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GIS- Based Urban Management Management for Quinta da Torre Detailed Plan, Castelo Branco

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Dedictory

To my faculty members, whose guidance and knowledge laid the foundation for this work.

To my family and friends, for their unwavering support, encouragement, and belief in my journey.

Acknowledgments

I would like to express my sincere gratitude to everyone who contributed to the successful completion of this project.

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Special thanks go to the authors and creators of the Quinta da Torre Detailed Plan drawings, whose detailed urban design framework made this GIS-based study possible.

Abstract

This report documents the creation and analysis of a GIS-based urban management model for the Quinta da Torre Detailed Plan, located in Castelo Branco, Portugal. The primary objective was to structure urban spatial data into a geodatabase using ArcGIS Pro, incorporating thematic layers that represent key infrastructure, utilities, land use, and public amenities.

The process included the interpretation and cleaning of AutoCAD drawings, organisation of data into layers, the creation of attribute tables for each layer, and the integration of spatial and non-spatial data through table joins. The model enables detailed spatial analysis, including proximity evaluation, zoning review, infrastructure overlay, and accessibility assessment.

The results demonstrate the utility of GIS in organizing complex urban datasets, facilitating accurate planning decisions, and aligning urban development with sustainability and regulatory compliance. The methodology offers a replicable framework for similar urban projects and highlights GIS as a core tool in modern urban planning.

Keywords

GIS-Based Urban Management, ArcGIS Pro, AutoCAD Integration, Spatial Decision-Making Analysis, Infrastructure Mapping, Smart City Planning, Sustainable Urban Growth

Resumo

Este relatório apresenta o desenvolvimento e análise de um modelo de gestão urbana baseado em SIG (Sistema de Informação Geográfica) para o Plano de Pormenor da Quinta da Torre, situado em Castelo Branco, Portugal. O objetivo principal foi estruturar os dados espaciais urbanos numa geodatabase através do ArcGIS Pro, incorporando camadas temáticas que representam infraestruturas, redes de serviços, uso do solo e equipamentos públicos.

O processo incluiu o estudo e limpeza de desenhos em AutoCAD, organização dos dados em camadas, criação de tabelas de atributos para cada camada e integração entre dados espaciais e não espaciais através de ligações (joins). O modelo resultante permite análises espaciais detalhadas, incluindo avaliação de proximidade, revisão de zoneamento, sobreposição de infraestruturas e análise de acessibilidade.

Os resultados demonstram a utilidade do SIG na organização de conjuntos de dados urbanos complexos, facilitando decisões de planeamento precisas e promovendo um desenvolvimento urbano sustentável e compatível com a legislação vigente. A metodologia apresentada oferece um modelo replicável para projetos urbanos semelhantes e reforça o SIG como uma ferramenta essencial no planeamento urbano contemporâneo.

Palavras chave

Gestão Urbana Baseado em SIG, ArcGIS Pro, Integração AutoCAD, Análise Tomada de Decisões Espaciais, Mapeamento de Infraestruturas, Planeamento de Cidades Inteligentes, Crescimento Urbano Sustentável

Index

1. Introduction.....	21
2. State of the Art & Conceptual Basis	21
2.1 Summary of Book- GIS for the Urban Environment	21
2.1.1 Introduction to GIS and Its Role in Urban Planning.....	21
2.1.2 GIS Data Collection and Management.....	22
2.1.3 GIS Applications in Urban Planning and Management	22
2.1.4 GIS in Smart Cities and Public Services.....	23
2.1.5 Challenges and Limitations of GIS in Urban Planning	23
2.1.6 Future of GIS in Urban Management.....	24
2.1.7 Conclusion.....	24
3. Methodology	24
3.1 Step by Step Process	25
3.2 GIS Algorithms	25
4. Urban Layers with Shapefile Maps and Attributes.....	26
5. Data Integration	35
6. GIS Data Accuracy and Validation.....	35
7. GIS Analysis	36
7.1 Spatial Data Analysis:	36
7.2 Route Optimization:.....	37
7.3 Proximity analysis:.....	38
7.4 Network Analysis:.....	38
7.5 Overlay Analysis:	38
8. Results	39
9. Challenges and Limitations.....	40
10. Conclusion.....	41
11. Future Enhancements	41
12. Bibliography	43
12.1 Work Link- for Project Files.....	44
13. Annexures	45

Index of figures

Figure 1: Detailed drawing of Quinta da Torre, Castelo Branco for study.....	25
Figure 2: Shapefile view of the plots layer in ArcGIS Pro.	26
Figure 3: Shapefile view of the buildings layer in ArcGIS Pro.	27
Figure 4: Shapefile view of the public equipments layer in ArcGIS Pro.	28
Figure 5: Shapefile view of the green spaces layer in ArcGIS Pro.	28
Figure 6: Shapefile view of the sidewalks layer in ArcGIS Pro.	29
Figure 7: Shapefile view of the roads layer in ArcGIS Pro.....	30
Figure 8: Shapefile view of the parkings layer in ArcGIS Pro.	30
Figure 9: Shapefile view of the waterlines layer in ArcGIS Pro.....	31
Figure 10: Shapefile view of the gaslines layer in ArcGIS Pro.	32
Figure 11: Shapefile view of the electricity (stations) layer in ArcGIS Pro, marked with green boxes.	32
Figure 12: Shapefile view of the garbage (bins) layer in ArcGIS Pro, marked with green dots.	33
Figure 13: Shapefile view of the sewagelines layer in ArcGIS Pro.....	34
Figure 14: Shapefile view of the sewageboxes layer (inspection chamber , manhole , gutter) in ArcGIS Pro.	34
Figure 15: Plots, Buildings, Greenspaces, Public Equipments are shown along with roads, sidewalks and parkings in ArcGIS, represented with color-coded layers as described in the legend below.	36
Figure 16: Garbage bins and the waste collection route was shown in ArcGIS, represented with symbols in the legend below.....	37
Figure 17: Waterlines, Gaslines, Sewagelines, Sewageboxes and Electricity Stations are shown together in ArcGIS and marked with legends below.	39
Figure 18: Waste collection route is shown with 1,2,...,44(white color) and garbage bins are shown with G1,G2,...,G22(blue color).	40

Index of Tables

Table 1: Attribute data table of all the plots shown in the layer.	45
Table 2: Attribute data table of all the buildings shown in the layer.....	48
Table 3: Attribute data table of all the public equipments shown in the layer.....	57
Table 4: Attribute data table of all the greenspaces shown in the layer.	58
Table 5: Attribute data table of all the sidewalks shown in the layer.	59
Table 6: Attribute data table of all the roads shown in the layer.	60
Table 7: Attribute data table of all the parkings shown in the layer.....	62
Table 8: Attribute data table of all the waterlines shown in the layer.....	65
Table 9: Attribute data table of all the gaslines shown in the layer.	67
Table 10: Attribute data table of all the electricity stations shown in the layer.	69
Table 11: Attribute data table of all the garbage bins shown in the layer.....	69
Table 12: Attribute data table of all the sewagelines shown in the layer.	70
Table 13: Attribute data table of all the sewageboxes shown in the layer.	85

Abbreviations and acronyms

Acronym	Full Form
3D GIS	– Three-Dimensional Geographic Information System
AI	– Artificial Intelligence
API	– Application Programming Interface
CAD	– Computer-Aided Design
CSV	– Comma-Separated Values
DWG	– Drawing File Format (used in AutoCAD)
EPSG	– European Petroleum Survey Group (Coordinate Reference Code System)
GIS	– Geographic Information System
IoT	– Internet of Things
ML	– Machine Learning
RTIEBT	– Regras Técnicas das Instalações Elétricas de Baixa Tensão (Portuguese Electrical Installation Standards)
SHP	– Shape file (standard geospatial vector data format)
SIG	– Sistema de Informação Geográfica (Portuguese for GIS)

1. Introduction

Nowadays, Urban planning faces increasing challenges due to population growth, infrastructure complexity, environmental concerns, and the demand for data-driven decision-making. As cities evolve, the ability to spatially manage land use, public services, infrastructure, and sustainability goals becomes essential.

This project presents a Geographic Information Systems (GIS)-based approach to urban analysis for the Quinta da Torre Detailed Plan, located in Castelo Branco, Portugal. The objective was to build a structured, accurate, and versatile geospatial model using ArcGIS Pro, capable of supporting urban development and infrastructure planning in line with regulatory and sustainability standards.

The project bridges architectural design, CAD-based planning, and spatial analysis by integrating AutoCAD drawings with GIS tools, enriching them with attribute data, and performing spatial queries and modeling. The result is a robust foundation for planning and managing urban systems more efficiently.

2. State of the Art & Conceptual Basis

GIS has revolutionized urban planning by enabling spatial analysis, infrastructure monitoring, and environmental management. Recent advancements in GIS technology, particularly in data visualization and geospatial analysis, have significantly improved urban management. Integration with AutoCAD allows for efficient handling of design files, improving data accuracy and usability. Building on this context, this project draws on concepts explained in GIS for the Urban Environment to structure a practical methodology for the Quinta da Torre Detailed Plan.

2.1 Summary of Book- GIS for the Urban Environment

The book **"GIS for the Urban Environment"** provides a comprehensive guide to the **application of Geographic Information Systems (GIS) in urban planning, management, and development** (Maantay & Ziegler, 2006). It explores how GIS technology enables city planners, policymakers, and researchers to analyze, model, and visualize spatial data to improve decision-making and solve urban challenges. The book serves as both an introductory guide and a practical resource for professionals working in urban environments.

2.1.1 Introduction to GIS and Its Role in Urban Planning

The book begins with an introduction to the fundamental concepts of **GIS, spatial data, and mapping technologies**. It explains how GIS helps urban planners collect, manage, and analyze data related to **land use, infrastructure, transportation, environment, and population demographics**. The introduction also covers the **history and**

evolution of GIS technology, demonstrating its growing importance in modern urban planning.

2.1.2 GIS Data Collection and Management

A critical part of urban GIS applications is the **collection, organisation, and management of spatial data**. The book details various data sources used in GIS, including:

- **Satellite imagery and aerial photography (Photos taken from drones or airplanes)** for mapping urban landscapes.
- **Remote sensing technologies** to assess environmental changes.
- **Survey data and census records** (population data — including number of people, age, income, education, etc) to analyze population distribution.
- **Topographic and detailed maps** (land ownership, property boundaries, and plot sizes) for land-use planning.
- **Real-time GPS data** for traffic and transportation analysis.

The book highlights the importance of **data accuracy, consistency, and interoperability** in urban GIS projects. It also discusses challenges related to **data integration from multiple sources**, ensuring quality control, and managing large spatial databases.

2.1.3 GIS Applications in Urban Planning and Management

The book explores various applications of GIS in urban development, demonstrating how the technology is used to tackle real-world challenges. Key GIS applications include:

Land Use and Zoning Regulations:

GIS is essential in **land-use planning and zoning**, helping planners allocate space for residential, commercial, industrial, and green areas. The book explains how GIS-based zoning maps help city officials **enforce development regulations, assess land suitability, and monitor urban expansion**.

Infrastructure and Transportation Planning:

One of the most critical applications of GIS in cities is **transportation planning and traffic management**. The book explores how GIS is used to:

- Analyze **road networks and public transit accessibility**.
- Optimize **traffic flow and congestion management**.
- Plan **new infrastructure projects such as roads, bridges, and metro lines**.
- Evaluate **pedestrian pathways and cycling routes for sustainable mobility**.

GIS-based transportation models enable planners to **identify bottlenecks, improve connectivity, and make data-driven decisions** on infrastructure investments.

Environmental Monitoring and Sustainability:

The book emphasizes the role of GIS in **environmental conservation and sustainable urban development**. Key topics covered include:

- **Air and water quality monitoring** to assess pollution levels.
- **Green space management**, ensuring urban parks and forests are preserved.
- **Climate change adaptation**, using GIS to predict flooding, **heat islands** (Urban areas that are hotter than nearby rural areas due to buildings, roads, and less greenery), and other **environmental risks** (Possible dangers to nature or health, like pollution, floods, or extreme heat).
- **Disaster management and emergency response planning**, using GIS to identify vulnerable areas and optimize evacuation routes.

GIS helps urban planners develop eco-friendly policies that balance urban growth with environmental protection.

2.1.4 GIS in Smart Cities and Public Services

The book discusses how modern cities are leveraging **GIS technology in smart city initiatives**. GIS is being integrated with **Internet of Things (IoT) sensors, big data, and artificial intelligence** to improve urban services. Key applications include:

- **Smart utilities management**, optimizing electricity, water, and waste collection systems.
- **Public safety and crime mapping**, analyzing spatial patterns of crime to improve law enforcement strategies.
- **Healthcare accessibility analysis**, ensuring hospitals and clinics are evenly distributed.
- **E-governance platforms**, providing citizens with online access to urban services and interactive GIS maps.

2.1.5 Challenges and Limitations of GIS in Urban Planning

While GIS offers numerous benefits, the book acknowledges several challenges that urban planners face in implementing GIS-based solutions:

- **Data accuracy issues**, as outdated or incorrect data can lead to poor decision-making.
- **High costs of GIS software and hardware**, making it inaccessible to some municipalities.
- **Technical expertise requirements**, as GIS professionals need specialized training.
- **Legal and privacy concerns**, particularly regarding geospatial data collection and sharing.

The book discusses possible solutions to these challenges, such as **GIS tools (QGIS), cloud-based GIS platforms, and data standardization efforts**.

2.1.6 Future of GIS in Urban Management

The book concludes with a look at emerging trends in GIS and their potential impact on urban environments. Some of the key future developments include:

- **3D GIS and digital twins** (Virtual copies of real-world places like a city block, used to test ideas or simulate changes), which allow cities to create detailed 3D models for simulation and planning.
- **Artificial Intelligence (AI) and machine learning**, enhancing predictive modeling for urban growth and resource allocation.
- **Real-time GIS applications**, using IoT sensors to monitor traffic, air quality, and public services in real time.
- **Crowd sourced GIS data**, allowing citizens to contribute geospatial information through mobile apps and open-data platforms.

2.1.7 Conclusion

"GIS for the Urban Environment" provides an insightful and detailed overview of **how GIS technology is transforming urban planning and management**. Through case studies, technical explanations, and real-world applications, the book demonstrates that **GIS is an essential tool for building smarter, more sustainable, and well-managed cities**. It serves as a valuable resource for urban planners, GIS professionals, and policymakers looking to leverage geospatial technology (Use mapping and location tools like GIS) for better decision-making.

After studying the principles and examples in GIS for the Urban Environment and reviewing technical standards and municipal planning rules, I structured the methodology for this project accordingly. The concepts of thematic layering, attribute table integration, and spatial query analysis from the book directly informed how I transformed the AutoCAD drawings into GIS-ready data. This foundation guided the step-by-step process of layer creation, data cleaning, attribute linking, georeferencing, and performing analyses in ArcGIS Pro, which is described in detail in the next section.

3. Methodology

The methodology of this project followed a step-by-step structured workflow combining design interpretation, data structuring, and GIS analysis:

3.1 Step by Step Process

Below drawing is provided for the **study of Quinta da Torre, Castelo Branco**.



Figure 1: Detailed drawing of Quinta da Torre, Castelo Branco for study.

1. **Drawing Analysis:** The original AutoCAD files of Quinta da Torre were studied to **understand the planning framework** and gathering **spatial and non-spatial data**.
2. **Layer Identification:** A list of **13 urban layers** including Plots, Buildings, Roads, Public Equipment, Green Spaces, Sidewalks, Parking, Waterline, Sewage line, Sewage box, Gas line, Electricity and Garbage bins which are very important for the management was created after analyzing all the drawings of the area.
3. **Drawing Cleaning:** The DWG files were simplified and structured by isolating each layer into clean in form of **polygons and polylines, manageable entities, ensuring accuracy and geometry readiness**.
4. **Attribute Table Preparation:** Detailed Excel attribute tables were created for each layer, assigning unique IDs and important necessary attributes like area, type, material, capacity, use, etc.
5. **Import into ArcGIS Pro:** DWG layers were imported in ArcGIS Pro and converted into shape files for joining with attribute tables using common fields.
6. **Analysis Execution:** GIS tools were used to **assess accessibility, infrastructure coverage, land use compatibility, and route optimization**.

This combination of manual interpretation, structured data development, and automated analysis provided a complete geospatial model for the urban area.

3.2 GIS Algorithms

GIS tools use spatial algorithms to process geographic data and produce meaningful analysis results. For example, buffer algorithms generate zones of influence around

features, which in this project were used to measure service coverage such as bin accessibility. Overlay algorithms combine multiple layers to detect conflicts or overlaps, like roads intersecting utilities. Network analysis algorithms calculate optimal paths and connectivity within the street network, supporting waste collection route planning. These functions work by performing spatial queries and geometric calculations based on the georeferenced coordinates of each feature.

4. Urban Layers with Shapefile Maps and Attributes

Each thematic layer developed for the Quinta da Torre GIS model includes both spatial geometries and corresponding attribute data that together form the core of the project's spatial database. These layers were digitized from AutoCAD drawings, enriched with attribute tables created in Excel, and integrated into ArcGIS Pro using the **EPSG:3763 coordinate system**.

The shapefiles visually represent the **distribution and layout of urban features**—such as plots, buildings, utilities, and public infrastructure—while the attribute tables contain detailed information like **size, type, capacity, material, usage, etc.** Together, they enable effective spatial analysis and informed decision-making in the context of **urban planning, zoning, and infrastructure management**.

1. Plot

The Plot layer represents individual land parcels within the Quinta da Torre area. It defines the legal boundaries and size of each plot, providing a foundation for zoning, construction permission, and land use planning.

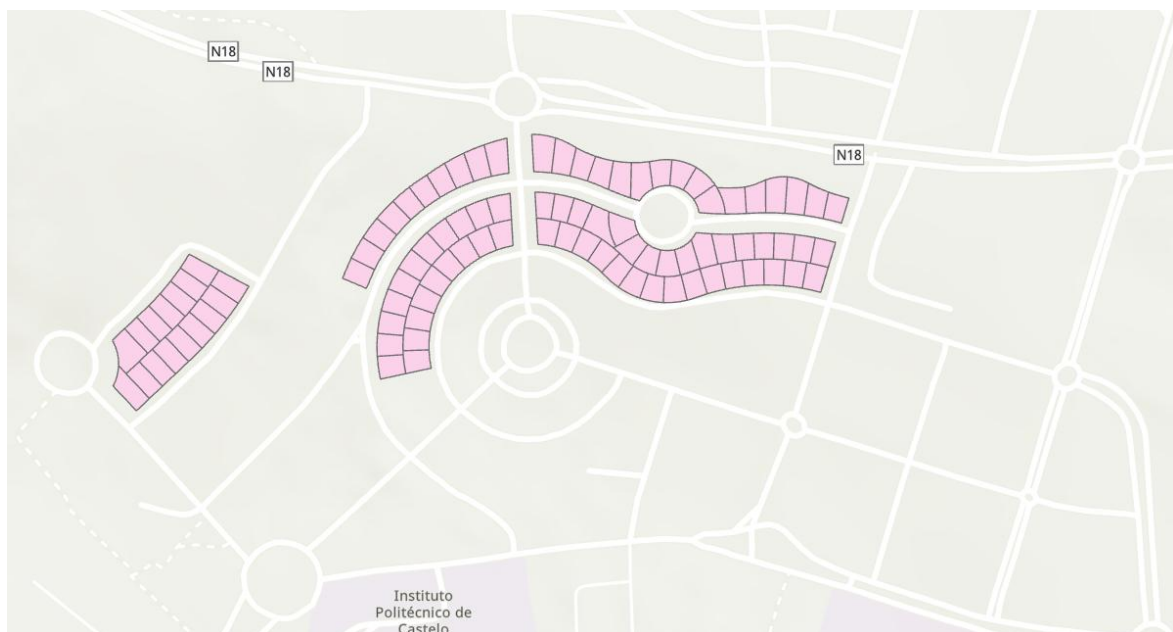


Figure 2: Shapefile view of the plots layer in ArcGIS Pro.

- **Attributes:** Plot ID, Lot Area (A_l) (m^2), Max Implementation Area (A_i) (m^2), Backyard Area (A_b) (m^2), Street Name, Postal Code, Police Code

This layer's attribute data describes the key physical and legal characteristics of each plot. The detailed attribute table for plot has been included in the Annex, which provides comprehensive information of all attributes for each plot shown in above shapefile.

2. Buildings

The Buildings layer maps all existing and planned building footprints in the project area. It helps evaluate built-up area, density, and floor usage.



Figure 3: Shapefile view of the buildings layer in ArcGIS Pro.

- **Attributes:** Building ID, Plot ID, Implementation Area (A_i) (m^2), Backyard Area (A_b) (m^2), Construction Area (A_c) (m^2), Number of Levels(Floors), Number of Units, Usage Type (Residential, Commercial, Services, Mixed Use), Street Name, Postal Code, Police Code

This attribute information supports zoning verification and urban density calculations. The complete table for the Buildings layer is provided in the Annex with all data for each building shown in above shapefile.

3. Public Equipment

The Public Equipment layer includes community facilities such as schools, health centers, and other public service buildings, ensuring community access to essential services.



Figure 4: Shapefile view of the public equipments layer in ArcGIS Pro.

- **Attributes:** Equipment ID, Name, Area (m²), Use Type (School, Sports Facility, Health Post, Institute, River, Cultural), Access, Street Name, Postal Code

This layer's attribute data lists public service facilities and their characteristics, aiding accessibility and service coverage analysis. The complete table for Public Equipment is included in the Annex with detailed data for each facility shown in the above shapefile.

