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COMBINED DRAINAGE WITH PRESSURE RELIEF WELLS IN THE FERGANA VALLEY

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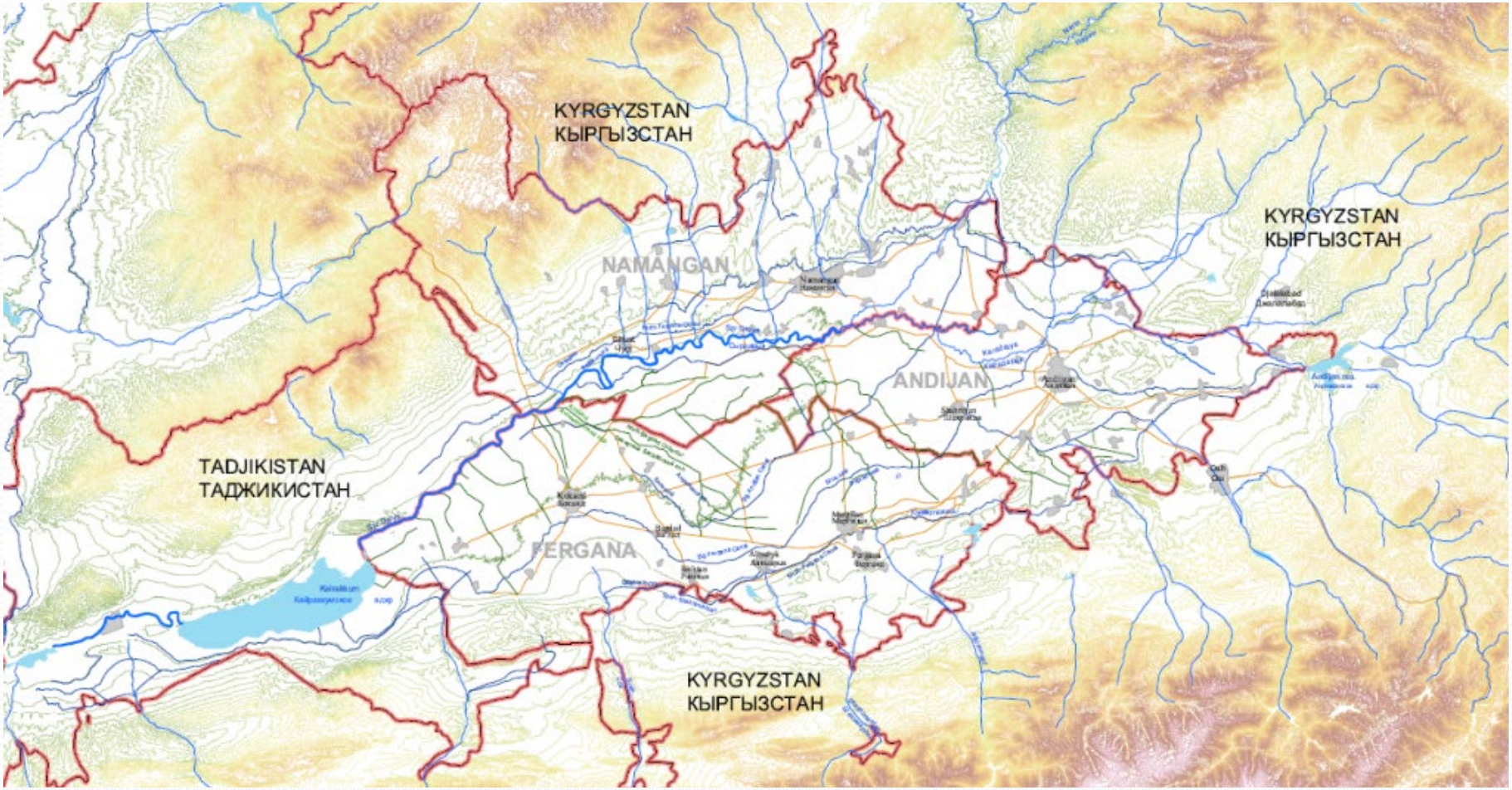
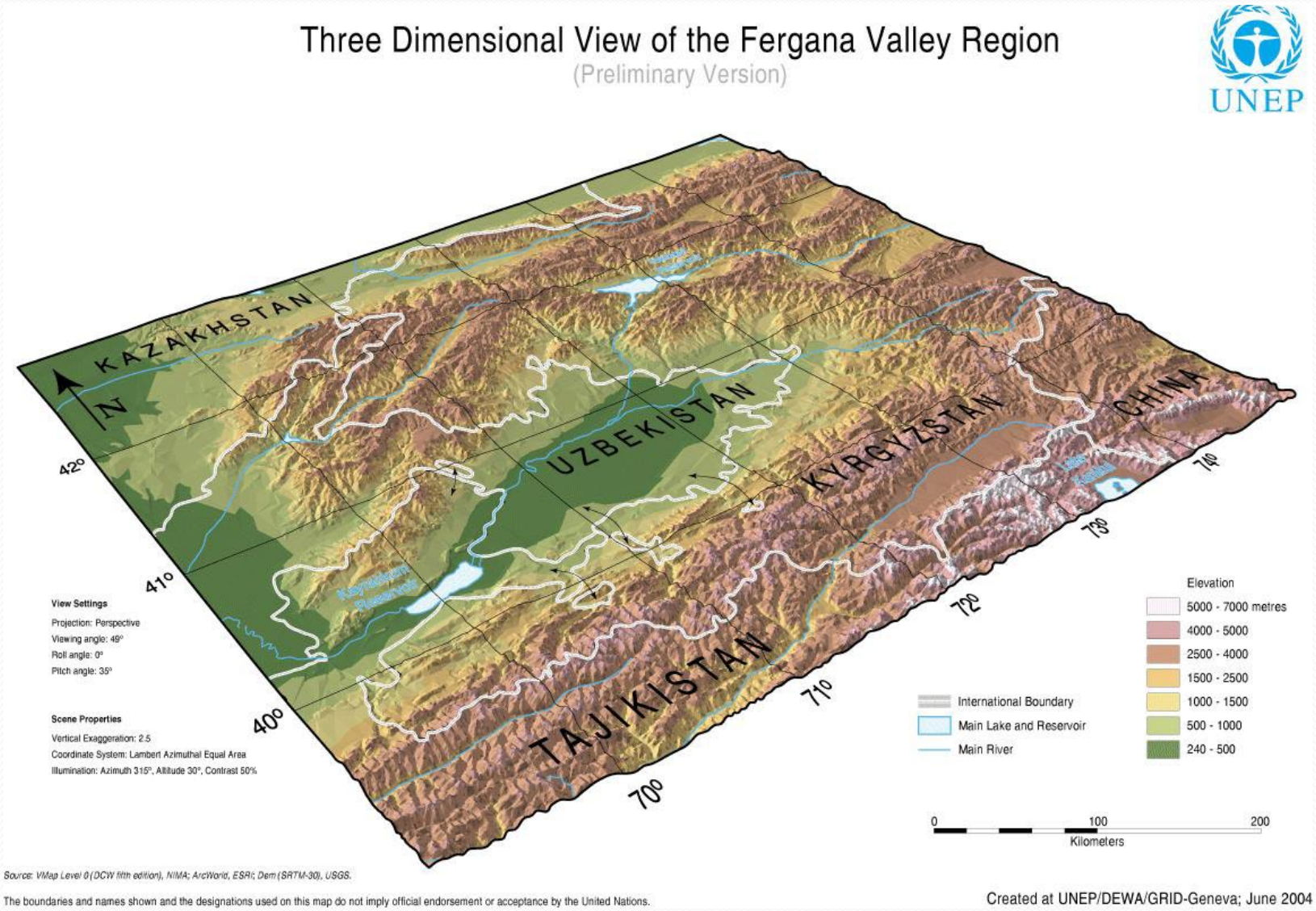
İntroduction

