

## TERMS OF REFERENCE

### for Task on Water Management Optimization Problems

SWARM Student Names: ..... Jovana Andrijevic .....

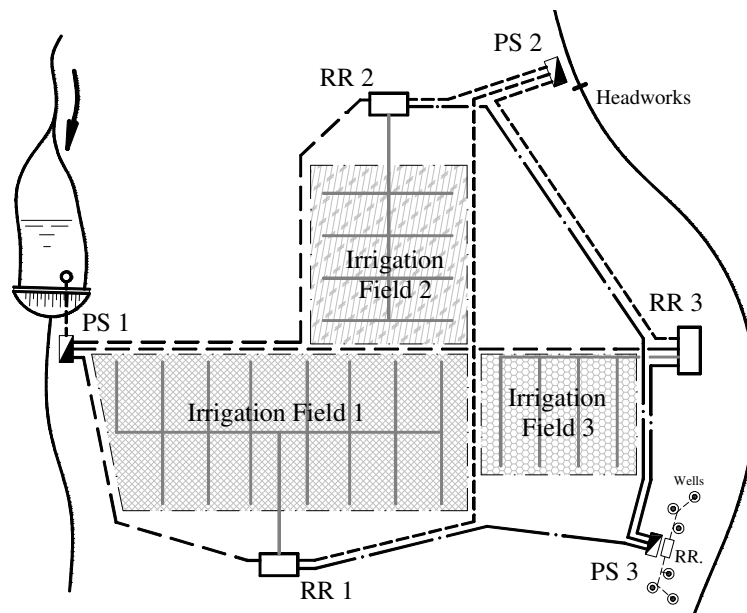
**Topic:** Transportation Problem – Application in Water Resources Management.

#### 1. Initial data

The water management system (WMS) shown on Fig. 1 consists of 3 water sources – a pumping station (PS 1) abstracting water from a reservoir, a pumping station (PS 2) abstracting surface water and a pumping station (PS 3) abstracting groundwater. These water sources are named  $A_1$ ,  $A_2$  и  $A_3$ .

The water users are 3 Irrigation Fields (IFs), together with their Regulating Reservoirs (RRs), which are located at a command elevation above the IFs. Generally, the water users are named  $B_1$ ,  $B_2$  и  $B_3$ .

The water from each water source  $A_i$  can be delivered to each water user – an Irrigation Field (IF). The water from sources  $A_i$  is supplied to RRs, thus to water users  $B_1$ ,  $B_2$  и  $B_3$ .



**Fig. 1. Simplified scheme of the Water Management System**

The daily supply capacities of water sources  $A_i$  and the demands for the water users  $B_j$  are shown in Annex 1.

#### Annex 1.

Water Source	Supply Capacity $10^3.m^3$	Water User	Demand, $10^3.m^3$
$A_1$ (PS 1)	90	$B_1$ (RR 1)	90
$A_2$ (PS 2)	70	$B_2$ (RR 2)	80
$A_3$ (PS 3)	50	$B_3$ (RR 3)	70

**FACULTY OF HYDRAULIC ENGINEERING**

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**SWARM Student Names:** ..... Selma Šoljić.....