4. Green Space

The Green Spaces layer includes parks, landscaped zones, and recreational public areas within the urban plan. It plays an important role in urban sustainability and quality of life.

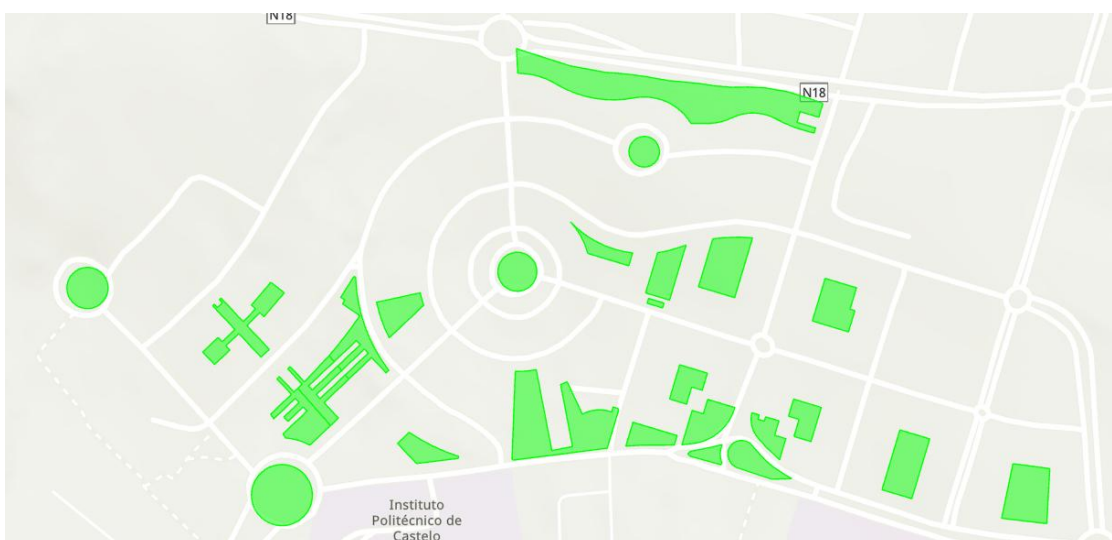


Figure 5: Shapefile view of the green spaces layer in ArcGIS Pro.

- **Attributes:** Space ID, Total Area (m²), Use Type (Park, Green Corridor, Playground, Tree-lined Street), Vegetation Type, Street Name, Postal Code

This layer's attribute data identifies and categorizes public green areas, supporting environmental and recreational planning. The detailed table for Green Spaces is provided in the Annex, listing all attributes for each green zone shown in the above shapefile.

5. Sidewalks

The Sidewalks layer represents all pedestrian pathways alongside streets and within public areas. It provides crucial information for evaluating walkability, pedestrian safety, and urban connectivity.

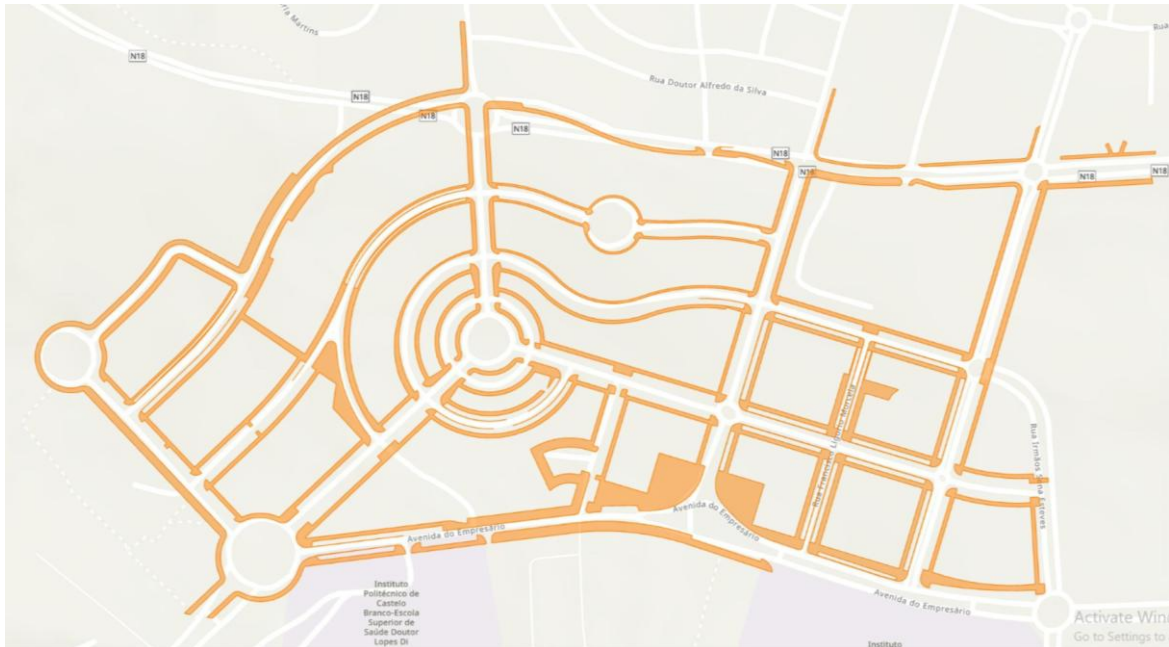


Figure 6: Shapefile view of the sidewalks layer in ArcGIS Pro.

- **Attributes:** Sidewalk ID, Total Area(m²), Width(m), Material Type (Cobblestone, Pavement Blocks, Granite Slabs), Trees Availability, Street Name, Postal Code

This layer's attribute data provides essential information for evaluating pedestrian pathways and connectivity. The detailed table for Sidewalks is included in the Annex, covering all attributes for each segment shown in the above shapefile.

6. Roads

The Roads layer defines the road network, including main, local, and access routes. It supports traffic flow analysis, hierarchy planning, and transport infrastructure design.



Figure 7: Shapefile view of the roads layer in ArcGIS Pro.

- **Attributes:** Road ID, Name, Postal Code, Width (m), Number of lanes, Surface Type (Asphalt Concrete, Cobblestone), Type of Levels (Primary, Secondary, Tertiary), Lighting and Parking Availability

The attributes of this layer define road names, widths, and classifications, supporting road hierarchy and traffic analysis. The complete attribute table for Streets has been added in the Annex with detailed data for each road shown in the above shapefile.

7. Parking

The Parking layer represents designated parking areas and lots throughout the plan area. It supports urban mobility and traffic management.



Figure 8: Shapefile view of the parkings layer in ArcGIS Pro.

- **Attributes:** Parking ID, Area(m²), Capacity of Vehicles, Type of Parking (Perpendicular, Parallel, Angled-45°/60°), Street Name, Postal Code, Lighting Availability

The Parking layer's attributes detail location, capacity, and access type to support traffic and urban mobility planning. The full Parking attribute table is provided in the Annex with comprehensive data for each parking area shown in the above shape file.

8. Water line

The Water line layer maps the water supply network, showing the layout and connections needed to distribute potable water throughout the area.

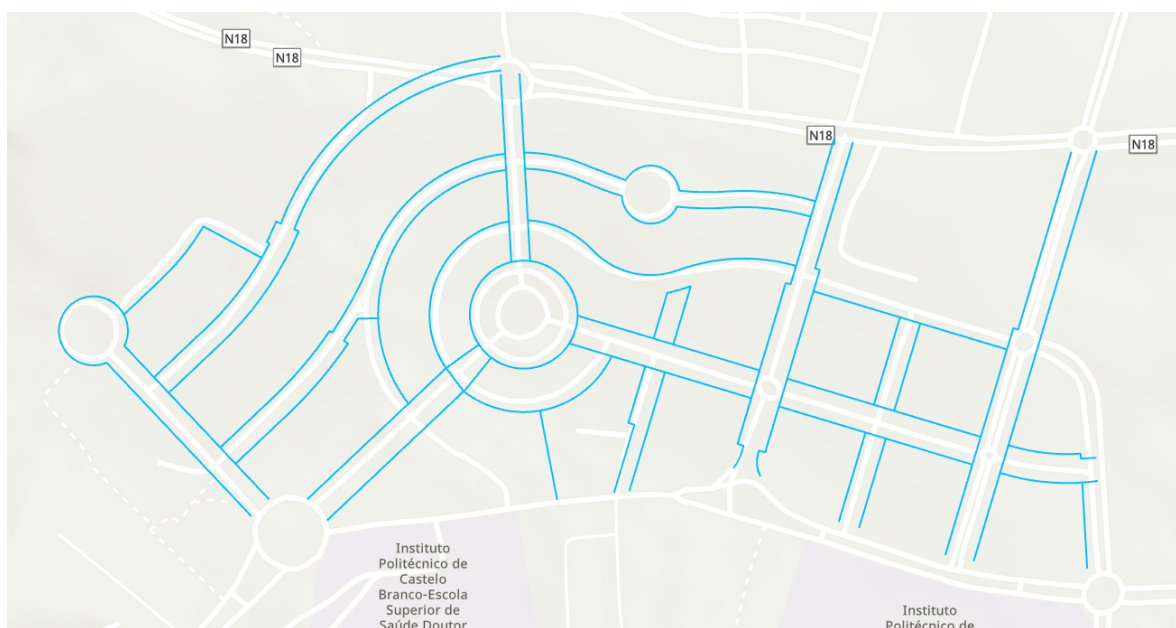


Figure 9: Shapefile view of the waterlines layer in ArcGIS Pro.

- **Attributes:** Pipe ID, Length (m), Diameter (mm), Type of Levels (Main, General, Branch), Material Type (HDPE/UPVC), Installation Type (Underground, Aboveground), Status

The attribute information for this layer details the layout and specifications of the water supply network. The complete Waterline attribute table is included in the Annex with comprehensive data for each line shown in the above shapefile.

9. Gas line

The Gas line layer shows the network of pipelines for residential and commercial gas supply. It helps ensure safe and efficient energy distribution.

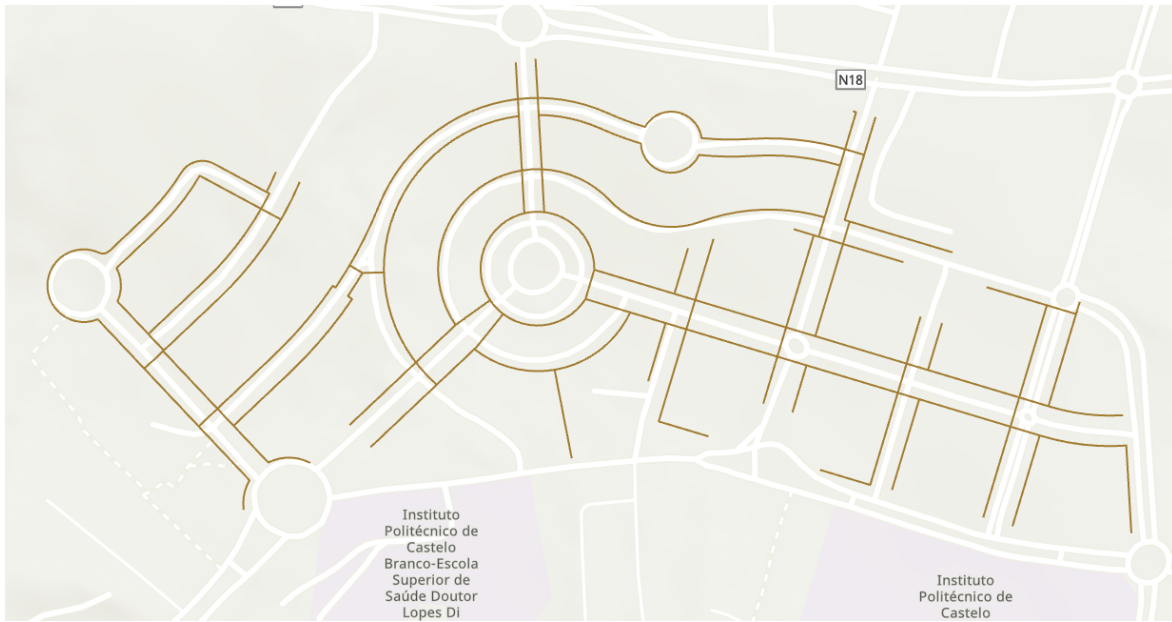


Figure 10: Shapefile view of the gaslines layer in ArcGIS Pro.

- **Attributes:** Pipe ID, Length (m), Diameter (mm), Material Type (HDPE/UPVC), Type of Levels (Main, Secondary, Branch), Installation Type (Underground, Aboveground), Status

This layer's attribute data records the layout and technical details of the gas distribution system. The complete Gas Line attribute table is included in the Annex with all information for each segment shown in the above shapefile.

10. Electricity

The Electricity layer depicts the electrical supply network for the area, including medium and low-voltage lines required for reliable power distribution.

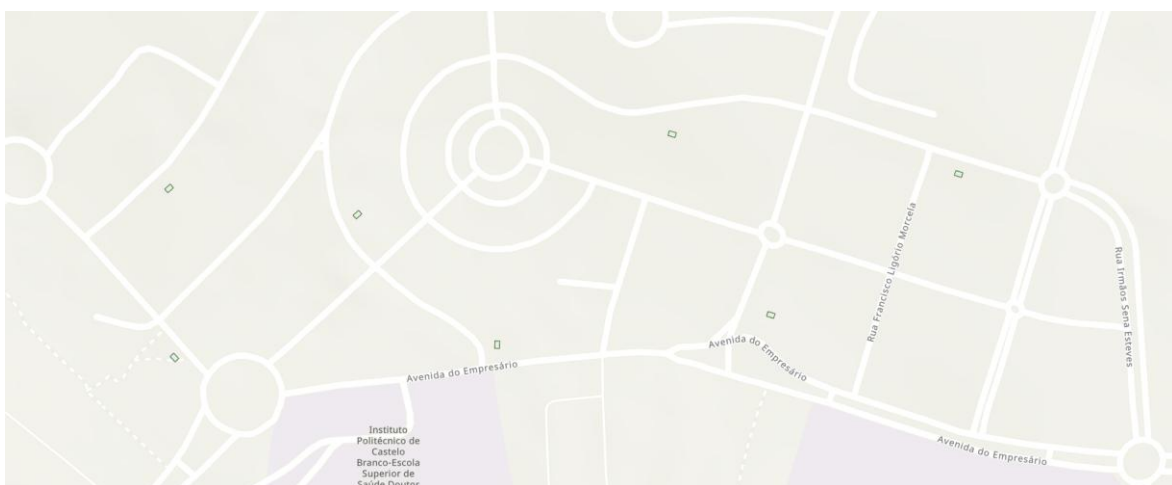


Figure 11: Shapefile view of the electricity (stations) layer in ArcGIS Pro, marked with green boxes.

- **Attributes:** Station ID, Type of Levels (Main, Distribution), Voltage Type (High, Medium 30kV, Low), Cable Material (XLPE- Copper, Aluminum), Number of Cables, Installation Type (Overhead/Underground), Status

The Electricity layer's attributes capture the network configuration and distribution specifics for electrical supply. The detailed Electricity table is provided in the Annex with all data for each line shown in the above shapefile.

11. Garbage Bins

The Garbage Bins layer locates all waste collection points within the study area. It helps plan efficient waste management and maintain public cleanliness.

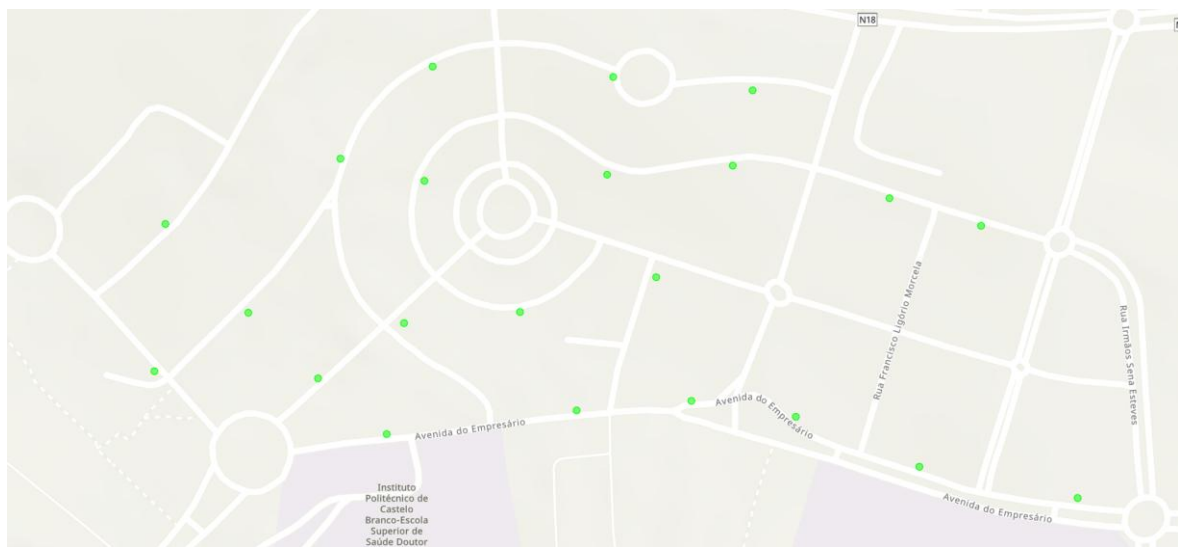


Figure 12: Shapefile view of the garbage (bins) layer in ArcGIS Pro, marked with green dots.

- **Attributes:** Bin ID, Type of waste (Mixed/Recyclable), Material type (Plastic/Metal), Condition, Street Name, Postal Code, Location

This layer's attribute data includes bin types, capacity, and collection frequency to optimize waste management services. The detailed Garbage Bins table is provided in the Annex with all information for each bin shown in the above shapefile.

12. Sewage Line

The Sewage Lines layer represents the network of pipes that collect and transport wastewater throughout the project area. It is essential for planning drainage routes, ensuring efficient waste water flow, and reducing flood risks.

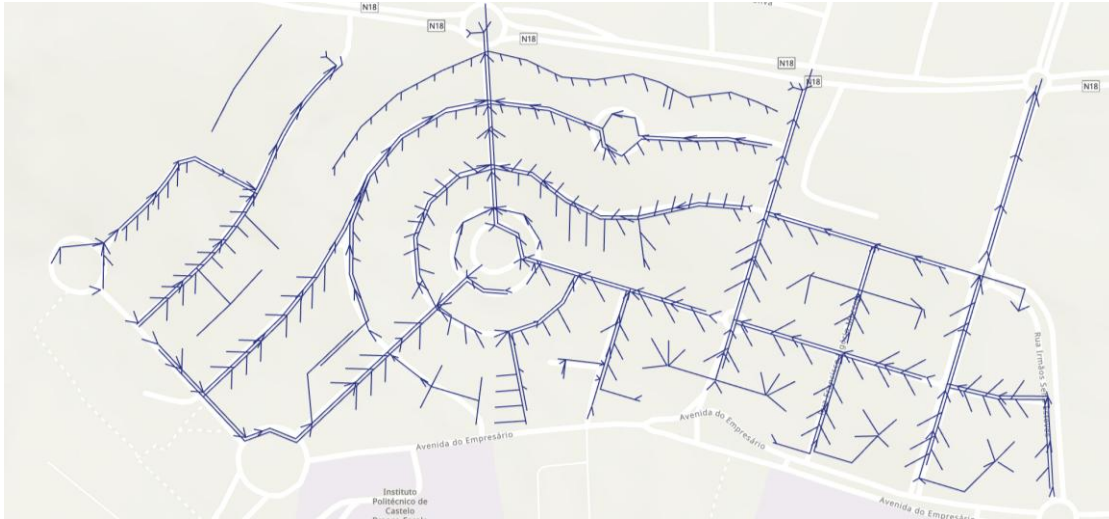


Figure 13: Shapefile view of the sewagelines layer in ArcGIS Pro.

- **Attributes:** Line ID, Diameter (mm), Type of Line (Wastewater, Storm water, Sewer branch line, Gutter line), Material Type (Concrete, PVC-U, HDPE, PP), Installation Type (Underground, Aboveground)

The Sewage Lines layer's attribute data includes technical details such as pipe type, diameter, and flow direction, which are vital for network maintenance and design. The complete attribute table for Sewage Lines is provided in the Annex with all detailed information for each pipeline shown in the above shapefile.

13. Sewage box

The Sewage Boxes layer identifies key infrastructure elements such as inspection chambers, manholes, and access boxes that are part of the sewage system. These features enable maintenance, inspection, and repair operations.

