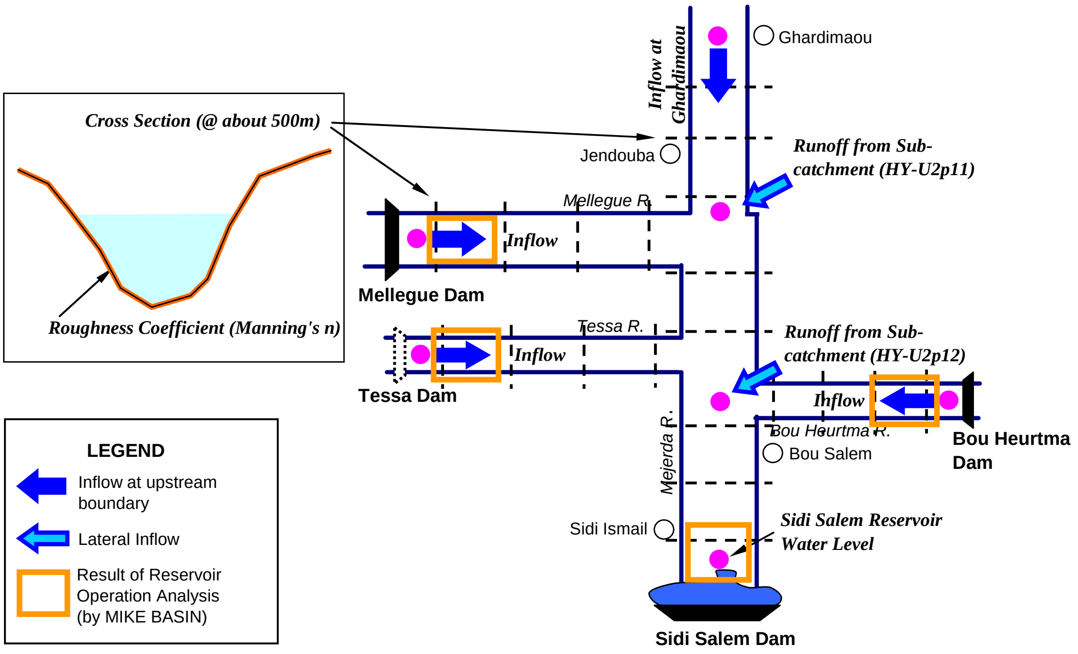
ANNEX 1 : MIKE11 TUTORIAL FOR THE MEJERDA MODEL USERS

AN1.0 Introduction

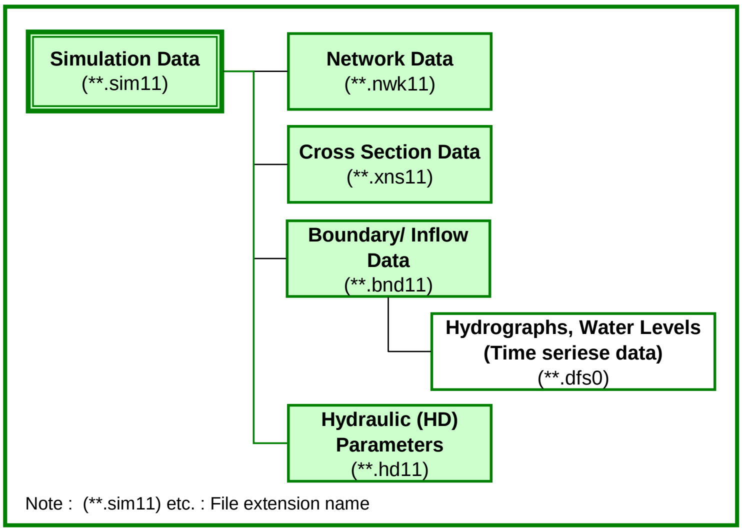
This annex was prepared as an introduction of building the 1-D (MIKE11) Mejerda Model for the users who are not familiar with the MIKE software. For the Mejerda Model, one 1-D unsteady hydraulic analysis model was built using MIKE11. The following figure schematically shows an example of a MIKE11 model and its required inputs.



Source : Study Team

Figure AN1.1 : Example of MIKE11 Model (Mejerda, Upstream of Sidi Salem Dam)

The major inputs for the 1-D inundation analysis model are data regarding river channel alignment (coordinates), cross sections, bed resistance, inflow hydrographs, downstream water levels, simulation time steps and other hydraulic parameters. One MIKE11 model applied to the Mejerda basin consists of the following input and simulation files, which acquire these required data. (See **Part II** of the Explanation Note on Inundation Analysis Model for the Mejerda River BPasin)

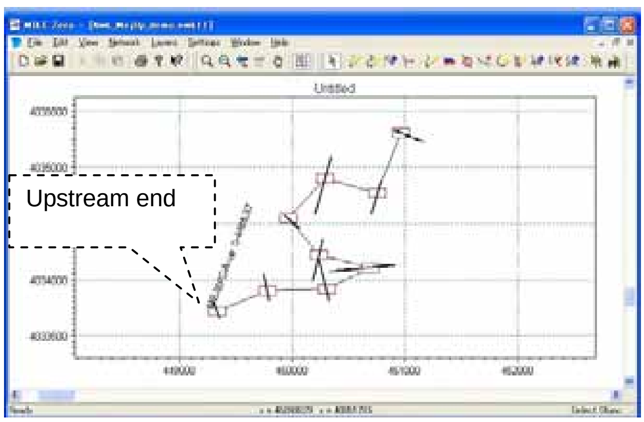


Source : Study Team

Figure AN1.2: Overall Structure of MIKE11 Model for Mejerda Model

This annex describes basic methodologies of the following work items of MIKE11 modelling, referring to a simple sample model with nine cross sections. (Files for this example were provided to the trainees during the training (in the folder "Example M11_Mejerda_byJICA Team").) These items are listed in order of the actual procedure of modelling.

1.	Preparing time series file	(**.dfs0)
2.	Preparing network file	(**.nwk11)
3.	Preparing cross section file	(**.xns11)
4.	Preparing HD (hydrodynamic) file	(**.hd11)
5.	Preparing boundary file (Empty file)	(**.bnd11)
6.	Preparing simulation file	(**.sim11)
7.	Inputting boundary data	(**.bnd11)
8.	Simulation	(**.sim11)
9.	Viewing result file	(**.res11)



Source : MIKE11 Network window, Network File prepared by the Study Team

Figure AN1.3: Channel Alignment of a sample model used in this Annex (Network Editor)

Box AN1.1: NOTE for French Operating System (Windows) Users

If unknown strange errors are observed, changing the numbering system might improve the situation.
A point [.], not a comma [,], is suggested to be used as a decimal point in the operating system. (For instance, one thousand five hundred should be expressed like 1500.0 not like 1500,0 .)

How to change or confirm the numbering system:
[Control Panel] – [Region and Language] – Change setting only of the numbering system or Change language selection to "English (UK)"
("English (UK)" is more convenient than "English (US)", because it applies a 24 hour system for showing hours, while "English (US)" employs a 12 hour system with a.m./p.m..)

Box AN1.2: Note Regarding Inputting Data of MIKE11

Users should keep the following issues in mind when modelling MIKE11.

- **Branch Name (River Name)**, **Topo ID** and **Chainage** in Cross Section (xns11) and Network (nwk11) Files should be exactly the same.

AN1.1 Preparing Time Series File

(1) File extension : *.dfs0

(2) Example of time series data :

- Hourly inflow discharge data at Ghardimaou and other gauging stations (hydrograph)

(3) Procedure :

Prepare an excel file → Make a dfs0 file → Copy data in excel file to dfs0 file

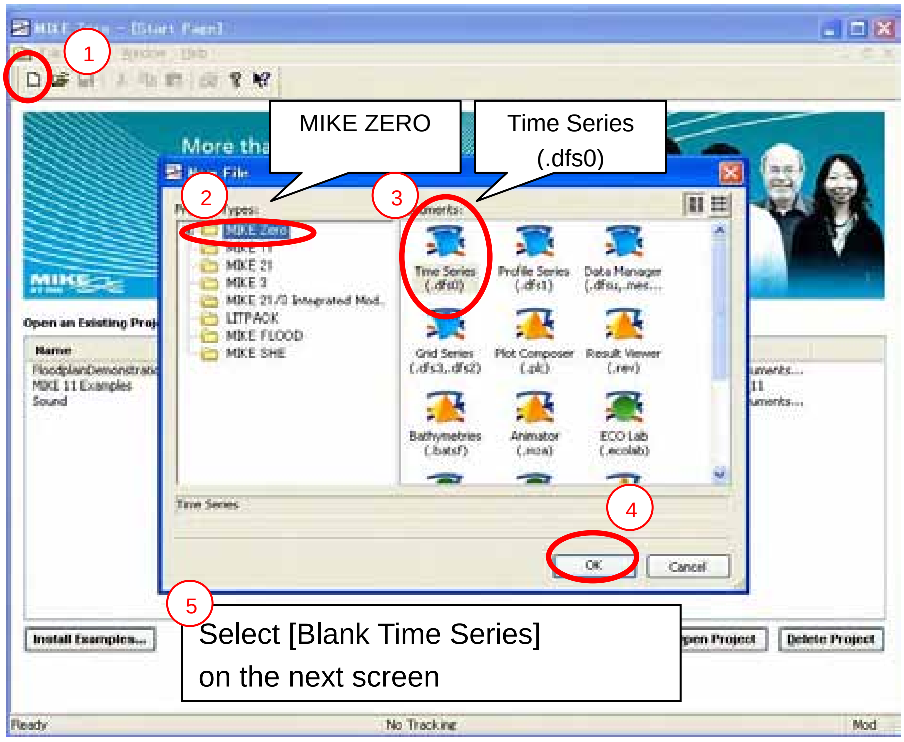
(i) Prepare an excel file

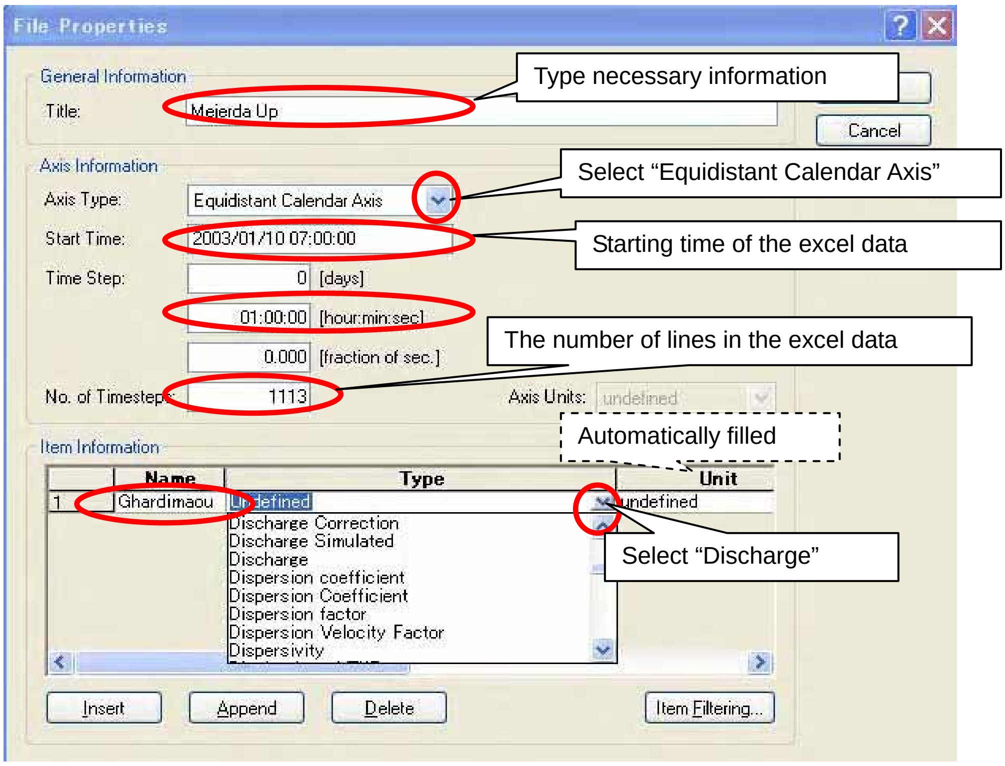
	A	B	C	D
1				
2		Discharge (m3/s)		
3	Time	Ghadimaou	Jendouba	Bou Salem
4	2003/1/10 7:00	3.0		
5	2003/1/10 8:00	3.0		
6	2003/1/10 9:00	3.0		
7	2003/1/10 10:00	3.0		
29	2003/1/11 8:00	400.0		
30	2003/1/11 9:00	576.0		18.6
31	2003/1/11 10:00	736.0		37
32	2003/1/11 11:00	928.0		60
33	2003/1/11 12:00	1090.0		83.1
34	2003/1/11 13:00	1070.0		105
35	2003/1/11 14:00	1030.0	48.1	139
36	2003/1/11 15:00	1090.0	[illegible]	[illegible]

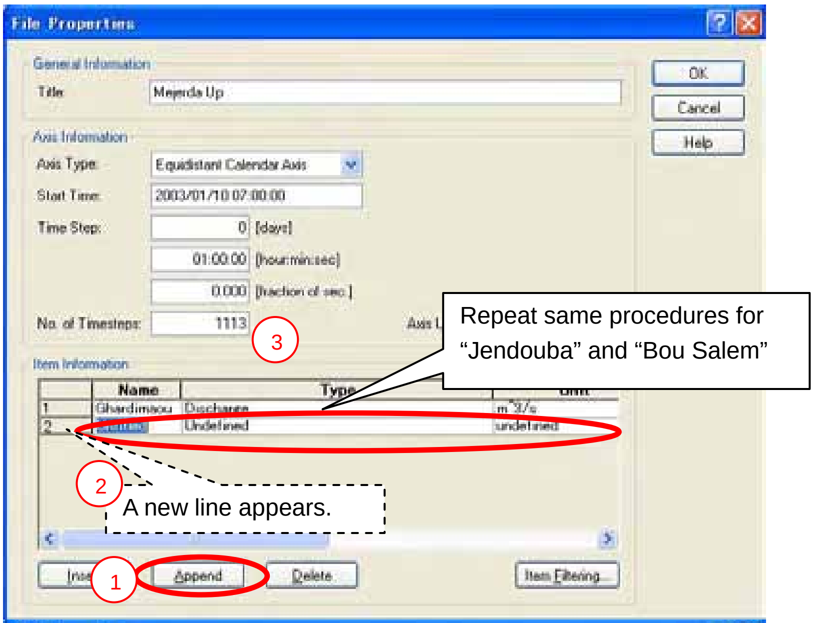
1st column : Time (hourly)
2nd column - : Hourly Data

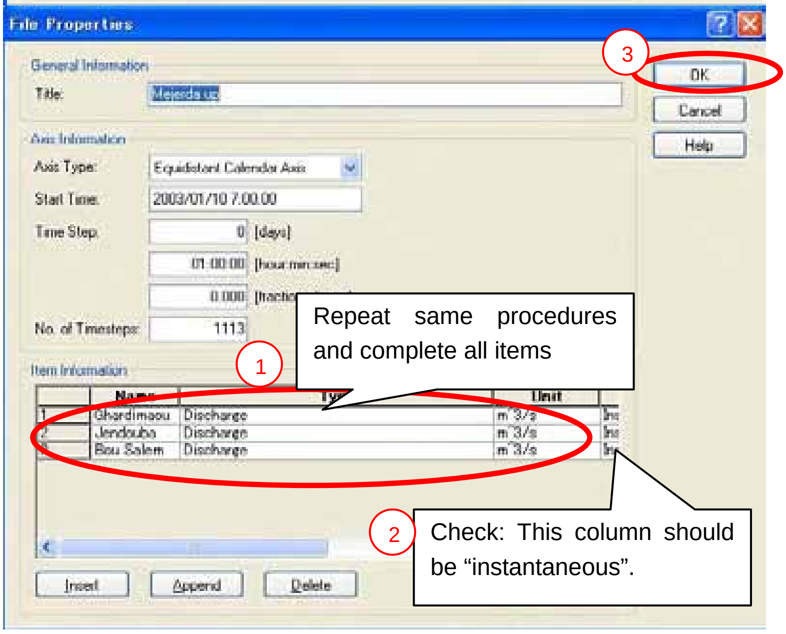
(ii) Make a dfs0 file

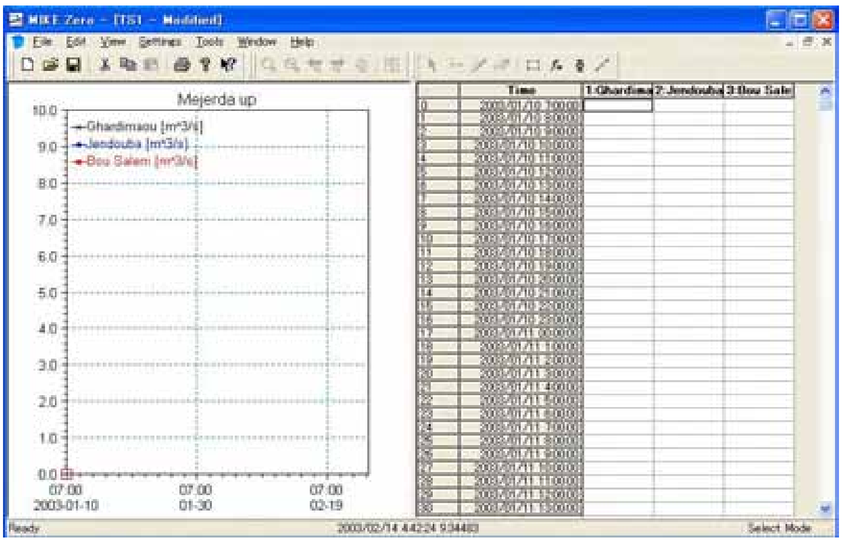
[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]


1
MIKE ZERO
Time Series
(.dfs0)
2
3
MIKE Zero
MIKE 11
MIKE 21
MIKE 3
MIKE 21/3 Integrated Mod...
LITPACK
MIKE FLOOD
MIKE SHE
Time Series (.dfs0)
Profile Series (.dfs1)
Data Manager (.dfsu,.mes...
Grid Series (.dfs3,.dfs2)
Plot Composer (.plc)
Result Viewer (.rev)
Bathymetries (.batsf)
Animator (.mza)
ECO Lab (.ecolab)
Time Series
4
OK
Cancel
5
Select [Blank Time Series]
on the next screen
Install Examples...
Open Project
Delete Project
Ready
No Tracking


File Properties
General Information
Title:
Mejerda Up
Type necessary information
Cancel
Axis Information
Axis Type:
Equidistant Calendar Axis
Select "Equidistant Calendar Axis"
Start Time:
2003/01/10 07:00:00
Starting time of the excel data
Time Step:
0 [days]
01:00:00 [hour:min:sec]
0.000 [fraction of sec.]
The number of lines in the excel data
No. of Timesteps:
1113
Axis Units:
undefined
Automatically filled
Item Information
Name
Type
Unit
1
Ghardimaou
Undefined
undefined
Discharge Correction
Discharge Simulated
Discharge
Dispersion coefficient
Dispersion Coefficient
Dispersion factor
Dispersion Velocity Factor
Dispersivity
Select "Discharge"
Insert
Append
Delete
Item Filtering...

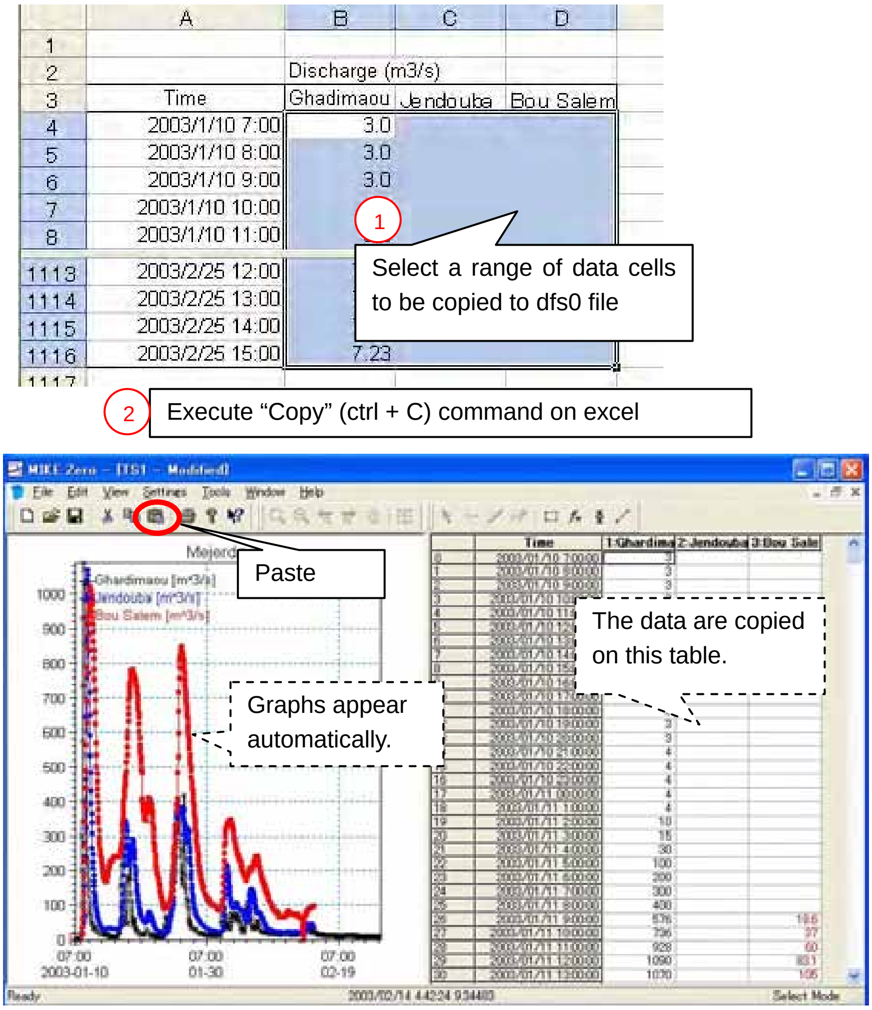

File Properties
General Information
Title: Mejerda Up
OK
Cancel
Help
Axis Information
Axis Type: Equidistant Calendar Axis
Start Time: 2003/01/10 07:00:00
Time Step: 0 [days]
01:00:00 [hour:min:sec]
0.000 [fraction of sec.]
No. of Timesteps: 1113
Repeat same procedures for “Jendouba” and “Bou Salem”
3
Item Information
Name
Type
Unit
Ghardimaou
Discharge
m^3/s
Undefined
undefined
2
A new line appears.
1
Append
Delete
Item Filtering...


File Properties
General Information
Title: Mejerda up
3
OK
Cancel
Help
Axis Information
Axis Type: Equidistant Calendar Axis
Start Time: 2003/01/10 7:00:00
Time Step: 0 [days]
01:00:00 [hour:min:sec]
0.000
No. of Timesteps: 1113
Repeat same procedures and complete all items
1
Item Information
Name
Unit
Ghardimaou
Discharge
m^3/s
Jendouba
Discharge
m^3/s
Bou Salem
Discharge
m^3/s
2
Check: This column should be “instantaneous”.
Insert
Append
Delete


MIKE Zero - [TS1 - Modified]
Mejerda up
Ghardimaou [m^3/s]
Jendouba [m^3/s]
Bou Salem [m^3/s]
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
07:00
2003-01-10
07:00
01-30
07:00
02-19
Time
1:Ghardimaou
2:Jendouba
3:Bou Salem
Ready

Save "**.dfs0" file in an appropriate folder

(iii) Copy data in excel file to dfs0 file



Source : Study Team

AN1.2 Preparing Network File

(1) File extension : *.nwk11

(2) Major information contained in a network file :

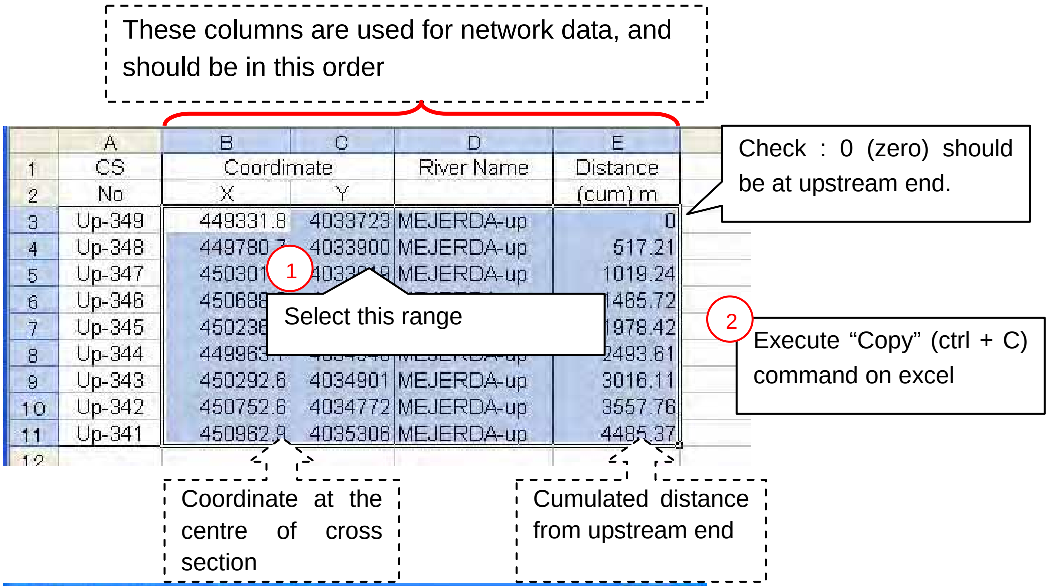
- River name
- Coordinates of cross section locations
- Chainage (Distances of cross sections from the upstream end)

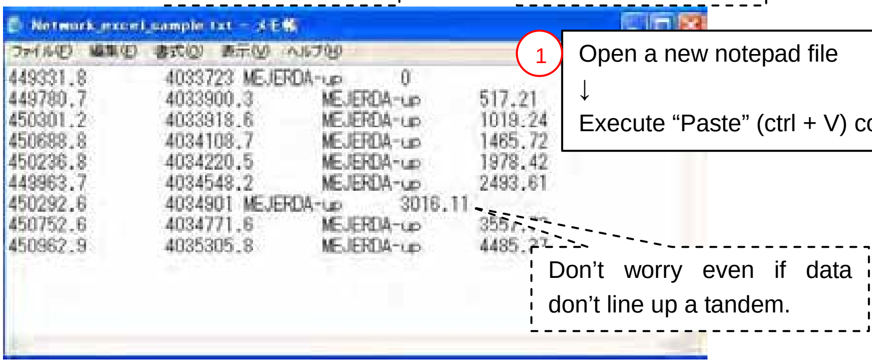
(3) Procedure :

Prepare an excel file and text file→ Make a nwk11 file → Import text file data to nwk11 file and input other necessary data on nwk11 file

(i) Prepare an excel file and text file

Prepare an excel file based on topographic survey result like below.

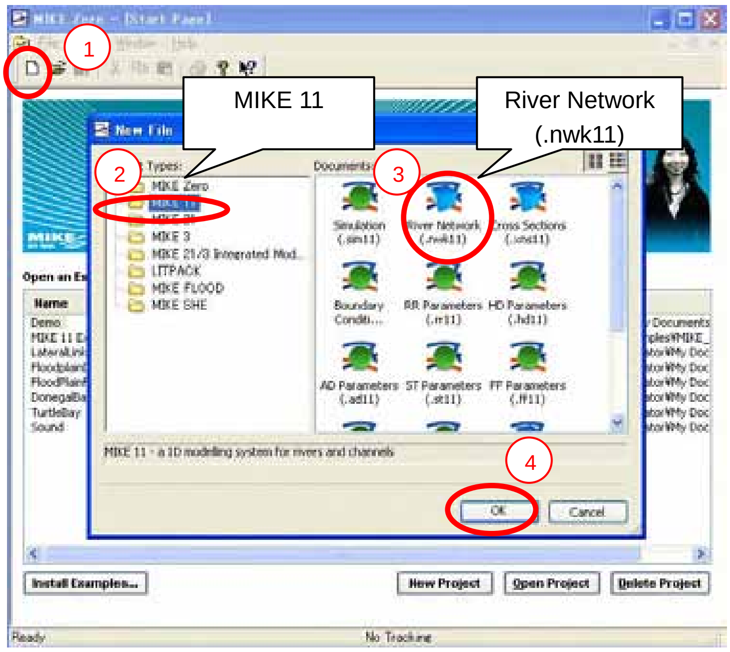


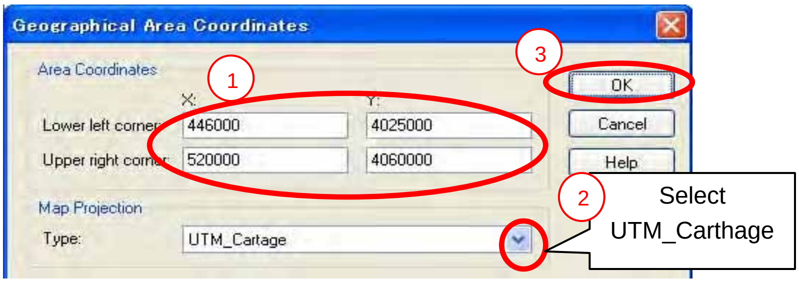


Save "**.txt" file in an appropriate folder

(ii) Make a nwk11 file

[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]





Coordinate for Mejerda upstream model

	X	Y
Lower left corner	446000	4025000
Upper right corner	520000	4060000

(iii)　Import text file data to nwk11 file and input other necessary data on nwk11 file

[File] – [Import] – [Point and Branch Data from Point-Branch ASCII File...]

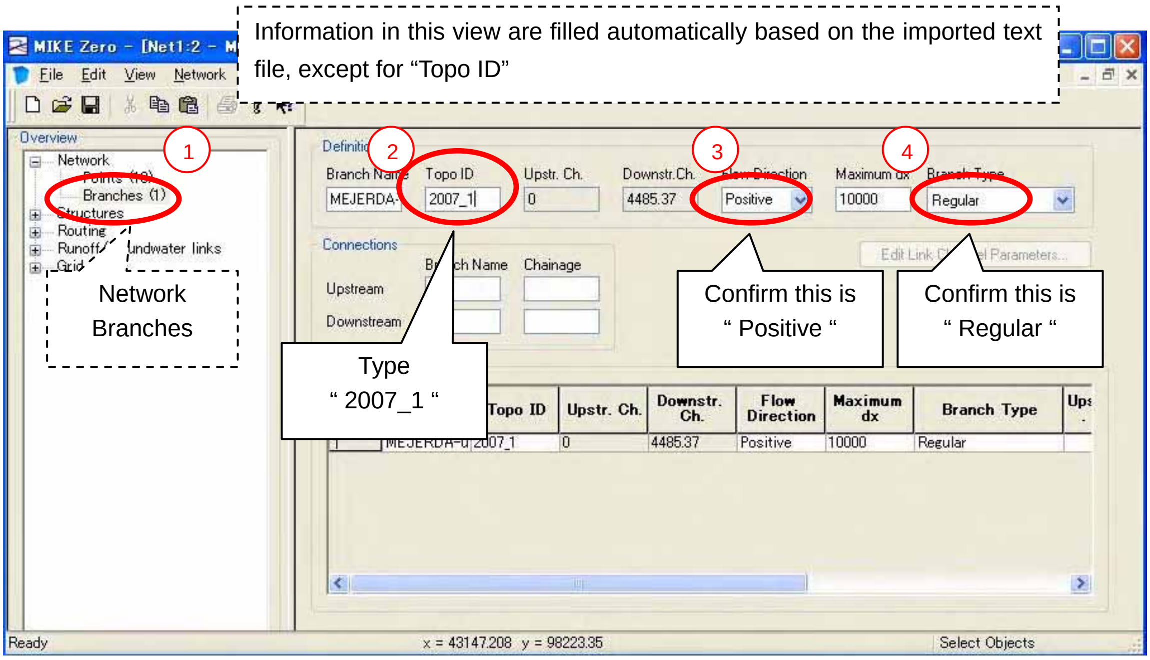
Select “meter” for unit

Select the **.txt file created in (i)

Save “**.nwk11” file in an appropriate folder

[File] – [Import] – [Point and Branch Data from Point-Branch ASCII File...]

