

RIVER AND DELTA URBAN RESEARCH PLATFORM

# URBAN, WATER AND SOCIAL INTEGRATION PLAN FOR QUILMES



**URBAN,  
WATER AND SOCIAL  
INTEGRATION PLAN FOR  
QUILMES**

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# SOURCES

## VISITS

Field work in Quilmes. August 12<sup>th</sup>-16<sup>th</sup> 2019

## DOCUMENTS

BID. Rain Drainage Master Plan

Quilmes Municipality. *Ribera de Quilmes*

Quilmes Municipality. *Planificación Territorial Fase Cero*

Unidad Ejecutora Proyecto de la Ribera. *Proyecto de la Ribera. Lineamientos generales*

Secretaría de Desarrollo Urbano y Obra Pública. *La Ribera. Resultados preliminares Antropología y Economía Urbana*

Secretaría de Desarrollo Urbano y Obra Pública. *Comparativa sociodemográfica*

Fundación Ciudad. *La Ribera Sur*

Buenos Aires Provincia. *Cuenca de los arroyos San Francisco y Las Piedras. Plan Integral Hídrico Social y Ambiental. Partidos Alte. Brown - Avellaneda - Florencio Varela - Quilmes*

Buenos Aires Provincia. *Integración Social y Urbana Villa Azul - Villa Itati. Opisu 2019*

Universidad de Buenos Aires. *Modelación hidrológica - hidráulica de la cuenca Sarandí - Santo Domingo ante un evento de precipitación extrema.*

AySA. *Estado de Obras Partido de Quilmes*

# EXECUTIVE SUMMARY AND POLICY RECOMMENDATIONS

The research project 'Urban, Water and Social Integration Plan for Quilmes' offers an innovative approach to address the main challenges of the city, with a long term and multidisciplinary approach that only top world research universities can offer. Quilmes coastline is seen as a great real estate development opportunity in an ecologically very sensible area that will face severe changes with the effect of sea level change and the continuous increase of climatic effects, in which the current flooding will be dramatically increased.

While high profile development actors are taking positions in the coast, the streams –'arroyos' in the inner city constitute an acute social and environmental challenge, with some of the least privileged citizens bear systematic pollution and flooding, in a city that does not meet by far the minimum standards of public space and other basic public facilities.

## Recommendations for the coastal area

1.Reorganize future development along the coast adjusting the total square footage to the appropriate amount for the market to avoid 'ghost neighborhoods', compatible with the coastal ecologies and adapted to the increased levels of flooding expected in the area.

See page 42

2.Reformulate the flood mitigation structures proposed in the Rain Drainage Masterplan, using the current berm of the highway and creating a floodable public

space to drain the urban area of Quilmes during *sudestada*.

See page 40

3.Create a continuous system of ecological and public spaces along the coast, addressing the three different conditions: a/ transformation of the landfills into parks, b/ reinforcement of the natural forest along the coast to prevent erosion and increase ecological value, and c/management of the 'sudestada' floods in public floodable parks.

See page 38

## Recommendations for the inner city

4.Connect the 'arroyos' with the Rio de La Plata through daylighted streams using the vacant land of the 'Acceso Sudeste', transforming this unfinished highway in a new central area of Quilmes with an urban park, public facilities and social housing.

See pages 26,32-35

5.Create a system of linear parks along the arroyos, able to manage floods while offering social benefits and inclusion.

See page 28-31

6.Reorder the interior city traffic in a macro grid of 'superblocks', introducing a sub grid of green slow mobility corridors, connecting the main civic nodes and parks, prioritizing pedestrians and bicycles.

See page 36

## OBJECTIVE

Quilmes is a city of 580,000 inhabitants within Buenos Aires Metropolitan Area (AMBA). Buenos Aires is the capital city of Argentina, located in the northeastern coast of the country, and one of the largest cities in the world, with a total population of around 15,600,000 people.

Rivers and its associate communities are at the frontline of climate impacts. Extreme weather conditions, rising sea levels, droughts and river floods are immense challenges to urban resilience worldwide, especially in the vulnerable settlements of the Global South, of which Quilmes is a paradigmatic case. The city suffers repeating floods in three ways, often combined. Floods due to the *sudestada* (water level surge from the Rio de la Plata estuary) cover the lower parts of the city, by or close to the waterfront. Heavy rains affect severely the vulnerable population along the *arroyos* (the two rivers crisscrossing the city) and the lower areas with insufficient drainage and affected by the blockage of the coastal highway. The worst case is the combination of both, with flooding coming from high grounds and from the Rio de la Plata itself, making impossible the urban drainage. Besides floods, lack of public space and basic infrastructures (sewage and trash accumulation) are important factors in the inequality of the city. At the same time, very powerful real estate development agents are expecting to develop the waterfront without social and ecological considerations, with the risk of privatizing the coastline with high end, segregated communities.

The Plan aims to help construct an innovative vision for the city combining urban development with ecological and social dynamics, most especially related to water. The various

layers that compose the city of Quilmes are analyzed and mapped in order to understand the current state of the city and its evolution throughout the past century, and to diagnose its potentials and its shortcomings.

While currently there is a clear conflict between water and citizens, a new approach can transform this relation in a positive and unique one. Instead of a polluted sewer, constantly threatening of floods, the water courses have the potential of becoming a new socioecological structure attending the hydraulic and environmental needs of the city.

The riparian ecosystem of La Plata River needs to be recovered and integrated in the city through both a natural park and an urban park in the floodplain. The unique *sudestada* floods are seen as an opportunity rather than a threat. Water becomes the structural system for public space and the city. Through the naturalization of the water courses and the opening of a new river, natural drain continuity is guaranteed and new room for water storage and runoff is given.

The objective of this Plan is to expose a complete vision of the current situation of Quilmes and to define a strategic vision for the present and future development of the city in which water has a main role in the reformulation of the city and its urban ecologies. The city of Quilmes serves as a case study for many cities confronting similar challenges all over Argentina as well as in other Latin American countries. The Plan is approached from a holistic perspective, through the collaboration of academic researchers and professionals with local teams and municipal organizations and authorities.

# ANALYSIS

The study starts with an exhaustive analysis of the city of Quilmes. The city is mapped using various lenses to create catalogs of socio-ecological and infrastructural systems. Due to the geographical position of Quilmes and the high relevance of water courses in the city, these different maps are mostly based around water.

The location of Quilmes is of high relevance when approaching an understanding of the city. Quilmes is located on the southern fluvial terrace of La Plata River, which is the widest river in the world and where the Paraná and Uruguay rivers converge. It is also a natural border between Argentina and Uruguay. Quilmes is out of the Paraná and Uruguay rivers deltaic dynamics.

There are four main basins that shape the zone of AMBA, Lujan basin, Reconquista basin, Riachuelo Matanza basin and La Plata South basin. This last basin covers the area from Avellaneda to the city of La Plata, where Quilmes is located. Its many streams and rivers flow directly into La Plata River through a large floodplain with a marshland character that serves as a transition between La Plata River and the plateau in which Quilmes is located. The floodplain is continuous from the edge of the city of Buenos Aires, limited by the Matanza River, to the city of La Plata.

The Metropolitan Area of Buenos Aires extends its urbanized zone along the coast of La Plata River toward the city of La Plata, becoming almost connected. The urban zones are spoiling and occupying marshlands in the floodplain. It is the case of the neighborhood of *la Ribera* in Quilmes and several new gated communities under consolidation in the city of Berazategui.

Water is the key to understand the city of Quilmes and its current challenges. The population of Quilmes struggles with serious problems regarding water pollution and

floods, which are a continuous and severe problem. There are two main causes for floods in Quilmes. The first cause is *sudestada*. The second cause is heavy rainfall, worsened due to a bad rain drainage system.

The morphology and occupation of the territory aggravates the impact of floods. The occupation of the neighborhood of *la Ribera*, located in the floodplain, has taken place without protection against floods. As a result, the neighborhood is frequently flooded under the level of La Plata River. At the same time, the construction of a highway Buenos Aires - La Plata, crossing through the floodplain as well, causes serious problems stopping the natural drainage of rainwater flowing from the city.

There are two streams (*arroyos*) of major importance that cross the city of Quilmes. These streams are highly polluted and carry water and waste from neighboring cities south of Quilmes down to La Plata River. The streams also break the pronounced topography separating the floodplain from the plateau where Quilmes was originally settled. This interruption in *la barranca* (slope) provides an entrance for flood into the city.

Analyzing ecologies, mobility and socio-economical aspects of Quilmes, we find that there are many irregular settlements in the city. Most of them are located along the *arroyos* area and in the floodplain. This means that there are large areas without drinking water, sewage or drainage infrastructure, and at the same time, population with the lowest income are seriously affected by floods.

## WATER CRISIS

- 01. Fishermen in La Plata River
- 02. Av. Ferrocarril Provincial
- 03. Arroyo Piedras
- 04. Arroyo San Francisco
- 05. Solid waste irregular dumping system
- 06. Solid waste pick up



01



02



03



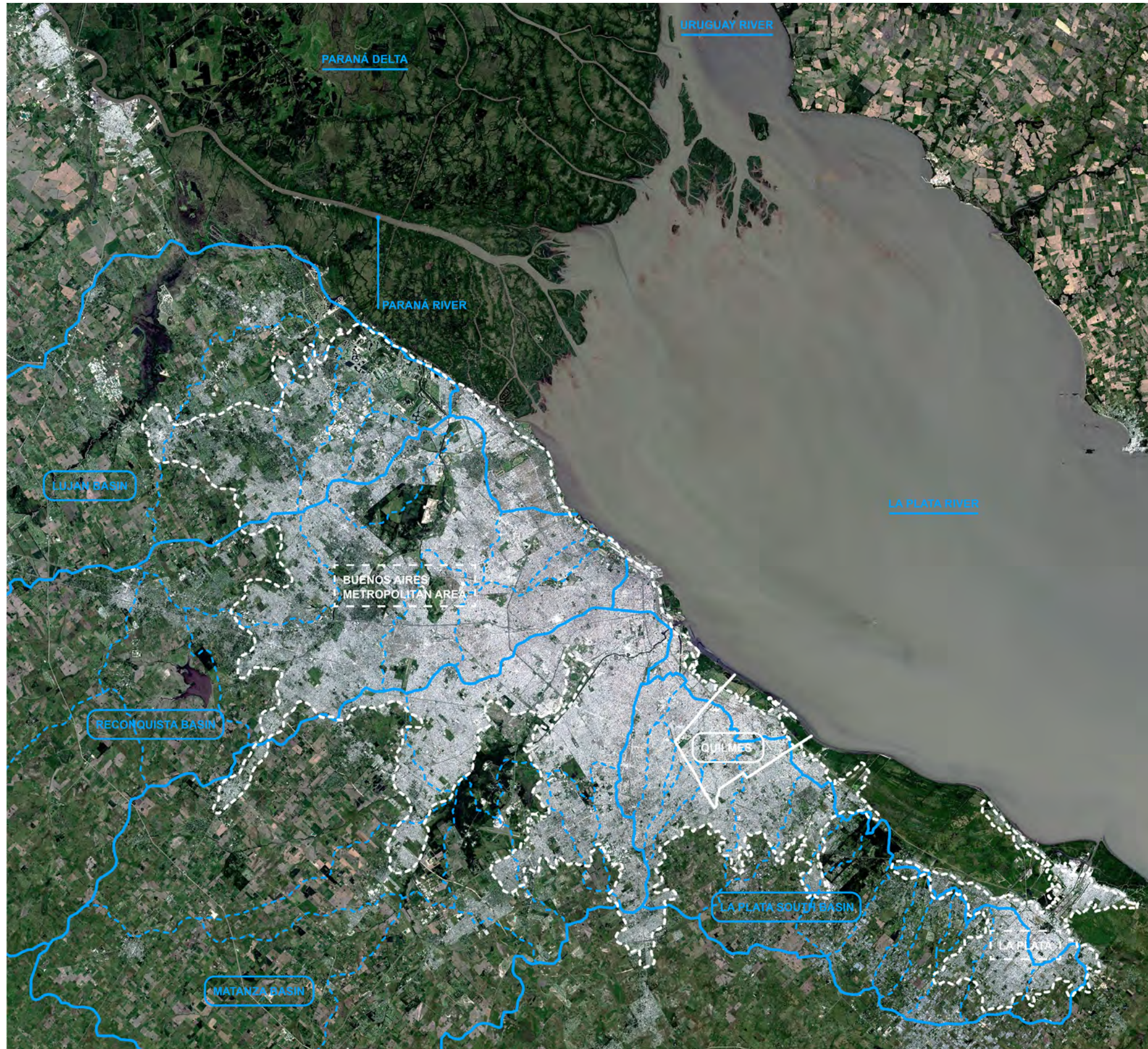
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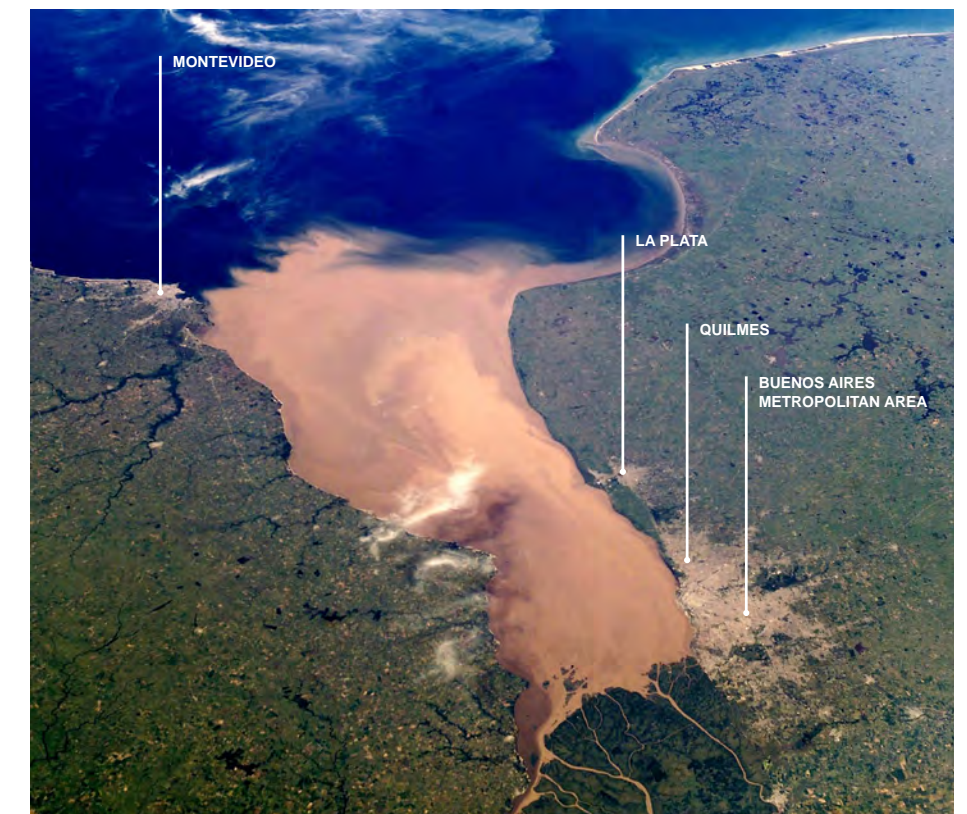


06



## LA PLATA RIVER BASINS

Quilmes is a city of 580,000 inhabitants within Buenos Aires Metropolitan Area (AMBA), the capital city of Argentina. This greater metropolis has a total population of around 15,600,000 people. It is located on the southern fluvial terrace of La Plata River, out of the Paraná and Uruguay rivers deltaic dynamics, in the northeastern coast of Argentina. Quilmes, located in the southeastern area of AMBA is one of the biggest cities of the metropolitan area and struggles with serious problems regarding water pollution, water scarcity and floods.



