



*Agricultural University in
Krakow*



*Department of Water
Engineering and
Geotechnics*

Problems found during generating the flood zones on the base of data from 1-D modelling

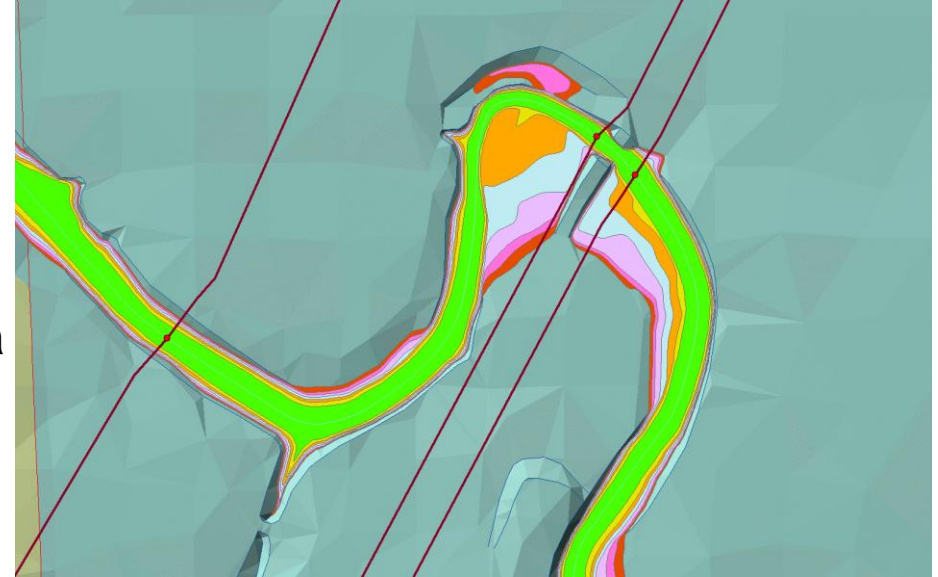
Dr inż. Jacek Florek
Dr inż. Andrzej Strużyński
Mgr inż. Mateusz Strutyński
Mgr inż. Maciej Wyrębek
Dr inż. Leszek Książek



Data

Geometric measurement in the river bed area

- cross-sections separation 500m
- hydrotechnical objects
- bridges
- flood banks



Roughness on the separated parts of the cross-sections

Numerical Model of Terrain (NMT, ang. DTM)

- points (ASCII) -> data NMT (TIN)

Numerical Model of Water Surface

- 1D in modeling: river beds, flood plains, terrain protected by dykes



Numerical Model of Terrain (NMT, ang. DTM)

ASCII files:

system: PUWG 1992

Field data from the time period 2003-2005

Grid resolution of the mesh: 25 m

Accuracy of DTM: +/- 0.6 m



Additional points representing morphological forms of the terrain:

- contour lines (bridges, rivers),
- incontinuity lines (pricipice, embankments),
- excluded surfaces (buildings),
- extremal hights (top, bottom).

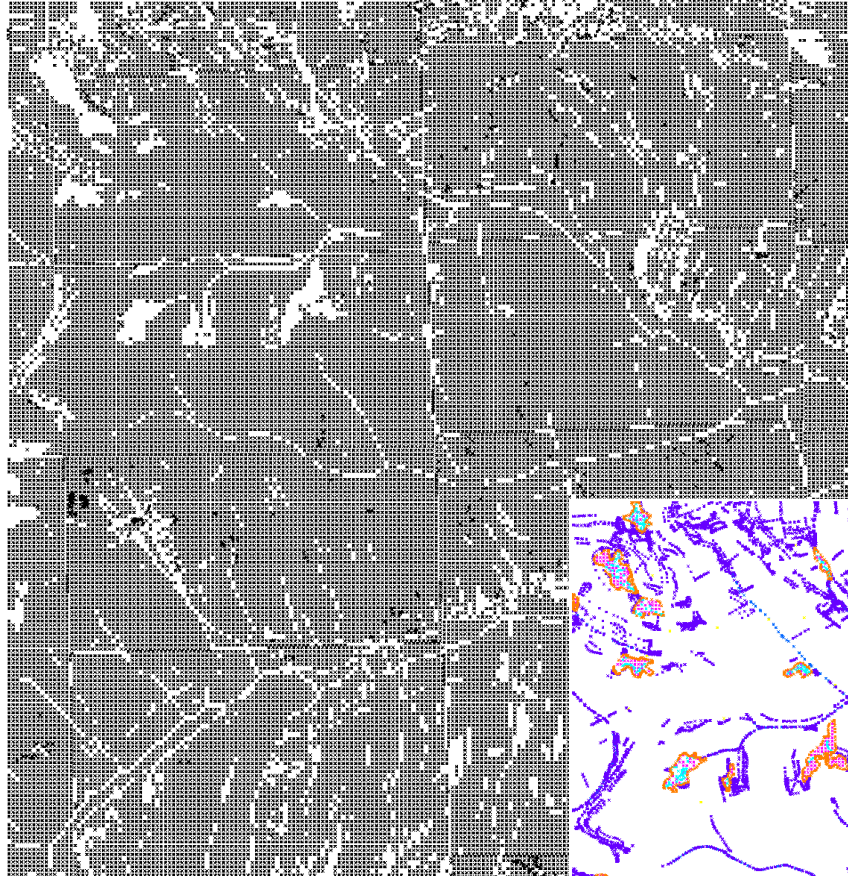


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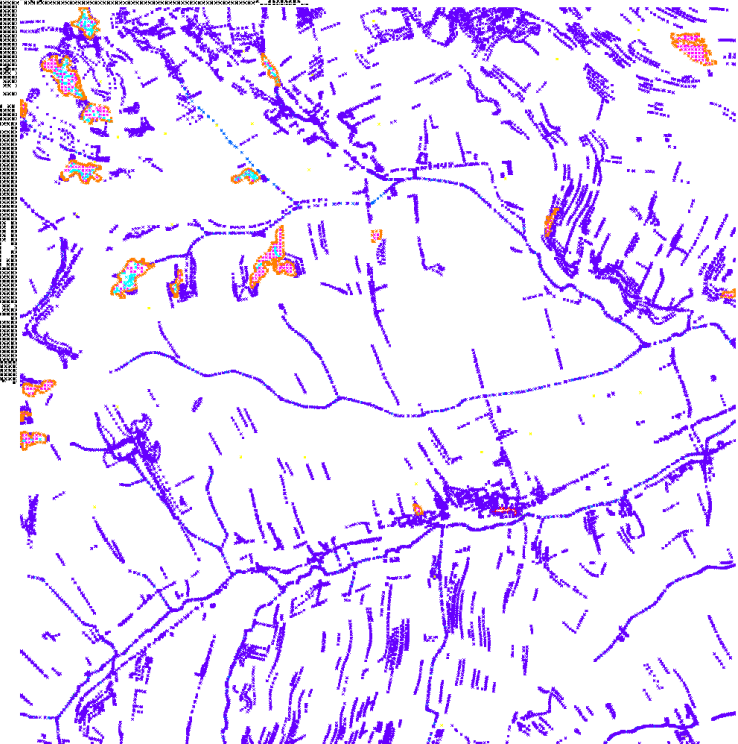


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Numerical Model of Terrain –
source of data
39 562 points