[View] – [Tabular View...]



AN1.3　Preparing Cross Section File

(1)　File extension :　　　*.xns11

(2)　Major information contained in a cross section file :

- River name
- Cross section ID

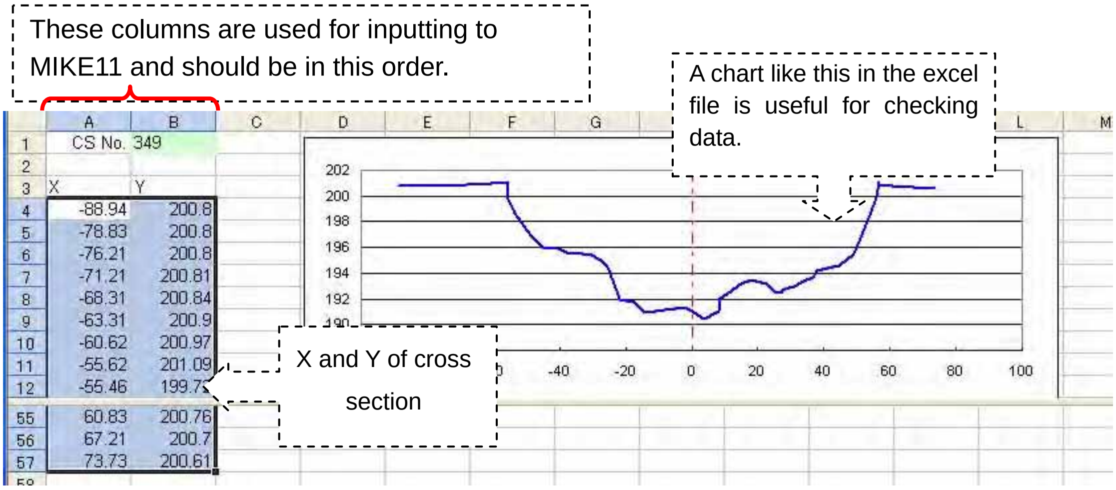
- Chainage (Distances of cross sections from the upstream end)
- Cross section shapes (X, Y)
- Roughness coefficient

(3) Procedure :

Prepare an excel file → Make an xns11 file → Input data on the xns11 file including copying data in the excel file to the xns11 file

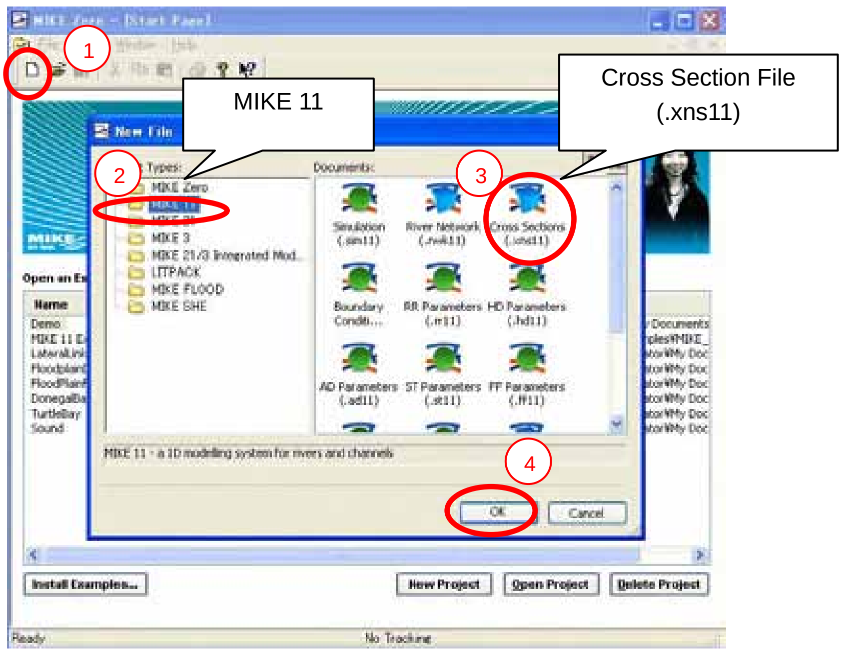
(i) Prepare an excel file

Prepare an excel file based on topographic survey result like below (one example).



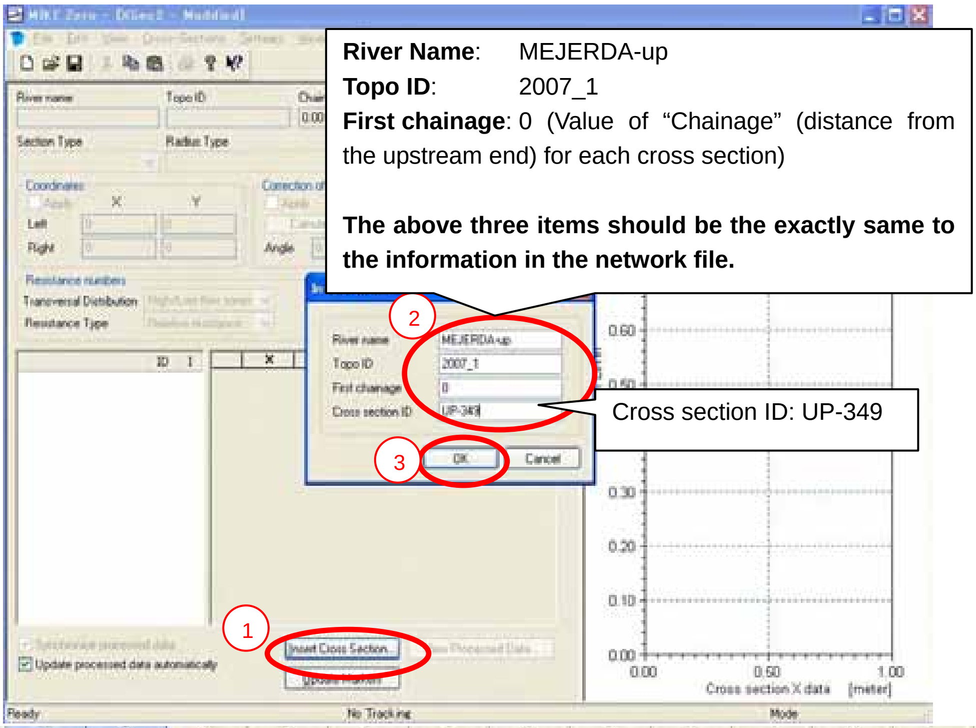
(ii) Make an xns11 file

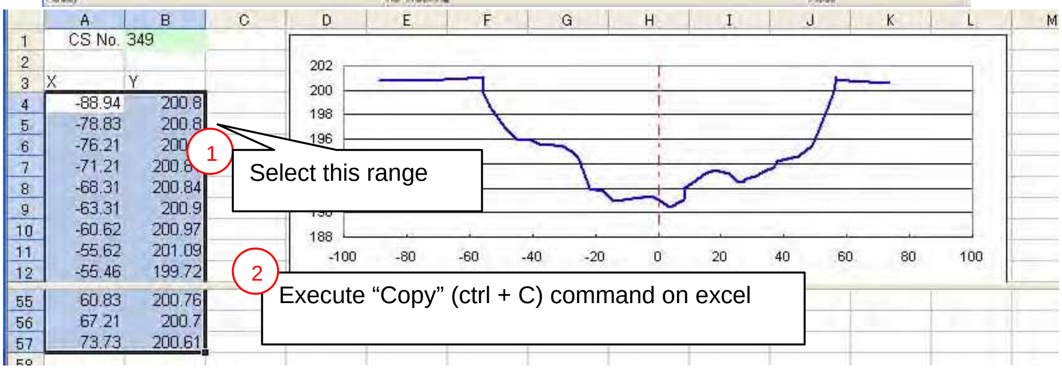
[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]

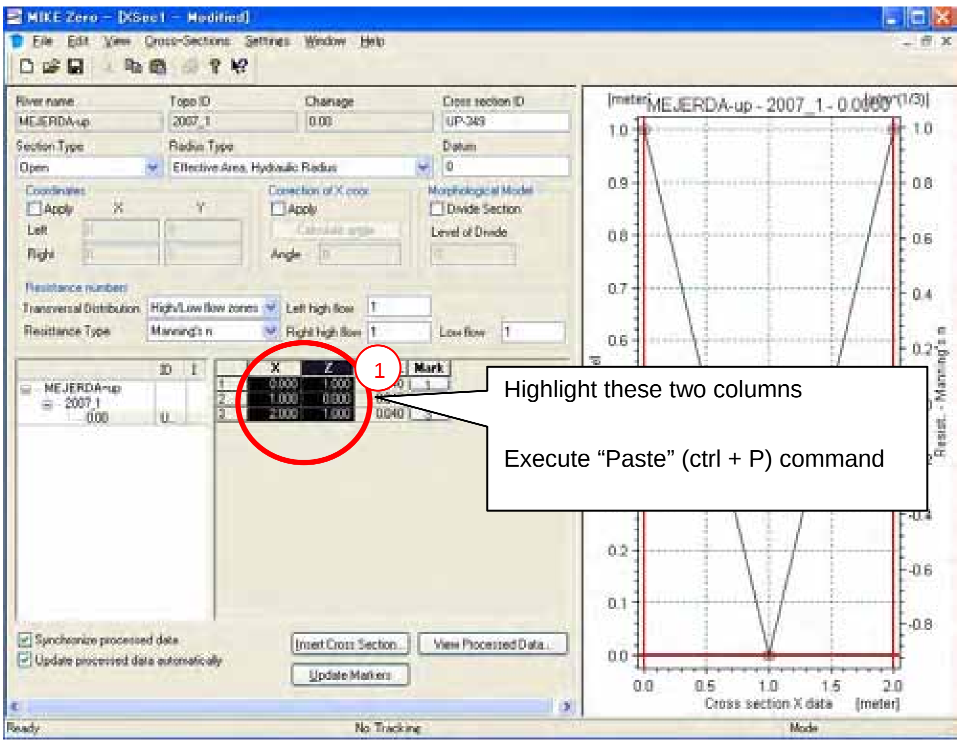


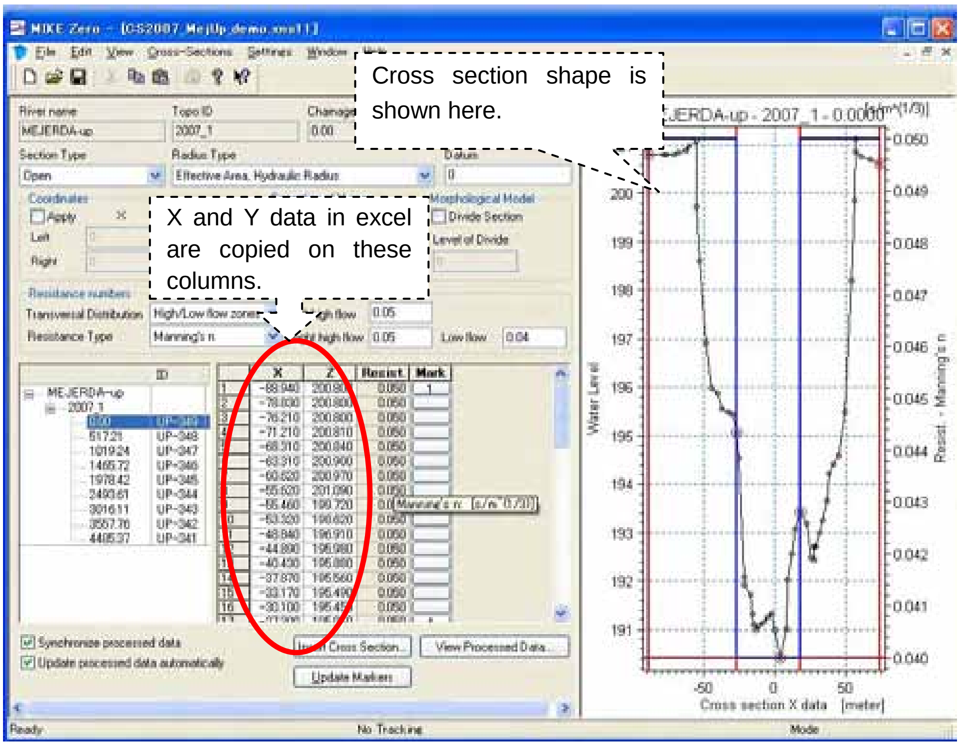
Save “**.xns11” file in an appropriate folder

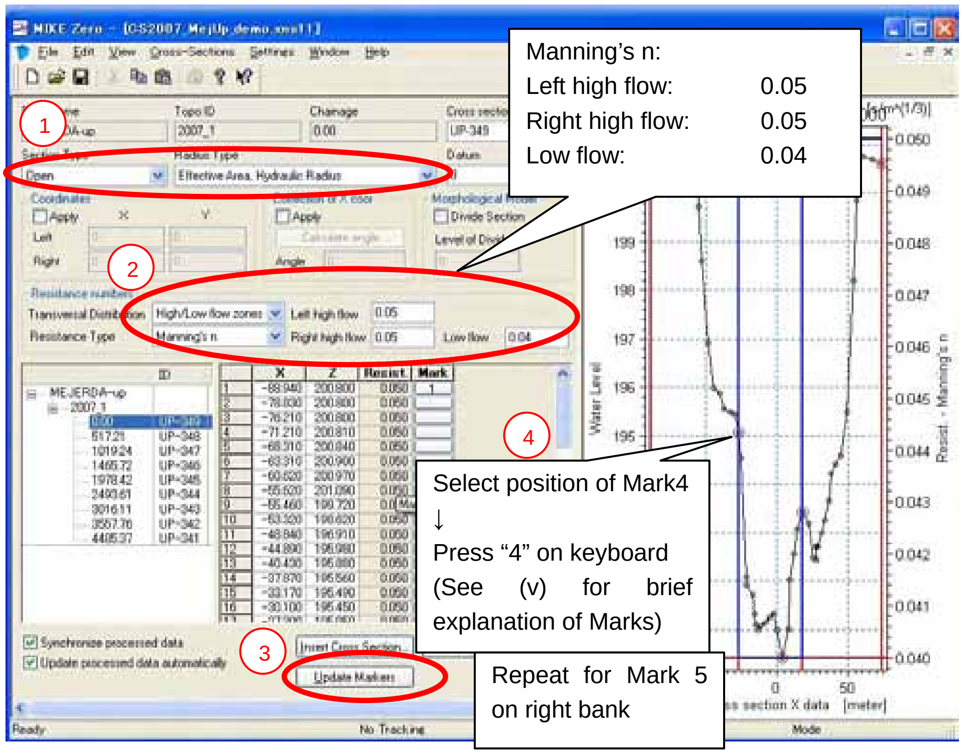
(iii) Input data on the xns11 file including copying data in the excel file to the xns11 file


River Name: MEJERDA-up
Topo ID: 2007_1
First chainage: 0 (Value of "Chainage" (distance from the upstream end) for each cross section)
The above three items should be the exactly same to the information in the network file.
Cross section ID: UP-349
1
2
3
Insert Cross Section...
OK
Cancel


CS No. 349
X
Y
1
Select this range
2
Execute "Copy" (ctrl + C) command on excel

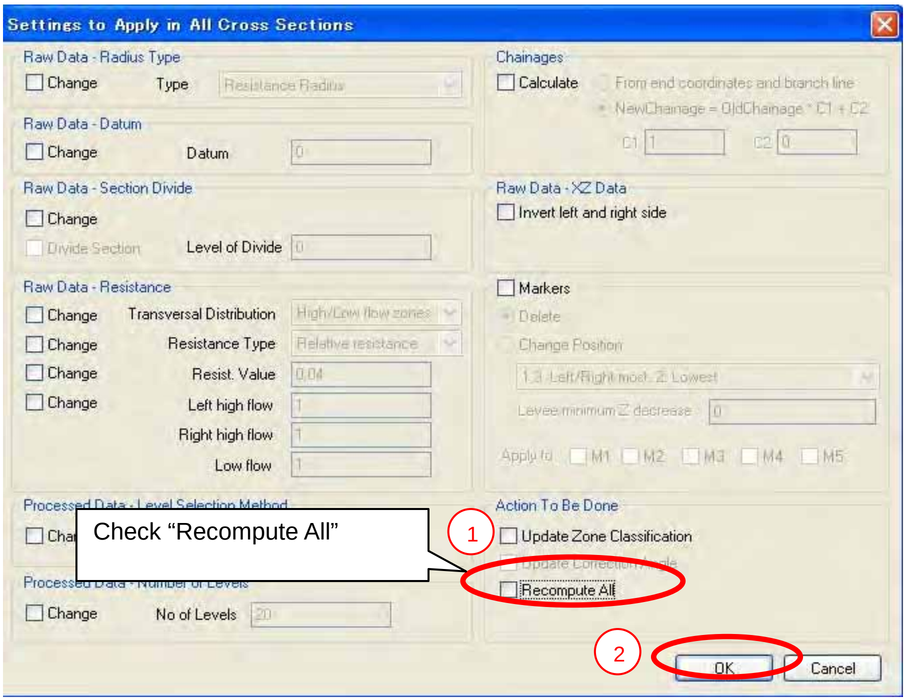

MIKE Zero – [XSec1 – Modified]
MEJERDA-up - 2007_1 - 0.000
1
Highlight these two columns
Execute "Paste" (ctrl + P) command





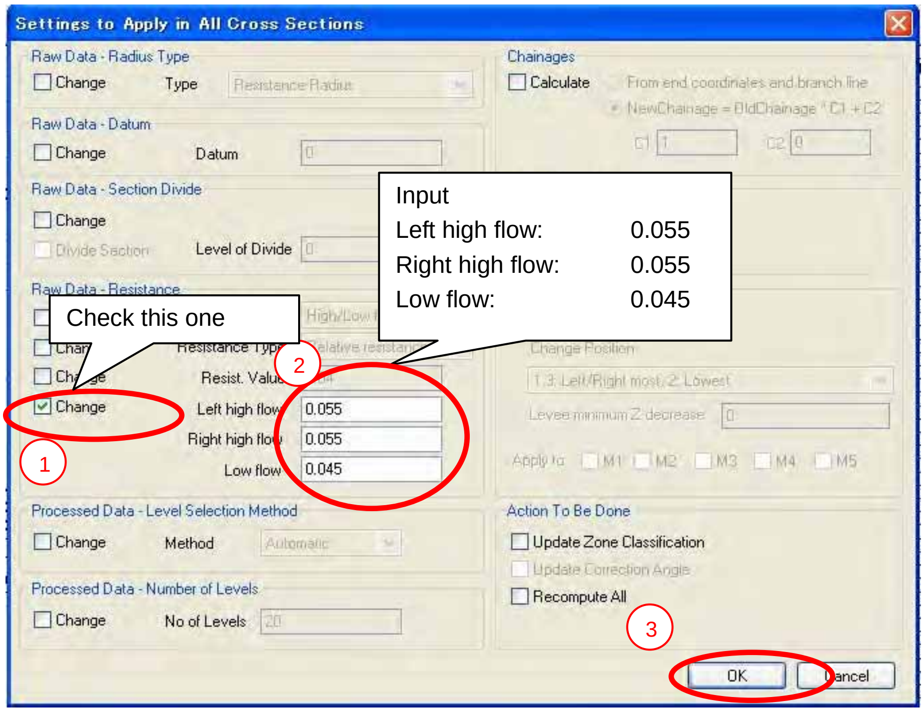
Click "Insert Cross Section" and repeat the same procedures for all cross sections

[Cross-Sections] – [Apply to all Sections...]

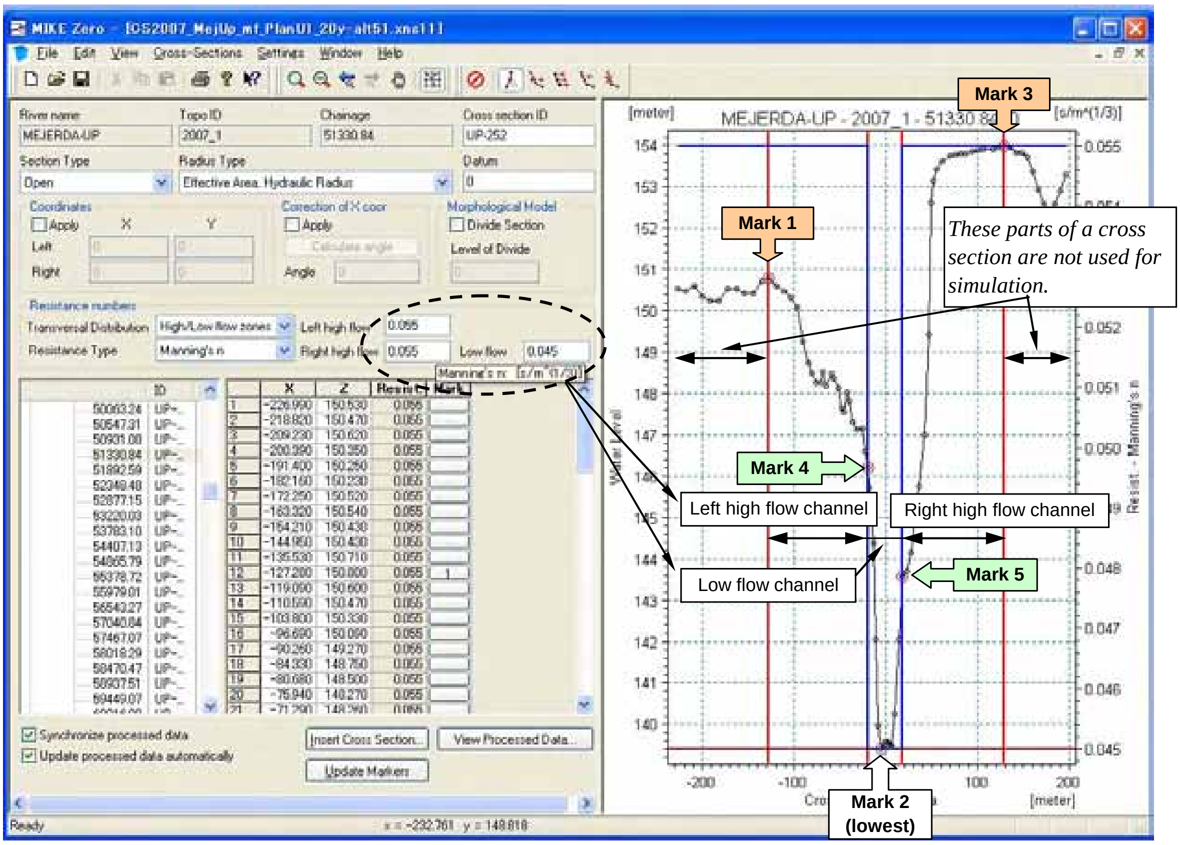


(iv) Practice : How to change inputted data in all cross sections at the same time

[Cross-Sections] – [Apply to all Sections...]



(v) Memo : Function of Marks (See the software manuals for further details)



AN1.4 Preparing HD (Hydrodynamic) File

(1) File extension : *.hd11

(2) Major information contained in a cross section file :

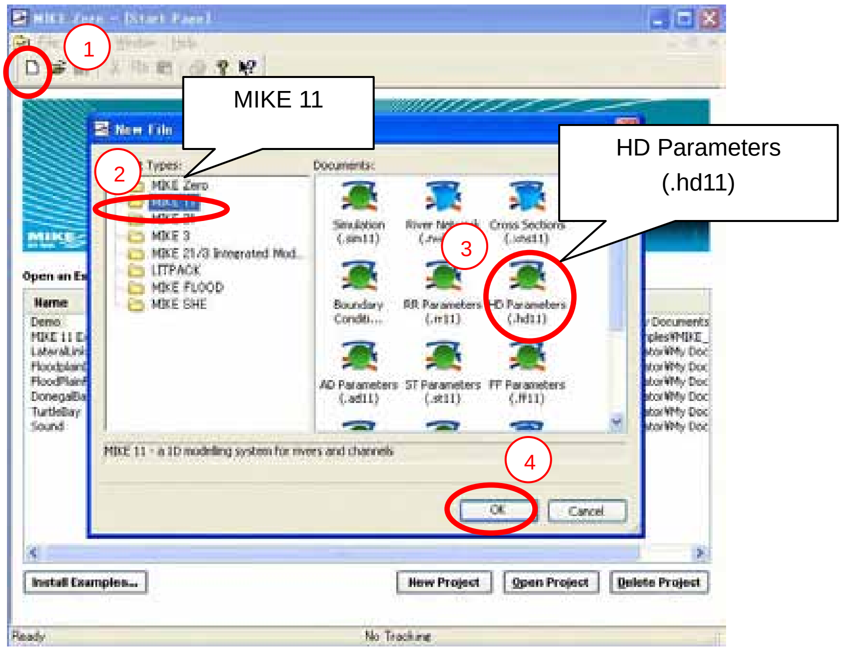
- Initial conditions
- Additional output files

(3) Procedure :

Make an hd11 file → Input necessary information

(i) Make an hd11 file

[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]



(ii) Input necessary information

[Initial] – Check “Water Depth” – Water depth : 1.5m

[Add. Output] – Check “Frude Number”

AN1.5 Preparing Boundary File (Empty File)

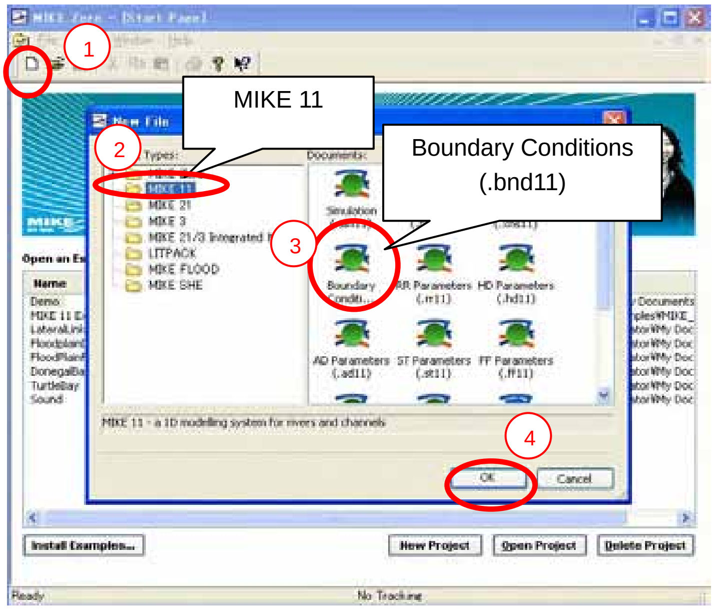
(1) File extension : *.bnd11

(2) Procedure :

Make an empty bnd11 file → (Further procedures should be conducted after preparing a simulation file. See Section **AN1.7**)

(i) Make an empty bnd11 file

[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]



Save "**.bnd11" file in an appropriate folder

AN1.6 Preparing Simulation File

(1) File extension : *.sim11

(2) Major information contained in a network file :

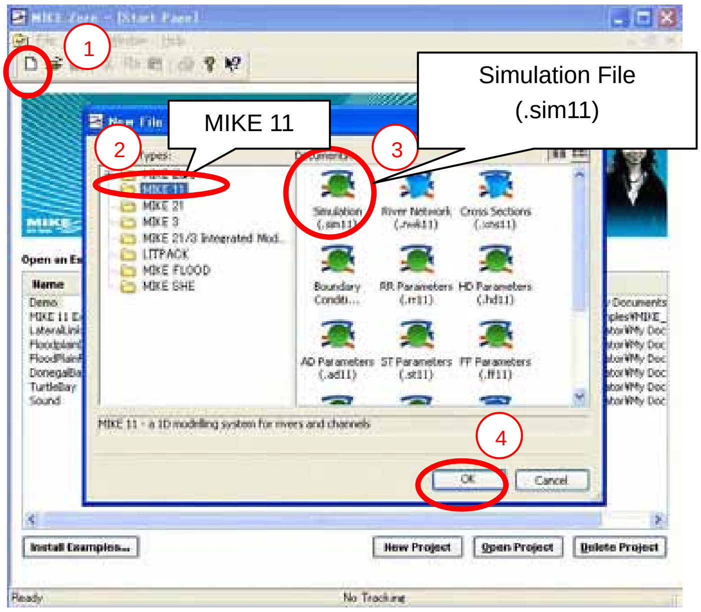
- Directories and names of input files
- Simulation time step and period
- Directories and names of a result file

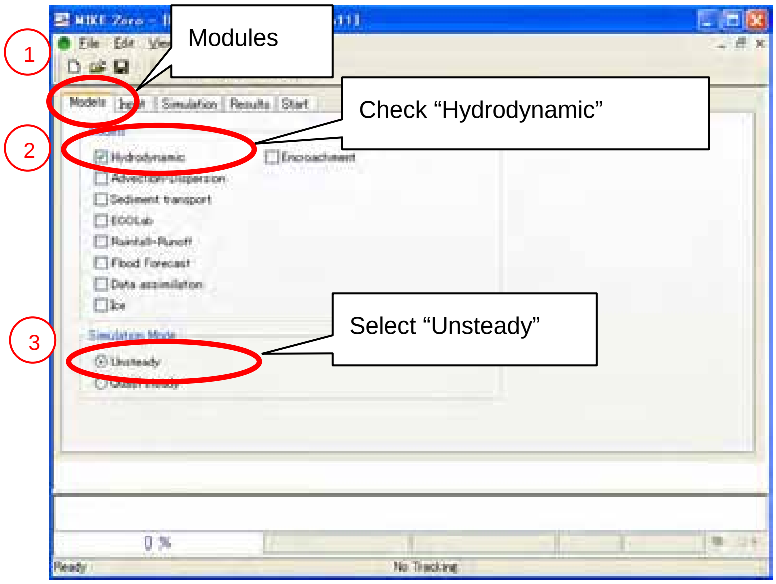
(3) Procedure :

Make a sim11 file → Specify directories and names of input files → Input simulation and result information

(i) Make a sim11 file

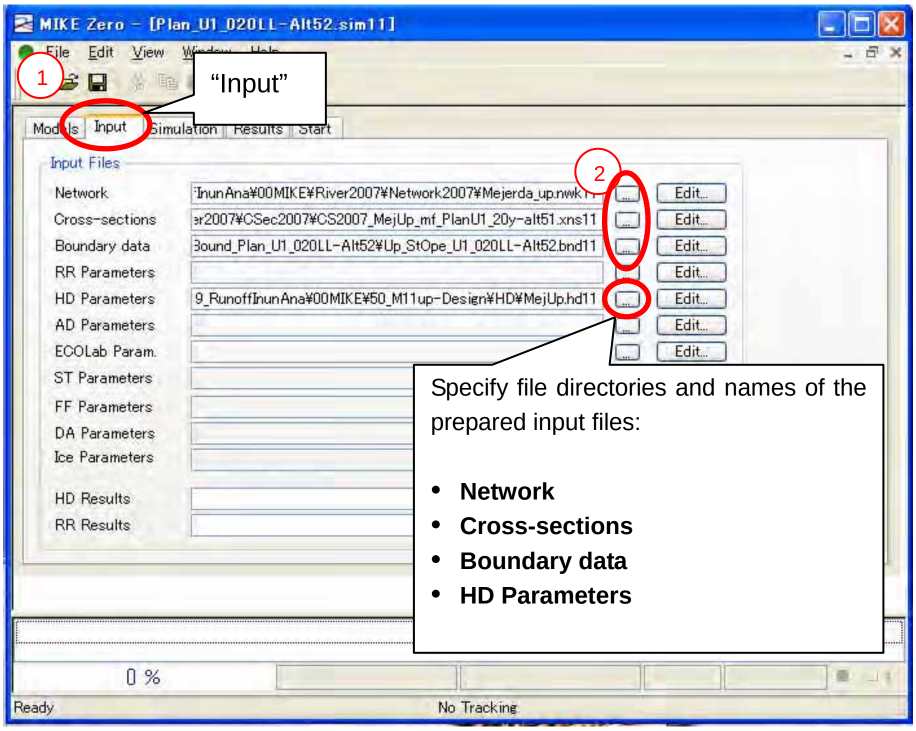
[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE11]