La Plata River. From the Paraná Delta to the Atlantic Ocean

# LA PLATA SOUTH BASIN

## LA PLATA SOUTH BASINS

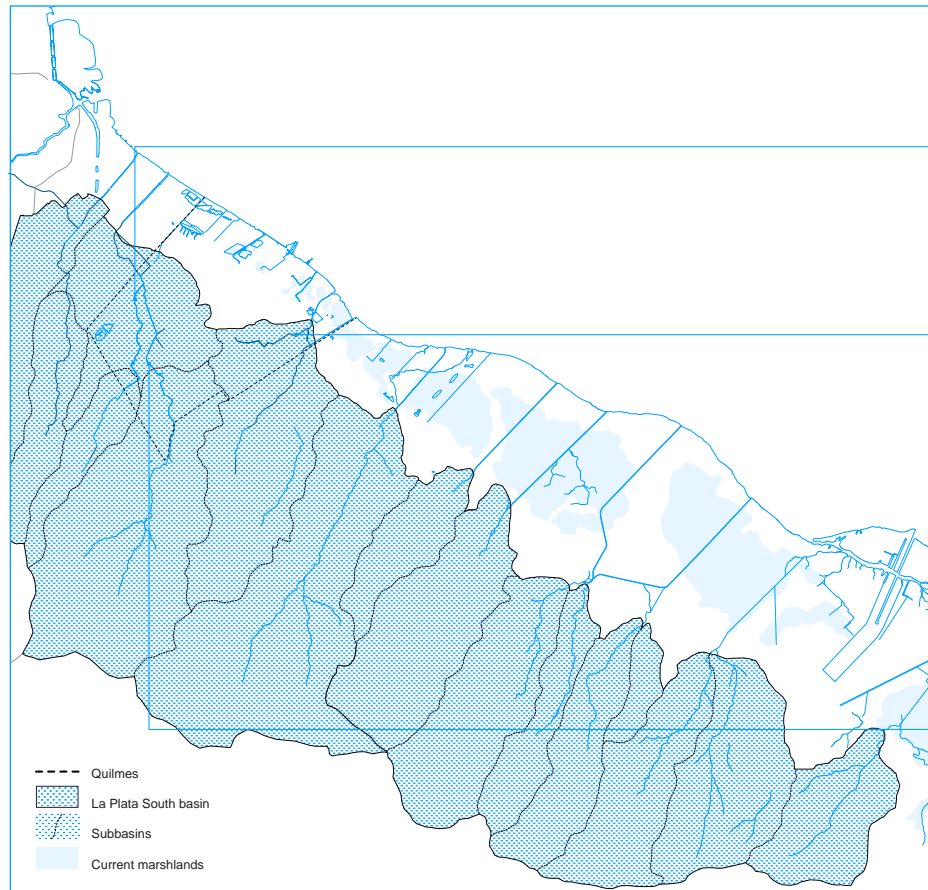
There are four main basins that shape the zone of AMBA. Lujan, Reconquista, Riachuelo Matanza and La Plata South. This last basin covers the area from Avellaneda to La Plata. Its many streams and rivers flow directly into La Plata River through the marshy flood plain. A pronounced topography determinates the limit of a large flood plain with a marshland character.

## LA PLATA SOUTH OCCUPATION

The Metropolitan Area of Buenos Aires extends its urbanized zone along the coast of La Plata River toward the city of La Plata, almost connected. The urban zones are spoiling and occupying marshlands in the flood plain. It is the case of the neighborhood of *La Ribera* in Quilmes and several new gated communities under consolidation in the city of Berazategui.

## LA PLATA SOUTH TOPOGRAPHY

The flood plain is continuous from the edge of the city of Buenos Aires, limited by the Matanza River, to the city of La Plata. A sharp topography shapes the original area of Quilmes and brings the floodable area inland through the *arroyos* in the western side of Quilmes.



