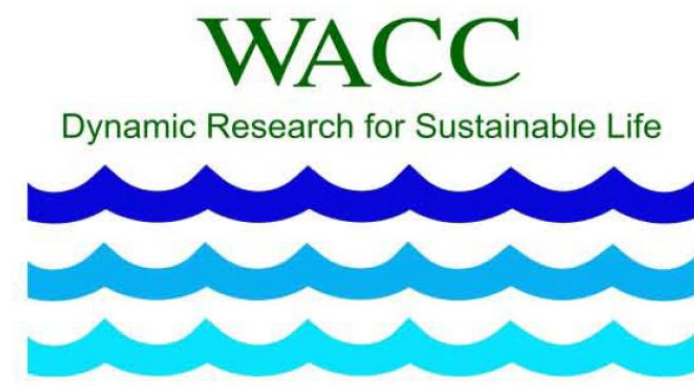


FAME: Freshwater Availability in the MEkong delta

FAME: Nguồn Nước Ngọt ở Đồng Bằng Sông Cửu Long



Deltares



Nelen & Schuurmans



Netherlands Enterprise Agency

Large groundwater extraction in the Mekong Delta for agri- and aquaculture



water consuming rice paddies

Aim of the FAME project

Freshwater Availability in the Mekong Delta (FAME) is a collaborative, multiphase project focusing on scoping, piloting and providing upscaling advice to national partners in Vietnam on how and where to implement **Aquifer Storage and Recovery (ASR)** systems. ASR systems would provide farm scale solutions aimed at addressing **fresh water quality and availability** issues being faced within the Ben Tre and Tra Vinh provinces of the Mekong Delta, Vietnam.

Approach

1. Executing a hydro(geo)logical survey at possible Shallow ASR locations
2. Creating an overview of the potential Shallow ASR technologies
3. Studying, designing and running a pilot with a Shallow ASR technology
4. Monitoring the status of surface and groundwater quality in the pilot.
5. Making recommendations for upscaling potential Shallow ASR measures
6. Transfer knowledge on ARS drilling and installation

Selected Study sites and opportunities for ASR

Three sites in the provinces of Ben Tre and Tra Vinh have been selected and studied to assess the potential and feasibility of installing ASR systems. The three sites are characterized by old sand dune ridges which serve as shallow aquifers supplying groundwater to the farmers living on or close to these ridges.

Ben Tre

In this province, two sites have been selected (BT02 and BT03). Farmers living in this area, produce rice, own cows and have orchards with fruit trees. The sand dune in BT02 is long and narrow and is occupied by houses and roads. BT03 is an extensive dune area highly populated and where groundwater is used for irrigation. Both sites are surrounded by ditches and canals.

Tra Vinh

This is one of the poorest areas in the Mekong Delta. The site is located in the eastern part of the province. The sand dune complex at this site (TV02) is quite extensive, and farmers have land on top of the dunes and also rice fields in the lower areas. The area in the immediate vicinity of the field site is relatively high and sandy, with little to no surface water available. The *International Fund for Agricultural Development* has installed a surface water reservoir as part of the *Adaptation in the Mekong Delta* project.