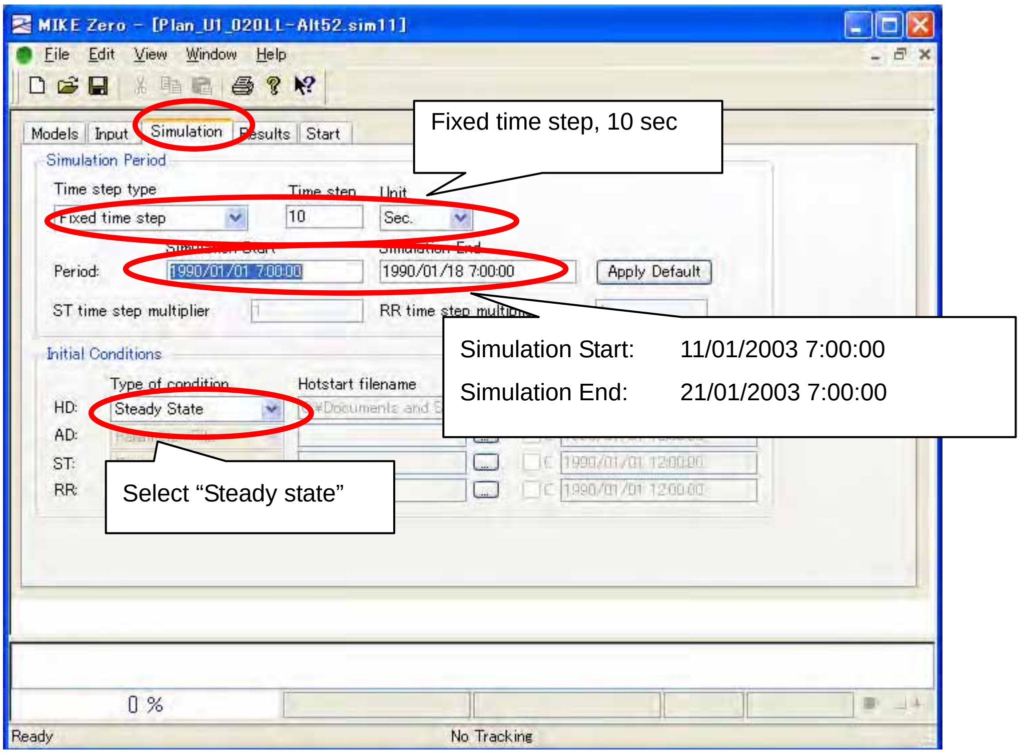


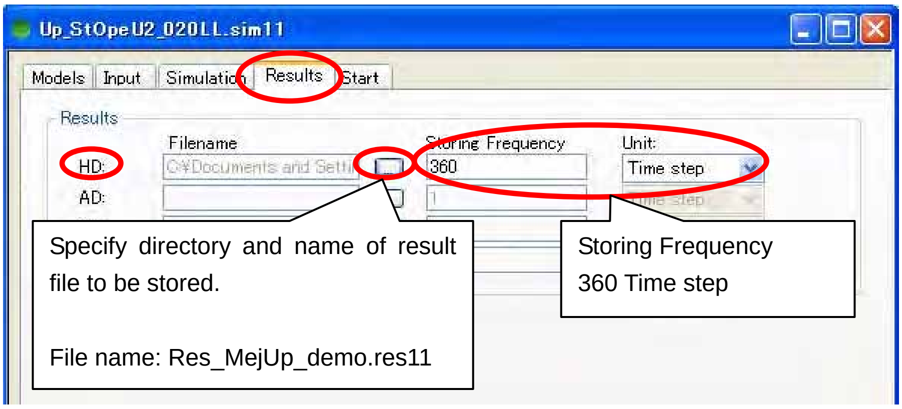
Save "**.sim11" file in an appropriate folder

(ii) Specify directories and names of input files



(iii) Input simulation and result information





(iv) Input boundary data

See the next section

AN1.7 Inputting Boundary Data

(1) File extension : *.bnd11

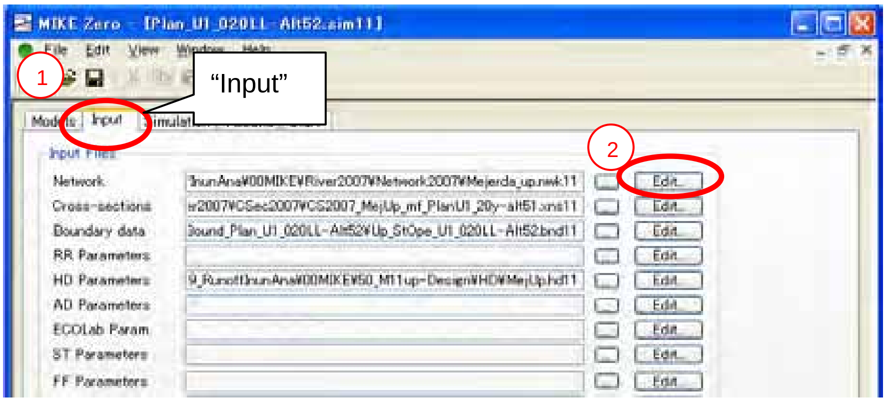
(2) Data/information determined by the boundary file

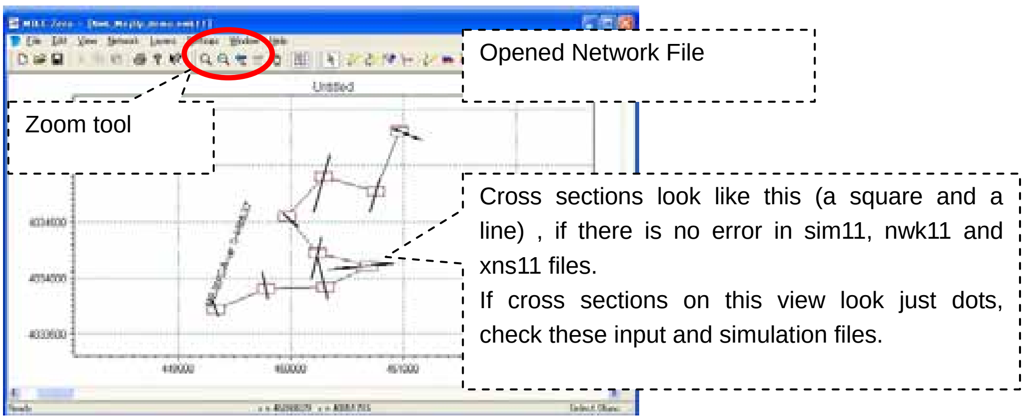
- Chainage (location) and time series of boundary inflow/ water level
- Upstream boundary of the demo model: Hourly inflow discharge
- Downstream boundary of the demo model: Hourly water level

(3) Procedure :

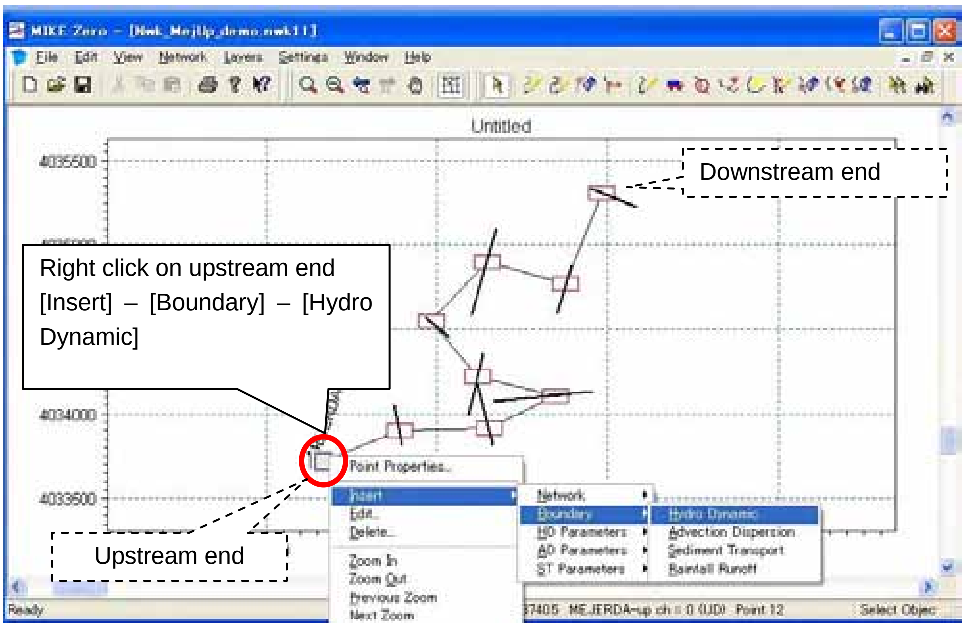
Open network editor through sim11 file → Input boundary data

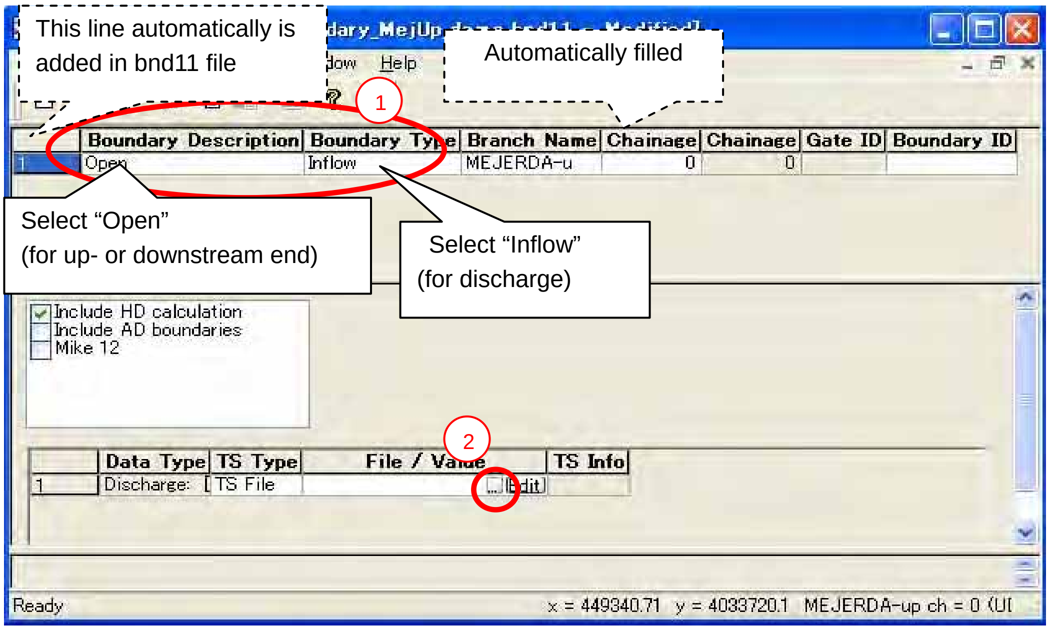
(ii) Open network editor through sim11 file

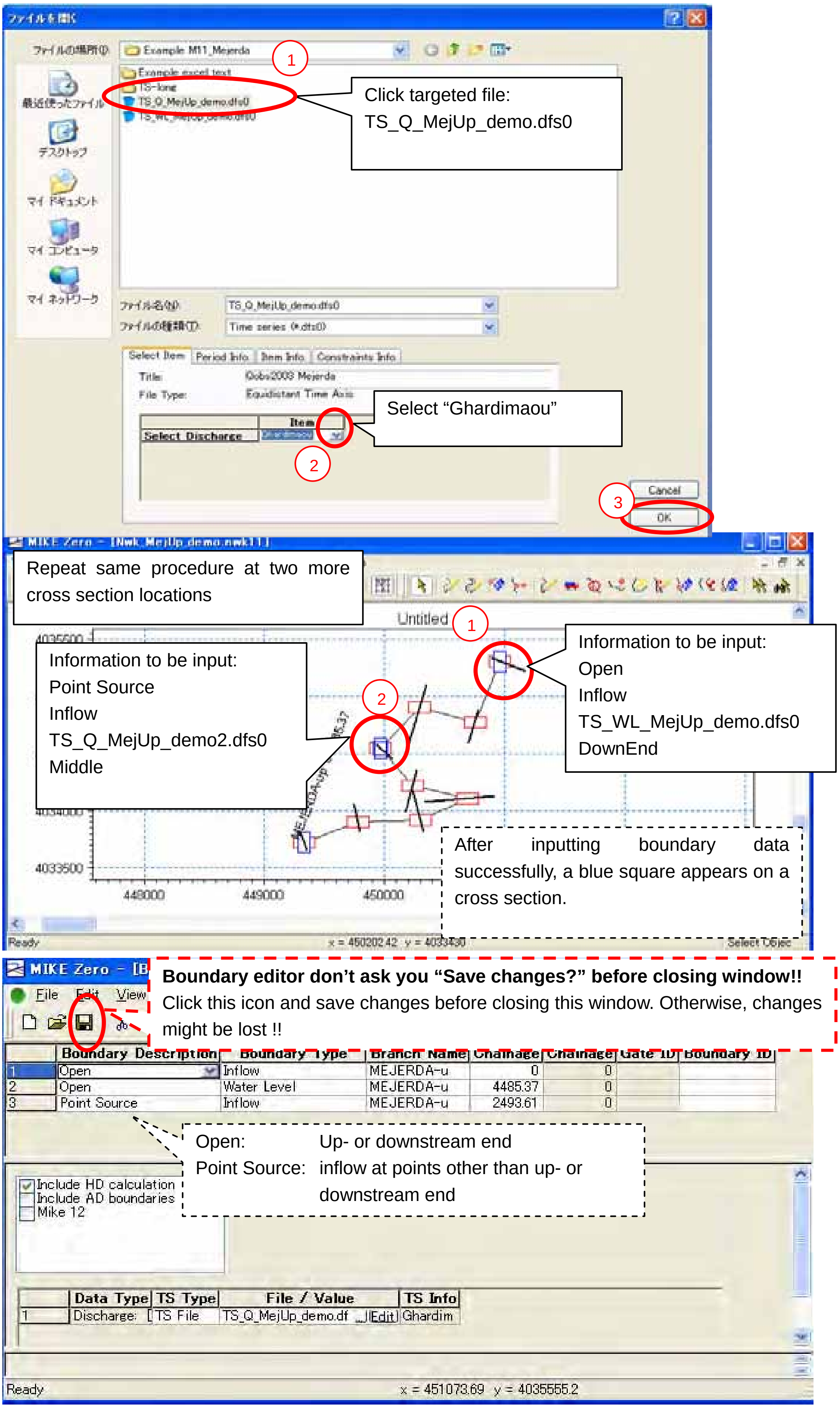




(ii) Input boundary data



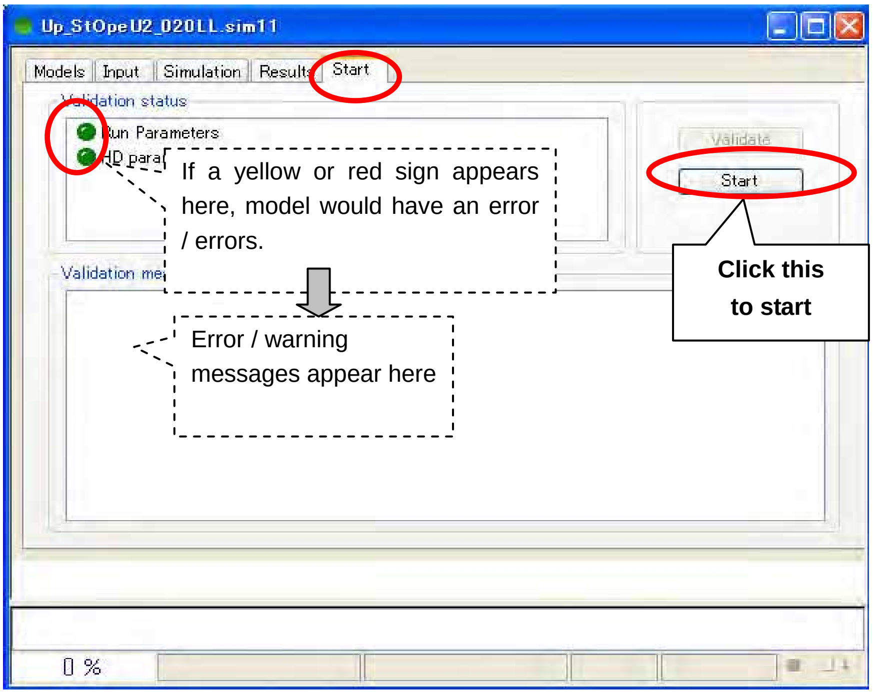




1
Click targeted file:
TS_Q_MejUp_demo.dfs0
Select "Ghardimaou"
2
3
Repeat same procedure at two more cross section locations
Information to be input:
Point Source
Inflow
TS_Q_MejUp_demo2.dfs0
Middle
Information to be input:
Open
Inflow
TS_WL_MejUp_demo.dfs0
DownEnd
After inputting boundary data successfully, a blue square appears on a cross section.
Boundary editor don't ask you "Save changes?" before closing window!!
Click this icon and save changes before closing this window. Otherwise, changes might be lost !!
Open: Up- or downstream end
Point Source: inflow at points other than up- or downstream end

AN1.8 Simulation

Open “Start” page of the sim11 file.



AN1.9 Viewing Result File

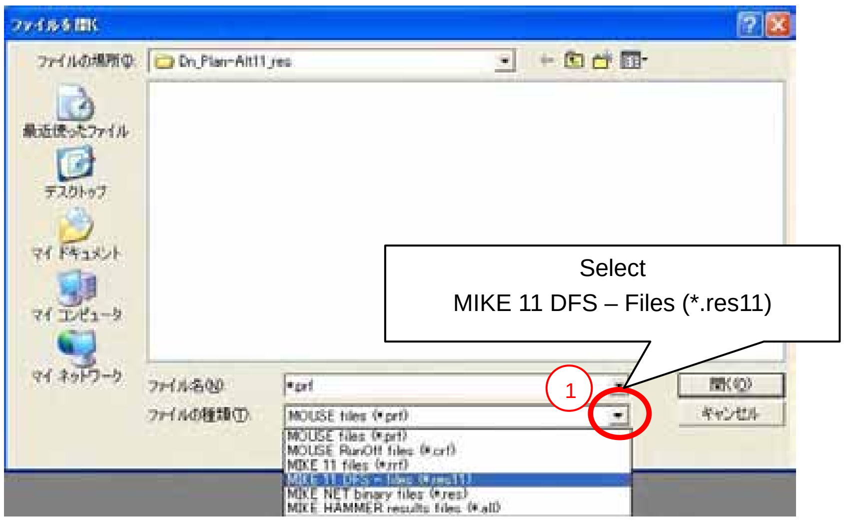
(1) File extension : *.res11

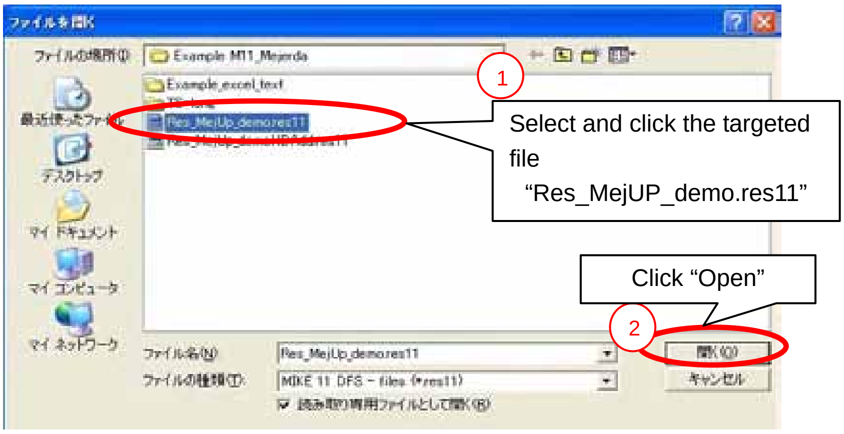
(2) Application used : MIKE VIEW

(3) Operations :

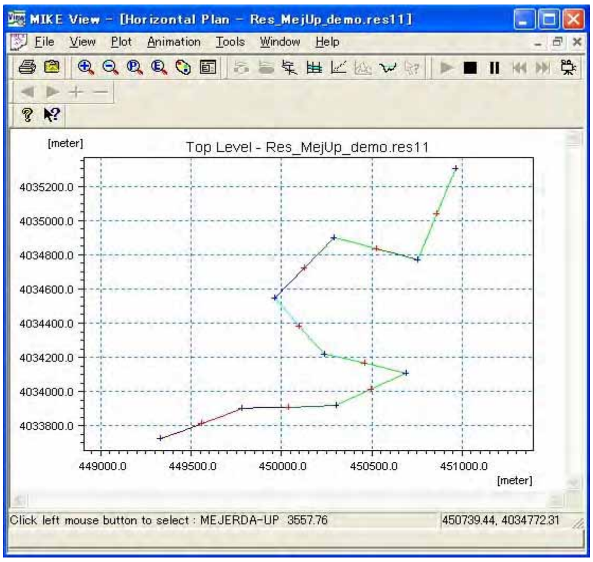
(i) Open a result file

[All Program] – [MIKE BY DHI] – [MIKE11] – [MIKE VIEW]

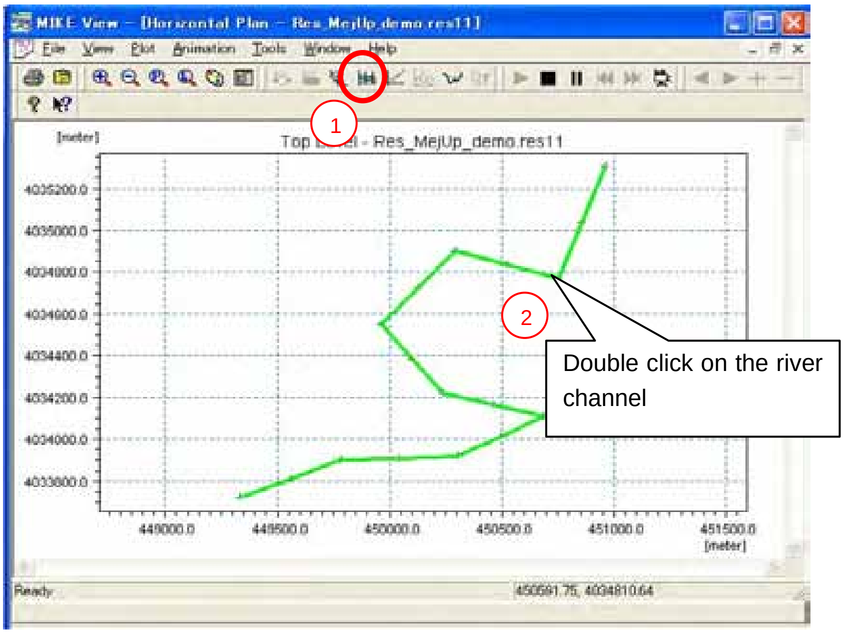




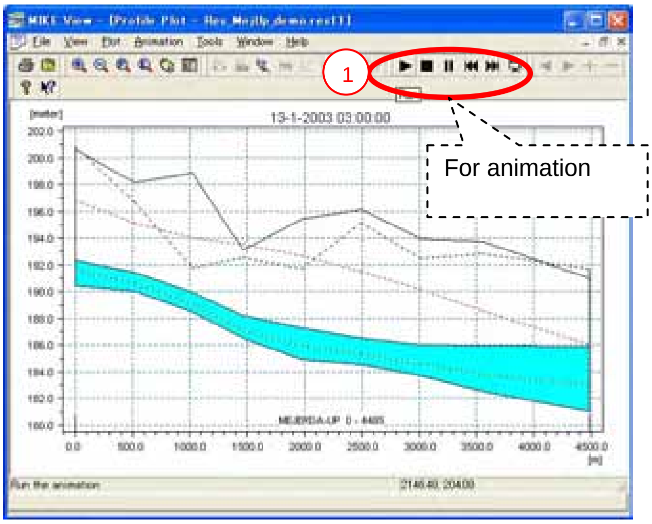
Click [OK] on next screen



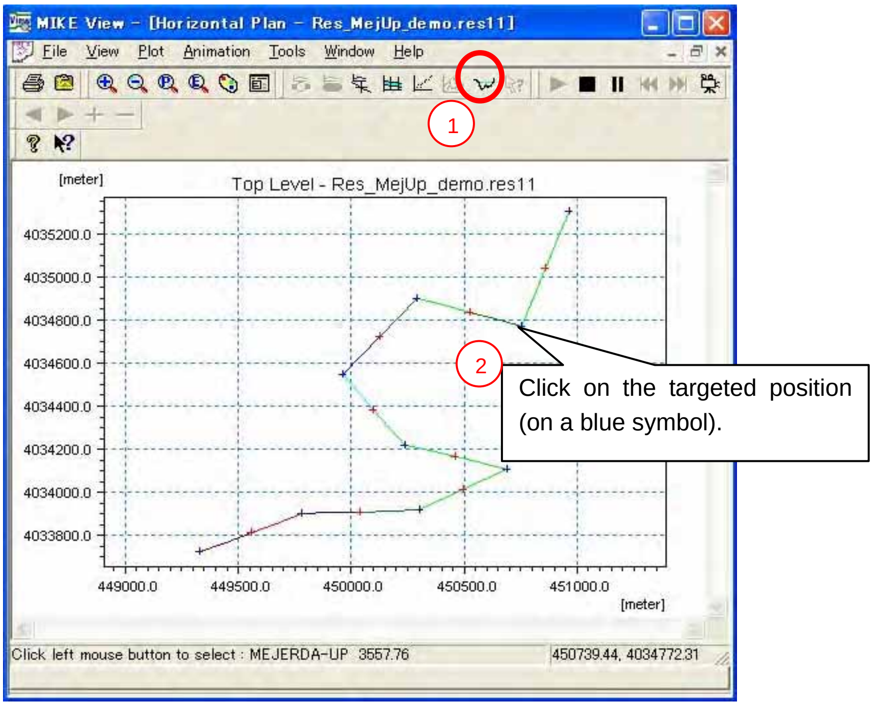
(ii) View profile

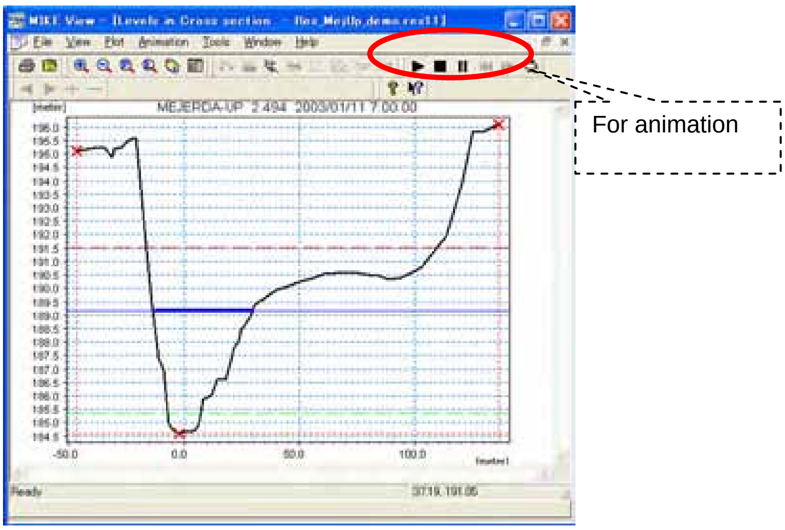


Click [OK] on next screen – Select "Water Level"

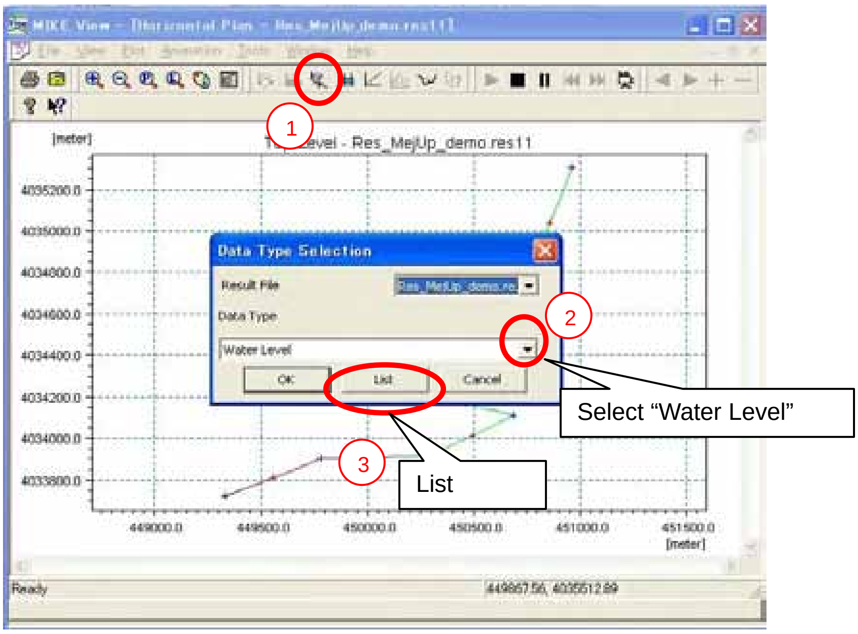


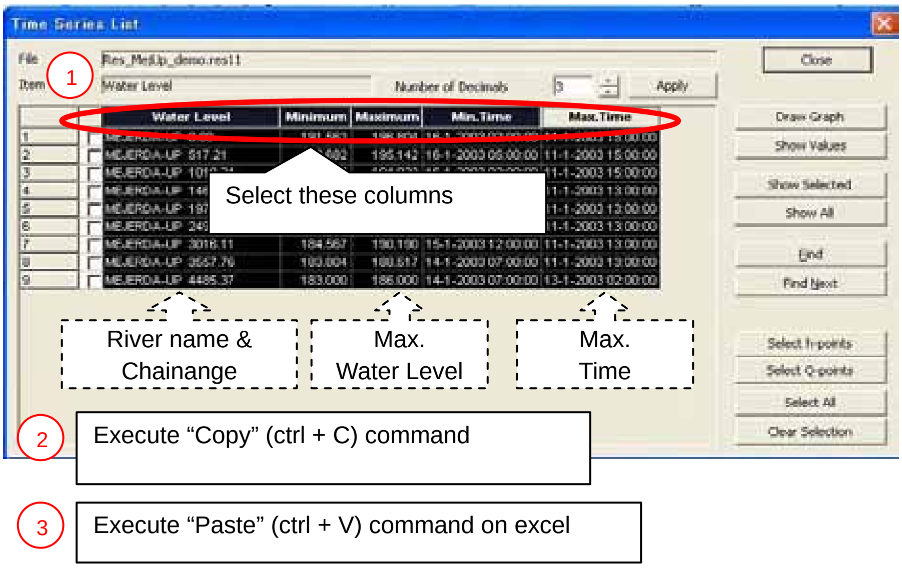
(iii) View cross section





(iii) Copy maximum water surface profile data to excel





	A	B	C	D	E
1	Water Level	Minimum	Maximum	Min.Time	Max.Time
2	MEJERDA-UP 0.00	191.563	196.804	16-1-2003 02:00:00	11-1-2003 15:00:00
3	MEJERDA-UP 517.21	190.682	195.142	16-1-2003 05:00:00	11-1-2003 15:00:00
4	MEJERDA-UP 1019.24	189.045	194.023	16-1-2003 02:00:00	11-1-2003 15:00:00
5	MEJERDA-UP 1465.72	187.051	193.5	16-1-2003 14:00:00	11-1-2003 13:00:00
6	MEJERDA-UP 1978.42	185.98	192.692	16-1-2003 02:00:00	11-1-2003 13:00:00
7	MEJERDA-UP 2493.61	185.335	191.509	15-1-2003 16:00:00	11-1-2003 13:00:00
8	MEJERDA-UP 3016.11	184.567	190.19	15-1-2003 12:00:00	11-1-2003 13:00:00
9	MEJERDA-UP 3557.76	183.804	188.517	14-1-2003 07:00:00	11-1-2003 13:00:00
10	MEJERDA-UP 4485.37	183	186	14-1-2003 07:00:00	13-1-2003 02:00:00

These data can be used for further analysis, including for making a water surface profile in excel.