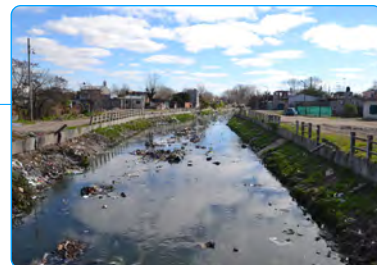
La Plata South basins



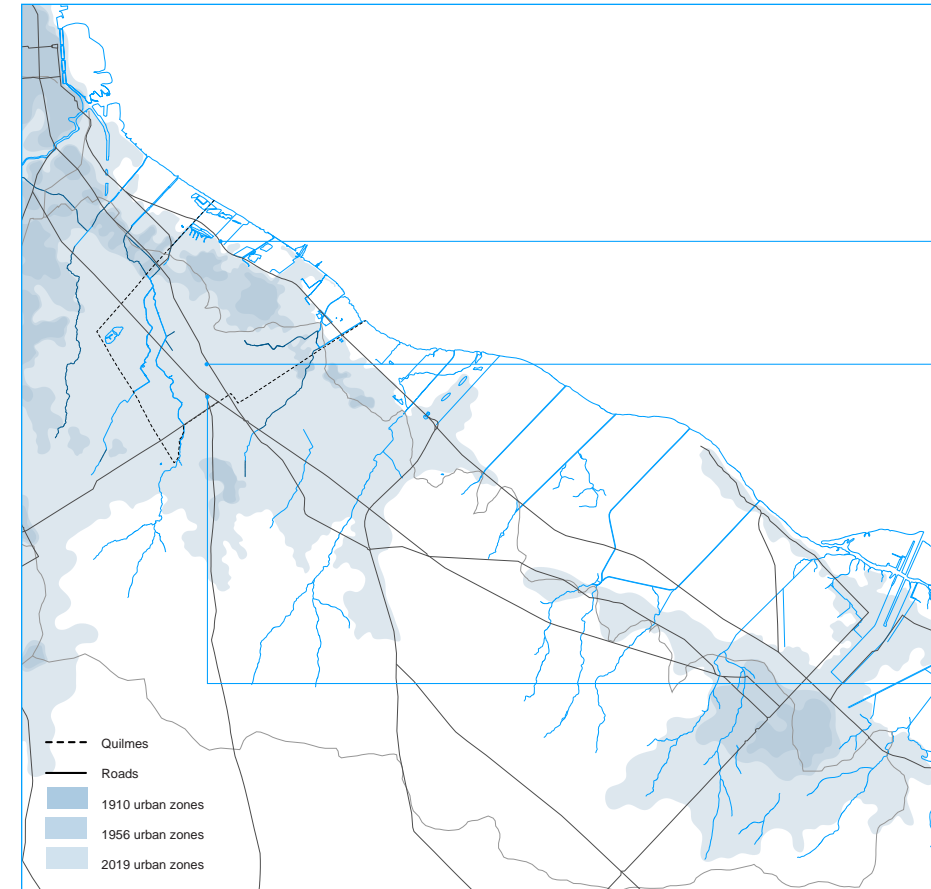
Arroyo San Francisco



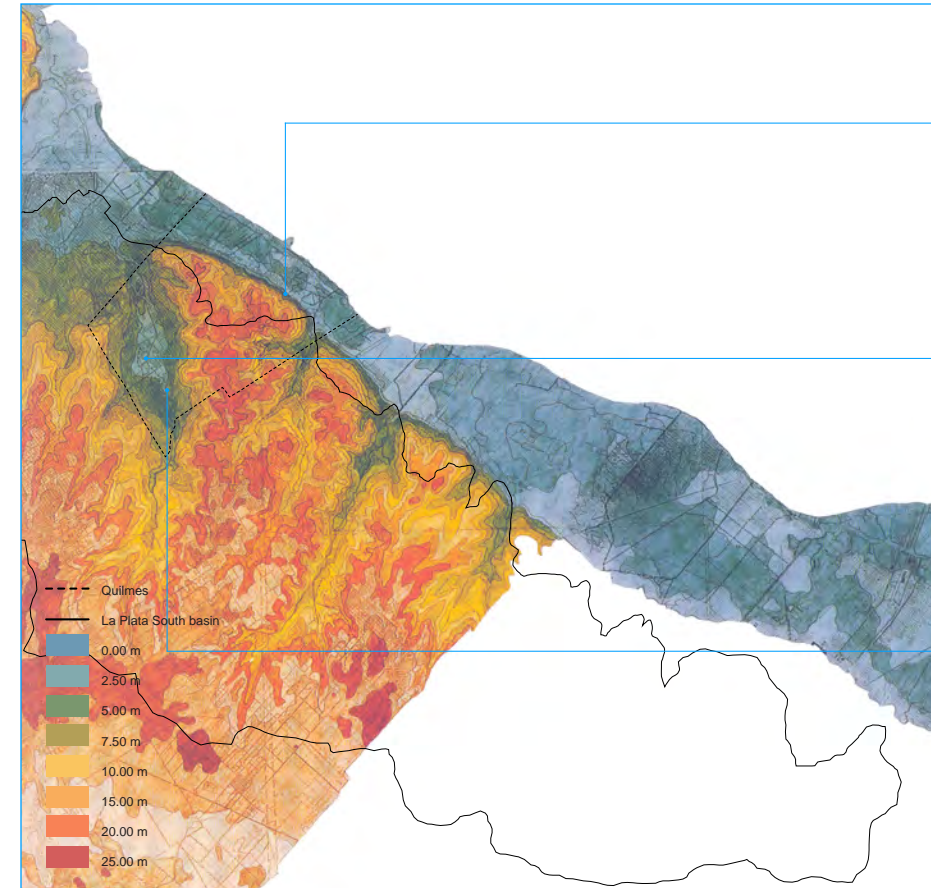
Arroyo Giménez



Arroyo Piedras



La Plata South occupation



La Plata South topography



Buenos Aires - La Plata Highway



Av. Calchaquí



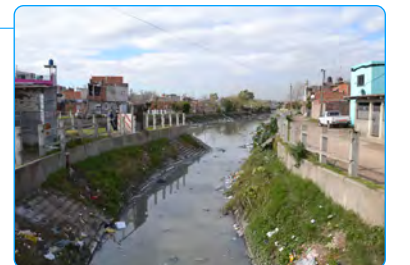
Camino Gral. Belgrano



La Barranca

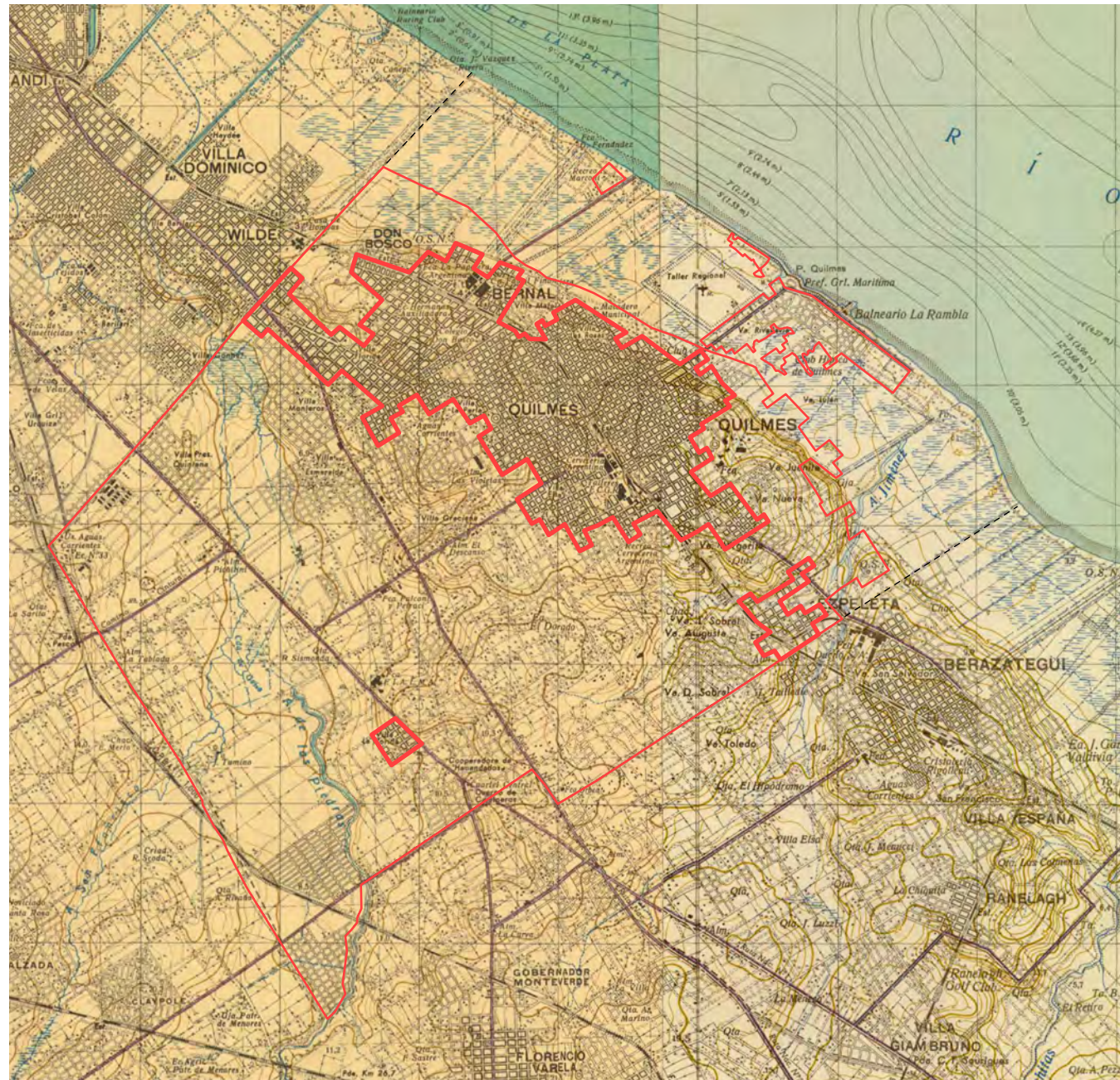


Arroyos basin



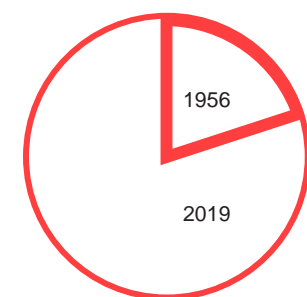
Arroyos basin





Historical map

- Quilmes
- Footprint 1956. 1,526.5 Ha
- Footprint 2019. 7,567 Ha

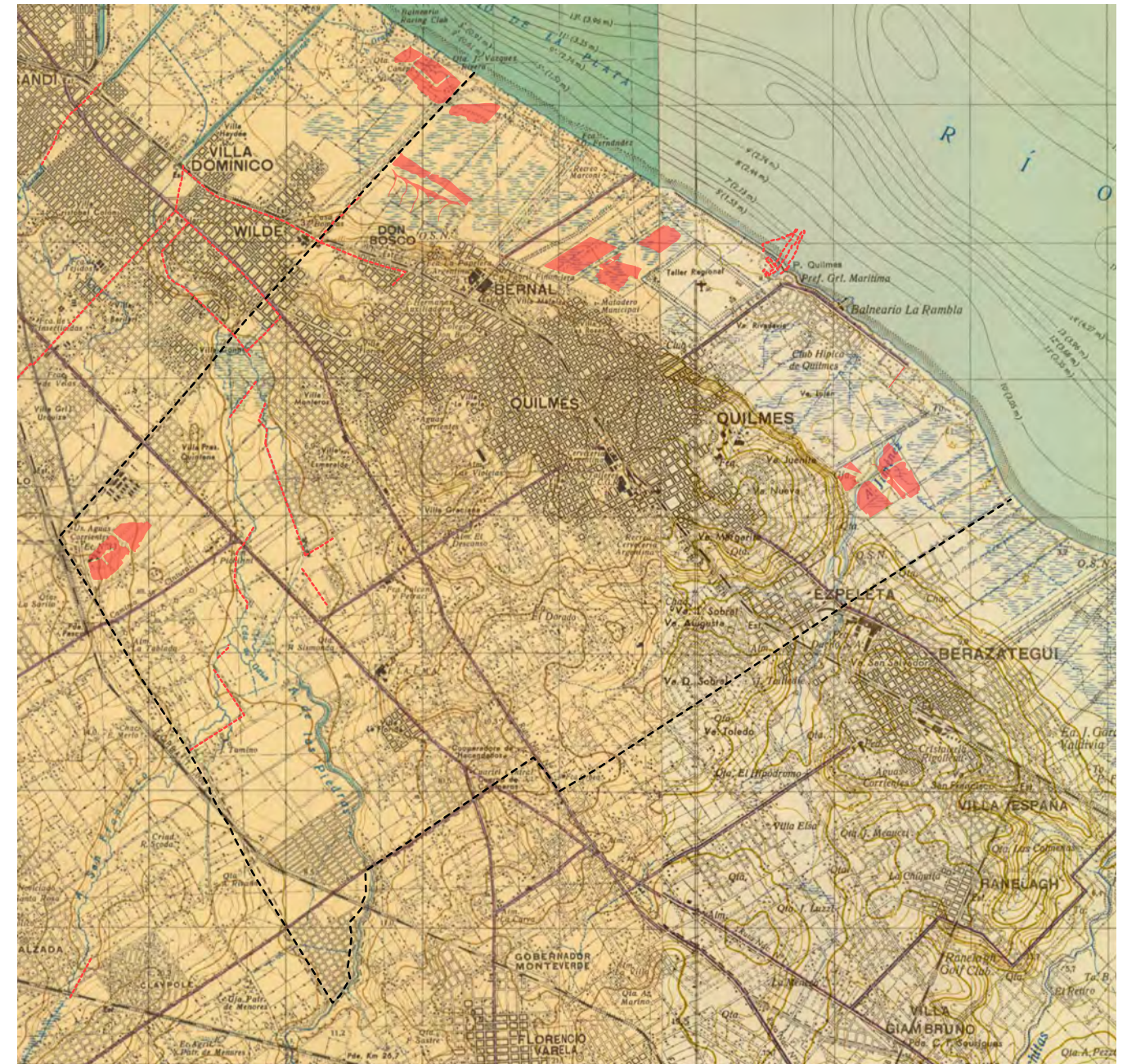


The footprint of Quilmes has been multiplied by five in the last 63 years.

## HISTORIC GROWTH AND HYDROLOGICAL CHANGES

This historical map traced in the early 1910's and updated in 1956 shows the original character of the flood plain and the urbanized area of Quilmes and the neighboring cities, located on the highest areas, between the riverside and the streams.

Overlapping the historical map from the 1910's with the current hydrological systems shows vast changes on the configuration of the marshlands and the riverbank. The riverside was originally a free space for floods and marshes and is now disturbed.



Hydrological system changes

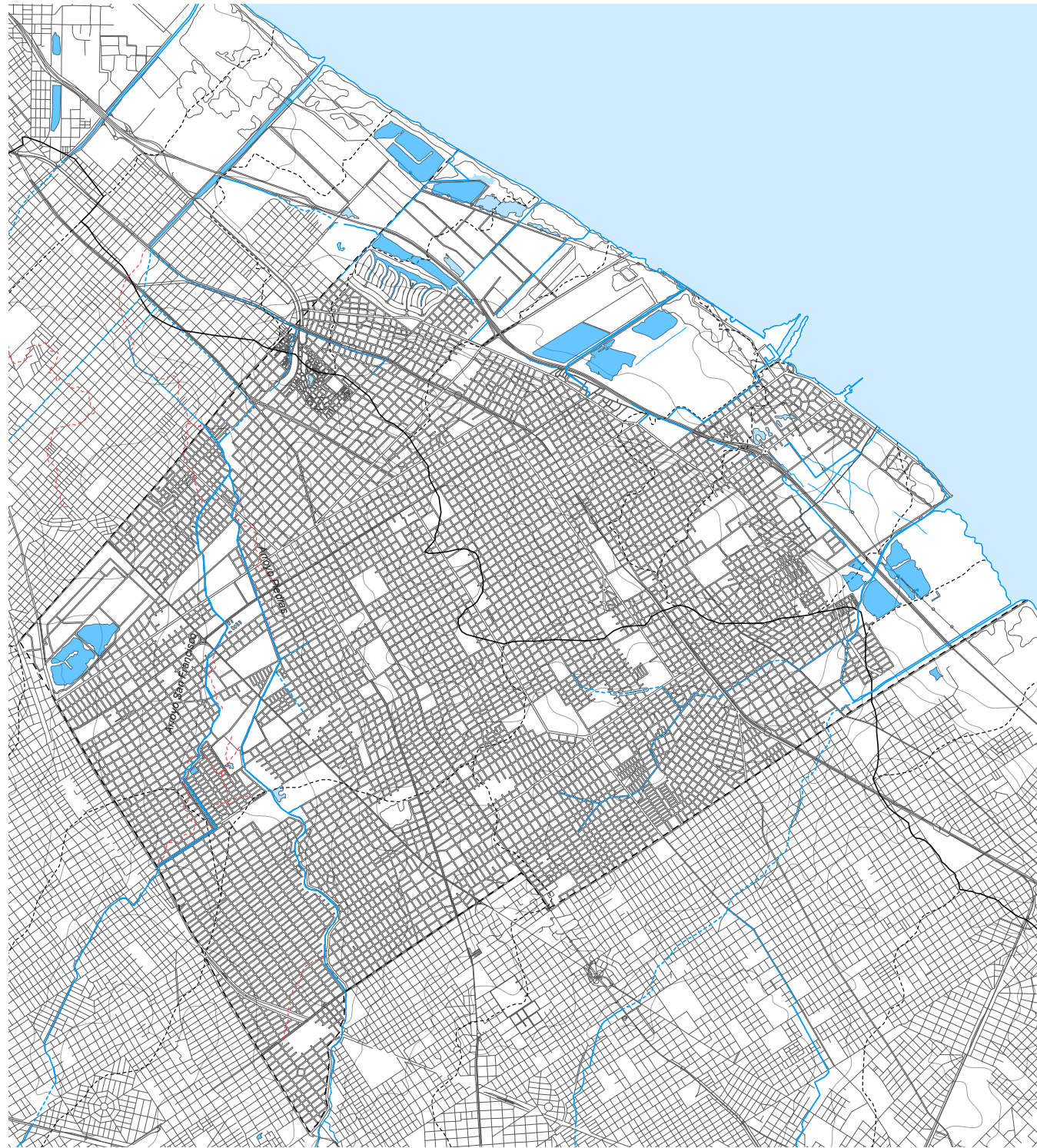
- Quilmes
- Modified waterline
- █ Excavated lagoon



Plaza San Martín 1936

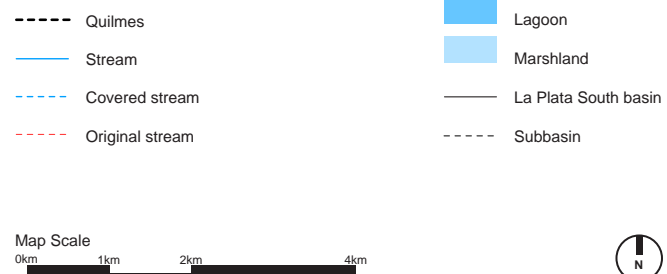


La Plata riverbank 1878

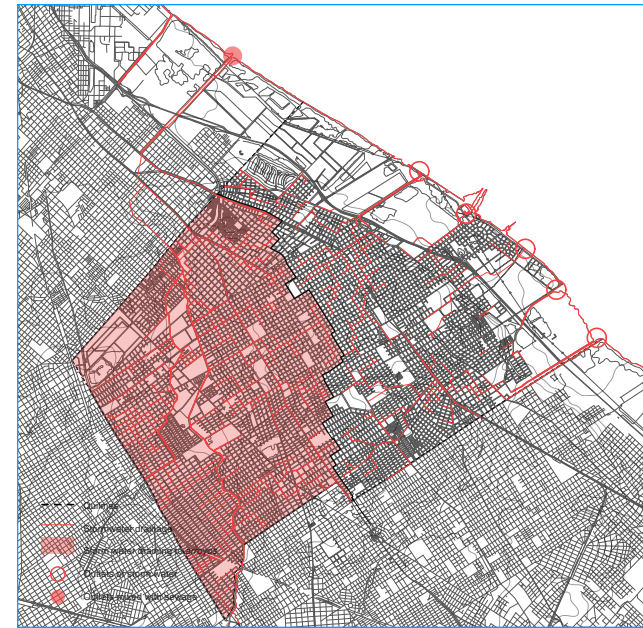


## HYDROLOGICAL SYSTEMS

There are two *arroyos* that cross the city south-north and flow down to La Plata River after entering in Avellaneda. The streams have been channelled and covered in many cases and are severely polluted. The riverside has a marshland character with various lagoons which were excavations for the construction of the highway Buenos Aires - La Plata and shows high levels of pollution as well.



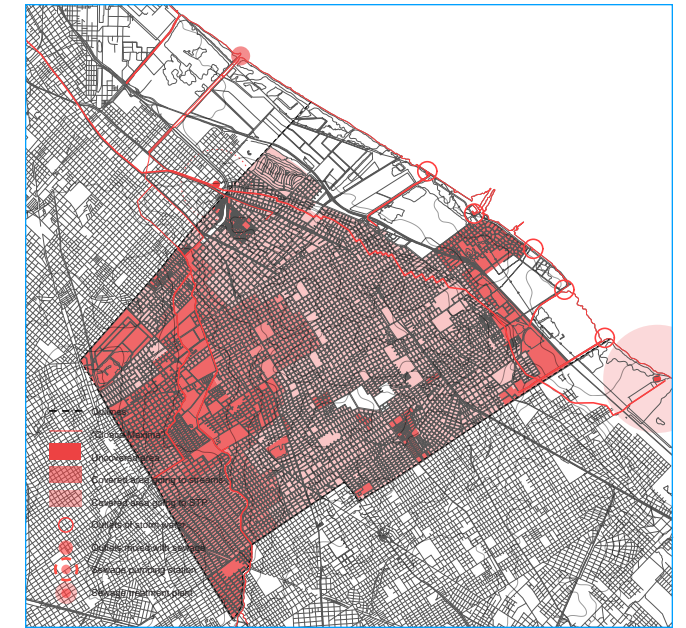
Drinking water network



Sewage network

Drinking water is obtained from La Plata River and treated in General Belgrano treatment plant. The plant has a treatment capacity of 1,950,000 m<sup>3</sup>/d and takes most of the water to the city of Buenos Aires through a subterranean river. There is a second subterranean river under construction that will take water Southwest of the province. The plant is currently being extended. Storm water is drained directly to La Plata River. The area in the subbasin of the *arroyos* is drained together with untreated sewage waters. This water goes later to La Plata untreated.