Irrigated agriculture is the backbone of the Uzbek economy, accounting for 35% of GDP, 60% of foreign exchange receipts, and 45% of employment. However, about 75% of irrigated land has poor natural drainage; therefore, irrigation there involves rising of the water table, increase of salinity, and soil salinization. In parallel to the measures to be financed by the national budget, Government of Uzbekistan started implementing donor funded projects for solution of the above mentioned problems. The Fergana Valley Water Resources Management Project Phase-I (FWRMP), which is World Bank funded, has been devised to address constraints on agricultural productivity in parts of the Uzbekistan territory lying within the Fergana Valley (FV)

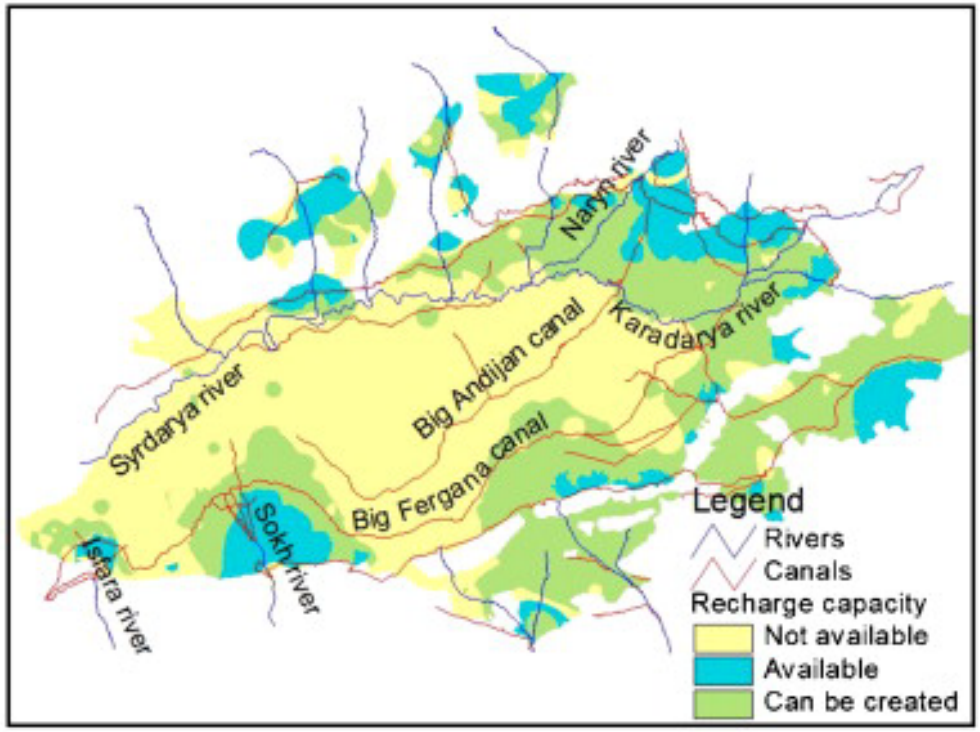


Fergana Valley Water Resources Management Project Area



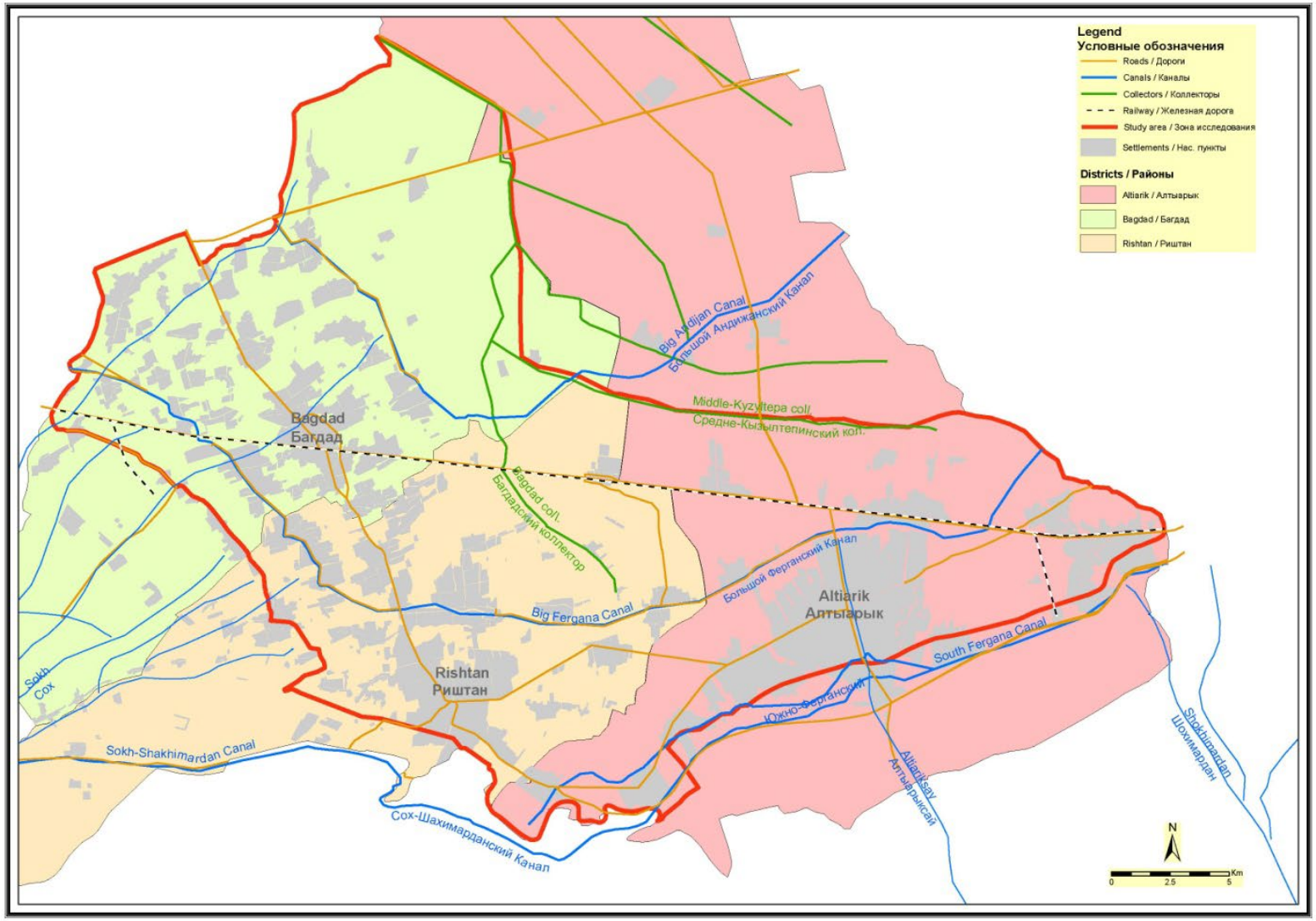
Topographic map of FV and surrounded area

