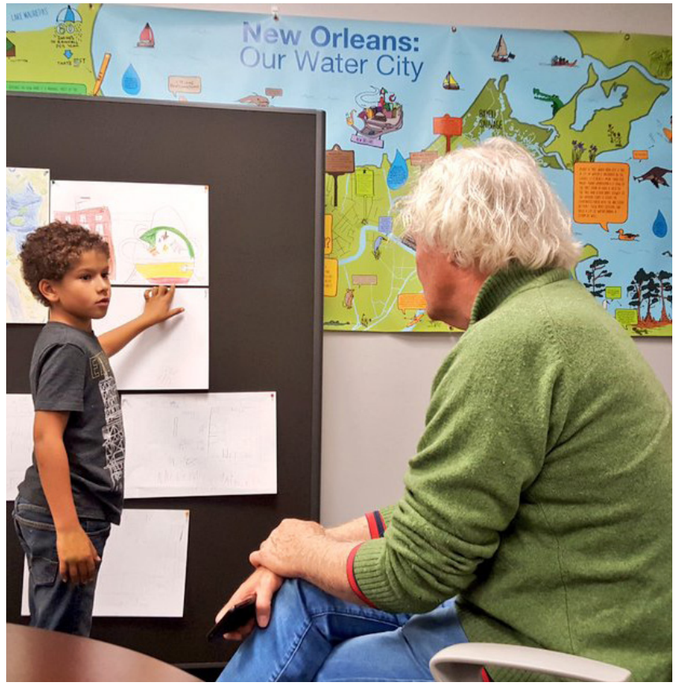
OUTREACH
COLLABORATION WITH SCHOOLS

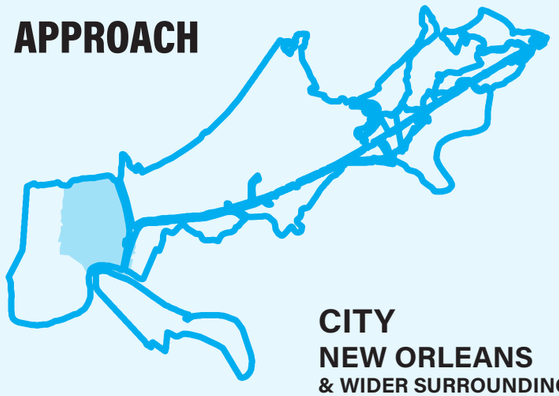
+ GROUNDWATER + STORAGE + WATER USE + RAIN + EVAPORATION



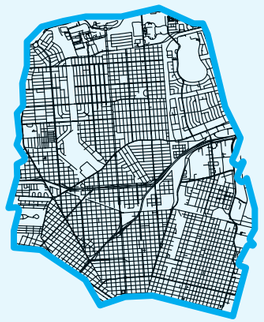
Community outreach

TOWARDS RESILIENT GROUNDWATER & SURFACE WATER MANAGEMENT IN NEW ORLEANS

3 SCALE APPROACH



CITY
NEW ORLEANS
& WIDER SURROUNDING



DISTRICT GENTILLY

BLOCK

New Orleans subsides by an average of 6-8mm annually and a large part of the city is below sea level. Katrina had such an enormous impact because water flooded the low-lying areas and then had to be pumped out. The city could better cope with water and land-subsidence challenges by investing in spatial planning in order to become more resilient. It is expected that current challenges will become more intense in the decades to come because of sea level rise, intense rainfall, drought, and ongoing land subsidence.

The New Orleans' NDRC plan "Reshaping the Urban Delta" proposes robust city structures and water infrastructure, which are crucial for the city's survival and economic prosperity. The plan is being funded by the National Disaster Resilience Competition (NDRC), and it will initially be implemented in the Gentilly district in the northeast of the city before being scaled up to cover all of New Orleans.

The City's Office of Resilience and Sustainability is partnering with Deltares and Deltares USA Inc., to assist with the development of the plans, as well as implementation of many of the plan's scientific and technical components.

