a key element of transport systems. Efficient terminals can improve the operation of passenger transportation networks, adjust the layout of public transportation networks, provide a passenger guidance system, and regulate the development of commercial forms. Jamrud does not have any transport terminal. Residents of the area approach cities of neighboring districts to use the transport terminals i.e. Peshawar. This makes it inconvenient to travel out of Jamrud. Moreover, the transport fares remain irregulated. Informal terminals are being operated on road near Bab-e-Khyber located at the center of Jamrud Bazar causing illegal roadside parking, congestion and hampered traffic flow.

6.6.1.7. Unregulated Fares

As per field visits and consultation meeting with Tehsil Municipal Administration (TMA) Jamrud, currently no official per kilometer commuting cost is determined therefore unregulated fare system is practiced in the city. During the public transport satisfaction

survey, the majority of the residents pointed out that they were not satisfied with the cost of travel.

6.6.1.8. Untrained traffic police staff

Implementation of traffic laws requires trained traffic police staff. The police staff in the newly merged areas is currently untrained as they were levies before and are now deployed as traffic police without providing proper training about traffic rules and regulations. This has resulted in unregulated traffic operations.

6.6.1.9. No designated parking spaces

At present, there are no public parking spaces available in Jamrud Bazar. The visitors coming into or passing through the bazaar park their cars on the street often causing traffic jams and congestion. Moreover, public transport vehicles primarily Suzuki Van are parked all along the commercial strip of bazaar, thus, limiting traffic flow.

6.6.1.10. Lack of traffic signs

Road signs are necessary for traffic guidance and regulation. The roads in Jamrud lack even the basic traffic signage. All along the route of the main highway of Jamrud along which much of the urban population is located, one seldom finds the required traffic sign. For example, there are no signs at U-turns, junctions, or parking. There are no speed limit signs to control over speeding. This lack of required signage may be linked to roadside accidents. FGD conducted at NC-8 pointed out one such problem where women crossing the road to fetch water are often met with traffic accidents resulting in deaths and injuries.

6.6.1.11. Lack of traffic sense in public

The public lacks traffic sense that aggravates traffic problems like congestion, roadside parking, while road safety is also compromised.

6.6.1.12. Travel pattern and cost

The travel pattern data of Jamrud reveals that:

- Most of the trips are generated from Mullan, Jamrud Bazar and Ghariza
- The destination for majority of the trips was Jamrud Bazar followed by Ghonday, Karkhano Market, Peshawar and Landi Kotal.
- The trip purpose in the case of 40% of respondents was Business, Job or Work while about 20% reported travel for shopping and almost same percentage for Social Purposes.

- Household information revealed that 34 % had ownership of personal vehicle(s). 63% of respondents were using public transport.
- The household information survey also revealed that daily travelling expenditure of almost half of the respondents is between Rs.100 to Rs. 500

6.6.2. Road Network

The road inventory for the area was created using data gathered from the relevant departments, as well as the road inventory survey and field observations conducted by the consultant's teams. Jamrud's road network is developing irregularly and without planning. Due to increased urban sprawl, travel demand and increased population, there is a need for the development of a multi-modal transportation system in newly emerging districts of KP, with Jamrud city being no exception. The road inventory survey conducted during the previous phase indicates that the existing road network revolves around the city's main commercial area.

There are seven other major and minor roads in the city and the total length of these roads is approximately 17 kilometers. Most of the urban area of Jamrud remained rural until 2020. As a result, the city infrastructure carries many characteristics of rural areas including unpaved roads. Secondary roads in the urban jurisdiction are not well-maintained and lack footpaths and drains. Most of these roads are single or two-lane roads and with poor conditions at most the places. Some of the prominent roads in Jamrud have been revisited in the following paragraphs.

6.6.2.1. National Highway (N-5) Road

The National highway or N5 that serves mainly through traffic to Afghanistan via Torkham border, is the major arterial road or the transport corridor of the city.

The total length of N5 that goes through the urban area of Jamrud is 10.1 km. The total width of the road is 60-75 feet with a carriageway width of 40-60 feet. The section of N-5 in the main Bazar features a 5’-8” wide footpath with 4 feet drains, underneath. Near the Bab-e-Khyber the width of N5 is reduced to 7.22 meters. Here, the road features a 1.8-meter-wide footpath on either side of the road.

Figure 6-2: National Highway 5 (N-5) Road

6.6.2.2. Tidi Bazar Road

Tidi Bazar is the second most important commercial hub of Jamrud. The road serving Tiddi Bazar is an offshoot from the main N-5 road. The road is 1 km long. It is a single lane road with a total width of 24 feet and 2 feet wide drain on the left side of the road.

Figure 6-3: Tidi Bazar Road

6.6.2.3. Doctor Sarfaraz Road

This road lies in the west of Tiddi Bazar and carries high volumes of traffic, particularly crush-stone trucks that carry material from the nearby mountains. It is a single lane road with a paved width of 14 feet. The road does not have a footpath or a drain.

Figure 6-4: Doctor Sarfaraz Road

6.6.2.4. Warsak Road/Frontier Road

This road originates from Warsak area and culminates at main Jamrud bazar. This is one of the main roads which feeds traffic to the urban center of Jamrud. The total length of this road is 3km. It is a two-lane single carriageway with a paved width of 24 feet.

Figure 6-5: Warsak Road/ Frontier Road

6.6.2.5. Haji Abdullah Shah Road

This is an under-construction road of C&W department. The road connects the village of New Abadi to the main N5 road. The length of the road is 1 km, and its width is 22 feet.

6.6.2.6. New Jamrud Bypass

This road begins at the junction of New Abadi road in-front of cloth commercial market and ends at the bypass road of Jamrud near the railway crossing. The length of this road is 2 km with a small patch still under construction. While the total width of the road is 20 feet.

Figure below depicts the Jamrud city road network, including the locations of major roads.

There are several unnamed local roads in Jamrud. The condition of these locals varies from paved to unpaved and provide access to various clusters of neighborhoods scattered.

The prominent attributes of the road Network of Jamrud are summarized in the table below. Likewise, the following figure shows the road network of Jamrud as described above.

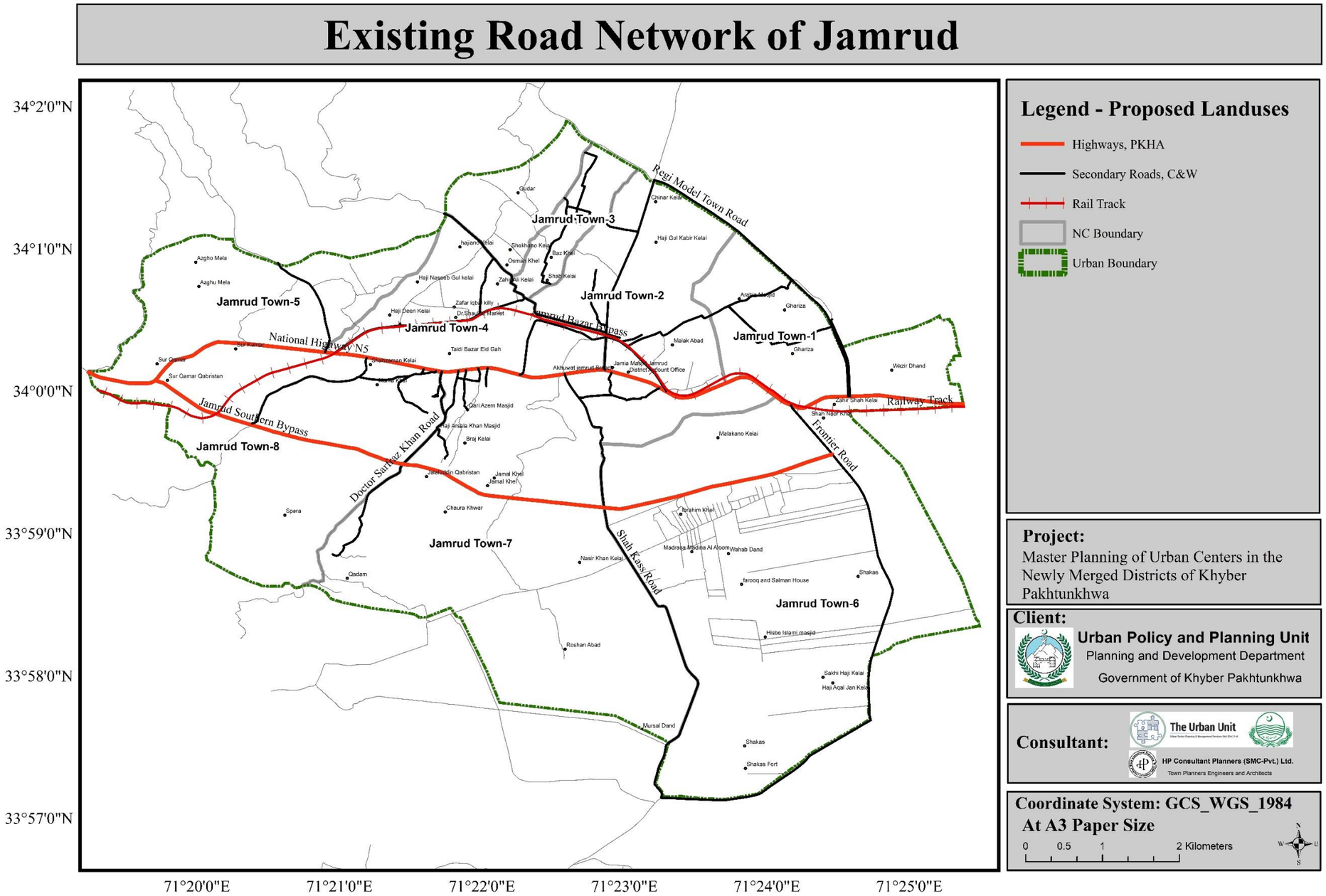
Table 6-31 Road Network Attributes

Road Name	Lanes	Carriageway	Owner	ROW*	Class	Capacity (veh/hr)**	Length (Km)	Width*** (m)
National Highway (N-5)	2	Single	NHA	18	National Highway	2000	10.1	12
Tidi Bazaar Road	1	Single	C& W	9.1	Local	450	1	7.3
Doctor Sarfraz Road	1	Single	C& W	6.1	Local	450	3	4.2
Warsak Road	2	Single	C& W	9.1	Primary	1800	3	7.3
Haji Abdullah Shah Road	1	Single	C& W	9.1	Secondary	900	1	6.7
New Jamrud Bypass	1	Single	C& W	30 9.1	Secondary	900	2	20 6
Jamrud Southern Bypass	2	Single	C& W	18	Primary	1800	7.8	40 12

**Right of Ways Quoted are nominal values for rural roads belonging to the respective owner. The ROW is variable in Urban Environments.*

***Capacity has been determined based on HCM formula C = 1800(N-1+Ps). The Value of P has been assumed to adjust for urban environment and cross-section reductions due to parking and stoppage.*

****C&W owned roads in rural settings have a typical cross section of 24 feet (16ft paved carriageway + 4ft shoulder and Utilities/Drainage on both side). Cross sections become variable in Urban Environments.*



Map 25: Existing Road Network of Jamrud

Source: The Urban Unit

The relevant line departments such as Construction and Works (C&W), Local Government & Rural Development Department, The Transport Department, and Government of KP need to maintain balance between transportation demand and supply of mobility infrastructure in the Jamrud. The renovation of existing transportation infrastructure and its capacity enhancement is required to accommodate the projected population of 2040.

6.6.3. The Khyber Pass Economic Corridor

With the anticipated rise in industrial activity in the Khyber Pass Economic Corridor (KPEC) area, the mobility issues of Jamrud may aggravate in the near future. The expansion of Jamrud and Torkham urban centers coincides with the construction of the 48-kilometer Peshawar-to-Torkham expressway by KPEC. The project, which will link Pakistan, Afghanistan, and Central Asia, is anticipated to have a significant impact on district Khyber's quality of life and create up to 100,000 new employments. The effects of economic growth and affluence will trickle down to better the social infrastructure and increased mobility with the increase in motorization.

6.6.4. Data Collection and Analysis

To solve the existing problems a comprehensive transportation survey plan was developed. For the purpose of transportation studies Jamrud must be divided into cordons. Since Jamrud is a small city with population less than 75000; hence two cordons were developed. The initial cordon would encompass the administrative boundary of the area and the second cordon was developed by encircling the Bazaar area where the commercial activity takes place. After cordon formation points were marked where traffic studies were to be conducted. Traffic counts are to be conducted at each point where the cordon lines cross a main road. Hence the points finalized for traffic counts were:

1. Matani Bypass Chowk Check Post,
2. Bigyari Check Post,
3. Wroky Neher Pull Check Post,
4. Bypass Junction N5 near Rahim Market,
5. Bypass Junction with N5 near education office Jamrud,
6. Railway Patak Junction near Warsak Road.

Roadside OD surveys were also conducted at the 3 cordon points i.e., 1,2 and 3. since they had police check-posts that could facilitate stopping vehicles and OD information.

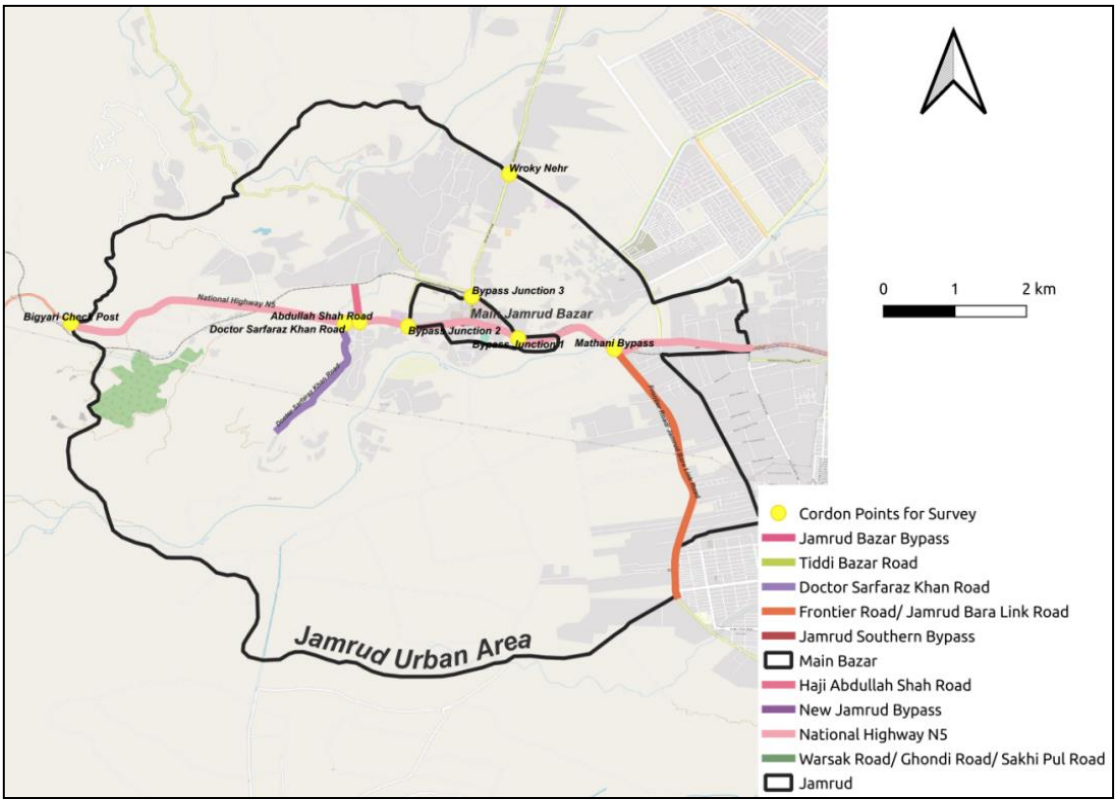


Figure 6-6: Main Survey Points Chosen for Transportation Survey

6.6.4.1. On-Street Parking

Due to lack of a proper parking lot facility in Jamrud city, the vehicles are parked on the main Jamrud road within the main bazaar area. The team of consultant surveyed street parking by noting the car number plates with 30 minutes intervals. The total number of vehicles parked along the main Jamrud road is given in the table below and shown graphically on the Bar chart as well.

Table 6-32 On-Street Parking

Time	9:00 to 9:30	9:30 to 10:00	10:00 to 10:30	10:30 to 11:00	11:00 to 11:30	11:30 to 12:00	12:00 to 12:30	12:30 to 1:00	2:00 to 2:30	2:30 to 3:00	3:00 to 3:30	3:30 to 4:00
Number of Vehicles Parked	111	158	54	106	116	126	45	19	44	84	105	116

Source: Transport Survey Conducted by the Consultant (The Urban Unit & HP Consultant)

The vehicles parked along other side roads are approximately 50-70 as per the calculation. Therefore, the maximum per hour on-street parking in Jamrud can be approximated to be 210-230. Most of the cars parked, 81% to be precise, are usually for a short period of time of 30 minutes or less. 12% of cars are parked for 1 hour, 3.3% and 1.6% are parked for 1.5 and 2 hours respectively.

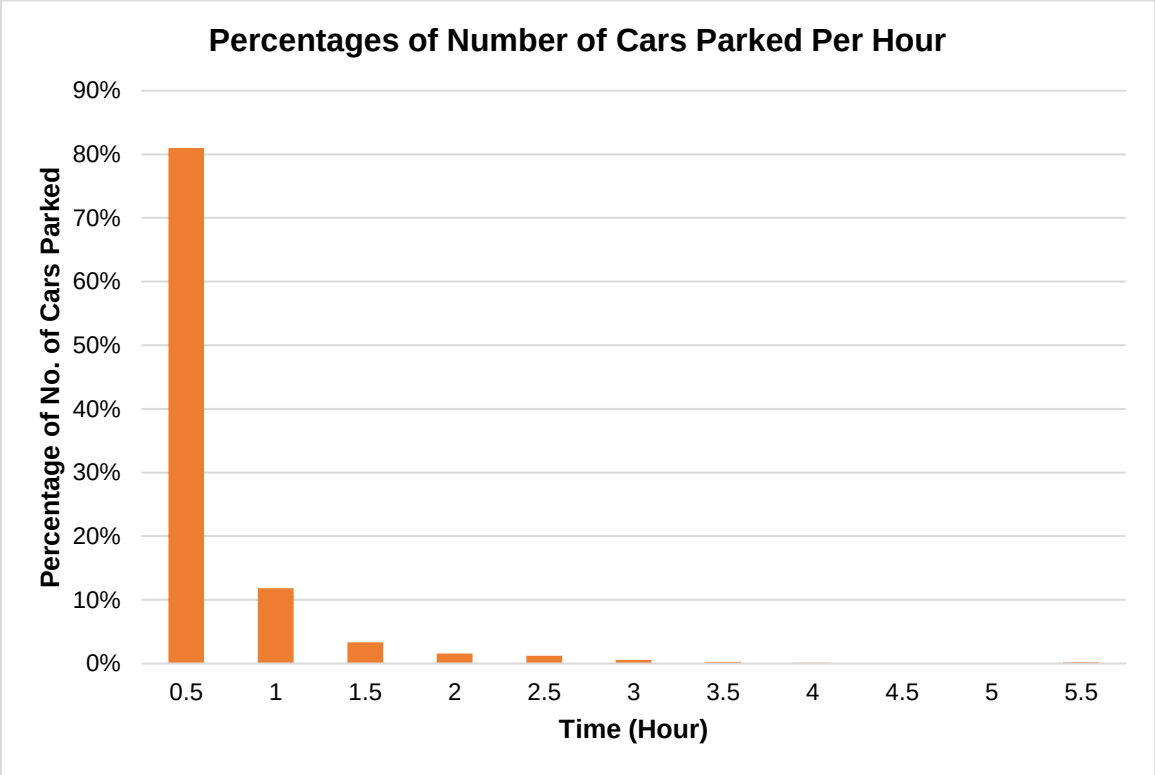


Figure 6-7 Percentages of Number of Cars Parked Per Hour

Source: Transport Survey Conducted by the Consultant (The Urban Unit & HP Consultant)

6.6.4.2. Parking Lot Survey

There is no formal or official parking lot in the area. A small portion near Warsak road meeting the main Jamrud road is allocated for an informal parking facility for Cars and Suzuki Bolans. The lot is divided into two portions, in one portion Suzuki Bolans are parked which serve as the public transport vehicles for Jamrud while another portion serves as a parking facility for local cars.

Survey carried out at the parking lot shows that the maximum number of vehicles parked at the lot at one time is 68. The Figure 1-8 and Table 1-3 show the number of cars parked at different time intervals.

6.6.4.3. Traffic Signage Survey (Signage relevant to public transport)

Traffic signage is one of the most important aspects of transportation systems particularly about catering for safety and human life protection on the roads. Most of the Jamrud Urban Area is deprived of proper Traffic signs, there are a few Informatory signs deployed at the main national highway N5 marking places like Tiddi Bazar, Mathani Bypass, Bab-e-Khyber and Jamrud Fort. For Public Transport Such Informatory signs are a must to facilitate the public transport users. But these signs are still not sufficient to cater to Public Transport. Similarly, there are no proper signs to indicate public transport stops. Public transport stops like Sur Qamar, Tiddi Bazar, Jamrud Bazar need to be marked with signs showing public transport stops. But these stops need to be provided in areas which are dispute free and can also be open enough to develop proper public transport stops. Also, public transport terminal needs to be developed and properly marked by traffic sign for public transport terminal.

6.6.4.4. Origin Destination Survey

OD survey is carried out to determine the flow of traffic within the city. OD survey provides a detailed picture of the trip patterns and travel choices used within the city. This information is used to understand travel patterns and characteristics, measure trends planning for area wide transportation infrastructure needs and services; and, to monitor progress in implementing transportation policies.

Roadside interview is a common method used for OD surveys, drivers are directly interviewed at selected roadside stations to determine their travel characteristics through the study area. Roadside OD Survey was carried out at three selected locations in Jamrud city. The locations were Mathani Checkpost, Bigyari Checkpost and Wroky Nehr (Small stream). Each of these locations had already police deputed who were asked to help in conducting the survey, local authorities and police were very cooperative in this regard and helped stop the vehicle to carry out the Road Interview survey. The results of the survey are as follows:

1. The average occupancy of vehicles was 3.05.
2. The vehicles interviewed consisted of 31% of Car/Jeep, 29% were Wagon/Suzuki Van, 15% Motorcycles and 14% were Taxi/Rickshaw/Qingqi.
3. The distribution of the trips by purpose showed that 26% of the vehicles interviewed were public transport vehicles which served the passengers. 24% of the passengers were heading towards work. 17% were heading towards

business while 15% were private vehicles going for personal affairs. The below Graph shows the complete distribution.