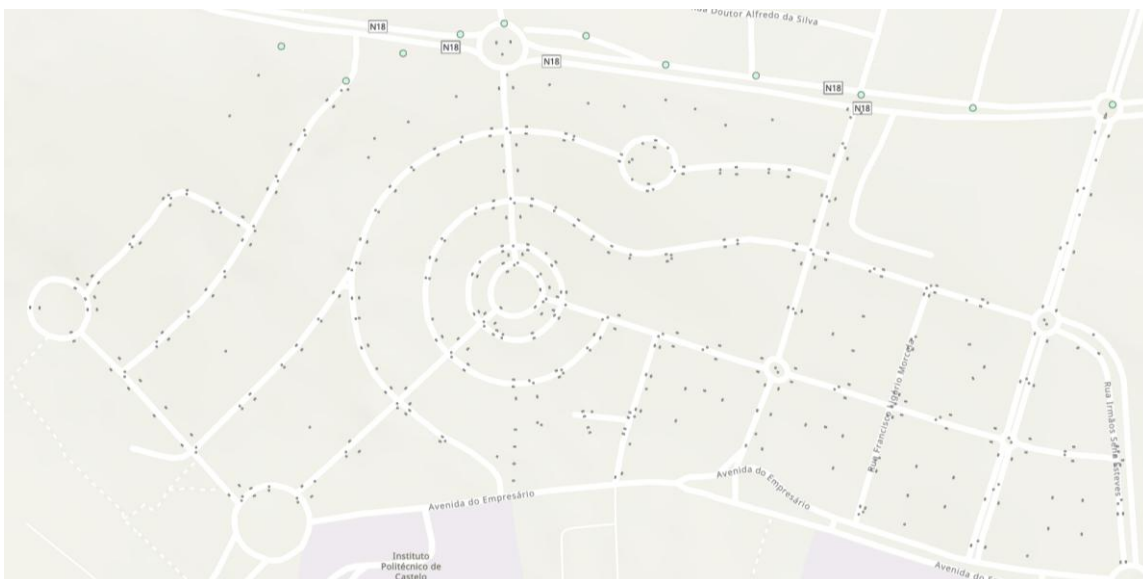


Figure 14: Shapefile view of the sewageboxes layer (inspection chamber, manhole, gutter) in ArcGIS Pro.

-
- **Attributes:** Box ID, Dimensions (mm), Type of Box (Manhole, Inspection chamber, Gutter), Material Type (Reinforced Concrete, Concrete)

This layer's attribute data describes the location, type, and condition of each inspection point, ensuring proper access to the sewage network for operational safety. The detailed attribute table for Sewage Boxes is included in the Annex, covering all attributes for each box shown in the above shape file.

5. Data Integration

A crucial step in GIS development is converting and integrating AutoCAD plans into GIS-compatible formats.

DWG to GIS Conversion: Integrating data from CAD into GIS required precise attention to geometry and attributes. Each DWG file was converted into a shapefile using **ArcGIS Pro's CAD to Geodatabase** tools.

Georeferencing and Projection: Aligning data with real-world coordinates to ensure accuracy. The coordinate system was defined as **ETRS_1989_TM06-Portugal (EPSG:3763)**.

Attribute Enrichment: Excel attribute tables were made and exported as .csv files. These were joined to shapefiles using unique IDs (e.g., Plot_ID, Building_ID) through **Join Field** operations in ArcGIS.

All geometries were validated for topology rules — no overlaps, closed polygons, and connectivity. Where necessary, geometry was corrected using ArcGIS editing tools to close boundaries, snap points, or adjust alignments.

6. GIS Data Accuracy and Validation

The accuracy of spatial data is a critical foundation for reliable GIS-based urban planning.

In this project, validation efforts focused on both **geometric precision and attribute consistency**. Spatial data imported from AutoCAD was carefully checked for errors during conversion to GIS format, particularly issues such as unclosed polygons, overlapping geometries, and misaligned features. To ensure topological integrity, all layers—especially those involving infrastructure like sidewalks and roads—were snapped and aligned correctly.

Attribute data was validated through spot checks and filtered to detect null values or mismatches, and custom validation rules were applied (e.g., "Parking Capacity > 0", "Road width $\geq$ 5.5 m"). The entire model was aligned using the official coordinate

system for mainland **Portugal (EPSG: 3763)**, ensuring spatial compatibility with national datasets.

Furthermore, metadata was documented for each layer, recording data sources, projection systems, and update history to support transparency and long-term data usability. These combined efforts ensured that the GIS model was technically sound, accurate, and ready for advanced spatial analysis.

7. GIS Analysis

To extract meaningful insights, various analyses are conducted:

7.1 Spatial Data Analysis:

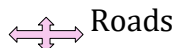
Understand **general distribution and density of features** across the urban area.

- Distribution of area based on its land use (Plots, Buildings, Green spaces, Public Equipment)
- Density of buildings per street
- Location clustering of public equipment



Figure 15: Plots, Buildings, Greenspaces, Public Equipments are shown along with roads, sidewalks and parkings in ArcGIS, represented with color-coded layers as described in the legend below.

Legend:



Roads

-  Sidewalks
-  Plots
-  Buildings
-  Greenspaces
-  Public Equipments
-  Parkings

7.2 Route Optimization:

The waste collection route was analyzed for **efficiency, avoiding narrow roads and maximizing coverage using a single-pass strategy.**

- Route that connects all bin points with minimal distance
- **Avoidance of narrow streets (<6m)**
- **Starting and ending at major access points**

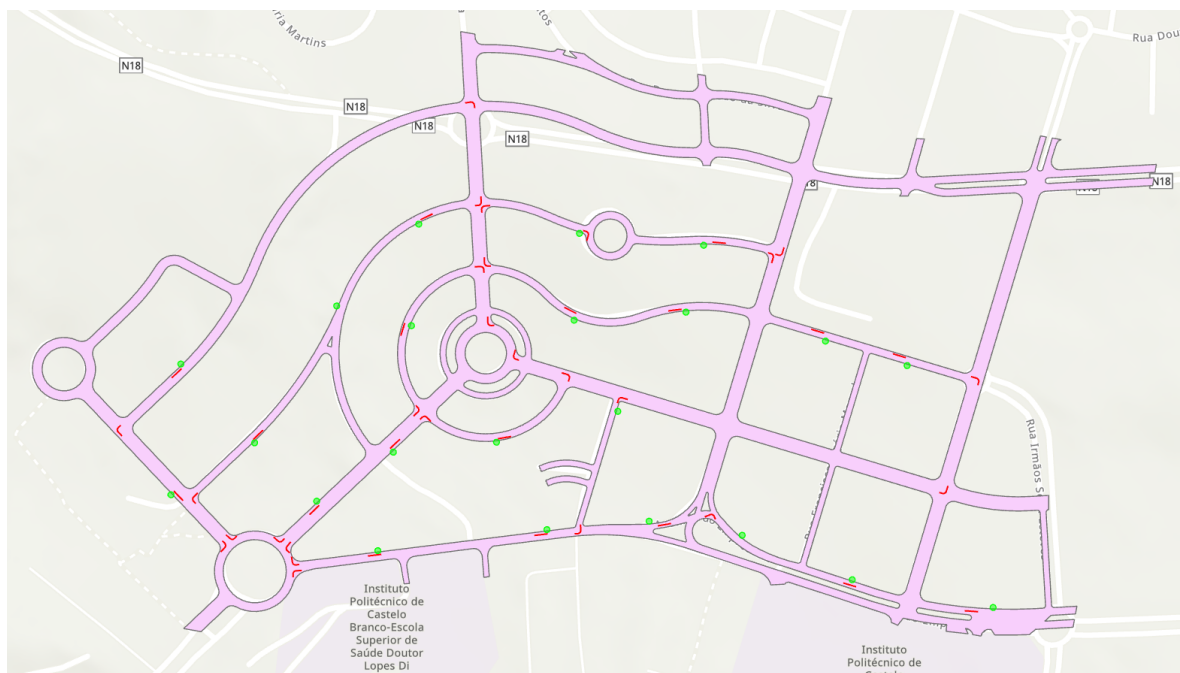


Figure 16: Garbage bins and the waste collection route was shown in ArcGIS, represented with symbols in the legend below.

Legend:

-  Roads
-  Garbage Bins

7.3 Proximity analysis:

To identify **infrastructure gaps** and areas requiring **infrastructure development**.
(e.g., bin coverage, road-sidewalk linkage)

- Bin coverage to plots/buildings (Plot-to-bin distances not more than 300m)
- Public Equipment coverage zones (distance to schools, health posts)
- Walkable green spaces access
- Accessibility to public parking
- Sidewalk access to road, or building-to-road distance

7.4 Network Analysis:

Enhancing **road connectivity**, **Assessing transportation and pedestrian accessibility** and optimizing infrastructure placement.

- Identify dead-end roads lacking connection
- Sidewalks that break near intersections or do not connect to roads
- Pedestrian access distance to nearest parking or equipment

7.5 Overlay Analysis:

Identifying land use conflicts and **planning constraints**. **Utility lines** were overlaid with buildings, plots, public equipment and green spaces to detect conflicts or overlaps.

- A utility line running under or through a building footprint
- Conflicts where lines passes under narrow residential street



Figure 17: Waterlines, Gaslines, Sewagelines, Sewageboxes and Electrivity Stations are shown together in ArcGIS and marked with legends below.

Legend:

-  Waterline
-  Gas line
-  Sewage lines
-  Inspection Chamber
-  Gutter
-  Manhole
-  Electricity Station

8. Results

The GIS model output showed:

- **High service coverage:** Most of the plots are in proximity of public services.
- Balanced plot development potential, complying with zoning.
- The existing plan supports **medium-density housing** with integrated commercial strips.
- Waste collection route is started from Avenida do Empresário and ending at R. Manuel Duque Vieira (marked with green color in below image) and only one narrow route R. Antonio Liberato de Oliveira of 5.5m (marked with yellow color in below image) is used in it which may need to be changeable. Also, it is optimised with **100% bin coverage**.



Figure 18: Waste collection route is shown with 1,2,...,44(white color) and garbage bins are shown with G1,G2,...,G22(blue color).

- Road network is **well-connected** but constrained in some narrow sectors with 5.5m width which is marked with (red color) Est. 2, Est. 3 (R. Francisco Ligorio Morcela) and Est. 4(R. Antonio Liberato de Oliveira) in above image that may need redesign (<6m).
- Opportunity areas for **public amenities, parking, and smart upgrades**.
- Electricity distribution mapped with PST station hierarchy; clarified existing overhead and proposed underground transitions.
- Water, gas and sewage all lines are passing through **underground**.
- Manholes and inspection chambers properly positioned for wastewater infrastructure.

GIS served as a diagnostic tool to verify assumptions and highlight planning bottlenecks. These insights formed the base for recommendations in the final plan.

9. Challenges and Limitations

Despite its numerous advantages, GIS implementation in urban planning faces several challenges. One of the primary concerns is **data collection constraints**, as spatial data may be outdated, inconsistent, or incomplete. Additionally, **technical challenges** arise when handling large-scale GIS datasets, requiring advanced computational resources for efficient processing. The integration of GIS into urban management also involves **institutional and regulatory challenges**, as policies governing land-use planning may limit access to critical spatial data. Overcoming these challenges requires the adoption of advanced data collection techniques, investment in

high-performance computing, and the establishment of regulatory frameworks that support GIS-based urban planning.

The project encountered:

- Complex DWG geometry requiring manual cleanup
- Limited metadata for some place
- Compatibility issues in Excel-GIS joins

Still, these were addressed through manual review, consistency checks, and prioritizing essential data.

10. Conclusion

This project demonstrates the transformative role of Geographic Information Systems (GIS) in urban management by delivering a **structured, spatially accurate, and data-enriched model** of the Quinta da Torre Detailed Plan in Castelo Branco.

Through the systematic integration of AutoCAD design drawings into ArcGIS Pro, and the development of comprehensive attribute tables for **13 urban layers**—including plots, infrastructure networks, public equipment, and waste management—this study establishes a reliable geodatabase that supports **advanced spatial analysis and planning**.

The model not only aligns with national urban planning legislation but also enhances decision-making by visualizing relationships between **infrastructure, land use, accessibility, and service coverage**.

Electricity and utility lines require coordinated mapping to avoid future service conflicts. Key outputs such as optimised waste collection routes, proximity analysis of public amenities, and identification of development potential zones confirm the practical value of GIS in real-world planning contexts. By offering a scalable, regulation-compliant foundation, this GIS model empowers urban planners to pursue **sustainable growth, infrastructure resilience, and smart city integration**.

This report and its associated geodatabase serve as a practical reference for urban planners, municipal engineers, and researchers interested in applying GIS for sustainable urban development.

11. Future Enhancements

The future of GIS in urban management is evolving with the integration of **Artificial Intelligence (AI) and Machine Learning (ML)**. These technologies enhance the ability of GIS models to detect patterns in urban development, infrastructure usage,

and environmental changes. Additionally, the emergence of real-time GIS applications is transforming urban planning by enabling continuous monitoring of **live traffic conditions, population movements, and weather patterns**. Another promising development is crowd sourced GIS data, where public participation contributes to urban planning efforts. By integrating user-generated spatial data, cities can develop more inclusive and community-driven urban policies.

To advance this project, future work can include:

- 3D GIS for visual impact and volume analysis
- Add **Smart sensors** for real-time data for monitoring (e.g., utility network flows, parking and waste management, bin fill levels)
- Public dashboards for participatory planning
- Legal integration with zoning compliance alerts
- Dynamic routing for public services
- **Automate update** of layers through **API-based integration** with municipal systems
- Incorporate AI-based predictive analytics for infrastructure needs assessment

These will bring the model closer to a living, interactive digital twin of the urban environment.

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12.1 Work Link- for Project Files

<https://drive.google.com/drive/folders/1N8Uk5AqOR0YjHYDViZcsV5FenpzjKO9N?usp=sharing>

13. Annexures

Table 1: Attribute data table of all the plots shown in the layer.

FI D	Plot ID	Lot Area (A _i)	Max Implementation Area (A _i)	Backyard Area (A _b)	Street Name	Postal Code	Police Code
0	A1	405	151	254	R. Manuel Duque Vieira	6000-474	20
1	A2	429	136	293	R. Prof. Amelia de Jesus Silva	6000-479	11
2	A3	434	140	294	R. Prof. Amelia de Jesus Silva	6000-479	12
3	A4	436	140	296	R. Prof. Amelia de Jesus Silva	6000-479	13
4	A5	436	140	296	R. Prof. Amelia de Jesus Silva	6000-479	14
5	A6	436	140	296	R. Prof. Amelia de Jesus Silva	6000-479	15
6	A7	583	120	463	R. Prof. Joaquim da Costa Salvado	6000-479	7
7	A8	440	140	300	R. Prof. Amelia de Jesus Silva	6000-479	16
8	A9	429	136	293	R. Prof. Amelia de Jesus Silva	6000-479	10
9	A10	399	120	279	R. Prof. Joaquim da Costa Salvado	6000-479	6
10	A11	406	120	286	R. Prof. Joaquim da Costa Salvado	6000-479	5
11	A12	420	125	295	R. Prof. Joaquim da Costa Salvado	6000-479	4
12	A13	420	125	295	R. Prof. Joaquim da Costa Salvado	6000-479	3
13	A14	420	125	295	R. Prof. Joaquim da Costa Salvado	6000-479	2
14	A15	433	125	308	R. Prof. Joaquim da Costa Salvado	6000-479	1
15	A16	488	136	352	R. Prof. Amelia de Jesus Silva	6000-479	8
16	A17	429	136	293	R. Prof. Amelia de Jesus Silva	6000-479	9
17	A18	380	121	259	R. Dra. Ludovina Barroso	6000-475	54
18	A19	380	133	247	R. Dra. Ludovina Barroso	6000-475	52
19	A20	380	133	247	R. Dra. Ludovina Barroso	6000-475	50
20	A21	380	133	247	R. Dra. Ludovina Barroso	6000-475	48

21	A22	380	133	247	R. Dra. Ludovina Barroso	6000-475	46
22	A23	380	133	247	R. Dra. Ludovina Barroso	6000-475	53
23	A24	380	133	247	R. Dra. Ludovina Barroso	6000-475	51
24	A25	380	133	247	R. Dra. Ludovina Barroso	6000-475	49
25	A26	380	133	247	R. Dra. Ludovina Barroso	6000-475	47
26	A27	386	139	247	R. Manuel Duque Vieira	6000-474	29
27	A28	386	145	241	R. Manuel Duque Vieira	6000-474	27
28	A29	386	145	241	R. Manuel Duque Vieira	6000-474	25
29	A30	386	145	241	R. Manuel Duque Vieira	6000-474	23
30	A31	386	145	241	R. Manuel Duque Vieira	6000-474	22
31	A32	386	145	241	R. Manuel Duque Vieira	6000-474	24
32	A33	386	145	241	R. Manuel Duque Vieira	6000-474	28
33	A34	386	145	241	R. Manuel Duque Vieira	6000-474	26
34	A35	386	145	241	R. Manuel Duque Vieira	6000-474	24
35	A36	386	145	241	R. Manuel Duque Vieira	6000-474	21
36	A37	386	145	241	R. Manuel Duque Vieira	6000-474	23
37	A38	405	151	254	R. Manuel Duque Vieira	6000-474	19
38	A39	405	151	254	R. Manuel Duque Vieira	6000-474	18
39	A40	366	129	237	R. Manuel Duque Vieira	6000-474	1
40	A41	444	129	315	R. Manuel Duque Vieira	6000-474	5
41	A42	489	122	367	R. Manuel Duque Vieira	6000-474	6
42	A43	366	129	237	R. Manuel Duque Vieira	6000-474	2
43	A44	464	129	335	R. Manuel Duque Vieira	6000-474	8
44	A45	396	120	276	R. Manuel Duque Vieira	6000-474	13
45	A46	418	133	285	R. Manuel Duque Vieira	6000-474	21

46	A47	541	122	419	R. Manuel Duque Vieira	6000- 474	7
47	A48	374	125	249	R. Manuel Duque Vieira	6000- 474	9
48	A49	462	133	329	R. Manuel Duque Vieira	6000- 474	11
49	A50	366	110	256	R. Manuel Duque Vieira	6000- 474	15
50	A51	391	138	253	R. Manuel Duque Vieira	6000- 474	10
51	A52	486	133	353	R. Manuel Duque Vieira	6000- 474	12
52	A53	366	110	256	R. Manuel Duque Vieira	6000- 474	14
53	A54	423	110	313	R. Manuel Duque Vieira	6000- 474	16
54	A55	372	131	241	R. Manuel Duque Vieira	6000- 474	22
55	A56	508	133	375	R. Manuel Duque Vieira	6000- 474	20
56	A57	413	134	279	R. Manuel Duque Vieira	6000- 474	18
57	A58	510	133	377	R. Manuel Duque Vieira	6000- 474	19
58	A59	427	136	291	R. Manuel Duque Vieira	6000- 474	17
59	A60	375	130	245	R. Dra. Ludovina Barroso	6000- 475	57
60	A61	375	132	243	R. Dra. Ludovina Barroso	6000- 475	59
61	A62	375	137	238	R. Dra. Ludovina Barroso	6000- 475	61
62	A63	375	129	246	R. Dra. Ludovina Barroso	6000- 475	63
63	A64	375	134	241	R. Dra. Ludovina Barroso	6000- 475	65
64	A65	375	134	241	R. Dra. Ludovina Barroso	6000- 475	67
65	A66	375	132	243	R. Dra. Ludovina Barroso	6000- 475	69
66	A67	375	134	241	R. Dra. Ludovina Barroso	6000- 475	68
67	A68	375	134	241	R. Dra. Ludovina Barroso	6000- 475	66
68	A69	375	134	241	R. Dra. Ludovina Barroso	6000- 475	64
69	C1	375	137	238	R. Dra. Ludovina Barroso	6000- 475	62
70	C2	375	137	238	R. Dra. Ludovina Barroso	6000- 475	60

71	C3	375	130	245	R. Dra. Ludovina Barroso	6000-475	58
72	C4	375	130	245	R. Dra. Ludovina Barroso	6000-475	56
73	C5	360	129	231	R. Manuel Duque Vieira	6000-474	45
74	C6	360	130	230	R. Manuel Duque Vieira	6000-474	43
75	C7	364	130	234	R. Manuel Duque Vieira	6000-474	41
76	C8	465	130	335	R. Manuel Duque Vieira	6000-474	39
77	C9	360	106	254	R. Manuel Duque Vieira	6000-474	37
78	C10	370	106	264	R. Manuel Duque Vieira	6000-474	35
79	C11	318	100	218	R. Manuel Duque Vieira	6000-474	30
80	C12	332	113	219	R. Manuel Duque Vieira	6000-474	32
81	C13	360	130	230	R. Manuel Duque Vieira	6000-474	44
82	C14	360	130	230	R. Manuel Duque Vieira	6000-474	42
83	C15	400	130	270	R. Manuel Duque Vieira	6000-474	40
84	C16	375	119	256	R. Manuel Duque Vieira	6000-474	38
85	C17	360	106	254	R. Manuel Duque Vieira	6000-474	36
86	C18	332	113	219	R. Manuel Duque Vieira	6000-474	31
87	C19	457	106	351	R. Manuel Duque Vieira	6000-474	34
88	C20	490	113	377	R. Manuel Duque Vieira	6000-474	33
89	C21	390	144	246	R. Manuel Duque Vieira	6000-474	17
90	C22	410	129	281	R. Manuel Duque Vieira	6000-474	4
91	C23	380	129	251	R. Manuel Duque Vieira	6000-474	3
92	C24	375	118	257	R. Dra. Ludovina Barroso	6000-475	55

Table 2: Attribute data table of all the buildings shown in the layer.