+ INTEGRATED APPROACH

1. SENSORS & DRILLING SPECIFICATIONS
2. DATABASING
3. DEALING WITH KNOWLEDGE GAPS
4. MONITORING
5. MAPPING
6. MODELING
7. REAL-TIME CONTROL OF WATER SYSTEM
8. RAIN GARDENS OUTREACH

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CITY OF NEW ORLEANS
MAYOR LATOYA CANTRELL

Resilience + Sustainability
CITY OF NEW ORLEANS

THE WATER INSTITUTE OF THE GULF

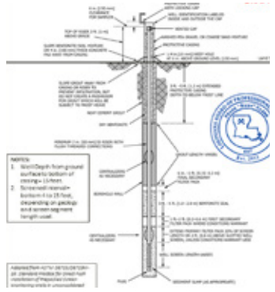
Gentilly Resilience District
Planning & Design Convening

Deltares
Enabling Delta Life

1. SENSORS & BOREHOLE
SPECIFICATIONS

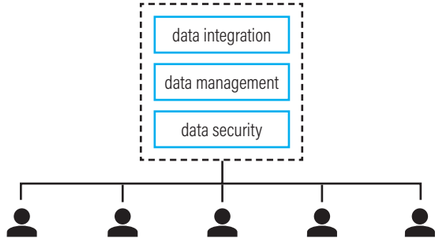
+ WATER MONITORING SENSOR SPECIFICATION SERVICES
- Identifying appropriate parameters to measure & gauge, in consultation with the City. These may include: precipitation, water levels, water quality parameters & subsidence of the soil surface
- Identifying appropriate instrumentation for installation to monitor surface & groundwater parameters
- Producing a final report (i.e. guidelines about types of sensors and data collection)

Sensors


Shallow/surface well generalized section

2. DATABASING
FOR MONITORING, MAPPING & MODELLING

+ WATER MONITORING DATABASE SERVICES
- To make all collected & produced information available for the City & the public
- Installing & set up a server to store water monitoring data, defining accesibility for key actors
- Providing a report on server system setup & guidelines for storing the data
- Demonstration & written guidelines for accesing & utilizing the data



3. DEALING
WITH KNOWLEDGE GAPS

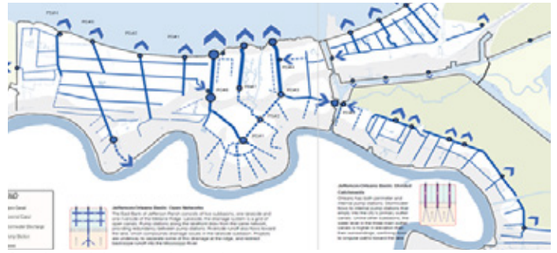
+ KNOWLEDGE GAP SERVICES
- Identify existing knowledge & knowledge gaps on soil & water related conditions in New Orleans, & their potential impacts on surface/subsurface infrastructure
- Research & production of a paper on current knowledge & future work needed on subsidence, water quality, etc. as it relates to the design of green & grey infrastructure


Knowledge gap: What are the rain storm intensities in the future?

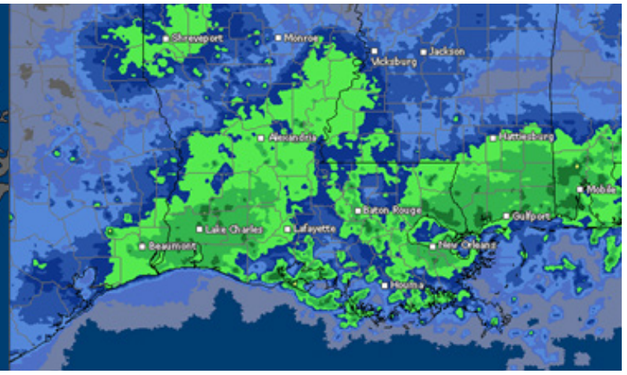

Knowledge gap: What is the relation between trees, climate change, groundwater & subsidence?