Numerical Model of Terrain –
source of data
28 107 points



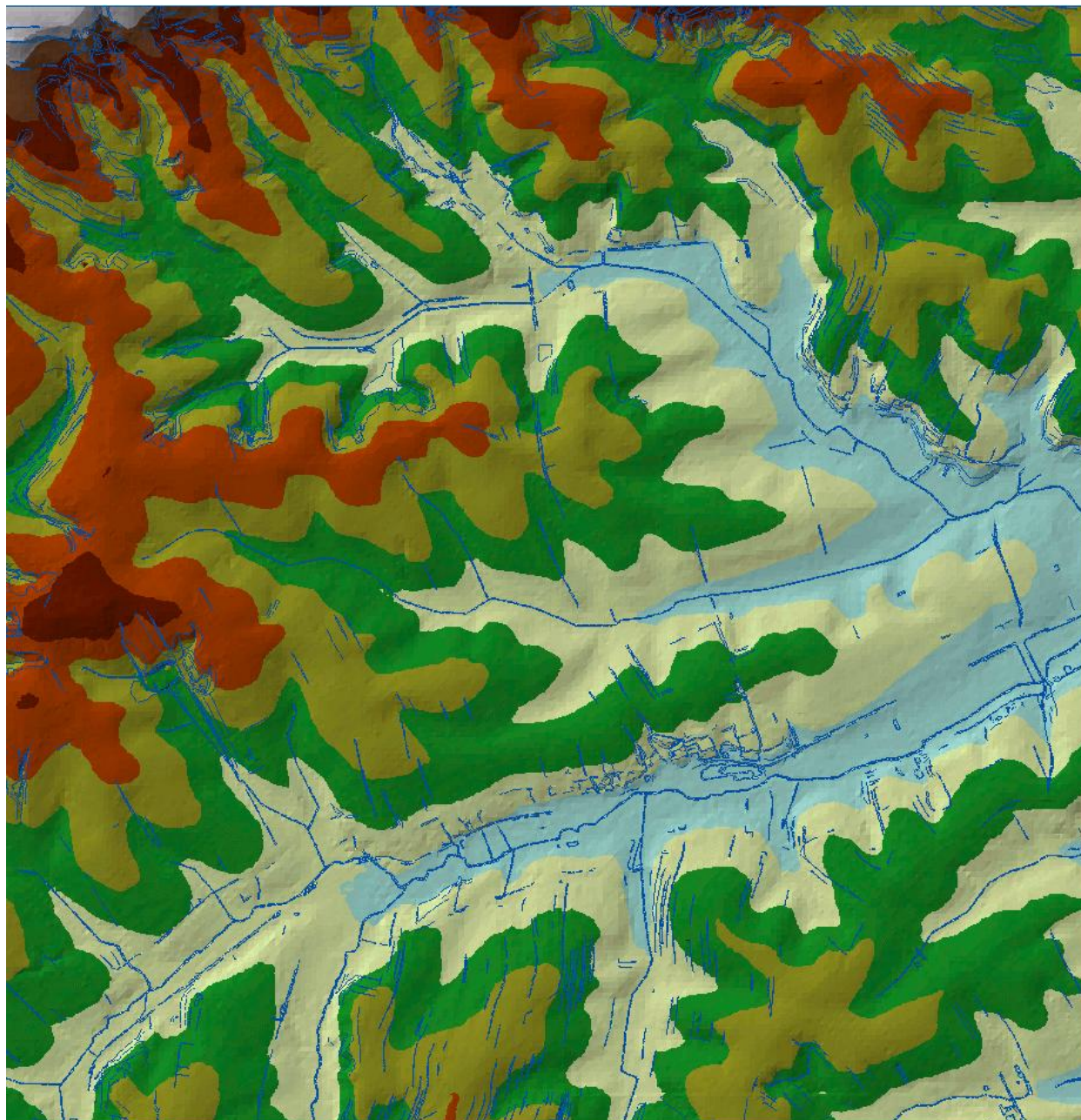


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Numerical Model of Terrain –
the net of triangles



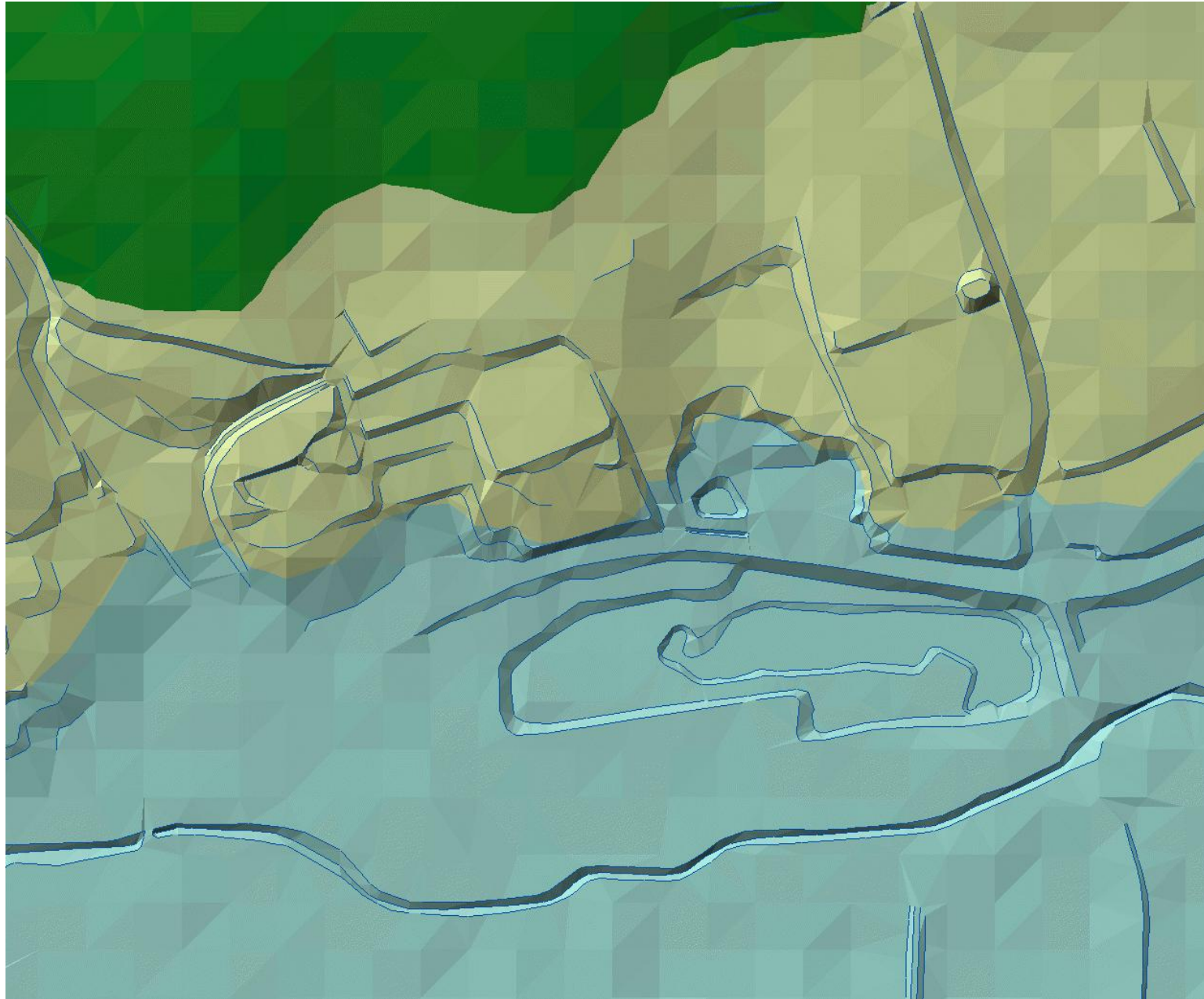


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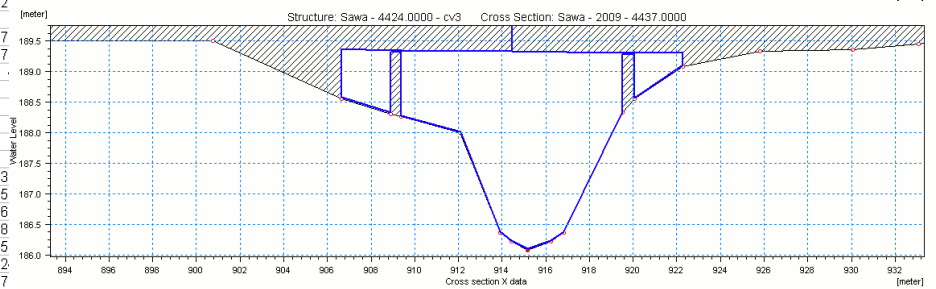
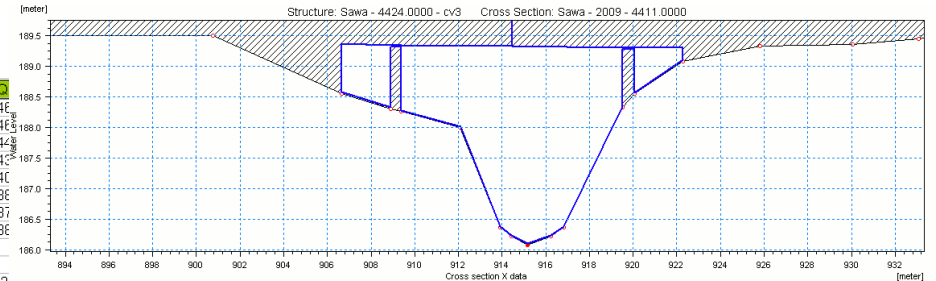
Numerical Model of
Terrain – representing
incontinuous lines





Modelling results 1D

RZĘKA	ODLEGŁOŚĆ	Q05_RZEDNA	Q1_RZEDNA	Q2_RZEDNA	Q5_RZEDNA	Q10_RZEDNA	Q20_RZEDNA	Q50_RZEDNA	ID	HYD	R	Q
MLECZKA_WSCHODNIA	4344	196.06	195.94	195.82	195.65	195.47	195.3	194.45	22688	24E		
MLECZKA_WSCHODNIA	4686	196.19	196.09	195.99	195.85	195.72	195.63	194.89	22688	24E		
MLECZKA_WSCHODNIA	5115	197.11	196.99	196.81	196.51	196.24	196.06	195.5	22688	24E		
MLECZKA_WSCHODNIA	5149	197.4	197.3	197.19	196.93	196.59	196.3	195.61	22688	24E		
MLECZKA_WSCHODNIA	5553	197.54	197.44	197.36	197.24	197.09	196.92	196.12	22688	24E		
MLECZKA_WSCHODNIA	5873	198.69	198.59	198.46	198.15	197.83	197.47	196.6	22688	23E		
MLECZKA_WSCHODNIA	5897	198.98	198.82	198.65	198.29	197.95	197.56	196.67	22688	23E		
MLECZKA_WSCHODNIA	6012	199.36	199.18	198.96	198.57	198.21	197.79	196.73	22688	23E		
W_TZP439-3550	439	193.02	192.81	192.47	192.02	191.6	190.92	190.92				
W_TZP439-3550	485	193.02	192.81	192.47	192.02	191.6	190.92	190.92				
W_TZP439-3550	969	193.03	192.81	192.47	192.02	191.6	190.88	190.29				
W_TZP439-3550	1246	193.03	192.81	192.47	192.02	191.6	190.88	190.35				
W_TZP439-3550	1741	193.03	192.82	192.48	192.03	191.6	191.39	191.17				
W_TZP439-3550	2187	193.04	192.82	192.49	192.05	191.67	191.54	191.27				
W_TZP439-3550	2653	193.04	192.82	192.49	192.06	192.06	192.06	192.06				
W_TZP439-3550	3098	193.04	192.82	192.49	192.35	192.35	192.35	192.35				
W_TZP439-3550	3550	193.29	193.21	193.16	193.06	193.06	193.06	193.06				
W_TZL439-3999	439	193.03	192.82	192.47	192.09	191.85	191.25	191.25				
W_TZL439-3999	485	193.03	192.82	192.47	192.09	191.85	191.25	191.25				
W_TZL439-3999	869	193.03	192.82	192.47	192.09	191.85	190.91	190.07				
W_TZL439-3999	1246	193.04	192.82	192.48	192.1	191.85	190.91	190.88				
W_TZL439-3999	1741	193.04	192.82	192.48	192.1	191.85	190.91	190.32				
W_TZL439-3999	2187	193.05	192.83	192.5	192.13	191.85	191.49	191.22				
W_TZL439-3999	2653	193.21	193.07	192.95	192.77	192.6	192.46	192.13				
W_TZL439-3999	3098	193.4	193.3	193.18	192.97	192.69	192.46	192.16				
W_TZL439-3999	3550	194.4	194.32	194.22	194.06	193.8	193.6	193.6				
W_TZL439-3999	3999	195.03	194.95	194.86	194.7	194.45	194.28	194.28				
W_TZL5115-6012	5115	197.47	197.36	197.24	196.97	196.77	195.75	195.42				
W_TZL5115-6012	5149	197.47	197.36	197.24	196.97	196.77	195.75	195.42				
W_TZL5115-6012	5553	197.48	197.37	197.25	196.98	196.77	196.41	196.31				
W_TZL5115-6012	5873	197.48	197.37	197.25	196.98	196.74	196.64	196.64				
W_TZL5115-6012	5897	197.48	197.37	197.25	196.98	196.73	196.64	196.64				
W_TZL5115-6012	6012	197.48	197.37	197.25	196.98	196.52	196.12	196.12				
W_LC-15115 0.00		197.11	196.99	196.81	196.51	196.24	196.06	195.5				
W_LC-15115 50.00		197.47	197.36	197.24	196.97	196.77	195.75	195.42				
W_LC-15149 0.00		197.4	197.3	197.19	196.93	196.59	196.3	195.61				
W_LC-15149 50.00		197.47	197.36	197.24	196.97	196.77	195.75	195.42				