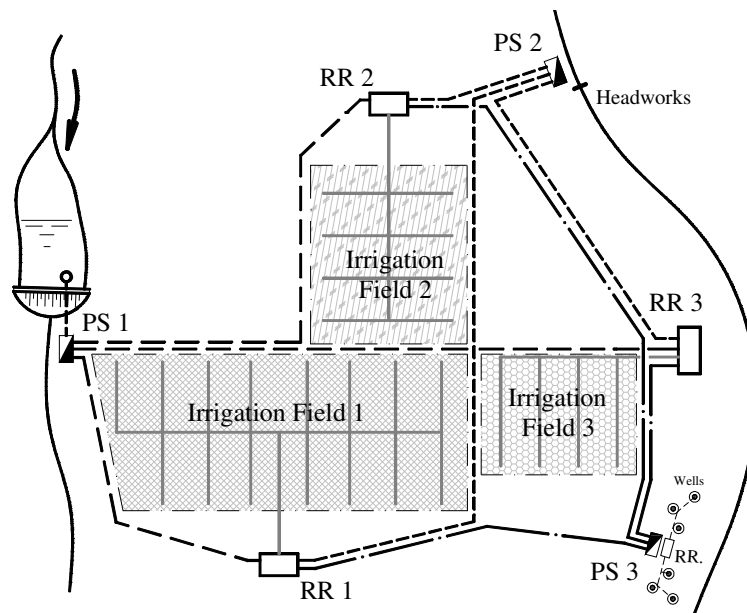
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$A_1$ (PS 1)	90	$B_1$ (RR 1)	75
$A_2$ (PS 2)	60	$B_2$ (RR 2)	80
$A_3$ (PS 3)	30	$B_3$ (RR 3)	55

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SWARM Student Names: ..... Aleksandar Komatina.....

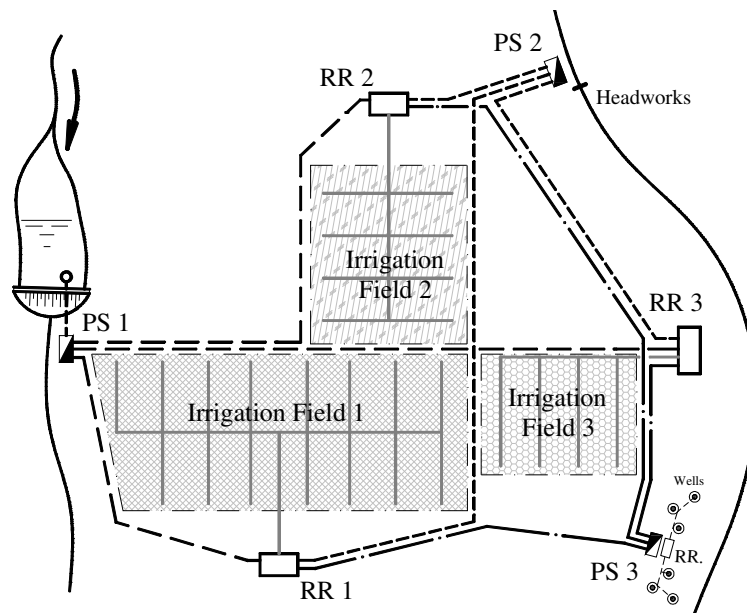
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$A_3$ (PS 3)	50	$B_3$ (RR 3)	65

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SWARM Student Names: ..... Dražana Miranović .....

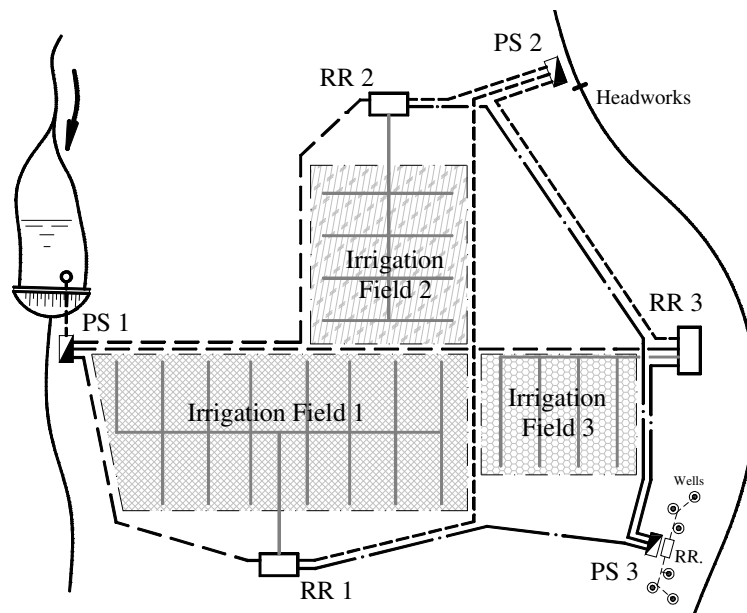
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$A_2$ (PS 2)	60	$B_2$ (RR 2)	60
$A_3$ (PS 3)	25	$B_3$ (RR 3)	75

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SWARM Student Names: ..... Nikola Jaksic .....