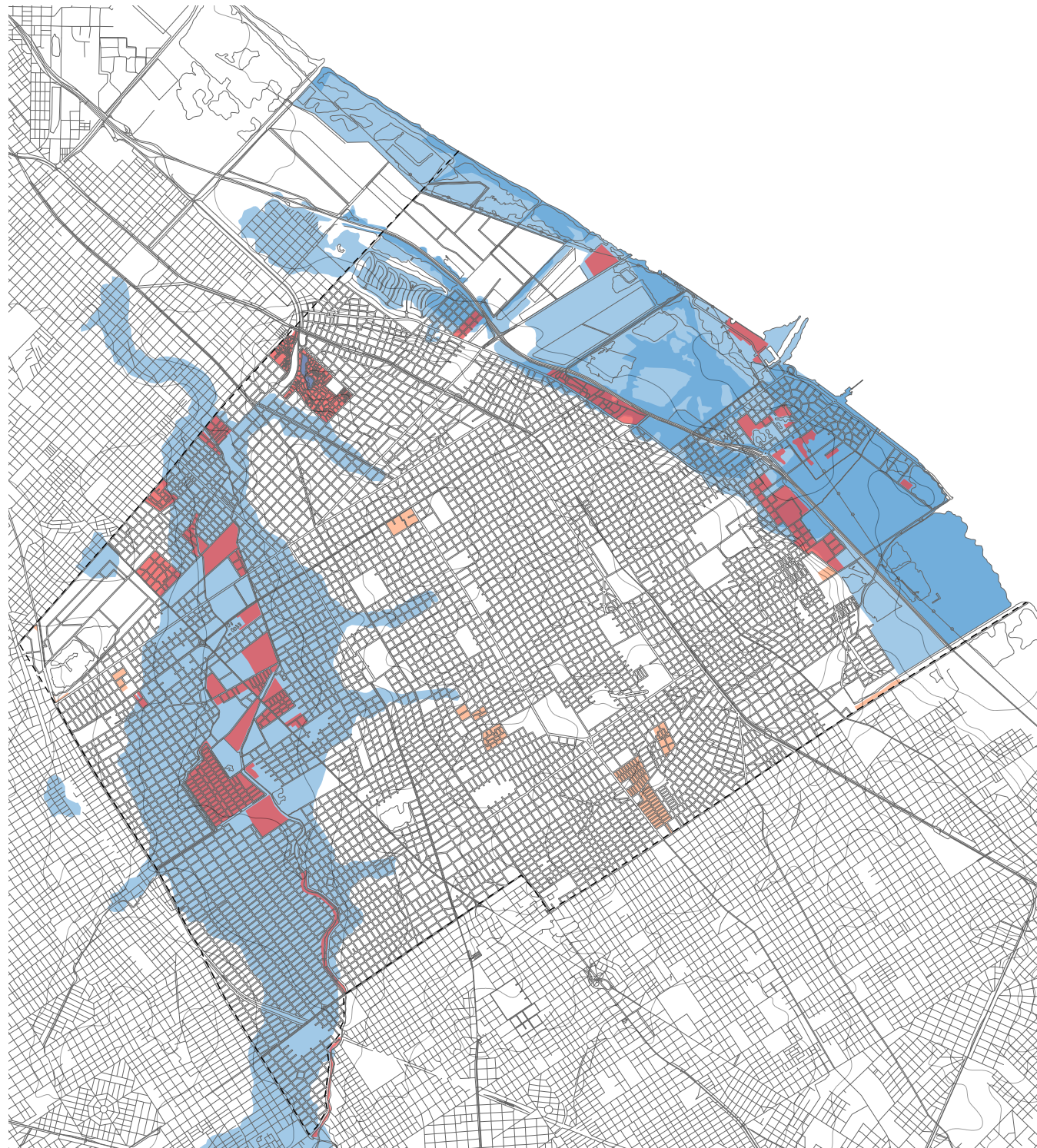
There are large areas that are not covered by the sewage network. Also, many areas are spilling untreated sewage directly into the streams, going later to La Plata River. There is a Pumping station in Avellaneda with a capacity of 1,843,000 m<sup>3</sup>/d and a STP in Berazategui with a capacity of 2,894,000 m<sup>3</sup>/d. Another one is under construction in Avellaneda which will treat 2,332,000 m<sup>3</sup>/d.



Storm water drainage



La Plata River



## INFORMAL SETTLEMENTS AND FLOOD

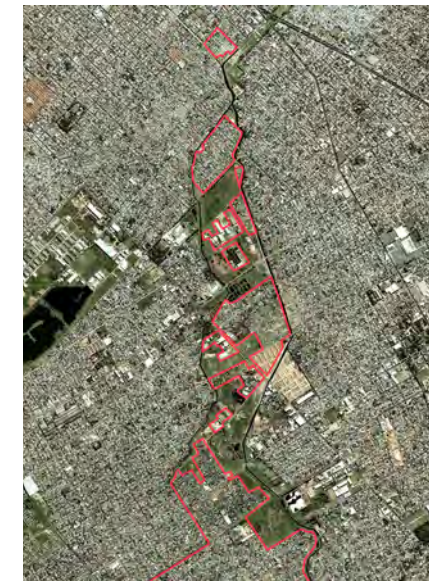
Around 150,000 people are living in informal settlements in Quilmes. Some of them are in extreme bad conditions, it is the case of the "villas". These settlements are growing very fast in the last few years. Also, most of the settlements are found in the riverside and along the arroyos, reason for which they are exposed to constant floods.

- Quilmes
- Flooding prone areas
- Informal settlements affected by flood
- Informal settlements not affected by flood

Map Scale  
0km 1km 2km 4km



ARROYOS. 09/2002



ARROYOS. 08/2008



ARROYOS. 09/2018



RIBERA. 01/2004



RIBERA. 12/2009



RIBERA. 04/2019



FLOODING PERIODS. Rainfall 100 years



FLOODING PERIODS. Sudestada 100 years

# URBAN SYSTEMS

## VEGETATION SYSTEM

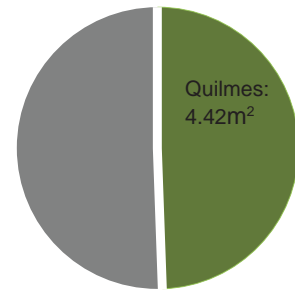
In general terms, there are very few green spaces and most of them are private. Considering the population of Quilmes (580,000) and the total area of green spaces (2.56 km<sup>2</sup>), the ratio of green space per person is 4.42m<sup>2</sup>. This is very low considering the recommendations of the World Health Organization (9m<sup>2</sup> minimum and 50m<sup>2</sup> ideally). At the same time, there are many vacant lots along the *arroyos* area and a large stripe of protected forest along the riverbank, these are not considered for the calculation.

## SOLID WASTE SYSTEM

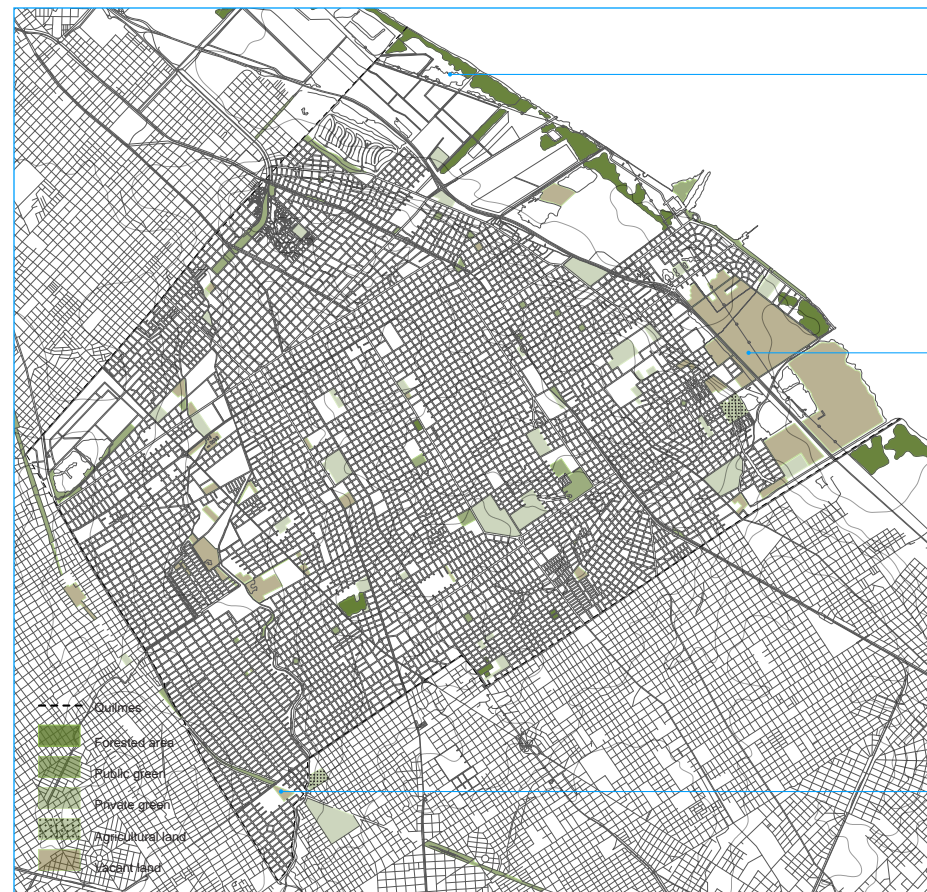
In the flood plain under the property of CEAMSE there are vast areas of landfills that have raised the ground level up to 18 meters, this area is no longer flooded by *sudestadas*. There are also several dumping places in the riverside and along the *arroyos*. A power line crosses the riverside cutting forested areas and dividing lots, as well as an underground pipeline, spoiling the soil in leak points.

## MOBILITY SYSTEM

There is a system of highways and main roads connecting Quilmes with the neighboring cities. Most of them, as the main highway, connect Buenos Aires and La Plata crossing through Quilmes. The highway has an unfinished section which was intended to be a road belt, provoking an unusual situation. It is the *Acceso Sudeste* and it has "villas" in each side of it.



Quilmes has half of the 9m<sup>2</sup>/person minimum area recommended by the WHO



Vegetation system



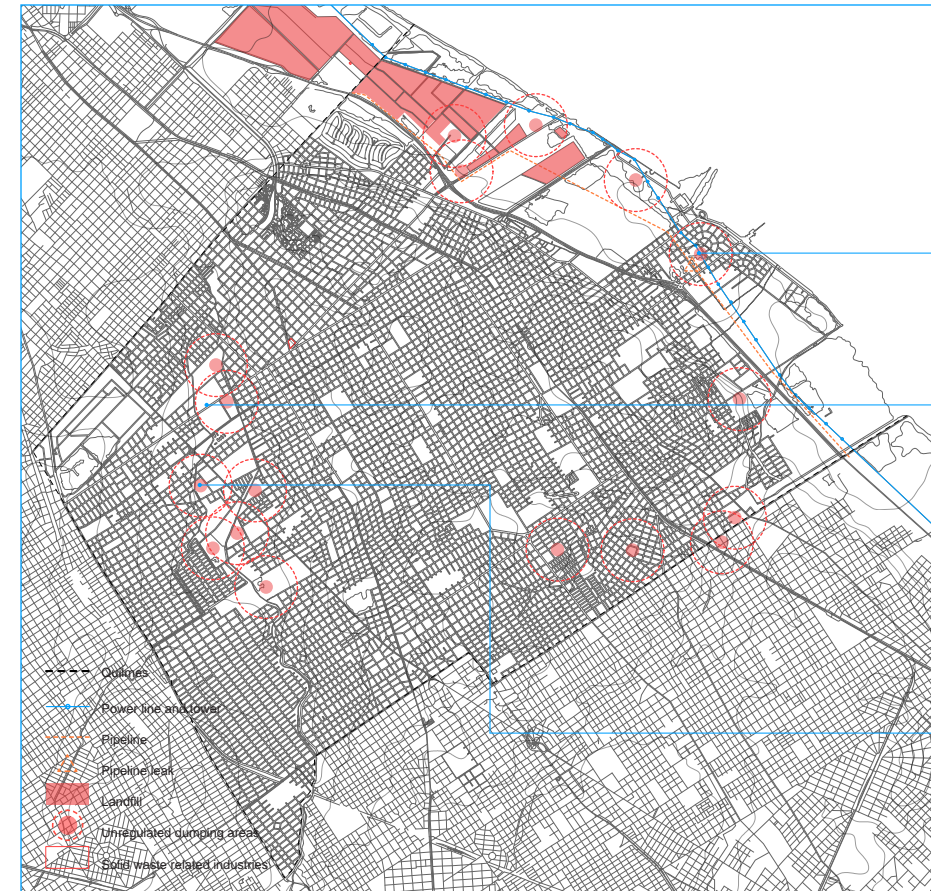
Marshlands



Vacant land in the floodplain



San Francisco Solano



Solid waste system



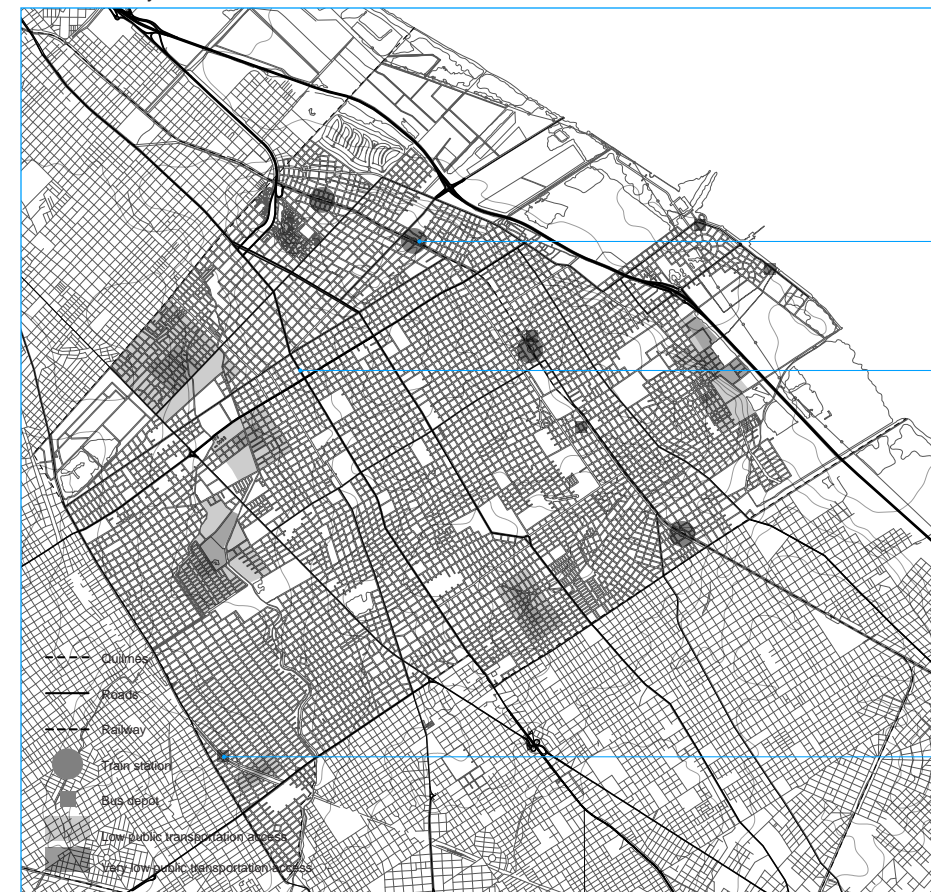
Open air dumping place over marshes



Solid waste pick up



Solid waste irregular dumping spot



Mobility system



Quilmes Intermodal Station



Metrobus station at Av. los Quilmes



Av. Ferrocarril provincial

# STRATEGIC VISION

After completing a transversal analysis of the city, a diagnosis is elaborated by overlaying the mapped information. The result is the proposal of a strategic vision for a global understanding of the future of the city.

This strategic vision is developed through three urban systems that draw a global vision for the whole city: the hydrological system, the vegetation system and the mobility system.

As per the previous analysis, the strategic vision starts through the understanding of water as an opportunity for reformulating the future of the city and for shaping a system of high quality public space for the entire city. Water has now a main role in the public space of Quilmes, structuring the public space of the city, managing floods and solving rainfall drainage.