16.21	12.94	9.67	3.79	1.22	0	0
16.21	13.05	9.7	4.01	2.49	0.4	0
162.11	134.46	98.93	51.47	19.57	3.03	0
1.81	1.6	1.38	0.54	0	0	0
1.58	1.38	1.2	0.48	0	0	0

River name: Sawa Topo ID: 2009 Chainage: 0.00

Section Type: Open Radius Type: Resistance Radius

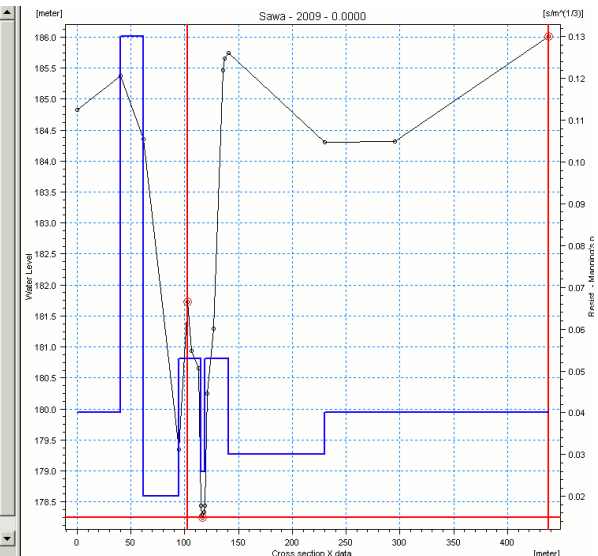
Coordinates: ☐ Apply X Y ☐ Apply Correction of X coord: ☐ Calculate angle Angle: 0

Resistance numbers: Transversal Distribution: Distributed Resistance Type: Manning's n

ID	I	X	Z	Resist.	Mark
1	0.000	184.63	0.040		
2	40.480	185.38	0.040		
3	61.910	184.35	0.130		
4	94.820	179.34	0.020		
5	102.31	181.73	0.053	1	
6	106.62	180.94	0.053		
7	113.16	180.66	0.053		
8	115.35	178.44	0.053		
9	115.59	178.28	0.026		
10	116.72	178.25	0.026	2	
11	118.14	178.34	0.026		
12	118.52	178.44	0.026		
13	120.64	180.25	0.053		
14	126.45	181.29	0.053		

☒ Synchronize processed data ☒ Update processed data automatically

Insert Cross Section... Update Markers

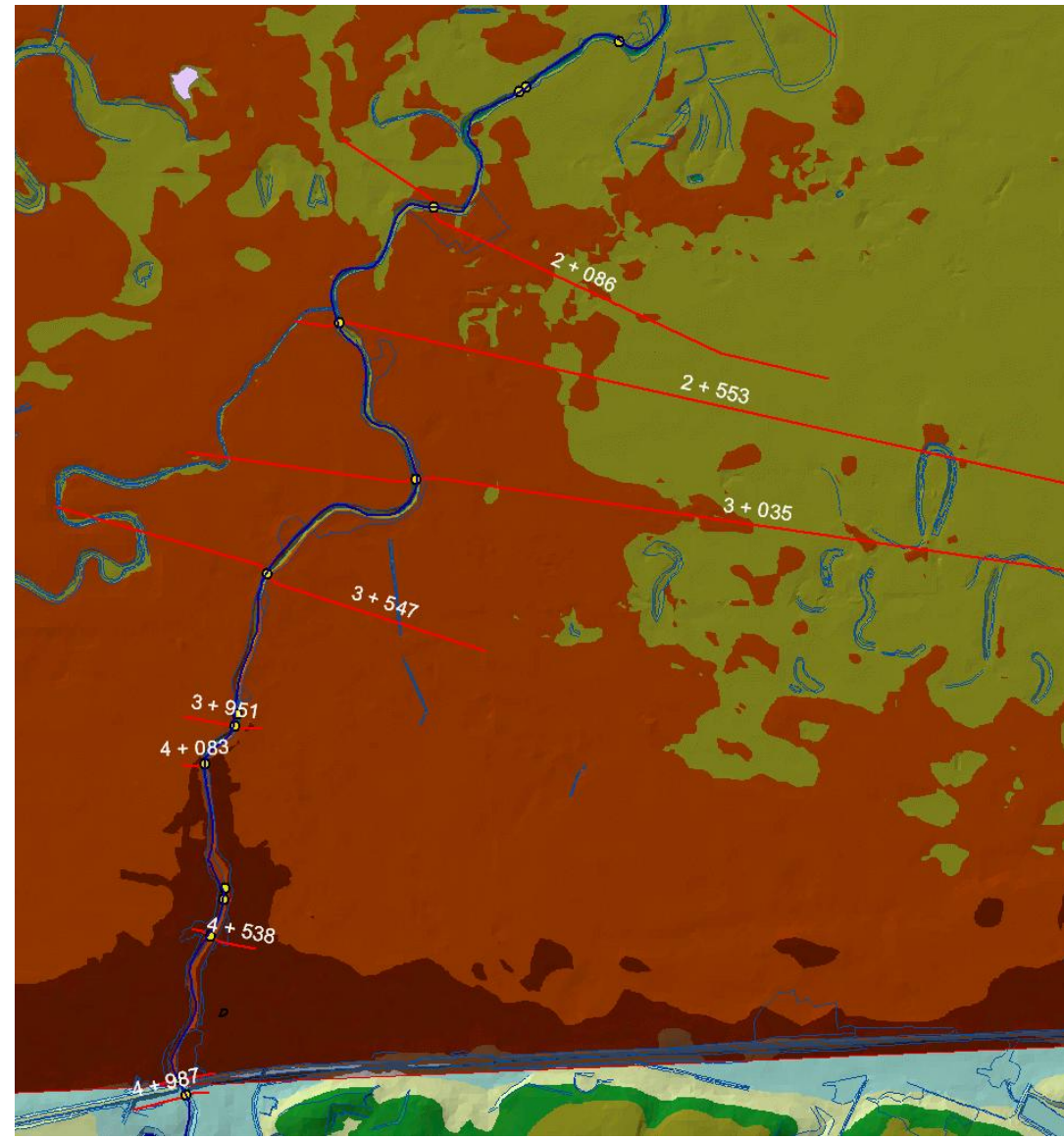
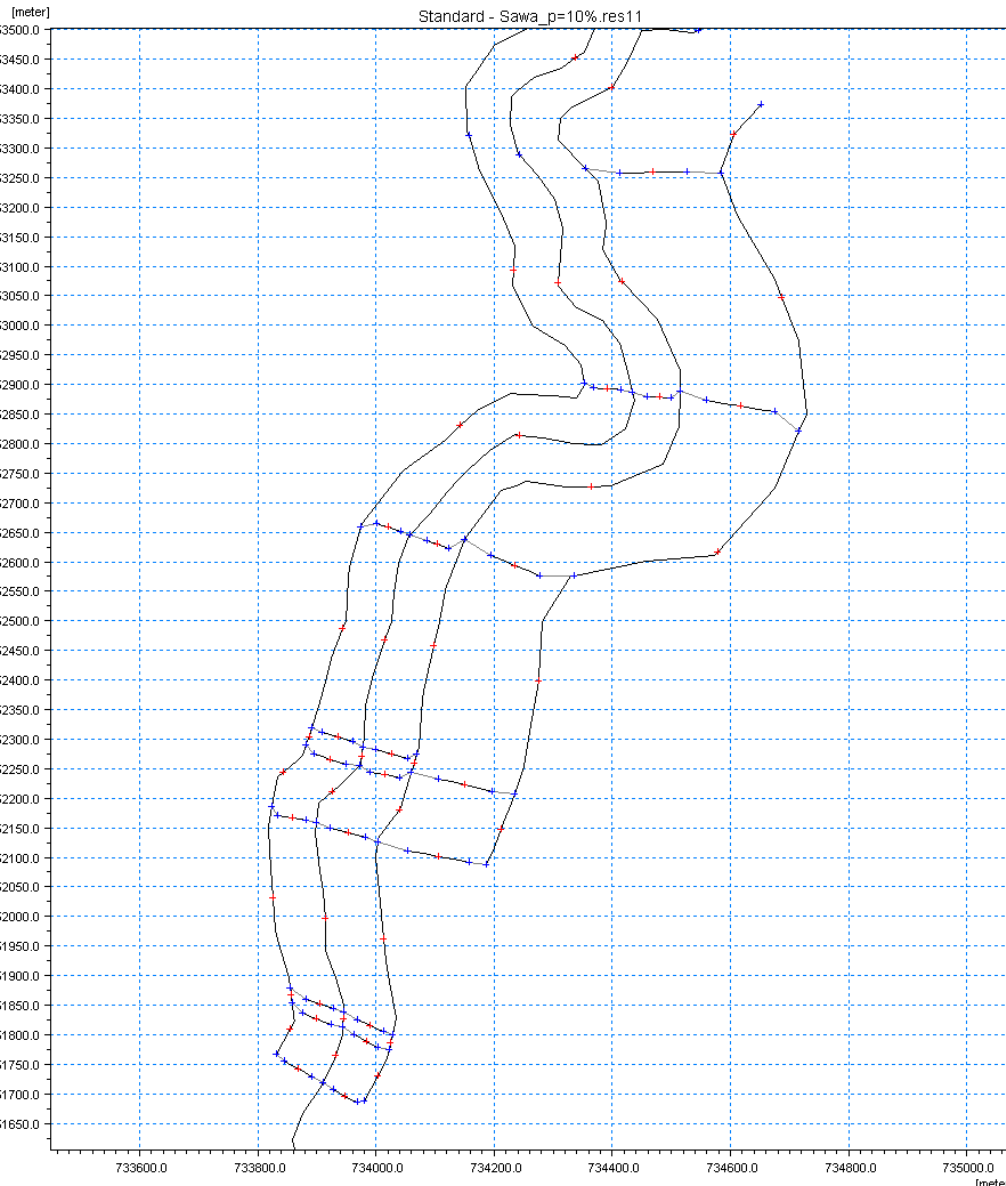