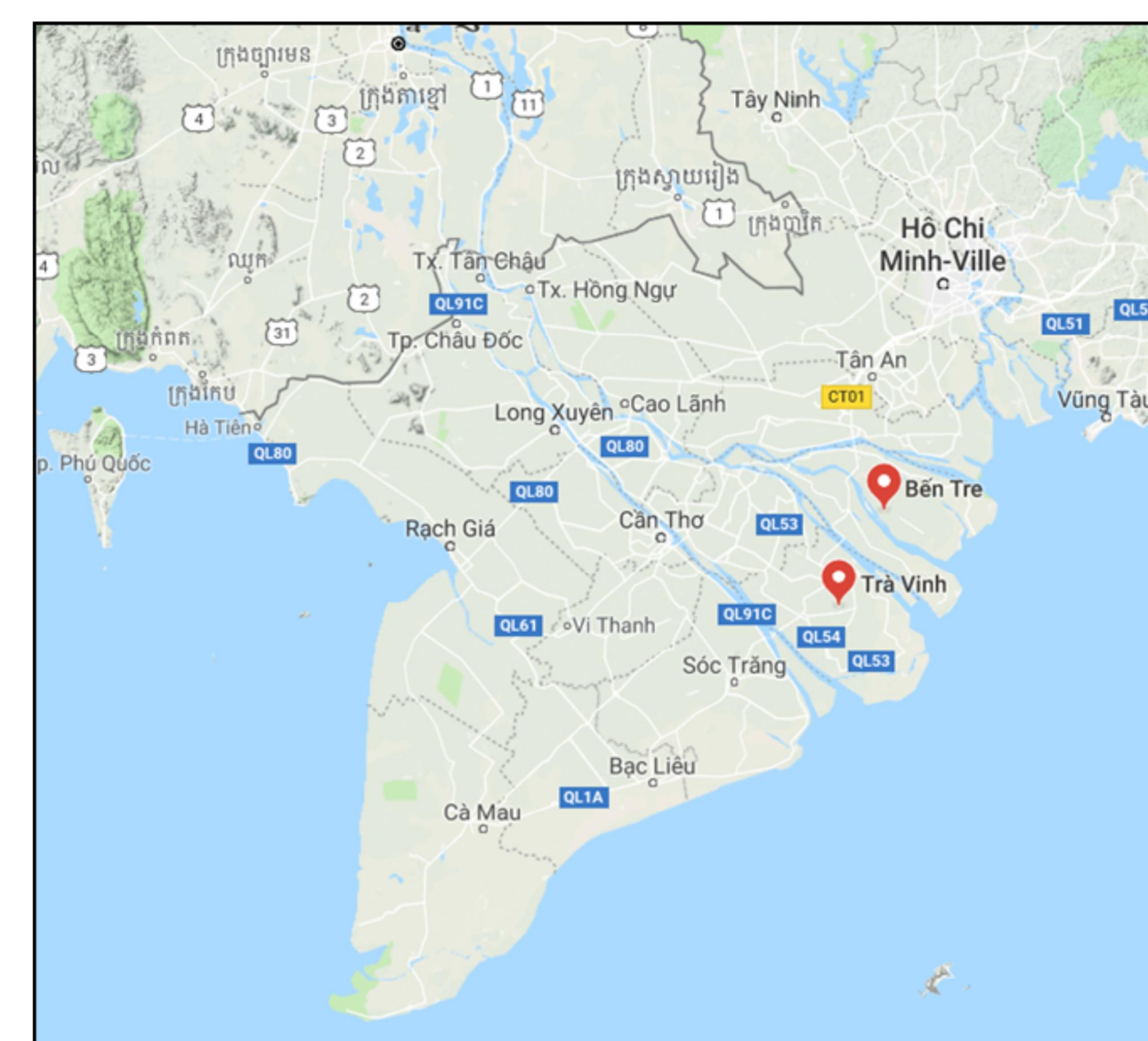
a. TV02 Long Son



b. BT02 An Duc



c. BT03 Bin Tangh



Figures: Locations of the Provinces Ben Tre and Tra Vinh. Picture of Tra Vinh



Figure: Shallow agricultural groundwater extraction well.