4. For the study of the origins of the trip coming into the Jamrud Urban area, 42% of the trips started from Peshawar. Out of them 21% started directly from Karkhano area of Peshawar. 15% of the trips started from Landi Kotal. Sakhi Pul area had 9% vehicles originating from this area, while 8% trips originated from Ghundi area. 11% of trips originated within the Jamrud area. and lastly 9% of the trips had their origin in Shakas/Takhtabaig.
5. The destinations of the trip coming into Project area had 49% trips having their destination as Jamrud Main Bazar out of which 1% were going into the Jamrud main Hospital while 2% of the trips were going to the Tehsil inside the Bazar. 25% of the trips went to other areas of Jamrud. 13% trips were going to Landi Kotal and Torkham area. 12% of trips ended in Peshawar out of which 2% were going to Karkhano market.

6.6.4.5. Traffic Count Study

For traffic count and turning movements at intersection 5 different locations were selected after approval from client. These points were located at the cordon points of the Urban Area and at the cordon points of the Jamrud Main Bazar. The traffic count conducted was initially for a total of 8 hours for 3 consecutive days and then a complete 12-hour count was also conducted for further refinement of the data after client further wanted to collect more data through the consultant. Total volumes for each point (both directions) are shown in Figure below.

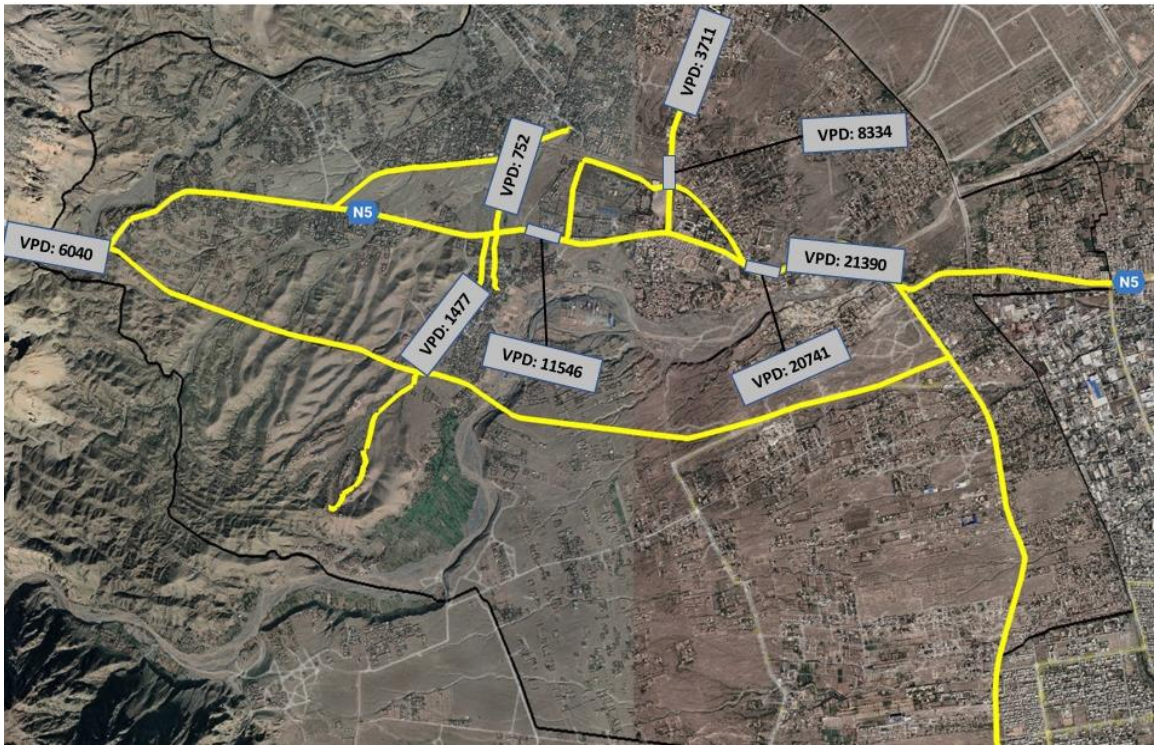


Figure 6-8 Traffic Volume

6.6.5. Network Capacity/ Level of Service

Traffic count studies were conducted in Jamrud to collect traffic volume, which was subsequently utilized to determine the volume-to-capacity ratio and Level of Service for crucial road segments within the region. Using the data collected and following the guidelines of the Highway Capacity Manual (HCM) 2010, the level of service was assessed for the sections where traffic counts were performed. The Level of service results are illustrated in the following table.

Table 6-33 Level of Service of Roads

Road Section	Level of Service (LOS)
Mathani Bypass	F
Bigyari Checkpost	B
Warsak Road, Jamrud	B
Bypass Western Entrance	D
Bypass Eastern Entrance	E

**Calculated using HCM Link Capacity Equation 1800*(N-1+Ps) and peak hour volumes*

The results show that the area is mainly Urban in nature. This nature of the area is mainly responsible for the LOS “B to F” for all the main points. Map below illustrates the volume to capacity ratios for the aforementioned roads.

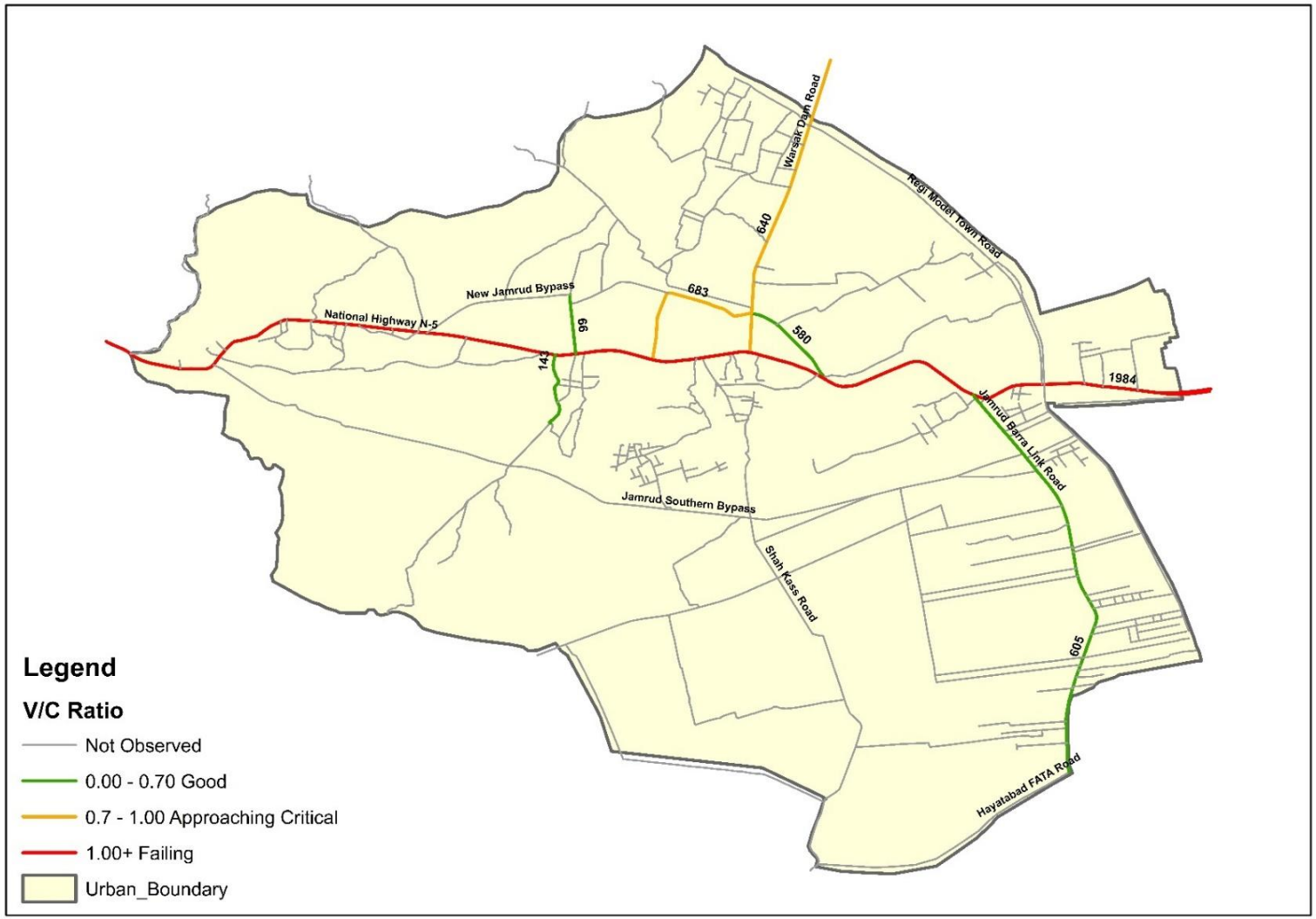


Figure 6-9: V/C Ratios of Key Roads

6.6.6. Proposed Transportation Interventions

The relevant line departments such as Construction and Works (C&W), Local Government & Rural Development Department, The Transport Department, and Government of KP are to implement the transportation interventions proposed herein to provide the necessary infrastructure for Jamrud transportation demands.

Short-term measures are proposed to tackle the problems of relatively immediate nature that were identified during the field surveys. These should be implemented during the first five years of the plan. The Medium- and Long-term interventions proposed in this master plan are to be undertaken beyond the 5-year planning horizon, subject to successful implementation of the proposed short-term interventions.

6.6.7. Short term measures

The following Short-term interventions are proposed to address the road infrastructure, vehicular parking, and public transit problems of relatively immediate nature and are to be implemented within 5 years following the notification of this Master Plan.

6.6.7.1. Rehabilitation and Widening of Roads and Allied Structure

The existing road network is inadequate to cope with the mobility requirements of Jamrud. These issues are expected to deteriorate further with the increase in traffic. Considering other government initiatives such as the construction of an international route parallel to N5, the city is expected to experience enhanced motorized traffic and regional expansion under the influence of these initiatives.

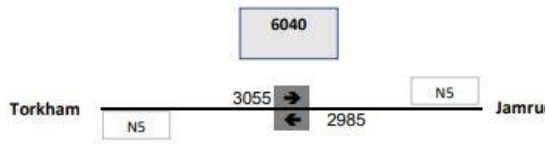
Consultation with the PKHA and C&W revealed that there is no specified threshold or criteria for undertaking road widening and improvements. Such initiatives are undertaken on an as needed basis. For the purposes of this master plan, the volume-to-capacity ratio of a given road is one determining factor for its recommended widening or dualization. A secondary reference is also used: The Widening threshold stipulated by the Planning & Development Board of Punjab of 800 vehicles per day[9] (24 Hours). These criteria are applied for all those roads for which traffic volume data is available.

[9] Planning and Development Board Strategic Interventions for Roads https://pnd.punjab.gov.pk/system/files/Road.pdf

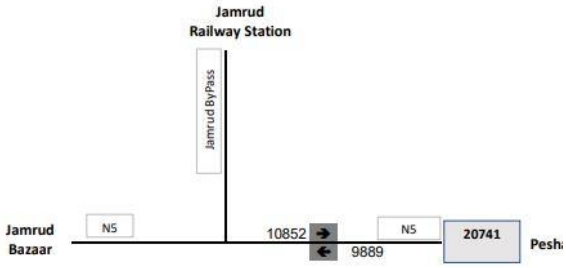
The current road network needs to be widened/Rehabilitate along with the allied infrastructure in the south and north of the city. N-5 is experiencing heavy traffic congestion especially near Jamrud bazaar. Jamrud Southern Bypass is proposed to bypass the traffic from national highway N-5. Presently Jamrud southern bypass is under construction and 2km patch is remaining including bridge. It is recommended that is should be completed early to relief the traffic on national highway N-5.

The traffic counts from the situational analysis were utilized to justify the proposed widening and dualizations of Jamrud's Roads. The intersection counts and calculated vehicles per day (VPD) are summarized in Figure 6-11 and Figure 6-12 respectively.

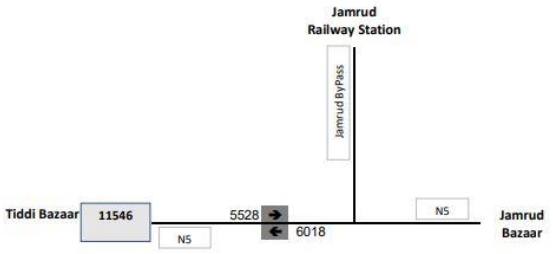
Bigyari Check Post



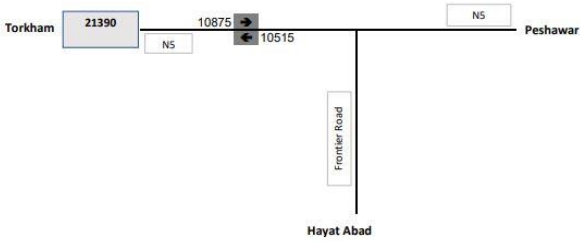
Bypass Junction N5 near education office



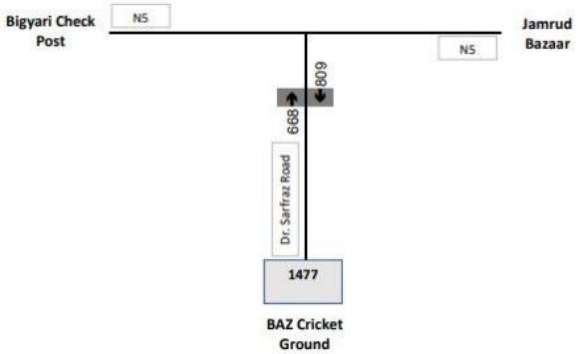
Bypass Junction N5 near Rahim Market



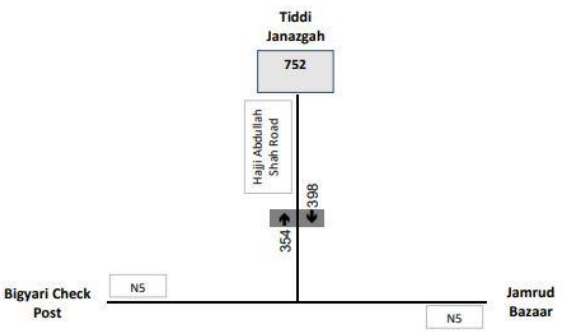
Matani Bypass Chowk Check Post



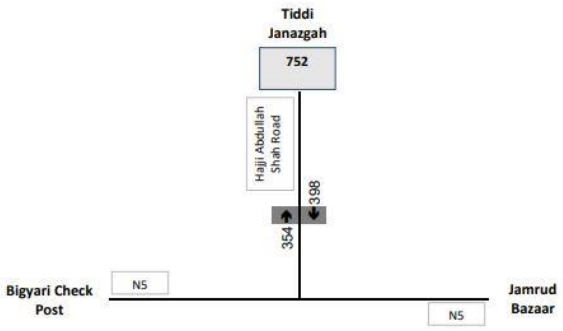
N5 - Dr Sarfraz Road Junction



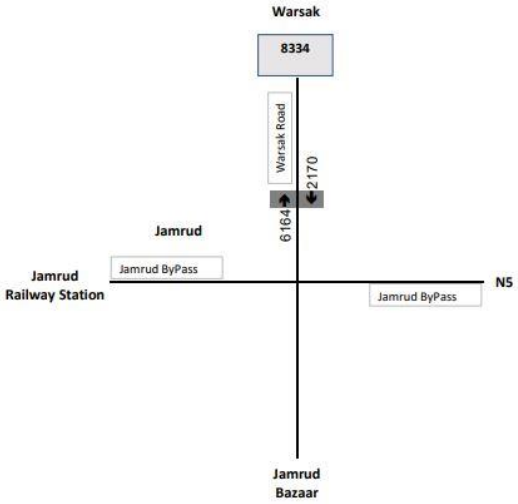
N5 - Haji Abdullah Shah Road Junction



N5 - Haji Abdullah Shah Road Junction



Railway Patak Junction near Warsak road



Wroky Neher Pull Check Post

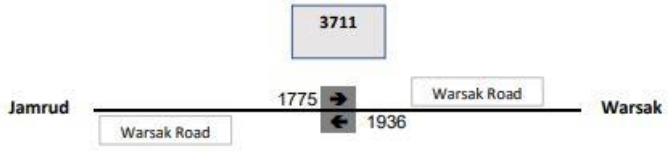


Figure 6-10 Traffic Volumes in Jamrud City

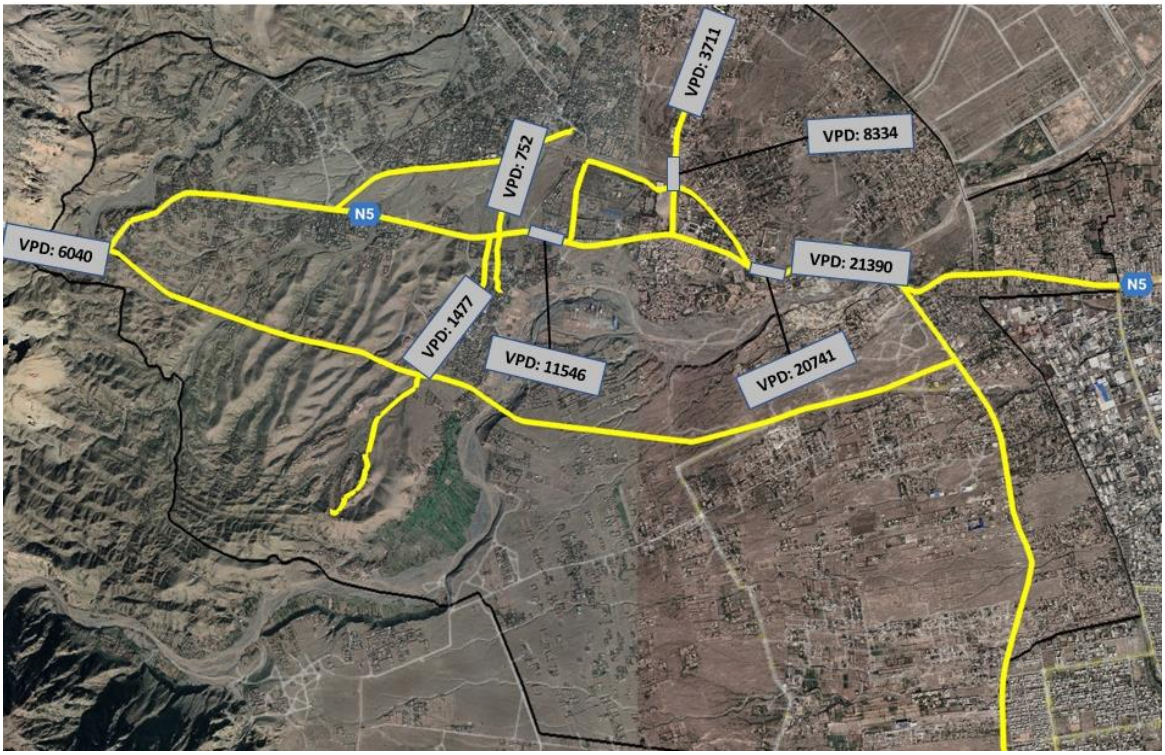


Figure 6-11: Link Volumes in Jamrud

Based on the traffic counts and surveys, it is proposed that the primary and secondary roads in the current road network of Jamrud city be rehabilitated and widened to 50 ft with allied structures.

The following roads are proposed for widening in the Short-Term.

1. Rehabilitation & Widening of Regi Model Town, 50 ft
2. Rehabilitation & Widening of Shah Kass Road, 50 ft
3. Completion Jamrud Southern Bypass

These upgraded roads will reduce regional disparity and bring prosperity to suburbs located in the south and north of the city. However, considering the mountainous nature of the district it is essential to initiate a detailed study to determine the best possible alignment considering all technical, economical social and environmental parameters.

6.6.7.2. *Proposed Dualization*

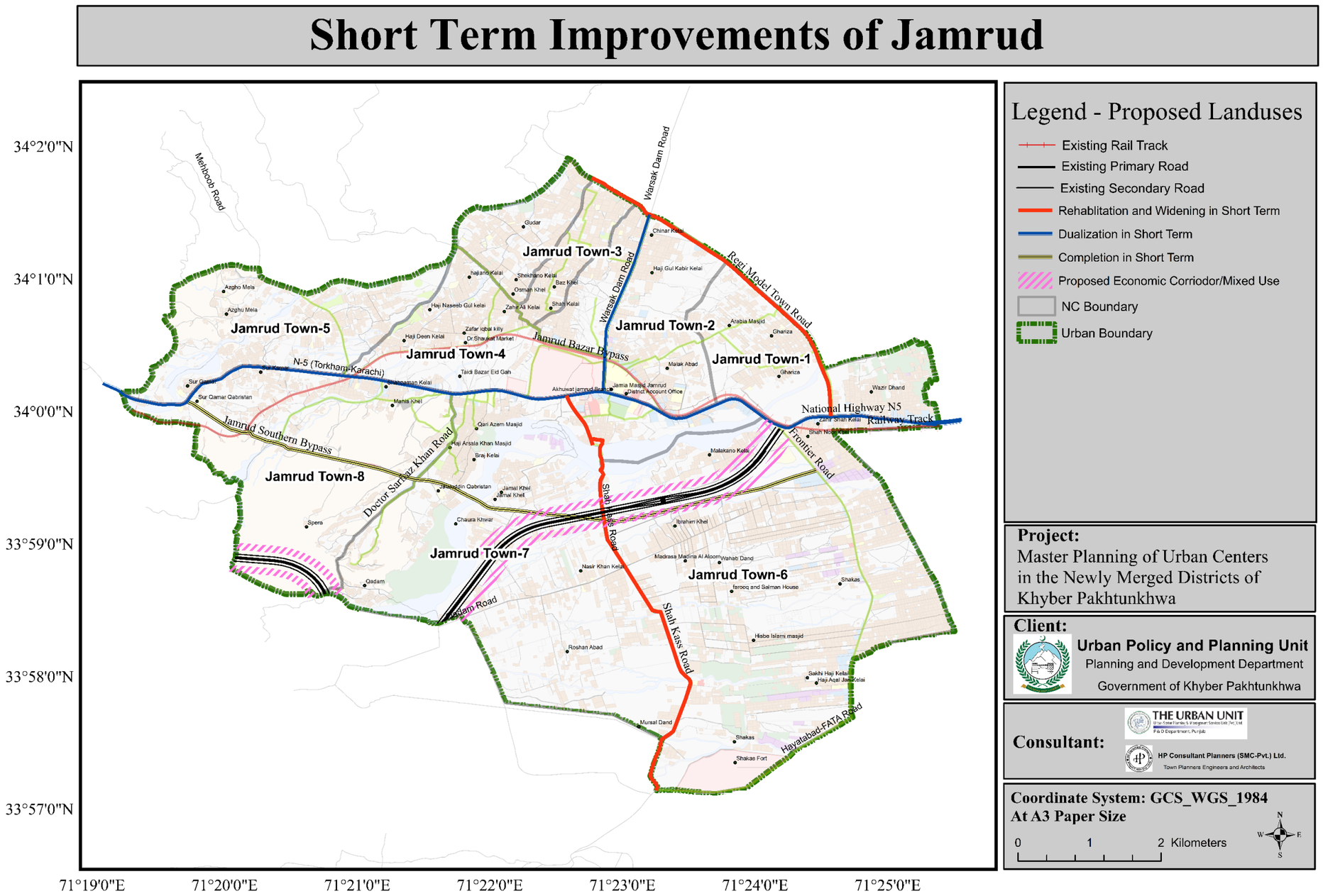
In addition to the widening of the secondary road network, it is also proposed to Dualize the Jamrud primary road to maintain the through traffic flow. These roads are recommended for dualization due to their industrial importance, high traffic volume and the usage of semi-trailer trucks that occupy substantial driving space.