The complete data from modelling was used



Modelling results 1D

The results were used on the layers:
modelling points and cross-sections



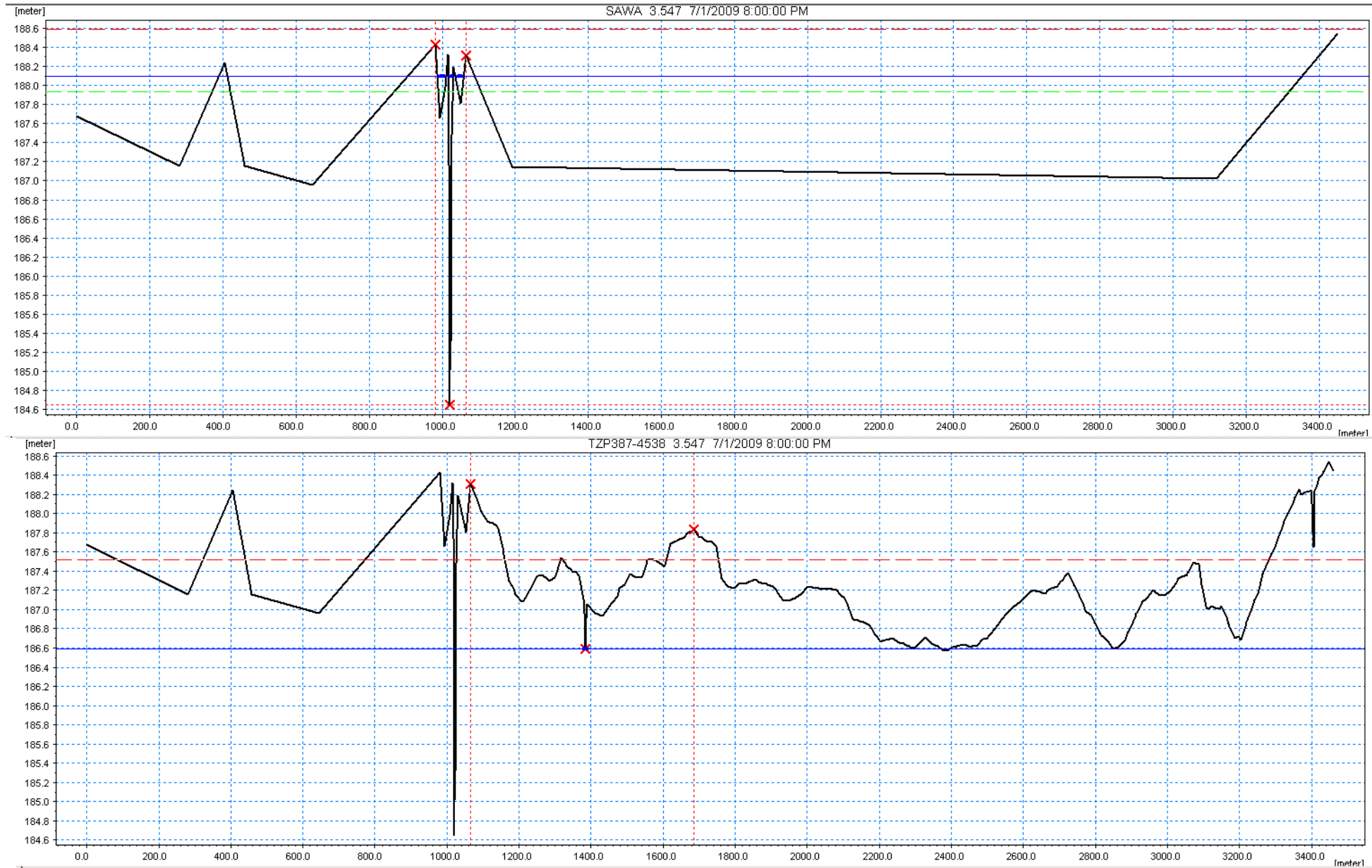


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Modelling results 1D – main channel and the flood plain



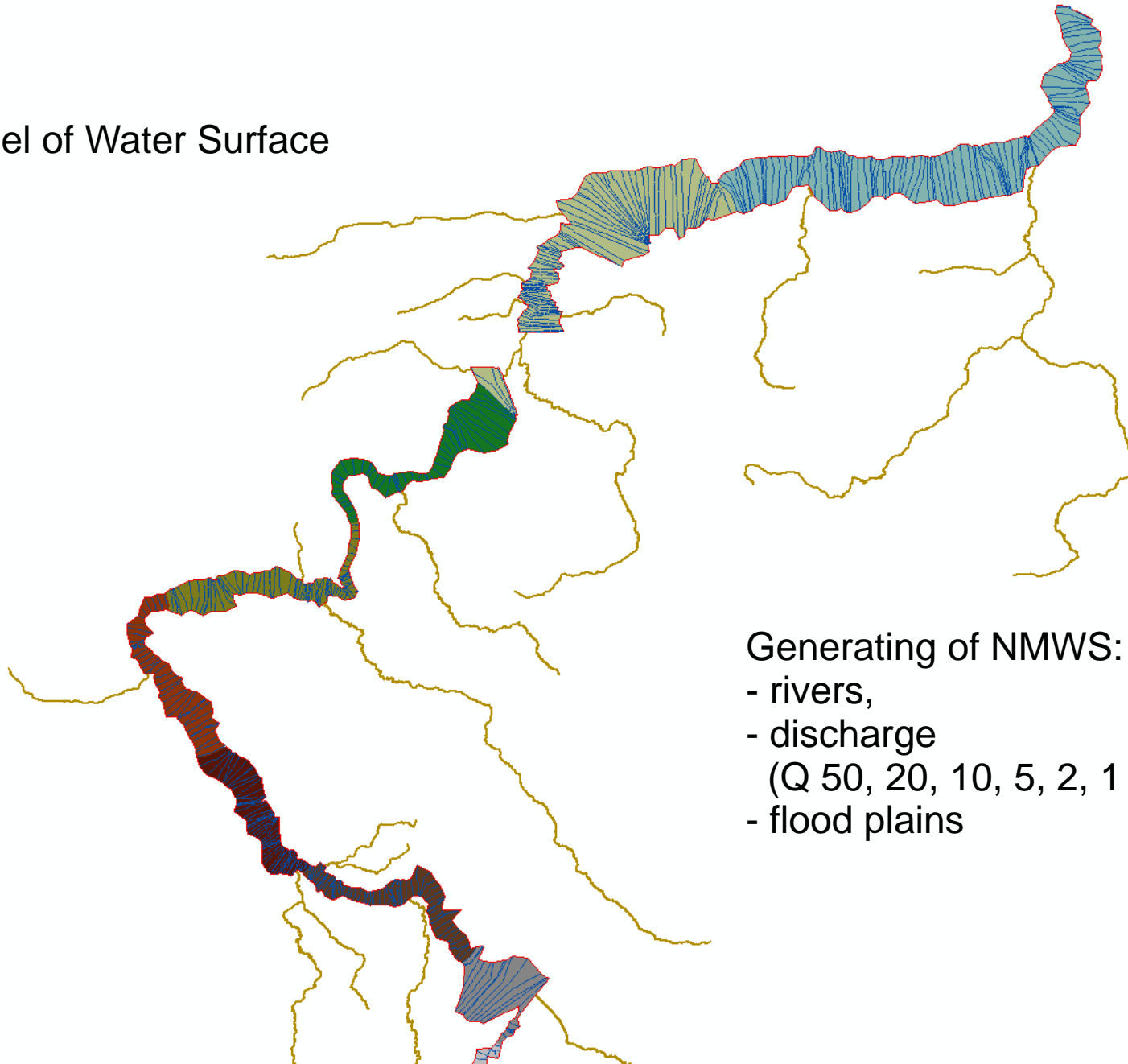


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Numerical Model of Water Surface