FID	Building_ID	Plot_ID	Implementation	Backyard Area	Construction	No. of Levels	No. of Units	Use Type	Street Name	Postal Code	Police Code
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			n Area (A _i)	a (A _b)	Area(A _c)	vel s					
0	A70	A110	319	91	1.775	Cv +6	12	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	110
1	A71	A108	319	91	1.775	Cv +6	12	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	108
2	A72	A109	319	91	1.775	Cv +6	12	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	109
3	A73	A150	373	156	1.735	Cv +5	10	Resid ential	Avenida do Empresario	6000 -767	150
4	A74	A148	448	47	2.065	Cv +5	12	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	148
5	A75	A146	309	49	1.725	Cv +6	12	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	146
6	A76	A144	373	110	1.735	Cv +5	10	Resid ential	R. Profa. Maria Amalia Fevereiro	6000 -472	144
7	A77	A149	373	110	1.735	Cv +5	10	Resid ential	R. Irmaos Sena Esteves	6000 -471	149
8	A78	A147	309	49	1.725	Cv +6	12	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	147
9	A79	A145	448	47	2.4	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	145
10	A80	A143	373	156	1.735	Cv +5	10	Resid ential	Avenida do Empresario	6000 -767	143

11	A81	A107	400	75	1.49	Cv +4	12	Resid ential	R. Dra. Ludovina Barroso	6000 -475	107
12	A82	A105	330	100	1.53	Cv +5	10	Resid ential	R. Profa. Maria Amalia Fevereiro	6000 -472	105
13	A83	A103	456	38	2.36	Cv +6	14	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	103
14	A84	A101	456	38	2.535	Cv +6	17	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	101
15	A85	A106	456	38	1.715	Cv +4	12	Resid ential	R. Dra. Ludovina Barroso	6000 -475	106
16	A86	A104	330	100	1.53	Cv +5	10	Resid ential	R. Profa. Maria Amalia Fevereiro	6000 -472	104
17	A87	A102	400	75	2.24	Cv +6	18	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	102
18	A88	A100	330	100	1.53	Cv +5	10	Resid ential	R. Francisco Ligorio Morcela	6000 -477	100
19	A89	A142	313	95	1.455	Cv +5	10	Resid ential	Avenida do Empresario	6000 -767	142
20	A90	A139	456	38	2.36	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	139
21	A91	A137	456	38	2.535	Cv +6	17	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	137
22	A92	A134	643	195	2.985	Cv +5	10	Resid ential	Avenida do Empresario	6000 -767	134
23	A93	A138	400	75	2.24	Cv +6	18	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	138

24	A94	A136	330	100	1.53	Cv +5	10	Resid ential	R. Francisco Ligorio Morcela	6000 -477	136
25	A95	A140	330	100	1.53	Cv +5	10	Resid ential	R. Profa. Maria Amalia Fevereiro	6000 -472	140
26	A96	A141	330	100	1.53	Cv +5	10	Resid ential	R. Profa. Maria Amalia Fevereiro	6000 -472	141
27	A97	A130	330	100	1.53	Cv +5	10	Resid ential	R. Dr. Victor dos Santos Pinto	6000 -478	130
28	A98	A132	400	75	2.24	Cv +6	18	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	132
29	A99	A1	330	100	1.445	Cv +5	10	Resid ential	R. Francisco Ligorio Morcela	6000 -477	1
30	A100	A3	388	20	1.78	Cv +5	14	Resid ential	Avenida do Empresario	6000 -767	3
31	A101	A133	456	38	2.535	Cv +6	17	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	133
32	A102	A131	456	38	2.36	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	131
33	A103	A2	430	0	1.445	Cv +5	10	Resid ential	R. Francisco Ligorio Morcela	6000 -477	2
34	A104	A4	300	80	1.16	Cv +4	8	Resid ential	Avenida do Empresario	6000 -767	4
35	A105	A99	330	100	1.53	Cv +5	10	Resid ential	R. Francisco Ligorio Morcela	6000 -477	99
36	A106	A97	400	75	2.24	Cv +6	18	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	97

37	A107	A95	330	100	1.53	Cv +5	10	Mix Use	R. Dr. Victor dos Santos Pinto	6000 -478	95
38	A108	A93	456	38	1.715	Cv +4	12	Resid ential	R. Dra. Ludovina Barroso	6000 -475	93
39	A109	A92	400	75	1.49	Cv +4	12	Resid ential	R. Dra. Ludovina Barroso	6000 -475	92
40	A110	A94	330	100	1.53	Cv +5	10	Resid ential	R. Dr. Victor dos Santos Pinto	6000 -478	94
41	A111	A96	456	38	2.36	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	96
42	A112	A98	456	38	2.535	Cv +6	17	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	98
43	A113	A25	297	45	1.62	Cv +6	12	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	25
44	A114	A27	310	48	1.685	Cv +6	12	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	27
45	A115	A26	313	49	1.7	Cv +6	12	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	26
46	A116	A71	345	110	1.6	Cv +5	10	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	71
47	A117	A70	328	81	1.52	Cv +5	10	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	70
48	A118	A13	300	80	1.5	Cv +5	10	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	13
49	A119	A11	613	108	2.52	Cv +5	16	Mix Use	Avenida do Empresario	6000 -767	11
50	A120	A12	330	50	1.5	Cv +5	10	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	12

51	A121	A14	596	46	1.705	Cv +5	8	Mix Use	R. Prof. M. da conceicao Silva	6000 -479	14
52	A122	A16	297	45	1.62	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	16
53	A123	A28	310	48	1.685	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	28
54	A124	A15	388	18	2.22	Cv +6	17	Resid ential	R. Prof. M. da conceicao Silva	6000 -479	15
55	A125	A32	476	0	2.605	Cv +6	18	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	32
56	A126	A30	363	53	1.985	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	30
57	A127	A31	366	54	2	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	31
58	A128	A29	310	48	1.685	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	29
59	A129	A114	302	58	1.405	Cv +5	10	Resid ential	R. Dra. Ludovina Barroso	6000 -475	114
60	A130	A112	436	50	2.05	Cv +5	15	Resid ential	R. Dra. Ludovina Barroso	6000 -475	112
61	A131	A113	302	58	1.405	Cv +5	10	Resid ential	R. Dra. Ludovina Barroso	6000 -475	113
62	A132	A111	330	50	1.53	Cv +5	10	Resid ential	R. Dr. Eduardo Almeida Esteves	6000 -481	111
63	A133	A46	297	45	1.62	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	46
64	A134	A44	388	18	2.295	Cv +6	18	Resid ential	R. Prof. M. da	6000 -479	44

									conceicao Silva		
65	A135	A42	388	18	2.185	Cv +6	17	Resid ential	R. Prof. M. da conceicao Silva	6000 -479	42
66	A136	A40	297	45	1.62	Cv +6	12	Resid ential	R. Prof. Amelia de Jesus Silva	6000 -479	40
67	A137	A45	297	45	1.62	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	45
68	A138	A43	307	62	1.585	Cv +6	10	Resid ential	R. Prof. M. da conceicao Silva	6000 -479	43
69	A139	A41	297	45	1.35	Cv +5	10	Resid ential	R. Prof. Amelia de Jesus Silva	6000 -479	41
70	A140	A33	363	53	1.985	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	33
71	A141	A35	476	0	2.605	Cv +6	18	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	35
72	A142	A37	427	0	2.345	Cv +6	18	Resid ential	R. Prof. Amelia de Jesus Silva	6000 -479	37
73	A143	A39	309	49	1.675	Cv +6	12	Resid ential	R. Prof. Amelia de Jesus Silva	6000 -479	39
74	A144	A34	366	54	2	Cv +6	12	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	34
75	A145	A38	305	47	1.66	Cv +6	12	Resid ential	R. Prof. Amelia de Jesus Silva	6000 -479	38
76	A146	A36	428	0	1.57	Cv +6	10	Resid ential	R. Prof. Adelino Tavares de Matos	6000 -495	36
77	A147	A76	322	0	1.37	Cv +5 / Cv +4	9	Resid ential	R. Dra. Ludovina Barroso	6000 -475	76

78	A148	A74	322	0	1.22	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	74
79	A149	A72	322	0	1.22	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	72
80	A150	A75	322	0	1.22	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	75
81	B1	A73	322	0	1.22	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	73
82	B2	A118	275	0	1.045	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	118
83	B3	A116	275	0	1.045	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	116
84	B4	A119	346	0	1.68	Cv +6	13	Mix Use	R. Dra. Ludovina Barroso	6000 -475	119
85	B5	A117	275	0	1.045	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	117
86	B6	A115	275	0	1.045	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	115
87	B7	A83	256	62	1.19	Cv +5	10	Resid ential	R. Dra. Ludovina Barroso	6000 -475	83
88	B8	A81	400	75	2.24	Cv +6	18	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	81
89	B9	A78	306	0	1.305	Cv +5 / Cv +4	9	Resid ential	R. Dra. Ludovina Barroso	6000 -475	78
90	B10	A82	456	38	2.535	Cv +6	17	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	82
91	B11	A80	396	31	1.825	Cv +6	15	Resid ential	R. Dra. Ludovina Barroso	6000 -475	80
92	B12	A79	306	0	1.16	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	79

93	B13	A77	306	0	1.305	Cv +5 / Cv +4	9	Resid ential	R. Dra. Ludovina Barroso	6000 -475	77
94	B14	A91	310	83	1.15	Cv +4	8	Resid ential	R. Dra. Ludovina Barroso	6000 -475	91
95	B15	A89	330	100	1.53	Cv +5	10	Resid ential	R. Dr. Victor dos Santos Pinto	6000 -478	89
96	B16	A87	400	75	2.24	Cv +6	18	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	87
97	C25	A85	330	100	1.53	Cv +5	10	Mix Use	R. Antonio Liberato de Oliveira	6000 -478	85
98	C26	A90	330	100	1.53	Cv +5	10	Resid ential	R. Dr. Victor dos Santos Pinto	6000 -478	90
99	C27	A88	456	38	2.36	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	88
100	C28	A86	456	38	2.535	Cv +6	17	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	86
101	C29	A84	292	118	1.35	Cv +5	10	Mix Use	R. Dra. Ludovina Barroso	6000 -475	84
102	C30	A129	330	100	1.53	Cv +5	10	Resid ential	R. Dr. Victor dos Santos Pinto	6000 -478	129
103	C31	A127	400	75	2.24	Cv +6	18	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	127
104	C32	A125	330	100	1.53	Cv +5	10	Resid ential	R. Antonio Liberato de Oliveira	6000 -478	125
105	C33	A6	388	20	1.78	Cv +5	14	Resid ential	Avenida do Empresario	6000 -767	6
106	C34	A128	456	38	2.36	Cv +6	14	Mix Use	R. Prof. Sebastiao Antonio	6000 -473	128

									Morao Correia		
107	C35	A126	456	38	2.535	Cv +6	17	Resid ential	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	126
108	C36	A5	330	100	1.445	Cv +5	10	Resid ential	R. Antonio Liberato de Oliveira	6000 -478	5
109	C37	A7	300	80	1.16	Cv +4	8	Resid ential	Avenida do Empresario	6000 -767	7
110	C38	A124	502	30	1.89	Cv +6	10	Mix Use	R. Prof. Sebastiao Antonio Morao Correia	6000 -473	124
111	C39	A121	309	48	1.445	Cv +5	10	Resid ential	R. Dra. Ludovina Barroso	6000 -475	121
112	C40	A10	305	46	1.385	Cv +5	10	Resid ential	R. Antonio Liberato de Oliveira	6000 -478	10
113	C41	A8	305	46	1.385	Cv +5	10	Resid ential	Avenida do Empresario	6000 -767	8
114	C42	A122	309	48	1.445	Cv +5	10	Resid ential	R. Dra. Ludovina Barroso	6000 -475	122
115	C43	A120	426	43	2.015	Cv +5	15	Resid ential	R. Dra. Ludovina Barroso	6000 -475	120
116	C44	A9	305	46	1.385	Cv +5	10	Resid ential	R. Antonio Liberato de Oliveira	6000 -478	9

Table 3: Attribute data table of all the public equipments shown in the layer.

F I D	Eqp _ID	Name	Area	Use Type	Access	Street Name	Post al Code
0	PE1	Urban Park	33227	Park	Public	Avenida do Empresario	6000 -767
1	PE2	Superior School of Applied Arts	22370	Institute	Public	R. Prof. Amelia de Jesus Silva	6000 -479
2	PE3	RIBEIRA DA TORRE	3963	River	Public	R. Prof. Amelia de Jesus Silva	6000 -479
3	PE4	Escola Básica João Roiz	23729	School	Public	Avenida Cidade de Zhuhai	6000 -077

4	PE5	Escola Superior de Tecnologia - Instituto Politécnico de Castelo Branco	18092	Institute	Public	Avenida do Empresario	6000-767
5	PE6	Escola Superior de Saude Dr. Lopes Dias - Politécnico Castelo Branco	43895	Institute	Public	R. Prof. M. da conceicao Silva	6000-479
6	PE7	Equipamento De Desporto	10329	Sports Facility	Public	R. Prof. Amelia de Jesus Silva	6000-479
7	PE8	-	4000	Recreational, Cultural Equipment and Social Security	Public	R. Prof. Amelia de Jesus Silva	6000-479
8	PE9	Parque Urbano Cruz do Montalvão	8596	Recreational, Cultural and Leisure Facility	Public	R. Profa. Maria Amalia Fevereiro	6000-472

Table 4: Attribute data table of all greenspaces shown in the layer.

FI D	Space_ID	Area	Use Type	Vegetation	Street Name	Postal Code
0	GS1	304	Green Corridor	Grass	Avenida do Empresario	6000-767
1	GS2	908	Green Corridor	Grass	Avenida do Empresario	6000-767
2	GS3	962	Green Corridor	Grass,Trees	R. Prof. Sebastiao Antonio Morao Correia	6000-473
3	GS4	598	Green Corridor	Grass,Trees	R. Manuel Duque Vieira	6000-474
4	GS5	966	Green Corridor	Grass,Trees	R. Dr. Eduardo Almeida Esteves	6000-481
5	GS6	1216	Green Corridor	Grass,Trees	R. Prof. M. da conceicao Silva	6000-479
6	GS7	1313	Green Corridor	Grass,Trees	R. Manuel Duque Vieira	6000-474
7	GS8	3912	Green Corridor	Grass,Trees	Avenida do Empresario	6000-767
8	GS9	919	Park	Grass,Trees	R. Manuel Duque Vieira	6000-474
9	GS10	65	Tree-Lined Street	Tree	R. Prof. Sebastiao Antonio Morao Correia	6000-473
10	GS11	6585	Non buildable Green Corridor	Grass,Trees	Avenida Cidade de Zhuhai	6000-077
11	GS12	1270	Playground	Grass,Trees	R. Dra. Ludovina Barroso	6000-475

12	GS13	1568	Playground	Grass,Trees	Avenida do Empresario	6000-767
13	GS14	1845	Playground	Grass,Trees	Avenida do Empresario	6000-767
14	GS15	672	Playground	Grass	Avenida do Empresario	6000-767
15	GS16	653	Playground	Grass,Trees	R. Dr. Victor dos Santos Pinto	6000-478
16	GS17	705	Green Corridor	Grass	Avenida do Empresario	6000-767
17	GS18	1075	Playground	Grass,Trees	R. Dr. Victor dos Santos Pinto	6000-478
18	GS19	636	Playground	Grass,Trees	Avenida do Empresario	6000-767
19	GS20	672	Playground	Grass	Avenida do Empresario	6000-767
20	GS21	1075	Green Corridor	Grass	R. Prof. M. da conceicao Silva	6000-479
21	GS22	530	Tree-Lined Street	Trees	R. Dra. Ludovina Barroso	6000-475
22	GS23	1740	Playground	Grass,Trees	R. Dra. Ludovina Barroso	6000-475
23	GS24	991	Tree-Lined Street	Trees	R. Dra. Ludovina Barroso	6000-475
24	GS25	1502	Playground	Grass,Trees	R. Prof. Adelino Tavares de Matos	6000-495
25	GS26	2366	Green Corridor	Grass,Trees	Avenida do Empresario	6000-767

Table 5: Attribute data table of all the sidewalks shown in the layer.

FI D	Sidewalk_ID	Total Area	Width	Type of Material	Trees	Street Name	Postal Code
0	SW1	297	2.5	Stone	Yes	Avenida Cidade de Zhuhai	6000-077
1	SW2	363	2.5	Stone	Yes	Avenida Cidade de Zhuhai	6000-077
2	SW3	325	2.5	Stone	Yes	Avenida Cidade de Zhuhai	6000-077
3	SW4	1932	3.9	Stone	Yes	Avenida Cidade de Zhuhai	6000-077
4	SW5	2157	5.9	Pavement Blocks	No	Avenida do Empresario	6000-767
5	SW6	264	4.15	Pavement Blocks	No	Avenida do Empresario	6000-767
6	SW7	2167	4.5	Stone	Yes	R. Profa. Maria Amalia Fevereiro	6000-472
7	SW8	1687	4	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
8	SW9	3671	3.5	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473

9	SW10	2158	3.5	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
10	SW11	133	3.5	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
11	SW12	218	3.5	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
12	SW13	1080	3.5	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
13	SW14	151	3.5	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
14	SW15	1649	2	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
15	SW16	7220	3.5	Granite Slabs	Yes	R. Prof. M. da conceicao Silva	6000-479
16	SW17	1833	2	Stone	Yes	R. Prof. M. da conceicao Silva	6000-479
17	SW18	1126	2	Stone	Yes	R. Manuel Duque Vieira	6000-474
18	SW19	910	3.95	Pavement Blocks	No	Avenida do Empresario	6000-767
19	SW20	2564	3.5	Granite Slabs	No	R. Dr. Eduardo Almeida Esteves	6000-481
20	SW21	1029	3.5	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
21	SW22	2874	3.5	Stone	Yes	Avenida Cidade de Zhuhai	6000-077
22	SW23	4613	3.5	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
23	SW24	1291	3.5	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
24	SW25	1607	3.5	Stone	Yes	R. Dra. Ludovina Barroso	6000-475
25	SW26	2684	4	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
26	SW27	1679	6	Stone	Yes	R. Prof. Sebastiao Antonio Morao Correia	6000-473
27	SW28	4622	4	Stone	Yes	R. Prof. M. da conceicao Silva	6000-479

Table 6: Attribute data table of all the roads shown in the layer.

FI D	Road _ID	Name	Post al Code	Wi dt h	No . of La ne s	Type of Material	Type of Levels	Lighti ng Availa bility	Parki ng Availa bility
0	Est. 3	R. Francisco Ligorio Morcela	6000-477	5.5	1	Asphalt Concrete	Secondary	Yes	Yes

1	Est. 4	R. Antonio Liberato de Oliveira	6000-478	5.5	1	Asphalt Concrete	Secondary	Yes	Yes
2	Est. 2	R. Francisco Ligorio Morcela	6000-477	5.5	1	Asphalt Concrete	Secondary	Yes	Yes
3	Est. 1	R. Irmaos Sena Esteves	6000-471	13	4	Asphalt Concrete	Secondary	Yes	Yes
4	Rua N	Avenida do Empresario	6000-767	13	4	Asphalt Concrete	Primary	Yes	Yes
5	Rua G	R. Dr. Eduardo Almeida Esteves	6000-481	13	2	Asphalt Concrete	Primary	Yes	Yes
6	Rua I	R. Prof. M. da conceicao Silva	6000-479	13	3	Asphalt Concrete	Tertiary	Yes	Yes
7	Rua L	R. Prof. Joaquim da Costa Salvado	6000-479	9	2	Asphalt Concrete	Tertiary	Yes	No
8	Rua M	Avenida Cidade de Zhuhai	6000-077	9	4	Asphalt Concrete	Primary	Yes	Yes
9	Rua J	R. Prof. Amelia de Jesus Silva	6000-479	9	2	Asphalt Concrete	Tertiary	Yes	Yes
10	Rua E	R. Manuel Duque Vieira	6000-474	7	2	Asphalt Concrete	Secondary	Yes	Yes
11	Rua H	R. Prof. Adelino Tavares de Matos	6000-495	7	1	Asphalt Concrete	Tertiary	Yes	Yes
12	Rua F	R. Eugenia Lima	6000-225	13	3	Asphalt Concrete	Primary	Yes	No
13	Rua A	R. Profa. Maria Amalia Fevereiro	6000-472	13	3	Asphalt Concrete	Primary	Yes	Yes
14	Rua B	R. Dr. Victor dos Santos Pinto	6000-478	13	3	Asphalt Concrete	Primary	Yes	Yes
15	Rua C	R. Prof. Sebastiao Antonio Morao Correia	6000-473	13	2	Asphalt Concrete	Primary	Yes	Yes
16	Rua D	R. Dra. Ludovina Barroso	6000-475	7	2	Asphalt Concrete	Secondary	Yes	Yes

Table 7: Attribute data table of all the parkings shown in the layer.