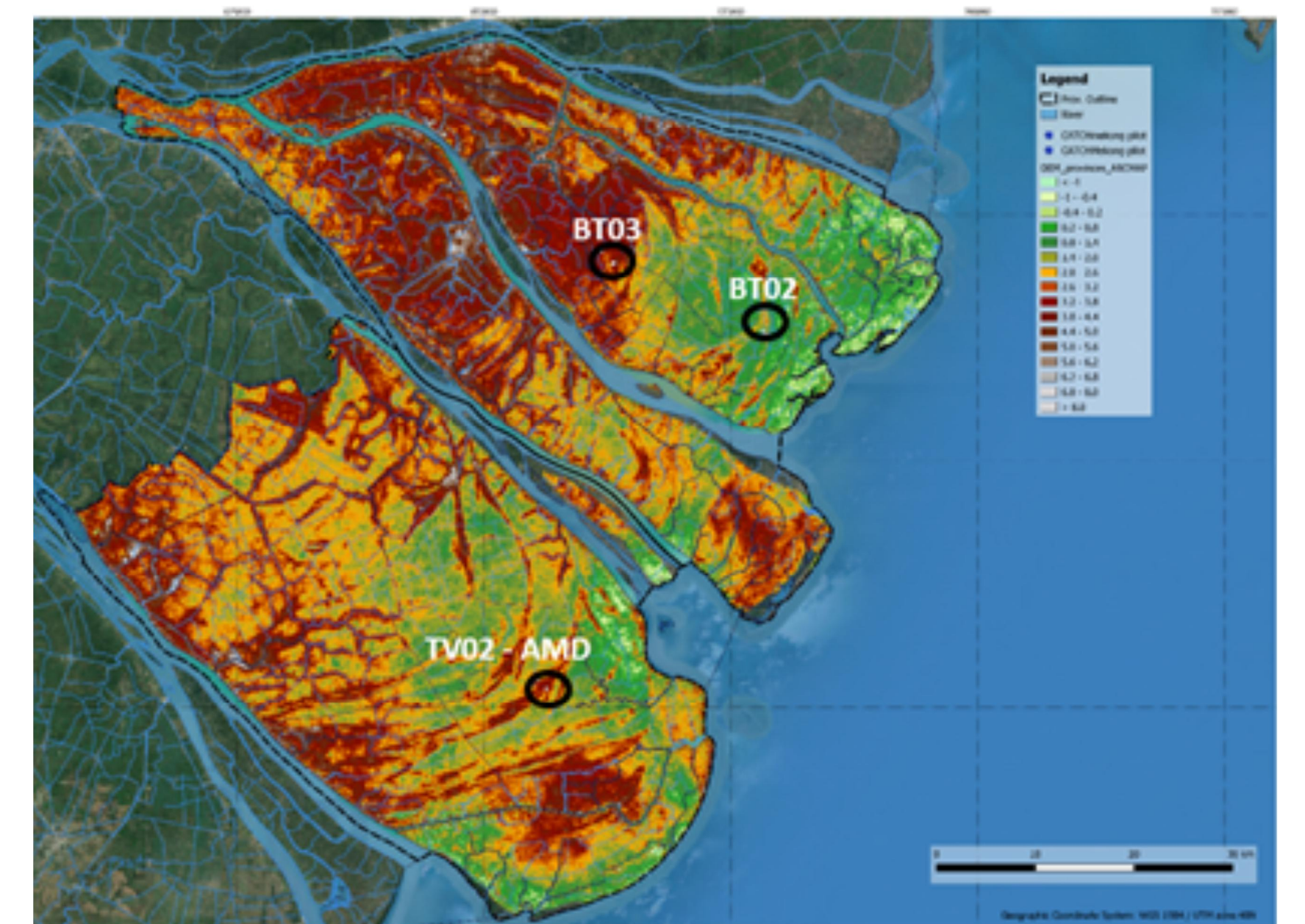


Figure: Elevation map and location of the three study areas.

Aquifer Storage and Recovery (ASR)

ASR is the process by which water is injected under pressure or allowed to infiltrate naturally into a permeable underground layer where it is stored until extracted, when needed at a later date.

Advantages:

- Increase water availability to farmers during dry periods
- Increase resiliency with respect to water available to users
- Potential for farm scale storage and water availability
- Provide a backup water reserve in the case of emergencies
- Decrease environmental and societal impacts in relation to (new) surface reservoirs
- Combat groundwater salinization
- Helps with flood mitigation measures

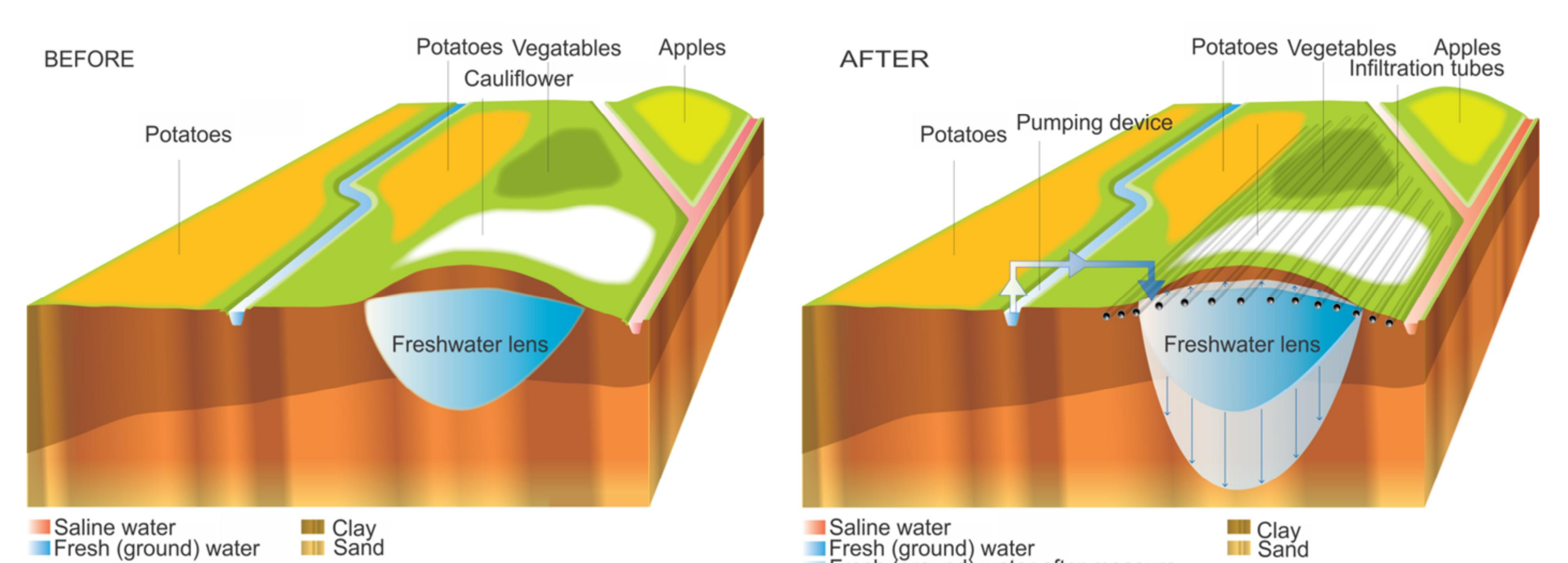


Figure: Example of a Shallow Controlled Artificial Recharge and Draining system at a shallow sandy creek ridge: if the phreatic water level is increased with X cm, the freshwater lens will, in time, deepen 40X cm.