The threshold for dualization stipulated by the *Planning & Development Board of Punjab* is 8000 vehicles per day[10]. Given that the above noted VPDs are based on 8-Hour Traffic Counts, it is likely that the number of vehicles along the proposed roads exceed 8000 during a 24-Hour period. It is therefore proposed to undertake dualization of these roads immediately. It is recommended that these roads be monitored in the interim (by conducting annual traffic counts) and considered for dualization:

1. Warsak Road (**VPD: 8334**)
2. National Highway N-5 (**VPD: 20741**)

The proposed short-term Widenings and dualizations are shown in Map below.

[10] Planning and Development Board Strategic Interventions for Roads https://pnd.punjab.gov.pk/system/files/Road.pdf



Map 26:Proposed Short Term Dualization and Widening

Source: The Urban Unit

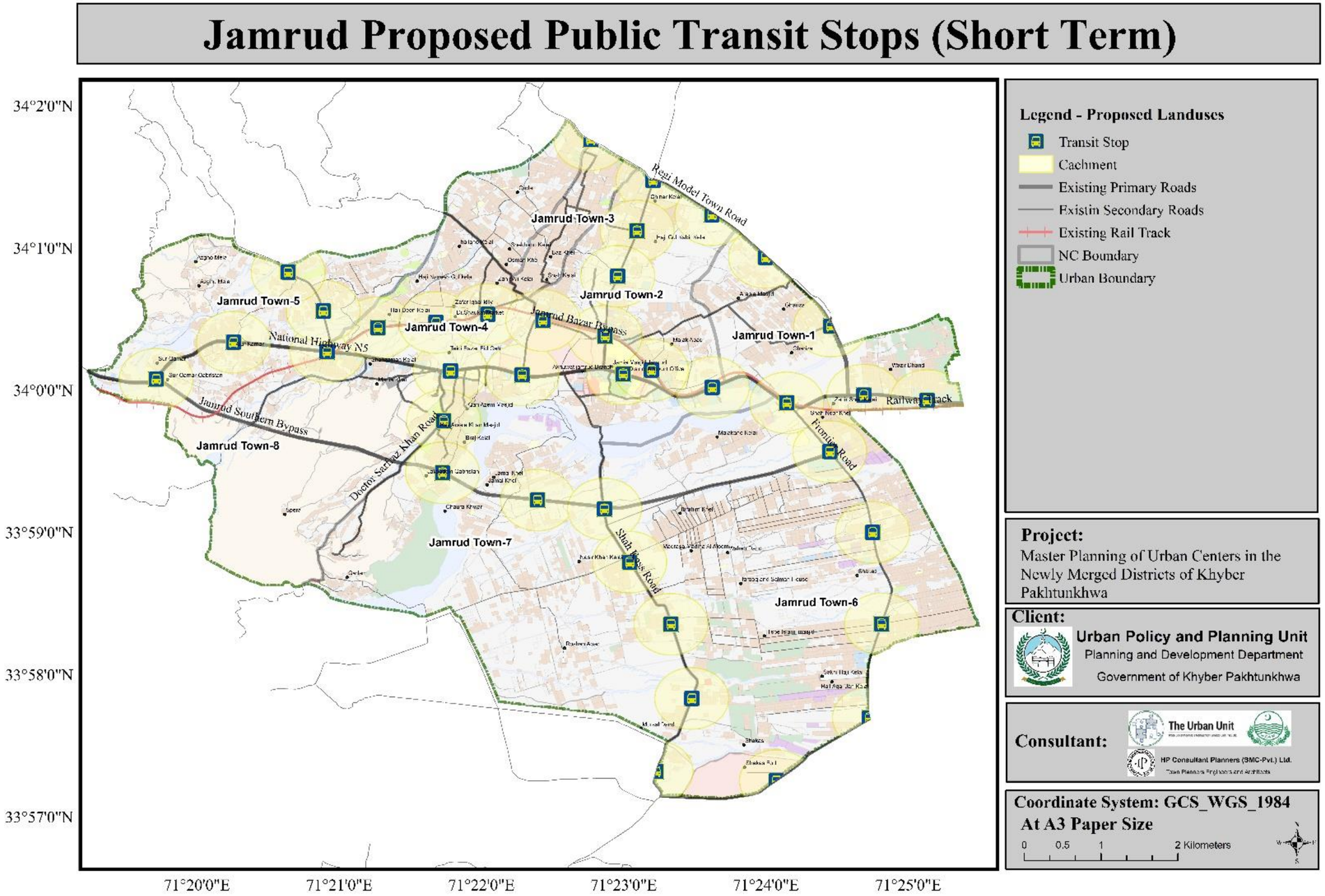
6.6.7.3. Provision of Intra-City Public Transit Services

Opportunities may be explored to provide an intra-city bus service in Jamrud to facilitate pedestrians and provide alternative modes of mobility. These services may be implemented using small vans.

In the short term, these services may be provided along the existing Secondary and local road network of Jamrud with services to the stops identified in the Figure below. The stops have been selected such that each have a catchment (service area) of 250 meters and provide access to prominent existing localities and land uses. 250 meters is considered to be a walkable distance and accessible to a community within a 5-minute timeframe based on an average walk-speed of 1.2 meters/second.

The route planning and scheduling for these services will be determined by the relevant implementation line department.

The transit stops should be marked with signposts on the roadside. As a best practice, it is preferable to situate a transit stop on the near side (before the crossing) of the intersection.



Map 27: Proposed Short Term Public Transit Service Areas – Short Term

Source: The Urban Unit

6.6.7.4. Drainage Network

Jamrud, like any other unplanned city in Pakistan, struggles with road drainage. The city's drainage system was built without any prior planning, and the entire drainage system is unmapped. During the rainy season, the roads become flooded with water, causing delays and adverse traveling conditions. Furthermore, because the drainage network is unplanned and un-mapped, municipal authorities are unable to properly respond to the situation, and roads are severely damaged as a result of the presence of water on roads for longer periods.

6.6.7.5. Provision of Parking Spaces

There are no government owned parking lots in the area. Most of the parking is done illegally on the road. There are private parking spaces, but they are not sufficient to fulfill the needs of the area. The main parking lot identified includes one on Warsak Road near the Commerce College while the second main parking space is the open area in-front of the Jamrud Press club. At present, there are no public parking spaces available in Jamrud Bazar. The visitors coming into or passing through the bazaar park their cars on street often causing traffic jams and congestion. Moreover, public transport vehicles primarily Suzuki Van are parked all along the commercial strip of bazaar, thus, limiting traffic flow. The markets in the Jamrud main Bazar also had limited car parking facilities.

As per the situational analysis, it was calculated that the hourly parking demand of Jamrud Bazaar is approximately **230 vehicles/hour** for 6-hours counts**.** To meet the parking needs of Jamrud Bazar and consequently improve its flow of traffic, two designated off-street lots have been proposed at various locations around the Jamrud Bazaar. Given that patrons need to access different parts of the bazaar, not all 250 vehicles would park in the same location for ease of access. Therefore, the locations of the parking lots have been proposed such that the parking demand of the bazaar is distributed. The parking demand such that people visiting the Bazaar can access different parts of the commercial area by foot.

The capacities of the proposed parking lots are summarized in table below. The number of spaces has been calculated for area-rate of 325 Sqft, which consider the

space required for parking and vehicular circulation. The proposed parking lots are shown in Figure below.

Table 6-34: Proposed Parking Lots in Jamrud

Lot	Area (Kanal)	No. of Spaces
1	62	1000
2	10	160
Total	**72**	**1160**

**A typical car measures 17 ft in length (10 feet for the circulation) and 6 ft in width (3 ft each side for doors). The space needed for one car to park is therefore 27x12, or 324 SFt (325 Sft Say). Example Calculation: Parking Lot – 1 (62 kanals): Parking Space for Lot-1 = 62 Kanal/325= 60 vehicles.*

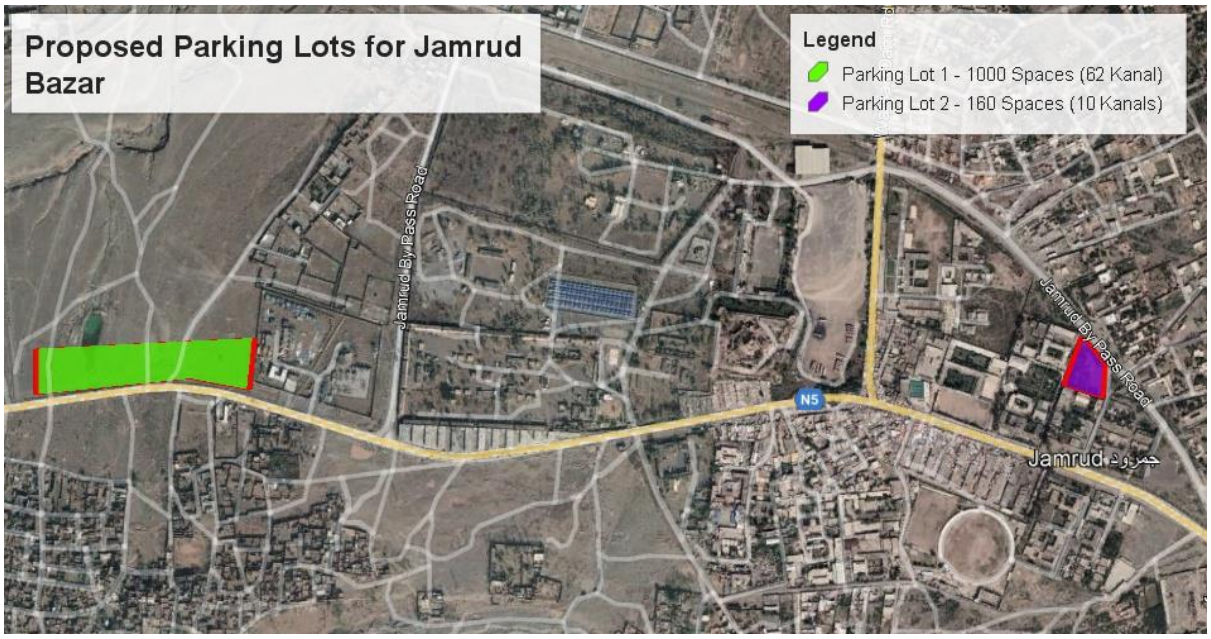


Figure 6-12: Proposed Parking Lot Locations

It is recommended that the relevant line department acquire these lands and immediately utilizes them for paid off-street parking in the short term. In the medium and long term, these lots may be paved. It should also be ensured that these lots are situated along the roadside for visibility and direct vehicular access and not obscured behind commercial establishments.

Way-finding signage should be provided along the portion of N5 in Jamrud Bazar along with “No Parking Signage”. Examples of regulatory signage for Parking are provided in Figure below[11].

[11] Ontario Traffic Manual https://stinson.ca/ontario-traffic-manual-pdf-downloads.html.

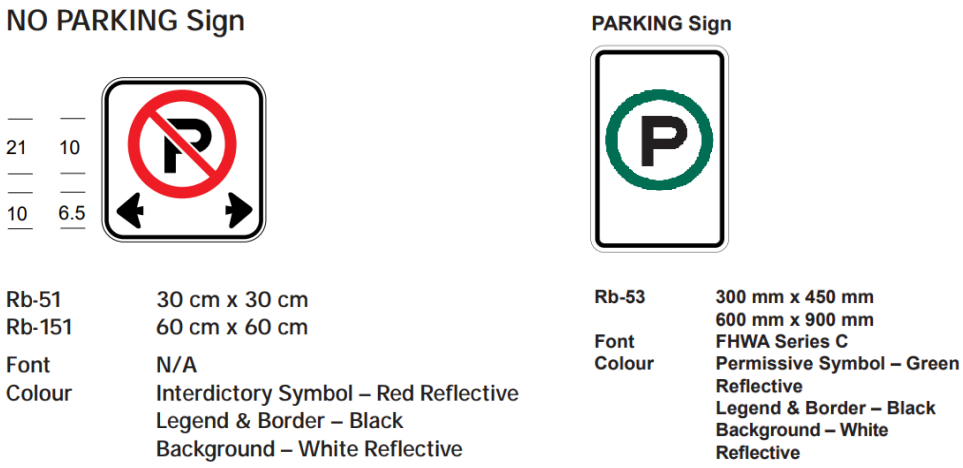


Figure 6-13: Example Parking Regulatory Signage

6.6.7.6. *Formalizing Public Transit*

Jamrud public transportation, like majority of the merged areas, is composed of privately-owned vehicles such as Car, jeep, taxi, rickshaw/qingqi and Suzuki/Bolan. These modes of transport are preferable for the people of Jamrud as they offer door-to-door service with privacy for families.

While this type of public transport service is effective, it is still part of the informal economy. It is recommended that the Transportation Department begins regulating these services, following the models adopted by the Punjab Transportation Department and its subsidiaries.

6.6.7.6.1. Issuing of Route Permits

The Transport Department would ensure compliance to Chapter 4 of *Section 44 of the Motor Vehicles Ordinance, 1965* and develop a database of these transport vehicles via registrations.[12]

The registration mechanism shown in Figure 1-16 has been obtained from the Punjab Transport Department and is provided as an example. The KP Transportation department operating in Jamrud is however encouraged to develop their own simpler registration process that conforms to the law of the land for the merged areas.

[12] KP Motor Vehicle Ordinance 1965 Amended 2010 https://kpcode.kp.gov.pk/uploads/1965_19_THE_PROVINCIAL_MOTOR_VEHICLES_ORDINANCE_1965.pdf

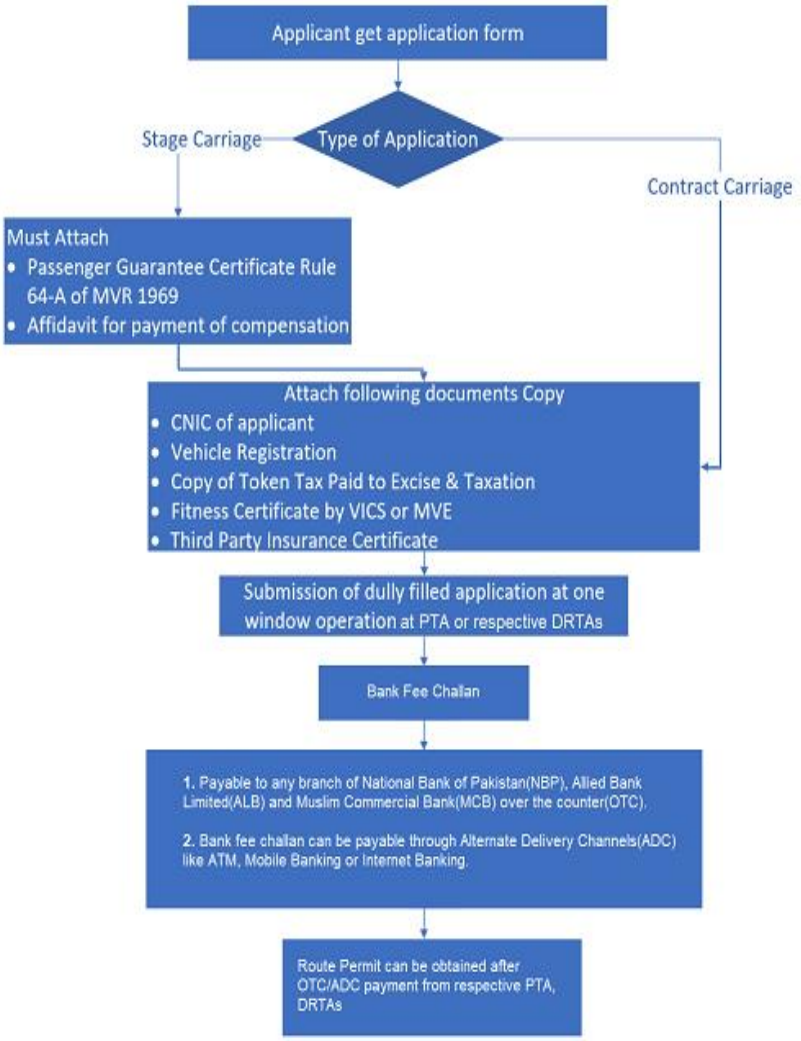


Figure 6-14: Route Permit Issuing Process (Punjab Transport Department Model)

Providing route permits to the transport operators is beneficial for the operator, regulator, and the users, in terms of ensuring safety and quality of service. Recall that the user interview surveys did indicate strong emphasis on transport safety.

The data on transport vehicles gathered through this system will also help identify the most commercially demanded routes and allow the transport department and government to undertake other development initiatives along those routes.

The implementation of this system is recommended for the short-term horizon of this master plan and shall indefinitely continue to be in routine operation. A note on institutional capacity building is also provided at the end of this chapter to supplement this initiative.

6.6.7.6.2. Provision and Upgradation of Transport Terminal

Transportation terminals are a key element of transport systems which adjust the layout of public transportation networks, provide a passenger guidance system, and regulate the development of commercial forms. Jamrud does not has any such transport terminal causing great inconvenience to the indigenous population. It is therefore proposed to provide at least one major transport terminal station along the major transport corridor supplemented by auxiliary terminals in the densely populated areas as well as potential sites for future housing schemes. These terminals will also support the feeder Bus service from Peshawar.

Currently, there is only one bus terminal being used as public transport and for parking. The location of terminals is near the Jamrud Bazaar, as shown in Figure below.

Figure 6-15 : Existing Public Transport Services in Jamrud

As part of the short-term transportation plan, it is recommended to separate parking of vehicles from the existing terminal to establish or designate the existing terminal in Jamrud as “Class C” stands to be managed by the district administration. In addition to the establishment of the route permit system described in section 1.7.1.6.1, the designation of these locations as transport terminals would formalize these sectors for both the transport operators and users.

While the existing northern terminal can maintain its size, the southern terminal is recommended to be extended to house more transit vehicles which are currently parked on the streets of Jamrud Bazaar. The proposal for Jamrud public transportation service are illustrated in Figure below.

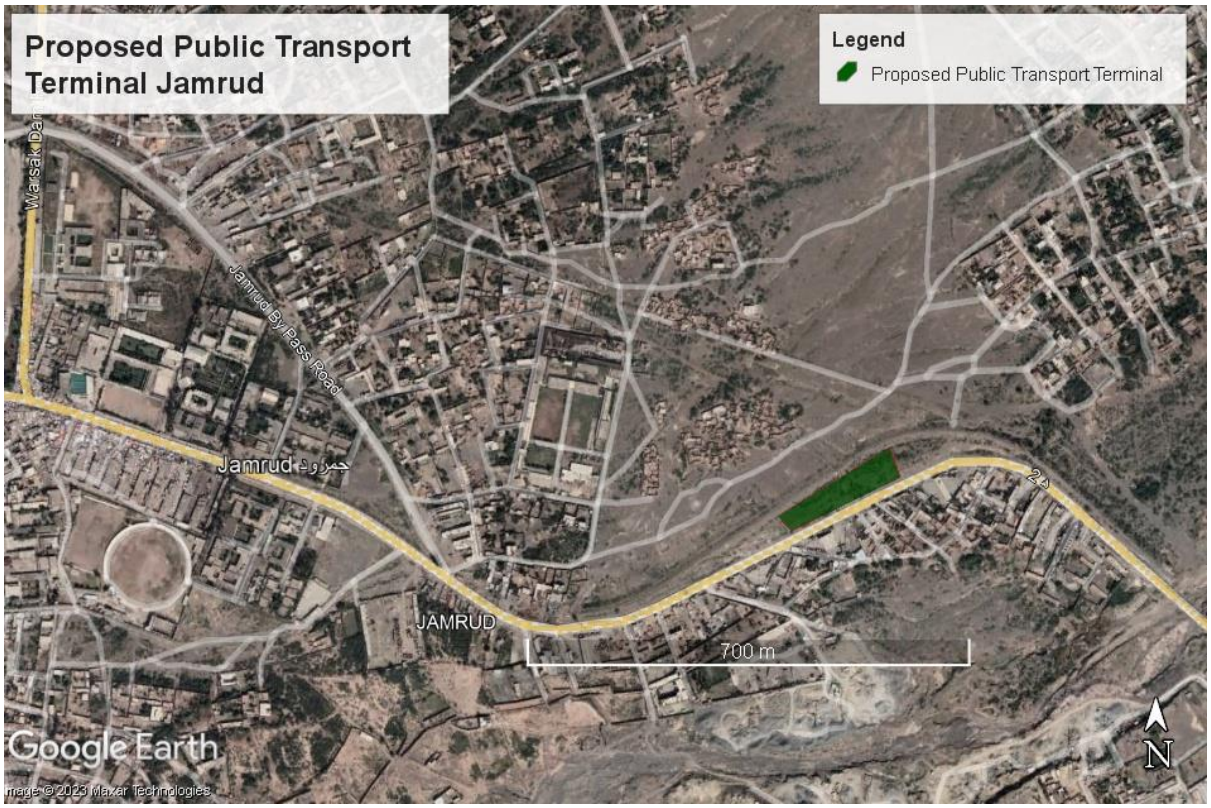


Figure 6-16: Proposed Terminal in Jamrud

With the designation of Class C terminals, the administration can ensure that the following requisite facilities for Passengers, Terminal Staff, and Vehicle Operators can be provided and maintained:

- **Passenger areas**
  - Ticketing and queuing
  - Passenger waiting areas
  - Passenger conveniences (drinking water facilities and toilets)
  - Passenger circulation
  - Boarding/Departing areas
  - Facility entry
  - Tourist information

- Security, including CCTV cameras
- Retail, concessions and lease space
- Dormitories and lodging (if required)
- Cloak room

- **Areas for terminal staff**
  - Revenue office
  - Security and information
  - Ticketing booth
  - Resting room
  - Staff conveniences (drinking water facilities and toilets)
  - Canteen
  - Maintenance staff (chairs and lockers)
  - Control room (CCTV surveillance)
- **Areas for Vehicle Operators**
  - Canteen
  - Resting areas
  - Lodging areas (if required)
  - Operator conveniences (drinking water facilities and toilets)

6.6.7.7. Summary of Short-Term Interventions

Road Infrastructure

- Rehabilitation and Widening of Shah Kass Road to 50ft;
- Rehabilitation and Widening of Regi Model Town Road to 50ft;
- Completion of Jamrud Southern Bypass
- Dualization of National Highway N-5 / Torkham Road, including the bypass circling Jamrud
- Dualization of Warsak Road

Public Transportation

- Implementation of Vehicle Route Permit Program
- Designation of Jamrud Transportation Terminals as a Class C terminals and provision of requisite facilities.