FI D	Park ing_I D	Area	No. of Vehicl es	Type of Parking	Street Name	Postal Code	Lighting Avaibility
0	P1	316	21	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
1	P2	674	45	90° Perpendicular	R. Dra. Ludovina Barroso	6000- 475	Yes
2	P3	260	17	Parallel	R. Manuel Duque Vieira	6000- 474	Yes
3	P4	335	22	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
4	P5	403	27	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
5	P6	279	19	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
6	P7	395	26	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
7	P8	249	17	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
8	P9	600	40	90° Perpendicular	R. Dra. Ludovina Barroso	6000- 475	Yes
9	P10	355	24	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
10	P11	738	49	Parallel	R. Dra. Ludovina Barroso	6000- 475	Yes
11	P12	148	10	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
12	P13	731	49	90° Perpendicular	R. Dra. Ludovina Barroso	6000- 475	Yes
13	P14	441	29	90° Perpendicular	R. Dr. Eduardo Almeida Esteves	6000- 481	Yes
14	P15	195	13	90° Perpendicular	R. Dr. Eduardo Almeida Esteves	6000- 481	Yes
15	P16	195	13	90° Perpendicular	R. Dr. Eduardo Almeida Esteves	6000- 481	Yes
16	P17	441	29	90° Perpendicular	R. Dr. Eduardo Almeida Esteves	6000- 481	Yes
17	P18	605	40	90° Perpendicular	R. Prof. M. da conceicao Silva	6000- 479	Yes
18	P19	380	25	90° Perpendicular	R. Antonio Liberato de Oliveira	6000- 478	Yes

19	P20	108	7	90° Perpendicular	R. Antonio Liberato de Oliveira	6000- 478	Yes
20	P21	109	7	Parallel	R. Prof. M. da conceicao Silva	6000- 479	Yes
21	P22	89	6	Parallel	R. Prof. M. da conceicao Silva	6000- 479	Yes
22	P23	92	6	Parallel	R. Prof. M. da conceicao Silva	6000- 479	Yes
23	P24	78	5	Parallel	R. Prof. M. da conceicao Silva	6000- 479	Yes
24	P25	310	21	90° Perpendicular	R. Prof. Adelino Tavares de Matos	6000- 495	Yes
25	P26	430	29	90° Perpendicular	R. Dr. Victor dos Santos Pinto	6000- 478	Yes
26	P27	430	29	90° Perpendicular	R. Dr. Victor dos Santos Pinto	6000- 478	Yes
27	P28	324	22	Parallel	R. Manuel Duque Vieira	6000- 474	Yes
28	P29	247	16	Parallel	R. Manuel Duque Vieira	6000- 474	Yes
29	P30	335	22	45° Angled	Avenida Cidade de Zhuhai	6000- 077	Yes
30	P31	572	38	45° Angled	R. Profa. Maria Amalia Fevereiro	6000- 472	Yes
31	P32	312	21	60° Angled	R. Francisco Ligorio Morcela	6000- 477	Yes
32	P33	385	26	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
33	P34	385	26	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
34	P35	385	26	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
35	P36	385	26	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
36	P37	390	26	90° Perpendicular	R. Profa. Maria Amalia Fevereiro	6000- 472	Yes
37	P38	364	24	90° Perpendicular	R. Profa. Maria Amalia Fevereiro	6000- 472	Yes
38	P39	360	24	90° Perpendicular	R. Irmaos Sena Esteves	6000- 471	Yes
39	P40	347	23	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes
40	P41	309	21	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000- 473	Yes

41	P42	418	28	60° Angled	Avenida do Empresario	6000-767	Yes
42	P43	302	20	60° Angled	Avenida do Empresario	6000-767	Yes
43	P44	406	27	90° Perpendicular	R. Dra. Ludovina Barroso	6000-475	Yes
44	P45	406	27	90° Perpendicular	R. Dra. Ludovina Barroso	6000-475	Yes
45	P46	409	27	90° Perpendicular	R. Dra. Ludovina Barroso	6000-475	Yes
46	P47	408	27	90° Perpendicular	R. Dra. Ludovina Barroso	6000-475	Yes
47	P48	203	14	Parallel	Avenida do Empresario	6000-767	Yes
48	P49	193	13	90° Perpendicular	R. Dr. Victor dos Santos Pinto	6000-478	Yes
49	P50	193	13	90° Perpendicular	R. Dr. Victor dos Santos Pinto	6000-478	Yes
50	P51	179	12	90° Perpendicular	Avenida do Empresario	6000-767	Yes
51	P52	424	28	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000-473	Yes
52	P53	326	22	Parallel	R. Manuel Duque Vieira	6000-474	Yes
53	P54	218	15	60° Angled	Avenida Cidade de Zhuhai	6000-077	Yes
54	P55	582	39	45° Angled	Avenida Cidade de Zhuhai	6000-077	Yes
55	P56	264	18	90° Perpendicular	Avenida do Empresario	6000-767	Yes
56	P57	345	23	90° Perpendicular	Avenida do Empresario	6000-767	Yes
57	P58	314	21	90° Perpendicular	R. Prof. Adelino Tavares de Matos	6000-495	Yes
58	P59	386	26	90° Perpendicular	R. Prof. Adelino Tavares de Matos	6000-495	Yes
59	P60	374	25	90° Perpendicular	R. Prof. Adelino Tavares de Matos	6000-495	Yes
60	P61	341	23	Parallel	Avenida do Empresario	6000-767	Yes
61	P62	433	29	Parallel	R. Manuel Duque Vieira	6000-474	Yes
62	P63	323	22	Parallel	R. Manuel Duque Vieira	6000-474	Yes
63	P64	390	26	90° Perpendicular	R. Profa. Maria Amalia Fevereiro	6000-472	Yes
64	P65	390	26	90° Perpendicular	R. Profa. Maria Amalia Fevereiro	6000-472	Yes
65	P66	312	21	60° Angled	R. Francisco Ligorio Morcela	6000-477	Yes

66	P67	390	26	90° Perpendicular	R. Francisco Ligorio Morcela	6000-477	Yes
67	P68	390	26	90° Perpendicular	R. Francisco Ligorio Morcela	6000-477	Yes
68	P69	255	17	90° Perpendicular	R. Antonio Liberato de Oliveira	6000-478	Yes
69	P70	600	40	Parallel	R. Manuel Duque Vieira	6000-474	Yes
70	P71	600	40	Parallel	R. Manuel Duque Vieira	6000-474	Yes
71	P72	267	18	90° Perpendicular	R. Prof. Sebastiao Antonio Morao Correia	6000-473	Yes
72	P73	846	56	Parallel	R. Dra. Ludovina Barroso	6000-475	Yes
73	P74	1329	89	90° Perpendicular	R. Dra. Ludovina Barroso	6000-475	Yes
74	P75	224	15	90° Perpendicular	R. Manuel Duque Vieira	6000-474	Yes
75	P76	397	26	90° Perpendicular	R. Manuel Duque Vieira	6000-474	Yes
76	P77	454	30	90° Perpendicular	Avenida do Empresario	6000-767	Yes
77	P78	510	34	90° Perpendicular	Avenida do Empresario	6000-767	Yes
78	P79	263	18	90° Perpendicular	Avenida do Empresario	6000-767	Yes
79	P80	258	17	Parallel	R. Manuel Duque Vieira	6000-474	Yes
80	P81	702	47	90° Perpendicular	R. Prof. Amelia de Jesus Silva	6000-479	Yes

Table 8: Attribute data table of all the waterlines shown in the layer.

FI D	Pipe ID	Length	Diameter	Type of Levels	Material	Installation Type	Status
0	W01	76	160	Main line	HDPE	Underground	Existing
1	W02	82	160	Main line	HDPE	Underground	Existing
2	W03	84	160	Main line	HDPE	Underground	Existing
3	W04	82	90	Distribution branch	HDPE	Underground	Existing
4	W05	82	90	Distribution branch	HDPE	Underground	Existing
5	W06	82	110	General distribution	HDPE	Underground	Existing
6	W07	283	110	General distribution	HDPE	Underground	Existing
7	W08	282	110	General distribution	HDPE	Underground	Existing
8	W09	275	110	General distribution	HDPE	Underground	Existing

9	W10	168	160	Main line	HDPE	Underground	Existing
10	W11	257	110	General distribution	HDPE	Underground	Existing
11	W12	171	110	General distribution	HDPE	Underground	Existing
12	W13	171	160	Main line	HDPE	Underground	Existing
13	W14	36	110	General distribution	HDPE	Underground	Existing
14	W15	168	160	Main line	HDPE	Underground	Existing
15	W16	110	160	Main line	HDPE	Underground	Existing
16	W17	157	110	General distribution	HDPE	Underground	Existing
17	W18	81	160	Main line	HDPE	Underground	Existing
18	W19	83	160	Main line	HDPE	Underground	Existing
19	W20	276	160	Main line	HDPE	Underground	Existing
20	W21	82	110	General distribution	HDPE	Underground	Existing
21	W22	182	90	Distribution branch	HDPE	Underground	Existing
22	W23	182	110	General distribution	HDPE	Underground	Existing
23	W24	83	160	Main line	HDPE	Underground	Existing
24	W25	171	110	General distribution	HDPE	Underground	Existing
25	W26	171	90	Distribution branch	HDPE	Underground	Existing
26	W27	182	110	General distribution	HDPE	Underground	Existing
27	W28	168	160	Main line	HDPE	Underground	Existing
28	W29	119	90	Distribution branch	HDPE	Underground	Existing
29	W30	26	110	General distribution	HDPE	Underground	Existing
30	W31	88	110	General distribution	HDPE	Underground	Existing
31	W32	83	90	Distribution branch	HDPE	Underground	Existing
32	W33	26	110	General distribution	HDPE	Underground	Existing
33	W34	26	110	General distribution	HDPE	Underground	Existing
34	W35	190	160	Main line	HDPE	Underground	Existing
35	W36	72	160	Main line	HDPE	Underground	Existing
36	W37	26	110	General distribution	HDPE	Underground	Existing
37	W38	142	160	Main line	HDPE	Underground	Existing
38	W39	26	110	General distribution	HDPE	Underground	Existing
39	W40	74	110	General distribution	HDPE	Underground	Existing

40	W41	70	160	Main line	HDPE	Underground	Existing
41	W42	149	160	Main line	HDPE	Underground	Existing
42	W43	122	160	Main line	HDPE	Underground	Existing
43	W44	39	110	General distribution	HDPE	Underground	Existing
44	W45	195	110	General distribution	HDPE	Underground	Existing
45	W46	219	110	General distribution	HDPE	Underground	Existing
46	W47	167	90	Distribution branch	HDPE	Underground	Existing
47	W48	36	90	Distribution branch	HDPE	Underground	Existing
48	W49	267	160	Main line	HDPE	Underground	Existing
49	W50	172	110	General distribution	HDPE	Underground	Existing
50	W51	167	110	General distribution	HDPE	Underground	Existing
51	W52	281	160	Main line	HDPE	Underground	Existing
52	W53	125	160	Main line	HDPE	Underground	Existing
53	W54	125	160	Main line	HDPE	Underground	Existing
54	W55	187	110	General distribution	HDPE	Underground	Existing
55	W56	112	110	General distribution	HDPE	Underground	Existing
56	W57	164	110	General distribution	HDPE	Underground	Existing
57	W58	70	90	Distribution branch	HDPE	Underground	Existing
58	W59	27	110	General distribution	HDPE	Underground	Existing
59	W60	28	90	Distribution branch	HDPE	Underground	Existing
60	W61	83	90	Distribution branch	HDPE	Underground	Existing
61	W62	62	90	Distribution branch	HDPE	Underground	Existing

Table 9: Attribute data table of all the gaslines shown in the layer.

FI D	Pipe ID	Length	Diameter	Material	Type of Levels	Installation Type	Status
0	GL01	80	63	HDPE	Secondary supply	Underground	Existing
1	GL02	188	63	HDPE	Secondary supply	Underground	Existing
2	GL03	41	63	HDPE	Secondary supply	Underground	Existing
3	GL04	96	50	HDPE	Branch connection	Underground	Existing

4	GL05	102	63	HDPE	Secondary supply	Underground	Existing
5	GL06	282	50	HDPE	Branch connection	Underground	Existing
6	GL07	302	50	HDPE	Branch connection	Underground	Existing
7	GL08	128	63	HDPE	Secondary supply	Underground	Existing
8	GL09	130	63	HDPE	Secondary supply	Underground	Existing
9	GL10	445	90	HDPE	Main supply line	Underground	Existing
10	GL11	149	63	HDPE	Secondary supply	Underground	Existing
11	GL12	79	50	HDPE	Branch connection	Underground	Existing
12	GL13	40	63	HDPE	Secondary supply	Underground	Existing
13	GL14	157	50	HDPE	Branch connection	Underground	Existing
14	GL15	76	50	HDPE	Branch connection	Underground	Existing
15	GL16	18	50	HDPE	Branch connection	Underground	Existing
16	GL17	51	63	HDPE	Secondary supply	Underground	Existing
17	GL18	41	63	HDPE	Secondary supply	Underground	Existing
18	GL19	80	63	HDPE	Secondary supply	Underground	Existing
19	GL20	92	63	HDPE	Secondary supply	Underground	Existing
20	GL21	160	63	HDPE	Secondary supply	Underground	Existing
21	GL22	160	63	HDPE	Secondary supply	Underground	Existing
22	GL23	208	50	HDPE	Branch connection	Underground	Existing
23	GL24	167	50	HDPE	Branch connection	Underground	Existing
24	GL25	272	50	HDPE	Branch connection	Underground	Existing
25	GL26	682	63	HDPE	Secondary supply	Underground	Existing
26	GL27	176	50	HDPE	Branch connection	Underground	Existing
27	GL28	722	90	HDPE	Main supply line	Underground	Existing
28	GL29	31	50	HDPE	Branch connection	Underground	Existing

29	GL30	112	50	HDPE	Branch connection	Underground	Existing
30	GL31	186	50	HDPE	Branch connection	Underground	Existing
31	GL32	193	63	HDPE	Secondary supply	Underground	Existing
32	GL33	205	63	HDPE	Secondary supply	Underground	Existing
33	GL34	278	90	HDPE	Main supply line	Underground	Existing
34	GL35	468	90	HDPE	Main supply line	Underground	Existing
35	GL36	26	90	HDPE	Main supply line	Underground	Existing
36	GL37	74	63	HDPE	Secondary supply	Underground	Existing
37	GL38	479	90	HDPE	Main supply line	Underground	Existing

Table 10: Attribute data table of all the electricity stations shown in the layer.

FI D	Statio n_ID	Type of Levels	Voltage (kV)	Cable Material	No of Cable	Installation Type	Status
0	PST-1	Distribution	30	Copper	3	Underground	Planned
1	PST-2	Main feeder connection	30	Copper	3	Underground	Planned
2	PST-3	Distribution	30	Copper	3	Underground	Planned
3	PST-4	Distribution	30	Copper	3	Underground	Planned
4	PST-5	Distribution	30	Copper	3	Underground	Planned
5	PST-6	Distribution	30	Copper	3	Underground	Planned
6	PST-7	Distribution	30	Copper	3	Underground	Planned

Table 11: Attribute data table of all the garbage bins shown in the layer.

FID	Bin_I D	Type of Waste	Type of Material	Condi tion	Street Name	Postal Code	Locati on
0	G-001	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Street-side
1	G-002	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Reside ntial
2	G-003	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Street-side
3	G-004	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Reside ntial
4	G-005	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Street-side
5	G-006	Mixed	Plastic	Good	Avenida do Empresario	6000-767	Reside ntial
6	G-007	Mixed	Plastic	Good	R. Prof. M. da conceicao Silva	6000-479	Street-side

7	G-008	Recyclable	Metal	Good	R. Dr. Eduardo Almeida Esteves	6000-481	Street-side
8	G-009	Recyclable	Metal	Good	R. Prof. Adelino Tavares de Matos	6000-495	Street-side
9	G-010	Mixed	Plastic	Good	R. Prof. Amelia de Jesus Silva	6000-479	Street-side
10	G-011	Mixed	Plastic	Good	R. Manuel Duque Vieira	6000-474	Street-side
11	G-012	Mixed	Plastic	Good	R. Dr. Eduardo Almeida Esteves	6000-481	Residential
12	G-013	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Street-side
13	G-014	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Residential
14	G-015	Mixed	Plastic	Good	R. Manuel Duque Vieira	6000-474	Residential
15	G-016	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Street-side
16	G-017	Recyclable	Metal	Good	R. Prof. Sebastiao Antonio Morao Correia	6000-473	Street-side
17	G-018	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Residential
18	G-019	Mixed	Plastic	Good	R. Manuel Duque Vieira	6000-474	Residential
19	G-020	Mixed	Plastic	Good	R. Manuel Duque Vieira	6000-474	Street-side
20	G-021	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Street-side
21	G-022	Mixed	Plastic	Good	R. Dra. Ludovina Barroso	6000-475	Residential

Table 12: Attribute data table of all the sewagelines shown in the layer.

FID	Line ID	Diameter	Type of Line	Type of Material	Installation
0	S1	200	Wastewater Pipe	PVC-U	Underground
1	S2	300	Stormwater Pipe	Concrete	Underground
2	S3	200	Wastewater Pipe	PVC-U	Underground
3	S4	300	Stormwater Pipe	Concrete	Underground
4	S5	300	Stormwater Pipe	Concrete	Underground
5	S6	110	Gutter Branch Line	HDPE	Underground
6	S7	110	Gutter Branch Line	HDPE	Underground
7	S8	200	Wastewater Pipe	PVC-U	Underground
8	S9	110	Gutter Branch Line	HDPE	Underground
9	S10	110	Gutter Branch Line	HDPE	Underground
10	S11	110	Gutter Branch Line	HDPE	Underground
11	S12	110	Gutter Branch Line	HDPE	Underground
12	S13	110	Gutter Branch Line	HDPE	Underground
13	S14	110	Gutter Branch Line	HDPE	Underground
14	S15	110	Gutter Branch Line	HDPE	Underground

15	S16	110	Gutter Branch Line	HDPE	Underground
16	S17	200	Wastewater Pipe	PVC-U	Underground
17	S18	300	Stormwater Pipe	Concrete	Underground
18	S19	200	Wastewater Pipe	PVC-U	Underground
19	S20	200	Wastewater Pipe	PVC-U	Underground
20	S21	200	Wastewater Pipe	PVC-U	Underground
21	S22	300	Stormwater Pipe	Concrete	Underground
22	S23	300	Stormwater Pipe	Concrete	Underground
23	S24	300	Stormwater Pipe	Concrete	Underground
24	S25	300	Stormwater Pipe	Concrete	Underground
25	S26	110	Gutter Branch Line	HDPE	Underground
26	S27	110	Gutter Branch Line	HDPE	Underground
27	S28	110	Gutter Branch Line	HDPE	Underground
28	S29	110	Gutter Branch Line	HDPE	Underground
29	S30	110	Gutter Branch Line	HDPE	Underground
30	S31	110	Gutter Branch Line	HDPE	Underground
31	S32	110	Gutter Branch Line	HDPE	Underground
32	S33	110	Gutter Branch Line	HDPE	Underground
33	S34	110	Gutter Branch Line	HDPE	Underground
34	S35	110	Gutter Branch Line	HDPE	Underground
35	S36	110	Gutter Branch Line	HDPE	Underground
36	S37	110	Gutter Branch Line	HDPE	Underground
37	S38	300	Stormwater Pipe	Concrete	Underground
38	S39	300	Stormwater Pipe	Concrete	Underground
39	S40	110	Gutter Branch Line	HDPE	Underground
40	S41	110	Gutter Branch Line	HDPE	Underground
41	S42	110	Gutter Branch Line	HDPE	Underground
42	S43	110	Gutter Branch Line	HDPE	Underground
43	S44	110	Gutter Branch Line	HDPE	Underground
44	S45	110	Gutter Branch Line	HDPE	Underground
45	S46	300	Stormwater Pipe	Concrete	Underground
46	S47	200	Wastewater Pipe	PVC-U	Underground
47	S48	110	Gutter Branch Line	HDPE	Underground
48	S49	110	Gutter Branch Line	HDPE	Underground
49	S50	110	Gutter Branch Line	HDPE	Underground
50	S51	110	Gutter Branch Line	HDPE	Underground
51	S52	110	Gutter Branch Line	HDPE	Underground
52	S53	110	Gutter Branch Line	HDPE	Underground
53	S54	110	Gutter Branch Line	HDPE	Underground
54	S55	110	Gutter Branch Line	HDPE	Underground
55	S56	160	Sewer Branch Line	PVC-U	Underground
56	S57	160	Sewer Branch Line	PVC-U	Underground
57	S58	160	Sewer Branch Line	PVC-U	Underground
58	S59	160	Sewer Branch Line	PVC-U	Underground
59	S60	160	Sewer Branch Line	PVC-U	Underground

60	S61	160	Sewer Branch Line	PVC-U	Underground
61	S62	160	Sewer Branch Line	PVC-U	Underground
62	S63	160	Sewer Branch Line	PVC-U	Underground
63	S64	160	Sewer Branch Line	PVC-U	Underground
64	S65	160	Sewer Branch Line	PVC-U	Underground
65	S66	160	Sewer Branch Line	PVC-U	Underground
66	S67	160	Sewer Branch Line	PVC-U	Underground
67	S68	160	Sewer Branch Line	PVC-U	Underground
68	S69	160	Sewer Branch Line	PVC-U	Underground
69	S70	110	Gutter Branch Line	HDPE	Underground
70	S71	110	Gutter Branch Line	HDPE	Underground
71	S72	300	Stormwater Pipe	Concrete	Underground
72	S73	200	Wastewater Pipe	PVC-U	Underground
73	S74	300	Stormwater Pipe	Concrete	Underground
74	S75	300	Stormwater Pipe	Concrete	Underground
75	S76	110	Gutter Branch Line	HDPE	Underground
76	S77	110	Gutter Branch Line	HDPE	Underground
77	S78	110	Gutter Branch Line	HDPE	Underground
78	S79	110	Gutter Branch Line	HDPE	Underground
79	S80	200	Wastewater Pipe	PVC-U	Underground
80	S81	160	Sewer Branch Line	PVC-U	Underground
81	S82	300	Stormwater Pipe	Concrete	Underground
82	S83	200	Wastewater Pipe	PVC-U	Underground
83	S84	160	Sewer Branch Line	PVC-U	Underground
84	S85	160	Sewer Branch Line	PVC-U	Underground
85	S86	160	Sewer Branch Line	PVC-U	Underground
86	S87	160	Sewer Branch Line	PVC-U	Underground
87	S88	160	Sewer Branch Line	PVC-U	Underground
88	S89	160	Sewer Branch Line	PVC-U	Underground
89	S90	160	Sewer Branch Line	PVC-U	Underground
90	S91	160	Sewer Branch Line	PVC-U	Underground
91	S92	160	Sewer Branch Line	PVC-U	Underground
92	S93	160	Sewer Branch Line	PVC-U	Underground
93	S94	160	Sewer Branch Line	PVC-U	Underground
94	S95	160	Sewer Branch Line	PVC-U	Underground
95	S96	160	Sewer Branch Line	PVC-U	Underground
96	S97	200	Wastewater Pipe	PVC-U	Underground
97	S98	300	Stormwater Pipe	Concrete	Underground
98	S99	110	Gutter Branch Line	HDPE	Underground
99	S100	110	Gutter Branch Line	HDPE	Underground
100	S101	110	Gutter Branch Line	HDPE	Underground
101	S102	110	Gutter Branch Line	HDPE	Underground
102	S103	110	Gutter Branch Line	HDPE	Underground
103	S104	110	Gutter Branch Line	HDPE	Underground
104	S105	160	Sewer Branch Line	PVC-U	Underground