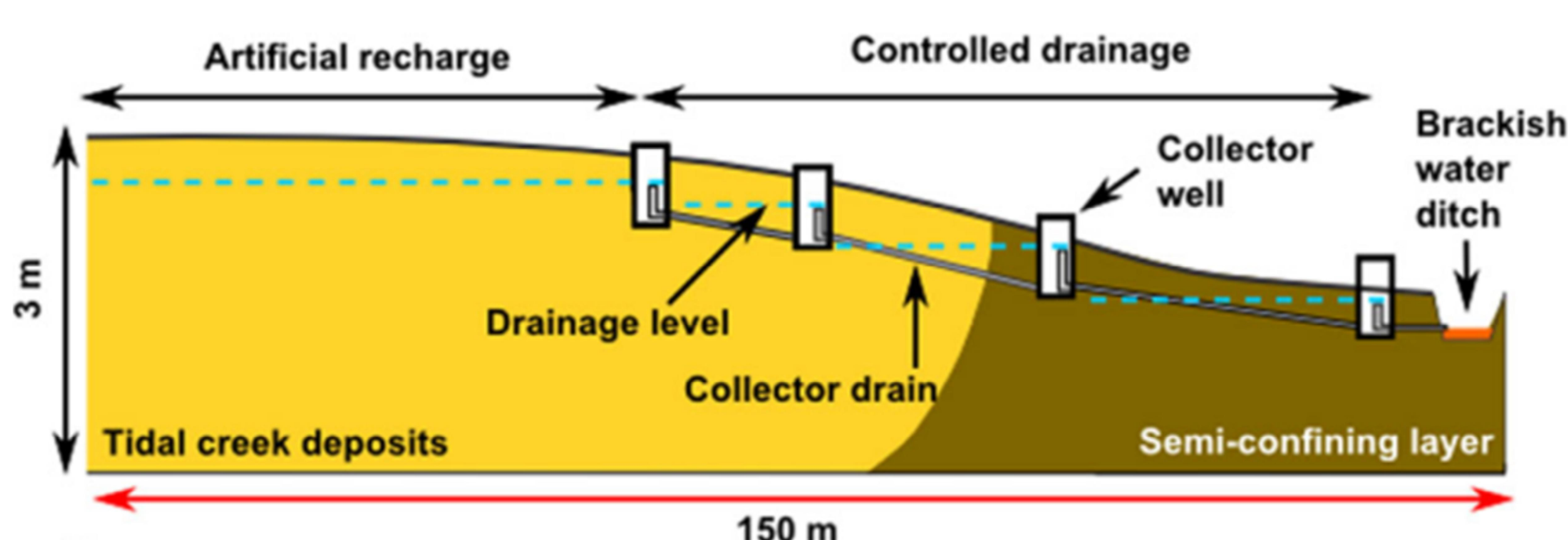


Figure: Aquifer and Recovery systems.

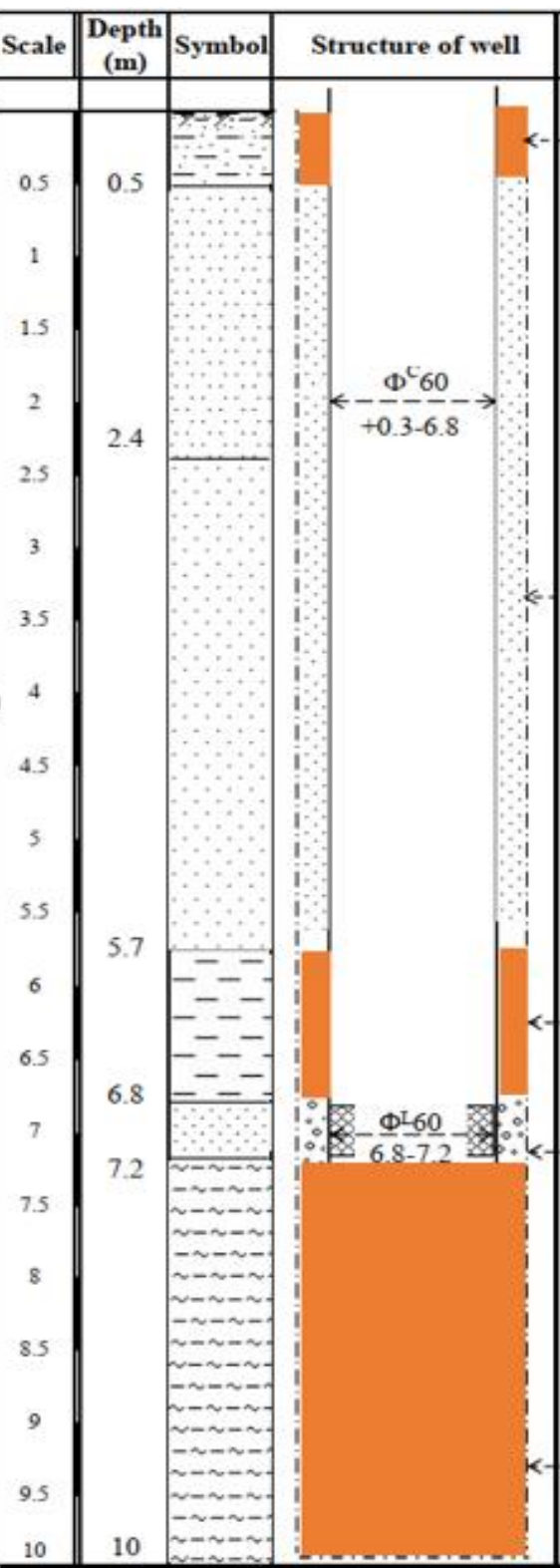
Field work to characterize selected sites