Water Resources of the FV

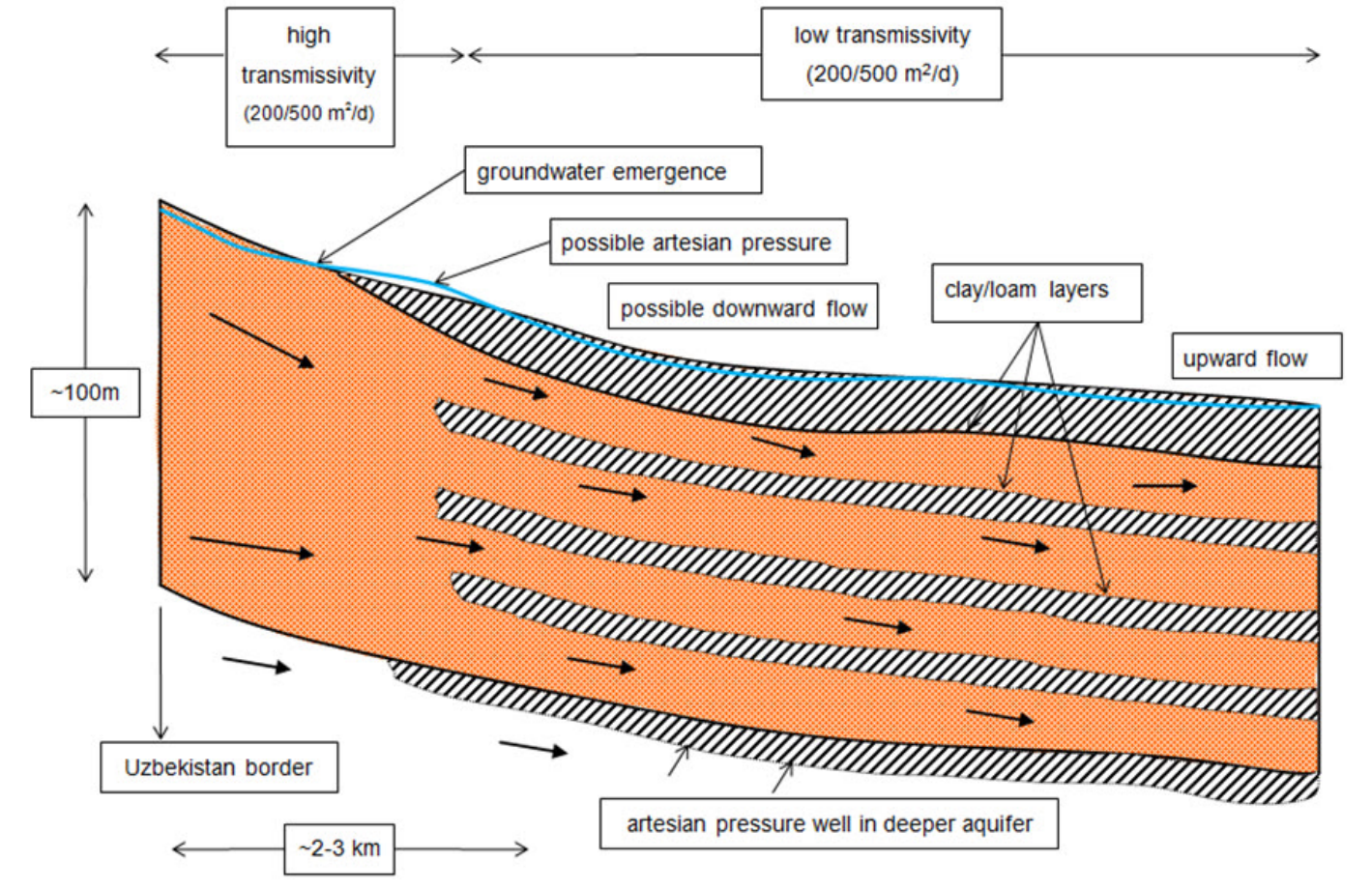


- The main water-sources for the FV are the Naryn River, the Kara Darya, and the Syr Darya, which is formed by the confluence of the Naryn and Kara Darya. Numerous small rivers flow in from the north, east and south, including the Sokh and Isfara. The FV has appreciable groundwater that has developed over geological time. The subterranean waters associated with the rivers noted above, especially the Sokh and Isfara, form a main source of potable water supply for the population in the Valley.