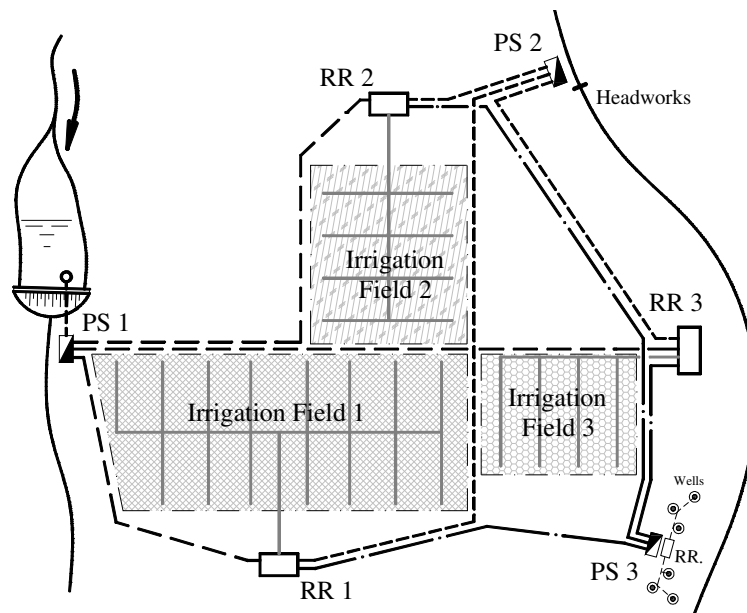
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$A_3$ (PS 3)	10	$B_3$ (RR 3)	35