Parking

- Establishment of two Parking Facilities in the Vicinity of Jamrud Bazaar with the following spaces:
    1. Parking Lot 1, 62 Kanals along N-5 West of Jamrud bazaar, Capacity: 1000 Spaces
    2. Parking Lot 2, 10 Kanals along N-5 east of Jamrud bypass, Capacity: 160 Spaces

6.6.8. Medium- and Long-term Interventions

Long- and medium-term measures in this Plan are those that are to be initiated during the next 5 to 20 years. These proposals are built on a comprehensive analysis of the baseline data gathered from the field or the secondary sources that has been discussed in detail in the last deliverable.

6.6.8.1. Future Travel Patterns

The Four step model has been used to predict the future travel demand of Jamrud.

- Trip Generation
- Trip Distribution
- Mode Choice
- Network Assignment

The key inputs for this analysis are:

1. Existing Road Network
2. Existing Land Uses
3. Proposed Land Use Plan

The following sections describe how the future travel demand is estimated for Jamrud.

6.6.8.1.1. Trip Generation

Major Land Uses, existing and proposed have been used to determine trips generated by each area of the city. For this analysis, the major land uses (150,000 sqft or greater) have been defined as Traffic Analysis Zones (TAZ). These are areas that will have a substantial number of inbound and outbound trips.

The TAZs defined for Jamrud are illustrated in the figure below.

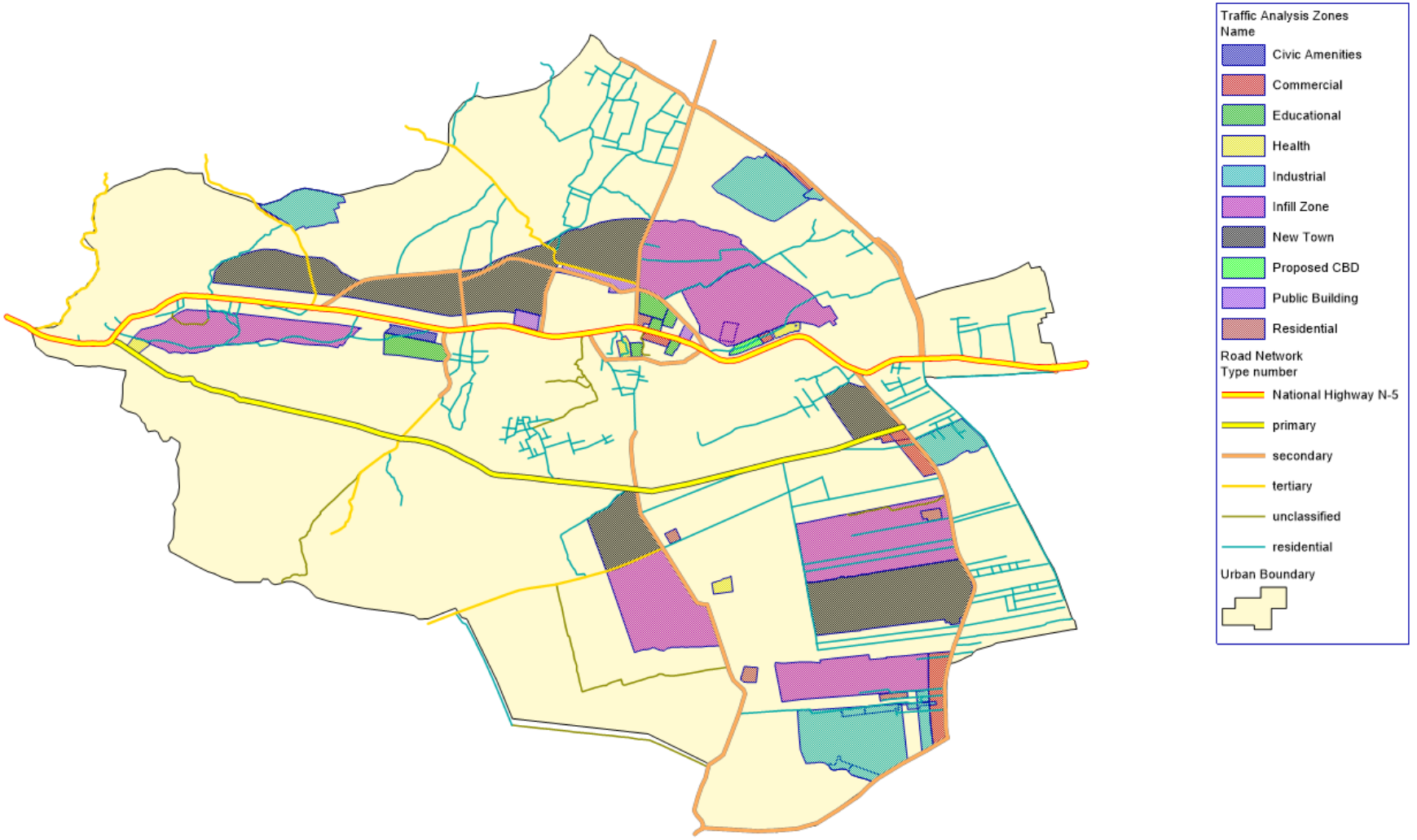


Figure 6-17: Traffic Analysis Zone

The ITE Trip Generation Manual 8th Edition has been used to estimate the peak hour trips to and from the major land uses in Jamrud based on the most appropriate unit and the relevant average trip rate.

Note the following considerations for trip generation:

- Educational facilities have not been considered as major trip generators as students are expected to commute to school via foot/bike/wagon. Moreover, proposed educational facilities are situated within neighborhoods which are expected to utilize the nearest facility. A school's traffic impact on the greater road network would therefore be negligible.
- Commercial Areas (including proposed CBD) are approximated with the ITE Code 770 (Business Park) as the definition of Business Park includes restaurants, convenience stores, and retail. Moreover, the appropriate unit of measurement (Acres) is available in the trip generation manual.
- New Towns, Infill Zones, and Residential Zones use the ITE Code 210 (Single Detached Dwellings) for trip generation as the appropriate unit of measurement (Acres) is available in the trip generation manual.
- Industrial Zones use the ITE Code 130 (Industrial Park). The Proposed Timber Market also uses this code.
- Public Buildings use the ITE Code 730 (Government Office Building).
- Health Facilities (Hospitals) are based on the ITE Code 610 (Hospital) and the covered area of their buildings.
- Civic Amenities are assumed to have 25% covered area of their total land space allocation based on measurement of existing similar facilities.

The Table below summarizes the Trip generation assumptions obtained from the ITE Trip Generation Manual.

Table 6-35 Trip Generation Parameters

Zone	ITE Code	Unit	Rate	In	Out
Public Building	730	1000Sqft	1.21	31%	69%
Health	610	1000Sqft	1.46	47%	53%
Residential	210	Acres	2.73	66%	34%
Commercial	770	Acres	16.84	20%	80%

Education	530	1000Sqft	2.12	31%	69%
New Town	210	Acres	2.73	66%	34%
Infill Zone	210	Acres	2.73	66%	34%
Industrial	130	Acres	8.67	21%	79%
Proposed CBD	770	Acres	16.84	20%	80%
University	540	1000Sqft	3.09	50%	50%
Civic Amenities	730	1000Sqft	1.21	31%	69%
Timber Market	130	Acres	8.67	21%	79%
Grain Market	770	Acres	16.84	20%	80%

Source: ITE Trip Generation Manual

The table below summarizes the trip generation calculation for each land use category in Jamrud for the peak hour.

Table 6-36 Trip Generation

TAZID	Zone	Acres	Sqft	Type	ITE Codes	ITE Units	ITE Units	Trip Rate	In%	Out %	Trips	Trips In	Trips Out
1	Residential	4	181576	E	210	Acres	5	2.73	0.66	0.34	14	10	5
2	Industrial	7	290606	E	130	Acres	7	8.67	0.21	0.79	61	13	49
3	Industrial	4	170223	E	130	Acres	4	8.67	0.21	0.79	35	8	28
4	Industrial	9	402458	E	130	Acres	10	8.67	0.21	0.79	87	19	69
5	Residential	3	152095	E	210	Acres	4	2.73	0.66	0.34	11	8	4
6	Education	4	163840	E	530	1000Sqft	164	2.12	0.31	0.69	348	108	241
7	Commercial	6	247914	E	770	Acres	6	16.84	0.2	0.8	102	21	82
8	Education	4	180586	E	530	1000Sqft	181	2.12	0.31	0.69	384	120	265
9	Health	6	248046	E	610	1000Sqft	249	1.46	0.47	0.53	364	172	193
10	Industrial	4	173135	E	130	Acres	4	8.67	0.21	0.79	35	8	28
11	Residential	6	249079	E	210	Acres	6	2.73	0.66	0.34	17	12	6
12	Residential	5	223301	E	210	Acres	6	2.73	0.66	0.34	17	12	6
13	Commercial	7	295766	E	770	Acres	7	16.84	0.2	0.8	118	24	95
14	Public Building	4	168436	E	730	1000Sqft	169	1.21	0.31	0.69	205	64	142
15	Education	7	299092	E	530	1000Sqft	300	2.12	0.31	0.69	636	198	439
16	Education	14	627512	E	530	1000Sqft	628	2.12	0.31	0.69	1332	413	920
17	Residential	4	173252	E	210	Acres	4	2.73	0.66	0.34	11	8	4

18	Education	5	206405	E	530	1000Sqft	207	2.12	0.31	0.69	439	137	303
19	Education	4	175085	E	530	1000Sqft	176	2.12	0.31	0.69	374	116	259
20	Public Building	9	410735	E	730	1000Sqft	411	1.21	0.31	0.69	498	155	344
21	Public Building	18	802883	E	730	1000Sqft	803	1.21	0.31	0.69	972	302	671
22	Industrial	168	7297161	P	130	Acres	168	8.67	0.21	0.79	1457	306	1152
23	Commercial	2	92164	P	770	Acres	3	16.84	0.2	0.8	51	11	41
24	Industrial	96	4179788	P	130	Acres	96	8.67	0.21	0.79	833	175	659
25	Commercial	38	1640936	P	770	Acres	38	16.84	0.2	0.8	640	128	512
26	Civic Amenities	11	484037	P	730	1000Sqft	485	1.21	0.31	0.69	587	182	406
27	Proposed CBD	7	317102	P	770	Acres	8	16.84	0.2	0.8	135	27	108
28	Health	7	287239	P	610	1000Sqft	288	1.46	0.47	0.53	421	198	224
29	Health	5	235450	P	610	1000Sqft	236	1.46	0.47	0.53	345	163	183
30	Infill Zone	142	6182408	P	210	Acres	142	2.73	0.66	0.34	388	257	132
31	Industrial	18	765336	P	130	Acres	18	8.67	0.21	0.79	157	33	125
32	New Town	225	9801929	P	210	Acres	226	2.73	0.66	0.34	617	408	210
33	Infill Zone	245	10668705	P	210	Acres	245	2.73	0.66	0.34	669	442	228
34	Infill Zone	180	7848850	P	210	Acres	181	2.73	0.66	0.34	495	327	169
35	New Town	85	3716174	P	210	Acres	86	2.73	0.66	0.34	235	156	80

36	Industrial	46	2009895	P	130	Acres	47	8.67	0.21	0.79	408	86	323
37	Commercial	20	863003	P	770	Acres	20	16.84	0.2	0.8	337	68	270
38	New Town	61	2674387	P	210	Acres	62	2.73	0.66	0.34	170	113	58
39	Industrial	4	182138	P	130	Acres	5	8.67	0.21	0.79	44	10	35
40	Commercial	10	415892	P	770	Acres	10	16.84	0.2	0.8	169	34	136
41	Infill Zone	159	6916527	P	210	Acres	159	2.73	0.66	0.34	435	288	148
42	Infill Zone	188	8170894	P	210	Acres	188	2.73	0.66	0.34	514	340	175
43	New Town	110	4785535	P	210	Acres	110	2.73	0.66	0.34	301	199	103
44	New Town	212	9252939	P	210	Acres	213	2.73	0.66	0.34	582	385	198
45	New Town	111	4850306	P	210	Acres	112	2.73	0.66	0.34	306	202	105
46	Education	30	1320319	P	530	1000Sqft	1321	2.12	0.31	0.69	2801	869	1933
47	Infill Zone	148	6450016	P	210	Acres	149	2.73	0.66	0.34	407	269	139
48	Industrial	55	2392543	P	130	Acres	55	8.67	0.21	0.79	477	101	377
49	Commercial	3	122362	P	770	Acres	3	16.84	0.2	0.8	51	11	41
50	Health	6	275390	P	610	1000Sqft	276	1.46	0.47	0.53	403	190	214

The trip generation for each zone based on the above calculation is illustrated in the figure below.

The sum value of all Trips Out for each Traffic Analysis Zone (12637) has been taken as the total number of induced vehicles in Jamrud's Road network.

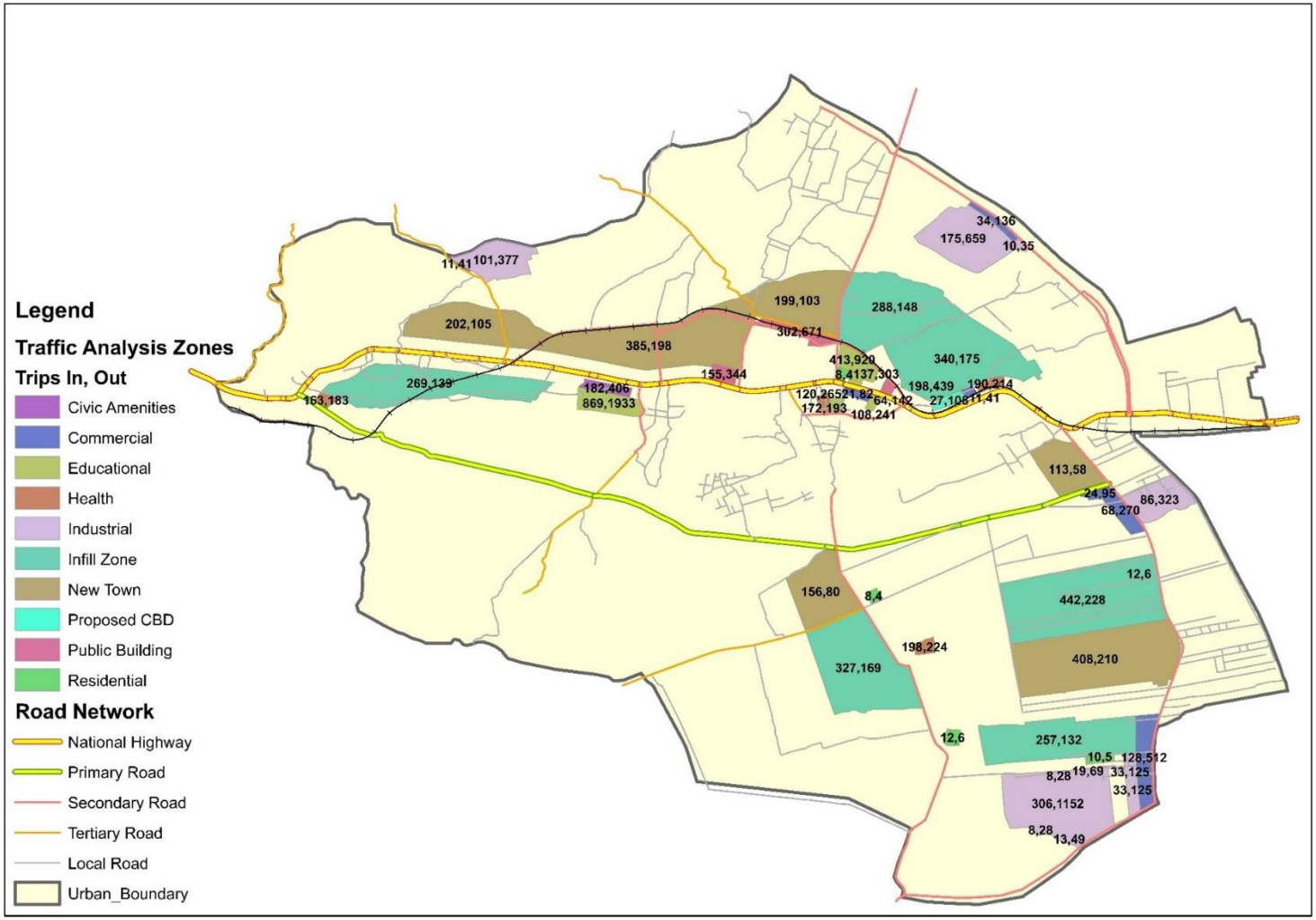


Figure 6-18: Trip Generation for Each Zone

6.6.8.1.2. Trip Distribution

An Origin Destination Matrix analysis was carried out to estimate the interaction between the existing proposed zones based on the trip generations and attractions calculated in the previous section.

While a 50x50 matrix was prepared to represent all origin and destination zones, the following assumptions were made for more logical trip distribution:

1. No Intra-Zonal Trips
2. No trips occur between residential zones.
3. The sum of productions for each zone should equal to “trips out” indicated in the trip generation table.
4. The relative proportion of trips originating from a zone is considered to model skews in trip assignment caused by large trip generating zones.

VISSUM’s trip distribution module was used to calculate the trip distribution matrix using a combined utility model and with production constraint parameters.

The result origin destination forecast matrix is shown below.

These trips can be assigned to the road network along the routes generated during the network assignment process in the next section to predict the traffic loads on Jamrud’s Road network.