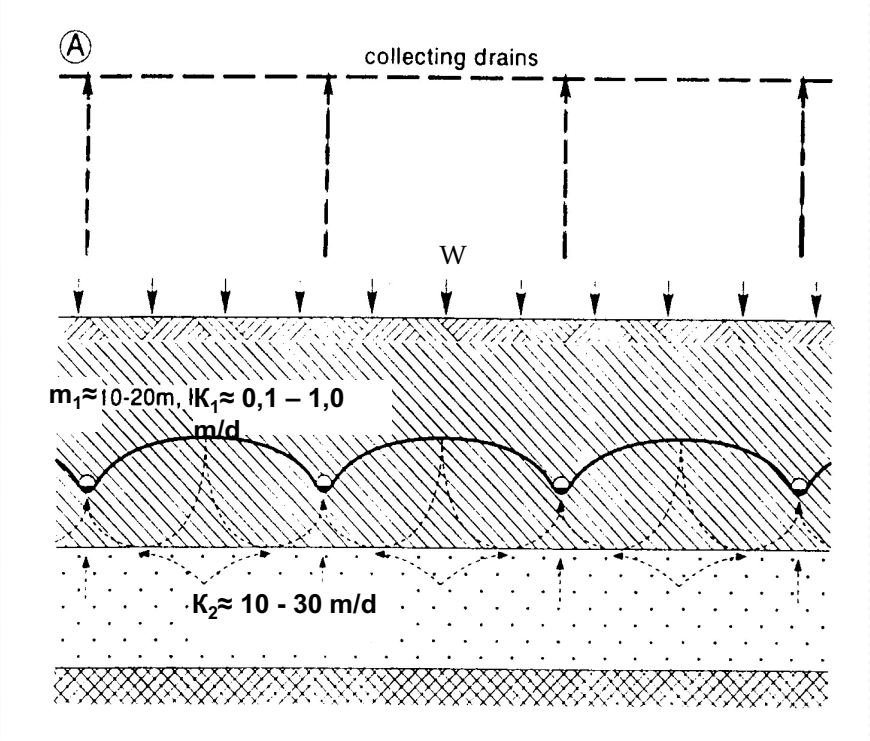
Project Area



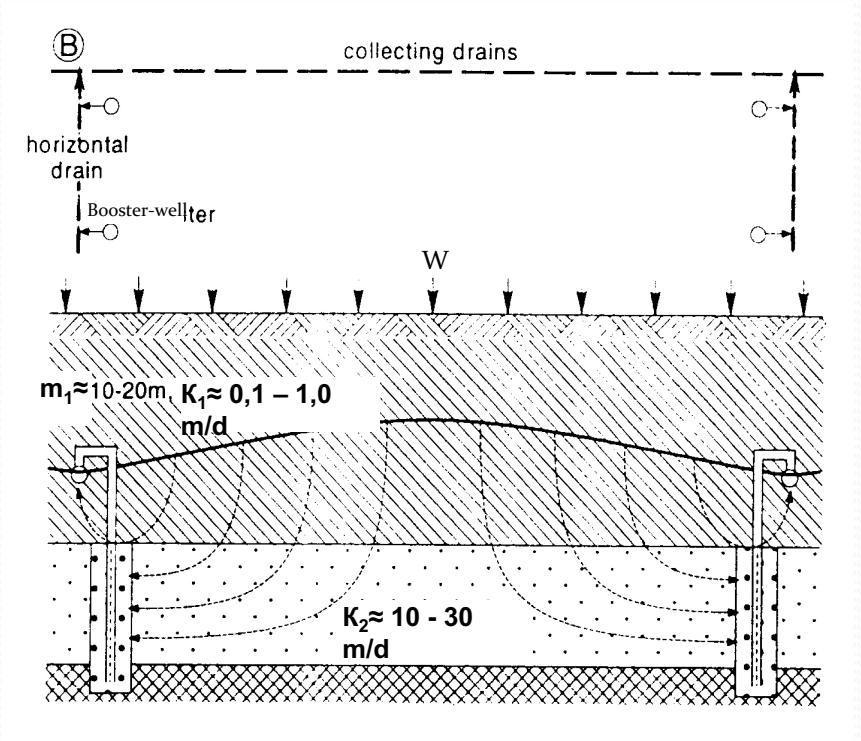
Typical Hydro-geological Cross-section in the Project Area