105	S106	160	Sewer Branch Line	PVC-U	Underground
106	S107	300	Stormwater Pipe	Concrete	Underground
107	S108	110	Gutter Branch Line	HDPE	Underground
108	S109	110	Gutter Branch Line	HDPE	Underground
109	S110	110	Gutter Branch Line	HDPE	Underground
110	S111	110	Gutter Branch Line	HDPE	Underground
111	S112	110	Gutter Branch Line	HDPE	Underground
112	S113	110	Gutter Branch Line	HDPE	Underground
113	S114	110	Gutter Branch Line	HDPE	Underground
114	S115	110	Gutter Branch Line	HDPE	Underground
115	S116	300	Stormwater Pipe	Concrete	Underground
116	S117	110	Gutter Branch Line	HDPE	Underground
117	S118	110	Gutter Branch Line	HDPE	Underground
118	S119	110	Gutter Branch Line	HDPE	Underground
119	S120	110	Gutter Branch Line	HDPE	Underground
120	S121	110	Gutter Branch Line	HDPE	Underground
121	S122	110	Gutter Branch Line	HDPE	Underground
122	S123	160	Sewer Branch Line	PVC-U	Underground
123	S124	160	Sewer Branch Line	PVC-U	Underground
124	S125	160	Sewer Branch Line	PVC-U	Underground
125	S126	160	Sewer Branch Line	PVC-U	Underground
126	S127	300	Stormwater Pipe	Concrete	Underground
127	S128	300	Stormwater Pipe	Concrete	Underground
128	S129	300	Stormwater Pipe	Concrete	Underground
129	S130	200	Wastewater Pipe	PVC-U	Underground
130	S131	300	Stormwater Pipe	Concrete	Underground
131	S132	110	Gutter Branch Line	HDPE	Underground
132	S133	110	Gutter Branch Line	HDPE	Underground
133	S134	110	Gutter Branch Line	HDPE	Underground
134	S135	110	Gutter Branch Line	HDPE	Underground
135	S136	110	Gutter Branch Line	HDPE	Underground
136	S137	110	Gutter Branch Line	HDPE	Underground
137	S138	110	Gutter Branch Line	HDPE	Underground
138	S139	110	Gutter Branch Line	HDPE	Underground
139	S140	110	Gutter Branch Line	HDPE	Underground
140	S141	110	Gutter Branch Line	HDPE	Underground
141	S142	110	Gutter Branch Line	HDPE	Underground
142	S143	110	Gutter Branch Line	HDPE	Underground
143	S144	110	Gutter Branch Line	HDPE	Underground
144	S145	110	Gutter Branch Line	HDPE	Underground
145	S146	110	Gutter Branch Line	HDPE	Underground
146	S147	110	Gutter Branch Line	HDPE	Underground
147	S148	110	Gutter Branch Line	HDPE	Underground
148	S149	110	Gutter Branch Line	HDPE	Underground
149	S150	110	Gutter Branch Line	HDPE	Underground

150	S151	110	Gutter Branch Line	HDPE	Underground
151	S152	110	Gutter Branch Line	HDPE	Underground
152	S153	110	Gutter Branch Line	HDPE	Underground
153	S154	200	Wastewater Pipe	PVC-U	Underground
154	S155	300	Stormwater Pipe	Concrete	Underground
155	S156	300	Stormwater Pipe	Concrete	Underground
156	S157	110	Gutter Branch Line	HDPE	Underground
157	S158	110	Gutter Branch Line	HDPE	Underground
158	S159	110	Gutter Branch Line	HDPE	Underground
159	S160	110	Gutter Branch Line	HDPE	Underground
160	S161	110	Gutter Branch Line	HDPE	Underground
161	S162	110	Gutter Branch Line	HDPE	Underground
162	S163	110	Gutter Branch Line	HDPE	Underground
163	S164	110	Gutter Branch Line	HDPE	Underground
164	S165	160	Sewer Branch Line	PVC-U	Underground
165	S166	160	Sewer Branch Line	PVC-U	Underground
166	S167	160	Sewer Branch Line	PVC-U	Underground
167	S168	160	Sewer Branch Line	PVC-U	Underground
168	S169	160	Sewer Branch Line	PVC-U	Underground
169	S170	160	Sewer Branch Line	PVC-U	Underground
170	S171	160	Sewer Branch Line	PVC-U	Underground
171	S172	160	Sewer Branch Line	PVC-U	Underground
172	S173	160	Sewer Branch Line	PVC-U	Underground
173	S174	200	Wastewater Pipe	PVC-U	Underground
174	S175	160	Sewer Branch Line	PVC-U	Underground
175	S176	160	Sewer Branch Line	PVC-U	Underground
176	S177	160	Sewer Branch Line	PVC-U	Underground
177	S178	160	Sewer Branch Line	PVC-U	Underground
178	S179	160	Sewer Branch Line	PVC-U	Underground
179	S180	160	Sewer Branch Line	PVC-U	Underground
180	S181	200	Wastewater Pipe	PVC-U	Underground
181	S182	110	Gutter Branch Line	HDPE	Underground
182	S183	110	Gutter Branch Line	HDPE	Underground
183	S184	160	Sewer Branch Line	PVC-U	Underground
184	S185	160	Sewer Branch Line	PVC-U	Underground
185	S186	160	Sewer Branch Line	PVC-U	Underground
186	S187	200	Wastewater Pipe	PVC-U	Underground
187	S188	160	Sewer Branch Line	PVC-U	Underground
188	S189	300	Stormwater Pipe	Concrete	Underground
189	S190	200	Wastewater Pipe	PVC-U	Underground
190	S191	160	Sewer Branch Line	PVC-U	Underground
191	S192	160	Sewer Branch Line	PVC-U	Underground
192	S193	160	Sewer Branch Line	PVC-U	Underground
193	S194	160	Sewer Branch Line	PVC-U	Underground
194	S195	160	Sewer Branch Line	PVC-U	Underground

195	S196	160	Sewer Branch Line	PVC-U	Underground
196	S197	110	Gutter Branch Line	HDPE	Underground
197	S198	110	Gutter Branch Line	HDPE	Underground
198	S199	300	Stormwater Pipe	Concrete	Underground
199	S200	200	Wastewater Pipe	PVC-U	Underground
200	S201	110	Gutter Branch Line	HDPE	Underground
201	S202	110	Gutter Branch Line	HDPE	Underground
202	S203	160	Sewer Branch Line	PVC-U	Underground
203	S204	160	Sewer Branch Line	PVC-U	Underground
204	S205	160	Sewer Branch Line	PVC-U	Underground
205	S206	160	Sewer Branch Line	PVC-U	Underground
206	S207	110	Gutter Branch Line	HDPE	Underground
207	S208	110	Gutter Branch Line	HDPE	Underground
208	S209	110	Gutter Branch Line	HDPE	Underground
209	S210	110	Gutter Branch Line	HDPE	Underground
210	S211	110	Gutter Branch Line	HDPE	Underground
211	S212	110	Gutter Branch Line	HDPE	Underground
212	S213	300	Stormwater Pipe	Concrete	Underground
213	S214	110	Gutter Branch Line	HDPE	Underground
214	S215	110	Gutter Branch Line	HDPE	Underground
215	S216	110	Gutter Branch Line	HDPE	Underground
216	S217	110	Gutter Branch Line	HDPE	Underground
217	S218	110	Gutter Branch Line	HDPE	Underground
218	S219	110	Gutter Branch Line	HDPE	Underground
219	S220	110	Gutter Branch Line	HDPE	Underground
220	S221	110	Gutter Branch Line	HDPE	Underground
221	S222	300	Stormwater Pipe	Concrete	Underground
222	S223	110	Gutter Branch Line	HDPE	Underground
223	S224	110	Gutter Branch Line	HDPE	Underground
224	S225	110	Gutter Branch Line	HDPE	Underground
225	S226	110	Gutter Branch Line	HDPE	Underground
226	S227	110	Gutter Branch Line	HDPE	Underground
227	S228	110	Gutter Branch Line	HDPE	Underground
228	S229	200	Wastewater Pipe	PVC-U	Underground
229	S230	300	Stormwater Pipe	Concrete	Underground
230	S231	300	Stormwater Pipe	Concrete	Underground
231	S232	300	Stormwater Pipe	Concrete	Underground
232	S233	300	Stormwater Pipe	Concrete	Underground
233	S234	110	Gutter Branch Line	HDPE	Underground
234	S235	110	Gutter Branch Line	HDPE	Underground
235	S236	200	Wastewater Pipe	PVC-U	Underground
236	S237	200	Wastewater Pipe	PVC-U	Underground
237	S238	200	Wastewater Pipe	PVC-U	Underground
238	S239	200	Wastewater Pipe	PVC-U	Underground
239	S240	200	Wastewater Pipe	PVC-U	Underground

240	S241	200	Wastewater Pipe	PVC-U	Underground
241	S242	200	Wastewater Pipe	PVC-U	Underground
242	S243	200	Wastewater Pipe	PVC-U	Underground
243	S244	200	Wastewater Pipe	PVC-U	Underground
244	S245	300	Stormwater Pipe	Concrete	Underground
245	S246	300	Stormwater Pipe	Concrete	Underground
246	S247	200	Wastewater Pipe	PVC-U	Underground
247	S248	200	Wastewater Pipe	PVC-U	Underground
248	S249	300	Stormwater Pipe	Concrete	Underground
249	S250	200	Wastewater Pipe	PVC-U	Underground
250	S251	300	Stormwater Pipe	Concrete	Underground
251	S252	300	Stormwater Pipe	Concrete	Underground
252	S253	300	Stormwater Pipe	Concrete	Underground
253	S254	200	Wastewater Pipe	PVC-U	Underground
254	S255	200	Wastewater Pipe	PVC-U	Underground
255	S256	200	Wastewater Pipe	PVC-U	Underground
256	S257	200	Wastewater Pipe	PVC-U	Underground
257	S258	200	Wastewater Pipe	PVC-U	Underground
258	S259	300	Stormwater Pipe	Concrete	Underground
259	S260	300	Stormwater Pipe	Concrete	Underground
260	S261	300	Stormwater Pipe	Concrete	Underground
261	S262	110	Gutter Branch Line	HDPE	Underground
262	S263	110	Gutter Branch Line	HDPE	Underground
263	S264	110	Gutter Branch Line	HDPE	Underground
264	S265	110	Gutter Branch Line	HDPE	Underground
265	S266	110	Gutter Branch Line	HDPE	Underground
266	S267	110	Gutter Branch Line	HDPE	Underground
267	S268	110	Gutter Branch Line	HDPE	Underground
268	S269	110	Gutter Branch Line	HDPE	Underground
269	S270	110	Gutter Branch Line	HDPE	Underground
270	S271	110	Gutter Branch Line	HDPE	Underground
271	S272	110	Gutter Branch Line	HDPE	Underground
272	S273	110	Gutter Branch Line	HDPE	Underground
273	S274	110	Gutter Branch Line	HDPE	Underground
274	S275	110	Gutter Branch Line	HDPE	Underground
275	S276	110	Gutter Branch Line	HDPE	Underground
276	S277	110	Gutter Branch Line	HDPE	Underground
277	S278	110	Gutter Branch Line	HDPE	Underground
278	S279	110	Gutter Branch Line	HDPE	Underground
279	S280	110	Gutter Branch Line	HDPE	Underground
280	S281	110	Gutter Branch Line	HDPE	Underground
281	S282	110	Gutter Branch Line	HDPE	Underground
282	S283	110	Gutter Branch Line	HDPE	Underground
283	S284	200	Wastewater Pipe	PVC-U	Underground
284	S285	300	Stormwater Pipe	Concrete	Underground

285	S286	200	Wastewater Pipe	PVC-U	Underground
286	S287	300	Stormwater Pipe	Concrete	Underground
287	S288	300	Stormwater Pipe	Concrete	Underground
288	S289	200	Wastewater Pipe	PVC-U	Underground
289	S290	300	Stormwater Pipe	Concrete	Underground
290	S291	200	Wastewater Pipe	PVC-U	Underground
291	S292	200	Wastewater Pipe	PVC-U	Underground
292	S293	200	Wastewater Pipe	PVC-U	Underground
293	S294	300	Stormwater Pipe	Concrete	Underground
294	S295	200	Wastewater Pipe	PVC-U	Underground
295	S296	300	Stormwater Pipe	Concrete	Underground
296	S297	110	Gutter Branch Line	HDPE	Underground
297	S298	110	Gutter Branch Line	HDPE	Underground
298	S299	110	Gutter Branch Line	HDPE	Underground
299	S300	110	Gutter Branch Line	HDPE	Underground
300	S301	110	Gutter Branch Line	HDPE	Underground
301	S302	110	Gutter Branch Line	HDPE	Underground
302	S303	110	Gutter Branch Line	HDPE	Underground
303	S304	110	Gutter Branch Line	HDPE	Underground
304	S305	110	Gutter Branch Line	HDPE	Underground
305	S306	110	Gutter Branch Line	HDPE	Underground
306	S307	110	Gutter Branch Line	HDPE	Underground
307	S308	110	Gutter Branch Line	HDPE	Underground
308	S309	110	Gutter Branch Line	HDPE	Underground
309	S310	110	Gutter Branch Line	HDPE	Underground
310	S311	110	Gutter Branch Line	HDPE	Underground
311	S312	110	Gutter Branch Line	HDPE	Underground
312	S313	110	Gutter Branch Line	HDPE	Underground
313	S314	110	Gutter Branch Line	HDPE	Underground
314	S315	200	Wastewater Pipe	PVC-U	Underground
315	S316	200	Wastewater Pipe	PVC-U	Underground
316	S317	200	Wastewater Pipe	PVC-U	Underground
317	S318	200	Wastewater Pipe	PVC-U	Underground
318	S319	200	Wastewater Pipe	PVC-U	Underground
319	S320	200	Wastewater Pipe	PVC-U	Underground
320	S321	300	Stormwater Pipe	Concrete	Underground
321	S322	300	Stormwater Pipe	Concrete	Underground
322	S323	300	Stormwater Pipe	Concrete	Underground
323	S324	300	Stormwater Pipe	Concrete	Underground
324	S325	300	Stormwater Pipe	Concrete	Underground
325	S326	300	Stormwater Pipe	Concrete	Underground
326	S327	110	Gutter Branch Line	HDPE	Underground
327	S328	110	Gutter Branch Line	HDPE	Underground
328	S329	110	Gutter Branch Line	HDPE	Underground
329	S330	110	Gutter Branch Line	HDPE	Underground

330	S331	110	Gutter Branch Line	HDPE	Underground
331	S332	110	Gutter Branch Line	HDPE	Underground
332	S333	110	Gutter Branch Line	HDPE	Underground
333	S334	110	Gutter Branch Line	HDPE	Underground
334	S335	110	Gutter Branch Line	HDPE	Underground
335	S336	110	Gutter Branch Line	HDPE	Underground
336	S337	110	Gutter Branch Line	HDPE	Underground
337	S338	110	Gutter Branch Line	HDPE	Underground
338	S339	110	Gutter Branch Line	HDPE	Underground
339	S340	110	Gutter Branch Line	HDPE	Underground
340	S341	110	Gutter Branch Line	HDPE	Underground
341	S342	110	Gutter Branch Line	HDPE	Underground
342	S343	110	Gutter Branch Line	HDPE	Underground
343	S344	110	Gutter Branch Line	HDPE	Underground
344	S345	110	Gutter Branch Line	HDPE	Underground
345	S346	110	Gutter Branch Line	HDPE	Underground
346	S347	200	Wastewater Pipe	PVC-U	Underground
347	S348	300	Stormwater Pipe	Concrete	Underground
348	S349	300	Stormwater Pipe	Concrete	Underground
349	S350	300	Stormwater Pipe	Concrete	Underground
350	S351	200	Wastewater Pipe	PVC-U	Underground
351	S352	200	Wastewater Pipe	PVC-U	Underground
352	S353	200	Wastewater Pipe	PVC-U	Underground
353	S354	110	Gutter Branch Line	HDPE	Underground
354	S355	110	Gutter Branch Line	HDPE	Underground
355	S356	110	Gutter Branch Line	HDPE	Underground
356	S357	110	Gutter Branch Line	HDPE	Underground
357	S358	110	Gutter Branch Line	HDPE	Underground
358	S359	110	Gutter Branch Line	HDPE	Underground
359	S360	110	Gutter Branch Line	HDPE	Underground
360	S361	110	Gutter Branch Line	HDPE	Underground
361	S362	110	Gutter Branch Line	HDPE	Underground
362	S363	200	Wastewater Pipe	PVC-U	Underground
363	S364	300	Stormwater Pipe	Concrete	Underground
364	S365	300	Stormwater Pipe	Concrete	Underground
365	S366	300	Stormwater Pipe	Concrete	Underground
366	S367	300	Stormwater Pipe	Concrete	Underground
367	S368	200	Wastewater Pipe	PVC-U	Underground
368	S369	200	Wastewater Pipe	PVC-U	Underground
369	S370	200	Wastewater Pipe	PVC-U	Underground
370	S371	110	Gutter Branch Line	HDPE	Underground
371	S372	110	Gutter Branch Line	HDPE	Underground
372	S373	110	Gutter Branch Line	HDPE	Underground
373	S374	110	Gutter Branch Line	HDPE	Underground
374	S375	110	Gutter Branch Line	HDPE	Underground

375	S376	110	Gutter Branch Line	HDPE	Underground
376	S377	200	Wastewater Pipe	PVC-U	Underground
377	S378	110	Gutter Branch Line	HDPE	Underground
378	S379	110	Gutter Branch Line	HDPE	Underground
379	S380	110	Gutter Branch Line	HDPE	Underground
380	S381	110	Gutter Branch Line	HDPE	Underground
381	S382	110	Gutter Branch Line	HDPE	Underground
382	S383	110	Gutter Branch Line	HDPE	Underground
383	S384	110	Gutter Branch Line	HDPE	Underground
384	S385	110	Gutter Branch Line	HDPE	Underground
385	S386	110	Gutter Branch Line	HDPE	Underground
386	S387	110	Gutter Branch Line	HDPE	Underground
387	S388	300	Stormwater Pipe	Concrete	Underground
388	S389	300	Stormwater Pipe	Concrete	Underground
389	S390	300	Stormwater Pipe	Concrete	Underground
390	S391	300	Stormwater Pipe	Concrete	Underground
391	S392	110	Gutter Branch Line	HDPE	Underground
392	S393	110	Gutter Branch Line	HDPE	Underground
393	S394	200	Wastewater Pipe	PVC-U	Underground
394	S395	300	Stormwater Pipe	Concrete	Underground
395	S396	200	Wastewater Pipe	PVC-U	Underground
396	S397	300	Stormwater Pipe	Concrete	Underground
397	S398	200	Wastewater Pipe	PVC-U	Underground
398	S399	200	Wastewater Pipe	PVC-U	Underground
399	S400	200	Wastewater Pipe	PVC-U	Underground
400	S401	300	Stormwater Pipe	Concrete	Underground
401	S402	300	Stormwater Pipe	Concrete	Underground
402	S403	200	Wastewater Pipe	PVC-U	Underground
403	S404	300	Stormwater Pipe	Concrete	Underground
404	S405	200	Wastewater Pipe	PVC-U	Underground
405	S406	300	Stormwater Pipe	Concrete	Underground
406	S407	200	Wastewater Pipe	PVC-U	Underground
407	S408	300	Stormwater Pipe	Concrete	Underground
408	S409	200	Wastewater Pipe	PVC-U	Underground
409	S410	300	Stormwater Pipe	Concrete	Underground
410	S411	200	Wastewater Pipe	PVC-U	Underground
411	S412	200	Wastewater Pipe	PVC-U	Underground
412	S413	300	Stormwater Pipe	Concrete	Underground
413	S414	300	Stormwater Pipe	Concrete	Underground
414	S415	300	Stormwater Pipe	Concrete	Underground
415	S416	200	Wastewater Pipe	PVC-U	Underground
416	S417	200	Wastewater Pipe	PVC-U	Underground
417	S418	300	Stormwater Pipe	Concrete	Underground
418	S419	300	Stormwater Pipe	Concrete	Underground
419	S420	300	Stormwater Pipe	Concrete	Underground