Table 6-37: Origin Destination Forecast

TAZ		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	Residential	0	2	0	0	0	8	8	8	8	1	0	0	3	8	8	9	0	8	8	10	9	1	12	7	1	12	8	5	10	0	1	0	0	0	0	4	3	0	7	8	0	0	0	0	0	12	0	12	5	5
2	Industry	2	0	2	2	6	9	9	9	9	1	4	3	4	9	9	9	9	9	9	10	9	2	13	8	1	12	9	5	11	2	1	3	4	7	6	4	4	4	8	8	10	8	9	10	12	13	12	13	6	6
3	Industry	0	2	0	2	6	9	8	8	8	3	3	3	4	9	9	9	8	9	8	10	9	2	13	8	1	12	9	5	10	1	1	3	4	6	6	4	3	4	7	8	9	8	9	10	12	12	11	13	6	6
4	Industry	0	2	2	0	6	8	8	8	8	1	4	2	3	8	8	8	8	8	8	10	9	1	12	7	1	12	8	5	10	2	1	2	4	6	6	4	3	4	7	8	9	8	9	10	11	12	11	12	5	5
5	Residential	0	6	6	6	0	4	4	4	4	6	0	0	3	4	4	4	0	4	4	5	4	6	8	7	5	7	4	1	6	0	5	0	0	0	0	4	3	0	6	7	0	0	0	0	0	8	0	8	4	5
6	Education	9	9	9	9	6	0	1	0	3	9	8	6	6	1	1	1	1	1	1	3	2	9	7	4	8	6	1	7	7	9	8	8	7	7	6	6	6	5	4	4	2	3	2	5	6	7	7	7	1	2
7	Commercial	8	9	9	8	6	1	0	0	3	9	8	6	5	1	1	1	0	1	0	3	2	9	6	4	8	6	1	7	7	9	8	8	7	7	6	6	6	5	4	4	2	3	2	5	6	6	7	6	1	2
8	Education	9	9	9	9	5	0	0	0	0	10	8	7	6	1	1	1	1	1	1	2	1	9	6	4	8	6	1	6	7	9	8	8	7	6	5	6	6	6	4	4	2	3	1	5	5	6	6	6	1	2
9	Health	9	9	9	9	5	1	1	0	0	9	7	7	6	1	1	1	1	1	1	2	1	9	6	4	8	6	1	6	7	9	8	8	7	6	5	6	6	6	3	4	2	3	1	5	5	6	6	6	1	2
10	Industry	1	1	3	1	6	9	9	9	9	0	4	3	4	9	9	9	9	9	9	11	9	1	13	8	2	13	9	6	11	3	2	3	5	7	6	4	4	4	8	8	10	9	10	11	12	13	12	13	6	6
11	Residential	0	4	3	4	0	6	6	6	6	4	0	0	5	6	6	6	0	6	6	7	6	4	10	9	3	9	6	3	8	0	3	0	0	0	0	6	5	6	9	9	0	0	0	0	0	10	0	10	7	7
12	Residential	0	3	3	2	0	6	6	6	6	3	0	0	1	6	6	6	0	6	6	8	7	3	10	5	2	10	6	3	8	0	2	0	0	0	0	1	1	2	5	6	0	0	0	0	0	10	0	10	3	3
13	Commercial	3	4	4	3	3	5	5	5	5	4	5	1	0	5	5	6	5	5	5	7	6	4	9	4	3	9	5	4	7	4	3	3	2	4	3	1	0	1	4	5	6	5	6	7	9	9	8	9	2	2
14	Public Building	8	9	8	8	6	2	2	2	3	9	8	6	5	0	1	1	2	1	2	3	1	9	6	4	7	6	1	7	7	9	8	8	7	7	6	6	5	5	3	4	2	3	2	5	6	6	6	6	1	2
15	Education	8	9	8	8	6	2	2	2	3	9	8	6	5	1	0	1	2	1	2	3	1	9	6	4	7	6	1	7	7	9	8	8	7	7	6	6	5	5	3	4	2	3	2	5	6	6	6	6	1	2
16	Education	8	9	9	8	5	1	1	1	2	9	7	6	5	1	1	0	1	0	1	2	1	9	5	3	8	5	1	6	6	9	8	8	7	6	5	6	6	5	3	3	1	2	1	4	5	5	5	5	1	2
17	Residential	0	9	9	8	0	1	0	1	2	9	0	0	5	1	1	1	0	0	0	2	1	9	6	3	8	5	1	6	6	0	8	0	0	0	0	6	5	0	3	4	0	0	0	0	0	6	0	6	1	2
18	Education	9	9	9	8	5	1	1	1	2	9	7	6	6	1	1	0	0	0	0	2	1	9	6	3	8	5	1	6	6	9	8	8	7	6	5	6	6	5	3	3	1	2	1	4	5	6	6	6	1	2
19	Education	8	9	9	8	5	1	0	1	2	9	7	6	5	1	1	1	0	0	0	2	1	9	6	4	8	6	1	6	6	9	8	8	7	6	5	6	5	5	3	4	1	3	1	4	5	6	6	6	1	2
20	Public Building	8	9	8	8	4	1	1	1	1	9	6	6	5	2	2	1	1	1	1	0	1	9	6	4	7	6	2	5	5	9	8	8	7	5	4	6	5	6	4	4	2	3	2	1	6	6	6	6	2	3
21	Public Building	9	9	9	9	5	1	1	1	2	10	7	7	6	1	1	1	1	1	1	2	0	9	5	3	8	5	2	6	6	9	8	8	8	6	5	6	6	6	3	4	1	3	0	4	4	5	5	5	2	2
22	Industrial	1	2	2	1	6	9	9	9	9	1	4	3	4	9	9	9	9	9	9	10	9	0	13	8	1	12	9	5	11	2	1	3	4	7	6	4	4	4	8	8	10	8	9	10	12	13	12	13	6	6
23	Commercial	10	11	11	10	6	3	3	3	3	11	8	8	7	4	4	4	3	3	3	3	4	11	0	6	10	2	4	7	3	11	10	10	9	7	6	8	7	8	6	6	4	5	4	3	1	2	2	1	4	5
24	Industrial	7	8	7	7	7	4	4	4	5	8	9	5	4	4	4	3	3	3	3	4	3	8	8	0	6	8	4	7	9	8	7	7	6	8	7	5	4	4	1	1	4	2	4	7	8	8	8	8	4	5
25	Commercial	1	1	1	1	5	8	7	7	7	2	3	2	3	8	8	8	7	8	7	9	8	1	12	7	0	11	8	4	9	1	0	2	3	6	5	3	2	3	6	7	8	7	8	9	11	11	10	12	4	5
26	Civic Amenities	9	9	9	9	4	2	2	2	2	10	7	7	6	2	2	2	2	2	2	1	2	9	2	5	8	0	2	5	2	9	9	8	8	5	4	7	6	6	5	5	3	4	3	1	1	1	2	2	3	3
27	Proposed CBD	8	9	9	8	6	2	2	2	3	9	8	6	5	1	1	1	2	1	2	3	2	9	6	4	8	6	0	7	7	9	8	8	7	7	6	6	5	5	4	4	2	3	2	5	6	6	6	6	1	1
28	Health	5	5	5	5	1	5	5	5	5	6	3	3	4	5	5	5	4	5	5	6	5	5	9	8	4	8	5	0	6	5	4	4	4	2	1	4	4	4	7	8	5	7	5	6	8	8	8	9	5	6
29	Health	10	11	10	10	6	4	4	4	4	11	8	8	7	4	4	4	3	4	4	3	4	11	3	7	9	2	4	6	0	10	10	10	9	6	5	8	7	7	6	7	4	6	4	3	2	2	2	3	4	5
30	Infill Zone	0	2	1	2	0	9	9	9	8	3	0	0	4	9	9	9	0	9	8	10	9	2	13	8	1	12	9	5	10	0	1	0	0	0	0	4	3	0	8	8	0	0	0	0	0	12	0	13	6	6
31	Industrial	1	1	1	1	5	8	8	8	8	2	3	2	3	8	8	8	8	8	8	9	8	1	12	7	0	11	8	4	10	1	0	2	3	6	5	3	3	3	7	7	9	7	9	9	11	12	11	12	5	5
32	New Town	2	3	3	2	6	8	8	8	8	3	4	2	3	8	8	8	8	8	8	9	8	3	12	7	2	11	8	4	10	3	2	0	3	6	5	3	3	3	7	7	0	0	0	0	0	12	0	12	5	5
33	Infill Zone	4	4	4	4	5	7	7	7	7	5	6	2	2	7	7	7	7	7	7	8	7	4	11	6	3	11	7	4	9	4	3	3	0	6	5	2	2	2	6	6	0	0	0	0	0	11	0	11	4	4
34	Infill Zone	6	7	6	6	1	5	5	5	4	7	3	5	4	5	5	5	4	5	4	6	5	7	9	8	6	8	5	2	6	6	6	6	6	0	1	4	4	4	7	8	0	0	0	0	0	8	0	9	5	6
35	New Town	6	6	6	6	1	4	4	4	4	6	3	4	3	4	4	4	3	4	4	5	4	6	8	7	5	7	4	1	5	6	5	5	5	1	0	4	3	3	6	7	0	0	0	0	0	7	0	8	4	5
36	Industrial	4	4	4	4	4	6	6	6	6	4	6	1	1	6	6	6	6	6	6	7	6	4	10	5	3	9	6	4	8	4	3	3	2	4	4	0	1	1	5	5	7	5	7	7	9	10	9	10	3	3
37	Commercial	3	4	3	3	3	5	5	5	5	4	5	1	0	5	5	6	5	5	5	7	6	4	9	5	2	9	6	4	7	3	3	3	2	4	3	1	0	1	4	5	6	5	6	7	9	9	8	9	2	2
38	New Town	4	4	4	4	3	6	6	6	6	4	6	2	1	5	5	5	5	6	6	7	6	4	10	4	3	9	5	4	7	4	3	3	2	4	3	1	1	0	4	4	6	5	6	7	9	9	0	10	2	2
39	Industrial	7	8	7	7	7	4	3	4	5	8	9	5	4	3	3	3	3	3	3	4	3	7	8	1	6	8	4	7	9	7	7	7	6	8	7	5	4	4	0	1	3	2	3	7	7	8	8	8	4	4
40	Commercial	7	8	8	7	7	4	4	4	5	8	9	5	4	4	4	3	4	3	4	5	4	8	8	1	7	8	4	8	9	8	7	7	6	8	7	5	5	4	1	0	4	2	4	7	8	8	8	8	4	5
41	Infill Zone	0	10	9	9	0	2	1	2	3	10	0	0	6	2	2	1	0	1	1	2	1	10	6	4	8	6	2	6	7	0	9	0	0	0	0	7	6	0	3	4	0	0	0	0	0	6	0	6	2	3
42	Infill Zone	0	8	8	7	0	3	3	3	4	8	0	0	5	3	3	2	0	2	3	4	3	8	7	2	7	7	3	8	8	0	7	0	0	0	0	5	5	0	2	2	0	0	0	0	0	7	0	7	3	4
43	New Town	0	10	9	9	0	1	1	2	3	10	0	0	6	2	2	1	0	1	1	2	0	10	5	4	8	5	2	6	6	0	9	0	0	0	0	7	6	0	3	4	0	0	0	0	0	5	0	5	2	3
44	New Town	0	9	9	9	0	2	2	2	2	10	0	0	6	2	2	2	0	2	2	1	2	9	6	5	8	5	2	5	5	0	8	0	0	0	0	6	6	0	5	5	0	0	0	0	0	6	0	6	3	3
45	New Town	0	10	10	10	0	3	3	3	3	11	0	0	7	3	3	3	0	3	3	2	3	10	1	6	9	1	3	6	2	0	9	0	0	0	0	7	7	0	5	6	0	0	0	0	0	1	0	1	3	4
46	Educational	9	9	9	9	4	2	2	2	2	10	7	7	6	2	2	2	2	2	2	1	2	9	2	5	8	1	2	5	2	9	8	8	8	5	4	6	6	6	5	5	3	4	2	1	1	0	2	2	3	3
47	Infill Zone	0	11	10	10	0	3	3	3	3	11	0	0	7	3	3	3	0	3	3	2	3	11	2	6	9	2	3	6	2	0	10	0	0	0	0	8	7	0	6	6	0	0	0	0	0	2	0	2	4	4
48	Industrial	11	11	11	10	6	3	3	3	3	11	8	8	8	4	4	4	3	3	3	3	4	11	1	6	10	2	4	7	3	11	10	10	9	7	6	8	8	8	6	7	4	5	4	3	1	2	2	0	4	5
49	Commercial	5	6	6	5	5	7	7	7	7	6	7	3	2	7	7	7	7	7	7	9	8	6	11	6	4	11	1	5	9	6	5	5	4	6	5	3	2	2	6	6	8	6	8	9	10	11	10	11	0	1
50	Health	5	6	6	5	5	7	7	7	7	6	7	3	2	7	7	7	7	7	7	9	8	6	11	6	5	11	7	6	9	6	5	5	4	6	5	3	2	2	6	6	8	6	8	9	10	11	10	11	1	0

6.6.8.1.3. Mode Choice

It is assumed that the primary mode of travel in Jamrud is private Vehicle (Car).

6.6.8.1.4. Network Assignment

VISSUM's *Private Transport Assignment Procedure* was used to assign the trips occurring between each zone along the existing road network of Jamrud with the primary factor of impedance being total Travel Time (Based on Road Class and Speed).

An equilibrium assignment method was used to assign vehicles to different roads such that average delay or impedance is relatively equal for all road users.

The network assignment results show that the New Jamrud Bypass, Jamrud Barra Link Road, Jamrud Bazzar Bypass, Shah Kass Road, Zahir Ali Kaly Road, Dr Sarfraz Khan Road/ Grand Truck Road will be the most utilized roadway during the peak hour due to the presence of Industrial and Residential Land Uses along its corridor. These 1 to 2-lane cross sections would however be able to accommodate this traffic with a maximum V/C Ratio of 1.02 to 2.49.

These roads will also face capacity and congestion issues in the vicinity of the Central business district where there is a significant presence of Education, Health, Public Buildings, Civic Amenities and Commercial Areas.

National Highway Road and Tiddi Bazaar Road will also be subject to volume to capacity ratios of 0.82 and 0.78 respectively in the vicinity of the Headquarter and Central Business District.

Table below summarizes the effects of future traffic on each road while figure below illustrates the condition of Jamrud's future road network if no improvements are made and only access links were constructed. Note that this table also includes unnamed local roads which are expected to be utilized by vehicles.

Table 6-38 Future Volume to Capacity Ratios of Key Roads

Name	LENGTH	NUM of LANES	CAPPRT	V0PRT	Peak Hour Volume	V/C Ratio
National Highway N-5	10.1	4	3600	100km/h	2948	0.82
Jamrud Southern Bypass	7.8	2	1800	80km/h	1280	0.71
Warsak Dam Road	3	4	3600	80km/h	2002	0.56
Dr Sarfraz Khan Road/ Grand Truck Road	3	1	900	50km/h	914	1.02
Haji Abdullah Shah Kali Road	1	1	900	50km/h	1370	0.52
New Jamrud Bypass	2	1	900	50km/h	2238	2.49
Zahir Ali Kaly Road	0.96	1	800	50km/h	903	1.13
Hayatabad FATA Road	2.8	2	900	70km/h	626	0.7
Jamrud Barra Link Road	4.5	2	900	80km/h	1402	1.56
Jamrud Bazzar Bypass	2.56	2	900	80km/h	1138	1.26
Regi Model Town Road	4.54	2	1800	80km/h	1158	0.64
Shah Kass Road	6.25	2	1800	80km/h	2049	1.14
Tiddi Bazzar Road	1	1	400	50km/h	311	0.78

**Roads with the same name refer to different segments of the same road. Roads were divided into segments for better detailed analysis.*

*** Capacity of each road is assumed based on HCM 2010 formula 1800*(N-1+P_S) and further reduced by 25-50% to account for congestion and road class.*

****Based on Traffic Count Data*

*****Based on trip generation, distribution, and route assignment*

******Existing Peak hour volume + Induced Volume*

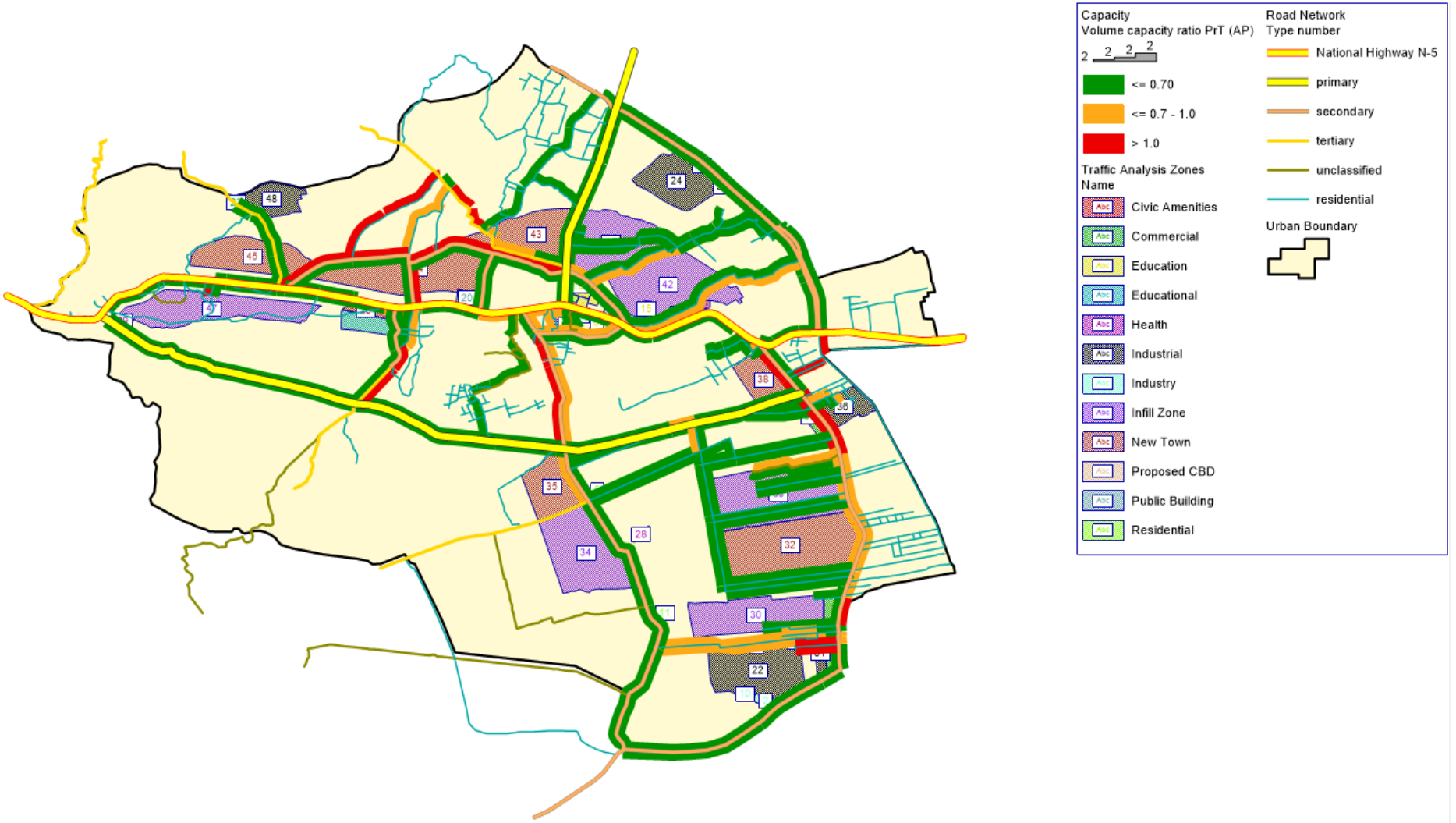


Figure 6-19: Future Peak Hour Volume to Capacity Ratios of Existing Road Network

The above analysis shows that the roads in the vicinity of the center business district/tehsil headquarter may be subject to congestion in the long term during the peak hour. This is mainly due to higher trips and their existing 1 to 2 lane cross sections which cause them to have a low capacity, approximately 900 to 1800 Vehicles/Hour.

It is therefore recommended that the roads highlighted in red in the previous figure be widened/ dualized to include an additional lane.

6.6.8.2. Road Network Proposals

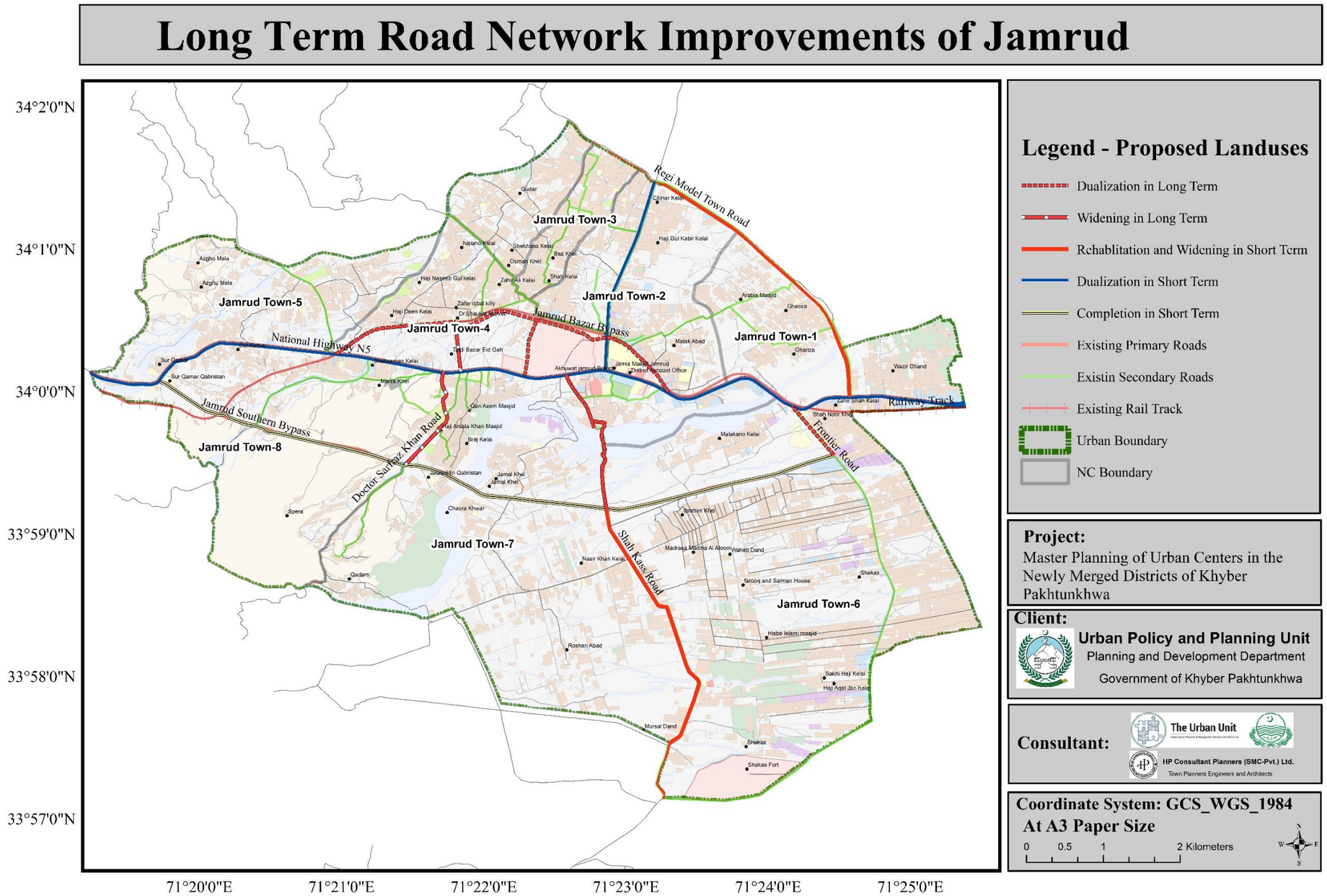
Based on the above analysis, it is necessary to widen the highlighted roads in the long term to accommodate for the additional traffic induced by the proposed land uses.

In addition, dualization are required to accommodate trips produced due to new land uses situated near the Urban Boundary of Jamrud.

1. Industrial Zone 1 (North)
2. Industrial Zone 2 (South)
3. Industrial Zone 3 (East)
4. Industrial Zone 4 (West)
5. New Town 2 Zones (South)
6. New Town 3 Zones (North)
7. Timber Market (South)

Figures below illustrate the proposed long-term improvements and the subsequent volume-to-capacity ratios after re-assignment of traffic to new roads.

Due to the improved capacities of the new roads and the shorter travel time offered by the improved links, the model calculated several trips utilizing the new roads and an overall improved volume of capacity ratio for most links. No link exhibits a V/C ratio of more than 1 under the improved conditions.