Typical Plan and Cross-section of Combined Drainage

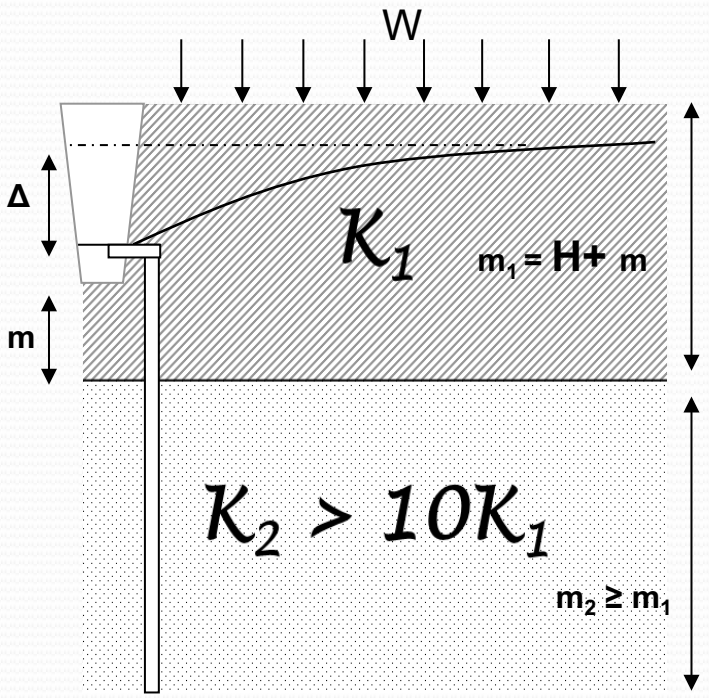


Horizontal Drainage



Combined Drainage

Illustration of permeability



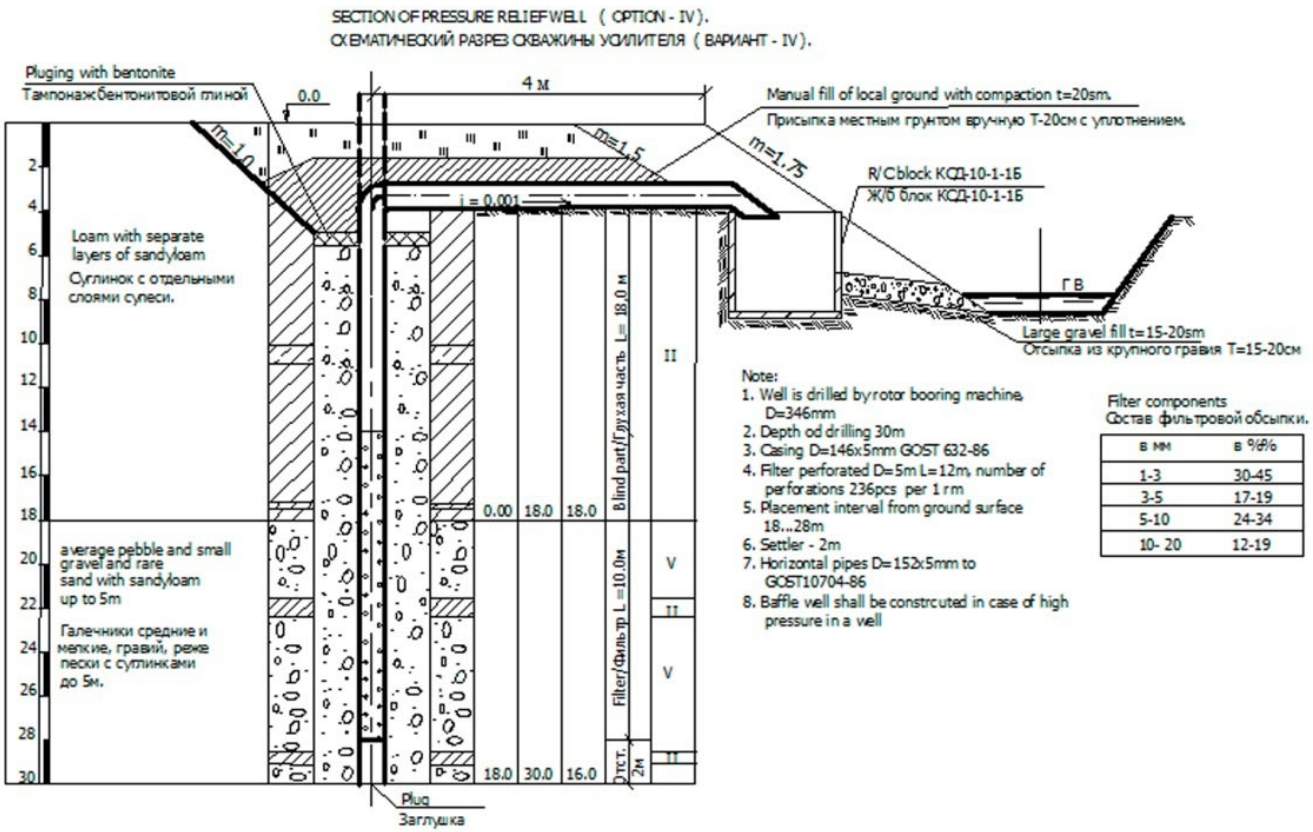
$$L_{HD} = 0.73 \left(k_2 m_2 / k_1 \right) \lg (8 m / \pi d_{HD})$$

$$L_{VB} = 0.366 \sigma \lg (\sigma / \pi d_{VB})$$

$$L_{CD} = (L_{HD} L_{VB}) / (L_{HD} + L_{VB})$$

$$B_{CD} = 4 [(L_{CD}^2 + (k_2 m_2 / 2W) \Delta]^{1/2} - L_{CD}$$

Vertical drainage sector



Note:

1. Well is drilled by rotor booring machine, D=346mm
2. Depth od drilling 30m
3. Casing D=146x5mm GOST 632-86
4. Filter perforated D=5m L=12m, number of perforations 236pcs per 1 rm
5. Placement interval from ground surface 18...28m
6. Settler - 2m
7. Horizontal pipes D=152x5mm to GOST10704-86
8. Baffle well shall be constrcuted in case of high pressure in a well

