Institute of Engineering Geodesy
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Module ENGINEERING GEODESY

(M.Sc.)

- Monitoring -

Winter Semester 2018/2019

Lab 4 *(Individual Laboratory)*
Measurement Concept for Dam Monitoring

Date of first submission:	*Date of renewed submission:*

Date of exercise	14.01.2019
Submission	28.01.2019

Family name	First name	Matriculation number	Signature

Testat	1. control	Renewed submission until:	2. control

1 Introduction

For new construction of a dam a measuring concept for monitoring tasks should be established. In this process it should be investigated whether the kinematic model, used by the planners, corresponds to reality. For that reason observations over several years are necessary. For the modelling of the kinematic behaviour of the dam, initiated by diverse influences, it is important to monitor the dam crest at several positions. Furthermore, for permanent monitoring appropriate sensors must be chosen to trigger the alarm in critical situations. The following sketch gives an overview of the situation.

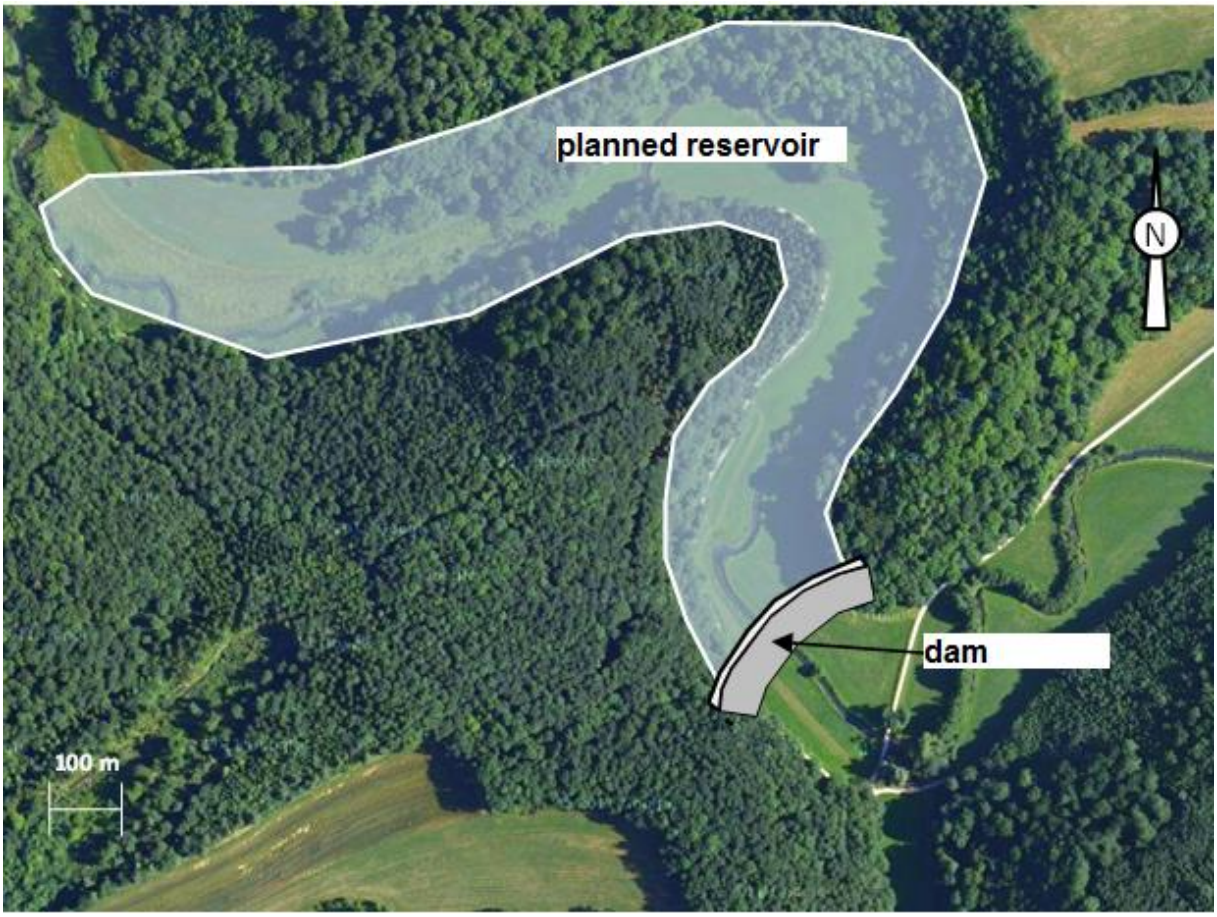

Figure 1: Overview Map of the Planned Dam and Reservoir (source: Google)

2 Task

For preparing a measurement concept and the choice of sensors, the following points should be respected:

1. **Movement of dam crest (δx=0.01 m):**
   The annual period of dam crest should be monitored. Please draw the required object- and reference points into the map sketch in the annex (Figure 2).