Map 28: Proposed New Roads/ Long Term Road Network Improvements

Source: The Urban Unit

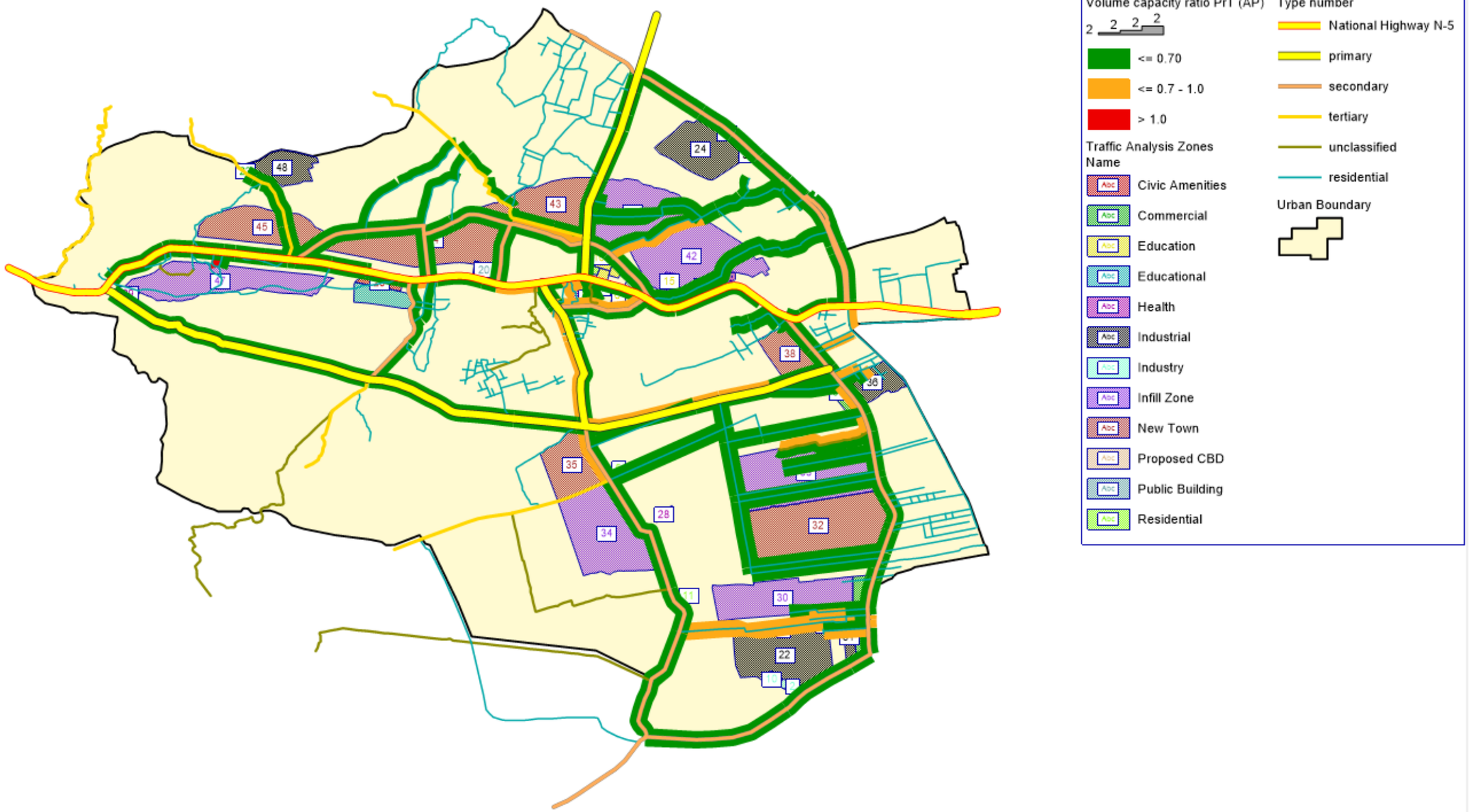
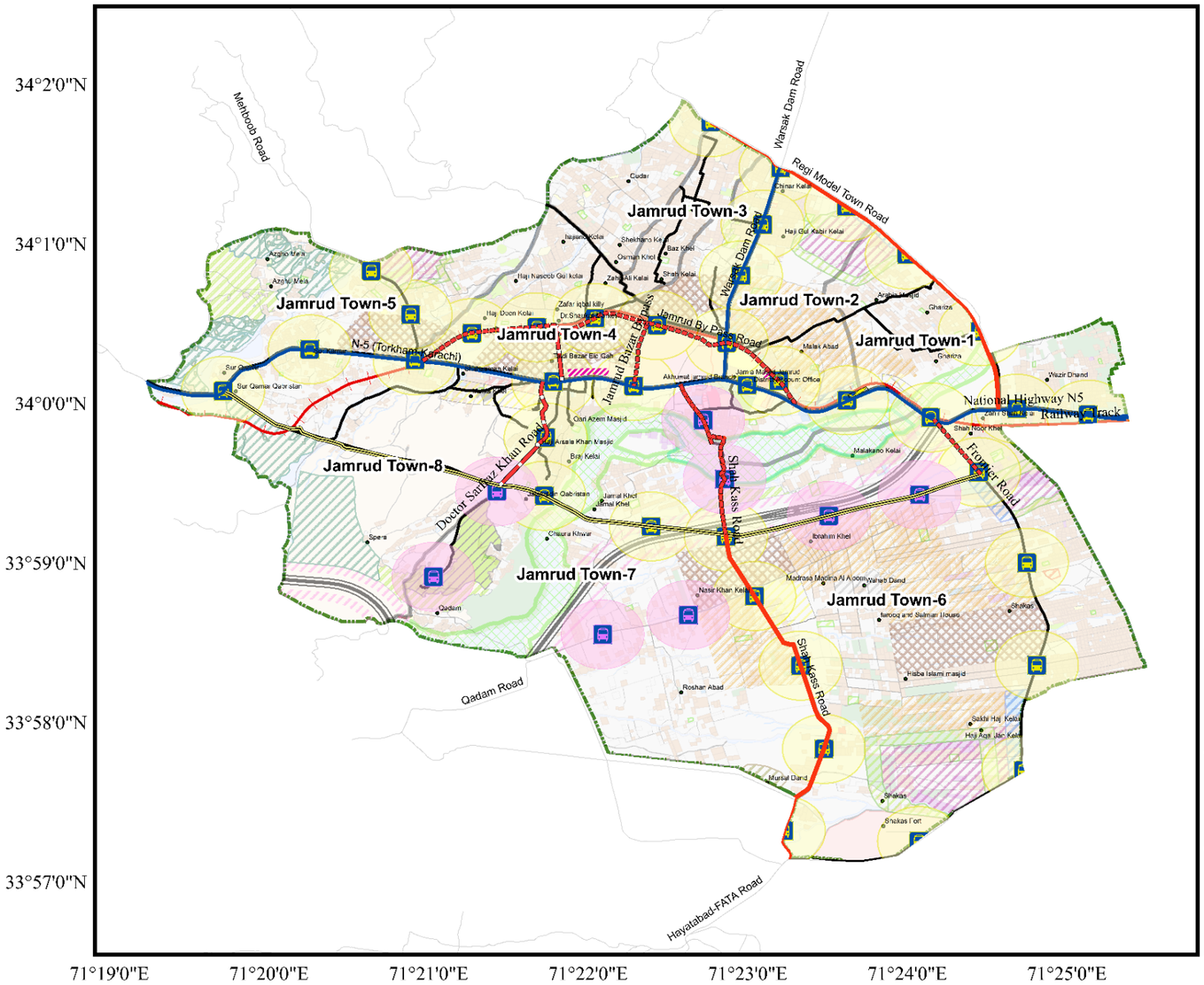


Figure 6-20 Future VC Ratios with New Roads

Overall Road Netwrok of Jamrud



Legend - Proposed Landuses

- Transit Stop proposed in Short Term
- Future Transit Stop
- Rehabilitation and Widening in Short Term
- Dualization in Short Term
- Completion in Short Term
- Dualization in Long Term
- Widening in Long Term
- Proposed Economic Comm/Mixed Use
- Existing Primary Roads
- Existin Secondary Roads
- Existing Rail Track
- Proposed Public Transport Terminal
- Proposed Parking Lot
- Existing Cachment
- Future Cachment
- Commercial Zone
- Cattle Fair
- Livestock Zone
- Slaughter House
- Educational Zone
- Civic Amenities Zone
- Land fill Site
- Graveyard Zone
- Green Space
- Health Zone
- Industrial Zone
- Infill Residential Zone
- New Residential Town
- Delcarec as CBD
- Proposed Plantation
- Proposed Park
- Proposed Cycling Track
- Chaura Khwar Beautification
- NC Boundary
- Urban boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 1 2 Kilometers

Map 29: Overall Road Network Plan

Source: The Urban Unit

6.6.8.2.1. Proposed Cross Sections for Road Widenings and Dualizations

The widened roads are proposed to be two-lane single carriageways (3meter driveways + 2.5-meter shoulders with a total cross section of 16 meters. Sidewalks between 2.5 meters - 4.5 meters wide are to be provided on either side of the road. A typical cross-section for local roads in urban environments is shown in the figure below.

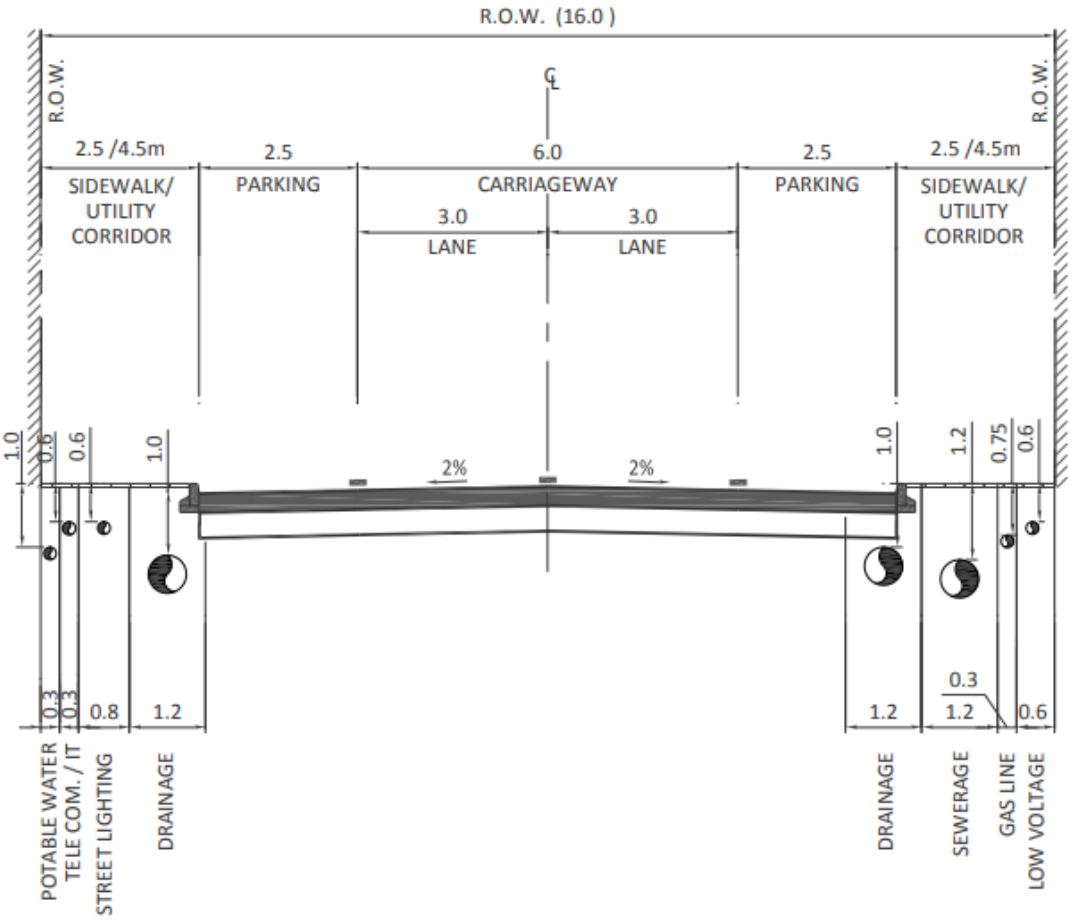


Figure 6-21: Typical Cross Section for Roads in Jamrud

Source: Geometric Design Guidelines (UPPU)

The dual roads are proposed to be four-lane dual carriageways (7.3-meter driveways + 2.5-meter shoulders + 3-meter median with a total cross section of 30 meters. Sidewalks between 2.5 meters - 4.5 meters wide are to be provided on either side of the road. A typical cross-section for local roads in urban environments is shown in the figure below.

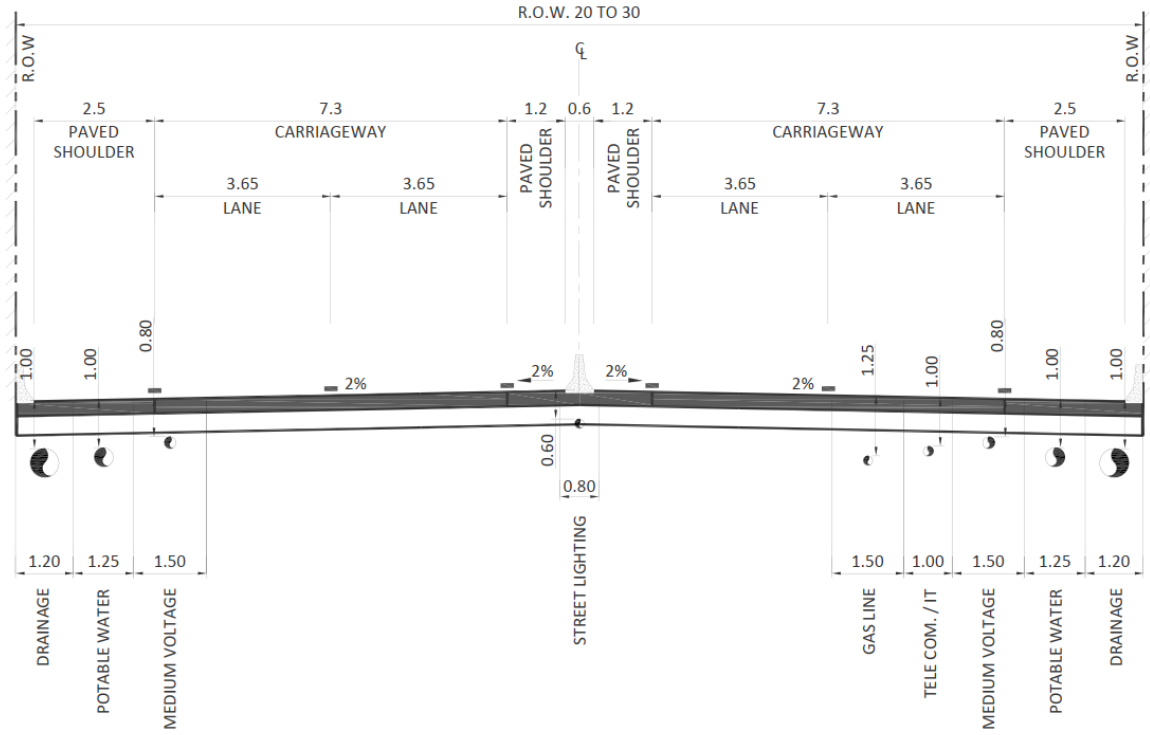


Figure 6-22 Typical Cross Section for Dual Roads in Jamrud

Source: Geometric Design Guidelines (UPPU)

These typical cross sections are based on the Khyber Pakhtunkhwa Geometric Design Guidelines[13]. In terms of Right-of-ways, the minimum right of way to be acquired should be at minimum 16 meters for widening and 30 meters for dualization based on the proposed cross-sections and the owning authorities' own standards. These, however, may be modified based on true availability of land during implementation.

6.6.8.3. Provision of Footpaths or Sidewalks

The lack of sidewalks on most urban roads in Jamrud forces pedestrians to use road spaces that are already crowded due to encroachments. It is therefore recommended that ample space be preserved for the provision of sidewalks in all future road extension or construction projects in Jamrud City urban areas.

[13] KP Geometric Design Guidelines https://urbanpolicyunit.gkp.pk/wpcontent/uploads/2018/07/Interim-Report-3_GDM_KP_12-01-2018.pdf.

The construction of all sidewalks shows follow the following criteria:

- Sidewalks should blend with the surrounding streetscape.
- In populated areas, a ribbon sidewalk should be provided in the city.
- In heavily populated areas, a complete sidewalk should be provided on both sides.
- Sidewalks and tree strips should be at least 2.5 meters in proportion to the width of the road and street.
- The Footpath should be wide enough for two people to pass each other comfortably, wheelchairs must be able to pass each other and turn around with sufficient space between them.
- At any pedestrian crossing, pedestrian ramps should be provided for on and off-street access, and separate ramps should be associated with each intersection.
- The detectable warning strip should be painted in a bright color that contrasts with the adjacent pavement.
- Permeable pavement should be used instead of impermeable pavement with proper storm-water protection where possible.

The Khyber Pakhtunkhwa Geometric Design Guidelines may be referred to for more design parameters and criteria for sidewalks[14]

[14] KPK Geometric Design Guidelines https://urbanpolicyunit.gkp.pk/wpcontent/uploads/2018/07/Interim-Report-3_GDM_KP_12-01-2018.pdf.

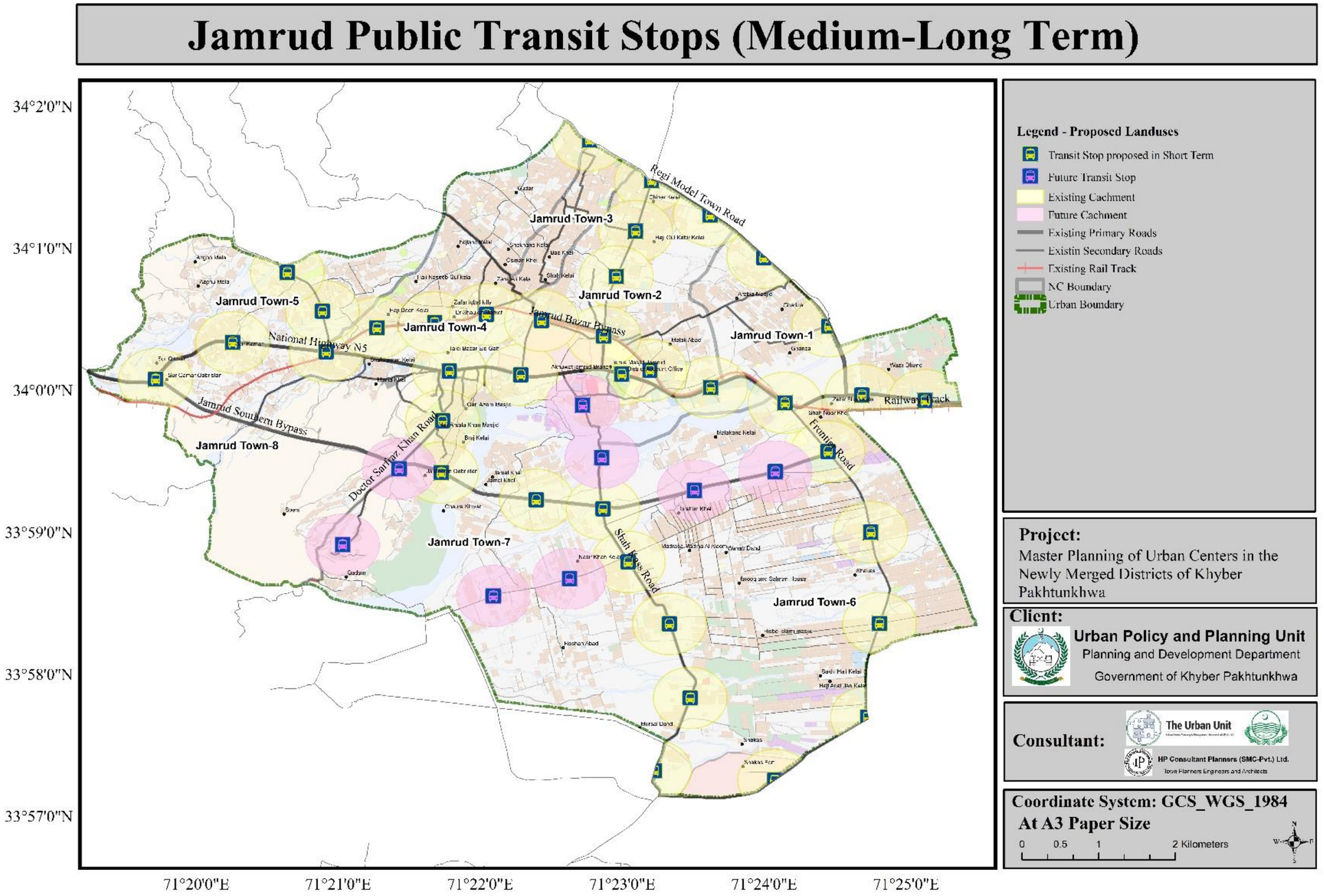
6.6.8.4. Traffic Management System

The field survey of the study area revealed that the vehicular mobility on the roads of Jamrud city is largely irregular with phenomenal delays because of traffic congestion, improper use of road space irregular parking with no dedicated parking space particularly in the trading areas of Jamrud city. There is no proper traffic management mechanism considering the embryonic state of the administrative change during last couple of years. Lack of sufficient traffic mangers and other essential infrastructure such traffic signals, signs, pavement marking, sidewalks, pedestrian crossings and other traffic control devices (TCDs) has resulted in chaos and degraded urban environment on the roads of Jamrud. The dependency of a large urban population on the core central place of the cities for meeting the routine daily needs has multiplied the associated mobility problems manifolds.

6.6.8.5. Enhanced Public Transit Services

Building upon the public transit service areas proposed in the short-term, a medium/long term public transit strategy is also provided to facilitate the future land use zones.

The figure below illustrates the locations of proposed transit stops to be provided in the future. Note that these stops follow the same criteria of a 250-meter service catchment and are situated along the new proposed secondary roads. They are also situated such that future land uses can be accommodated. The route planning and scheduling between all the proposed stops can be determined by the relevant implementation agency.



Map 30: Medium/Long Term Public Transit Stops

Source: The Urban Unit

6.6.8.6. Bus service for the intracity mobility

It is anticipated that the city will attract more international tourists if economic activity increases in the near future. It will open new opportunities for the city's social well-being and overall quality of life. It would therefore be necessary to provide better, more secure, and more comfortable intracity mobility services. As a result, it is proposed that bus services for high volume passenger transport be implemented.

The current dependency on the car as a public transport is costly besides being damaging to the environment. It is recommended that the feeder Bus service from Karkhano market in the west of Peshawar to Jamrud Bazar should be installed to support greater moving population in the years to come at reasonable rates. Being relatively flexible in the sense of reachability, the bus service can supplement the railways and help more population with easy, safe and economical travelling.

6.6.8.7. Provision of Infrastructure for Non-Motorized Transport

The provision of infrastructure only for motorized modes of transportation will not serve the problem; facilities for non-motorized road users are also required. For example, Sidewalks, pedestrian bridges, underpasses, and bicycle lanes. However, these facilities are always vulnerable to encroachment; therefore, strict enforcement policies should be implemented to discourage vehicle parking in such spaces and the use of these areas for commercial purposes. School-age children, women, the elderly, and the disabled are particularly affected because they must cross busy roads during peak hours.

Appropriate pedestrian phases in signals or push button around traffic signal installation in pedestrian demand areas can help to improve pedestrian safety while assisting older, females, and people traveling for medical treatment. It is also critical to educate the public on the proper use of traffic signs, signals, and other markings etc.

6.6.8.8. Restoration and Upgradation of Peshawar Jamrud Railway track

The existing railway services between Peshawar and Jamrud have been halted in the recent past. The Household information survey revealed that a significant number (58%) of the respondents spend less than Rs100 on their daily commute and require

a cheaper source of transport. It is recommended that the historic railway line be restored and upgraded to support the moving population in the coming years.

6.6.9. Regulatory Measures

6.6.9.1. *Removal of Roadside Encroachments*

There is a need to remove all encroachments, such as those caused by illegal parking and commercial activities, so that the road carriageway width can be increased, and traffic can continue to flow smoothly without traffic jams and delays.

The pavement conditions of the road network may be reviewed regularly in terms of various pavement distresses such as cracking and rutting. Regular road maintenance is required to ensure that traffic flows smoothly.

The intrusion of businesses, vendors, street hawkers, makeshift taxi stands, and illegal on-street parking onto the right-of-way of the main road in Jamrud commercial areas is a major cause of traffic congestion and pedestrian inconveniences. The main Jamrud Bazaar has a service road along the entire length of the road, but this (service road) is occupied by illegal encroachers. The Tehsil Municipal Administration lacks the capacity to stop encroachment which leads to traffic jams and severe congestion particularly during peak hours. Pedestrian infrastructure is also affected by encroachment causing severe inconvenience.

Controlling encroachments that cause traffic jams and peak hour congestion is therefore required along the road network. It is proposed to implement a strict policy that discourages encroachment of the road space. The policy is to be enforced by the city's administration via policing. Establishing an Anti-Encroachment Squad as has been done by the Municipal Corporation of Lahore may be considered.