A new system of public spaces is created through the relation of the vegetation

system and the hydrological system. The improvement of water quality provides a new understanding of water amongst citizenship and favors the association between green open spaces and water spaces, that are frequently shared between neighbors and water during floods and heavy rainfall events.

At the same time the reorganization of the mobility system through new hierarchies helps integrate a green grid within the entire city, creating the opportunity for consolidating slow mobility corridors.

In order to complete the vision for the entire city a close approach to the riverside is carefully developed at the same time, reformulating the riverside of Quilmes as a new Riverine City. A system of berms and hydraulic protections make future building developments possible and keep the city safe from floods.

## FIELDTRIPS AND WORKSHOPS

- 01. Meeting at Quilmes Municipality
- 02. Engagement signature with Mayor Martiniano Molina

- Visits with the head of Urban Development Secretary Francisco Milia:
- 03. La Plata River
  - 04. Marshlands in Mozart
  - 05. Arroyo San Francisco
  - 06. Arroyo Piedras



01



02



03



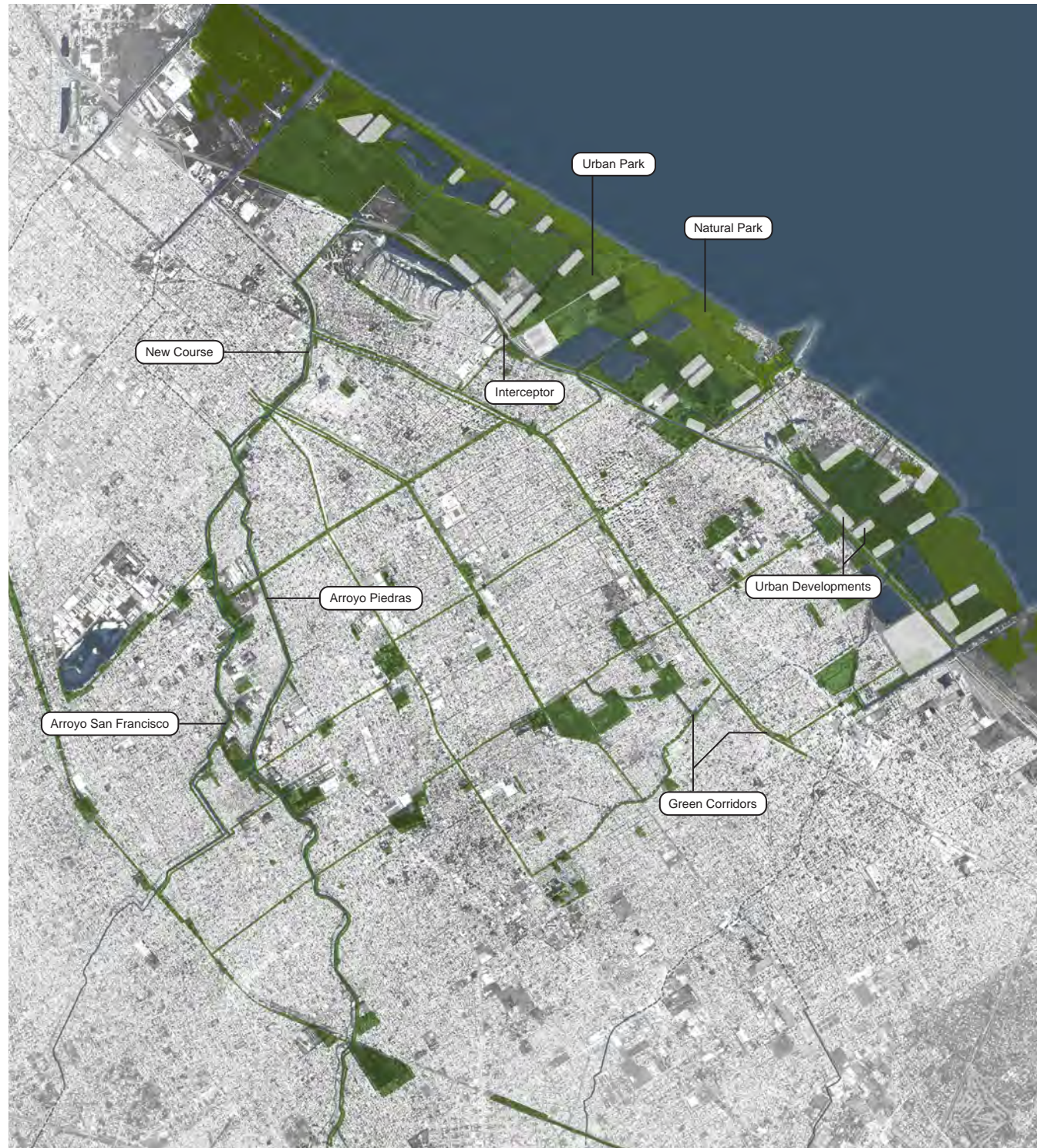
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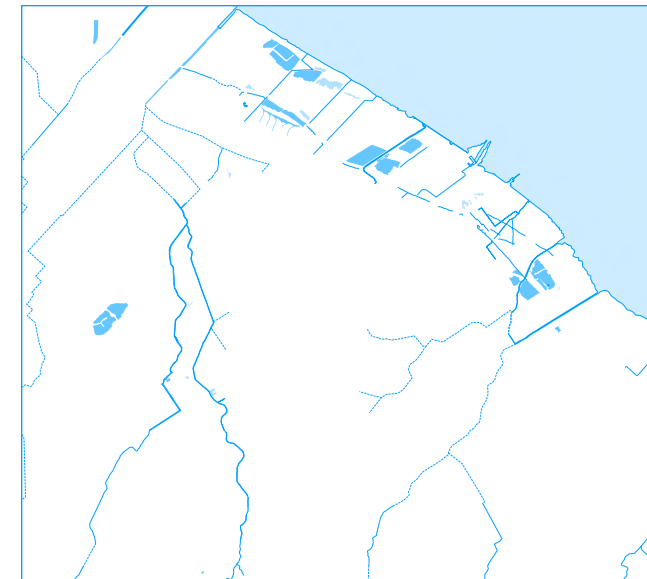


## STRATEGIC VISION

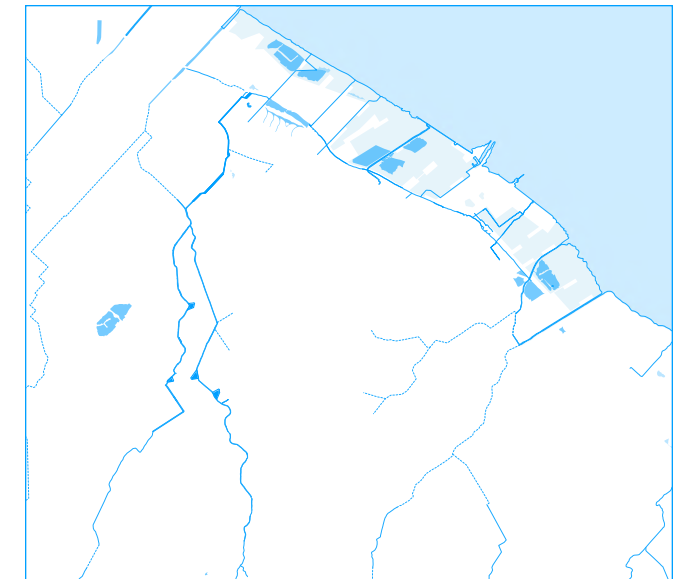
The improvement of water quality and the relation of citizenship with water courses serve as starting point to create a new system of public green spaces. The relation between the vegetation system and the hydrological system, the reorganization of the mobility system and consideration of a future careful development in the riverside composes a global vision for the city of Quilmes.

- Quilmes
- Stream
- Water system
- Vegetation system

Map Scale  
0km 1km 2km 4km



CURRENT. Hydrological System



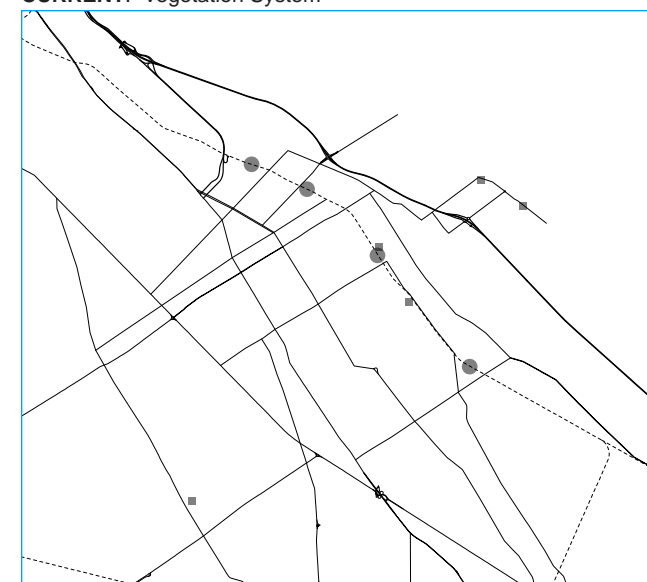
PROPOSED. Hydrological System



CURRENT. Vegetation System



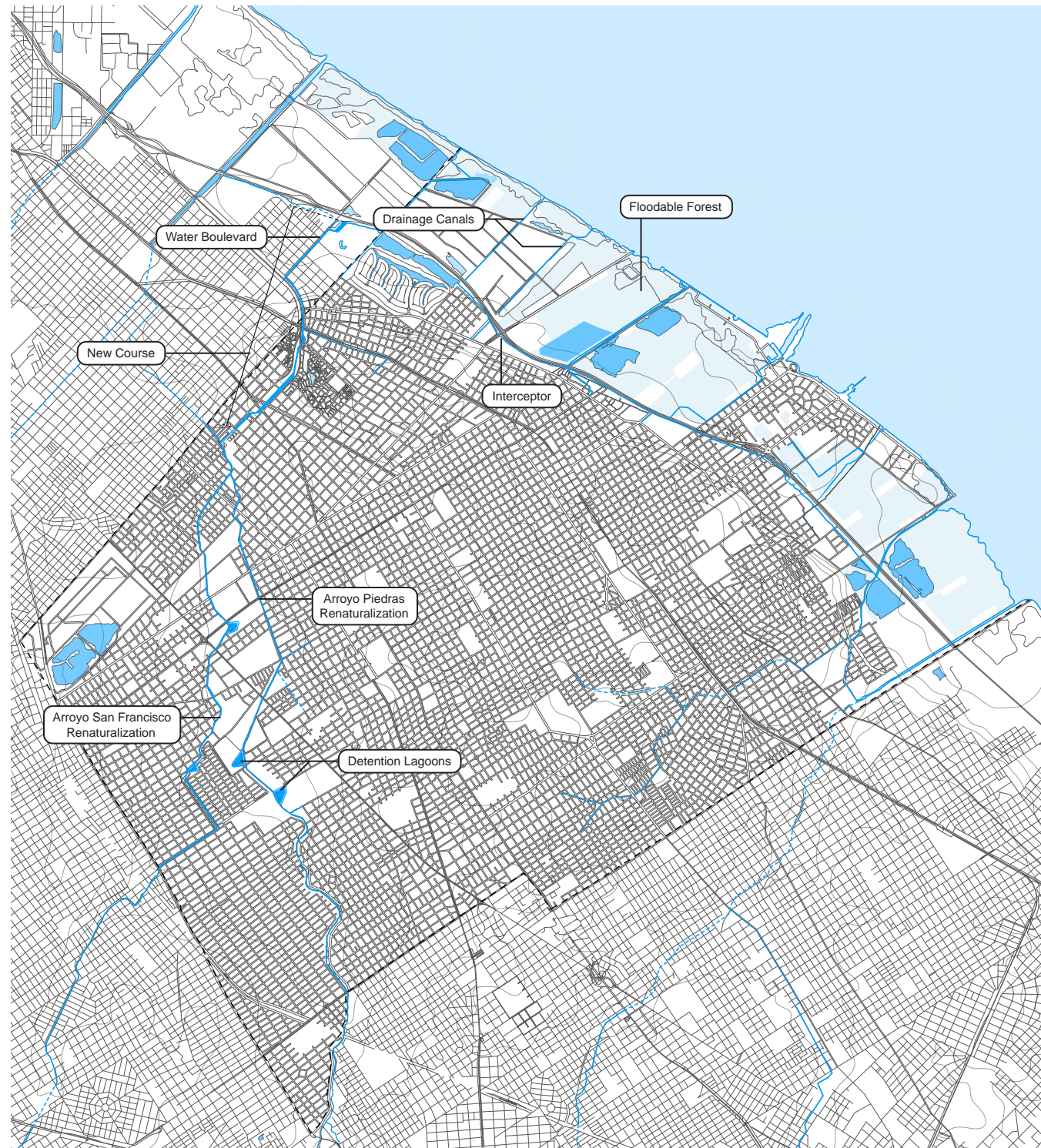
PROPOSED. Vegetation System



CURRENT. Mobility System



PROPOSED. Mobility System

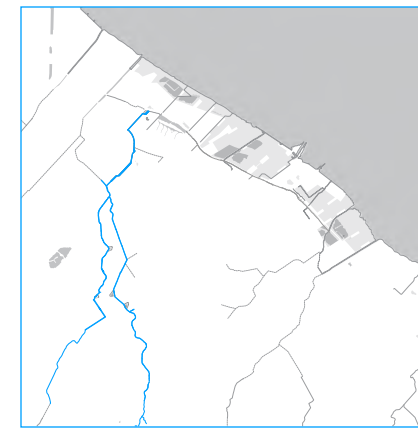


## HYDROLOGICAL SYSTEM

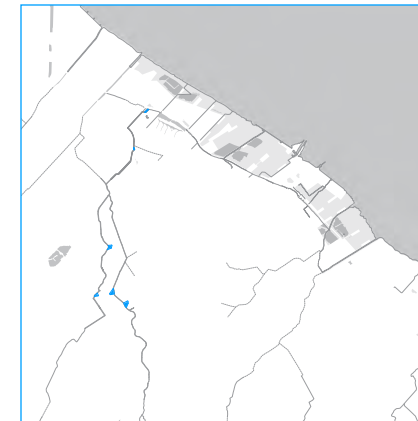
All water courses in the city of Quilmes are understood as a unique hydrological system. The improvement of water quality and a new approach towards floods creates a new understanding of public space as a shared space between people and water.