Generating of NMWS:

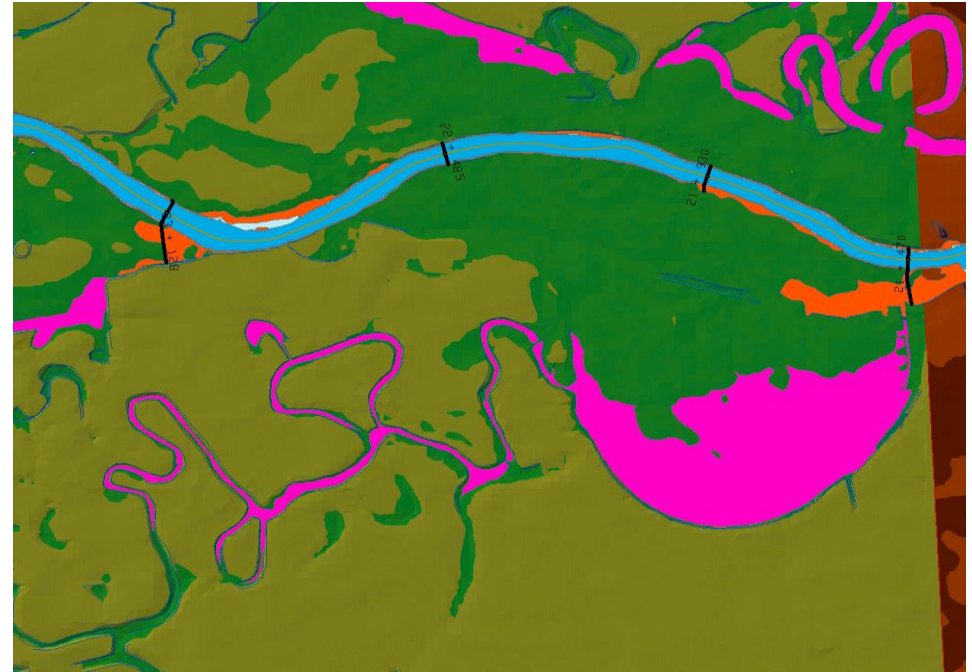
- rivers,
- discharge
(Q 50, 20, 10, 5, 2, 1 i 0,5%)
- flood plains



Results and verification

Layers:

- flood_plain_Q%
- cross-sections
- flood plains without runoff



Verification in places:

- compatibility of flood-plain range with modelling results
- backwater zones
- verification of the range for flood-plains
- linking channels to the water reservoirs



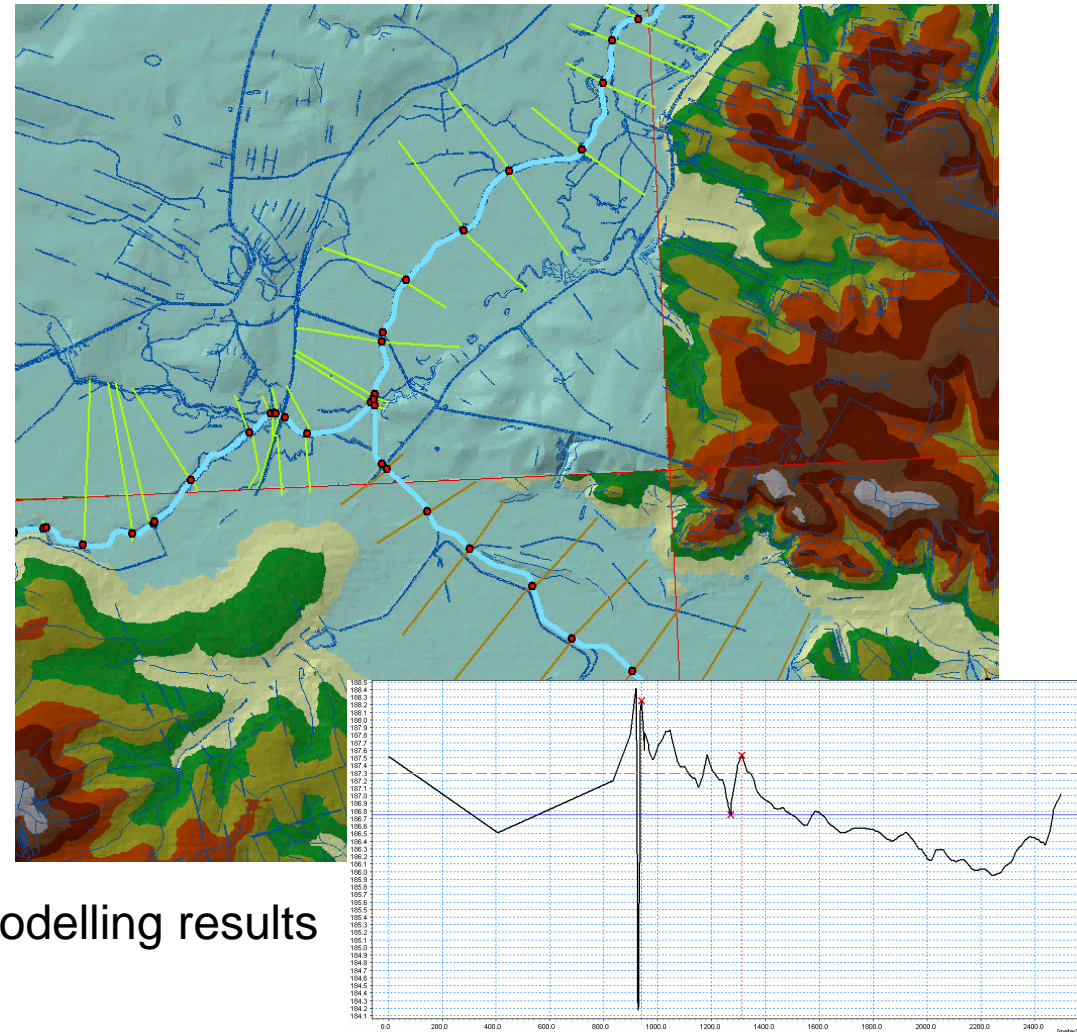
Results and verification

Layers:

- flood_plain_Q%
- flood_plain (for the whole Wisłok)
- cross-sections

Verification in places:

- rivers – tributary (river junctions)
 - river mouths
 - compatibility of flood-plain range with modelling results
-
- verification of the range for flood-plains
 - verification of shape of the cross-sections





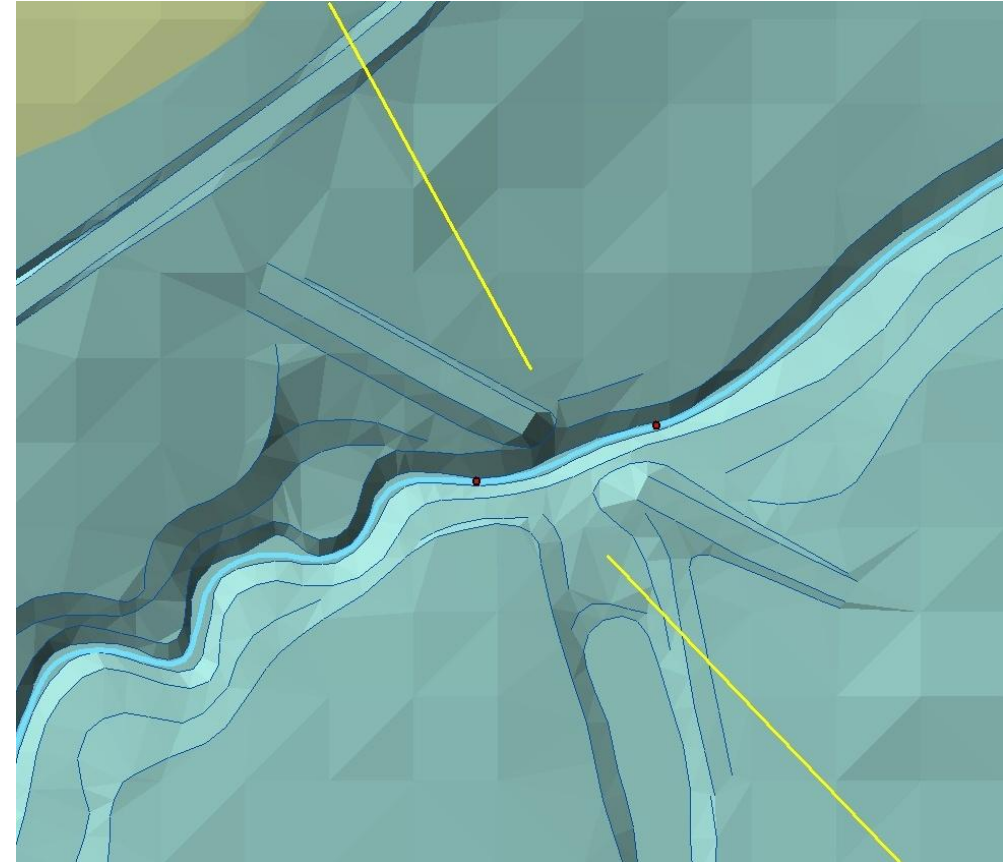
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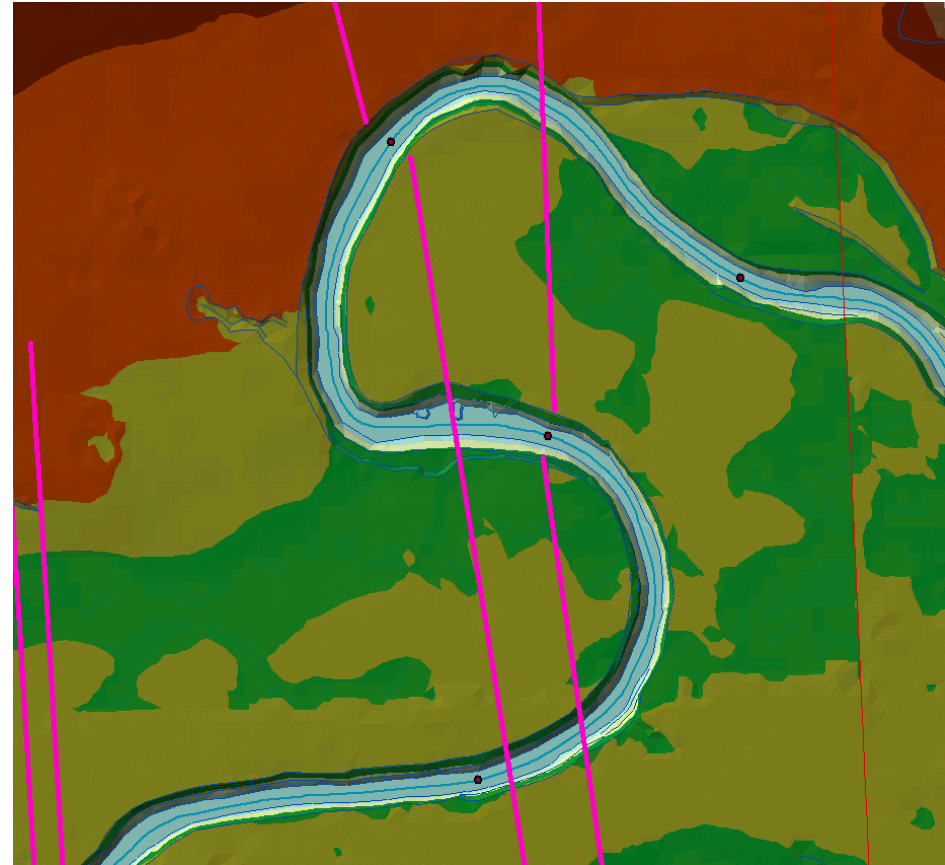
Results and verification