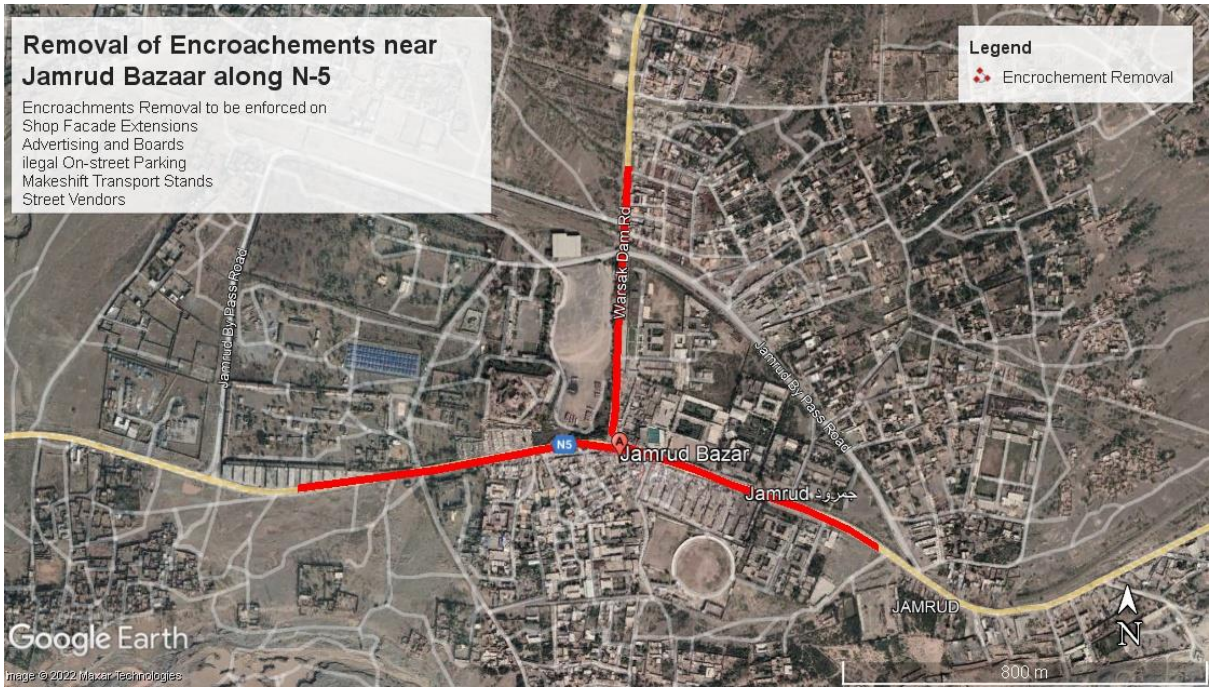


Figure 6-23: Encroachment Removal Areas in Jamrud Bazar

6.6.9.2. Institutional capacity building

The post-2018 scenario of the district Khyber Pakhtunkhwa, with administrative amendments, has brought new opportunities for growth and development. For this purpose, the development of institutions and data repositories of existing infrastructure is required. In this context, it is essential to enhance the capacity of the relevant supporting institutes like Construction and Works Department (C&W), Local Government and Rural Department, Transport Department and Traffic Police Department in terms of both manpower and equipment.

The primary institution overseeing transportation in Jamrud is the Transportation Line Department of the Khyber District Administration. It is recommended that the following personnel and equipment, at minimum, be provided for the planning, execution, and monitoring of the proposed transportation related interventions.

Table 6-39: Recommended HR and Equipment for Institutional Capacity Building

Human Resource	Responsibilities	Nos.
Civil/Transportation Engineer	- Preparation of PC-1s for infrastructure construction projects - Tendering and Procurement of Design and Construction Services. - Monitoring transportation development activities.	1
Technical Writers (Engineers or DAEs)	Assisting the Engineer in preparing requisite documents for project conception, procurement, and implementation	2
GIS Operator (BS or DAE)	Assisting the Engineer Preparation of Transportation Infrastructure Maps	1
Quantity Surveyor (DAE or Engineer with expertise in CAD)	Estimation of Material Quantities from preliminary designs for costing and procurement purposes	1
Public Transport Officer (BSc.)	Issuance of Route Permits to Vehicle Operators Maintaining Database Record of Route Permits	1
Facilities	**Purpose**	**Nos.**
Computers or Laptops equipped with basic software and GIS, CAD.	1 per personnel to prepare reports, drawings, cost estimations, maps, letters, and communicate with other entities.	6
Printer	One for entire transportation team	1

As Jamrud develops as an urban locality and the District Administration matures, it is recommended that the transportation department develops in-house surveying and design capabilities for planning and design of their transportation infrastructure in the long-term.

6.6.9.3. Provision of Road Signage

Signage systems are visual information aids that include signs, arrows, maps, pictograms, color scheme systems, and a variety of typographic components. Signage systems with different colors, themes, materials, shapes add color in the road environment and present a colorful view to the public. Most of the *black spots* on the

road network in Jamrud city can be eliminated by providing appropriate signage facilities.

Each newly constructed road and transportation facility is recommended to be supplemented by appropriate traffic and way finding signage. Examples of some road signs include:

- Distance Markers
- Way Finding Signs
- Posted Speed Limit Signs
- Populated Area Signs
- Transport Terminal Signs
- Tourist Attract Signs
- Road Hazards Signs (steep slopes, sharp turns, etc.)

Signage examples are shown in Figure below. Detailed specifications of the recommended signage in terms of colors, dimensions, and font size can be obtained from the Punjab Geometric Design Manual[15] and Ontario Traffic Manuals[16].

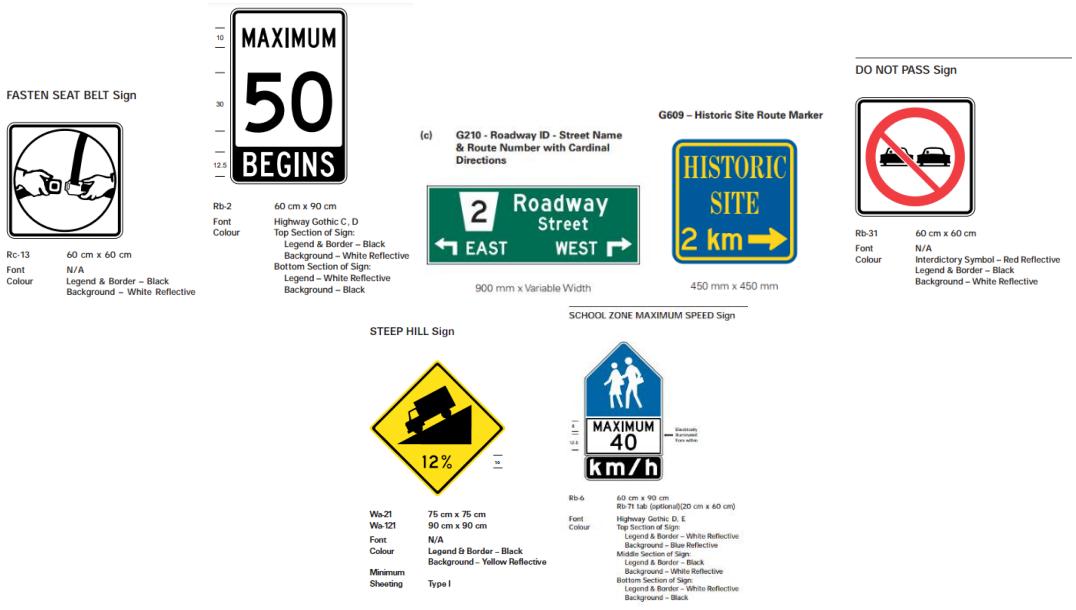


Figure 6-24: Example Roadside Signage

[15] Punjab Geometric Design Manual https://urbanunit.gov.pk/Download/publications/Files/8/2021/PGDM-Vol-2.pdf.
[16] Ontario Traffic Manuals https://inps.net/graphics/sites/default/files/pdf/MTO-Book-5.pdf

Signage is recommended to be written in both English and Urdu script to accommodate the local people of the region.

6.7. Landfill Site

Controlled landfill sites have been identified in Jamrud near Shah Kaas Road. The dumpsite area shall withstand the waste load of 25 years for Jamrud is 17 acres (7 Hectares). It is proposed that TMA should acquire this land on a priority basis to avoid open dumps in the area. This will help control illegal dumping of waste into drains and water bodies. Maps for Landfill suitability and identified land for potential disposal sites have been depicted in figures below

Table 6-40: Area Calculation for Landfill in Jamrud

Area Required for Controlled Dumpsite		
Design Criteria	**Waste Generation (t/d)**	33
	Density (ton/cu.m)	0.6
	Depth of L.F (m)	15
District	**Dimension**	**Value**
Jamrud	Volume (cu.m)	501,875
	Area (m2)	66,917
	Area (Acres)	17
	Area (Hectares)	7

Source: Recommended by the Urban Unit and HP Consultants

6.7.1. Rationale for the Proposed Landfill Site

The following parameters have been considered to identify zones for a landfill site in Jamrud:

- **Airports**: If a landfill is located within a specified distance of an airport, the owner or operator must demonstrate that the Landfill will not present a bird hazard to aircraft. The minimum acceptable distance of the Landfill from the airport is 5 km.
- **Flood plains:** For landfills located on a 100-year flood plain, the owner or operator must demonstrate that the Landfill will not restrict the flow of a 100-year flood, reduce the storage capacity of the flood plain, or result in the washout of solid waste.
- **Wetlands:** New landfills and lateral expansions can only be located in wetlands with no practical alternative.

- **Fault areas**: New landfills and lateral expansions must not be located within 200
- **Seismic zones:** New landfills and lateral expansions are restricted in areas susceptible to ground motion resulting from earthquakes.
- **Unstable areas:** Unless demonstrated otherwise, landfills must not be located in areas susceptible to natural or human-induced events or forces capable of impairing the integrity of landfill components. Examples of unstable areas are those with poor foundation conditions, areas susceptible to mass movements (landslides, rock falls, etc.), and areas with karst terrains (sinkholes).

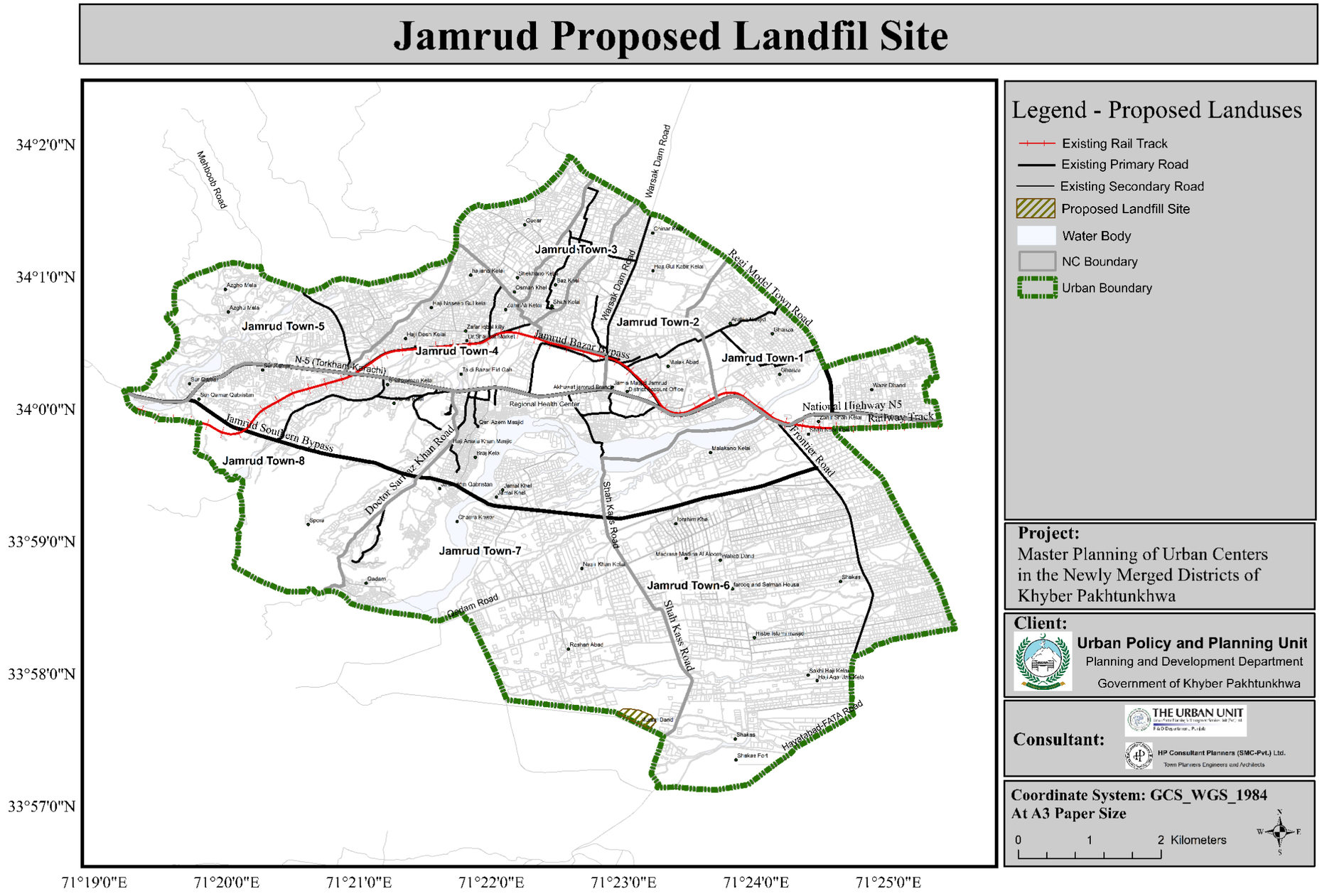
As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for landfill sites are below:

Table 6-41: Landfill Site Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Treatment or recycling plant, Petrol pump, Gas filling station,	Heavy, large and extensive industries, Loading/unloading facilities, Workshops for buses, Slaughter-housing, wholesale mandis, Public utilities,	Residential housing schemes; private and public both, Mixed use apartment buildings. Large health, recreational commercial and educational institutions, Agriculture and horticulture,

Grid station, Taxi/rickshaw stand, Parking lot.	Servicing/repair of farm equipment and machinery, Industrial Park.	Dairy and poultry farming Recreational facilities. any other that are not in permitted or permissible uses

Source: Urban Unit and HP Consultants



Map 31: Proposed Landfill Site

Source: The Urban Unit

6.8. Graveyard

Considering accessibility and planning standards, 04 areas for graveyards are designated in the city. These graveyards are near the proposed zones of development for ease of access. The graveyards can be further divided according to the requirement of practiced religions in the town.

Table 6-42: Graveyard Requirement

Existing area (sq. km.)	0.19
Existing area (in %)	0.40
Recommended NRM standard	0.5% to 4%
Recommended graveyard area – min (sq. km.)	0.24
Recommended graveyard area – max (sq. km.)	1.93
Required (Recommended (min) – Existing Land Use)	0.05
Required (Recommended (max) – Existing Land Use)	1.74
Proposed area 2040 (sq. km.)	0.21

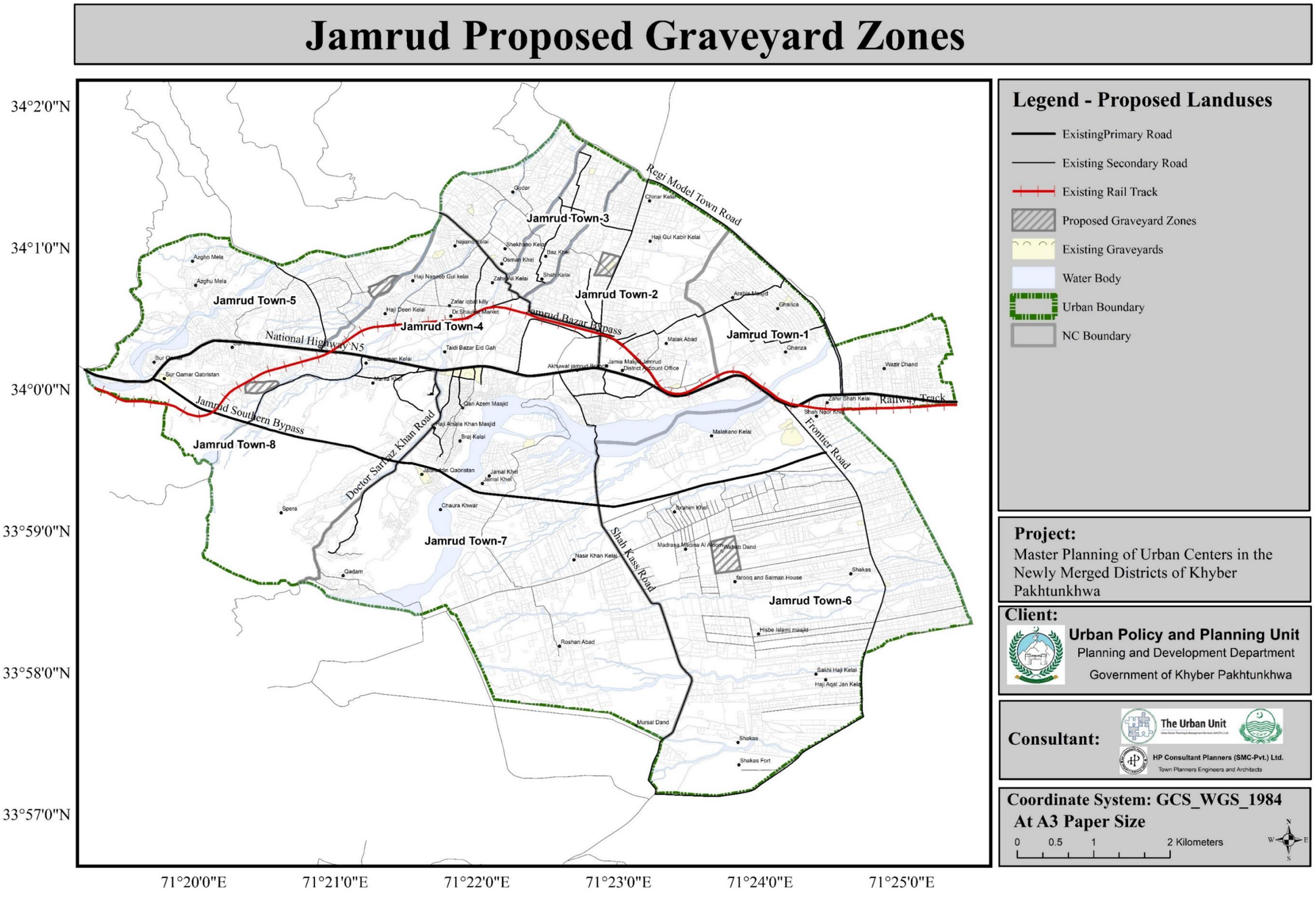
Source: Recommended by the Urban Unit and HP Consultants

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Graveyard sites are below:

Table 6-43: Graveyard Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Administration buildings Religious	residential for graveyard workers / caretakers Shops, Zoological garden	Heavy, large and extensive industries: noxious, obnoxious

building such as Mosques, Clinics/dispensaries Local shopping areas Retail stores may also be included such as flower shop / horticulture; and convenience stores Petrol pump, Gas filling station Parking facilities	Botanical garden, Bird sanctuary	and hazardous industries, warehousing, storage go-downs of perishables, hazardous, inflammable goods, Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Research laboratories treating contagious diseases.



Map 32: Proposed Graveyard

Source: The Urban Unit

6.9. Reserved Agriculture Area

The total Reserved Agriculture Area is 1.16 sq.km in Jamrud. The agriculture reserved area is multifaceted, encompassing environmental conservation, food security, economic sustainability, climate change resilience, and long-term planning. This strategic allocation aims to address the growing challenges associated with urbanization, population growth, and urban sprawl. The focus of this area will be on the agro-production of locally grown commodities, and all amenities and services will be offered to increase agricultural output within city limits. In this way, the city's spatial growth will be constrained, and the core of its agricultural activity will continue to stay in the vicinity of the city. Additionally, it will result in a healthy atmosphere and control the infrastructure network's spread.

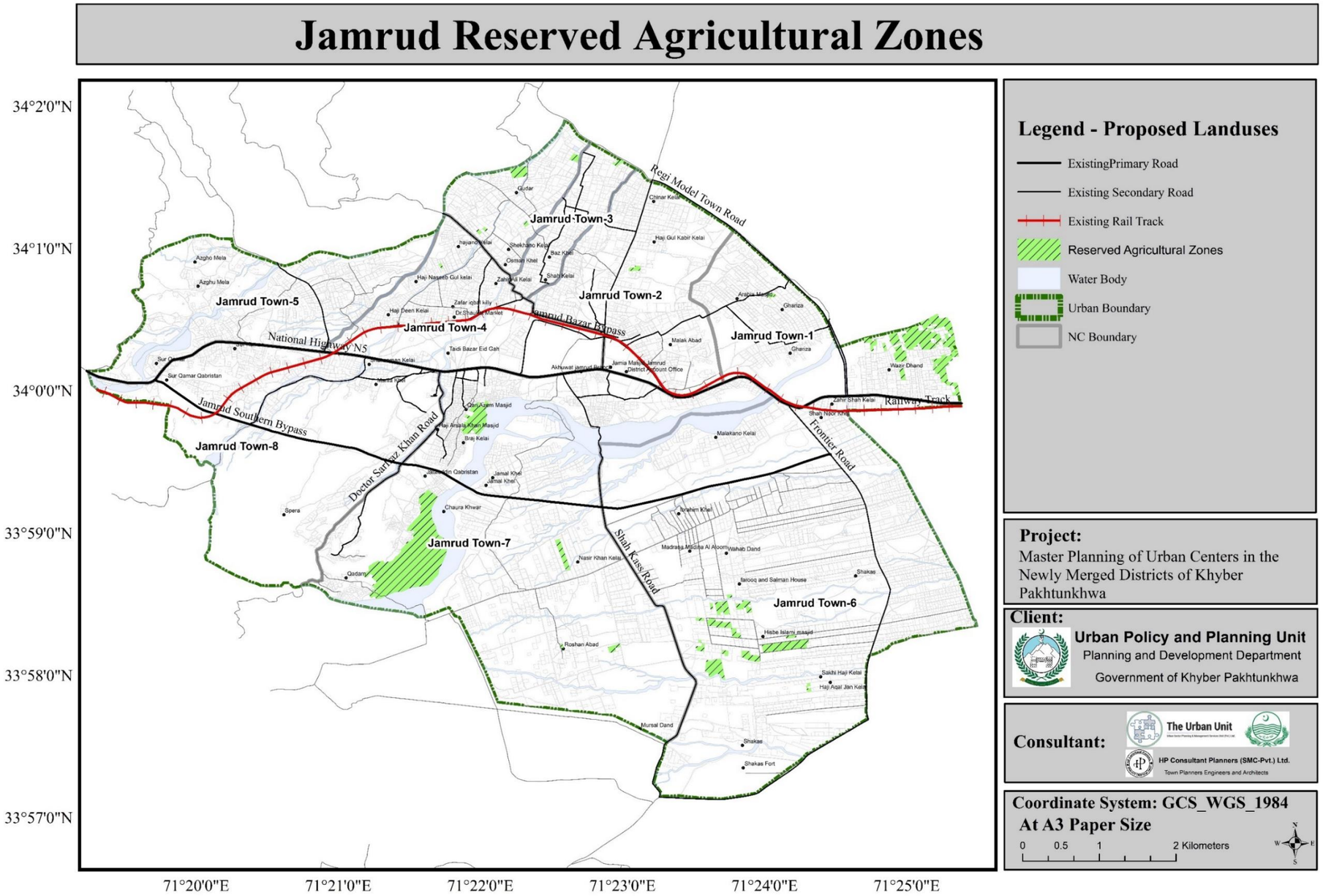
As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Reserved Agriculture Area is below:

Table 6-44: Reserved Agriculture Area Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Crop, Orchard, Pasture land livestock such as dairy or poultry farm Forest, Nursery or a green house, horticulture, Tube well, Existing rural settlement or village,	Milk Chilling and Pasteurization Animal husbandry clinic; Country club, Zoological garden, Botanical garden, Bird sanctuary, Zoo or wildlife park, Grain market, Cattle	Other than permitted and permissible

place of worship or prayer; Agricultural machinery workshop; Farm house Storage activities of agricultural goods which are non-hazardous in nature.	market Fruit and vegetable market,	

Source: Urban Unit and HP Consultants



Map 33: Reserved Agricultural Zones

Source: The Urban Unit

6.10. Livestock and Dairy Development Zone

A proposed Livestock and Dairy Development Zone spanning 0.41 sq. km. aims to foster animal and milk production. It is located on the Doctor Sarfraz Road, this zone is envisioned to predominantly comprise cattle farms accommodating a diverse range of livestock, including cattle, buffaloes, sheep, goats, camels, and poultry. The farms will be surrounded by expansive grazing and pasture areas. The zone will host dairy farms equipped with milk processing units. This zone is intended to not only boost livestock and dairy production but also create a holistic environment that supports the well-being of the animals and ensures the efficient processing and distribution of dairy products. Slaughter house having an area of 0.002sq.km is proposed near the Doctor Sarfraz Khan Road.