Republic of Tunisia

The Study
on
Integrated Basin Management
Focused on Flood Control
in
Mejerda River

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

Presentation Material
for
Day 1 (4 June, 2008)

Purposes of Training

- Obtain basic information of the inundation analysis model for the Mejerda basin prepared under the JICA Study
- Acquire fundamental knowledge on how to operate the inundation analysis model prepared under the JICA Study using MIKE FLOOD

3

Contents of Training

- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of the Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version)
- Practices how to operate and update the Mejerda inundation analysis model

4

Contents of Today's Presentation (1/2)

Topic 1: What is MIKE FLOOD

- Outcomes of inundation analysis (What can be obtained form inundation analysis?)
- Functions of MIKE 11, MIKE 21 and MIKE FLOOD, and their relations
- Overall procedure of inundation analysis with MIKE FLOOD

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Contents of Today's Presentation (2/2)

Topic 2: Overview of the Mejerda Model

- Overall Structure of the Mejerda Model
- Major inputs for the Mejerda Model
- Simulation Cases for the Mejerda Model
- General idea on how to modify / update the Mejerda Model

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Topic 1:

What is MIKE FLOOD ?

What is MIKE FLOOD ?

Name of the software used for the inundation analysis under the JICA Study

before explaining the software..

Please see what can be obtained from the inundation analysis .....

Outcomes of inundation analysis
(What can be obtained form inundation analysis?)

Major outcomes of inundation analysis

INPUT
- Inflow Discharge
- Channel condition
- ... etc.

MIKE FLOOD Simulation

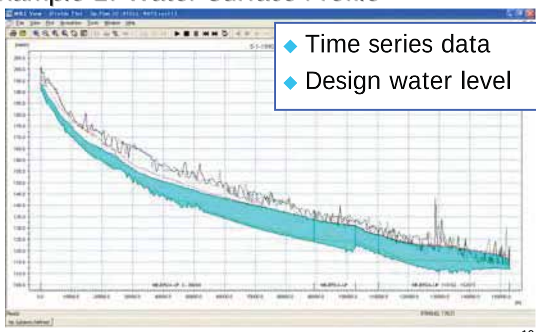
OUTPUT
- Water level
- Inundation Area
- ... etc.

Post-processing

- Water surface profile (Design water level)
- Inundation map
- The inundation area (Numerical data)

Outcomes of inundation analysis
(What can be obtained form inundation analysis?)

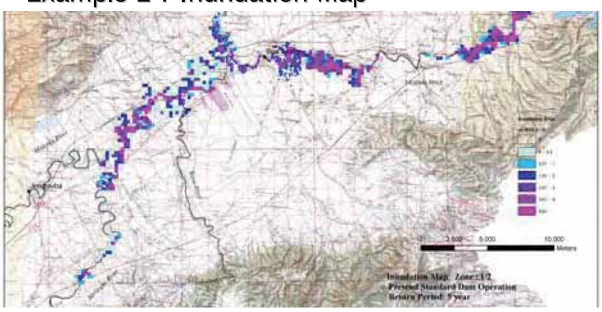
Example 1: Water Surface Profile



- Time series data
- Design water level

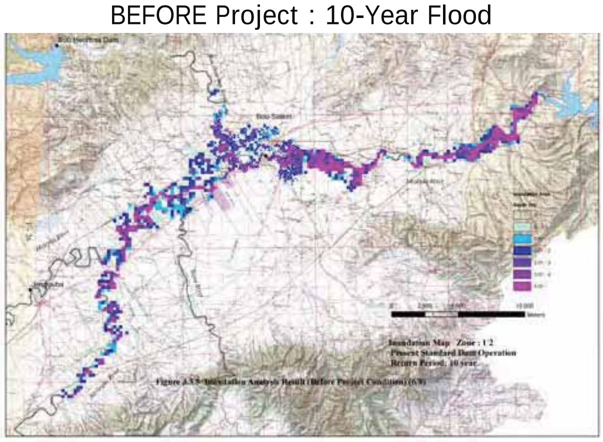
Outcomes of inundation analysis
(What can be obtained form inundation analysis?)

Example 2 : Inundation Map

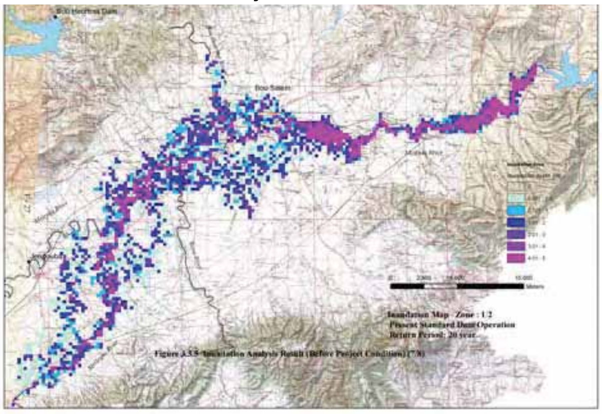


BEFORE Project : 5-Year Flood

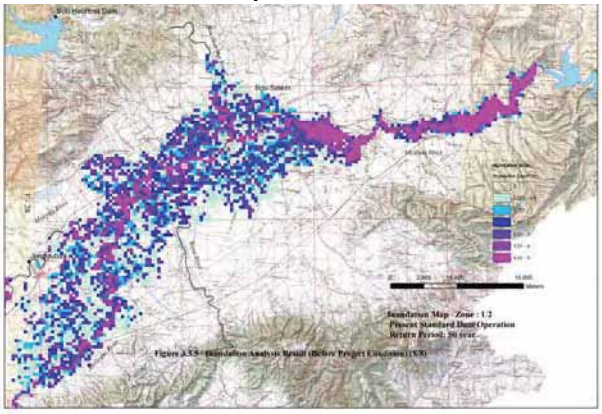
BEFORE Project : 10-Year Flood



BEFORE Project：20-Year Flood

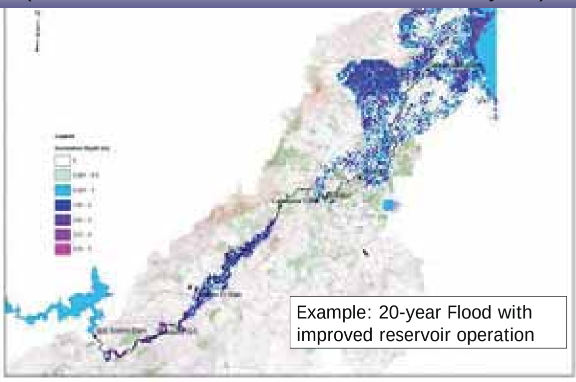


BEFORE Project：50-Year Flood



Outcomes of inundation analysis

(What can be obtained form inundation analysis?)



Example: 20-year Flood with improved reservoir operation

Outcomes of inundation analysis

(What can be obtained form inundation analysis?)

Example 3：Inundation Area (numerical data)

Unit：ha

Depth / Delegation	<0.5m	0.5-1m	1-2m	2-3m	3-4m
BEJA SUD	26	14	53	26	18
BOU SALEM	28	639	20	22	15
DOUAR HICHER	259	40	0	0	0
EL BATTANE	425	377	541	253	32
…..	…..	…..	…..	…..	…..

Note：Above table shows an example of data type only. The values in the table do not based on actual computations.

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MIKE 11, MIKE 21 and MIKE FLOOD

- MIKE FLOOD：Software used for the inundation analysis under the JICA Study
  - Unsteady & Two dimensional simulation
  - Commercial software produced by DHI (Danish company)
  - Combination of three applications：MIKE 11, MIKE 21 and MIKE FLOOD
    - MIKE 11：1-D analysis application } Independent software
    - MIKE 21：2-D analysis application } Independent software
    - MIKE FLOOD：Combine 1-D and 2-D Models

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MIKE 11, MIKE 21 and MIKE FLOOD

MIKE 11

- For one dimensional (1-D) hydraulic analysis
- Simulation of hydraulic conditions (water level, discharge, etc.) in river channels
- Unsteady analysis function available (Applied to the Mejerda Model)
- Similar software：HEC-RAS (by USACE)

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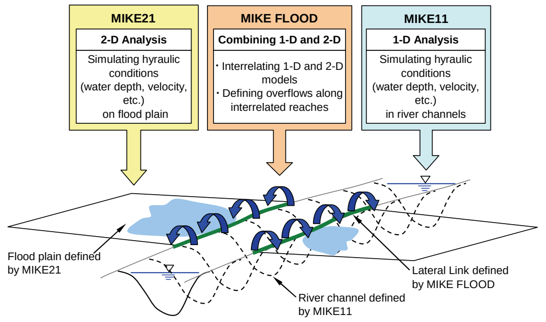
MIKE 11, MIKE 21 and MIKE FLOOD

MIKE 21

- For two dimensional (2-D) hydraulic analysis
- Simulation of hydraulic conditions (water level, velocity, etc.) on flood plain, in a gulf, or in estuary ... etc. (flow in grid data)

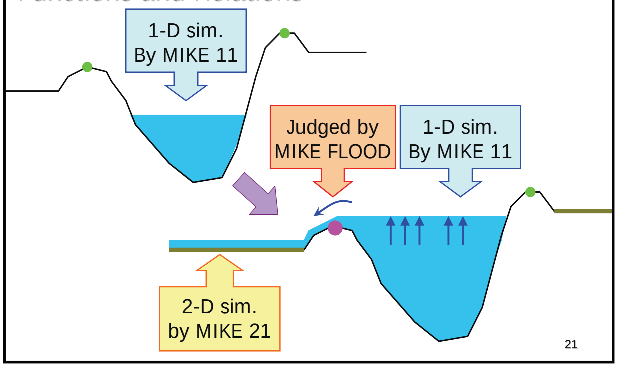
MIKE 11, MIKE 21 and MIKE FLOOD

Functions and Relations



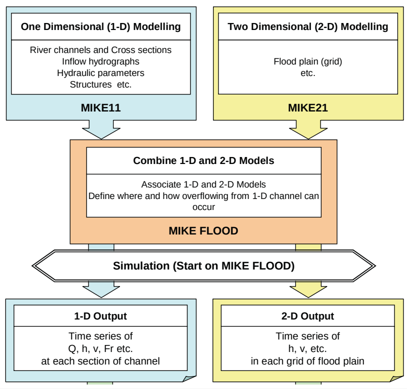
MIKE 11, MIKE 21 and MIKE FLOOD

Functions and Relations



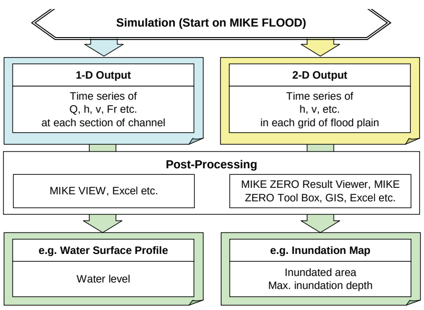
Overall Procedure of Inundation Analysis

Overall Procedure (1/2)



Overall Procedure of Inundation Analysis

Overall Procedure (2/2)



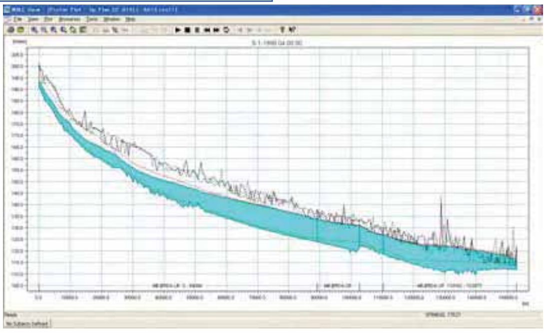
Overall Procedure of Inundation Analysis

Notes on the procedure:

- MIKE11 and MIKE21 models have to be completed before making the MIKE FLOOD model.
- MIKE FLOOD controls the start of the simulation only. Results are actually produced by MIKE 11 and MIKE 21.
- Post-processing procedures are necessary to develop required outcomes of the inundation analysis.

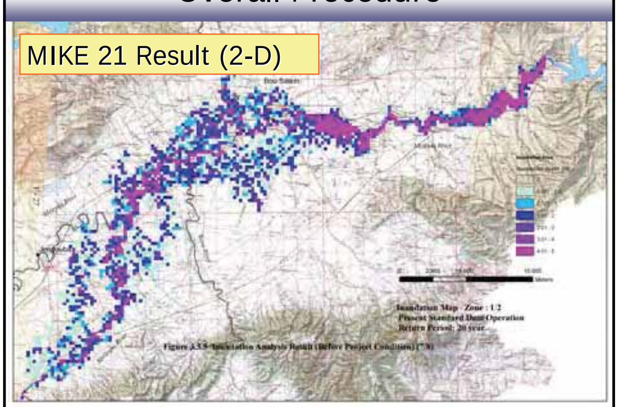
Overall Procedure

MIKE 11 Result (1-D)



Overall Procedure

MIKE 21 Result (2-D)



Topic 2:

Overview of the Mejerda Model

Contents of Today's Presentation (2/2)

Topic 2: Overview of the Mejerda Model

- Overall Structure of the Mejerda Model
- Major inputs for the Mejerda Model
- Simulation Cases of the Mejerda Model
- General idea on how to modify / update the Mejerda Model

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Overall Structure of the Mejerda Model

Mejeda Model

- **Upstream Model** (Upstream of Sidi Salem Dam)
  - MIKE 11 Model
  - MIKE 21 Model
  - MIKE FLOOD Model (Definition file)
- **Downstream Model** (Downstream of Sidi Salem Dam)
  - MIKE 11 Model
  - MIKE 21 Model
  - MIKE FLOOD Model (Definition file)

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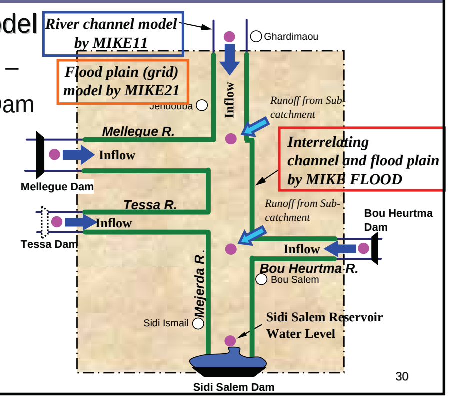
Overall Structure of the Mejerda Model

Upstream Model

- Ghardimaou – Sidi Salem Dam



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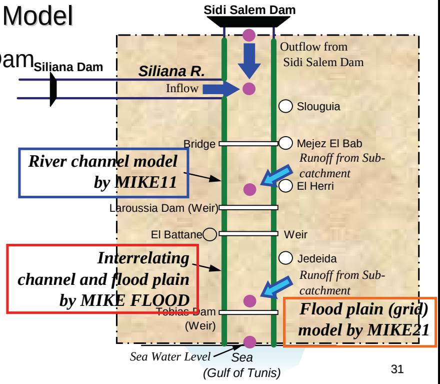
Overall Structure of the Mejerda Model

Downstream Model

- Sidi Salem Dam
  - – Estuary



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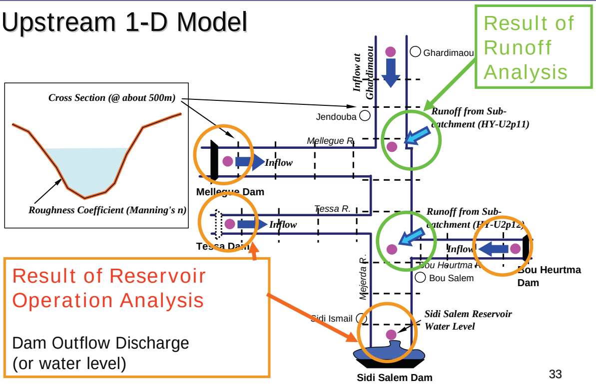
Purposes of Inundation Analysis
in the Mejerda JICA Study

- To clarify flood characteristics (flow direction, inundated area and depth, etc.) — Area, Location
- To examine and compare inundation BEFORE and AFTER project. — Effects & Impacts
  - Improvement of reservoir operation
  - Improvement of river channel conditions (Structural measures)
- To determine design water level for the master plan level of design

The simulation model should be built to fulfill these purposes.

Major Input for the Mejerda Model

Upstream 1-D Model



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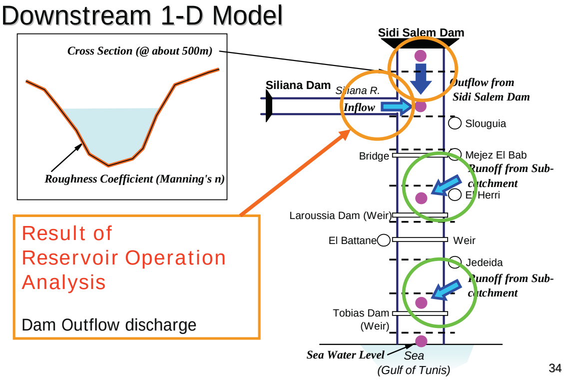
Major Input for the Mejerda Model

Downstream 1-D Model



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Major Input for the Mejerda Model

MIKE 11 Model

- Inflow to River Channel
  - Outflow from dams
  - Runoff from subcatchment
- Cross Section and Profile
  - Cross section (X, Y)
  - Cross section distances
  - Positions of cross sections (Coordinates)
  - Roughness coefficient

Reservoir Operation Analysis

Runoff Analysis

Topographic Survey

MIKE 21 Model

- Grid Elevation on Flood Plain

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Simulation Cases of the Mejerda Model

Alternative cases analyzed under the Study

Combinations of .....

- Probability of inflow
  - 5-year, 10-year, 20-year, 50-year
- River channel shape
  - Present condition
  - Design alternatives (Excavation, embankment)
- Inflow by different reservoir operation
  - Present standard operation
  - Improved dam operation

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Simulation Cases of the Mejerda Model

Selected Cases of the Mejerda Model

Zone	Probability	Flood Control Option
U1 (-Mel Conf.)	10-year fl.	Present
		Reservoir Operation
		Reservoir Operation + River Improvement
U2 (Mel. Conf.)	20-year fl.	Present
		Reservoir Operation
		Reservoir Operation + River Improvement
D1 & D2	10-year fl.	Present
		Reservoir Operation
		Reservoir Operation + River Improvement

Note : The above tables lists the selected cases. Many other cases with different probabilities, alternative design and other conditions were analyzed during the JICA Study.

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Simulation Cases of the Mejerda Model

Reservoir Operation Analysis

Flood Control Option	Reservoir Operation	River Channel
Present	Present standard operation	Present condition
Reservoir Operation	Recommended improved operation	Present condition
Reservoir Operation + River Improvement	Recommended improved operation	Planned (Master plan design by the JICA Study

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General Idea on How to Modify / Update the Mejerda Model

I want to modify/update ....

- Cross Section and Profile
  - Cross section shape (X, Y) (e.g. change design)
  - Positions of cross sections (Coordinates)
  - Roughness coefficient
  - Bridges, weirs, etc.

→ MIKE 11 Model

- Flood Plain Grid Data (eg. grid size, ground elevation. etc.)

→ MIKE 21 Model

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General Idea on How to Modify / Update the Mejerda Model

I want to modify/update ....

- How and where overflow occurs
  - Length of linked reaches, etc.

→ MIKE FLOOD Model

- Reservoir operation
  - Outflow from dams, etc.

→ go back to Reservoir Operation Analysis → MIKE 11 Model

Republic of Tunisia

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June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

Presentation Material
for
Lecture 2
(MIKE 11 Mejerda Model)

Contents of Training

- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of the Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version)
- Practices how to operate and update the Mejerda inundation analysis model

3

Contents of Presentation (1/2)

MIKE 11 Mejerda Model

- MIKE11 Model Structure
- MIKE11 Modelling Procedure
- Some Information of Input Files
  - Time Series File (**.dfs0)
  - Network File (**.nwk11)
  - Cross Section File (**.xns11)
  - Boundary File (**.bnd11)
  - Network File (**.nwk11) Structures
  - Simulation File (**.sim11)

4

Contents of Presentation (2/2)

- Example of Errors
- MIKE11 Model as a Part of MIKE FLOOD Model

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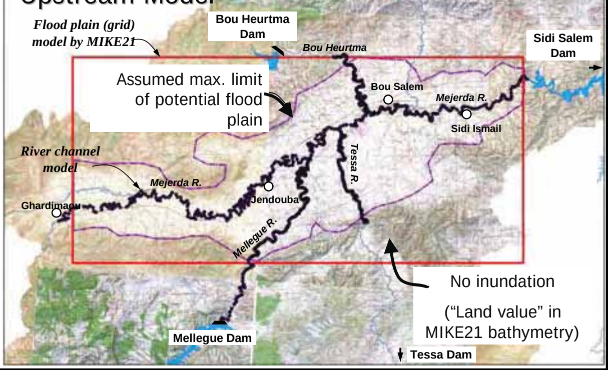
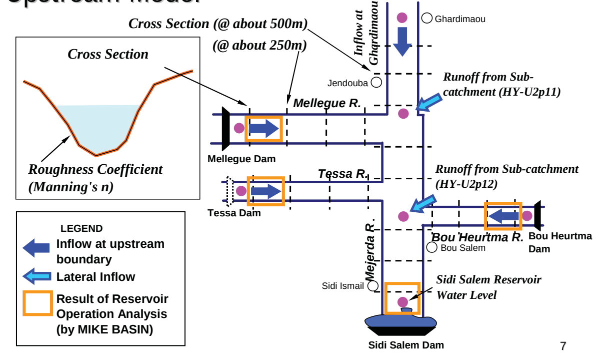
MIKE11 Model Structure

Upstream Model



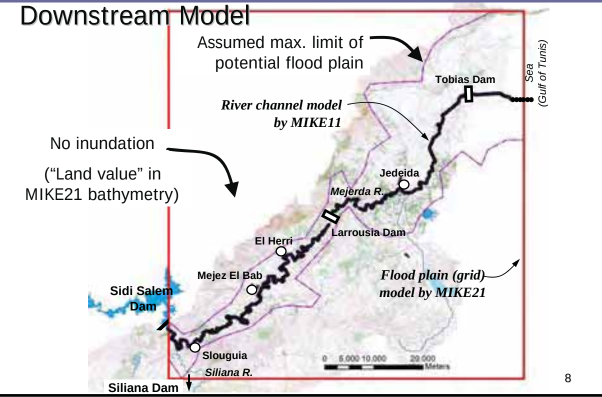
MIKE11 Model Structure

Upstream Model



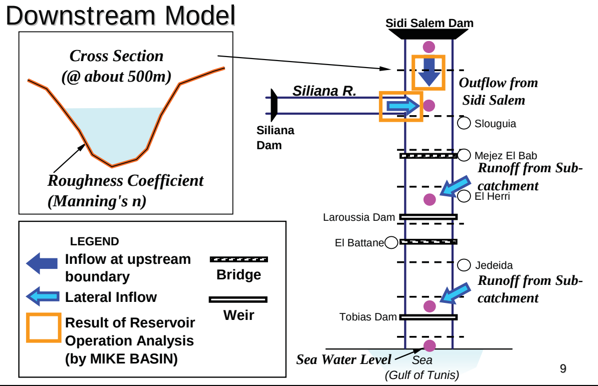
MIKE11 Model Structure

Downstream Model



MIKE11 Model Structure

Downstream Model

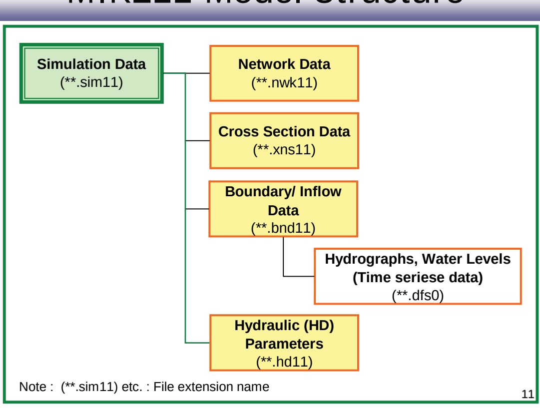


MIKE11 Model Structure

As a part of MIKE FLOOD model, MIKE11 Mejerda Model was designed so that....

- The model covers river reaches located on the potential flood plain (corresponding to MIKE21 bathymetry).
- Upstream and downstream ends of river channels are located outside of the potential flood plain.
- The river channel model contains the Mellegue, Bou Heurtma and Tessa rivers which are connected to selected seven dams in order to evaluate effects of reservoir operation improvement on inundation in downstream areas.

MIKE11 Model Structure



MIKE 11 Modelling Procedure

1. Preparing time series file (*.dfs0)
2. Preparing network file (*.nwk11)
3. Preparing cross section file (*.xns11)
4. Preparing Hydrodynamic file (*.hd11)
5. Preparing boundary file (Empty, *.bnd11)
6. Preparing simulation file (*.sim11)
7. Inputting boundary data (*.bnd11)
8. Test simulation 1 (*.sim11)
9. Inputting structure data (*.nwk11)
10. Test simulation 2 (*.sim11)
11. Viewing result file (*.res11, MIKE VIEW)

MIKE 11 Modelling Procedure

Prepare River Channel Model

↓

Test Simulation 1 ← To detect errors in a river channel model

↓

Input Structure data (weir, etc.)

↓

Test Simulation 2 ← To confirm MIKE11 model has no error prior to building a MIKE FLOOD model

↓

MIKE FLOOD Modelling

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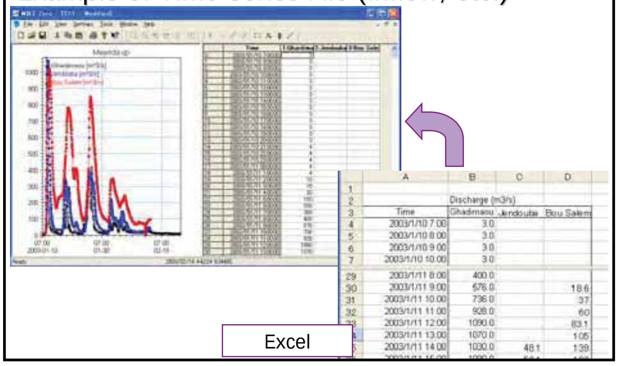
Time Series File (**.dfs0)

Example of Time Series File (inflow, etc.)



Time Series File (**.dfs0)

Time Series Data for Mejerda Model

- Hourly data are used.
- Time series data starts from 1st Jan, 1990 at 7:00 and covers simulation period (18 days). (The year 1990 has no meaning, but just be same to all time series files.)
- Reservoir operation and runoff analysis results (input data for MIKE11) were organized in one column in Excel so as to correspond to the MIKE time series file format.