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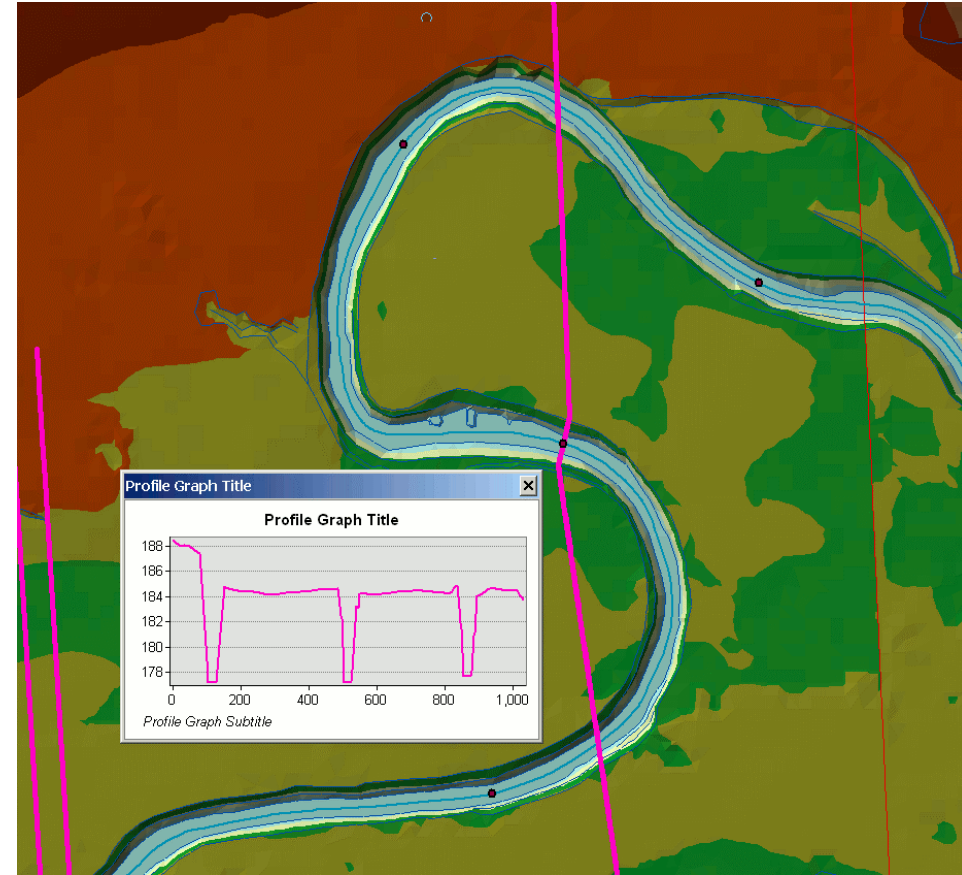
Results and verification

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Verification in places:

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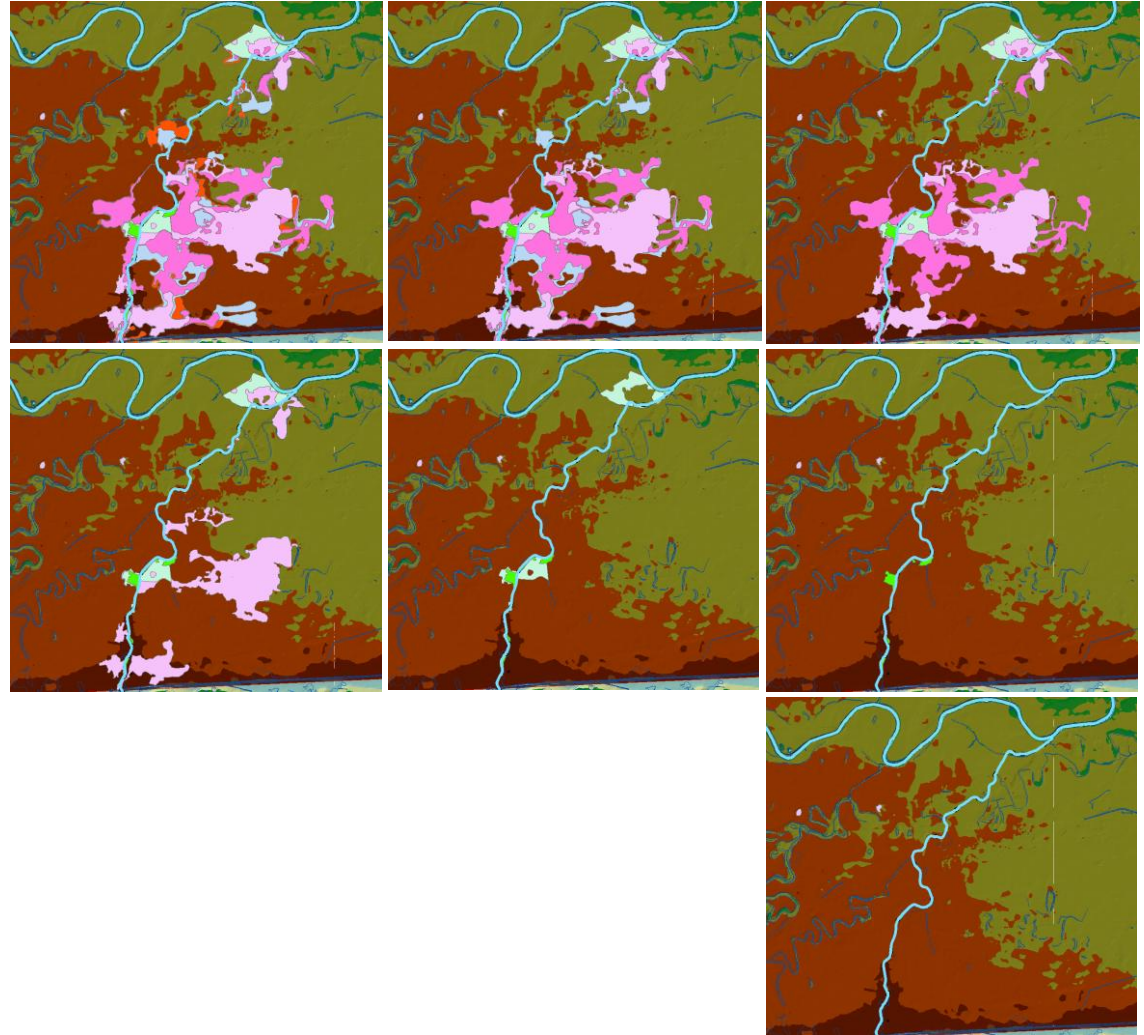
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Results and verification