2. **Permanent monitoring of vertical movements of the dam (δx=0.001 m):**
   This monitoring should be performed continuously and automatically to detect non periodic vertical movements of the dam. Please draw the positions of the chosen sensors in the section sketch of the dam (Figure 3). If it's necessary, construction changes must be made to enable the installation of the sensors.

3. **Permanent monitoring of horizontal movements of the dam (δx=0.001 m):**
   This monitoring should be performed continuously and automatically to detect non periodic horizontal movements of the dam as well (tilt related to the abutments W1 and W2). Please consider where you can install the corresponding sensors.

The expected periodic movements are listed in the following table. The reference point of the deflection is the top point in the middle of the dam crest. The maximum deflection occurs in south east direction.

Cause of movement	**Deflection at dam crest**	**Period**
Water level/ Temperature	0.030 m	365 days
Temperature	0.005 m	1 day

Furthermore critical states of the construction due to rapid vertical and horizontal movements shall be monitored:

Movement	**Deflection of the dam**
Deflection at center of dam crest	0.020 m (per second)
Tilt (height difference between abutment W1 and W2)	0.020 m (per second)

3 Elaboration

The elaboration shall be in written form. Edit the task following the checklist (a - r), introduced in the lecture. Specify all required formulas, calculations and results for each point of the checklist. The results should be comprehensible. Specify your chosen sensors for monitoring the given task. Name the monitoring tasks that can be performed by relative respectively absolute measurement concepts. For answering subtasks 2.1 and 2.2 use the sketches in the annex.