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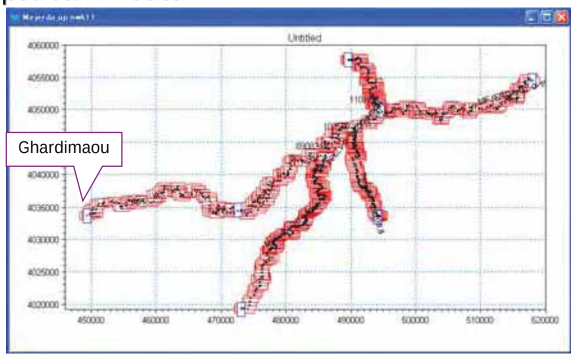
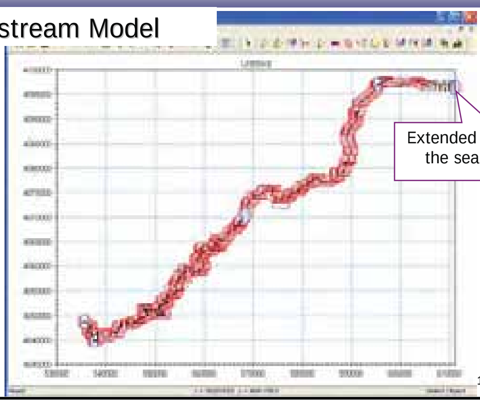
Network File (**.nwk11)

Upstream Model



Network File (**.nwk11)

Downstream Model



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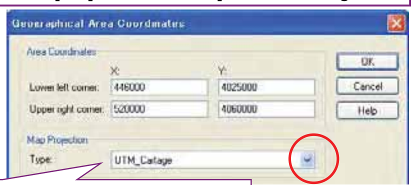
Network File (**.nwk11)

Geographical Coordinate

Opening window of a new nwk11 file
or [Network] – [Resize Area...] in an existing file



[Brows…"] – [D_Carthage] –
[Carthage_UTM_Zone_32N]

(or select UTM_Carthage)

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Network File (**.nwk11)

As a part of MIKE FLOOD Model

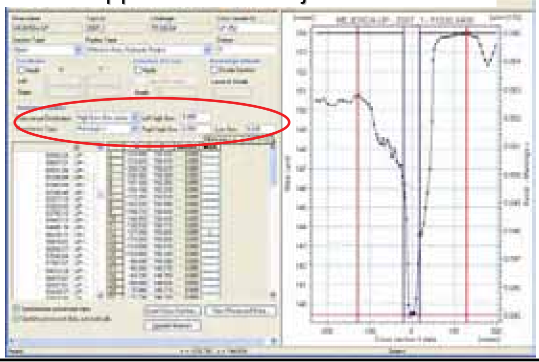
- Coordinate system applied to MIKE 11 Network file should be consistent with the one in MIKE 21 and GIS etc.. (be careful with coordinates in topographic survey results)

Carthage_UTM_Zone_32N
- Transversal Mercator
- Ellipsoid: Clarke_1880_IGN
- Central meridian : 9 º
- False easting : 500000

MIKE FLOOD Model = MIKE 11 + MIKE21
Inundation Map = MIKE21 Results + Topo Map

Cross Section File (**.xns)

Resistance Applied to the Mejerda Model



Cross Section File (**.xns)

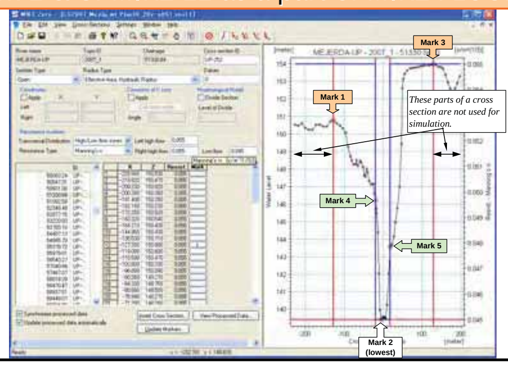
Resistance Applied to the Mejerda Model

Parameter	Selection / Value
Transversal distribution	High/Low flow zones
Resistance Type	Manning's n
Left high flow	0.055
Right high flow	0.055
Low flow	0.045

Calibration using H-Q data at Major Gauging stations

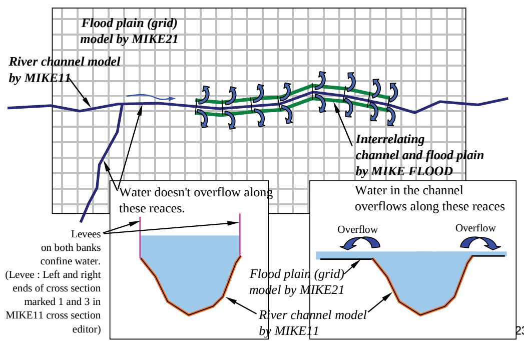
Cross Section File (**.xns11)

Mark 1 & 3: MIKE 11 as a part of MIKE FLOOD

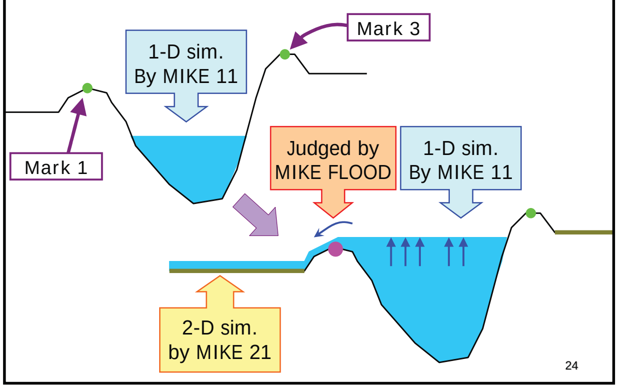


Cross Section File (**.xns11)

Mark 1 & 3: MIKE 11 as a part of MIKE FLOOD



Cross Section File (**.xns11)



Cross Section File (**.xns11)

Mark 1 & 3: MIKE 11 as a part of MIKE FLOOD

- In the Mejerda Model, chainages of "overflowing reaches" changes according to the case (present, alternatives of river improvement).
- Hence, even at the same cross section, positions of marks 1 and 3 could differ according to the case.
  - Before project : Overflow
  - After project : No overflow (with levees)

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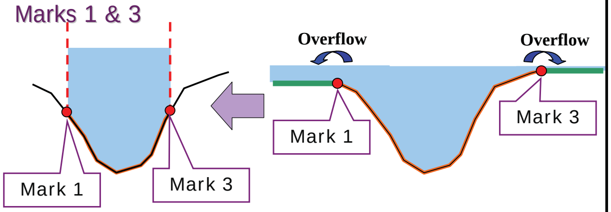
Cross Section File (**.xns11)

Mark 1 & 3: MIKE 11 as a part of MIKE FLOOD

Same cross section, but Different positions of Marks 1 & 3



- Future (after Project)
  - with levees
- Present (before Project)
  - no levee

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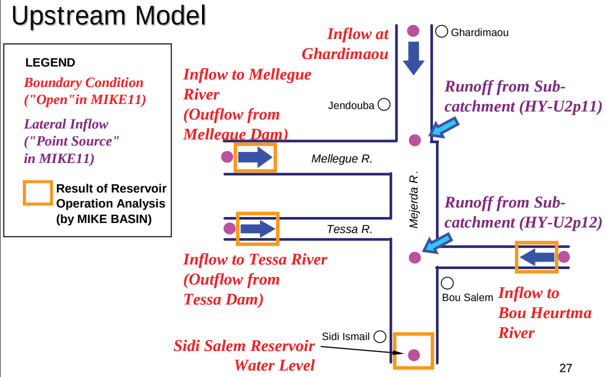
Boundary File (**.bnd11)

Upstream Model



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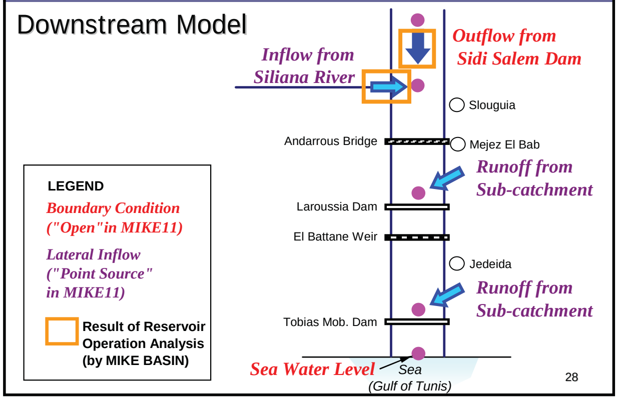
Boundary File (**.bnd11)

Downstream Model



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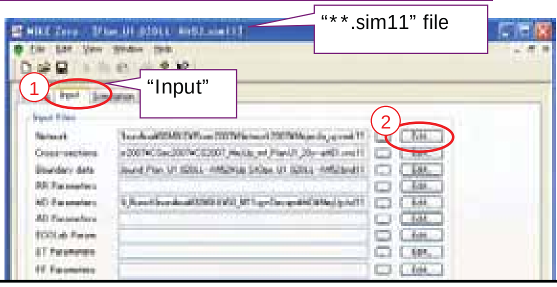
Boundary File (**.bnd11)

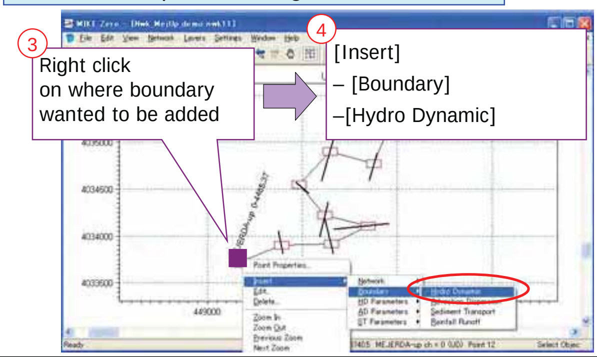
How to Input Boundaries in Network File (1/3)

Open Network File (nwk11) through Simulation file (sim11)



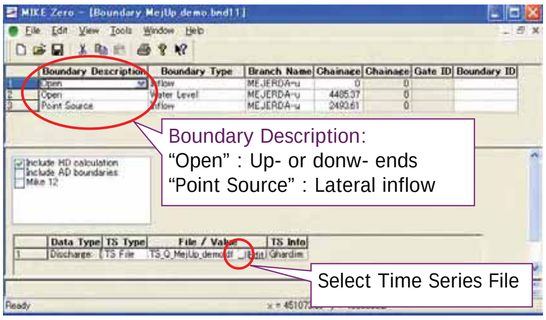
Boundary File (**.bnd11)

Network File opened through Simulation File



Boundary File (**.bnd11)

This page appears. (Bounary File)



Network File (**.nwk11) Structures

Structures (Bridges and Weirs)

- All river crossing structures (bridge, weir) were considered. (←Cross sectional survey results)
- Water surface profiles and flow capacities of all structure sites were checked by non-uniform analysis (by HEC-RAS) before making MIKE11 model.
- Structures showing significant impacts on river flow were identified and included in the MIKE11 model.
  - Add "Structure" in MIKE 11 Model
  - Reflect on cross section shapes (e.g. Consider effective area)

Network File (**.nwk11) Structures

Structures considered in MIKE 11 Model

Upstream	Bridge over Bou Heurtma River near the confluence with the Mejerda
Downstream	Andarrous Bridge at Mejez El Bab Larrousia Dam El Battane weir Tobias Mobile Dam Old Bridge at Jedeida Other weirs crossing riverbed, such as a weir at the El Herri pumping station

input in MIKE 11 Model as "Structure"

Considered in cross section shape. Can be input as "Structure" at detailed design stage.

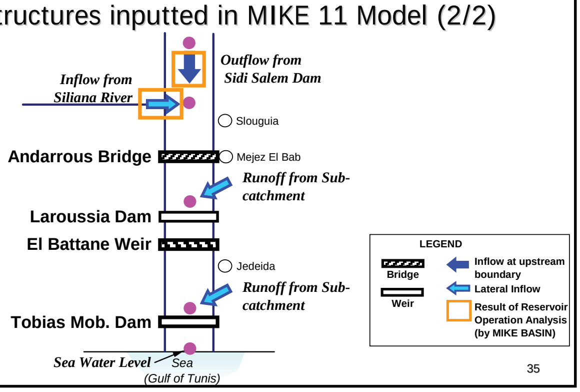
Network File (**.nwk11) Structures

Structures input in MIKE 11 Model (1/2)

Structure Name	Structure Type in MIKE 11
Andalous Bridge (at Mejez El Bab)	Bridge (+ Weir and Culvert)
El Battan Weir	Bridge (+ Weir and Culvert)
Larrousia Dam	Weir
Tobias Mobile Dam	Weir

Network File (**.nwk11) Structures

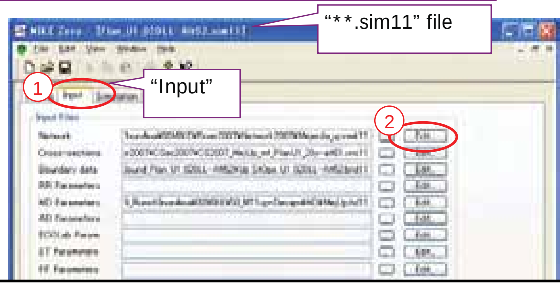
Structures inputted in MIKE 11 Model (2/2)



Network File (**.nwk11) Structure

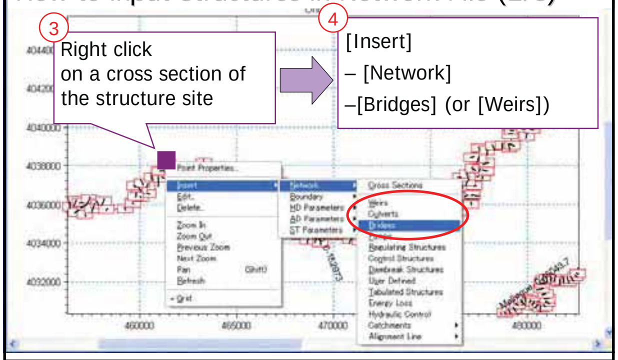
How to input Structures in Network File (1/3)

Open Network File (nwk11) through Simulation file (sim11)



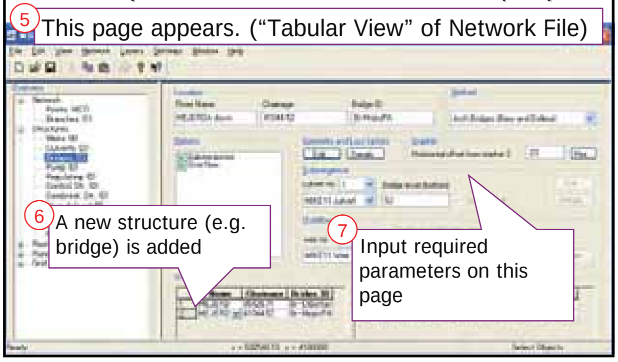
Network File (**.nwk11) Structure

How to input Structures in Network File (2/3)



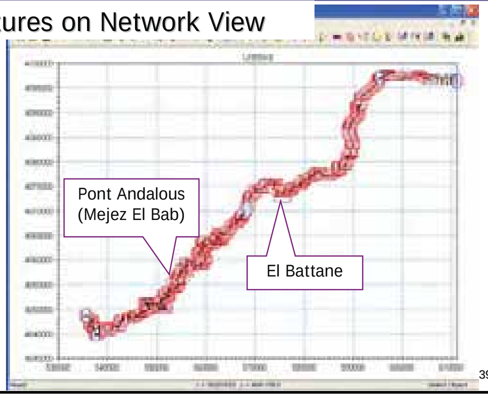
Network File (**.nwk11) Structures

How to input Structures in Network File (3/3)



Network File (**.nwk11) Structures

Structures on Network View



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Network File (**.nwk11) Structures

"Weir" in MIKE11 Mejerda Model (1/2)

- Larrousia Dam
- Tobias Mobile Dam

- Broad Crested Weir
- Opening geometry
  - Cross section or HxB
  - Crest elevation

Topographic Survey Results (Cross Section)

Existing Drawings

- Simulation Condition : All gates are fully opened during the major flood.

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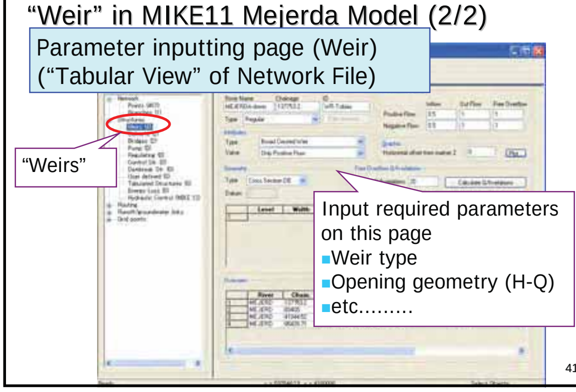
Network File (**.nwk11) Structures

"Weir" in MIKE11 Mejerda Model (2/2)



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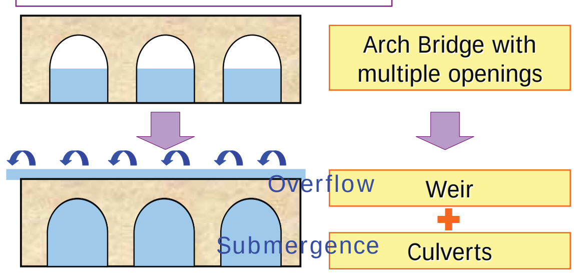
Network File (**.nwk11) Structures

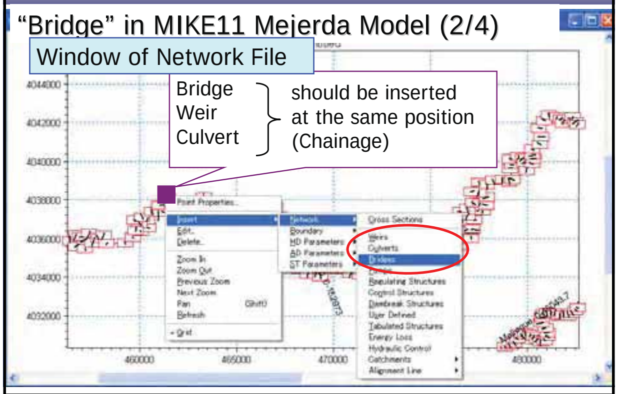
"Bridge" in MIKE11 Mejerda Model (1/4)

- Andalous Bridge (Mejez El Bab)
- El Battan Weir



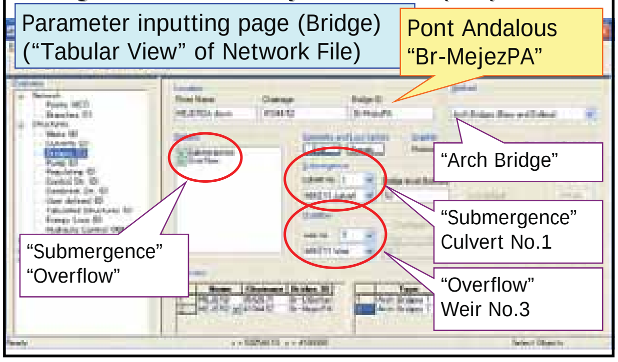
Network File (**.nwk11) Structure

"Bridge" in MIKE11 Mejerda Model (2/4)



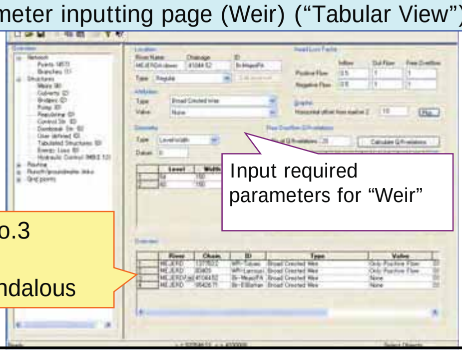
Network File (**.nwk11) Structures

"Bridge" in MIKE11 Mejerda Model (3/4)



Network File (**.nwk11) Structures

"Bridge" in MIKE11 Mejerda Model (4/4)



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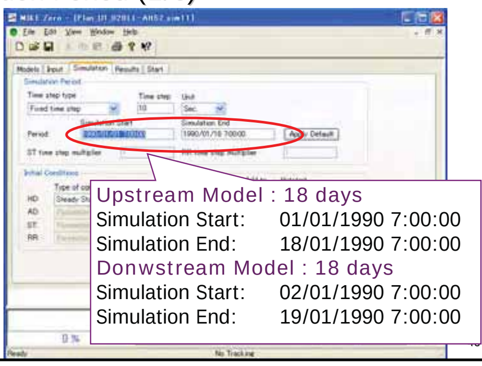
Simulation File (**.sim11)

Simulation Period (1/3)



Simulation File (**.sim11)

Simulation Period (2/3)

- According to the duration of inflow hydrographs...
- Simulation period should cover the duration of a flood peak + α
  - Mejerda basin : One peak of flood could last more than ten days due to natural runoff and an effect of dam operation, especially in downstream areas.
  - Require simulation period was determined to be long enough.

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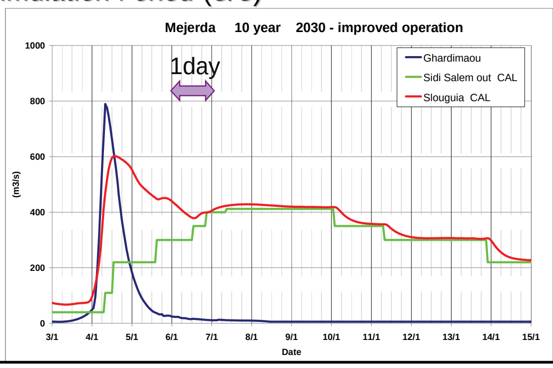
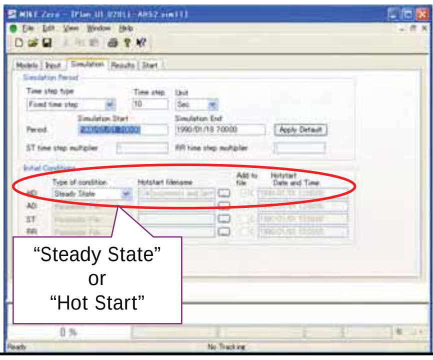
Simulation File (**.sim11)

Simulation Period (3/3)



Simulation File (**.sim11)

Initial Condition ("Steady State" or "Hot Start") (1/4)



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Simulation File (**.sim11)

Initial Condition ("Steady State" or "Hot Start") (2/4)

- Steady State
  - Starting simulation from the steady condition (Water depth or discharge specified in HD file)
- Hot Start
  - Starting simulation from the last step of the previous simulation.

01/Jan. 7:00 | 09/Jan. 7:00 | 18/Jan. 7:00

Simulation 1 | Simulation 2

Steady State | Hot Start

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Simulation File (**.sim11)

Initial Condition ("Steady State" or "Hot Start") (3/4)

01/Jan. 7:00 — 09/Jan. 7:00

Simulation 1

Result File 1

09/Jan. 7:00 — 18/Jan. 7:00

Simulation 2

Hot Start File = Result File 1

Result File for entire simulation period

Initial Condition = result at 09/Jan 7:00

Results after 09/Jan 7:00 are added to the result file

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Simulation File (**.sim11)

Initial Condition ("Steady State" or "Hot Start") (4/4)

- "Hot Start" is useful **As a part of MIKE FLOOD Model**
  - One simulation of a MIKE FLOOD model often requires significantly long time (a half day or more), because of the MIKE21 simulation.
  - Dividing a simulation into two could give a chance to check results at the middle of simulation.
  - "Hot Start" file could save a half of results, even if unexpected termination of the simulation occurs at nearly end of the required simulation period.

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Example of Errors

- Test simulation 1 : To detect errors in a river channel model before adding structures (e.g. bridge)
  - Inappropriate time step (usually too large) = divergence of computation (c.f. Time step for Mejerda Model: 10s)
  - Wrong marking (Marks 1, 2, 3, 4 and 5)
  - Wrong Manning's number, etc.
- Test simulation 2 : To confirm that the MIKE 11 model (with structure) has no error prior to building a MIKE FLOOD model
  - Inappropriate time step : Presence of structures often necessitates smaller simulation time step, etc.

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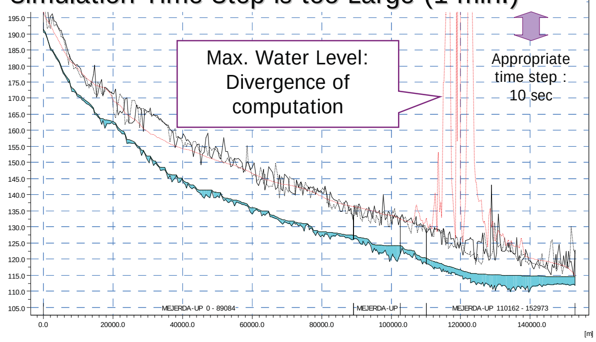
Example of Errors

Simulation Time Step is too Large (1 min.)



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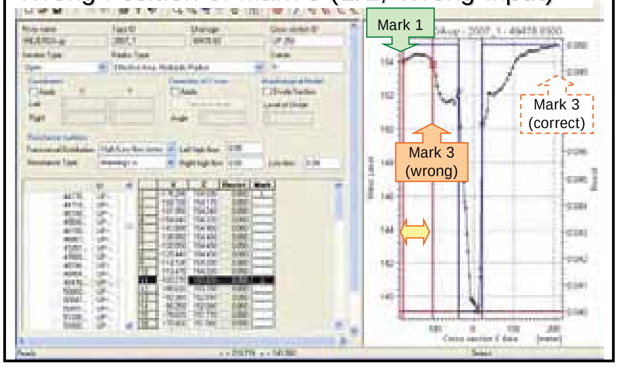
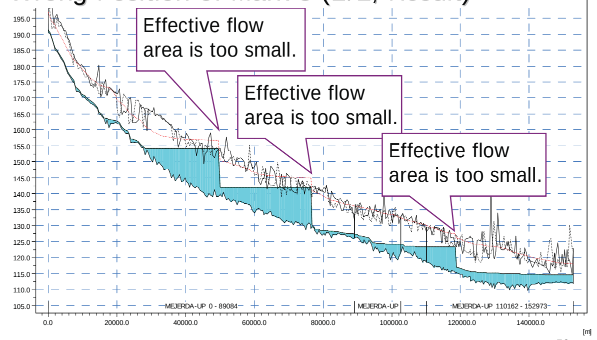
Example of Errors

Wrong Position of Mark 3 (1/2, Wrong input)



Example of Errors

Wrong Position of Mark 3 (2/2, Result)



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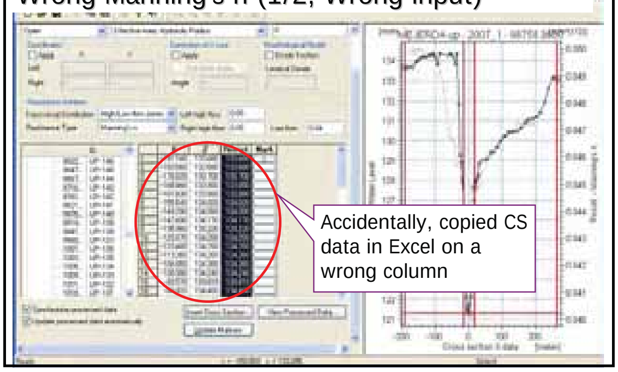
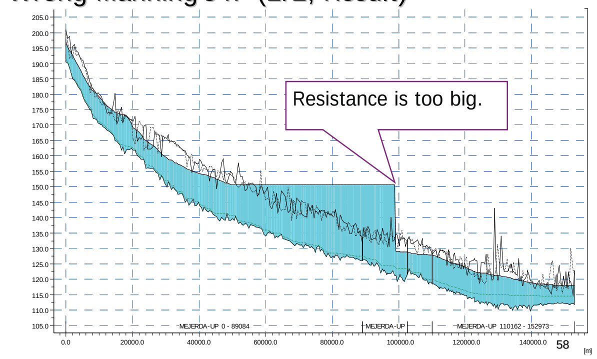
Example of Errors

Wrong Manning's n (1/2, Wrong input)



Example of Errors

Wrong Manning's n (2/2, Result)



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Example of Errors

- Evaluation of simulation results are important!!

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MIKE 11 Model as a part of MIKE FLOOD Model

- Positions of Marks 1 and 3 on a cross section should carefully be selected.
- Geographical coordinate system in MIKE 11 model should be consistent with the ones in MIKE 21 (and GIS data) files.
- Simulation time step and period should be consistent with the one in MIKE21.
- "Steady State" or "Hot Start" of simulation should be selected according to the time required for the simulation of MIKE FLOOD (MIKE 21) Model.

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Personal Comments

- MIKE FLOOD is applied to the inundation analysis for the Mejerda River basin, because 2-D analysis wanted to be employed, especially for Bou Salem and downstream areas.
- However, in many cases, (if inundation areas have the limited extent) 1-D analysis is already a useful method to discuss flood conditions.
- For 1-D analysis, other software, such as HEC-RAS (FREE software), could also be a strong tool instead of MIKE11.

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Republic of Tunisia

The Study
on
Integrated Basin Management
Focused on Flood Control
in
Mejerda River

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

Presentation Material
for
Lecture 3
(MIKE 21 Mejerda Model)

Contents of Training

- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of the Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version)
- Practices how to operate and update the Mejerda inundation analysis model

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Contents of Presentation

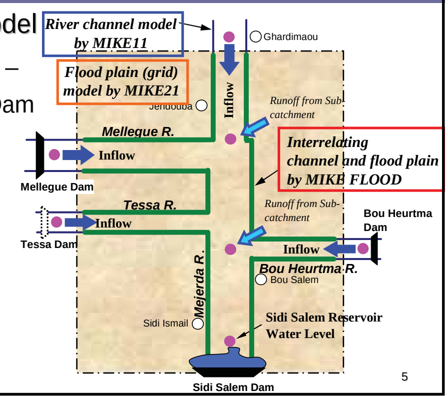
MIKE 21 Mejerda Model

- Overall Structure of the Mejerda Model
- Structure of MIKE 21 Mejerda Model
- Bathymetry File
- Simulation “Cold Start” or “Hot Start”
- MIKE 21 Model as a part of MIKE FLOOD Model
- Post Processing MIKE21 Results

Overall Structure of the Mejerda Model

Upstream Model

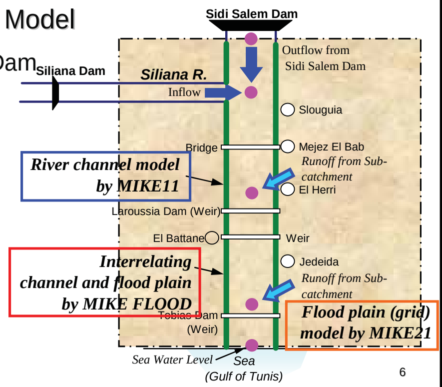
- Ghardimaou – Sidi Salem Dam



Overall Structure of the Mejerda Model

Downstream Model

- Sidi Salem Dam – Estuary



Structure of MIKE 21 Mejerda Model

Flow Model File (Simulation file) (**.m21)

Bathymetry File (Topography 2-D grid data) (**.dfs2)

Structure of MIKE 21 Model as a part of Mejerda MIKE FLOOD MODEL

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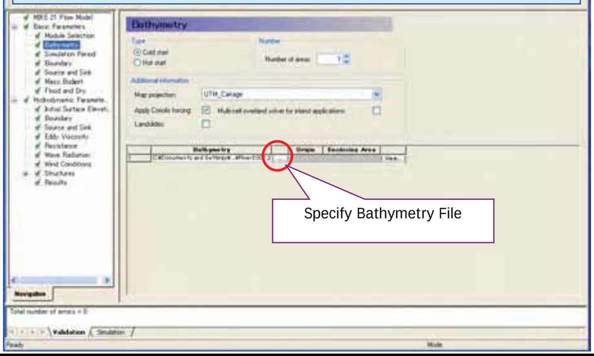
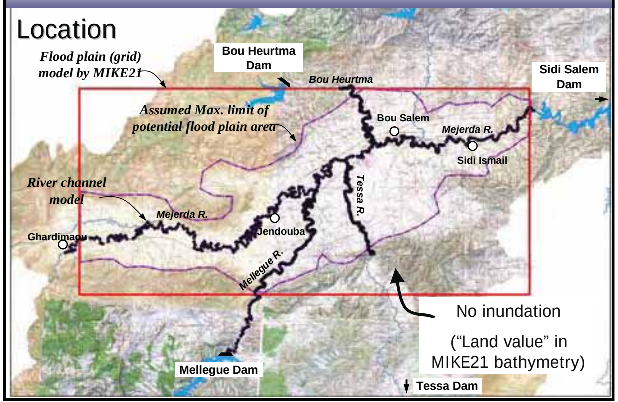
Structure of MIKE 21 Mejerda Model

Simulation File [Basic Parameters] – [Bathymetry]

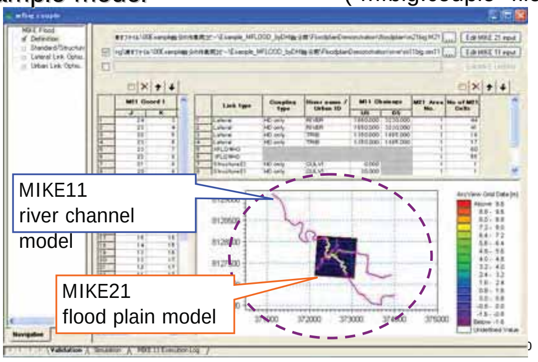


Bathymetry File (Upstream Model)

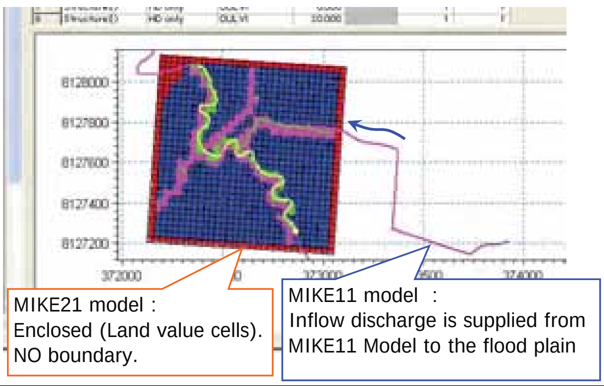


Bathymetry File

sample model ("mfbig.couple" file)



Bathymetry File



Bathymetry File

- Bathymetry for the Mejerda Model was prepared to cover the maximum limit of potential inundation area.
- Bathymetry (except land value) was designed to be within the extent of MIKE11 Model
- One grid = Square
  → Bathymetry should be a square shape. (including "land value")

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Bathymetry File

- Boundary conditions (inflow discharges and downstream water level) of a MIKE FLOOD Model area controlled by MIKE11.