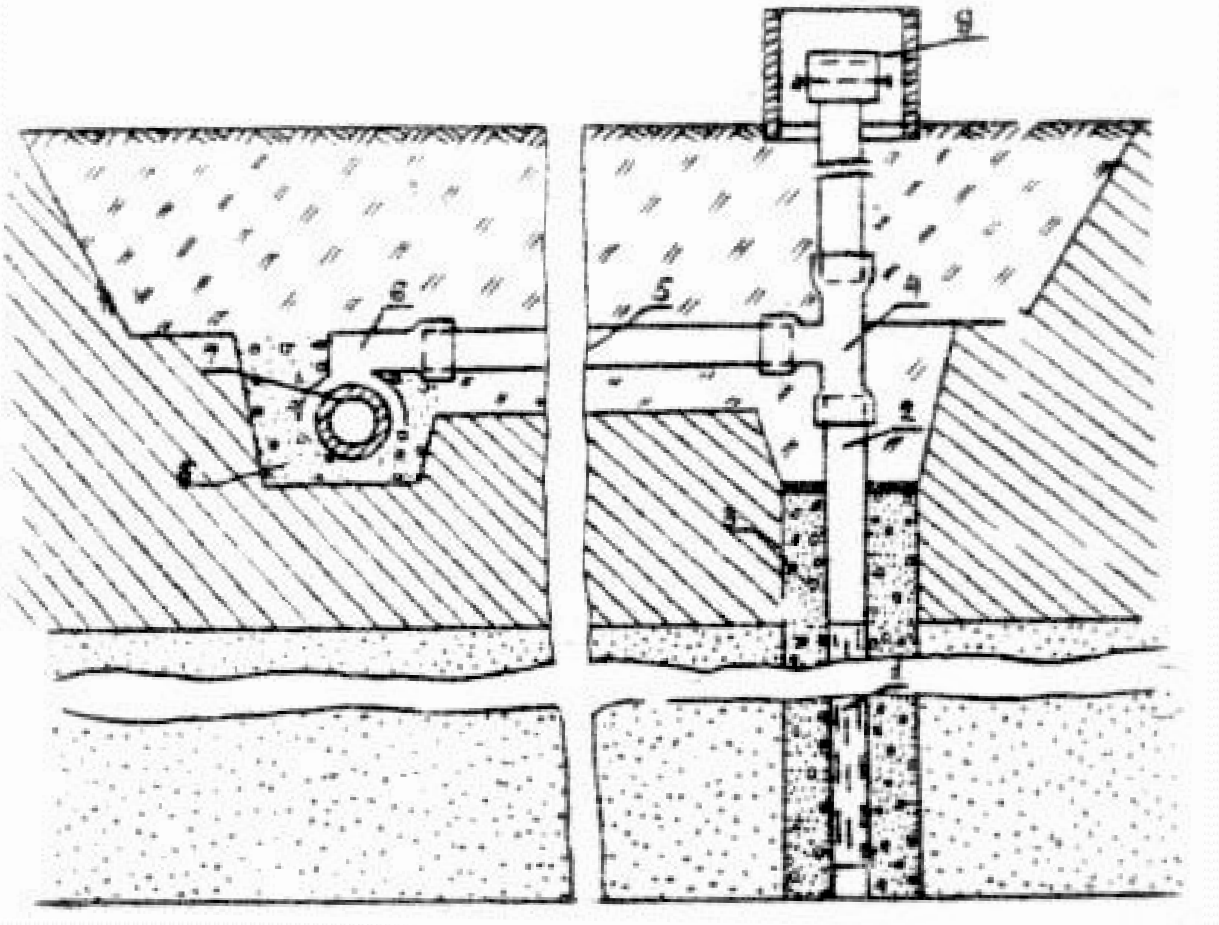
Filter components
Состав фильтровой обсыпки.

в мм	в %%
1-3	30-45
3-5	17-19
5-10	24-34
10- 20	12-19

Outfall of structure of SHD



Section of combined drainage



1-filter column; 2-water lifting column; 3-filter envelope of the well; 4-junction box; 5-drain line; 6-pipe bend with bandage to drain line; 7-drainage pipe; 8-filter envelope of the pipe; 9-well cap

Comprition of drainage systems

Indicator	Unit	Type of Drainage			
		Open	Closed	Vertical	Combined
Land Use Efficiency (LUE)	%	87-90	95-96	98-99	96-97
Diapason of groundwater table regulation	m	1,5-2,0	2,0-2,4	2,0-5,0	2,0-3,5
Velocity of lowering of water table	cm/day	2-5	5-10	15-25	10-20
Duration of reclamation period	Year	15-20	5-8	3-4	4-5
Water saving owing to ensuring the most optimal reclamation regime aimed at speeding up the rate of desalination	%	-	12-25	25-40	25-30

Conclusion

Combined drainage is a system of horizontal drainage enforced by pressure relief wells located along the drain placed in the impermeable cover silts and connected to vertical flowing wells with their water intake portion in a well-permeable underlying layer.

Advantages of the combined drainage

- Low construction costs
- Savings in materials
- Reduced electricity consumption
- Low operational costs
- Simplicity in operation
- Shorter desalination period

The systems proved to be extremely **sustainable** due to simplicity of design and ability to work in autonomy mode through the fluctuations of the ground water levels. Therefore, combined drainage could be a low cost solution to improve land conditions where appropriate and subsequently increase water and land productivity

Thank you for your attention!!!