4 Annex

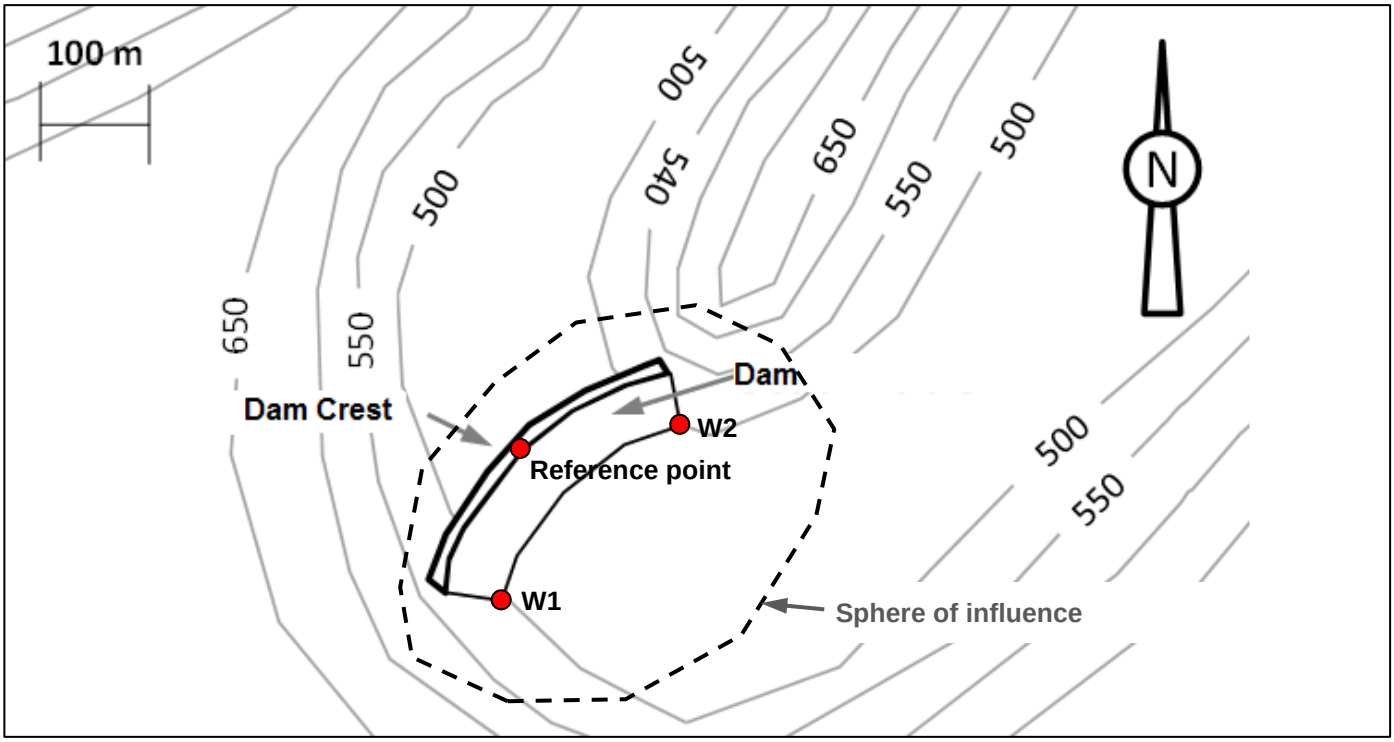

Figure 2: Map sketch of the dam

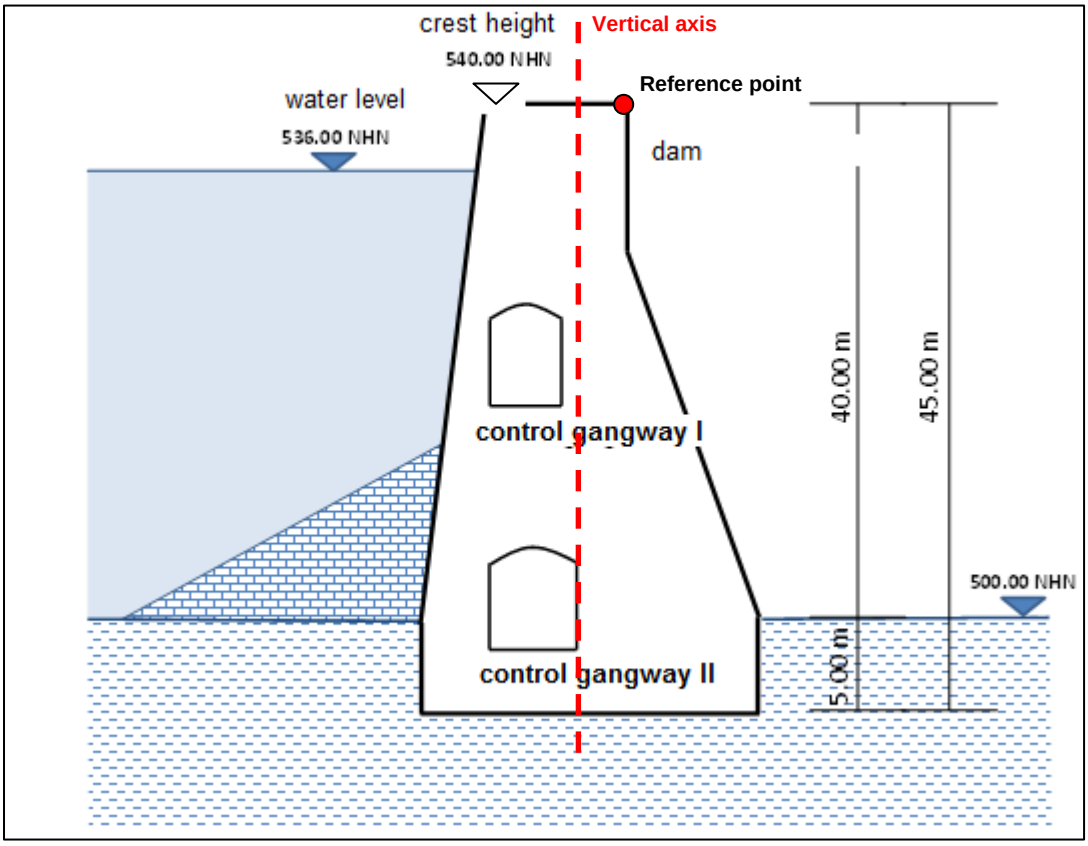

Figure 3: Cross section of the dam