→ Bathymetry boundaries were designed to be closed, in principle. (except downstream end of the downstream model)

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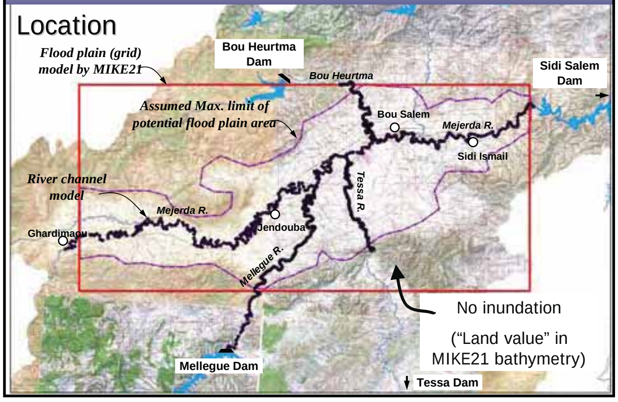
Bathymetry File (Upstream Model)

Location

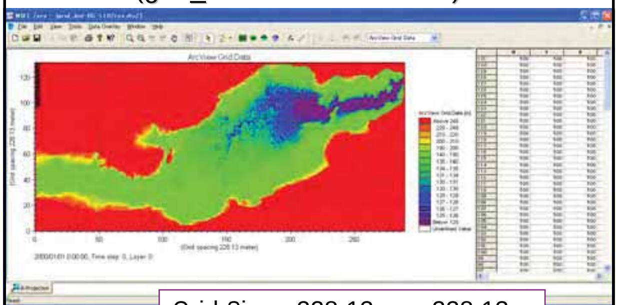


No inundation

("Land value" in MIKE21 bathymetry)

Bathymetry File (Upstream Model)

dfs2 File (grid_Jnd-BS-LL02rev.dfs2)



Grid Size : 228.13 m x 228.13 m

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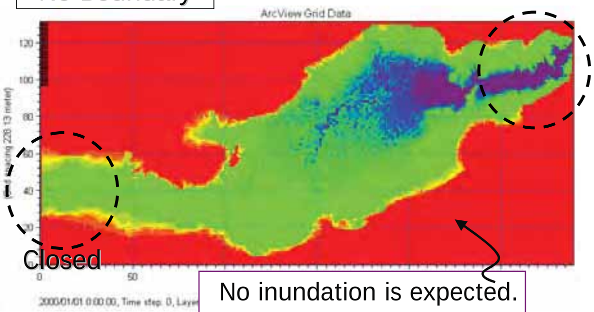
Bathymetry File (Upstream Model)

No Boundary

Closed



Closed

No inundation is expected.
"Land value" = 500 (NGTm)

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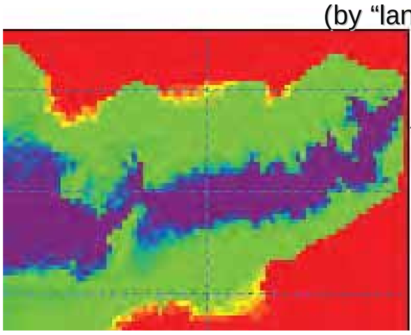
Bathymetry File (Upstream Model)

Closed Boundary
(by "land value" 500)



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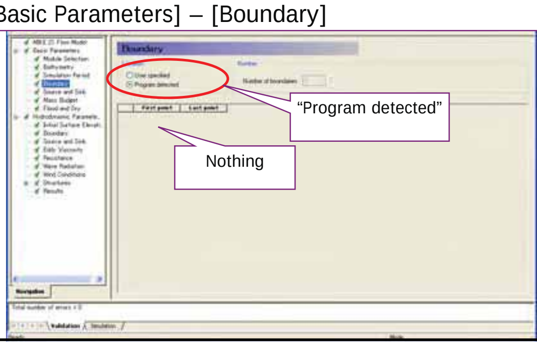
Bathymetry File (Upstream Model)

MIKE21 Simulation File (**.m21)

[Basic Parameters] – [Boundary]



"Program detected"

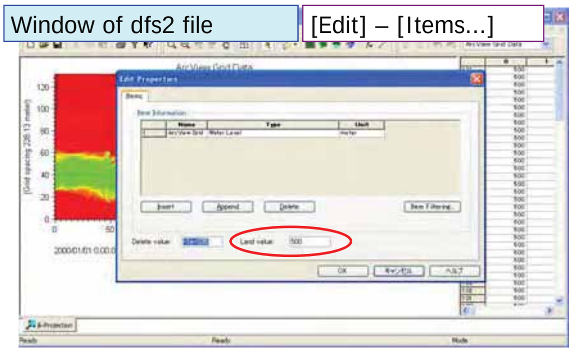
Nothing

Bathymetry File (Upstream Model)

Setting Land Value

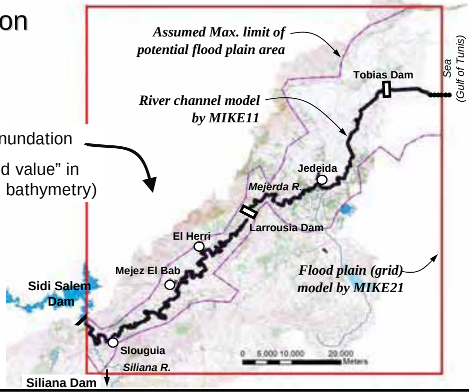
Window of dfs2 file

[Edit] – [Items…]



Bathymetry File (Downstream Model)

Location



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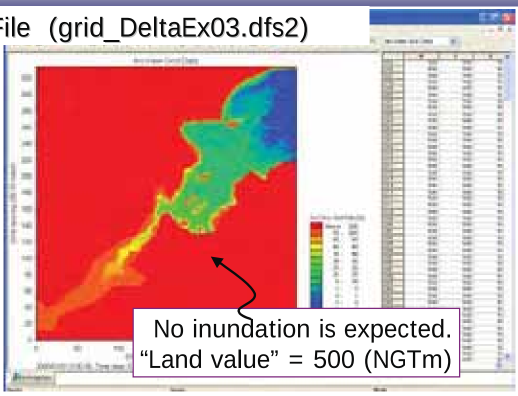
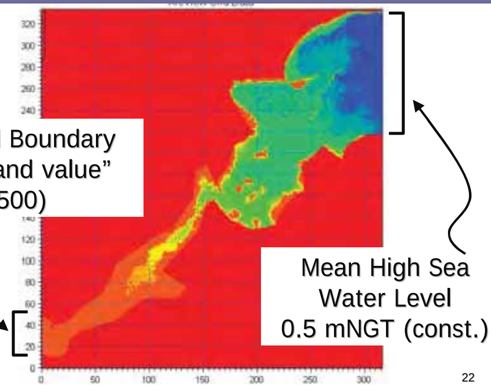
Bathymetry File (Downstream Model)

dfs2 File (grid_DeltaEx03.dfs2)



Bathymetry File (Downstream Model)



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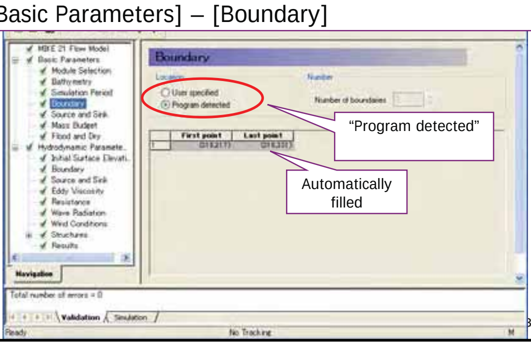
Bathymetry File (Downstream Model)

MIKE21 Simulation File (**.m21)

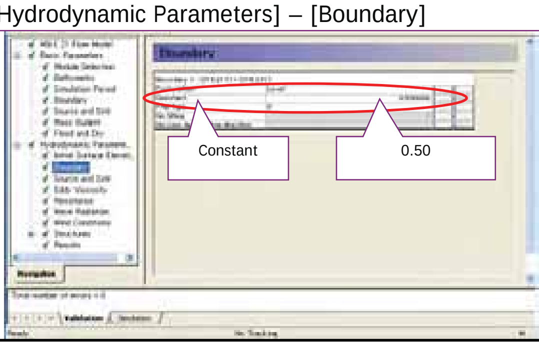
[Basic Parameters] – [Boundary]



Bathymetry File (Downstream Model)

MIKE21 Simulation File (**.m21)

[Hydrodynamic Parameters] – [Boundary]



Bathymetry File (Coordinate System)

- Coordinate system applied to MIKE 21 should be consistent with the one applied in MIKE 11 (and topographic survey) and GIS.

MIKE FLOOD Model = MIKE 11 + MIKE21
MIKE 21 Bathymetry File = Prepared in GIS
Inundation Map = MIKE21 Results + Topo Map

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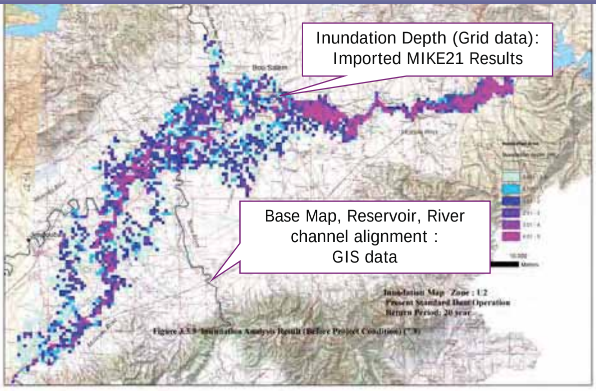
Bathymetry (Coordinate System)



Bathymetry File (Coordinate System)

Coordinate System Applied to the Mejerda Model

- Carthage_UTM_Zone_32N (or UTM Carthage)
  - Transversal Mercator
  - Ellipsoid: Clarke_1880_IGN
  - Central meridian : 9 degree
  - False easting : 500000

This system was applied, because it matches with...
- the one used in GIS data prepared by MARH, and
- the one used for the topographic survey

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Bathymetry File (Grid Size)

Grid Size Applied to the Mejerda Model

Upstream Model	228.13 m x 228.13 m (76.04 m x 76.04 m)
Downstream Model	228.13 m x 228.13 m

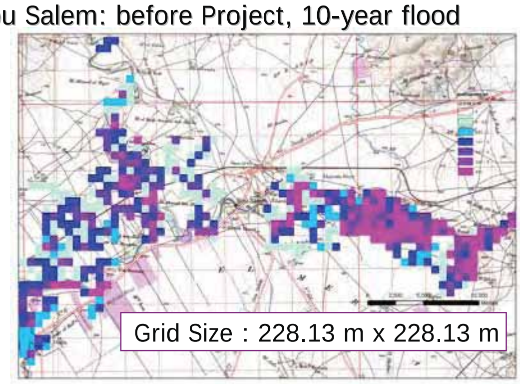
Notes on grid size selection

- Elevation in a grid cell represents average elevation.
  - Sporadic depressions cannot be expressed. (Modify one by one, if necessary)
- Small cell size result in.... (but, often not available....)
  - Long simulation time, but unnecessarily high resolution.....

Size selection according to the required accuracy (the stage of study) is required.

Bathymetry File (Grid Size)

Bou Salem: before Project, 10-year flood

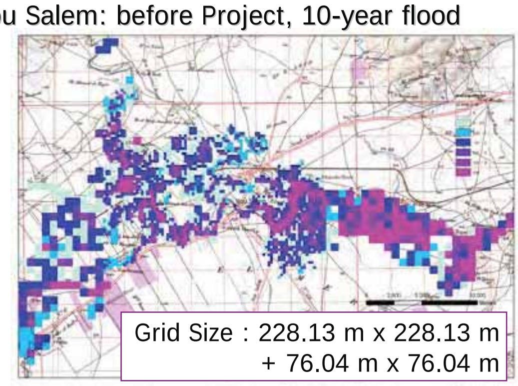


Grid Size : 228.13 m x 228.13 m

9

Bathymetry File (Grid Size)

Bou Salem: before Project, 10-year flood

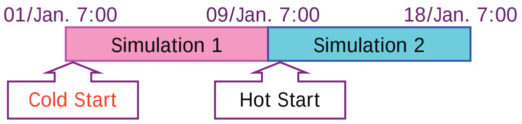


Grid Size : 228.13 m x 228.13 m + 76.04 m x 76.04 m

0

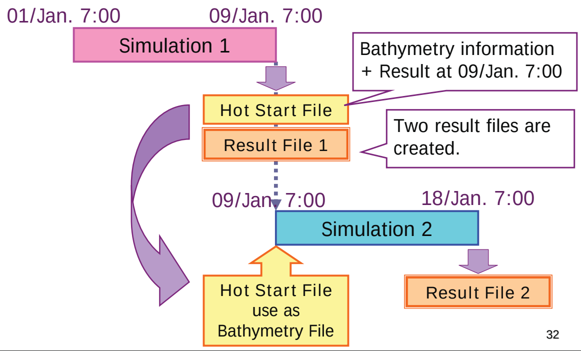
Simulation “Cold Start” or “Hot Start”

Initial Condition “Cold Start” or “Hot Start” (1/2)



Simulation “Cold Start” or “Hot Start”

Initial Condition “Cold Start” or “Hot Start” (2/2)



Simulation “Cold Start” or “Hot Start”

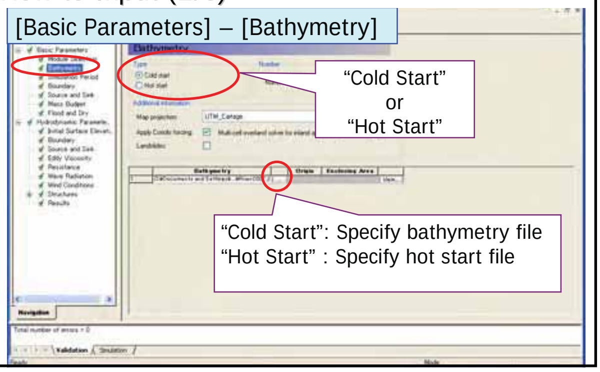
How to Input (1/3)

- In MIKE 21, settings require in the windows of.....
  - [Basic Parameters] – [Bathymetry]
  - [Hydraulic Parameters] – [Result]

Simulation “Cold Start” or “Hot Start”

How to Input (2/3)

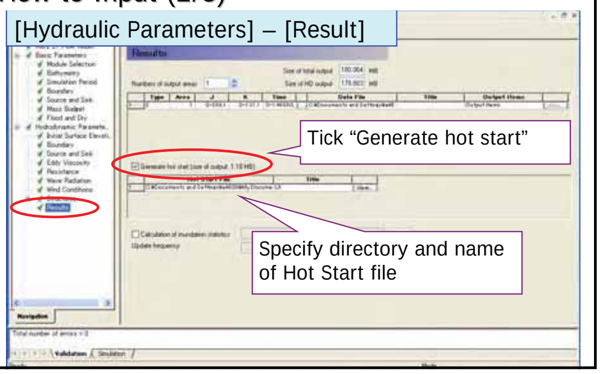
[Basic Parameters] – [Bathymetry]



Simulation “Cold Start” or “Hot Start”

How to Input (2/3)

[Hydraulic Parameters] – [Result]



Simulation “Cold Start” or “Hot Start”

- Advantages of “Hot Start” in MIKE21
  - Save a half of results, even if unexpected termination of the simulation occurs at the nearly end of the required simulation period
  - Dividing a simulation could give a chance to check results at the middle of simulation.
  - The size of one result file can be limited.
    e.g. Downstream model: Present condition 50-y
    1 file = could be about 1 GB.

Simulation “Cold Start” or “Hot Start”

- Disadvantages of “Hot Start” in MIKE21
  - Results are divided and stored in separate files.
  - Additional post-processing procedures (e.g. combining two files) might be involved.

Note:
- Larger MIKE21 result file size is brought by
  - More cells with inundation
  - Longer simulation period (and smaller time step)
- Larger MIKE21 result file = Longer simulation time

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Simulation “Cold Start” or “Hot Start”

- In consideration of post-processing of MIKE21 result files, one result file for the entire simulation period (without “Hot Start”) is more convenient........
- For Mejerda Model, Hot Start was applied only for cases with extensive inundation areas (=significantly long simulation time) ....
  - Present condition: Upstream. and Downstream, 20, 50-year, etc.

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MIKE 21 Model as a part of MIKE FLOOD Model

- Bathymetry (except “land value”) should be within the extent of MIKE11 Model
- Boundaries are suggested to be closed in principle.
- Boundary conditions (inflow discharges and downstream water level) of MIKE FLOOD Model are basically controlled by 1-D model (MIKE11).

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MIKE 21 Model as a part of MIKE FLOOD Model

- Geographical coordinate system in MIKE 21 model should be consistent with the ones in MIKE 11 and GIS data files.
- Simulation time step and period should be consistent with the one in MIKE11.
- “Cold Start” or “Hot Start” of simulation should be selected according to the time required for the simulation.

(MIKE21=“Hot Start” ⇨ MIKE11=“Hot Start”)

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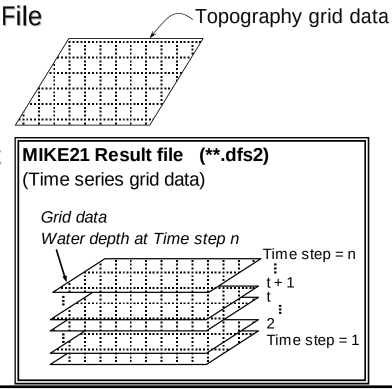
Post Processing MIKE21 Results

Concept of dfs2 File

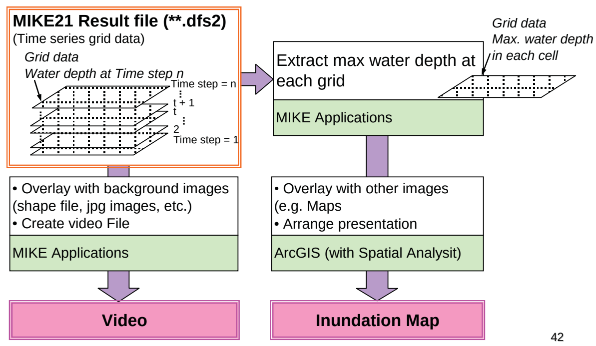
Bathymetry dfs2 file

Simulation result dfs2 file



Post Processing MIKE21 Results

Overall Procedure



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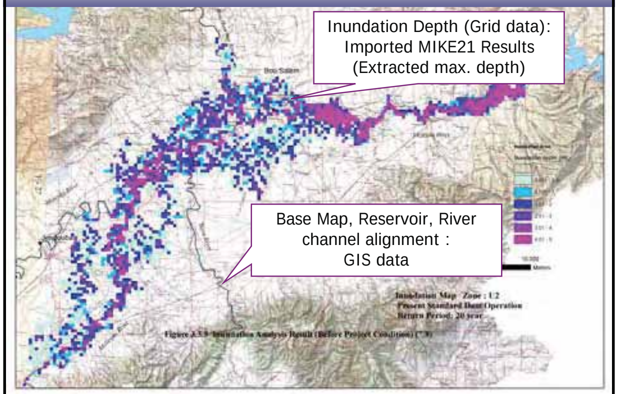
Post Processing MIKE21 Results



Republic of Tunisia

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Training on Inundation Analysis Model (MIKE FLOOD) for the Mejerda River Basin

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Hydrology/Hydraulics/Runoff and Sediment Analyses

TOTSUKA Natsuko

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

Presentation Material for Lecture 4 (MIKE FLOOD Mejerda Model)

Contents of Training

- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of the Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version)
- Practices how to operate and update the Mejerda inundation analysis model

3

Contents of Presentation

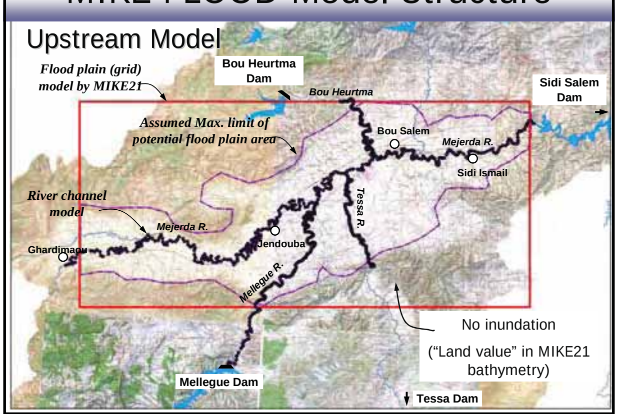
MIKE FLOOD Mejerda Model

- MIKE FLOOD Model Structure
- "Overflowing" River Reaches
- Linking River Reaches to MIKE21

4

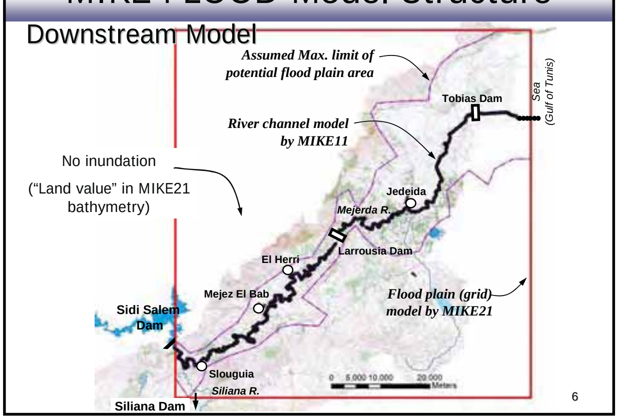
MIKE FLOOD Model Structure

Upstream Model



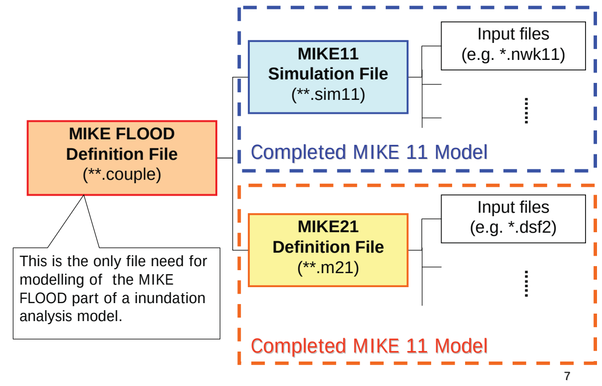
MIKE FLOOD Model Structure

Downstream Model



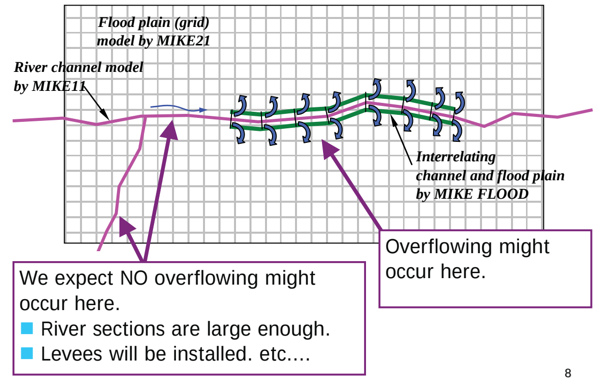
6

MIKE FLOOD Model Structure



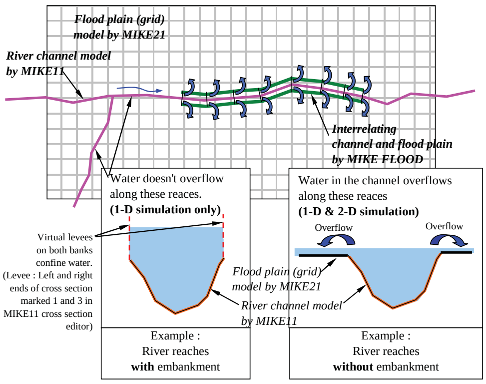
7

"Overflowing" River Reaches



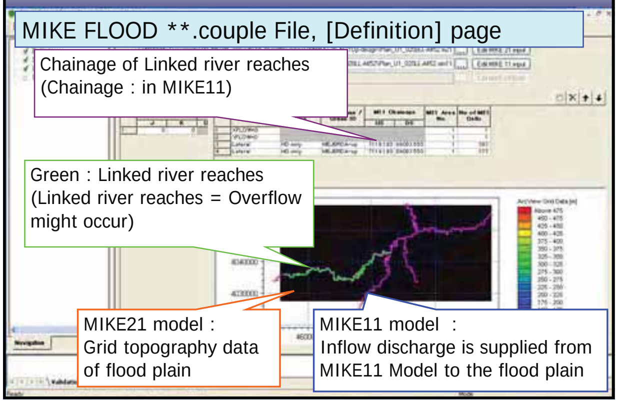
8

"Overflowing" River Reaches



9

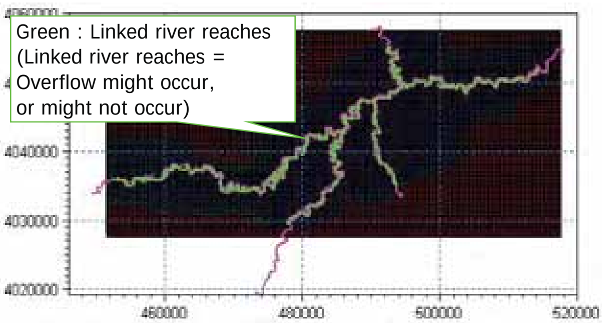
"Overflowing" River Reaches



10

"Overflowing" River Reaches

Upstream Model: Present Condition



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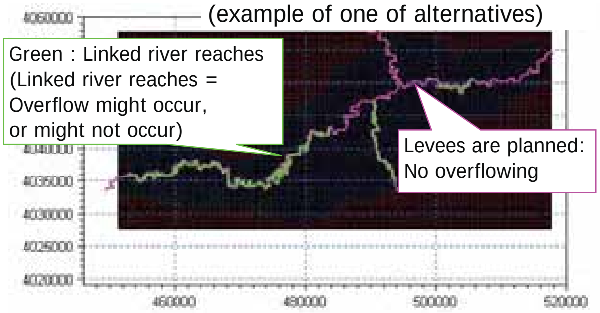
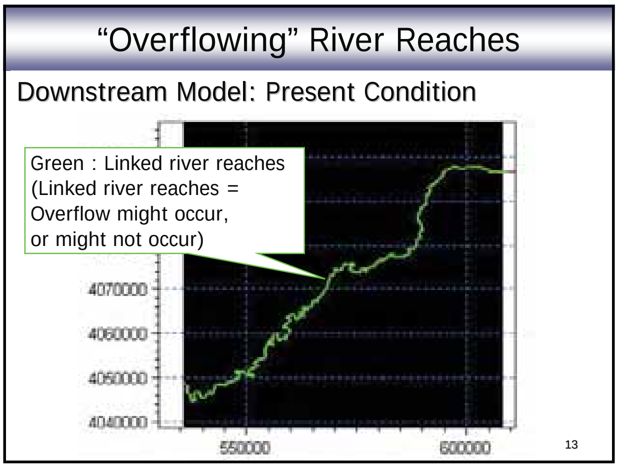
"Overflowing" River Reaches

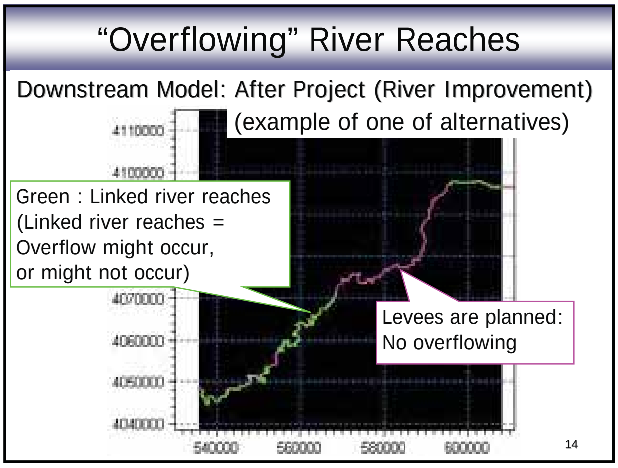
Upstream Model: After Project (River Improvement)

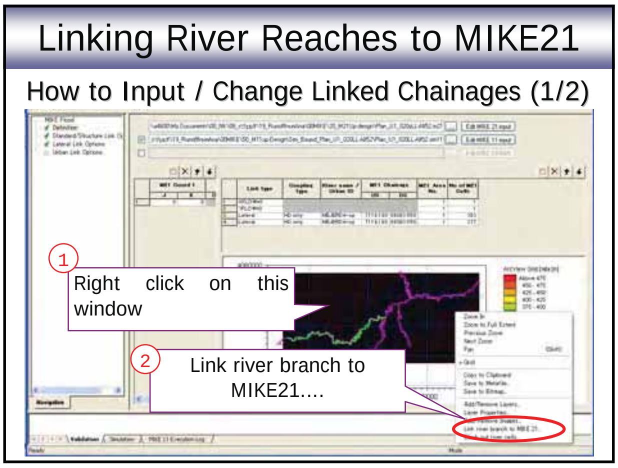
(example of one of alternatives)

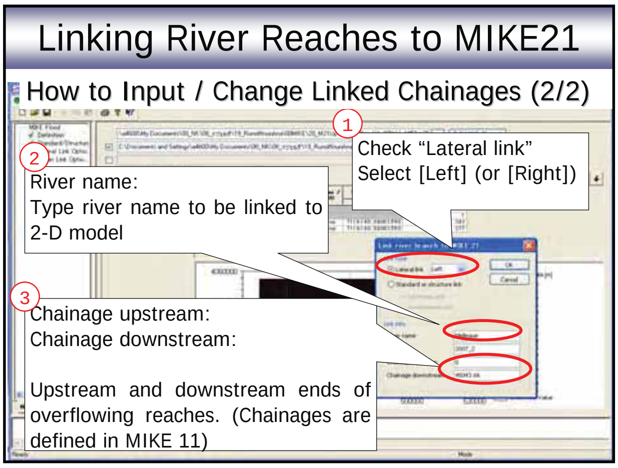


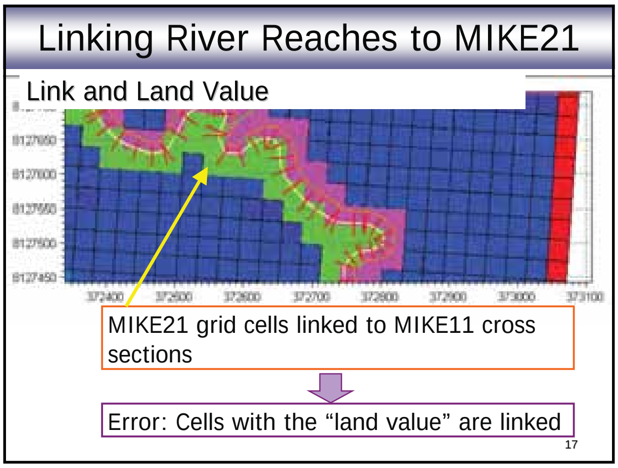
12

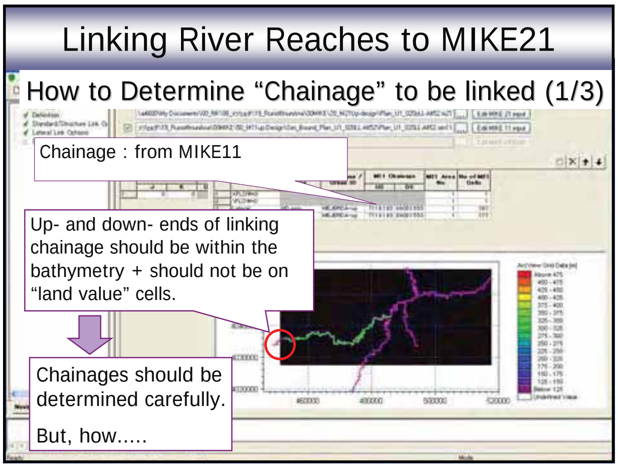

“Overflowing” River Reaches
Downstream Model: Present Condition
Green : Linked river reaches
(Linked river reaches =
Overflow might occur,
or might not occur)
4070000
4060000
4050000
4040000
550000
600000
13


“Overflowing” River Reaches
Downstream Model: After Project (River Improvement)
(example of one of alternatives)
4110000
4100000
Green : Linked river reaches
(Linked river reaches =
Overflow might occur,
or might not occur)
4070000
4060000
4050000
4040000
Levees are planned:
No overflowing
540000
560000
580000
600000
14


Linking River Reaches to MIKE21
How to Input / Change Linked Chainages (1/2)
1
Right click on this window
2
Link river branch to MIKE21....

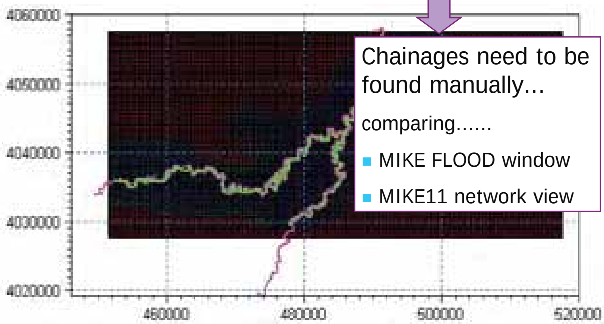

Linking River Reaches to MIKE21
How to Input / Change Linked Chainages (2/2)
1
Check “Lateral link”
Select [Left] (or [Right])
2
River name:
Type river name to be linked to 2-D model
3
Chainage upstream:
Chainage downstream:
Upstream and downstream ends of overflowing reaches. (Chainages are defined in MIKE 11)


Linking River Reaches to MIKE21
Link and Land Value
8127650
8127600
8127550
8127500
8127450
372400
372500
372600
372700
372800
372900
373000
373100
MIKE21 grid cells linked to MIKE11 cross sections
Error: Cells with the “land value” are linked
17


Linking River Reaches to MIKE21
How to Determine “Chainage” to be linked (1/3)
Chainage : from MIKE11
Up- and down- ends of linking chainage should be within the bathymetry + should not be on “land value” cells.
Chainages should be determined carefully.
But, how.....