420	S421	300	Stormwater Pipe	Concrete	Underground
421	S422	300	Stormwater Pipe	Concrete	Underground
422	S423	200	Wastewater Pipe	PVC-U	Underground
423	S424	200	Wastewater Pipe	PVC-U	Underground
424	S425	200	Wastewater Pipe	PVC-U	Underground
425	S426	200	Wastewater Pipe	PVC-U	Underground
426	S427	300	Stormwater Pipe	Concrete	Underground
427	S428	200	Wastewater Pipe	PVC-U	Underground
428	S429	300	Stormwater Pipe	Concrete	Underground
429	S430	300	Stormwater Pipe	Concrete	Underground
430	S431	200	Wastewater Pipe	PVC-U	Underground
431	S432	300	Stormwater Pipe	Concrete	Underground
432	S433	200	Wastewater Pipe	PVC-U	Underground
433	S434	300	Stormwater Pipe	Concrete	Underground
434	S435	200	Wastewater Pipe	PVC-U	Underground
435	S436	110	Gutter Branch Line	HDPE	Underground
436	S437	110	Gutter Branch Line	HDPE	Underground
437	S438	110	Gutter Branch Line	HDPE	Underground
438	S439	110	Gutter Branch Line	HDPE	Underground
439	S440	110	Gutter Branch Line	HDPE	Underground
440	S441	110	Gutter Branch Line	HDPE	Underground
441	S442	110	Gutter Branch Line	HDPE	Underground
442	S443	110	Gutter Branch Line	HDPE	Underground
443	S444	300	Stormwater Pipe	Concrete	Underground
444	S445	300	Stormwater Pipe	Concrete	Underground
445	S446	300	Stormwater Pipe	Concrete	Underground
446	S447	110	Gutter Branch Line	HDPE	Underground
447	S448	110	Gutter Branch Line	HDPE	Underground
448	S449	200	Wastewater Pipe	PVC-U	Underground
449	S450	300	Stormwater Pipe	Concrete	Underground
450	S451	300	Stormwater Pipe	Concrete	Underground
451	S452	200	Wastewater Pipe	PVC-U	Underground
452	S453	200	Wastewater Pipe	PVC-U	Underground
453	S454	300	Stormwater Pipe	Concrete	Underground
454	S455	300	Stormwater Pipe	Concrete	Underground
455	S456	200	Wastewater Pipe	PVC-U	Underground
456	S457	200	Wastewater Pipe	PVC-U	Underground
457	S458	300	Stormwater Pipe	Concrete	Underground
458	S459	300	Stormwater Pipe	Concrete	Underground
459	S460	300	Stormwater Pipe	Concrete	Underground
460	S461	110	Gutter Branch Line	HDPE	Underground
461	S462	110	Gutter Branch Line	HDPE	Underground
462	S463	110	Gutter Branch Line	HDPE	Underground
463	S464	110	Gutter Branch Line	HDPE	Underground
464	S465	110	Gutter Branch Line	HDPE	Underground

465	S466	110	Gutter Branch Line	HDPE	Underground
466	S467	110	Gutter Branch Line	HDPE	Underground
467	S468	110	Gutter Branch Line	HDPE	Underground
468	S469	110	Gutter Branch Line	HDPE	Underground
469	S470	110	Gutter Branch Line	HDPE	Underground
470	S471	110	Gutter Branch Line	HDPE	Underground
471	S472	110	Gutter Branch Line	HDPE	Underground
472	S473	110	Gutter Branch Line	HDPE	Underground
473	S474	110	Gutter Branch Line	HDPE	Underground
474	S475	110	Gutter Branch Line	HDPE	Underground
475	S476	110	Gutter Branch Line	HDPE	Underground
476	S477	110	Gutter Branch Line	HDPE	Underground
477	S478	110	Gutter Branch Line	HDPE	Underground
478	S479	110	Gutter Branch Line	HDPE	Underground
479	S480	110	Gutter Branch Line	HDPE	Underground
480	S481	110	Gutter Branch Line	HDPE	Underground
481	S482	110	Gutter Branch Line	HDPE	Underground
482	S483	110	Gutter Branch Line	HDPE	Underground
483	S484	110	Gutter Branch Line	HDPE	Underground
484	S485	200	Wastewater Pipe	PVC-U	Underground
485	S486	300	Stormwater Pipe	Concrete	Underground
486	S487	300	Stormwater Pipe	Concrete	Underground
487	S488	300	Stormwater Pipe	Concrete	Underground
488	S489	300	Stormwater Pipe	Concrete	Underground
489	S490	200	Wastewater Pipe	PVC-U	Underground
490	S491	110	Gutter Branch Line	HDPE	Underground
491	S492	110	Gutter Branch Line	HDPE	Underground
492	S493	110	Gutter Branch Line	HDPE	Underground
493	S494	110	Gutter Branch Line	HDPE	Underground
494	S495	110	Gutter Branch Line	HDPE	Underground
495	S496	110	Gutter Branch Line	HDPE	Underground
496	S497	200	Wastewater Pipe	PVC-U	Underground
497	S498	200	Wastewater Pipe	PVC-U	Underground
498	S499	200	Wastewater Pipe	PVC-U	Underground
499	S500	110	Gutter Branch Line	HDPE	Underground
500	S501	110	Gutter Branch Line	HDPE	Underground
501	S502	110	Gutter Branch Line	HDPE	Underground
502	S503	110	Gutter Branch Line	HDPE	Underground
503	S504	110	Gutter Branch Line	HDPE	Underground
504	S505	110	Gutter Branch Line	HDPE	Underground
505	S506	110	Gutter Branch Line	HDPE	Underground
506	S507	110	Gutter Branch Line	HDPE	Underground
507	S508	110	Gutter Branch Line	HDPE	Underground
508	S509	110	Gutter Branch Line	HDPE	Underground
509	S510	110	Gutter Branch Line	HDPE	Underground

510	S511	110	Gutter Branch Line	HDPE	Underground
511	S512	110	Gutter Branch Line	HDPE	Underground
512	S513	110	Gutter Branch Line	HDPE	Underground
513	S514	110	Gutter Branch Line	HDPE	Underground
514	S515	110	Gutter Branch Line	HDPE	Underground
515	S516	110	Gutter Branch Line	HDPE	Underground
516	S517	110	Gutter Branch Line	HDPE	Underground
517	S518	110	Gutter Branch Line	HDPE	Underground
518	S519	110	Gutter Branch Line	HDPE	Underground
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532	S533	110	Gutter Branch Line	HDPE	Underground
533	S534	110	Gutter Branch Line	HDPE	Underground
534	S535	110	Gutter Branch Line	HDPE	Underground
535	S536	110	Gutter Branch Line	HDPE	Underground
536	S537	110	Gutter Branch Line	HDPE	Underground
537	S538	160	Sewer Branch Line	PVC-U	Underground
538	S539	160	Sewer Branch Line	PVC-U	Underground
539	S540	160	Sewer Branch Line	PVC-U	Underground
540	S541	160	Sewer Branch Line	PVC-U	Underground
541	S542	160	Sewer Branch Line	PVC-U	Underground
542	S543	160	Sewer Branch Line	PVC-U	Underground
543	S544	160	Sewer Branch Line	PVC-U	Underground
544	S545	160	Sewer Branch Line	PVC-U	Underground
545	S546	160	Sewer Branch Line	PVC-U	Underground
546	S547	160	Sewer Branch Line	PVC-U	Underground
547	S548	160	Sewer Branch Line	PVC-U	Underground
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550	S551	160	Sewer Branch Line	PVC-U	Underground
551	S552	160	Sewer Branch Line	PVC-U	Underground
552	S553	160	Sewer Branch Line	PVC-U	Underground
553	S554	160	Sewer Branch Line	PVC-U	Underground
554	S555	160	Sewer Branch Line	PVC-U	Underground

555	S556	160	Sewer Branch Line	PVC-U	Underground
556	S557	160	Sewer Branch Line	PVC-U	Underground
557	S558	160	Sewer Branch Line	PVC-U	Underground
558	S559	160	Sewer Branch Line	PVC-U	Underground
559	S560	160	Sewer Branch Line	PVC-U	Underground
560	S561	160	Sewer Branch Line	PVC-U	Underground
561	S562	160	Sewer Branch Line	PVC-U	Underground
562	S563	160	Sewer Branch Line	PVC-U	Underground
563	S564	160	Sewer Branch Line	PVC-U	Underground
564	S565	160	Sewer Branch Line	PVC-U	Underground
565	S566	160	Sewer Branch Line	PVC-U	Underground
566	S567	160	Sewer Branch Line	PVC-U	Underground
567	S568	160	Sewer Branch Line	PVC-U	Underground
568	S569	160	Sewer Branch Line	PVC-U	Underground
569	S570	160	Sewer Branch Line	PVC-U	Underground
570	S571	160	Sewer Branch Line	PVC-U	Underground
571	S572	160	Sewer Branch Line	PVC-U	Underground
572	S573	160	Sewer Branch Line	PVC-U	Underground
573	S574	160	Sewer Branch Line	PVC-U	Underground
574	S575	160	Sewer Branch Line	PVC-U	Underground
575	S576	160	Sewer Branch Line	PVC-U	Underground
576	S577	160	Sewer Branch Line	PVC-U	Underground
577	S578	160	Sewer Branch Line	PVC-U	Underground
578	S579	160	Sewer Branch Line	PVC-U	Underground
579	S580	160	Sewer Branch Line	PVC-U	Underground
580	S581	160	Sewer Branch Line	PVC-U	Underground
581	S582	160	Sewer Branch Line	PVC-U	Underground
582	S583	160	Sewer Branch Line	PVC-U	Underground
583	S584	160	Sewer Branch Line	PVC-U	Underground
584	S585	160	Sewer Branch Line	PVC-U	Underground
585	S586	160	Sewer Branch Line	PVC-U	Underground
586	S587	160	Sewer Branch Line	PVC-U	Underground
587	S588	160	Sewer Branch Line	PVC-U	Underground
588	S589	160	Sewer Branch Line	PVC-U	Underground
589	S590	160	Sewer Branch Line	PVC-U	Underground
590	S591	160	Sewer Branch Line	PVC-U	Underground
591	S592	160	Sewer Branch Line	PVC-U	Underground
592	S593	160	Sewer Branch Line	PVC-U	Underground
593	S594	160	Sewer Branch Line	PVC-U	Underground
594	S595	160	Sewer Branch Line	PVC-U	Underground
595	S596	160	Sewer Branch Line	PVC-U	Underground
596	S597	160	Sewer Branch Line	PVC-U	Underground
597	S598	160	Sewer Branch Line	PVC-U	Underground
598	S599	160	Sewer Branch Line	PVC-U	Underground
599	S600	160	Sewer Branch Line	PVC-U	Underground

600	S601	160	Sewer Branch Line	PVC-U	Underground
601	S602	160	Sewer Branch Line	PVC-U	Underground
602	S603	160	Sewer Branch Line	PVC-U	Underground
603	S604	160	Sewer Branch Line	PVC-U	Underground
604	S605	160	Sewer Branch Line	PVC-U	Underground
605	S606	160	Sewer Branch Line	PVC-U	Underground
606	S607	160	Sewer Branch Line	PVC-U	Underground
607	S608	160	Sewer Branch Line	PVC-U	Underground
608	S609	160	Sewer Branch Line	PVC-U	Underground
609	S610	160	Sewer Branch Line	PVC-U	Underground
610	S611	160	Sewer Branch Line	PVC-U	Underground
611	S612	160	Sewer Branch Line	PVC-U	Underground
612	S613	160	Sewer Branch Line	PVC-U	Underground
613	S614	160	Sewer Branch Line	PVC-U	Underground
614	S615	160	Sewer Branch Line	PVC-U	Underground
615	S616	160	Sewer Branch Line	PVC-U	Underground
616	S617	160	Sewer Branch Line	PVC-U	Underground
617	S618	160	Sewer Branch Line	PVC-U	Underground
618	S619	160	Sewer Branch Line	PVC-U	Underground
619	S620	160	Sewer Branch Line	PVC-U	Underground
620	S621	160	Sewer Branch Line	PVC-U	Underground
621	S622	160	Sewer Branch Line	PVC-U	Underground
622	S623	160	Sewer Branch Line	PVC-U	Underground
623	S624	160	Sewer Branch Line	PVC-U	Underground
624	S625	160	Sewer Branch Line	PVC-U	Underground
625	S626	160	Sewer Branch Line	PVC-U	Underground
626	S627	160	Sewer Branch Line	PVC-U	Underground
627	S628	160	Sewer Branch Line	PVC-U	Underground
628	S629	160	Sewer Branch Line	PVC-U	Underground
629	S630	160	Sewer Branch Line	PVC-U	Underground
630	S631	160	Sewer Branch Line	PVC-U	Underground
631	S632	160	Sewer Branch Line	PVC-U	Underground
632	S633	160	Sewer Branch Line	PVC-U	Underground
633	S634	160	Sewer Branch Line	PVC-U	Underground
634	S635	160	Sewer Branch Line	PVC-U	Underground
635	S636	160	Sewer Branch Line	PVC-U	Underground
636	S637	160	Sewer Branch Line	PVC-U	Underground
637	S638	160	Sewer Branch Line	PVC-U	Underground
638	S639	160	Sewer Branch Line	PVC-U	Underground
639	S640	160	Sewer Branch Line	PVC-U	Underground
640	S641	160	Sewer Branch Line	PVC-U	Underground
641	S642	160	Sewer Branch Line	PVC-U	Underground
642	S643	160	Sewer Branch Line	PVC-U	Underground
643	S644	160	Sewer Branch Line	PVC-U	Underground
644	S645	160	Sewer Branch Line	PVC-U	Underground

645	S646	160	Sewer Branch Line	PVC-U	Underground
646	S647	160	Sewer Branch Line	PVC-U	Underground
647	S648	160	Sewer Branch Line	PVC-U	Underground
648	S649	160	Sewer Branch Line	PVC-U	Underground
649	S650	160	Sewer Branch Line	PVC-U	Underground
650	S651	160	Sewer Branch Line	PVC-U	Underground
651	S652	160	Sewer Branch Line	PVC-U	Underground
652	S653	160	Sewer Branch Line	PVC-U	Underground
653	S654	160	Sewer Branch Line	PVC-U	Underground
654	S655	160	Sewer Branch Line	PVC-U	Underground
655	S656	160	Sewer Branch Line	PVC-U	Underground
656	S657	160	Sewer Branch Line	PVC-U	Underground
657	S658	160	Sewer Branch Line	PVC-U	Underground
658	S659	160	Sewer Branch Line	PVC-U	Underground
659	S660	160	Sewer Branch Line	PVC-U	Underground
660	S661	160	Sewer Branch Line	PVC-U	Underground
661	S662	160	Sewer Branch Line	PVC-U	Underground
662	S663	160	Sewer Branch Line	PVC-U	Underground
663	S664	160	Sewer Branch Line	PVC-U	Underground
664	S665	160	Sewer Branch Line	PVC-U	Underground
665	S666	160	Sewer Branch Line	PVC-U	Underground
666	S667	160	Sewer Branch Line	PVC-U	Underground
667	S668	160	Sewer Branch Line	PVC-U	Underground
668	S669	160	Sewer Branch Line	PVC-U	Underground
669	S670	160	Sewer Branch Line	PVC-U	Underground
670	S671	160	Sewer Branch Line	PVC-U	Underground
671	S672	160	Sewer Branch Line	PVC-U	Underground
672	S673	160	Sewer Branch Line	PVC-U	Underground
673	S674	160	Sewer Branch Line	PVC-U	Underground
674	S675	160	Sewer Branch Line	PVC-U	Underground
675	S676	160	Sewer Branch Line	PVC-U	Underground
676	S677	160	Sewer Branch Line	PVC-U	Underground
677	S678	160	Sewer Branch Line	PVC-U	Underground
678	S679	160	Sewer Branch Line	PVC-U	Underground
679	S680	160	Sewer Branch Line	PVC-U	Underground
680	S681	160	Sewer Branch Line	PVC-U	Underground
681	S682	160	Sewer Branch Line	PVC-U	Underground
682	S683	160	Sewer Branch Line	PVC-U	Underground
683	S684	160	Sewer Branch Line	PVC-U	Underground
684	S685	160	Sewer Branch Line	PVC-U	Underground
685	S686	160	Sewer Branch Line	PVC-U	Underground

Table 13: Attribute data table of all the sewageboxes shown in the layer.

FID	Box ID	Dimensions	Type of Box	Type of Material
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0	BOX1	560	Inspection Chamber	Reinforced Concrete
1	BOX2	560	Inspection Chamber	Reinforced Concrete
2	BOX3	560	Inspection Chamber	Reinforced Concrete
3	BOX4	560	Inspection Chamber	Reinforced Concrete
4	BOX5	560	Inspection Chamber	Reinforced Concrete
5	BOX6	560	Inspection Chamber	Reinforced Concrete
6	BOX7	560	Inspection Chamber	Reinforced Concrete
7	BOX8	560	Inspection Chamber	Reinforced Concrete
8	BOX9	560	Inspection Chamber	Reinforced Concrete
9	BOX10	560	Inspection Chamber	Reinforced Concrete
10	BOX11	560	Inspection Chamber	Reinforced Concrete
11	BOX12	500x200	Main Starting Point	-
12	BOX13	200x100	Gutter	Concrete
13	BOX14	200x100	Gutter	Concrete
14	BOX15	300	Manhole	Reinforced Concrete
15	BOX16	300	Manhole	Reinforced Concrete
16	BOX17	300	Manhole	Reinforced Concrete
17	BOX18	300	Manhole	Reinforced Concrete
18	BOX19	300	Manhole	Reinforced Concrete
19	BOX20	300	Manhole	Reinforced Concrete
20	BOX21	300	Manhole	Reinforced Concrete
21	BOX22	300	Manhole	Reinforced Concrete
22	BOX23	200x100	Gutter	Concrete
23	BOX24	200x100	Gutter	Concrete
24	BOX25	200x100	Gutter	Concrete
25	BOX26	200x100	Gutter	Concrete
26	BOX27	200x100	Gutter	Concrete
27	BOX28	200x100	Gutter	Concrete
28	BOX29	200x100	Gutter	Concrete
29	BOX30	200x100	Gutter	Concrete
30	BOX31	300	Manhole	Reinforced Concrete
31	BOX32	300	Manhole	Reinforced Concrete
32	BOX33	300	Manhole	Reinforced Concrete
33	BOX34	300	Manhole	Reinforced Concrete
34	BOX35	300	Manhole	Reinforced Concrete
35	BOX36	300	Manhole	Reinforced Concrete
36	BOX37	300	Manhole	Reinforced Concrete
37	BOX38	300	Manhole	Reinforced Concrete
38	BOX39	200x100	Gutter	Concrete
39	BOX40	200x100	Gutter	Concrete
40	BOX41	200x100	Gutter	Concrete
41	BOX42	200x100	Gutter	Concrete
42	BOX43	200x100	Gutter	Concrete
43	BOX44	200x100	Gutter	Concrete
44	BOX45	200x100	Gutter	Concrete

45	BOX46	200x100	Gutter	Concrete
46	BOX47	200x100	Gutter	Concrete
47	BOX48	200x100	Gutter	Concrete
48	BOX49	200x100	Gutter	Concrete
49	BOX50	200x100	Gutter	Concrete
50	BOX51	300	Manhole	Reinforced Concrete
51	BOX52	300	Manhole	Reinforced Concrete
52	BOX53	200x100	Gutter	Concrete
53	BOX54	200x100	Gutter	Concrete
54	BOX55	200x100	Gutter	Concrete
55	BOX56	200x100	Gutter	Concrete
56	BOX57	200x100	Gutter	Concrete
57	BOX58	200x100	Gutter	Concrete
58	BOX59	300	Manhole	Reinforced Concrete
59	BOX60	300	Manhole	Reinforced Concrete
60	BOX61	200x100	Gutter	Concrete
61	BOX62	200x100	Gutter	Concrete
62	BOX63	200x100	Gutter	Concrete
63	BOX64	200x100	Gutter	Concrete
64	BOX65	300	Manhole	Reinforced Concrete
65	BOX66	300	Manhole	Reinforced Concrete
66	BOX67	200x100	Gutter	Concrete
67	BOX68	200x100	Gutter	Concrete
68	BOX69	200x100	Gutter	Concrete
69	BOX70	200x100	Gutter	Concrete
70	BOX71	200x100	Gutter	Concrete
71	BOX72	200x100	Gutter	Concrete
72	BOX73	200x100	Gutter	Concrete
73	BOX74	200x100	Gutter	Concrete
74	BOX75	200x100	Gutter	Concrete
75	BOX76	200x100	Gutter	Concrete
76	BOX77	300	Manhole	Reinforced Concrete
77	BOX78	300	Manhole	Reinforced Concrete
78	BOX79	300	Manhole	Reinforced Concrete
79	BOX80	300	Manhole	Reinforced Concrete
80	BOX81	300	Manhole	Reinforced Concrete
81	BOX82	300	Manhole	Reinforced Concrete
82	BOX83	300	Manhole	Reinforced Concrete
83	BOX84	200x100	Gutter	Concrete
84	BOX85	200x100	Gutter	Concrete
85	BOX86	200x100	Gutter	Concrete
86	BOX87	200x100	Gutter	Concrete
87	BOX88	200x100	Gutter	Concrete
88	BOX89	200x100	Gutter	Concrete
89	BOX90	300	Manhole	Reinforced Concrete