- flood_plain_Q%

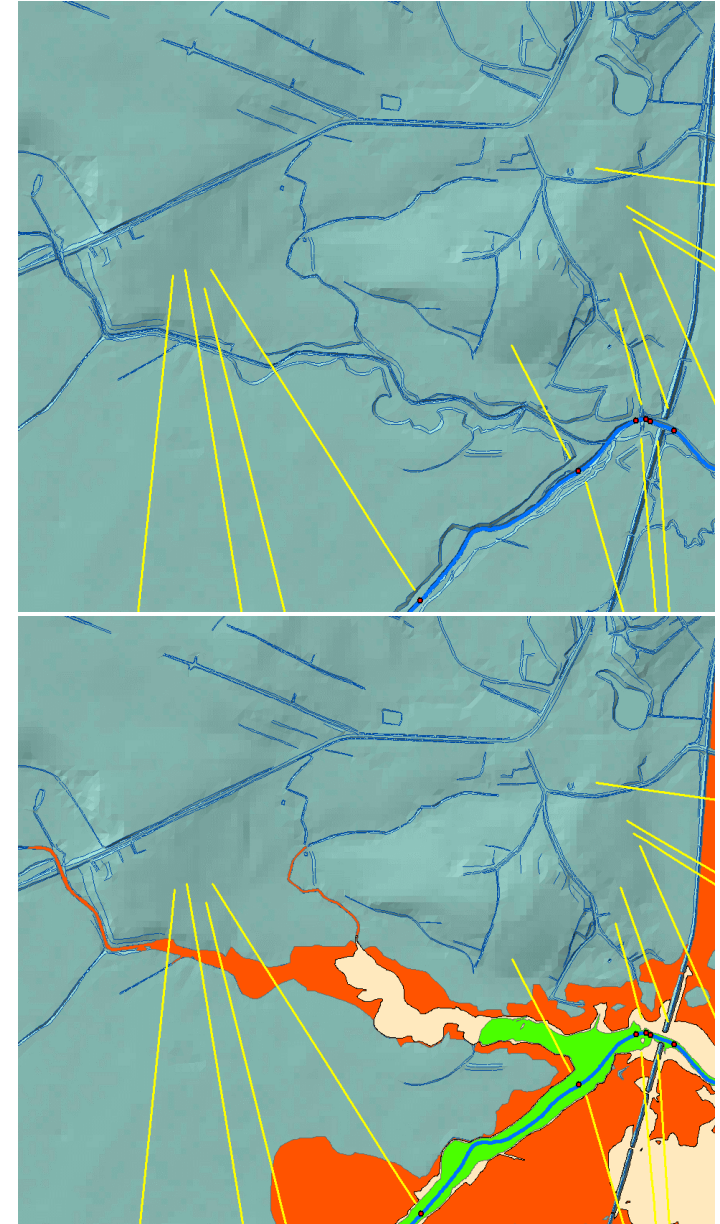
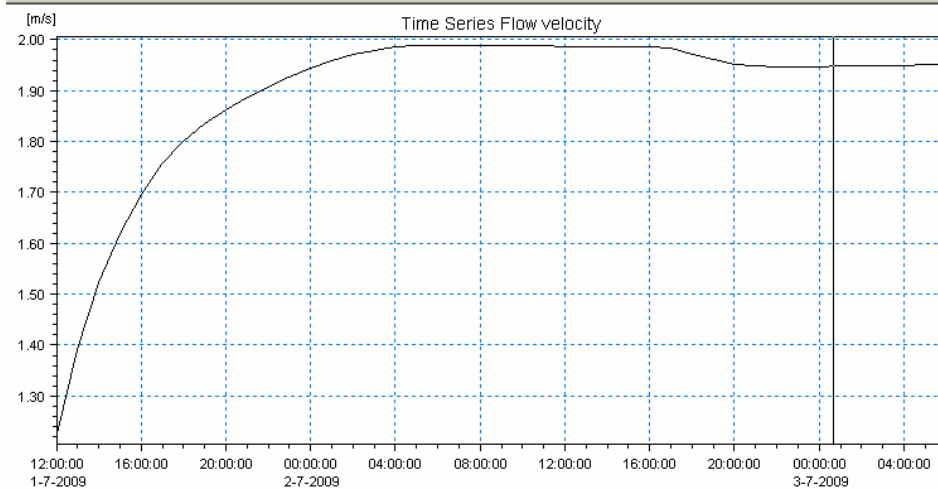
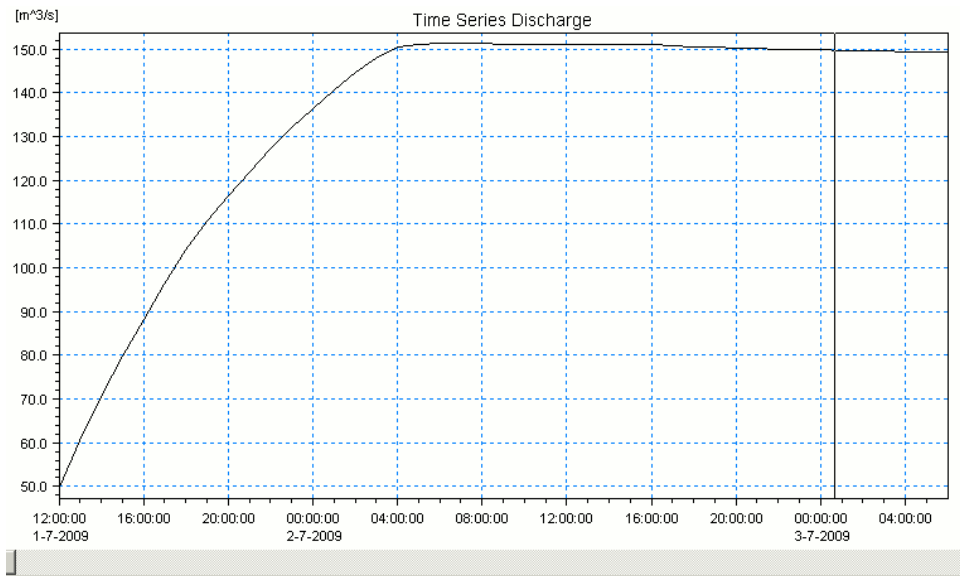




Results and verification

Backwater zones

Discharge and the velocity





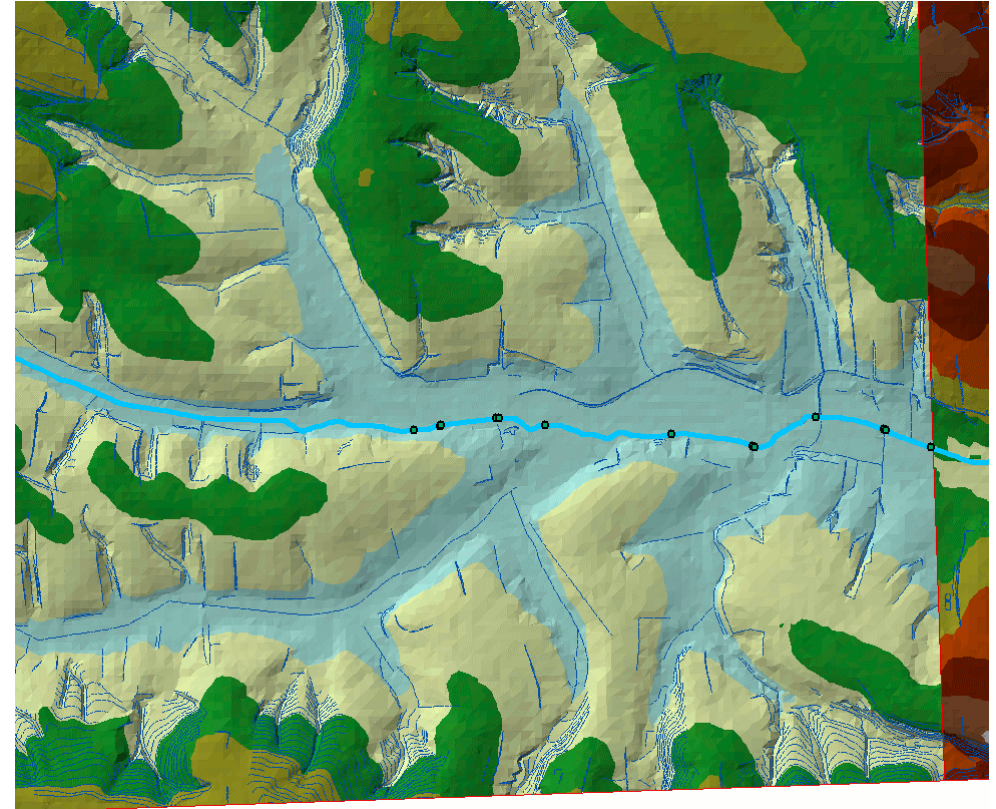
Results and verification

Layers:

- flood_plain_Q%
- flood_plain (for the whole Wisłok)
- modelling points
- cross-sections
- flood plains without runoff