- Quilmes
- Stream
- - - Covered stream
- New river and lagoons
- Lagoon
- Marshland
- Floodable area (shared space)

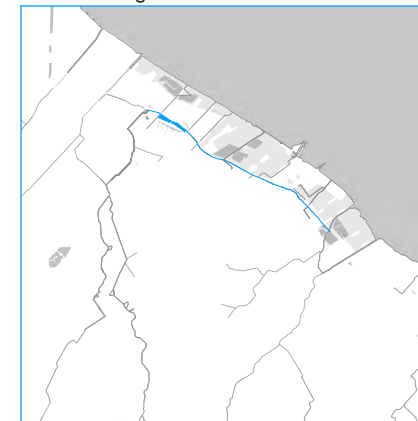
Map Scale  
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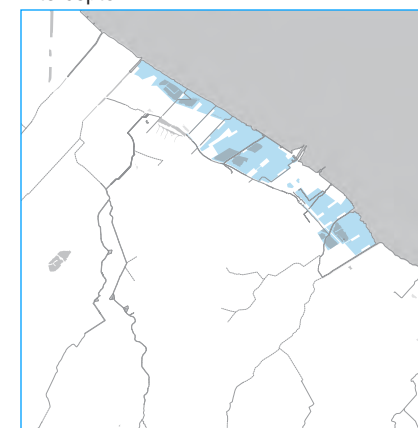
Renaturalization of streams



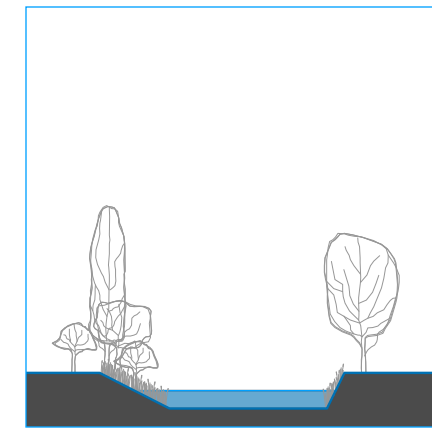
Detention lagoons



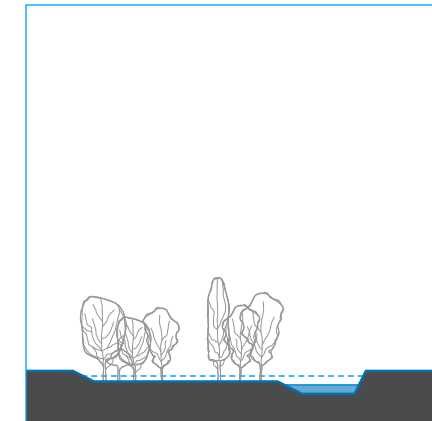
Interceptor



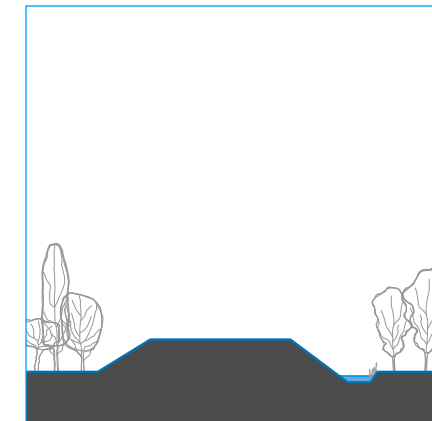
Floodable forest



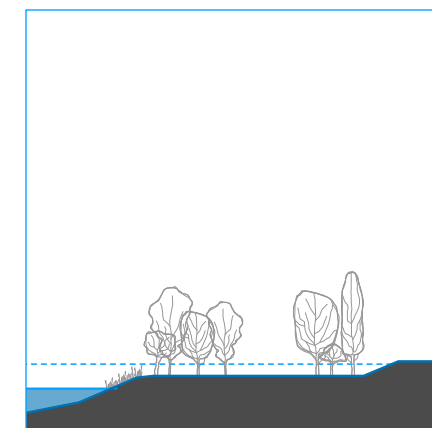
Water Park, 2008, aldayjover



Aranzadi Park, 2011, aldayjover



Water Park, 2008, aldayjover

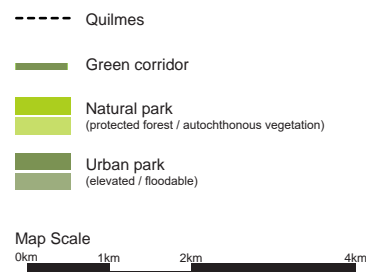


Water Park, 2008, aldayjover



## VEGETATION SYSTEM

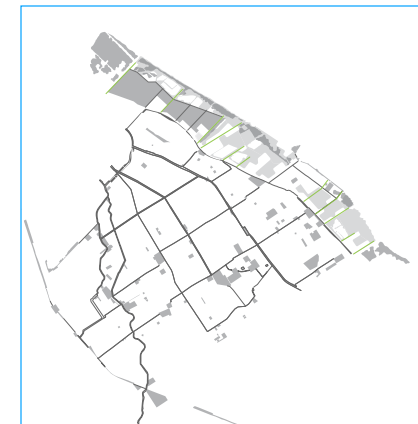
The strong relationship between water and green spaces weaves a network of high quality public spaces in the entire city of Quilmes. Through a system of green corridors a green grid is created from the riverside up to the *arroyos*. In the riverside, two different types of parks are considered. A natural park in the edge of La Plata River and an urban park related to future developments and management of floods.



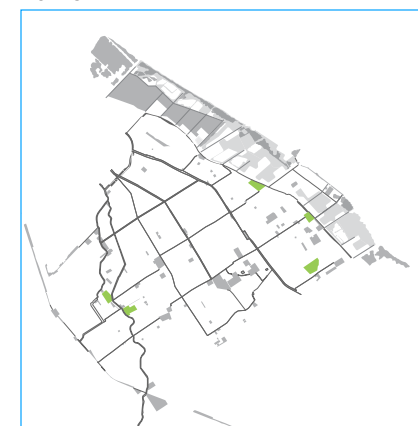
Green corridors



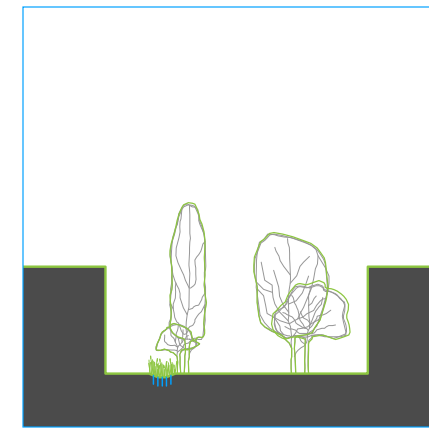
Riverside forest



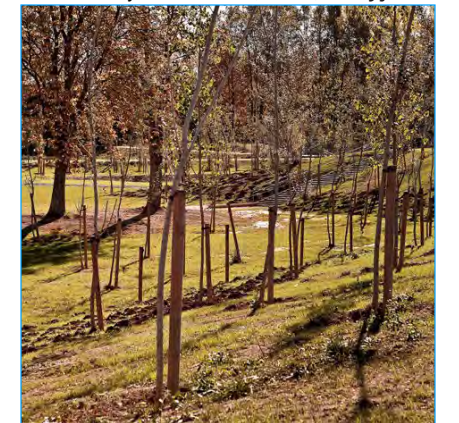
Berms



Green open spaces



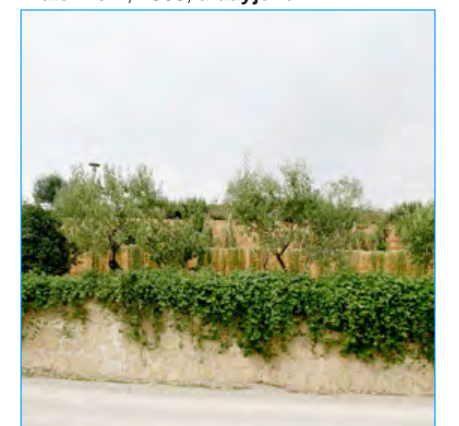
Vara de Rey Promenade, 2017, aldayjover



Aranzadi Park, 2011, aldayjover



Water Park, 2008, aldayjover



Ecological crops, 2008, dataAE



# SLOW MOBILITY CORRIDORS

## WATER BOULEVARD

*Avenida las Flores* in Avellaneda is transformed into a water boulevard. The new river, coming from the streams and through *Acceso Sudeste*, flows along *Av. las Flores* until the highway, where it will connect with the existing streams and canals to finally take the water into La Plata River.

## URBAN GREEN CORRIDORS

Various streets inside the consolidated urban grid are transformed into pedestrian or slow mobility streets. The creation of a green grid will favour activity on the streets and will also help connect the currently few and isolated green spaces in the city.

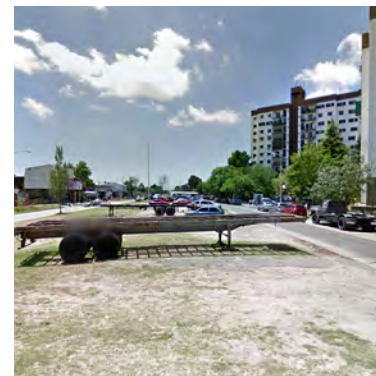
## RECONCEPTUALIZED HIGHWAY

The highway divides the city from the riverside, provoking new settlements to grow next to it. The edges of the highway have currently temporary courses of water.

New green corridors with the consolidation of a continuous canal parallel to the highway and with floodable green spaces to prevent heavy rainfall undesired floods, give a new understanding of the edge of the highways as a usable new landscape.



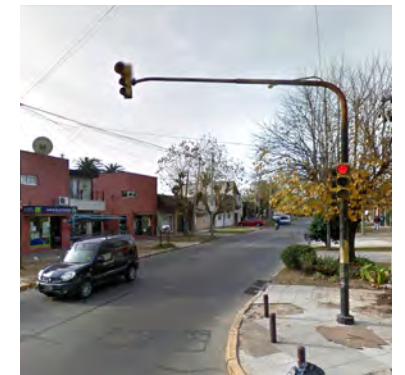
WATER BOULEVARD. Proposed



Current view



URBAN GREEN CORRIDORS. Proposed



Current view



RECONCEPTUALIZED HIGHWAY. Proposed



Current view



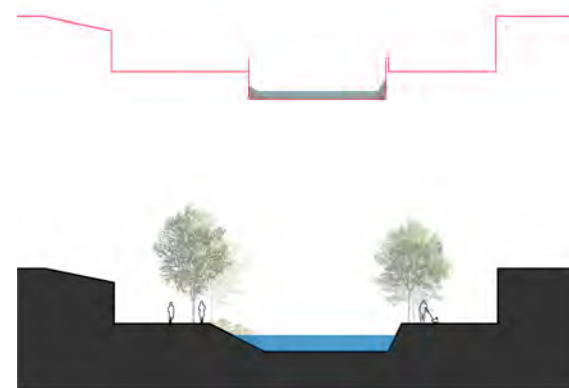
## ARROYOS

The *arroyos*, currently carrying sewage water and buried when entering the neighboring city of Avellaneda, are a great opportunity to reconnect the city with its waters. With softer edges and dense vegetation, the arroyos are renaturalized. A new type of green corridor is created for slow mobility by the streams.

- Arroyos
- - - Transversal connections
- //// Informal settlements in safe areas
- ▭ Villas in floodable areas (relocation needed)
- ▨ Green spaces
- ▩ Floodable green spaces



Proposed



Section



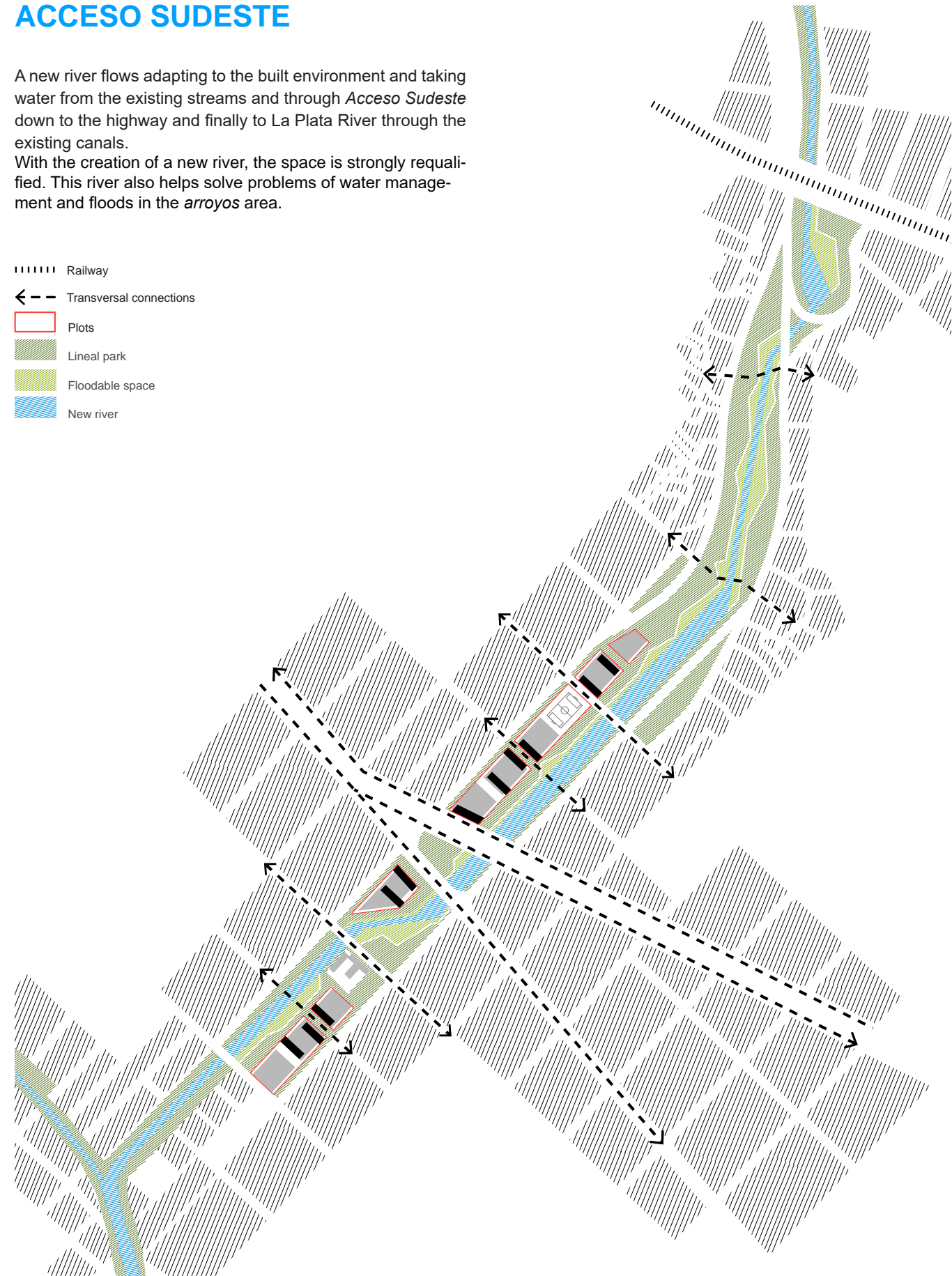
Current view

## ACCESO SUDESTE

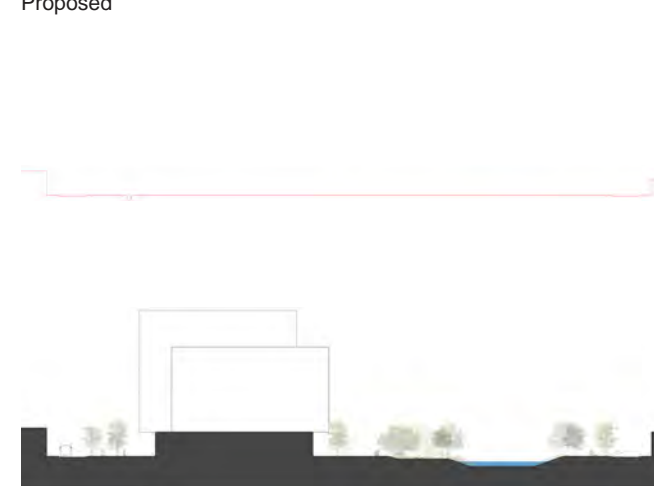
A new river flows adapting to the built environment and taking water from the existing streams and through *Acceso Sudeste* down to the highway and finally to La Plata River through the existing canals.