7. REAL-TIME CONTROL
OF WATER SYSTEM

+ REAL-TIME CONTROL SERVICES
- Identify the potential benefits of operating city wide urban forecasting & real-time control systems
- Provide a working pilot application of a forecasting & model predictive control scheme, & support knowledge exchange
- Provide a plan to implement & operate the new control system


Overview real-time control network

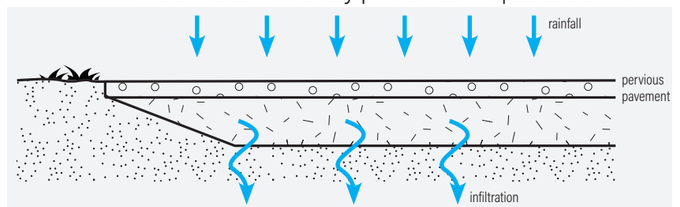
Rainfall forecast



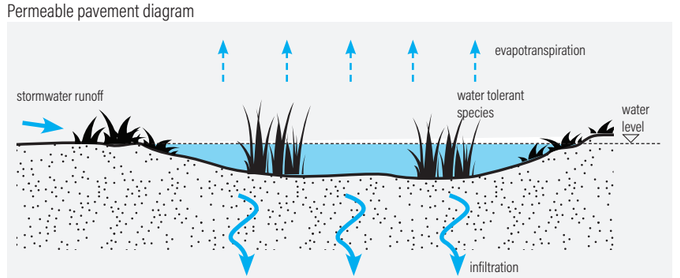
24hrs rainfall

8. RAIN GARDEN
& PERMEABLE PAVEMENT EVALUATION

+ GREEN INFRASTRUCTURE APPLIED RESEARCH SERVICES
- Analyze costs (design, construction, maintenance) & water storage efficiency of existing rain gardens and permeable pavements
- Produce a user-friendly performance quantification tool



Permeable pavement diagram



Rain garden diagram

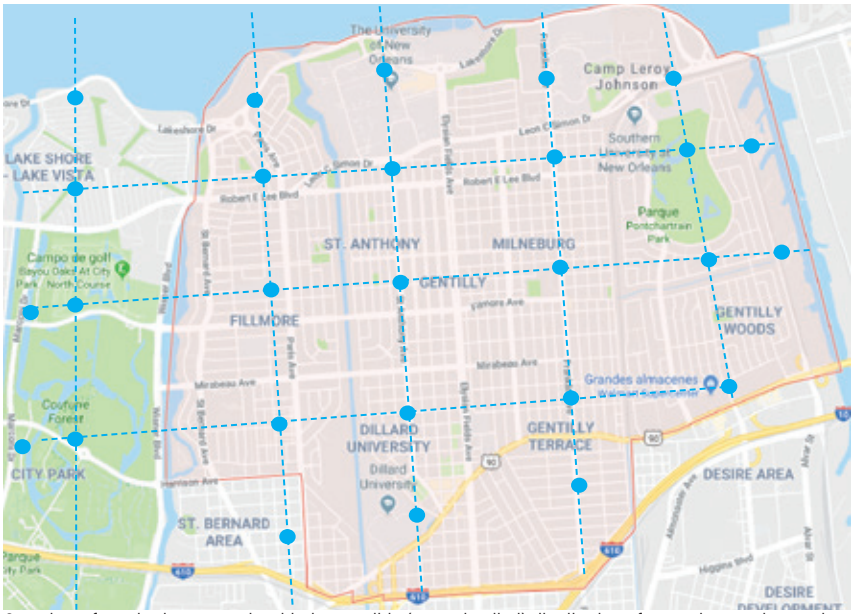

Permeable pavement


Rain garden

4. MONITORING
GROUNDWATER, SURFACE WATER & SUBSIDENCE

NETWORK DESIGN & INSTALLATION SERVICES

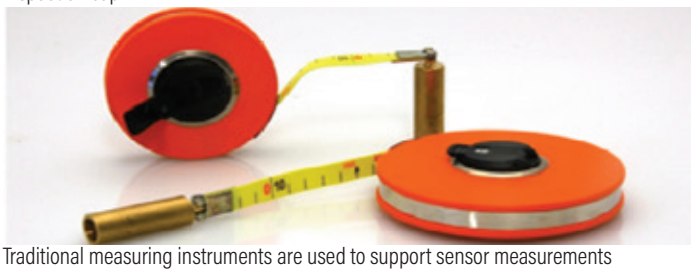
- Design & install an integrated groundwater/surface water/subsidence quantitative & qualitative monitoring network, including a report with the results from the first 6 months



Overview of monitoring network, with the possible (more detailed) distribution of groundwater observation wells in Gentilly. Exact locations need to be determined in collaboration with stakeholders