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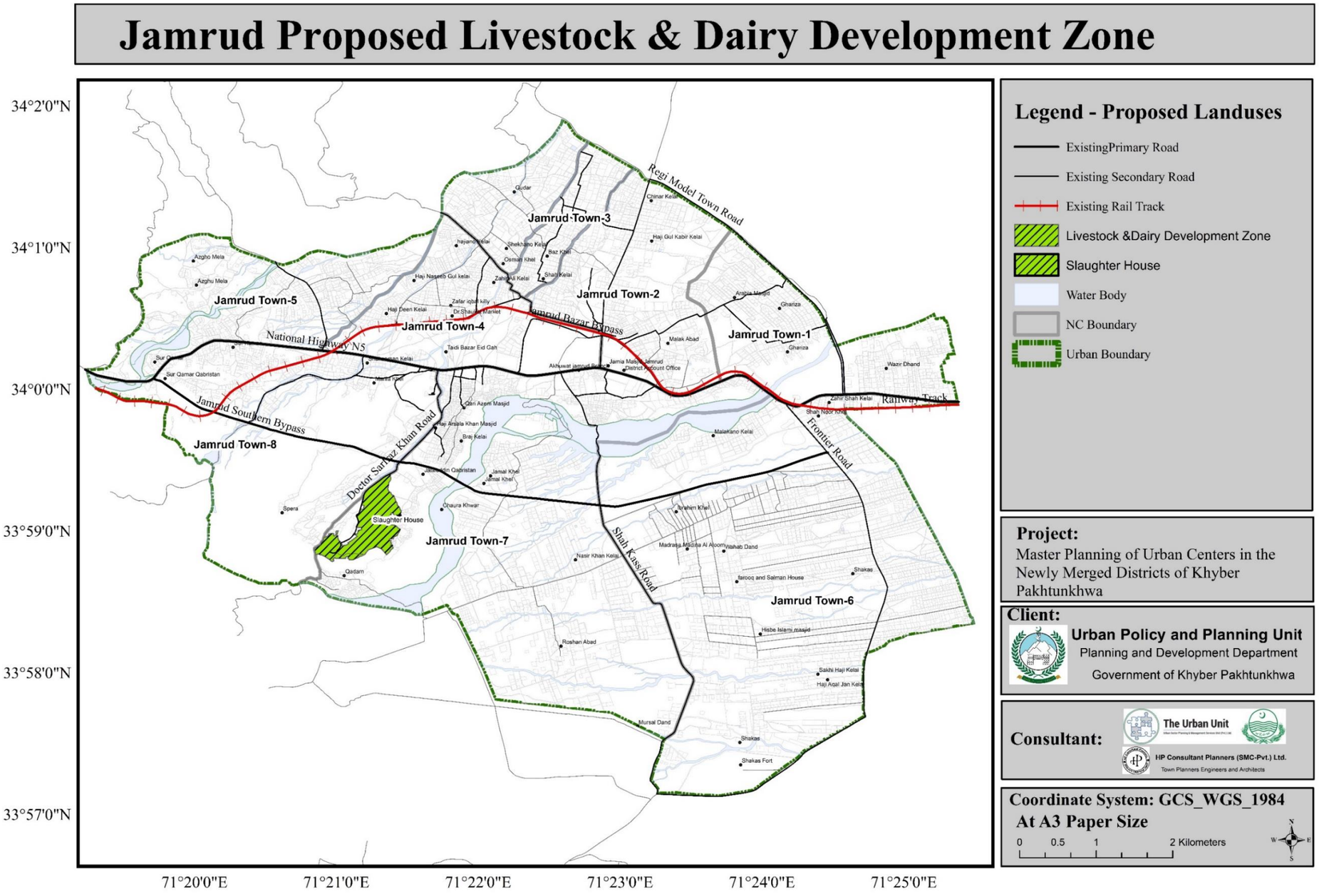
Table 6-45: Livestock and Dairy Development Zone Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Cattle Farms, Poultry Farms, Pasture and grazing lands, Slaughter Houses, Dairy production, Veterinary services,	Godowns Cold storage, Cattle Market Fueling stations Residences of caretakers Related commercial activities Veterinary Hospital	Other than permitted and permissible

Veterinary education and training Grain Market		

Source: Urban Unit and HP Consultants



Map 34: Proposed Livestock and Dairy Development Zone

Source: The Urban Unit

6.11. Civic Amenities Zone

The current expanse of public buildings covers 1.57 sq.km, and proposed civic amenities zone is spanning 0.04 sq.km. The existing public buildings are dispersed, posing challenges for convenient access therefore in future with the rising activities more space for different public offices and amenities will be required.

Existing area (sq. km.)	**1.57**
Existing area (in %)	3.3%
Recommended NRM standard	2% to 10%
Recommended area – min (sq. km.)	0.96
Recommended area – max (sq. km.)	4.82
Required (Recommended (min) – Existing Land Use)	-0.61
Required (Recommended (max) – Existing Land Use)	3.25
Proposed area 2040 (sq. km.)	0.04

A new Civic Amenities Zone has been proposed along National Highway-5. This strategic location ensures easy accessibility for the public. This zone involves consolidating all dispersed public buildings into this designated zone, which will house essential entities such as the Government or Semi-Government offices like District Secretariat, Town Hall and other essential buildings.

This concerted effort aims to streamline public services, enhance accessibility, and provide a consolidated hub for administrative functions. The thoughtful relocation of these key offices to the Civic Services Zone is poised to improve operational efficiency and cater to the growing needs of the district, aligning with the vision for a more organized and accessible administrative setup.

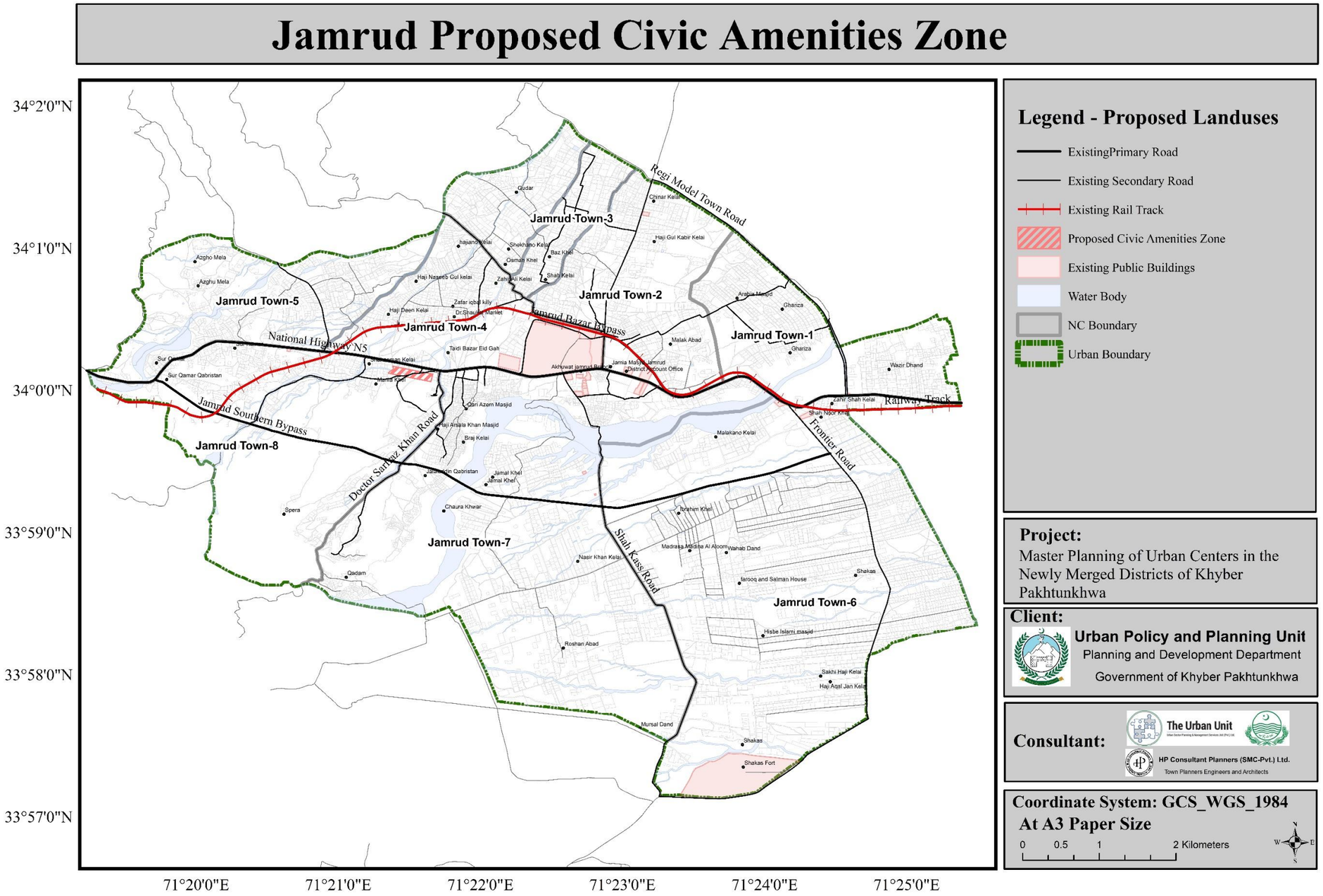
As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has

reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Civic Amenities Zone are below:

Table 6-46: Civic Amenities Zone Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Government or semi-government offices (District Secretariat, Town Hall etc. Social welfare institution such as community centre, art gallery, museum and auditorium Local and zonal municipal office Police station, fire station or post office Shelter home, Pannahgahh, Convention centre	Employees Residences (for all grades) - Auditoriums, seminar halls, workshop spaces Community facilities Sports facilities Hotel or Motel, Guest house, Athletic club, gymnasium, fitness centre or indoor sport facility, Research and development centres	Other than permitted and permissible

Source: Urban Unit and HP Consultants



Map 35: Proposed Civic Amenities Zone

Source: The Urban Unit

6.12. Green Spaces

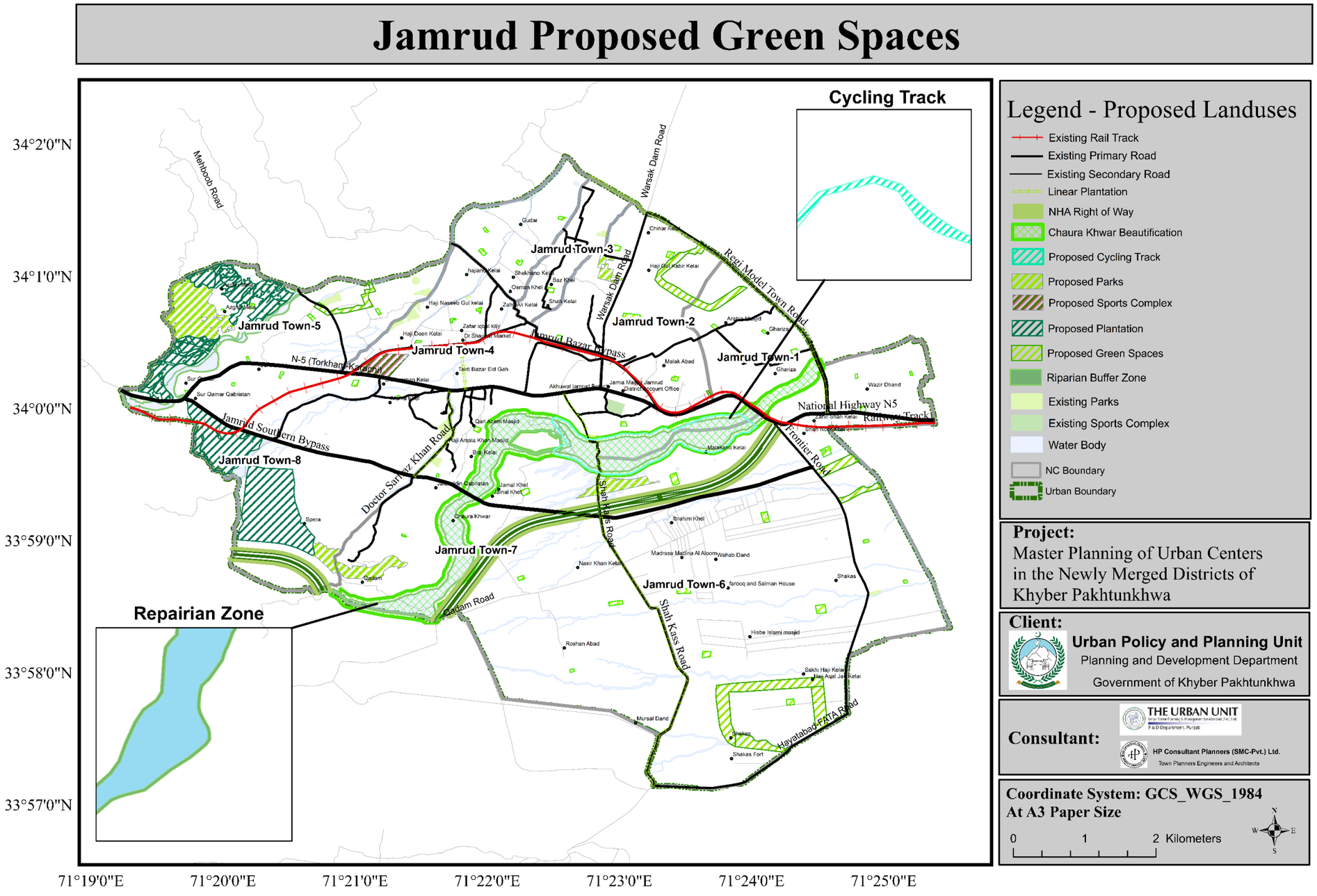
Green spaces are essential to each community as it improve community's natural environment, aesthetic, and recreational opportunities. These are mostly used for leisure activities including cycling, walking, working out, and playing. Jamrud urban center has parks and playgrounds; however, these are not adequate to serve the growing population. As per the Land Use Survey of Jamrud, out of the 48.18 sq. km parks and sports complex covers only 0.15 sq.km and 0.03 sq.km respectively.

The World Health Organization (WHO) advises all cities to provide each resident with a minimum of 9 sq.m of urban green space[17]. Jamrud's proportion of green space falls below of the standard for cities around the globe. Therefore, dispersed green space having an area 3.43 Sq.km area is proposed to benefit the whole population.

A riparian buffer zone is a vegetated area near water bodies, it helps shade and partially protect the water body from the impact of adjacent land uses. It plays a key role in increasing water quality in associated streams, rivers, and lakes. It serves diverse purposes, for example, protection of surface waters from pollution, protection of structures from flooding or erosion, and preservation of riparian habitat. Therefore, riparian buffer is proposed along the water bodies of Jamrud.

Furthermore, green buffer along industrial area and economic corridor is proposed. Buffer zones surrounding industrial areas are established primarily to ensure that nearby residential communities are not adversely impacted by health and amenity issues that can be attributed to industrial emissions. Cycling track of 6 km is proposed along the Chaura Khwar beautification. The below map shows the proposed Green Spaces in Jamrud urban center.

[17] Russo, Alessio, and Giuseppe Cirella. "Modern Compact Cities: How Much Greenery Do We Need?" International Journal of Environmental Research and Public Health, vol. 15, no. 10, 5 Oct. 2018, p. 2180, www.ncbi.nlm.nih.gov/pmc/articles/PMC6209905/, https://doi.org/10.3390/ijerph15102180.



Map 36: Proposed Green Spaces

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Green Spaces are below: The development guidelines for Green Spaces are below:

Table 6-47: Green Spaces Guidelines

Permitted Uses	Permissible Uses	Prohibited Uses
Bird sanctuary, botanical garden, park, memorial, monument or playground, forest, orchard, picnic hut, plant nursery, place of worship, joy land or play land, farm, recreational club or resort, shooting range, swimming pool library and zoological garden.	Building and structures ancillary to use permitted in open spaces and parks such as stand for vehicles on hire, taxis and scooters, bus and railway passenger terminals, facilities such as police post, fire post, post and telegraph office, commercial use of transit nature like cinema, circus and other shows, public assembly halls, restaurants and caravan parks, sports stadium, open air cinemas, subject to the coverage, height, FAR and set backs of this zone.	Any building or structure which is not required for open air recreation, dwelling unit except for watch and ward personnel and uses not specifically permitted therein.

Source: Urban Unit and HP Consultants

7. Way Forward

The Jamrud Master Plan provides a visionary roadmap for guiding the city's transformation into a resilient, inclusive, and sustainable urban center. Building on this framework, a scenario-based development strategy has been designed for Jamrud rooted in land suitability analysis and evidence-based planning principles. The proposed land use zones aim to ensure compatibility with existing built-up areas while responding proactively to the future needs of the city's growing population. These zones accommodate housing, commercial, industrial, and mixed-use developments, while indirectly generating employment, improving access to services, and elevating the overall quality of life for residents.

To further consolidate the urban transformation process, a set of integrated sectoral action plans has been developed. These plans address critical development gaps across key domains—transportation, governance, economy, housing, environment, and social services—while aligning with the provincial development vision and Sustainable Development Goals (SDGs). The following sector-wise summaries outline the strategic priorities and implementation mechanisms envisioned:

- **Transportation Action Plan:** The plan focuses on improved mobility through road dualization, terminal upgrades, and rehabilitation of the main roads. Key implementation includes the regulation of route permits, removal of encroachments, structured parking, and signage installation. Long-term success hinges on building institutional capacity within local transport authorities and phased execution based on congestion and demand analyses.
- **Rural-Urban Fringe Development:** Focusing on peri-urban zones, this plan leverages strategic zoning for agriculture, livestock, and mixed land use. The implementation includes legal enforcement through KP Land Use Act 2021, coordinated urban-rural policy alignment, and the creation of reserved green belts.
- **Economic Development:** This plan promotes investment attraction through SEZ incentives and job training schemes. Implementation includes establishment of a Development Authority, tax incentives for investors, traffic mitigation in bazaars, and pre-feasibility studies for 10 high-impact sectors.
- **Disaster Risk Reduction (DRR):** The DRR strategy incorporates early warning systems, community preparedness, and climate-resilient infrastructure.

Implementation includes GIS-based risk zoning, capacity-building drills for emergency services, and integration of DRR in land use policy.

- **Zoning and Land Management:** This action plan emphasizes digital land record management, zoning regulation enforcement, and land-use planning. Implementation involves the digitization of Jamrud land records, formulation of zoning by-laws, and training of revenue staff in coordination with the Board of Revenue.
- **Education:** The plan aims to bridge existing gaps through provision of new schools, especially for girls, and facility upgrades in underserved localities. Implementation strategies include GIS-based school planning, hiring trained educators, and partnerships with NGOs for community-based schooling.
- **Governance and Institutional Framework:** This plan seeks institutional strengthening via one-window cells, and inter-agency coordination. Implementation involves assigning dedicated staff in TMA offices, stakeholder training programs, and local representation in planning councils.
- **Environmental Action Plan:** This includes air quality management, urban forestry, and noise control. Implementation projects involve setting up PM2.5/PM10 monitoring stations, roadside plantation, and urban parks. Environmentally sensitive areas will be protected through regulatory zoning, while awareness campaigns will address pollution at the community level.
- **Health:** The health action plan proposes developing health facilities to meeting the population demand, recruitment of specialist staff, and ensuring equitable access to healthcare facilities.
- **Housing:** To address housing deficit, this plan proposes areas for infill development and housing allocation for all-income groups. Implementation is phased based on demand forecasting.
- **Quality of Life (QoL):** The QoL plan targets improved urban aesthetics, civic engagement, and public amenities. Key actions include establishing parks, sports complex, and enhancing walkability, supported with monitoring KPIs focused on citizen satisfaction and public space usability.
- **Security Measures:** Security enhancement will be pursued through smart surveillance, CPTED (Crime Prevention Through Environmental Design), and community policing by proposals such as installation of CCTVs, enhancing street

lighting, improving signage, and controlling entry points to sensitive areas to reduce crime opportunities and deploying trained rapid response units.

- **Tourism and Heritage:** The tourism action plan proposes the preservation and promotion of iconic sites such as Bab-e-Khyber, Jamrud Fort, and Sphola Stupa. The strategy involves site-specific restoration, and eco-tourism initiatives. Implementation will require collaboration with the archaeology department, phased investment in visitor infrastructure, and awareness campaigns to engage locals as tourism facilitators.
- **Behavior Change Communication (BCC):** The BCC action plan addresses civic behavior on waste disposal, public space usage, and engagement with municipal services. It proposes multi-level communication interventions via print, digital, and face-to-face formats. Implementation includes SOPs for outreach, partnerships with schools and community groups, and ongoing monitoring to adapt strategies based on behavioral response and feedback.
- **Slum Upgradation:** This plan promotes integrated redevelopment of informal settlements through basic infrastructure, water and sanitation, and public spaces. Implementation follows a revitalization zone strategy, aligning with SDGs. Local councils will lead resident engagement and monitor progress.

The sectoral action plans outlined above represent a comprehensive roadmap for guiding Jamrud's transformation into a dynamic, resilient, and well-managed urban center. Their successful implementation will depend on strong interdepartmental coordination, continuous capacity building, and community-led participation. Institutional mechanisms such as the Urban Development Authority, local TMAs, and district planning units must be empowered with technical resources, legal mandates, and financial allocations to drive the process. Importantly, progress should be anchored in results-based monitoring systems, aligned with KP’s development priorities and national SDGs. By operationalizing these strategies with commitment and coherence, Jamrud is poised to emerge as a model for sustainable urban regeneration in the newly merged districts of Khyber Pakhtunkhwa.