The selected sites have been studied with the objectives to:

- Understand the physical system (geology, hydrogeology)
- Identify the urgency for ASR systems
- Estimate the potential for a shallow ASR pilot

The field work carried out consisted of:

- Geological surveys
- Installing piezometers and monitoring groundwater levels
- Monitoring water quality of wells and surface water bodies
- Interviews with farmers



Groundwater monitoring



Drilling and installing the groundwater monitoring wells at BT03

Insights from geological fieldwork, monitoring and measurements:

- The three sites are feasible for ASR use, from a geological point of view,
- Window of opportunity for infiltration between November—December
- Current limiting factor for ASR pilot in BT02 and BT03: surface water quality

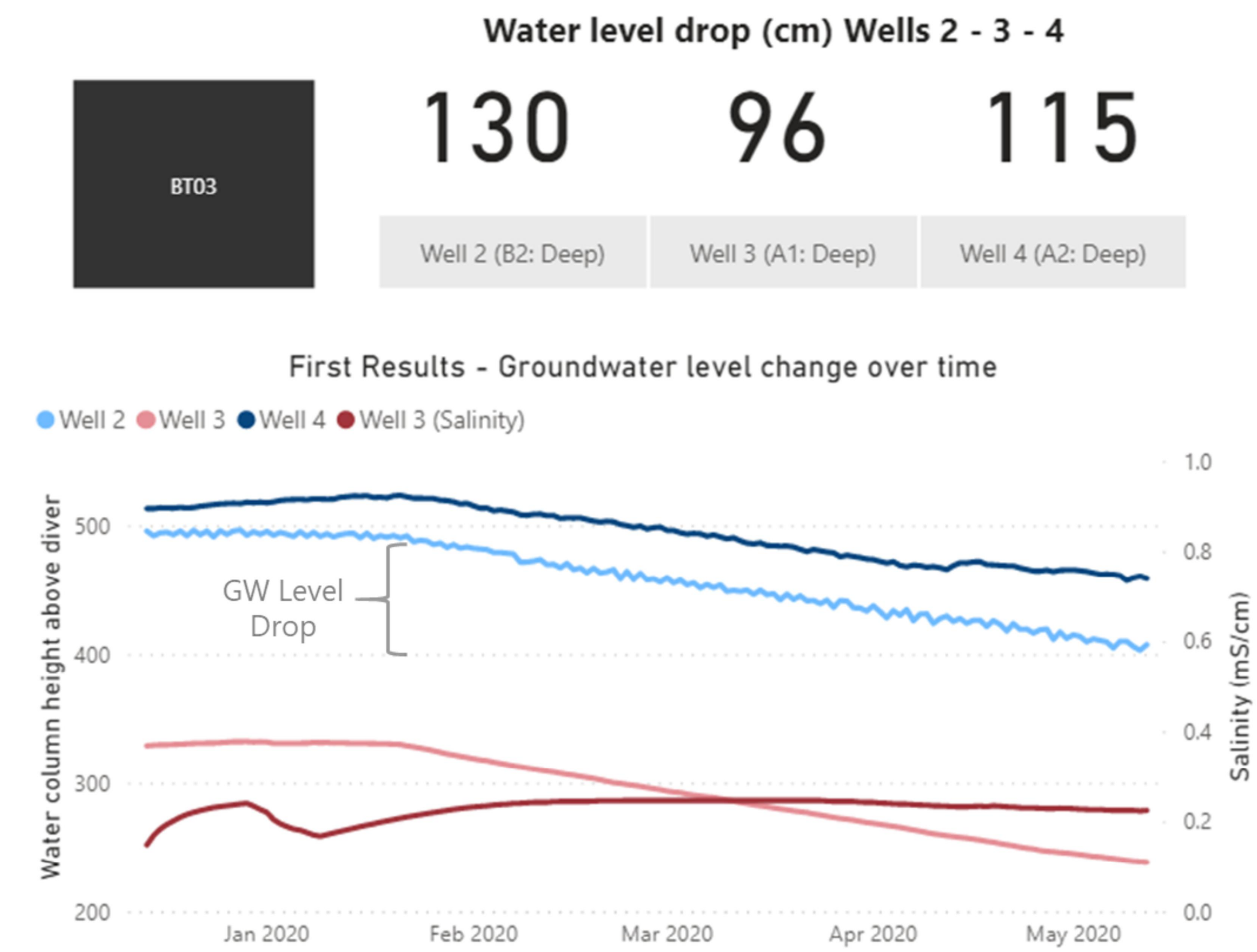


Figure: Water level and salinity monitoring at BT03. Water levels decrease into the dry season.