90	BOX91	300	Manhole	Reinforced Concrete
91	BOX92	300	Manhole	Reinforced Concrete
92	BOX93	300	Manhole	Reinforced Concrete
93	BOX94	200x100	Gutter	Concrete
94	BOX95	200x100	Gutter	Concrete
95	BOX96	300	Manhole	Reinforced Concrete
96	BOX97	300	Manhole	Reinforced Concrete
97	BOX98	200x100	Gutter	Concrete
98	BOX99	200x100	Gutter	Concrete
99	BOX100	200x100	Gutter	Concrete
100	BOX101	200x100	Gutter	Concrete
101	BOX102	200x100	Gutter	Concrete
102	BOX103	200x100	Gutter	Concrete
103	BOX104	200x100	Gutter	Concrete
104	BOX105	200x100	Gutter	Concrete
105	BOX106	200x100	Gutter	Concrete
106	BOX107	200x100	Gutter	Concrete
107	BOX108	200x100	Gutter	Concrete
108	BOX109	200x100	Gutter	Concrete
109	BOX110	300	Manhole	Reinforced Concrete
110	BOX111	300	Manhole	Reinforced Concrete
111	BOX112	300	Manhole	Reinforced Concrete
112	BOX113	300	Manhole	Reinforced Concrete
113	BOX114	300	Manhole	Reinforced Concrete
114	BOX115	300	Manhole	Reinforced Concrete
115	BOX116	300	Manhole	Reinforced Concrete
116	BOX117	200x100	Gutter	Concrete
117	BOX118	200x100	Gutter	Concrete
118	BOX119	200x100	Gutter	Concrete
119	BOX120	200x100	Gutter	Concrete
120	BOX121	200x100	Gutter	Concrete
121	BOX122	200x100	Gutter	Concrete
122	BOX123	200x100	Gutter	Concrete
123	BOX124	200x100	Gutter	Concrete
124	BOX125	200x100	Gutter	Concrete
125	BOX126	200x100	Gutter	Concrete
126	BOX127	200x100	Gutter	Concrete
127	BOX128	200x100	Gutter	Concrete
128	BOX129	200x100	Gutter	Concrete
129	BOX130	200x100	Gutter	Concrete
130	BOX131	200x100	Gutter	Concrete
131	BOX132	200x100	Gutter	Concrete
132	BOX133	200x100	Gutter	Concrete
133	BOX134	200x100	Gutter	Concrete
134	BOX135	200x100	Gutter	Concrete

135	BOX136	200x100	Gutter	Concrete
136	BOX137	200x100	Gutter	Concrete
137	BOX138	200x100	Gutter	Concrete
138	BOX139	300	Manhole	Reinforced Concrete
139	BOX140	200x100	Gutter	Concrete
140	BOX141	200x100	Gutter	Concrete
141	BOX142	200x100	Gutter	Concrete
142	BOX143	200x100	Gutter	Concrete
143	BOX144	200x100	Gutter	Concrete
144	BOX145	200x100	Gutter	Concrete
145	BOX146	200x100	Gutter	Concrete
146	BOX147	200x100	Gutter	Concrete
147	BOX148	300	Manhole	Reinforced Concrete
148	BOX149	300	Manhole	Reinforced Concrete
149	BOX150	200x100	Gutter	Concrete
150	BOX151	200x100	Gutter	Concrete
151	BOX152	200x100	Gutter	Concrete
152	BOX153	200x100	Gutter	Concrete
153	BOX154	300	Manhole	Reinforced Concrete
154	BOX155	300	Manhole	Reinforced Concrete
155	BOX156	200x100	Gutter	Concrete
156	BOX157	200x100	Gutter	Concrete
157	BOX158	300	Manhole	Reinforced Concrete
158	BOX159	300	Manhole	Reinforced Concrete
159	BOX160	200x100	Gutter	Concrete
160	BOX161	200x100	Gutter	Concrete
161	BOX162	300	Manhole	Reinforced Concrete
162	BOX163	300	Manhole	Reinforced Concrete
163	BOX164	300	Manhole	Reinforced Concrete
164	BOX165	300	Manhole	Reinforced Concrete
165	BOX166	300	Manhole	Reinforced Concrete
166	BOX167	200x100	Gutter	Concrete
167	BOX168	200x100	Gutter	Concrete
168	BOX169	300	Manhole	Reinforced Concrete
169	BOX170	300	Manhole	Reinforced Concrete
170	BOX171	200x100	Gutter	Concrete
171	BOX172	200x100	Gutter	Concrete
172	BOX173	200x100	Gutter	Concrete
173	BOX174	200x100	Gutter	Concrete
174	BOX175	200x100	Gutter	Concrete
175	BOX176	200x100	Gutter	Concrete
176	BOX177	200x100	Gutter	Concrete
177	BOX178	200x100	Gutter	Concrete
178	BOX179	300	Manhole	Reinforced Concrete
179	BOX180	300	Manhole	Reinforced Concrete

180	BOX181	300	Manhole	Reinforced Concrete
181	BOX182	200x100	Gutter	Concrete
182	BOX183	200x100	Gutter	Concrete
183	BOX184	200x100	Gutter	Concrete
184	BOX185	200x100	Gutter	Concrete
185	BOX186	200x100	Gutter	Concrete
186	BOX187	200x100	Gutter	Concrete
187	BOX188	200x100	Gutter	Concrete
188	BOX189	200x100	Gutter	Concrete
189	BOX190	300	Manhole	Reinforced Concrete
190	BOX191	300	Manhole	Reinforced Concrete
191	BOX192	200x100	Gutter	Concrete
192	BOX193	200x100	Gutter	Concrete
193	BOX194	200x100	Gutter	Concrete
194	BOX195	200x100	Gutter	Concrete
195	BOX196	200x100	Gutter	Concrete
196	BOX197	200x100	Gutter	Concrete
197	BOX198	300	Manhole	Reinforced Concrete
198	BOX199	200x100	Gutter	Concrete
199	BOX200	200x100	Gutter	Concrete
200	BOX201	300	Manhole	Reinforced Concrete
201	BOX202	300	Manhole	Reinforced Concrete
202	BOX203	300	Manhole	Reinforced Concrete
203	BOX204	300	Manhole	Reinforced Concrete
204	BOX205	300	Manhole	Reinforced Concrete
205	BOX206	300	Manhole	Reinforced Concrete
206	BOX207	300	Manhole	Reinforced Concrete
207	BOX208	300	Manhole	Reinforced Concrete
208	BOX209	300	Manhole	Reinforced Concrete
209	BOX210	300	Manhole	Reinforced Concrete
210	BOX211	300	Manhole	Reinforced Concrete
211	BOX212	300	Manhole	Reinforced Concrete
212	BOX213	300	Manhole	Reinforced Concrete
213	BOX214	300	Manhole	Reinforced Concrete
214	BOX215	300	Manhole	Reinforced Concrete
215	BOX216	300	Manhole	Reinforced Concrete
216	BOX217	300	Manhole	Reinforced Concrete
217	BOX218	300	Manhole	Reinforced Concrete
218	BOX219	300	Manhole	Reinforced Concrete
219	BOX220	300	Manhole	Reinforced Concrete
220	BOX221	300	Manhole	Reinforced Concrete
221	BOX222	300	Manhole	Reinforced Concrete
222	BOX223	200x100	Gutter	Concrete
223	BOX224	200x100	Gutter	Concrete
224	BOX225	200x100	Gutter	Concrete

225	BOX226	200x100	Gutter	Concrete
226	BOX227	200x100	Gutter	Concrete
227	BOX228	200x100	Gutter	Concrete
228	BOX229	300	Manhole	Reinforced Concrete
229	BOX230	300	Manhole	Reinforced Concrete
230	BOX231	200x100	Gutter	Concrete
231	BOX232	200x100	Gutter	Concrete
232	BOX233	200x100	Gutter	Concrete
233	BOX234	200x100	Gutter	Concrete
234	BOX235	200x100	Gutter	Concrete
235	BOX236	200x100	Gutter	Concrete
236	BOX237	200x100	Gutter	Concrete
237	BOX238	200x100	Gutter	Concrete
238	BOX239	200x100	Gutter	Concrete
239	BOX240	200x100	Gutter	Concrete
240	BOX241	200x100	Gutter	Concrete
241	BOX242	200x100	Gutter	Concrete
242	BOX243	200x100	Gutter	Concrete
243	BOX244	200x100	Gutter	Concrete
244	BOX245	200x100	Gutter	Concrete
245	BOX246	200x100	Gutter	Concrete
246	BOX247	300	Manhole	Reinforced Concrete
247	BOX248	300	Manhole	Reinforced Concrete
248	BOX249	300	Manhole	Reinforced Concrete
249	BOX250	300	Manhole	Reinforced Concrete
250	BOX251	300	Manhole	Reinforced Concrete
251	BOX252	300	Manhole	Reinforced Concrete
252	BOX253	300	Manhole	Reinforced Concrete
253	BOX254	300	Manhole	Reinforced Concrete
254	BOX255	300	Manhole	Reinforced Concrete
255	BOX256	300	Manhole	Reinforced Concrete
256	BOX257	300	Manhole	Reinforced Concrete
257	BOX258	300	Manhole	Reinforced Concrete
258	BOX259	200x100	Gutter	Concrete
259	BOX260	200x100	Gutter	Concrete
260	BOX261	200x100	Gutter	Concrete
261	BOX262	200x100	Gutter	Concrete
262	BOX263	200x100	Gutter	Concrete
263	BOX264	200x100	Gutter	Concrete
264	BOX265	200x100	Gutter	Concrete
265	BOX266	200x100	Gutter	Concrete
266	BOX267	200x100	Gutter	Concrete
267	BOX268	200x100	Gutter	Concrete
268	BOX269	200x100	Gutter	Concrete
269	BOX270	200x100	Gutter	Concrete

270	BOX271	200x100	Gutter	Concrete
271	BOX272	200x100	Gutter	Concrete
272	BOX273	200x100	Gutter	Concrete
273	BOX274	200x100	Gutter	Concrete
274	BOX275	200x100	Gutter	Concrete
275	BOX276	200x100	Gutter	Concrete
276	BOX277	300	Manhole	Reinforced Concrete
277	BOX278	300	Manhole	Reinforced Concrete
278	BOX279	300	Manhole	Reinforced Concrete
279	BOX280	300	Manhole	Reinforced Concrete
280	BOX281	300	Manhole	Reinforced Concrete
281	BOX282	300	Manhole	Reinforced Concrete
282	BOX283	300	Manhole	Reinforced Concrete
283	BOX284	300	Manhole	Reinforced Concrete
284	BOX285	300	Manhole	Reinforced Concrete
285	BOX286	300	Manhole	Reinforced Concrete
286	BOX287	300	Manhole	Reinforced Concrete
287	BOX288	300	Manhole	Reinforced Concrete
288	BOX289	300	Manhole	Reinforced Concrete
289	BOX290	300	Manhole	Reinforced Concrete
290	BOX291	200x100	Gutter	Concrete
291	BOX292	200x100	Gutter	Concrete
292	BOX293	200x100	Gutter	Concrete
293	BOX294	200x100	Gutter	Concrete
294	BOX295	200x100	Gutter	Concrete
295	BOX296	200x100	Gutter	Concrete
296	BOX297	200x100	Gutter	Concrete
297	BOX298	200x100	Gutter	Concrete
298	BOX299	200x100	Gutter	Concrete
299	BOX300	200x100	Gutter	Concrete
300	BOX301	200x100	Gutter	Concrete
301	BOX302	200x100	Gutter	Concrete
302	BOX303	200x100	Gutter	Concrete
303	BOX304	200x100	Gutter	Concrete
304	BOX305	200x100	Gutter	Concrete
305	BOX306	200x100	Gutter	Concrete
306	BOX307	200x100	Gutter	Concrete
307	BOX308	200x100	Gutter	Concrete
308	BOX309	200x100	Gutter	Concrete
309	BOX310	200x100	Gutter	Concrete
310	BOX311	200x100	Gutter	Concrete
311	BOX312	200x100	Gutter	Concrete
312	BOX313	200x100	Gutter	Concrete
313	BOX314	300	Manhole	Reinforced Concrete
314	BOX315	200x100	Gutter	Concrete

315	BOX316	200x100	Gutter	Concrete
316	BOX317	300	Manhole	Reinforced Concrete
317	BOX318	300	Manhole	Reinforced Concrete
318	BOX319	300	Manhole	Reinforced Concrete
319	BOX320	300	Manhole	Reinforced Concrete
320	BOX321	200x100	Gutter	Concrete
321	BOX322	200x100	Gutter	Concrete
322	BOX323	200x100	Gutter	Concrete
323	BOX324	200x100	Gutter	Concrete
324	BOX325	300	Manhole	Reinforced Concrete
325	BOX326	300	Manhole	Reinforced Concrete
326	BOX327	300	Manhole	Reinforced Concrete
327	BOX328	300	Manhole	Reinforced Concrete
328	BOX329	300	Manhole	Reinforced Concrete
329	BOX330	300	Manhole	Reinforced Concrete
330	BOX331	300	Manhole	Reinforced Concrete
331	BOX332	300	Manhole	Reinforced Concrete
332	BOX333	200x100	Gutter	Concrete
333	BOX334	200x100	Gutter	Concrete
334	BOX335	200x100	Gutter	Concrete
335	BOX336	200x100	Gutter	Concrete
336	BOX337	200x100	Gutter	Concrete
337	BOX338	200x100	Gutter	Concrete
338	BOX339	300	Manhole	Reinforced Concrete
339	BOX340	300	Manhole	Reinforced Concrete
340	BOX341	200x100	Gutter	Concrete
341	BOX342	200x100	Gutter	Concrete
342	BOX343	200x100	Gutter	Concrete
343	BOX344	200x100	Gutter	Concrete
344	BOX345	200x100	Gutter	Concrete
345	BOX346	200x100	Gutter	Concrete
346	BOX347	200x100	Gutter	Concrete
347	BOX348	200x100	Gutter	Concrete
348	BOX349	200x100	Gutter	Concrete
349	BOX350	200x100	Gutter	Concrete
350	BOX351	300	Manhole	Reinforced Concrete
351	BOX352	300	Manhole	Reinforced Concrete
352	BOX353	300	Manhole	Reinforced Concrete
353	BOX354	300	Manhole	Reinforced Concrete
354	BOX355	200x100	Gutter	Concrete
355	BOX356	200x100	Gutter	Concrete
356	BOX357	300	Manhole	Reinforced Concrete
357	BOX358	300	Manhole	Reinforced Concrete
358	BOX359	300	Manhole	Reinforced Concrete
359	BOX360	300	Manhole	Reinforced Concrete

360	BOX361	300	Manhole	Reinforced Concrete
361	BOX362	300	Manhole	Reinforced Concrete
362	BOX363	300	Manhole	Reinforced Concrete
363	BOX364	300	Manhole	Reinforced Concrete
364	BOX365	300	Manhole	Reinforced Concrete
365	BOX366	300	Manhole	Reinforced Concrete
366	BOX367	300	Manhole	Reinforced Concrete
367	BOX368	300	Manhole	Reinforced Concrete
368	BOX369	300	Manhole	Reinforced Concrete
369	BOX370	300	Manhole	Reinforced Concrete
370	BOX371	300	Manhole	Reinforced Concrete
371	BOX372	300	Manhole	Reinforced Concrete
372	BOX373	300	Manhole	Reinforced Concrete
373	BOX374	300	Manhole	Reinforced Concrete
374	BOX375	300	Manhole	Reinforced Concrete
375	BOX376	300	Manhole	Reinforced Concrete
376	BOX377	300	Manhole	Reinforced Concrete
377	BOX378	300	Manhole	Reinforced Concrete
378	BOX379	300	Manhole	Reinforced Concrete
379	BOX380	300	Manhole	Reinforced Concrete
380	BOX381	300	Manhole	Reinforced Concrete
381	BOX382	300	Manhole	Reinforced Concrete
382	BOX383	300	Manhole	Reinforced Concrete
383	BOX384	300	Manhole	Reinforced Concrete
384	BOX385	300	Manhole	Reinforced Concrete
385	BOX386	300	Manhole	Reinforced Concrete
386	BOX387	300	Manhole	Reinforced Concrete
387	BOX388	300	Manhole	Reinforced Concrete
388	BOX389	300	Manhole	Reinforced Concrete
389	BOX390	300	Manhole	Reinforced Concrete
390	BOX391	300	Manhole	Reinforced Concrete
391	BOX392	300	Manhole	Reinforced Concrete
392	BOX393	300	Manhole	Reinforced Concrete
393	BOX394	300	Manhole	Reinforced Concrete
394	BOX395	300	Manhole	Reinforced Concrete
395	BOX396	300	Manhole	Reinforced Concrete
396	BOX397	300	Manhole	Reinforced Concrete
397	BOX398	200x100	Gutter	Concrete
398	BOX399	200x100	Gutter	Concrete
399	BOX400	200x100	Gutter	Concrete
400	BOX401	200x100	Gutter	Concrete
401	BOX402	200x100	Gutter	Concrete
402	BOX403	200x100	Gutter	Concrete
403	BOX404	200x100	Gutter	Concrete
404	BOX405	200x100	Gutter	Concrete

405	BOX406	300	Manhole	Reinforced Concrete
406	BOX407	300	Manhole	Reinforced Concrete
407	BOX408	300	Manhole	Reinforced Concrete
408	BOX409	300	Manhole	Reinforced Concrete
409	BOX410	300	Manhole	Reinforced Concrete
410	BOX411	200x100	Gutter	Concrete
411	BOX412	200x100	Gutter	Concrete
412	BOX413	300	Manhole	Reinforced Concrete
413	BOX414	300	Manhole	Reinforced Concrete
414	BOX415	300	Manhole	Reinforced Concrete
415	BOX416	300	Manhole	Reinforced Concrete
416	BOX417	300	Manhole	Reinforced Concrete
417	BOX418	300	Manhole	Reinforced Concrete
418	BOX419	300	Manhole	Reinforced Concrete
419	BOX420	300	Manhole	Reinforced Concrete
420	BOX421	300	Manhole	Reinforced Concrete
421	BOX422	300	Manhole	Reinforced Concrete
422	BOX423	200x100	Gutter	Concrete
423	BOX424	200x100	Gutter	Concrete
424	BOX425	200x100	Gutter	Concrete
425	BOX426	200x100	Gutter	Concrete
426	BOX427	300	Manhole	Reinforced Concrete
427	BOX428	200x100	Gutter	Concrete
428	BOX429	200x100	Gutter	Concrete
429	BOX430	200x100	Gutter	Concrete
430	BOX431	200x100	Gutter	Concrete
431	BOX432	200x100	Gutter	Concrete
432	BOX433	200x100	Gutter	Concrete
433	BOX434	200x100	Gutter	Concrete
434	BOX435	200x100	Gutter	Concrete
435	BOX436	300	Manhole	Reinforced Concrete
436	BOX437	300	Manhole	Reinforced Concrete
437	BOX438	200x100	Gutter	Concrete
438	BOX439	200x100	Gutter	Concrete
439	BOX440	200x100	Gutter	Concrete
440	BOX441	200x100	Gutter	Concrete
441	BOX442	200x100	Gutter	Concrete
442	BOX443	200x100	Gutter	Concrete
443	BOX444	200x100	Gutter	Concrete
444	BOX445	200x100	Gutter	Concrete
445	BOX446	200x100	Gutter	Concrete
446	BOX447	200x100	Gutter	Concrete
447	BOX448	200x100	Gutter	Concrete
448	BOX449	200x100	Gutter	Concrete
449	BOX450	300	Manhole	Reinforced Concrete

450	BOX451	300	Manhole	Reinforced Concrete
451	BOX452	300	Manhole	Reinforced Concrete
452	BOX453	300	Manhole	Reinforced Concrete
453	BOX454	300	Manhole	Reinforced Concrete
454	BOX455	300	Manhole	Reinforced Concrete
455	BOX456	200x100	Gutter	Concrete
456	BOX457	200x100	Gutter	Concrete
457	BOX458	200x100	Gutter	Concrete
458	BOX459	200x100	Gutter	Concrete
459	BOX460	200x100	Gutter	Concrete
460	BOX461	200x100	Gutter	Concrete
461	BOX462	300	Manhole	Reinforced Concrete
462	BOX463	300	Manhole	Reinforced Concrete
463	BOX464	200x100	Gutter	Concrete
464	BOX465	200x100	Gutter	Concrete
465	BOX466	200x100	Gutter	Concrete
466	BOX467	200x100	Gutter	Concrete
467	BOX468	200x100	Gutter	Concrete
468	BOX469	200x100	Gutter	Concrete
469	BOX470	200x100	Gutter	Concrete
470	BOX471	200x100	Gutter	Concrete
471	BOX472	200x100	Gutter	Concrete
472	BOX473	200x100	Gutter	Concrete
473	BOX474	200x100	Gutter	Concrete
474	BOX475	200x100	Gutter	Concrete
475	BOX476	200x100	Gutter	Concrete
476	BOX477	200x100	Gutter	Concrete
477	BOX478	200x100	Gutter	Concrete
478	BOX479	200x100	Gutter	Concrete
479	BOX480	200x100	Gutter	Concrete
480	BOX481	200x100	Gutter	Concrete
481	BOX482	200x100	Gutter	Concrete
482	BOX483	200x100	Gutter	Concrete
483	BOX484	200x100	Gutter	Concrete
484	BOX485	200x100	Gutter	Concrete
485	BOX486	200x100	Gutter	Concrete
486	BOX487	200x100	Gutter	Concrete
487	BOX488	200x100	Gutter	Concrete
488	BOX489	200x100	Gutter	Concrete
489	BOX490	200x100	Gutter	Concrete
490	BOX491	200x100	Gutter	Concrete
491	BOX492	200x100	Gutter	Concrete
492	BOX493	200x100	Gutter	Concrete
493	BOX494	200x100	Gutter	Concrete
494	BOX495	200x100	Gutter	Concrete

495	BOX496	200x100	Gutter	Concrete
496	BOX497	200x100	Gutter	Concrete
497	BOX498	200x100	Gutter	Concrete
498	BOX499	200x100	Gutter	Concrete
499	BOX500	200x100	Gutter	Concrete
500	BOX501	200x100	Gutter	Concrete