With the creation of a new river, the space is strongly requalified. This river also helps solve problems of water management and floods in the *arroyos* area.

- ||||| Railway
- ← - - Transversal connections
- Plots
- ▨ Lineal park
- ▨ Floodable space
- ▨ New river



Proposed



Section



Current view

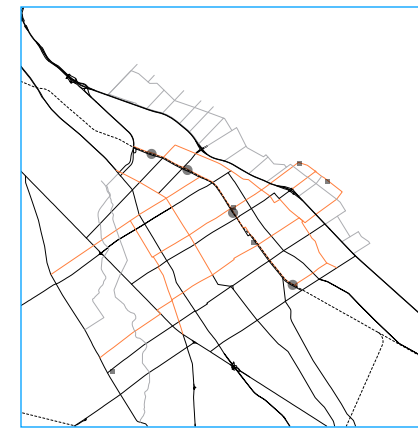


## MOBILITY SYSTEM

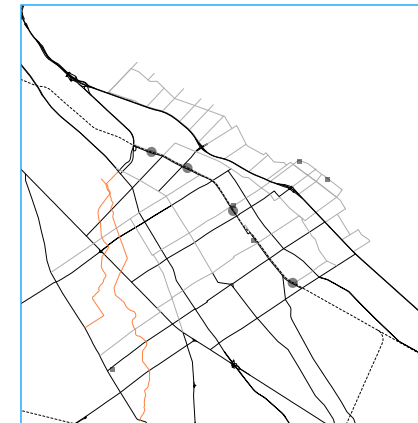
Traffic hierarchies are rebalanced favoring a new grid of main roads. This 'superblock' grid leaves inner streets with less traffic and easy access for neighbors. A secondary grid of slow mobility corridors appears following the green grid and connecting open spaces. New roads are built in the riverside giving access to private developments and drawing a system of roads and paths that are used as flooding management.

- Quilmes
- Highway
- Primary roads
- Railway
- Slow mobility corridors (neighbors, bikes, pedestrians)
- Train station
- Bus depot

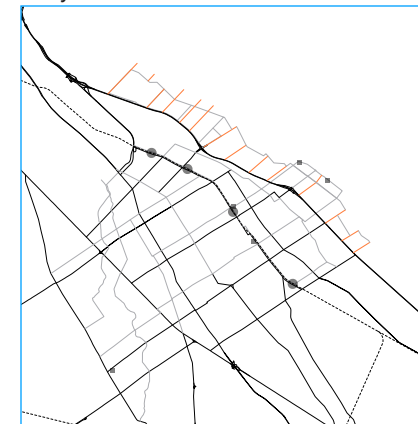
Map Scale  
0km 1km 2km 4km



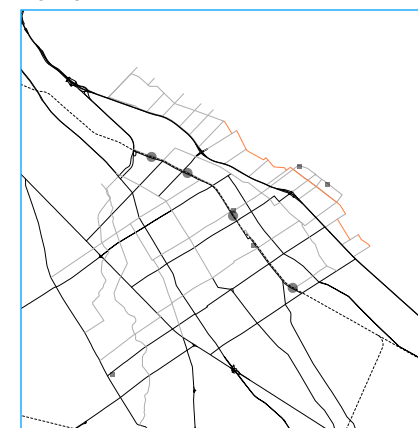
Urban corridors



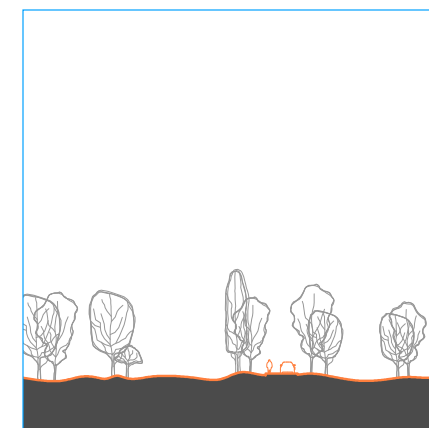
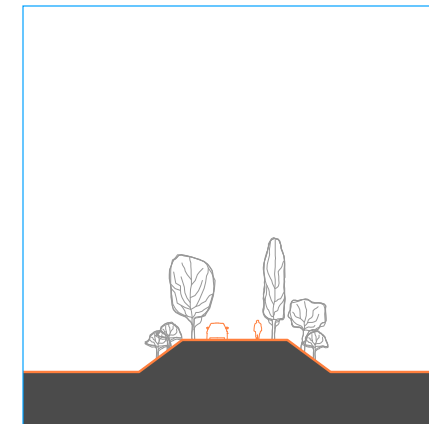
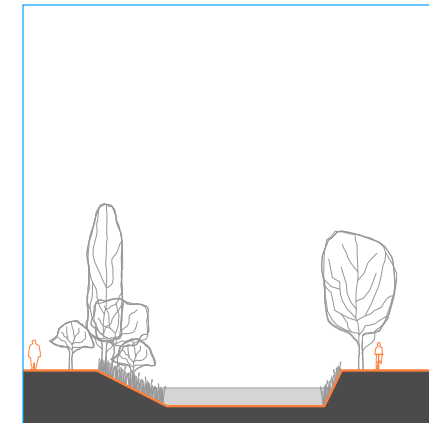
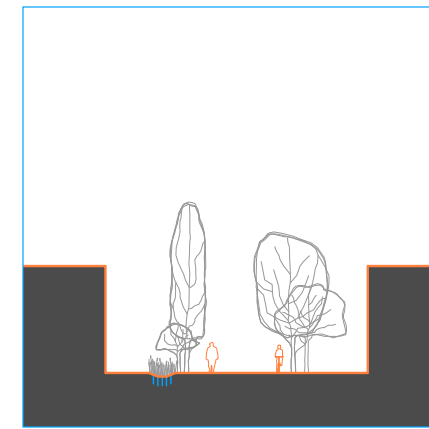
Arroyos



Berms



Forest corridors



Gran Via Boulevard, 2010, aldayjover



Water Park, 2008, aldayjover



Water Park, 2008, aldayjover



Water Park, 2008, aldayjover

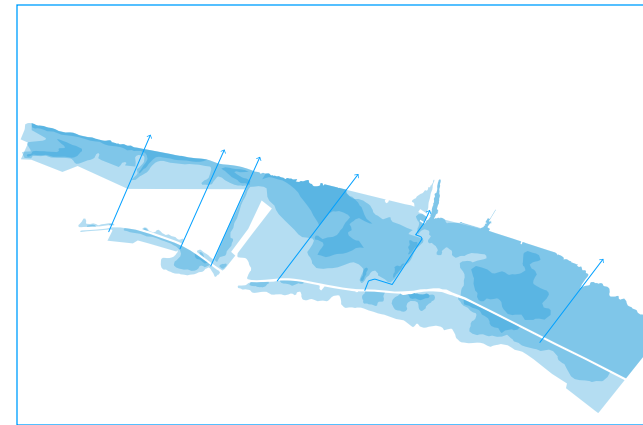


## RIVERINE CITY

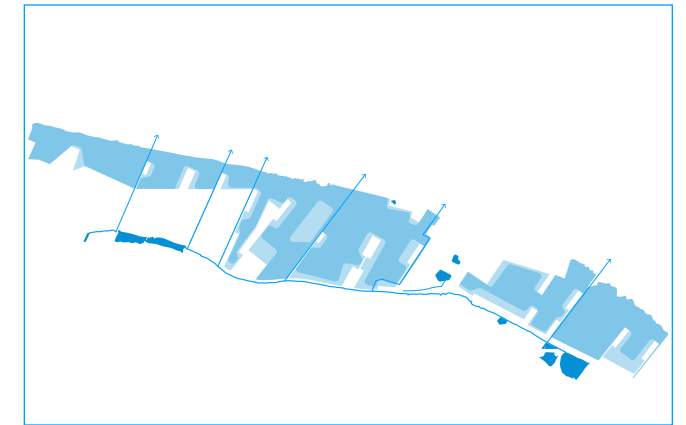
The development of a new Riverine City is defined by the careful treatment of the existing ecosystem and the understanding of complex hydraulic logics. The management of the flood and the respect to the ecology of the site defines the future development of this area.

- Quilmes
- Water lagoons
- Private urbanized areas
- Natural park (protected forest / autochthonous vegetation)
- Urban park (elevated / floodable)

Map Scale  
0km 0.5km 1km 2km



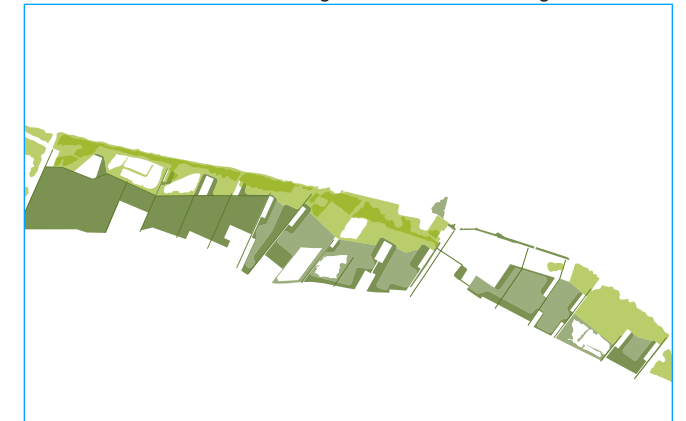
**CURRENT.** Sudestada and rain drainage



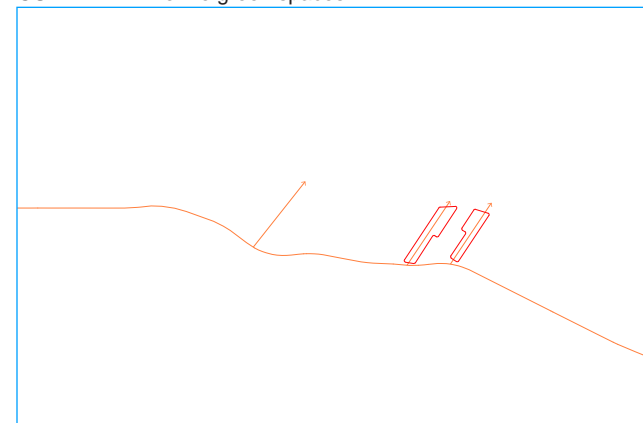
**PROPOSED.** Sudestada management and rain drainage



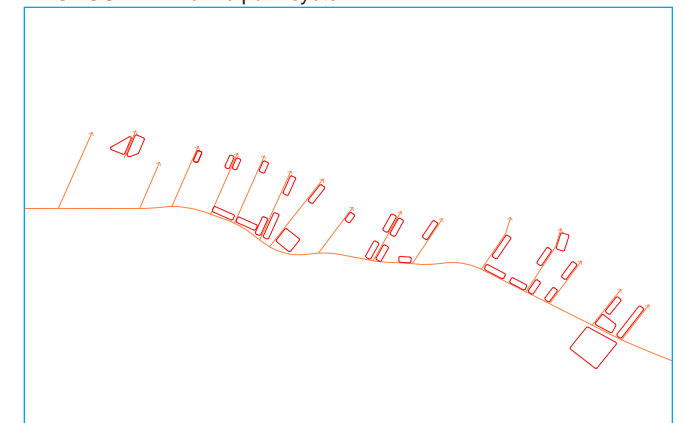
**CURRENT.** Riverine green spaces



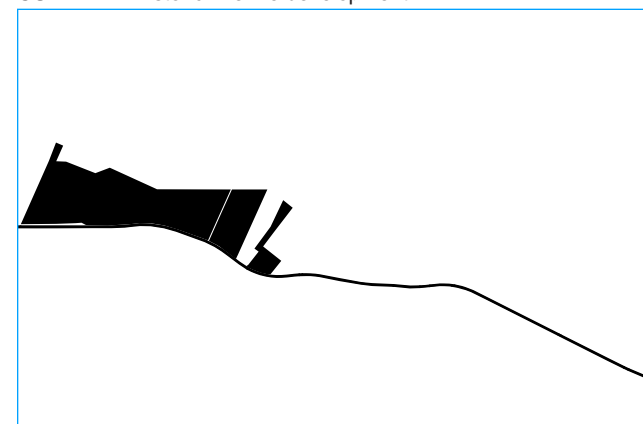
**PROPOSED.** Riverine park system



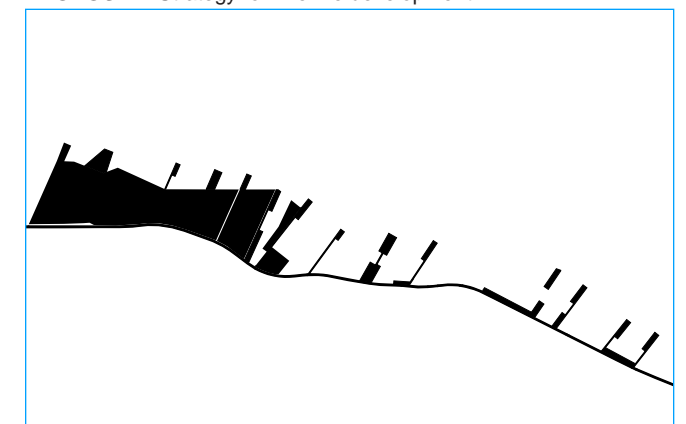
**CURRENT.** Historic riverine development