Borehole


Inspection cap


Traditional measuring instruments are used to support sensor measurements

5. MAPPING
SUBSIDENCE VULNERABILITY

SUBSIDENCE VULNERABILITY MAPPING SERVICES

- Mapping groundwater level & subsidence vulnerability city wide, during a 1 week field campaign (>75 shallow boreholes of 9-12 feet), considering existing borehole information
- Groundwater levels, bulk density & amount of organic material to determine future subsidence caused by drained groundwater

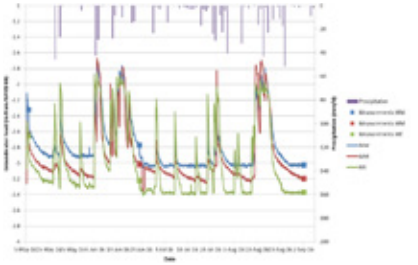
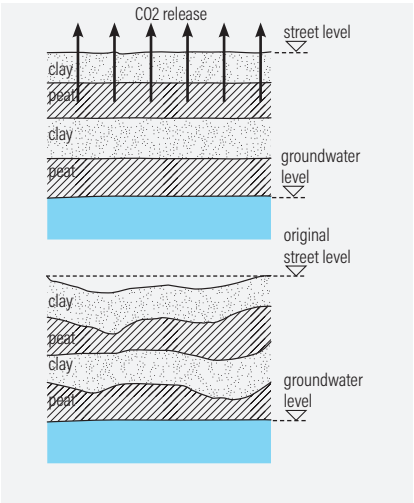