Linking River Reaches to MIKE21

How to Determine “Chainage” to be linked (2/3)



Chainages need to be found manually…

comparing……

- MIKE FLOOD window
- MIKE11 network view

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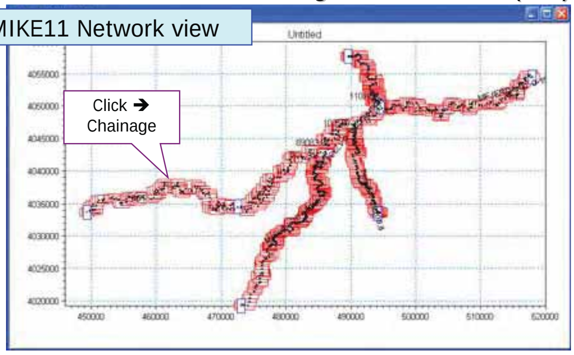
Linking River Reaches to MIKE21

How to Determine “Chainage” to be linked (3/3)



Closing

- Building model involves engineering judgement and a lot of data processing routine work. (Modelling cannot be all automatic!!)
- Evaluating simulation results is important.
  - Finding mistakes
  - Evaluating calibration results (parameter values)
  - Judging settings in the model. (←based on results)
    - Modelling always involves assumptions and simplification.
    - There might be limitation of software functions
    - Required accuracy according to the purpose.

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Republic of Tunisia

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Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

Today's Training Item

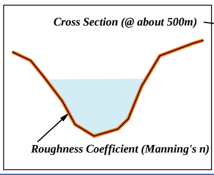
- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Part of Mejerda Model
- Software practices using a simple sample model
- Practices how to use and update Mejerda inundation analysis model

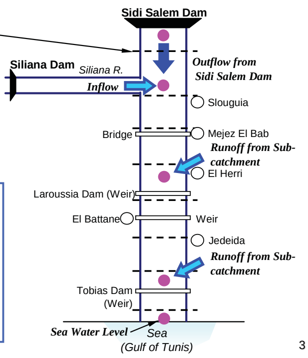
MIKE11 : Software for 1-D Hydraulic Analysis (like HEC-RAS)

2

Overall view of MIKE11 Model

Model Example

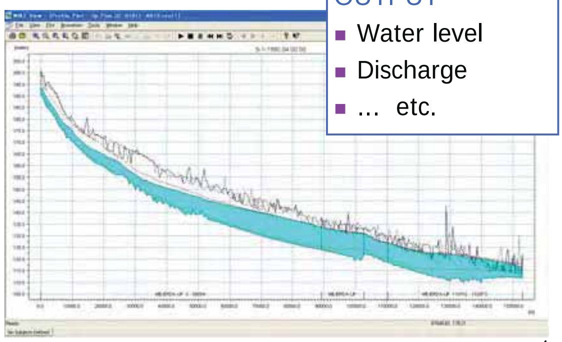




INPUT
- Inflow Discharge
- Cross section
- … etc.

3

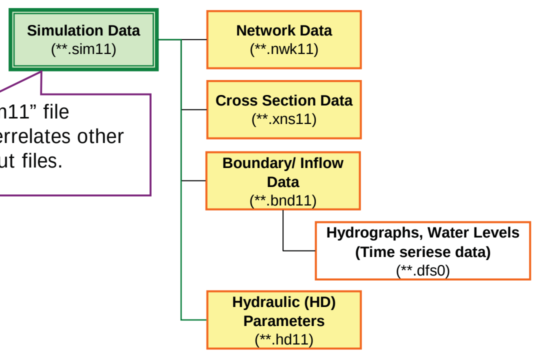
Outcome of MIKE 11 Simulation



OUTPUT
- Water level
- Discharge
- … etc.

4

Structure of MIKE 11 Model



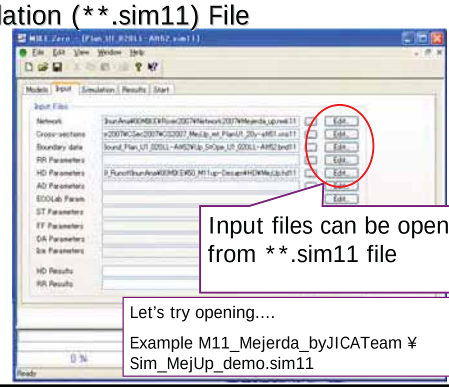
"sim11" file interrelates other input files.

Note : (**.sim11) etc. : File extension name

5

Structure of MIKE 11 Model

Simulation (**.sim11) File



Input files can be opened from **.sim11 file

Let's try opening....

Example M11_Mejerda_byJICATeam ¥ Sim_MejUp_demo.sim11

Major Input Data to MIKE 11

- Simulation File (*.sim11)
  - Model definition (Hydrodynamic, unsteady)
  - Names and directories of input files (Network, Cross section, Boundary, etc.) and a result file
  - Simulation time step and period
- Network File (*.nwk11)
  - Coordinates of cross section positions (Easting, Northing)
  - Chainage (distance for the upstream end) of cross sections
  - Structures (e.g. bridge) (Type, location, dimension)
  - Location of boundary conditions (inflow, etc.)

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Major Input Data to MIKE 11

- Cross Section File (*.xns11)
  - Cross section ID No.
  - Location (chainage) of cross sections
  - Cross section shape (X, Y)
  - Bed resistance (resistance type, roughness coefficient)
- Boundary file (*.bnd11)
  - (Location of boundary conditions) (This can be input on the Network editor.)
  - Names (and directories) of inflow/water level time series data files (**.dfs0)
- Hydraulic parameter file (*.hd11)
  - Initial condition (water level or discharge)

8

MIKE 11 Modelling Procedure

Procedure of Modelling

1. Preparing time series file (*.dfs0)
2. Preparing network file (*.nwk11)
3. Preparing cross section file (*.xns11)
4. Preparing Hydrodynamic file (*.hd11)
5. Preparing boundary file (Empty, *.bnd11)
6. Preparing simulation file (*.sim11)
7. Inputting boundary data (*.bnd11)
8. Simulation (*.sim11)
9. Viewing result file (*.res11)

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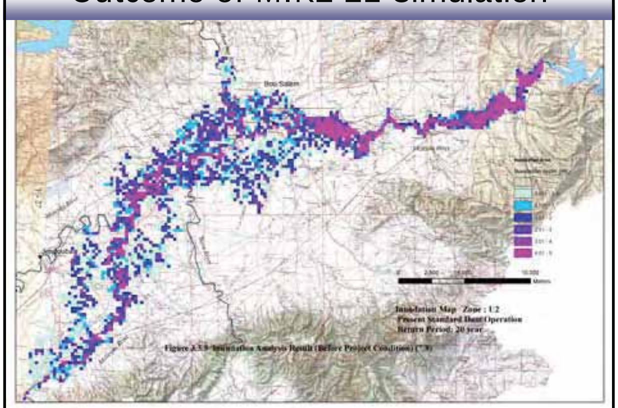
- Software practices using a simple sample model
  MIKE21 : Software for 2-D Hydraulic Analysis
- Practices … inundation analysis model

2

Outcome of MIKE 21 Simulation



Topography data for 2-D Analysis

- For MIKE21, 2-D (grid) topography data should be prepared.

(Elevation in m)

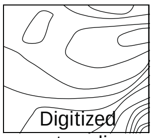
5	5	4	6	6	7	7	5
6	4	5	5	4	4	4	3
6	4	5	5	4	4	4	3
6	4	6	6	5	4	5	4
6	5	7	6	4	5	5	4
6	7	6	6	4	4	4	7
5	7	5	5	5	6	9	16
5	7	5	5	5	6	9	22

2-D (grid) topography data
(called "Bathymetry" in MIKE21)

For MIKE 21 : One Grid = Perfect square

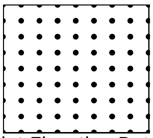
GIS Software
or
MIKE application

or
Existing grid data



Digitized contour lines

or



Point Elevation Data

4

Concept of 2-D Analysis Result

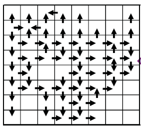
Example of Result

Results are also grid data.

1.2	1.2	2.2	0.2	0.2	0	0	1.2
0.2	2.2	1.2	1.2	2.2	2.2	2.2	3.2
0.2	2.2	1.2	1.2	2.2	2.2	2.2	3.2
0.2	2.2	0.2	0.2	1.2	2.2	1.2	2.2
0.2	1.2	0	0.2	2.2	1.2	1.2	2.2
0.2	0	0.2	0.2	2.2	2.2	2.2	0
1.2	0	1.2	1.2	1.2	0.2	0	0
1.2	0	1.2	1.2	1.2	0.2	0	0

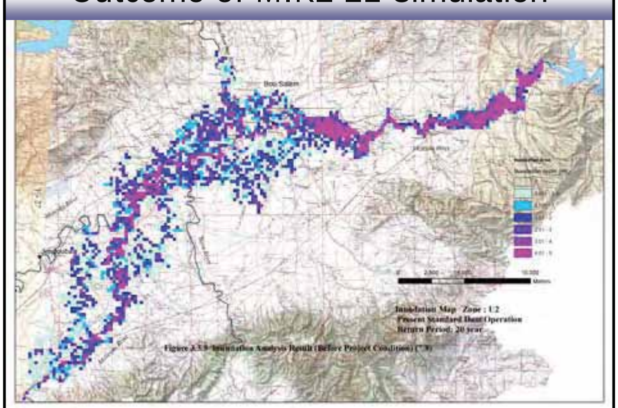
Max. Water Depth (m)
(Inundation Depth)

Simulation by MIKE 21
and
Post-processing by
MIKE Software, GIS etc.



5

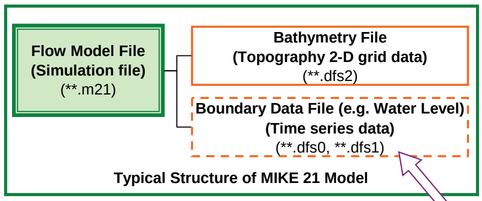
Outcome of MIKE 21 Simulation



Some Notes

- MIKE 21 (2-D analysis) is often used for simulation of coastal areas (current in a bay, etc.)
- MIKE 21 (2-D analysis) can be also applied to the simulation of inundation on a flood plain.

Structure of MIKE 21 Model



This is not always necessary. (The Mejerda Model does not require this.)

For example...
If a boundary water level is constant, the boundary condition can be defined in the Simulation file (*.m21) without time series files.

Major Input Data to MIKE 21

- Bathymetry file (*.dfs2)
  - Grid data (Topography of flood plain, sea bottom, etc.)
- Flow model file (Simulation file) (*.m21)
  - Name of bathymetry file
  - Simulation time step, simulation period
  - Resistance (Manning number, etc.)
  - Boundary condition (constant values or time series file)
  - Result file name
  - Other parameters (wind, etc.)
- Boundary time series file (if necessary)

Structure of MIKE 21 Model

Sample 1: Lake (provided by DHI)
- lake.m21 ---- Flow model file (simulation file)
- bathy.dfs2 ---- Bathymetry file (2-D grid data)

Sample 2: Sound (provided by DHI)
- Sound_HD.m21 (in “HD” folder) ---- Flow model file (simulation file)
- Bathy900.dfs2 (in “Data” folder) ---- Bathymetry file (2-D grid data)
- wln.dfs1 (in “Data” folder) ---- Boundary time series
- wls.dfs1 (in “Data” folder) ---- Boundary time series

Sample 1: “Lake”

Let’s see the model structure !
- Open “lake.m21” (double click)
- [Basic Parameters] – [Bathymetry] – [View]
  - “bathy.dfs2” file opens
  - This is a simple example of bathymetry (grid) data.
- Close “bathy.dfs2”
- [Basic Parameters] – [Simulation Period]
  - A time step is normally small. (20 second for “Lake”)
- [Basic Parameters] – [Boundary]
  - [Program detected] is normally recommended.

Continue

Sample 1: “Lake”

Continued...
- [Hydraulic Parameters] – [Initial surface elevation]
- [Hydraulic Parameters] – [Boundary]
  - In “Lake”, [constant] is selected.
- [Hydraulic Parameters] – [Resistance]
  - In “Lake”, [constant] is selected.
- [Hydraulic Parameters] – [Results]
  - Click a small squire on right of “Time”.
  - Click “Ctrl + D” on “Data File”

Continue

Sample 1: "Lake"

Continued...

- [Run] – [Start Simulation.....] – [OK]

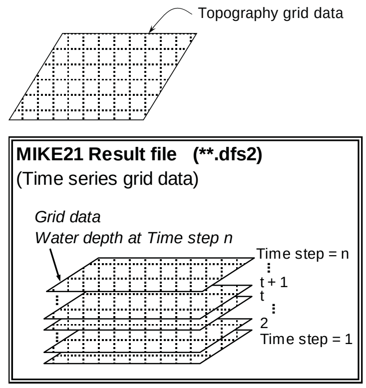
- Open "lakeres.dfs2" file created (Result file)
- Click "Timestep forward" and "Timestep back" icons (symbol look like clocks) on Tool bar
- Slide a bar at the bottom of the table view
  - Mesh on the grid moves simultaneously
- Select one of cells in the table view, and input 5
- Close "lakeres.dfs2" (Don't save your changes)

13

Concept of dfs2 files

Bathymetry dfs2 file

Simulation result dfs2 file



MIKE 21 Modelling Procedure

5 1. Develop Bathymetry File (grid data) (*.dfs2)

1 2. Make "Flow Model File" (simulation file) (*.m21)

2 3. Input parameters

3 4. Simulation

4 5. Viewing results

Order of modelling

Order of today's practice

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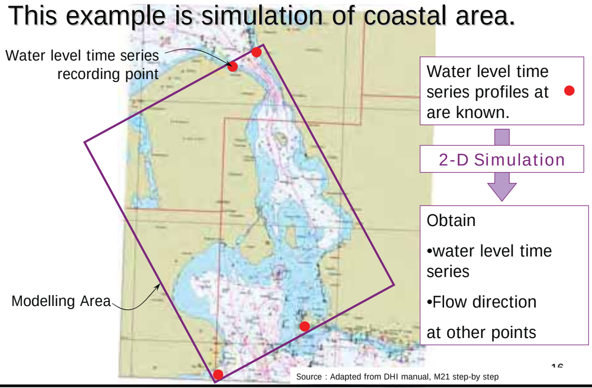
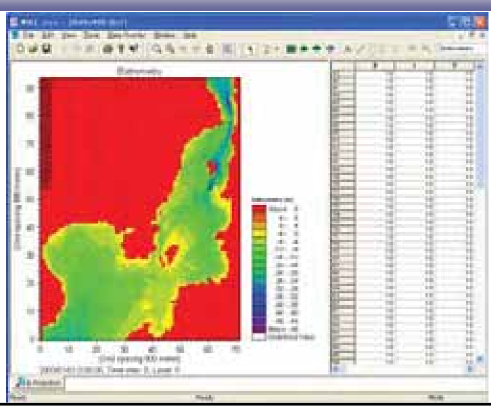
Sample 2: "Sound"

This example is simulation of coastal area.



Source : Adapted from DHI manual, M21 step-by step

Sample 2: "Sound" Bathymetry File



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Sample 2: Make "Flow Model File" (*.m21) and Input Parameters

- Start MIKE21 – [MIKE 21] – [Flow Model (.m21)]
- Save *.m21 file

Go to page 23 of DHI Manual (MIKE 21 step-by-step)

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Sample 2: Viewing Results

- Directly open *.dfs2 file
- Prot Composer
  - Start MIKE 21 – "New" icon – [MIKE ZERO] – [Prot Composer]
  - [Plot] – [Insert New Plot Object] – [Grid Plot] – select the result dfs2 file at "Master File"
- Result Viewer
  - Start MIKE 21 – "New" icon – [MIKE ZERO] – [Result Viewer]
  - [Projects] – [Add Files to Project] – at "File Type" select "MIKE21 Result File" – Click [...] , select result dfs2 file

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Sample 2: Develop Bathymetry File

- Start MIKE21 – [MIKE ZERO] – [Bathymetries]

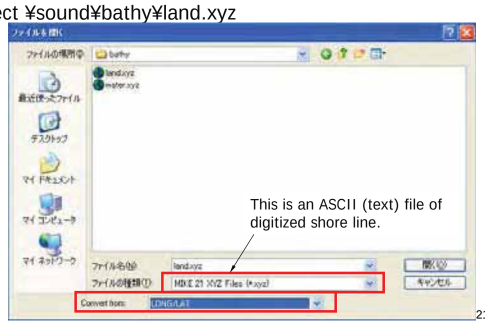
- UTM-33
- E: 290000
- N: 6120000
- W: 120000
- H: 120000

- [OK] – Save **.batsf File

20

Tutorial: Develop Bathymetry File

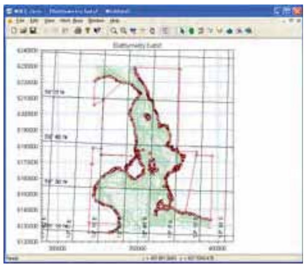
- [Work Area] – [Background Management] – [Import]
- [Files of Type : MIKE21 XYZ Files (*.xyz)]
- Select ¥sound¥bathy¥land.xyz



21

Tutorial: Develop Bathymetry File

- [Import] - Select ¥sound¥bathy¥water.xyz
- [Convert from : LONG/LAT] – [Open]
- [OK]
- Fig 2.7 in DHI Manual (MIKE21 Step-by-step)



22

Tutorial: Develop Bathymetry File

Procedure of Modelling

- [Work Area] – [Bathymetry Management] – [New]
- [Convert from : LONG/LAT] – [Open]
- [OK]
- Fig 2.7 in DHI Manual (MIKE21 Step-by-step)

Go to page 6 of DHI Manual
(MIKE 21 step-by-step)

23

Republic of Tunisia

The Study
on
Integrated Basin Management
Focused on Flood Control
in
Mejerda River

Training
on
Inundation Analysis Model
for
the Mejerda River Basin

June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

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  - 1-2: Overview of Mejerda Model
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  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Part of Mejerda Model
- Software practices using a simple sample model
  MIKE21 : Software for 2-D Hydraulic Analysis
- Practices how to use and update Mejerda inundation analysis model

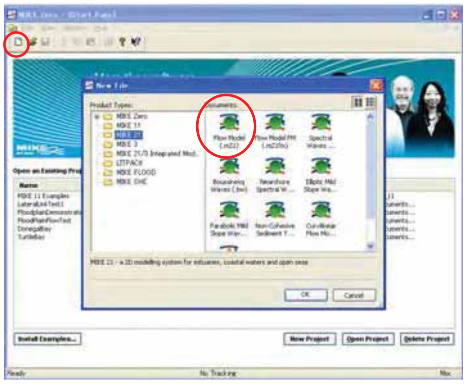
2

Sample 1: "Lake"

Continue

3

Sample 1: "Lake"



4

Sample 1: "Lake"

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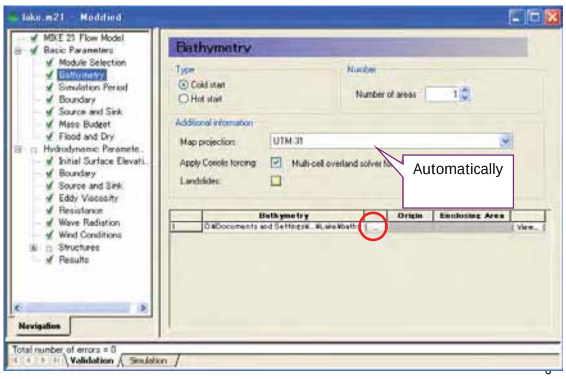
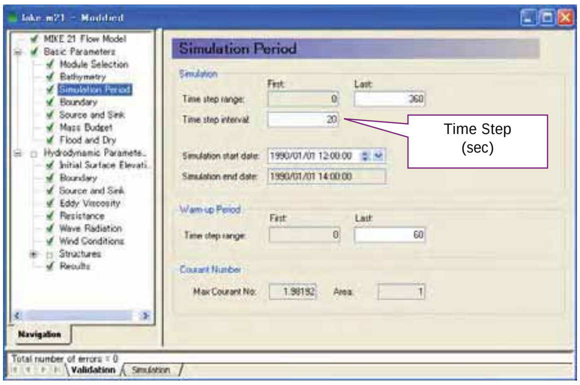
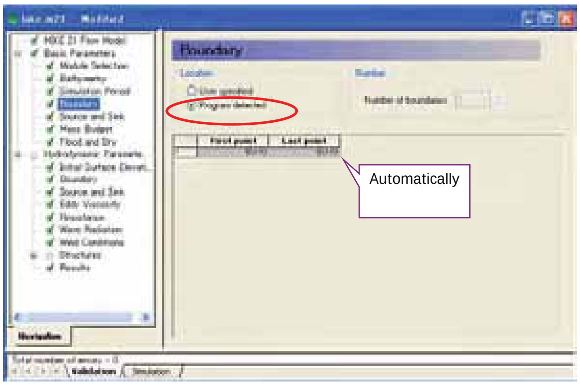


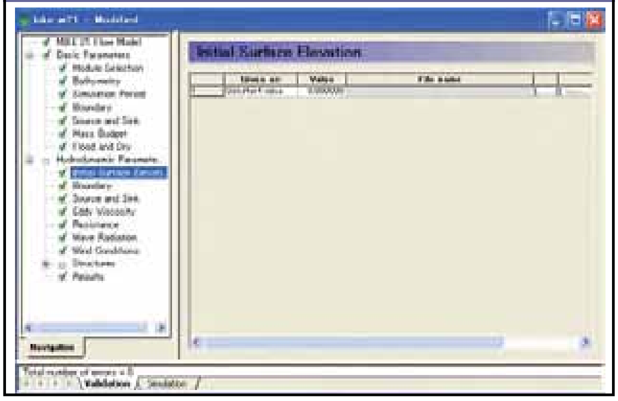
Sample 1: “Lake”



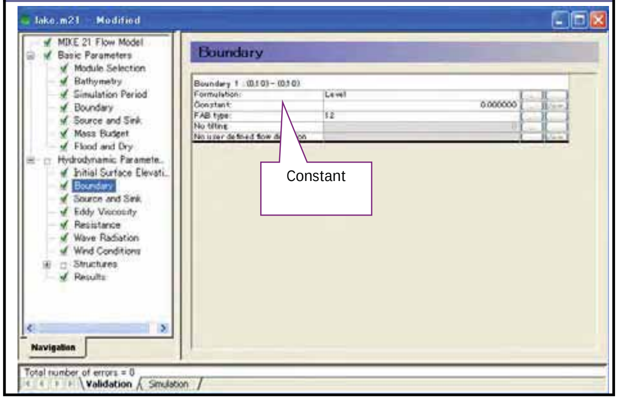
Sample 1: “Lake”



Sample 1: “Lake”



Sample 1: “Lake”



Sample 1: “Lake”

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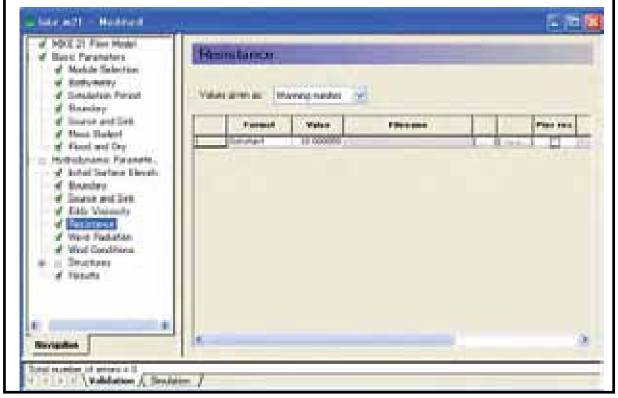
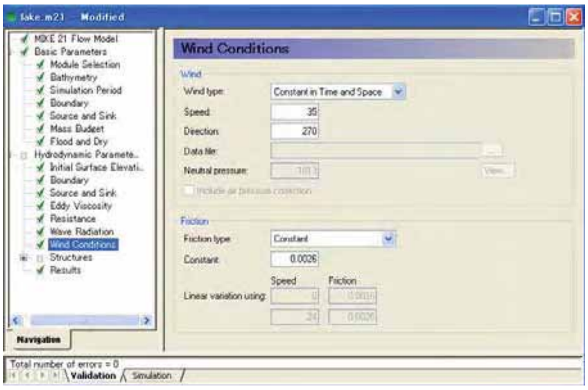
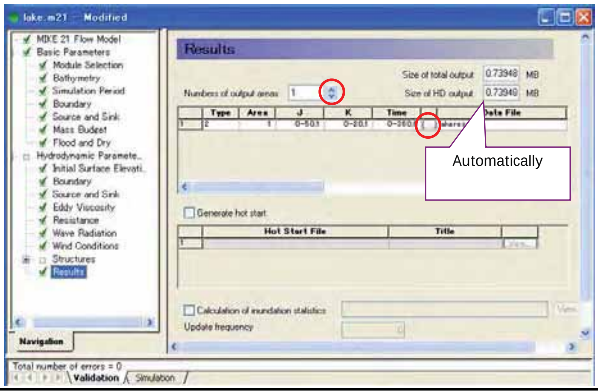


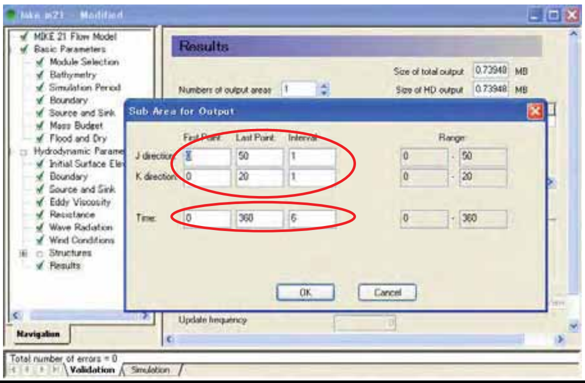
Sample 1: “Lake”



Sample 1: “Lake”



Sample 1: “Lake”



Republic of Tunisia

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  MIKE FLOOD : Software for combining 1-D and 2-D Models
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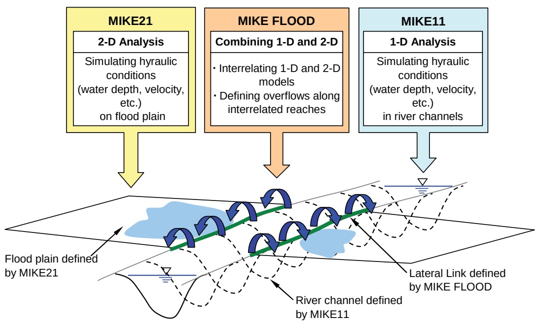
2

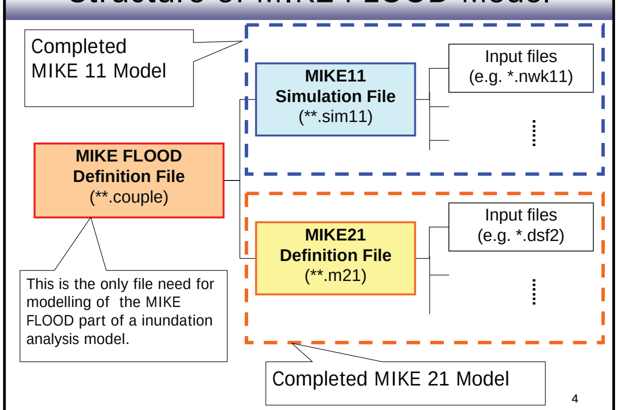
MIKE 11, MIKE 21 and MIKE FLOOD

Functions and Relations



3

Structure of MIKE FLOOD Model



4

Structure of MIKE FLOOD Model

Note :

- MIKE 11 (1-D) and MIKE 21 (2-D) models have to be completed before building a MIKE FLOOD Model.
  - Test run / MIKE 11 and MIKE 21 models independently →
  - Confirm MIKE 11 and MIKE 21 models have no error.

5

Structure of MIKE FLOOD Model

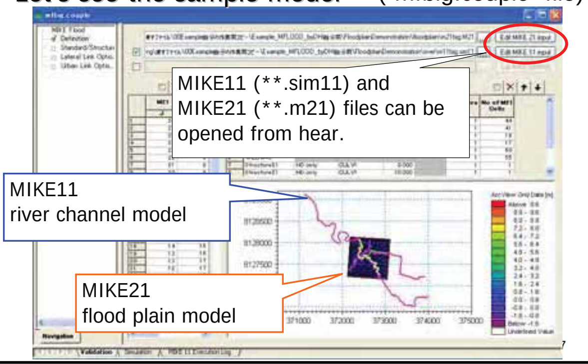
Sample model

- Sample programme used in this session
  - "mfbig.couple" in "FloodplainDemonstration" provided by DHI
- MIKE 11 model files are in "river" folder
- MIKE 21 model files are in "floodplain" folder

6

Structure of MIKE FLOOD Model

Let's see the sample model (“mfbig.couple” file)



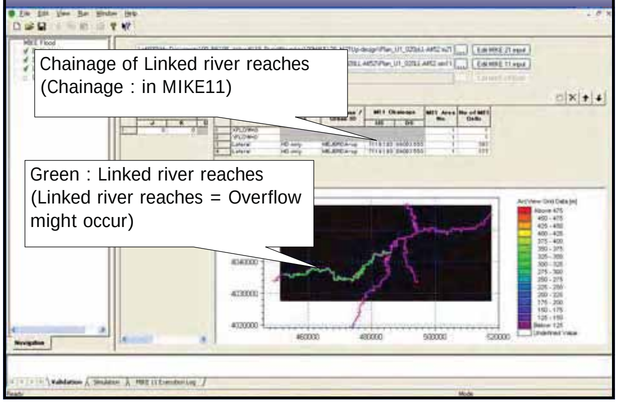
7

Major Input Data to MIKE FLOOD

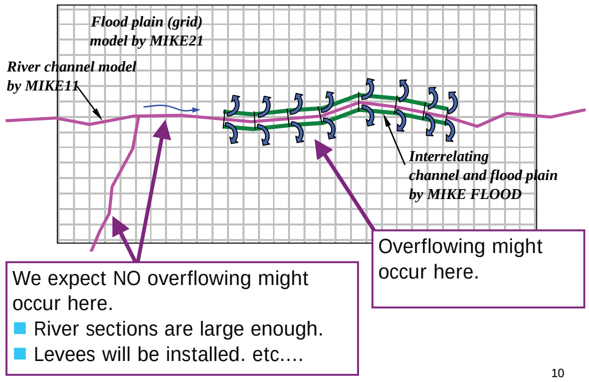
- Name of MIKE 11 simulation file (*.sim11)
- Name of MIKE 21 simulation file (*.m21)
- Chainage of river reaches overflow occurs
- Definition of overflowing

8

Meanings of “Overflowing”

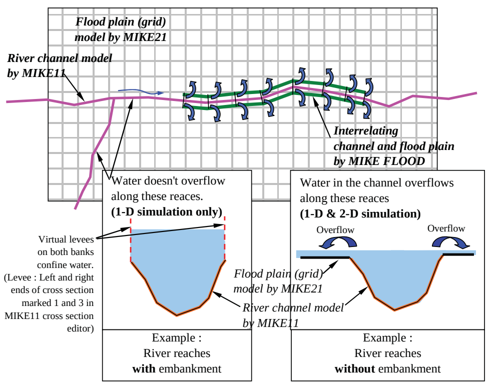


Meanings of “Overflowing”



10

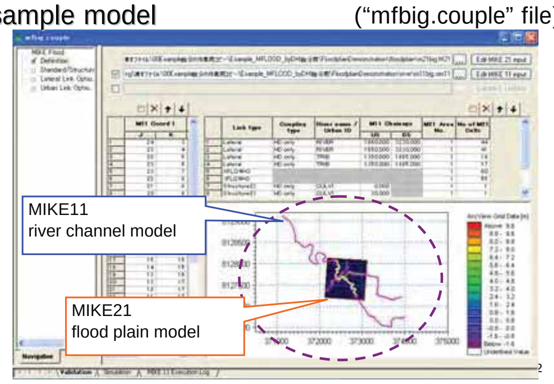
Meanings of “Overflowing”



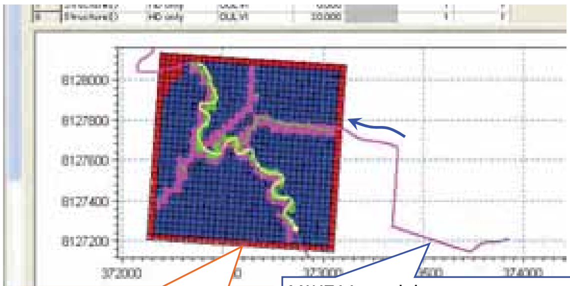
11

MIKE 21 Model in MIKE FLOOD Model

sample model (“mfbig.couple” file)



MIKE 21 Model in MIKE FLOOD Model



MIKE21 model :
Enclosed (Land value cells).
NO boundary.