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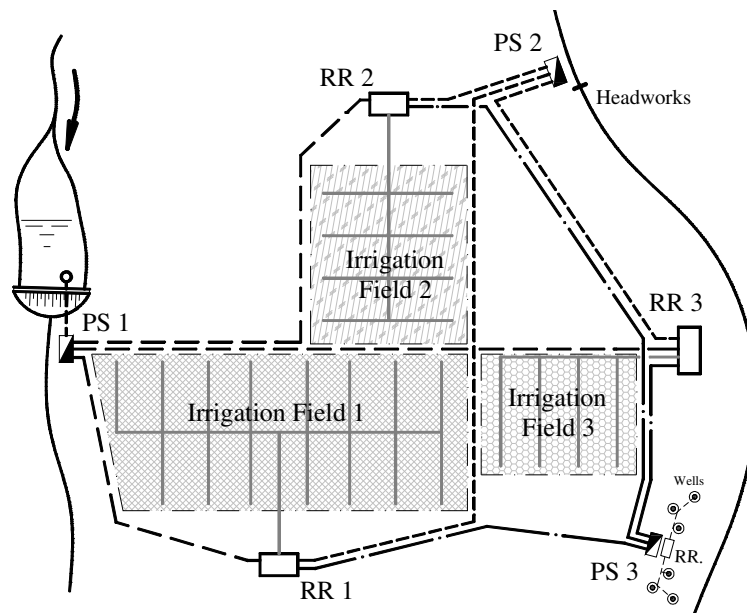
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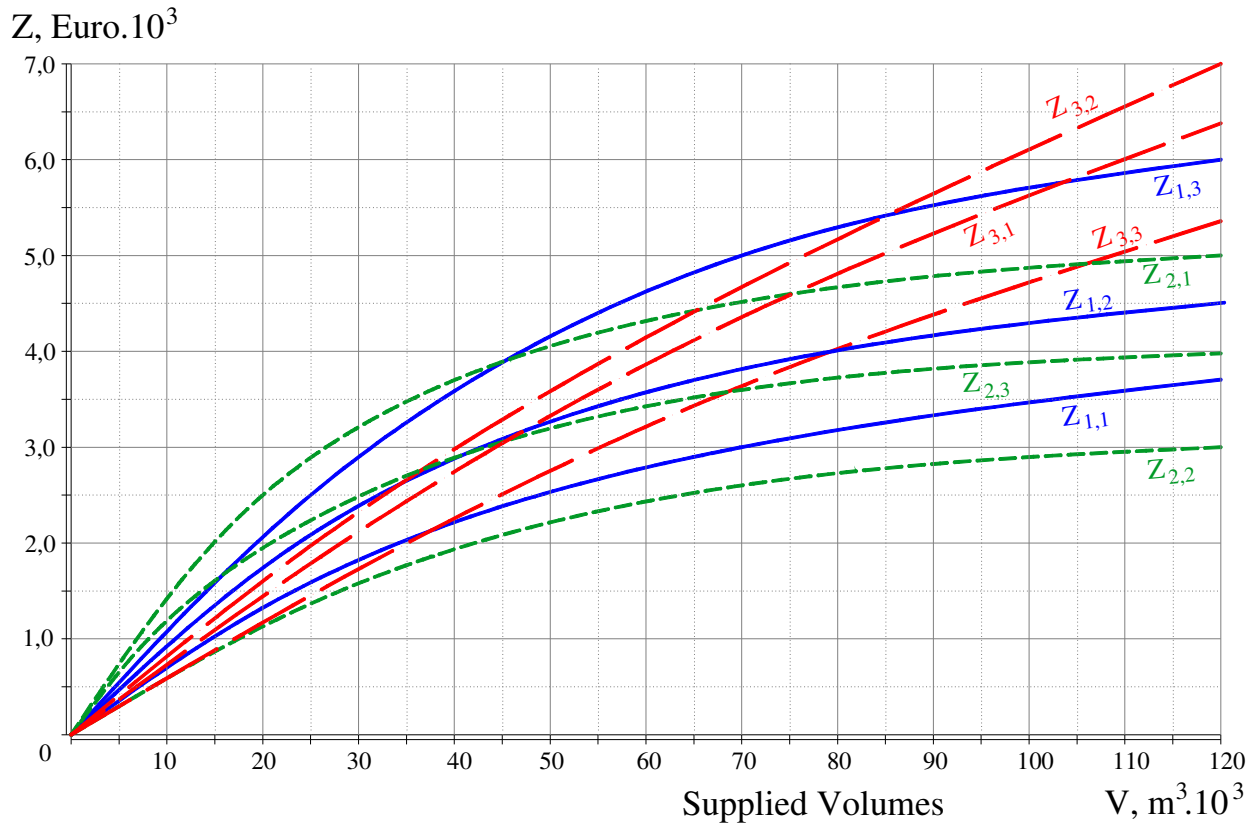
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$A_2$ (PS 2)	90	$B_2$ (RR 2)	55
$A_3$ (PS 3)	20	$B_3$ (RR 3)	100

The costs  $Z_{ij}$  for supplying water from water source  $A_i$  to water user  $B_j$  are variable, according to the supplied volumes  $V_{ij}$ . Cost functions  $Z_{ij} - V_{ij}$  are presented in Annex 2.

## Annex 2.



## 2. Task

The volumes  $V_{ij}$  supplied from water source  $A_i$  to water user  $B_j$  to be determined in order to have minimum transportation costs for water supply within the entire water management system.

If the total demand of water users is greater than the total capacity of the water sources the deficit should be allocated according to requirement for minimum transportation costs for water supply within the entire water management system.

## 3. Deliverables

- 3.1. An explanatory note containing necessary estimations and sketches to be prepared and sent as pdf file to [pifilkov@yahoo.com](mailto:pifilkov@yahoo.com) (deadline 9 December 2021).
- 3.2. Short presentation (up to 6 slides) has to be prepared and presented on 10 December 2021.

Sofia City,  
 30 November 2021