Table: Corrected groundwater levels


Sampling of soil composition



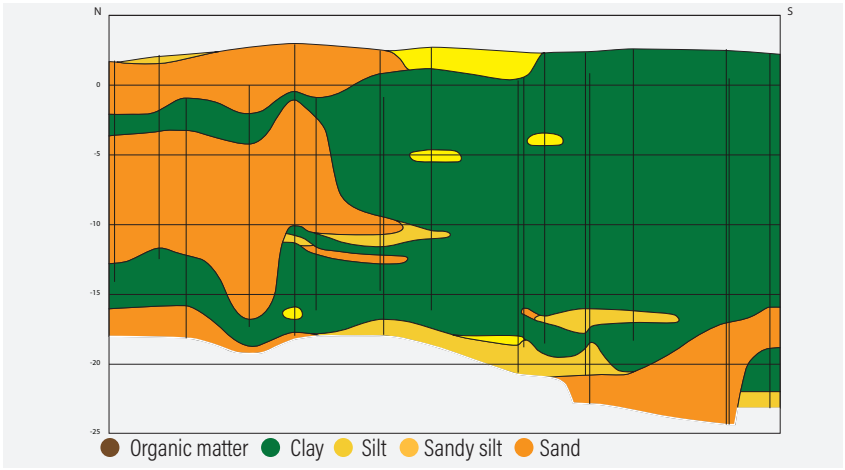
Scheme of subsidence process

Elevation map

6. MODELING
GROUNDWATER & SUBSIDENCE

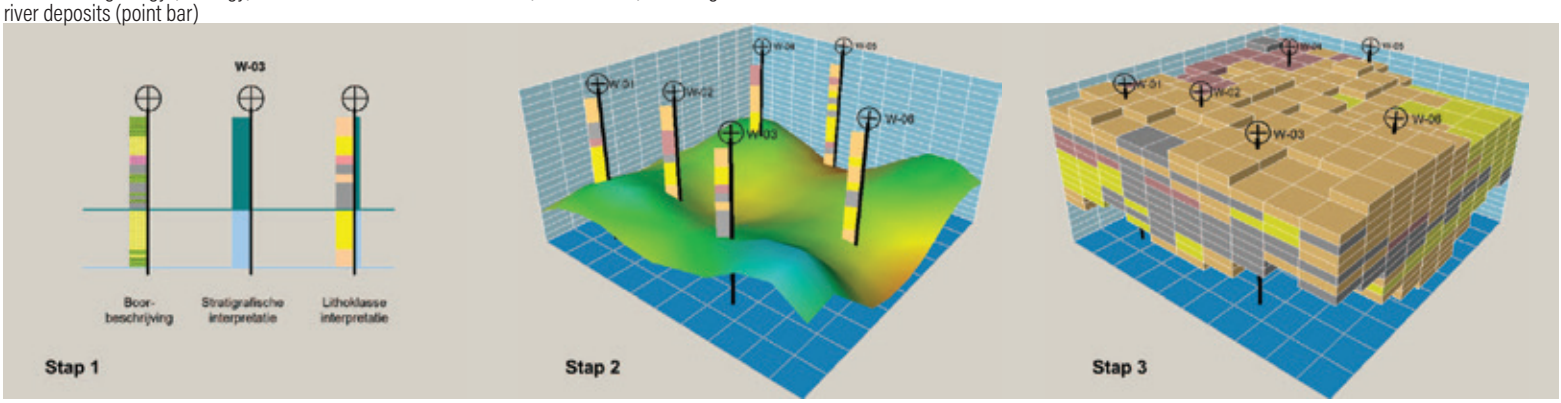
INTEGRATED GROUNDWATER & SUBSIDENCE MODELLING SERVICES

- Construct a 3D city wide geology (foxel) model of the Holocene subsurface based on available cross-sections and existing borehole descriptions
- Analyze flow & subsidence related to drained groundwater with a detailed shallow groundwater model
- Analyze groundwater flow, salinization risks, subsidence, climate change impacts & the impacts of urban re-constructions
- Analyze past & future effects of deep groundwater pumping (i.e. subsidence, salinization) with a regional flow/subsidence model

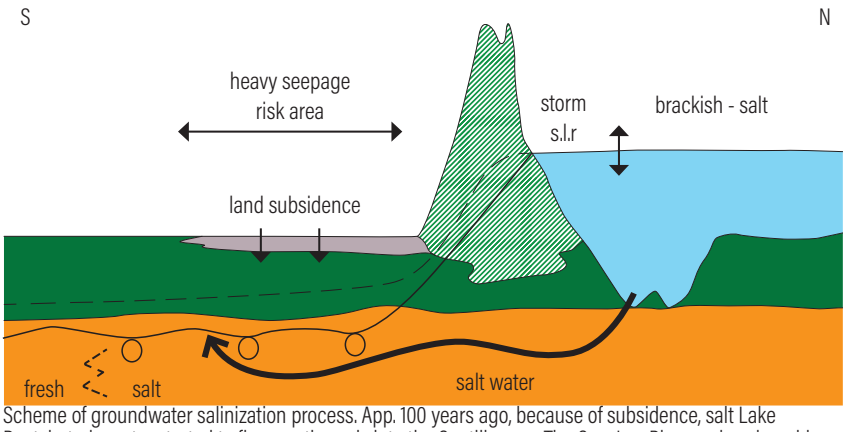


Constructed geology (lithology) section from the river to the north (Jefferson Ave), showing the coarse river deposits (point bar)

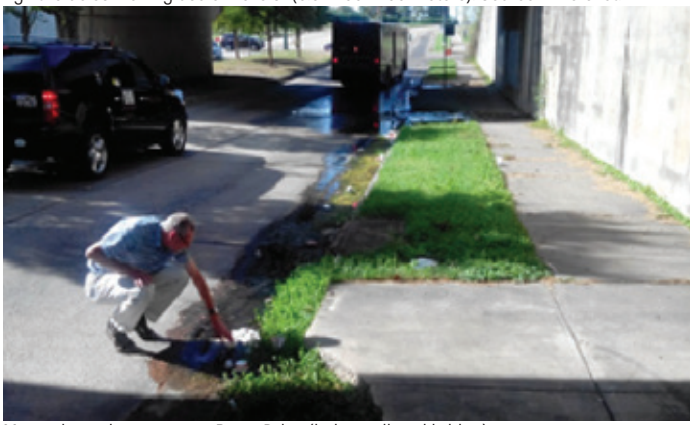
Lithology map



Step 1: Schematization of boreholes - Step 2: Modelling lithostratigraphical bounding surfaces - Step 3: Modelling lithofacies making use of "foxels" (0.5 x 100 x 100 meters). Source DINOloket.nl



Scheme of groundwater salinization process. App. 100 years ago, because of subsidence, salt Lake Pontchatrain water started to flow southwards into the Gentilly area. The Gen. Lee Blv. area is vulnerable for salt water seepage.


Measuring salt seepage at Press Drive (below railroad bridge)