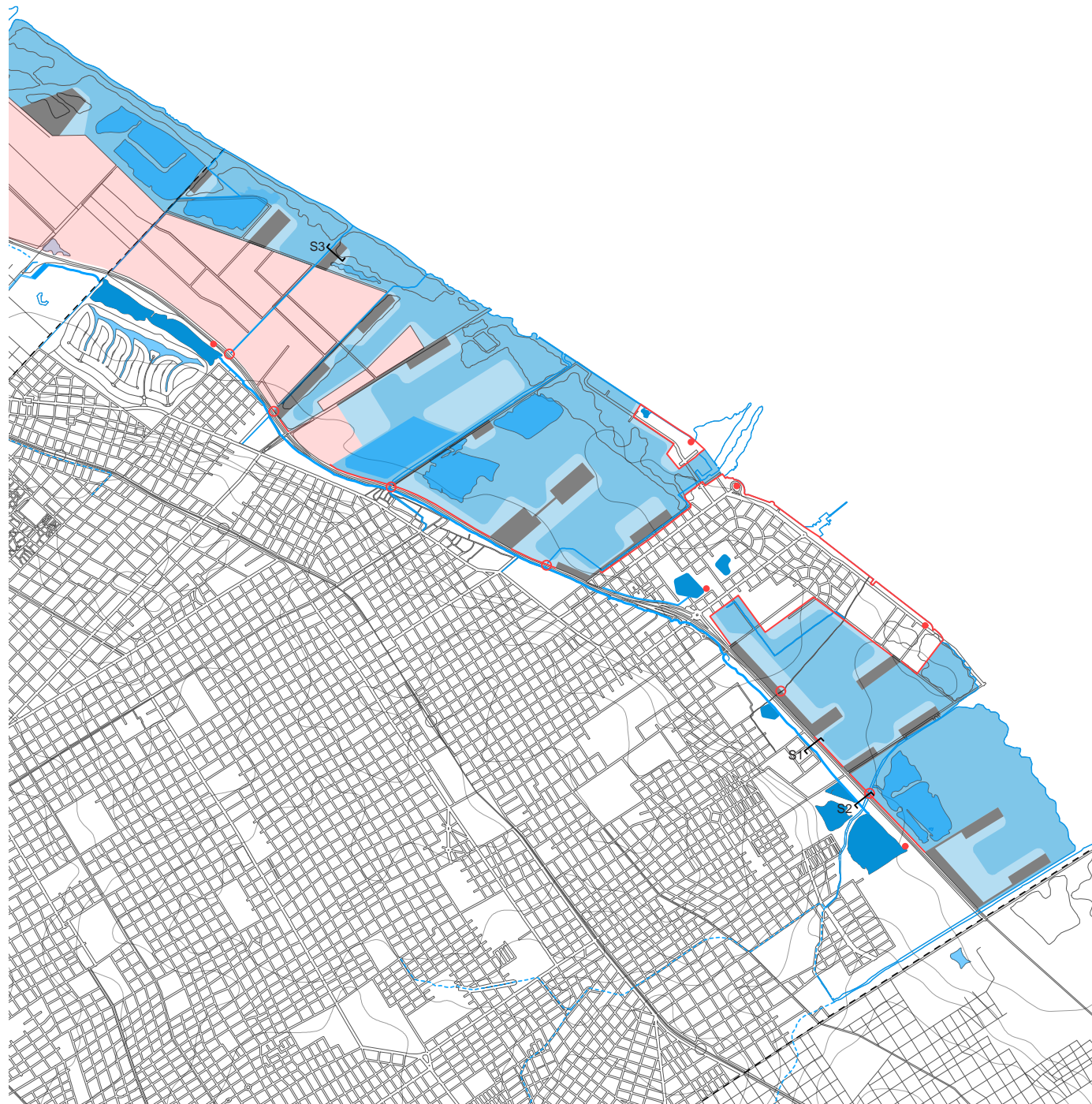
**PROPOSED.** Strategy for riverine development



**CURRENT.** Topography (landfills and highway)

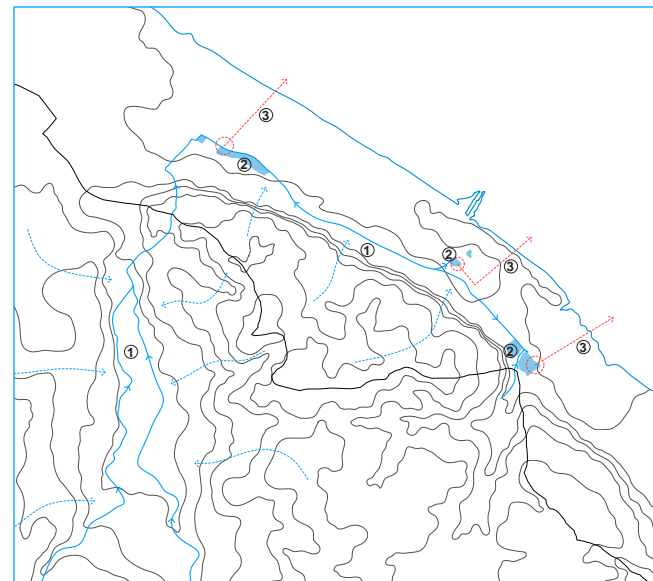
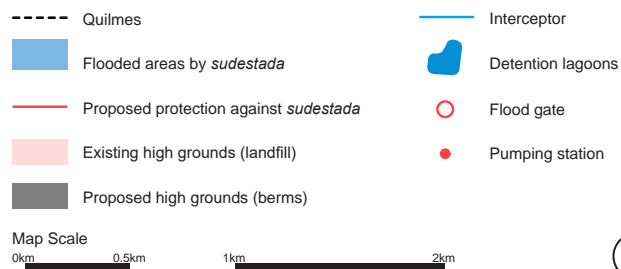


**PROPOSED.** Topography (berms)

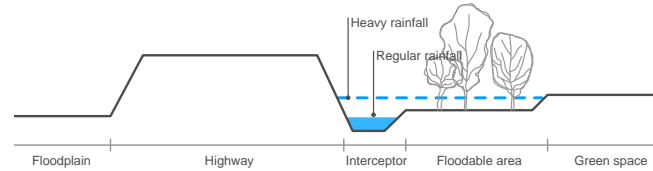


## HYDRAULIC PROTECTIONS

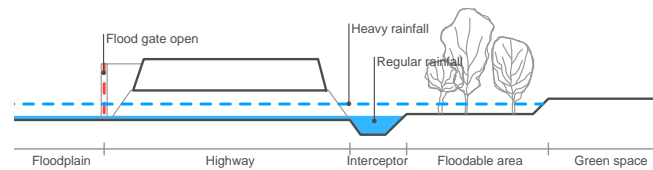
In a first phase, the highway is improved in order to serve as a protection for *sudestada* itself, adding some flood gates when needed, eliminating the need of a parallel levee. The consolidated neighborhoods in the riverside are also protected with a new system of levees and green protections. The streams in the riverside are widened and converted into green ways.



Water flow diagram



S1. Section through interceptor (rainfall)



S2. Drainage under highway (rainfall)

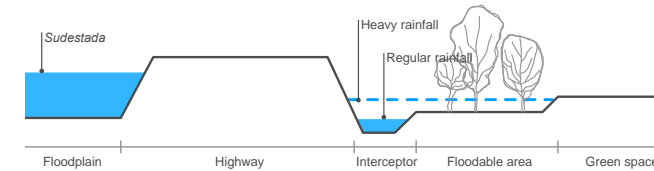
A channel running parallel to the highway collects rainwater and serves as an increased system storage and for flow equalization across the outlet streams running to La Plata River.

In a second phase, as private developments take place, a system of berms colonize the floodplain in a gentle and respectful way to the riverine ecosystem. Following a 'pier' logic. Ground level is raised to protect new developments from *sudestada* and shape the flooded area, without need for pumps or new flow flap gates.

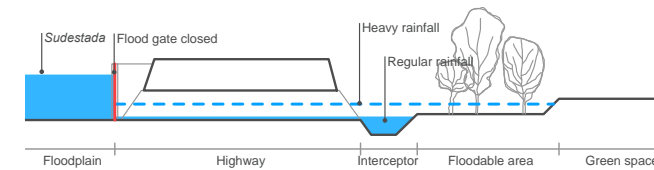
### WATER FLOW DURING SUDESTADA

When heavy rain events occur during an external flood (*sudestada*), water flow follows a clear and simple scheme:

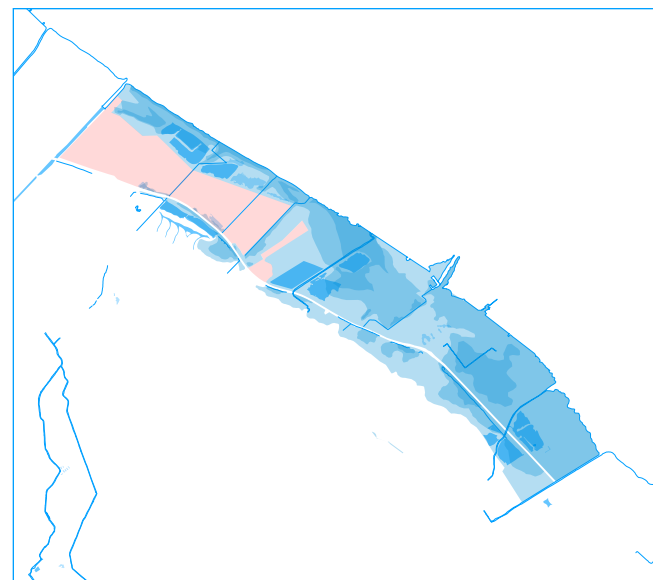
1. Water is **intercepted** by the *arroyos* and the new channel parallel to the highway.
2. These interceptors carry water to three main **storm water reservoirs**.
3. When the reservoirs are at full capacity, water is **pumped** into La Plata River.



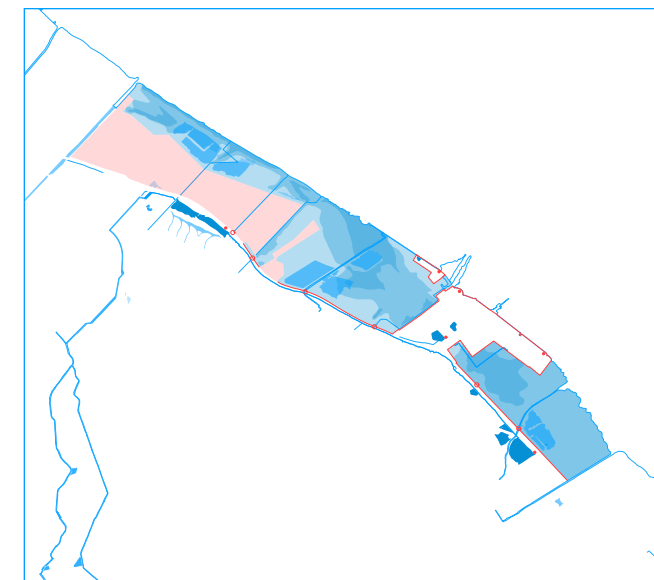
S1. Section through interceptor (*sudestada*)



S2. Drainage under highway (*sudestada*)



CURRENT. *Sudestada* flood



PROPOSED. Phase one, hydraulic protections



## RIVERINE DEVELOPMENT

New urbanized areas are defined within the private plots along the riverside. These urbanized areas are located on the edges of the berms defined for flood protection. The total built up area is reduced to 66% of the current private proposals, resulting in a more suitable proposal for the ecosystem in the riverside.

- Quilmes
- - - - - New roads
- High grounds
- Urbanized areas

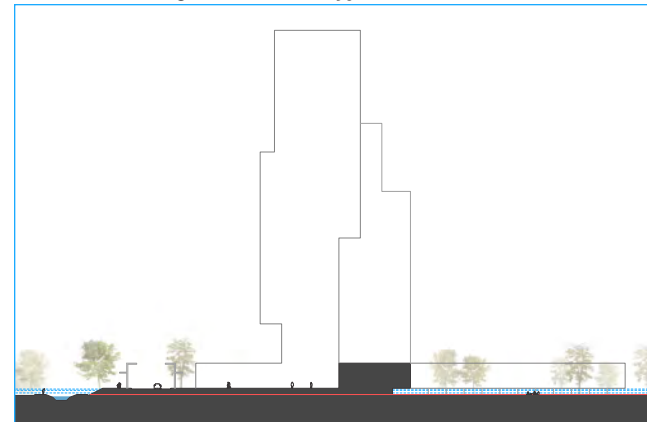
Map Scale  
0km 0.5km 1km 2km



Development on riverside prototype 1



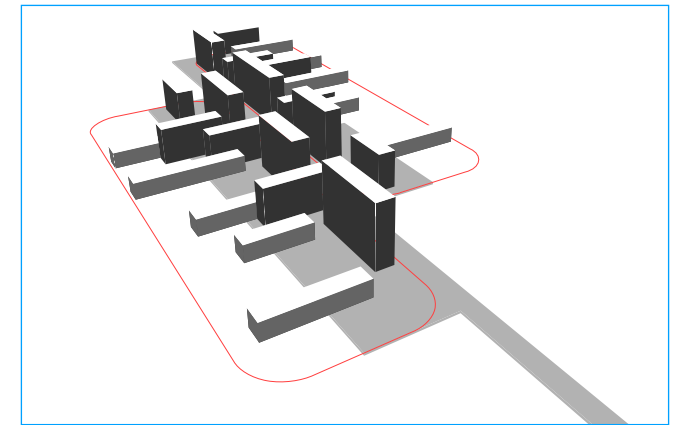
Water Park, Zaragoza, 2008, **aldajover**



Development on riverside prototype 2



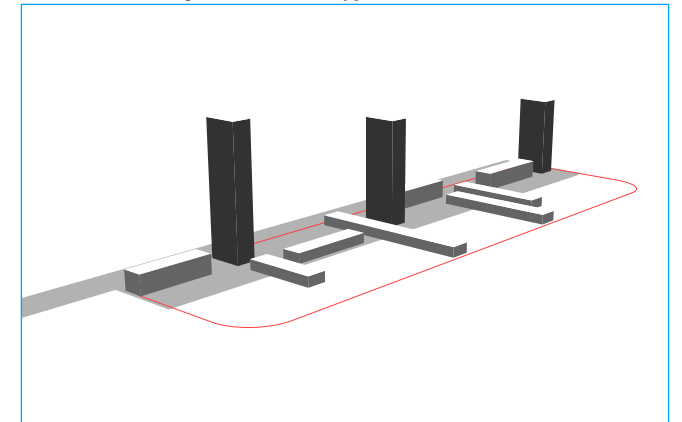
La Remonta, Santander, 2009, **aldajover**



Development on riverside prototype 1



Water Park, Zaragoza, 2008, **aldajover**



Development on riverside prototype 2



Sagrera Green Diagonal, Barcelona, 2011, **aldajover**