Project planned activities

- Workshop April 2021 on feasibility and upscaling, visiting field site
- Monitoring campaign water quality at BT03
- Pilot implementation at TV02
- Creating potential maps for shallow aquifer storage and recovery
- Final workshop November 2021 on recommendations of water resources management

End date of the project: December 2021

Geological fieldwork

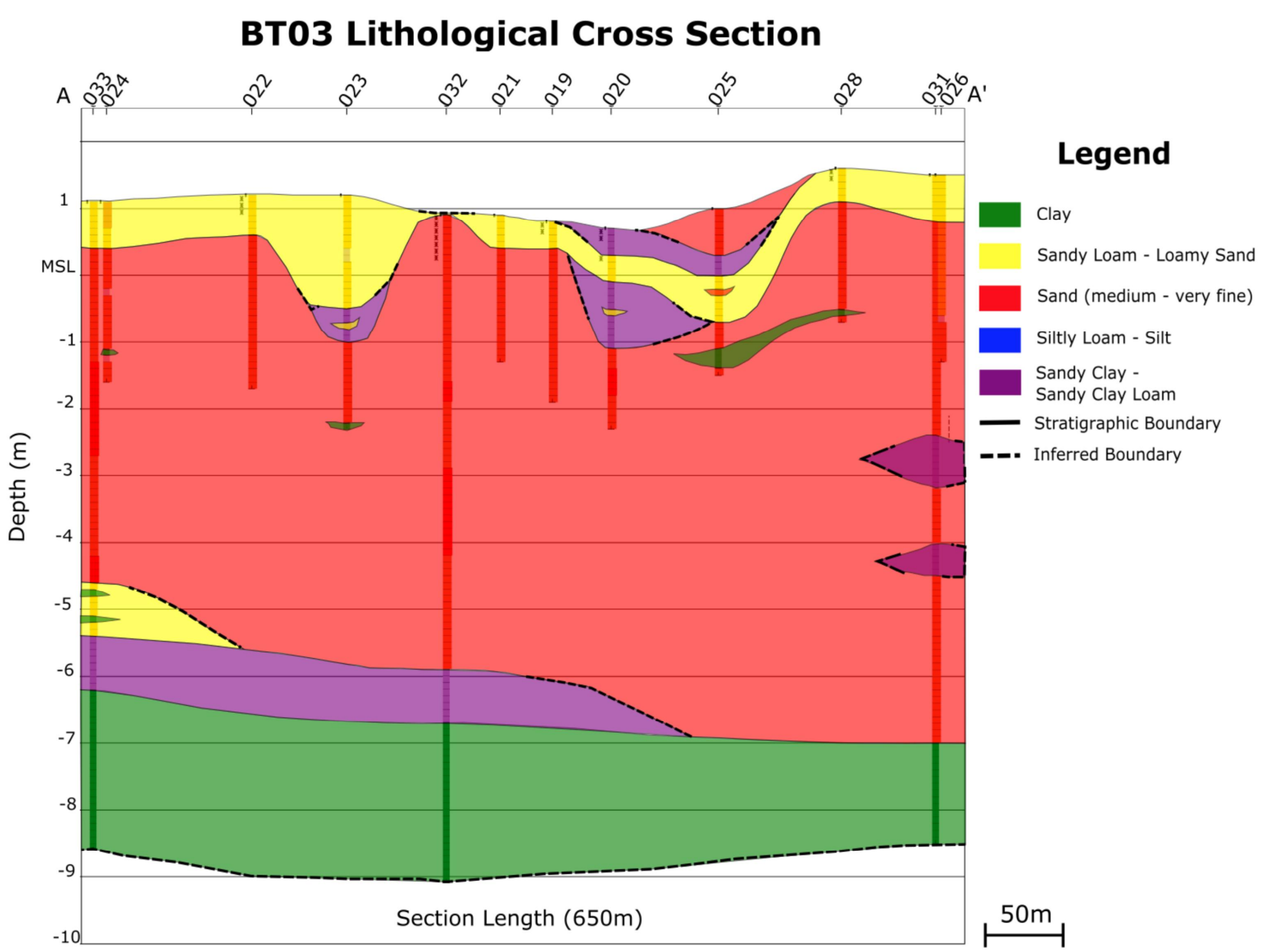
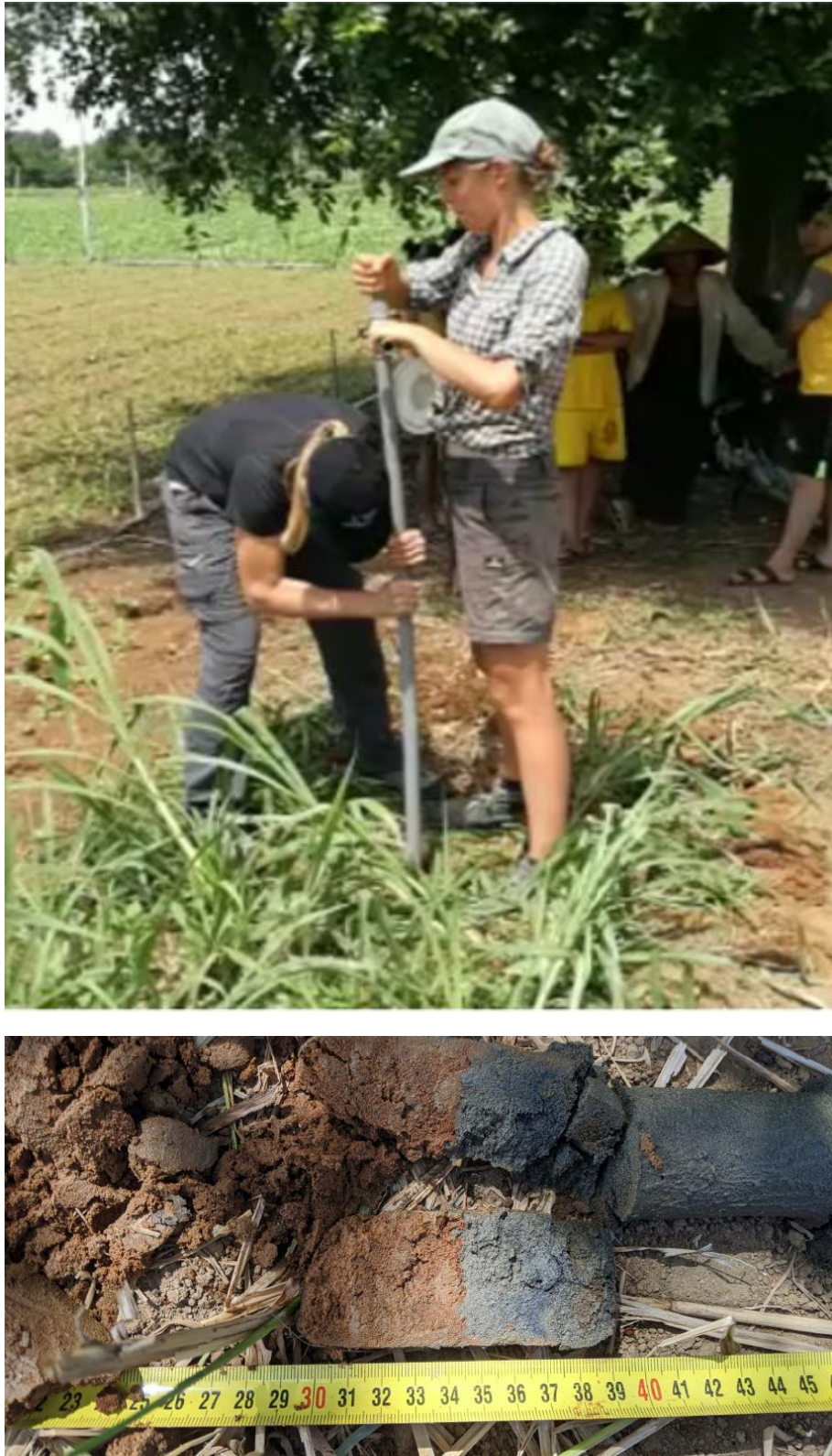