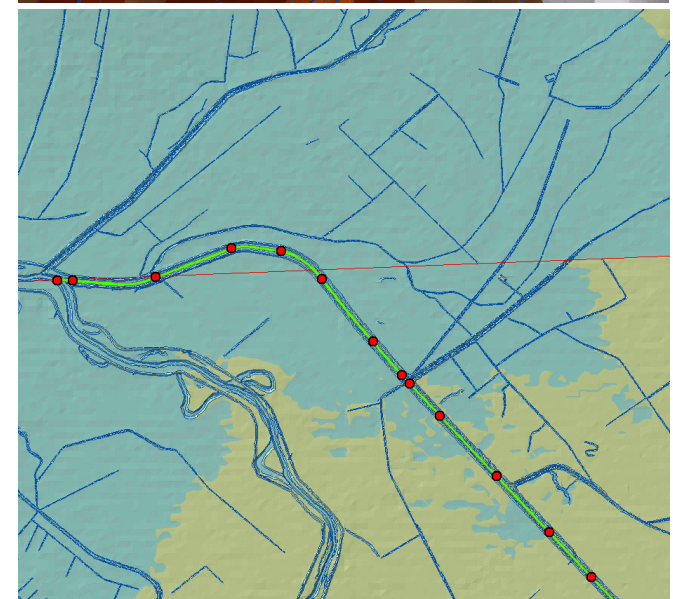
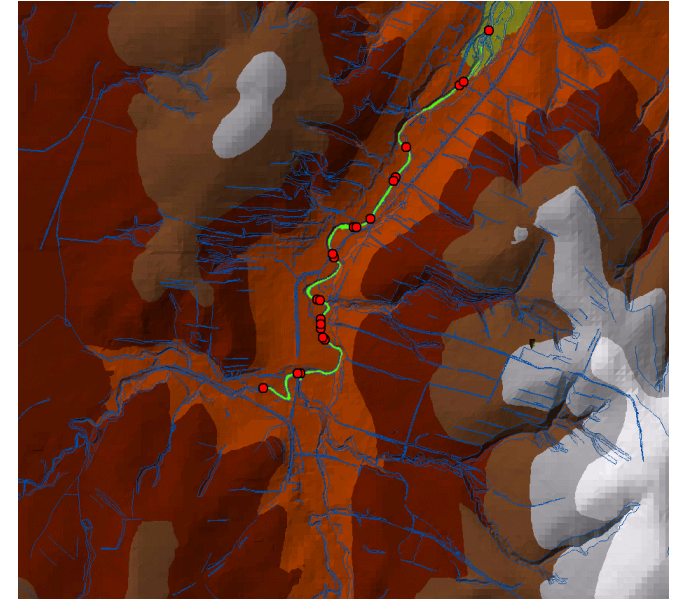
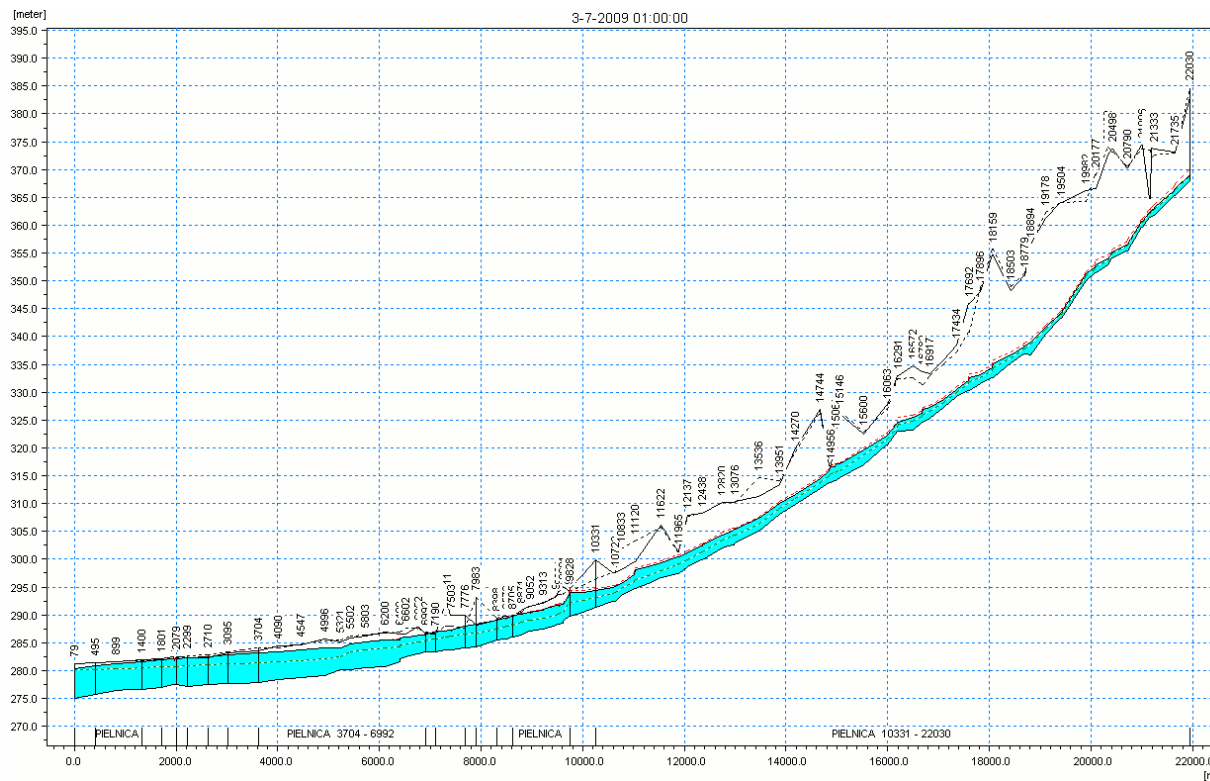
Verification in places:

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- verification of shape of the cross-sections
- linking channels to the water reservoirs



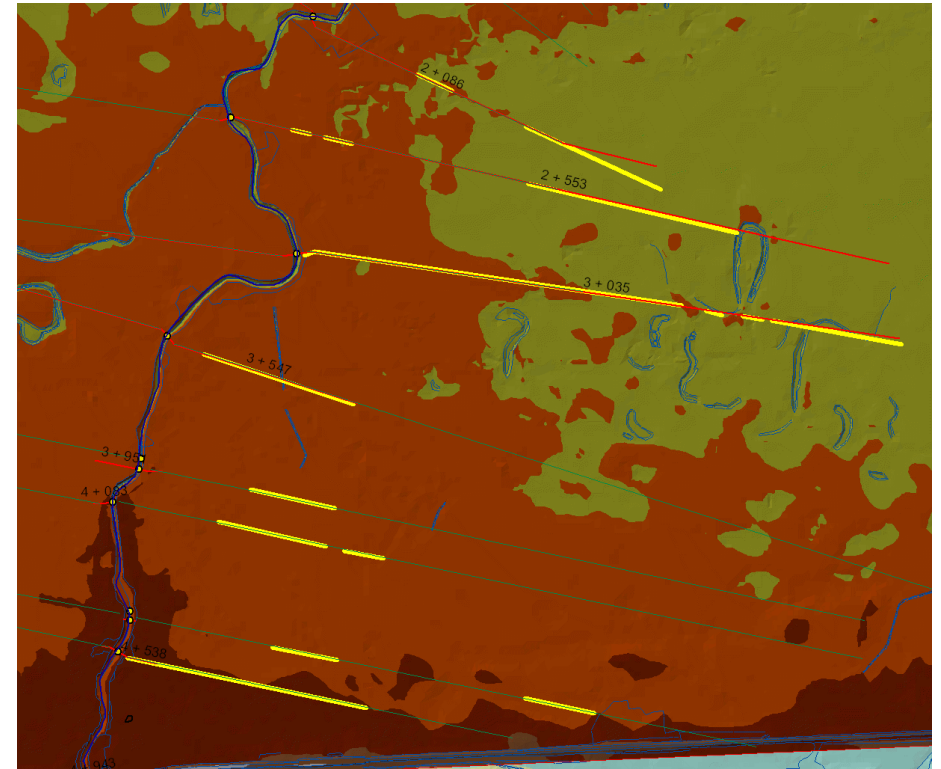


Results and verification – upper and down-part





Results and verification



Backwater, flow direction

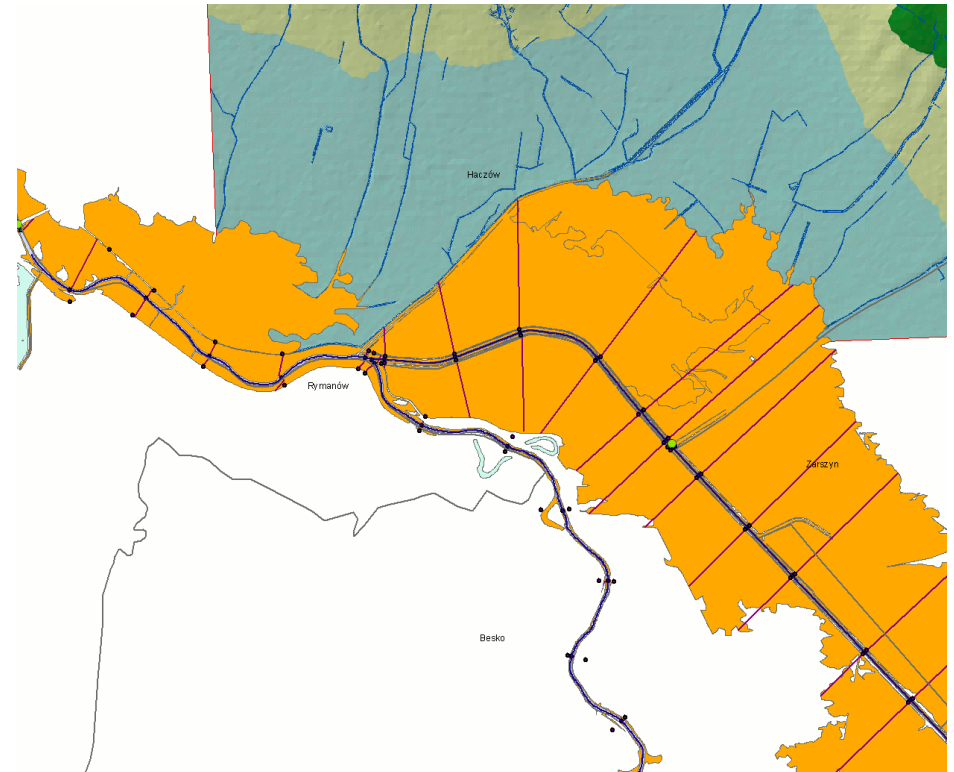


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Results and verification



Finding the boundary lines to the
flood-plain area



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Thank you very much for your attention