Figure: Cross-section of lithology, red is the sand body in which shallow groundwater can be infiltrated.

Water quality monitoring

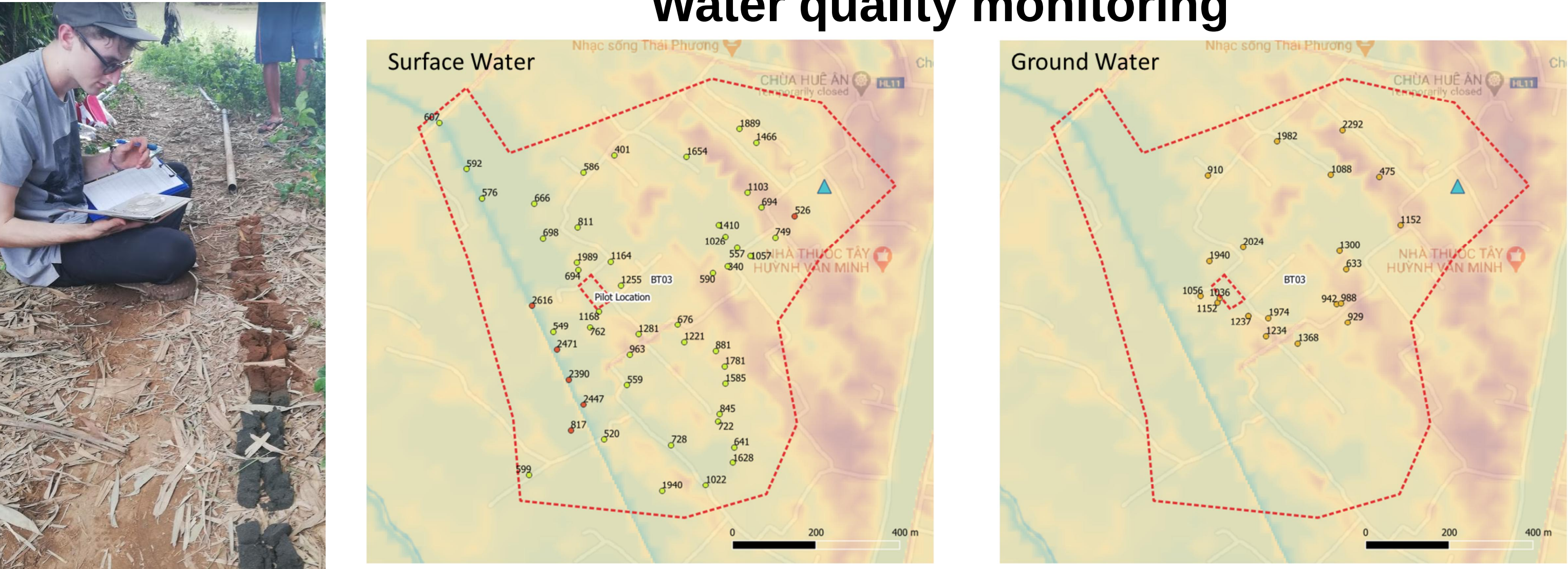


Figure: Locations of surface and groundwater quality monitoring.



Figure: Field surveys to measuring water quality in surface and groundwater.

Opportunities for ASR in the selected study sites

Ben Tre

BT02— This site offers opportunities for ASR but finding the right locations is a challenge due to the occupation of the dune. Groundwater drops and there is space to recharge the aquifer but groundwater is used for domestic needs but not for agriculture. Water quality from potential sources might not be suitable for infiltration.

BT03— Groundwater levels drop in the dry season and shallow wells get dry. Water quality of the canal, which could be used for infiltration, shows high phosphate levels and might not be suitable for infiltration. Even if this site offers the best opportunities for ASR, water quality needs to be well monitored before starting a pilot.

Tra Vinh

TV02— in the dry season groundwater levels drop and there is room in the sand dunes between October and December. Water from AMD reservoir could potentially be infiltrated. This site has been chosen to install the shallow ASR pilot within FAME.

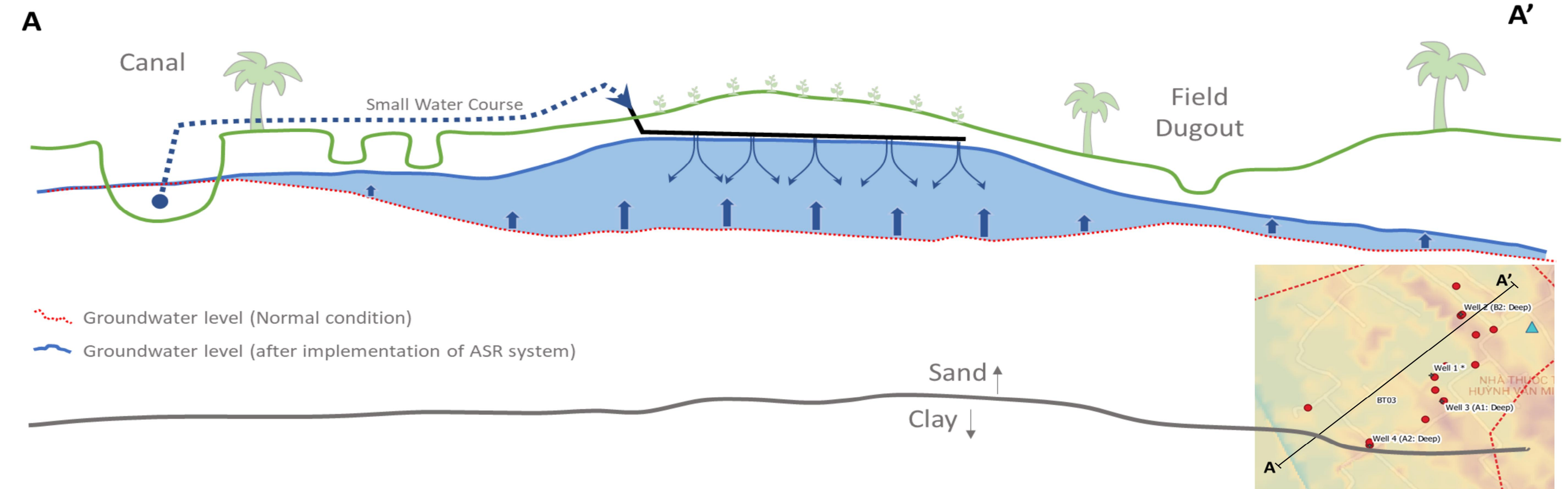


Figure: Conceptual design of an ASR pilot at BT03 that will be adapted for the pilot in TV02.

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