MIKE11 model :
Inflow discharge is supplied from MIKE11 Model to the flood plain

Procedure of MIKE FLOOD Modelling

1	Create a new "**.couple" file
Combine MIKE11 (1-D) and MIKE21 (2-D) Models	
2	Specify prepared MIKE11 simulation file (**.sim11) and MIKE21 definition file (**.m21)
3	Define overflowing reaches (where 1-D and 2-D models are interrelated.)
4	Final check of MIKE11 and MIKE21 Models
5	Simulation

Major Items of Final Check

MIKE 11 and MIKE 21

- Simulation time step and simulation period should be consistent in the two models.
- Directory and name of result file is defined correctly.

MIKE 21

- Ranges of time and grid for storing result should cover required time and area.

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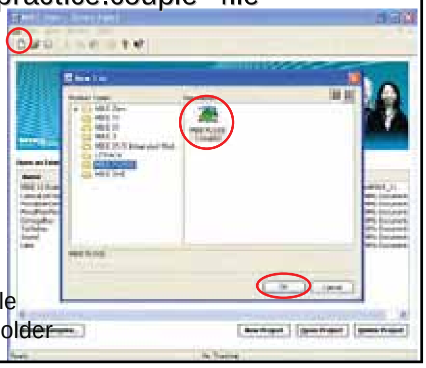
Practice on Sample Model

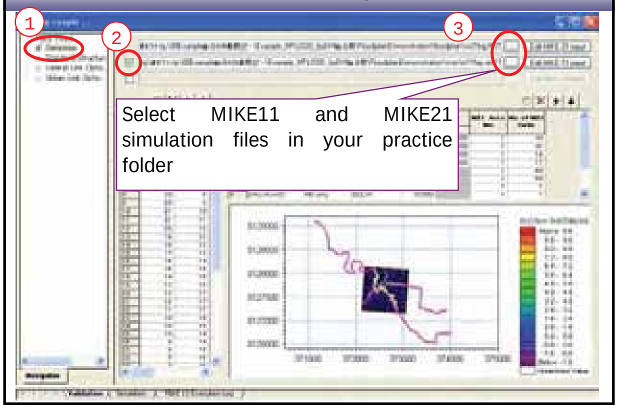
Make a "mf-practice.couple" file

[Program]
-[MIKE BY DHI]
-[MIKE FLOOD]
-[MIKE FLOOD]

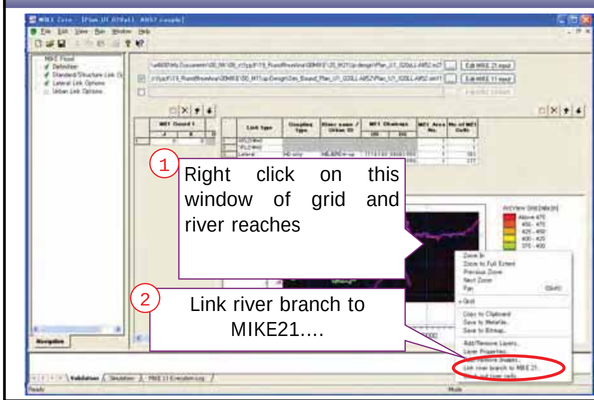


Save as ….
mf-practice.couple
in your practice folder

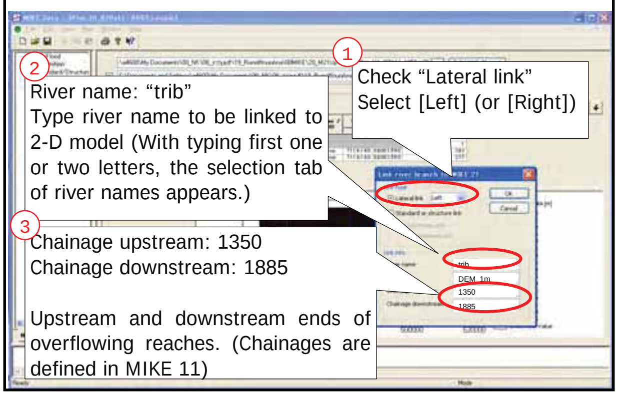
Practice on Sample Model



Practice on Sample Model



Practice on Sample Model



1 Check “Lateral link”
Select [Left] (or [Right])

2 River name: “trib”
Type river name to be linked to 2-D model (With typing first one or two letters, the selection tab of river names appears.)

3 Chainage upstream: 1350
Chainage downstream: 1885

Upstream and downstream ends of overflowing reaches. (Chainages are defined in MIKE 11)

Practice on Sample Model

“Definition” page

		Link type	Coupling type	River name / Urban ID	M11 Chainage US	M11 Chainage DS
Right	1	Lateral	HD only	RIVER	1660.000	3000.000
Left	2	Lateral	HD only	RIVER	1660.000	3000.000
Right	3	Lateral	HD only	TRIB	1350.000	1885.000
Left	4	Lateral	HD only	TRIB	1350.000	1885.000

“Lateral Link Options” page

River name	M11 Chainage US	M11 Chainage DS	M11 Side	Structure Method	Structure Type	Structure Source	Structure Depth Tol	Structure Weir C	Structure Fric(n)
RIVER	1660.00	3230.00	Right	Cell to Cell	Weir 1	HIGH	0.100	1.838	0.050
RIVER	1660.00	3230.00	Left	Cell to Cell	Weir 1	HIGH	0.100	1.838	0.050
TRIB	1350.00	1885.00	Right	Cell to Cell	Weir 1	HIGH	0.100	1.838	0.050
TRIB	1350.00	1885.00	Left	Cell to Cell	Weir 1	HIGH	0.100	1.838	0.050

Save – (Close – Open) – Simulation (Key)

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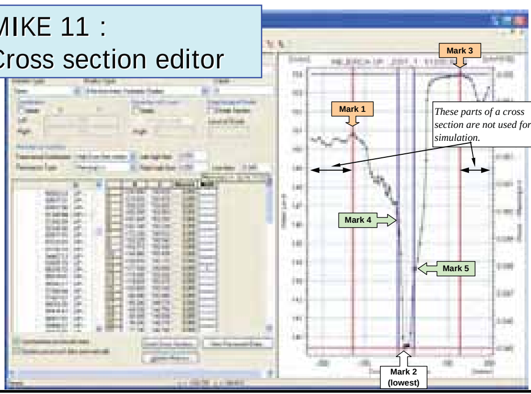
“Lateral Link” and MIKE11 Markers

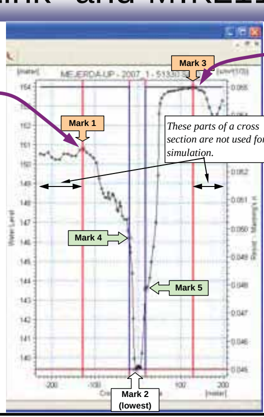
MIKE 11 :
Cross section editor



21

“Lateral Link” and MIKE11 Markers

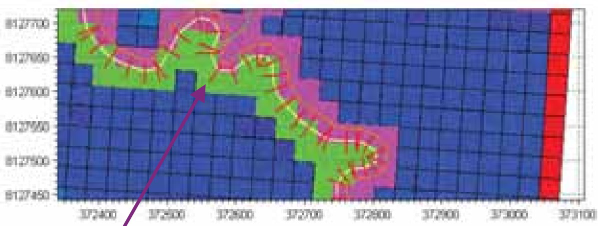
“Left” in MIKE FLOOD lateral link



“Right” in MIKE FLOOD lateral link

22

“Lateral Link” and MIKE11 Markers

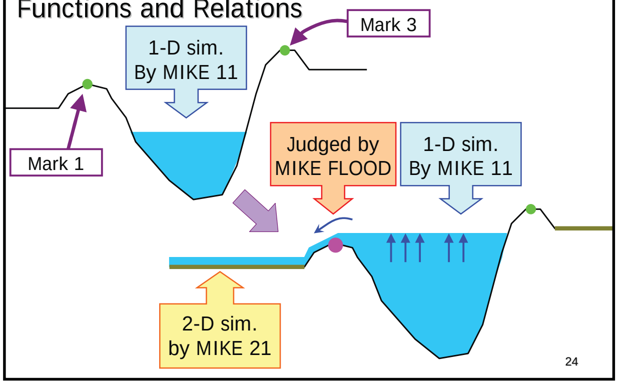


Left and right of river channel =
Come from Marks 1 and 3 in MIKE 11

23

“Lateral Link” and MIKE11 Markers

Functions and Relations



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  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version) MIKE11
- Practices how to operate and update the Mejerda inundation analysis model

2

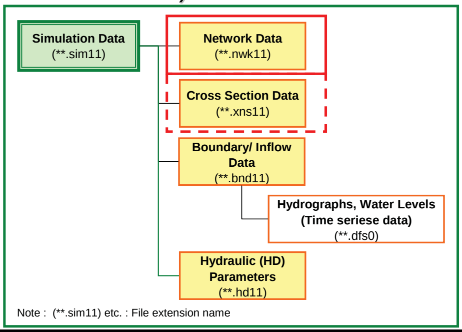
Practice Items : MIKE 11 Mejerda Model

Down stream Model
D1 : Add Tobias Weir and Andalous Bridge
Upstream Model
U1 : Input boundary condition
U2 : Input Marks 4 and 5
U3 : Change Manning's n (all Cross sections)
U4 : Make a new model for different inflow
U5 : Change cross section shape
U6 : Add Bou Heurtma River (Cross section file)
U7 : Add Bou Heurtma River (Network file)

3

MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



4

MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)

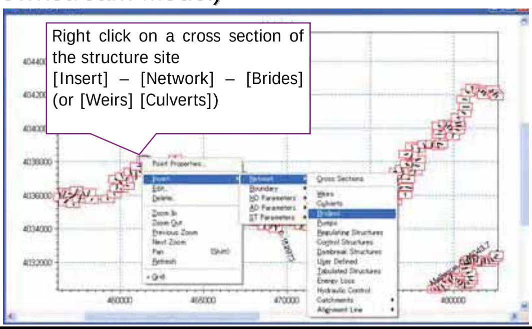
prac_Dn_OptOpe2030_D2t_010LL.sim11

- Network File (**.nwk11)
- Open network file through simulation file
  - MejDn_st-exs_woPAandTobi.nwk11
- Add Tobias Weir (Weir)
  - Chainage : 137753.2
- Add Andalous Bridge (Bridge, Weir, Culvert)
  - Chainage : 41044.52

5

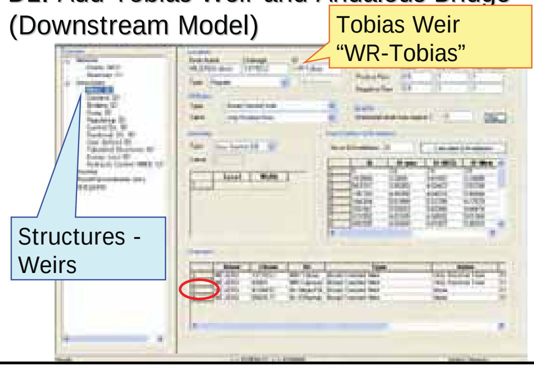
MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



MIKE 11 Mejerda Model : Practice D1

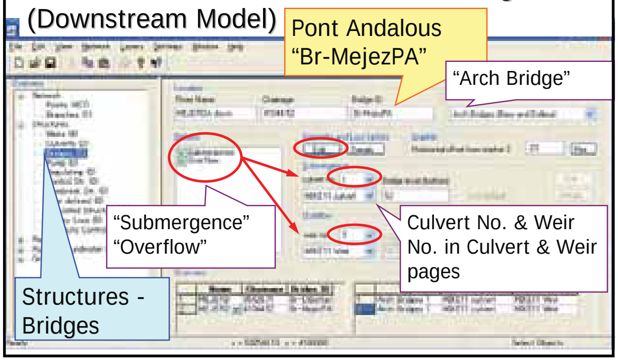
D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



7

MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)

[Geometry and Loss factors]-[Edit]

Pont Andalous “Br-MejezPA”

Parameters	Values
Opening width, b	9
Number of arches	5
Level for bottom of arch curvature	48.5
Level for top of each curvature	53
Radius of arch curvature, r	4.5

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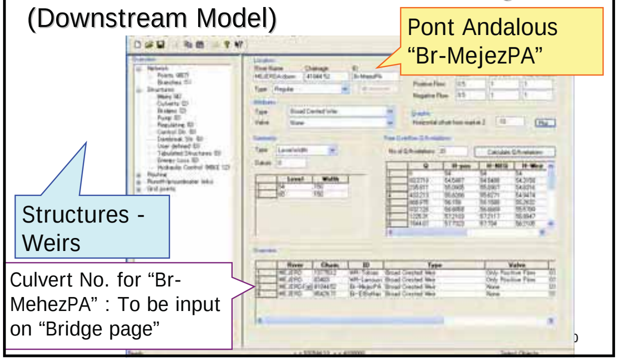
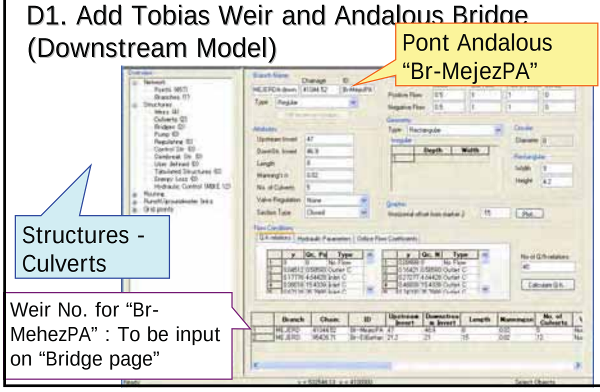
MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



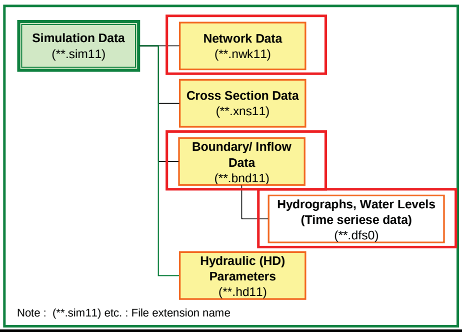
MIKE 11 Mejerda Model : Practice D1

D1. Add Tobias Weir and Andalous Bridge (Downstream Model)



MIKE 11 Mejerda Model : Practice U1

U1. Input boundary condition (Upstream Model)



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MIKE 11 Mejerda Model： Practice U1

U1. Input boundary condition (Upstream Model)

Prac_Up_StOpeU2_010.sim11

- Network File (*.nwk11) and Boundary file (*.bnd11)
- Inflow discharge : Standard operation, 10-year
- Make empty boundary file
  "Prac_Up_StOpeU2_010.bnd11"
- Specify boundary file in simulation file
- Open Network file through the simulation file

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MIKE 11 Mejerda Model： Practice U1

U1. Input boundary condition (Upstream Model)

Prac_Up_StOpeU2_010.sim11

- Input upstream boundaries ("Open") : "inflow"
  - Mejerda (Ghardimaou), Mellegue, Bou Heurtma, Tessa
- Input downstream boundary ("Open") : "water level"
  - Sidi Salem Water Level
- Input lateral inflow ("Point Source") : "inflow"
  - Conf. with Mellegue (U2p11), Conf. with BH (U2p12)

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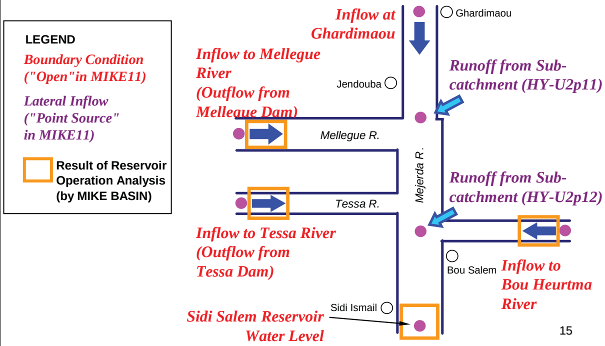
MIKE 11 Mejerda Model： Practice U1

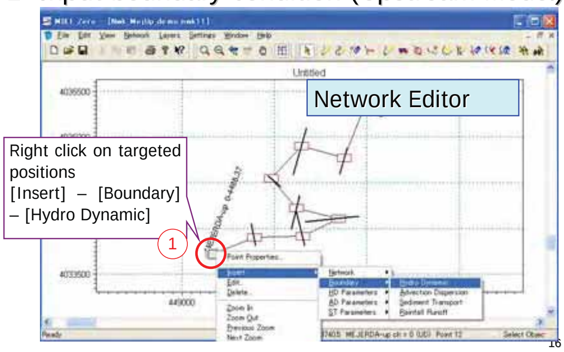
U1. Input boundary condition (Upstream Model)



15

MIKE 11 Mejerda Model： Practice U1

1. Input boundary condition (Upstream Model)



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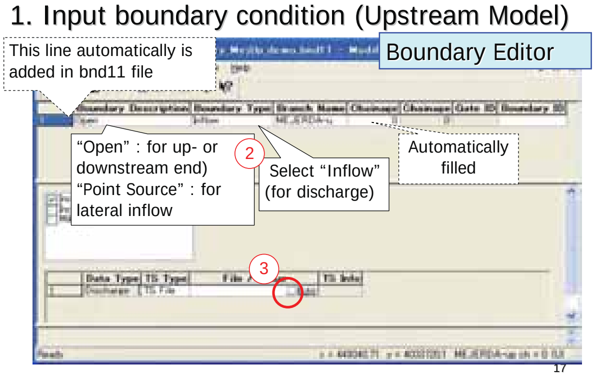
MIKE 11 Mejerda Model： Practice U1

1. Input boundary condition (Upstream Model)



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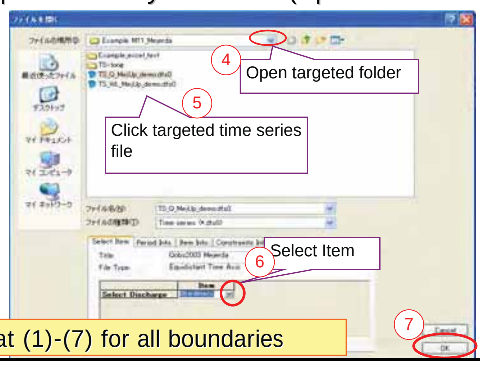
MIKE 11 Mejerda Model： Practice U1

1. Input boundary condition (Upstream Model)



Repeat (1)-(7) for all boundaries

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MIKE 11 Mejerda Model : Practice U1

1. Input boundary condition (Upstream Model)

Up- & Down- ends : “Open”

Location	Chainage	Folder Name	File Name+	Item
Upstream end (Ghardimaou)	0	TS-QDesign	Qin-BPAU1 _Ghardi.dfs0	10-y
Downstream end (Upstream end of Sidi Salem Reservoir)	152972.97	TS-DamWL Design	SSWLd-D2t-4damStOpe-MIKEBasin.dfs0	10-y
Upstream end of Mellegue River	0	TS-QDesign	Qd-D2t-4damStOpe _10y.dfs0	MelDam _out
Upstream end of Bou Heurtma River	0	TS-QDesign	Qdb-D2t-4damStOpe _BouHeurtma.dfs0	10-y
Upstream end of Tessa River	0	TS-QDesign	Qdb-D2t-4damStOpe _Tessa.dfs0	10-y

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MIKE 11 Mejerda Model : Practice U1

1. Input boundary condition (Upstream Model)

Up- & Down- ends : “Point Source”

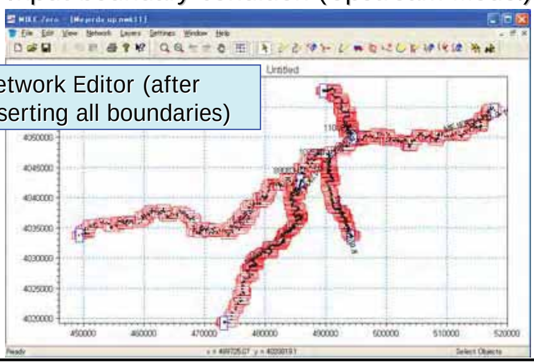
Location	Chainage	Folder Name	File Name	Item
Mejerda & Mellegue Confluence,	88834.33	TS-QDesign	Qd-U2tp11.dfs0	10-y
Mejerda & B.Heurtma Confluence	110641.48	TS-QDesign	Qd-U2tp12.dfs0	10-y

20

MIKE 11 Mejerda Model : Practice U1

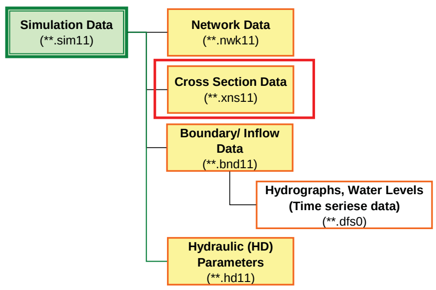
1. Input boundary condition (Upstream Model)

Network Editor (after inserting all boundaries)



MIKE 11 Mejerda Model : Practice U2

U2. Input Marks 4 and 5 (Upstream Model)



Note : (**.sim11) etc. : File extension name

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MIKE 11 Mejerda Model : Practice U2

U2. Input Marks 4 and 5 (Upstream Model)

Prac_Up_StOpeU2_010.sim11

- Cross section File (**.xns11)
- MEJERDA-up : UP-200 ~ UP-213
- After inputting, compute section parameters,
  - [Cross Sections] – [Apply to all Sections]
  - “Re-compute All”

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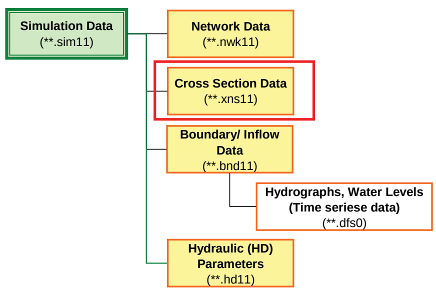
MIKE 11 Mejerda Model : Practice U3

U3. Change Manning’s n (all Cross sections) (Upstream Model)



Note : (**.sim11) etc. : File extension name

24

MIKE 11 Mejerda Model : Practice U3

U3. Change Manning's n (all Cross sections) (Upstream Model)

Prac_Up_StOpeU2_010.sim11

- Cross section File (**.xns11)
- 0.05, 0.04 ➔ 0.055, 0.045
  - [Cross Sections] – [Apply to all Sections] – [Raw data-Resistance]
  - High/Low flow zones
  - Manning's n
  - 0.055, 0.055, 0.045

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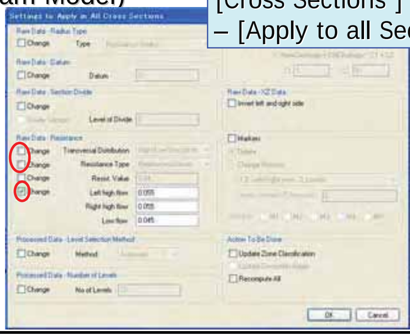
MIKE 11 Mejerda Model : Practice U3

U3. Change Manning's n (all Cross sections) (Upstream Model)

[Cross Sections] – [Apply to all Sections]



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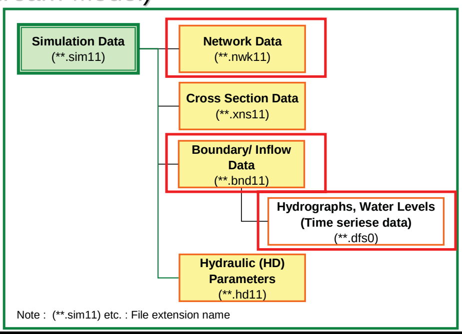
MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)



Note : (**.sim11) etc. : File extension name

27

MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)

Flood Control Option	Reservoir Operation (Boundary : Change)	River Channel (Cross sec.: No Change)
Present	Present (Standard Operation)	Present
Reservoir Operation	Improved ("Optimized, 2030")	Present
Reservoir Operation + River Improvement	Improved ("Optimized, 2030")	After Project

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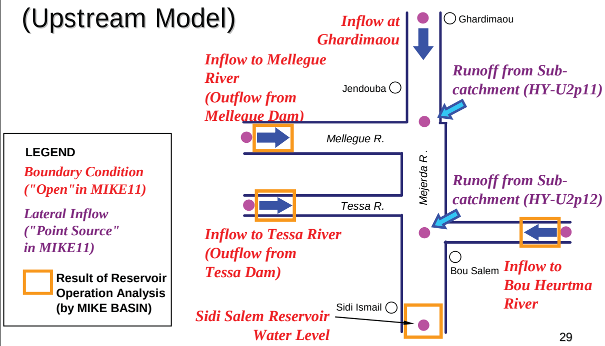
MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)



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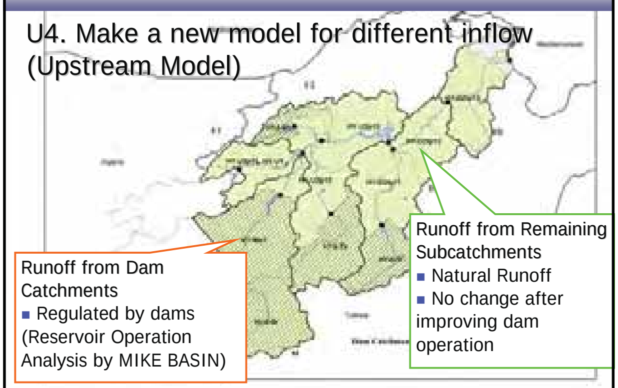
MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)



MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)

Original : Prac_Up_StOpeU2_010.sim11

New : Prac_Up_OptOpeU2_010.sim11

- Network File (**.nwk11) and Boundary file (**.bnd11)
- Change inflow, No change in cross section
- Inflow : Standard dam operation 10-year ➔
  Optimized dam operation (2030) 10-year
- Copy and Change file names [StOpe] (copy a folder)
  - simulation file (Prac_Up_OptOpeU2_010.sim11)
  - boundary file (Prac_Up_OptOpeU2_010.bnd11)

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MIKE 11 Mejerda Model : Practice U4

U4. Make a new model for different inflow (Upstream Model)

New : Prac_Up_OptOpeU2_010.sim11

- Open new Simulation file
- Specify new boundary file in Simulation. file
  - Prac_Up_OptOpeU2_010.bnd11
- Open new boundary file through Simulation File (**.bnd11)
- Change time series data (upstream inflow and water level)
  - Standard dam operation 10-year ➔
    Optimized dam operation (2030) 10-year
- Save Boundary File

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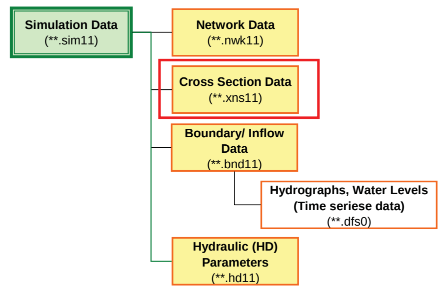
MIKE 11 Mejerda Model : Practice U5

U5. Change cross section shape (Upstream Model)



Note : (**.sim11) etc. : File extension name

33

MIKE 11 Mejerda Model : Practice U5

U5. Change cross section shape (Upstream Model)

Copy from CS2007_MejUp.xns11

- Cross section file (**.xns11)
- Copy and Change file names
  - Original : CS2007_MejUp.xns11
  - Copied : CS2007_MejUp-practice.xns11
- Change cross section shapes

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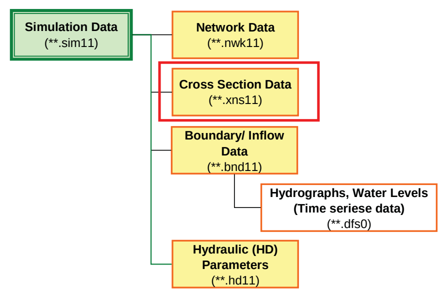
MIKE 11 Mejerda Model : Practice U6

U6. Add Bou Heurtma River (Cross section file) (Upstream Model)



Note : (**.sim11) etc. : File extension name

35

MIKE 11 Mejerda Model : Practice U6

U6. Add Bou Heurtma River (Cross section file) (Upstream Model)

CS2007_MejUp-woBH.xns11

CS2007_Bouheurtma.xns11

- Cross section file (**.xns11)
- Export Bou Heurtma cross section data to text file
  - CS2007_Bouheurtma.xns11
  - [File] – [Export All Sections] – [Export raw data]
  - Save text file (folder “00Excel_txt File” “BouH.txt”)

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MIKE 11 Mejerda Model : Practice U6

U6. Add Bou Heurtma River (Cross section file) (Upstream Model)

CS2007_MejUp-woBH.xns11

CS2007_Bouheurtma.xns11

- Import Bou Heurtma cross section data in to “CS2007_MejUp-woBH.xns11”
  - [File] – [Import raw data]
  - Select text file of Bou Heurtma cross sections (folder “00Excel_txt File” “BouH.txt”)

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MIKE 11 Mejerda Model : Practice U7

U7. Add Bou Heurtma River (Network file) (Upstream Model)

Mejerda_up_woBH.nwk11

BHeurtma.nwk11

- Network file (**.nwk11)
- Copy Bou Heurtma cross section data in excel file
  - BHeurtma.nwk11
  - [View] – [Tabular View]
  - [Network] – [Points]
  - Select “X-coord.” to “Chainage”, then “Copy”

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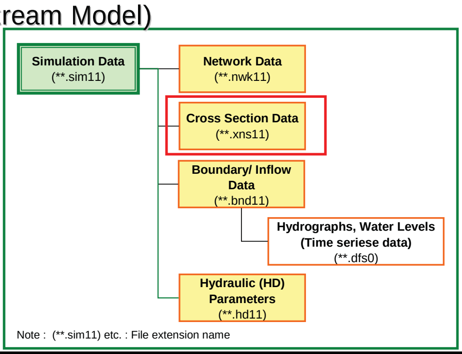
MIKE 11 Mejerda Model : Practice U7

U7. Add Bou Heurtma River (Network file) (Upstream Model)



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MIKE 11 Mejerda Model : Practice U7

U7. Add Bou Heurtma River (Network file) (Upstream Model)

Mejerda_up_woBH.nwk11

BHeurtma.nwk11

- Paste data on excel file
- Delete the column of “Chainage type”
- Select columns in Excel
- Past on a new Note Pad file
- Save Note Pad file “prac_bh.txt”

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MIKE 11 Mejerda Model : Practice U7

U7. Add Bou Heurtma River (Network file) (Upstream Model)

Mejerda_up_woBH.nwk11

BHeurtma.nwk11

- Import text file
  - “Mejerda_up_woBH.nwk11”
  - [File] – [Import] – [Point and Branch Data from Point-Branch ASCII File...]
  - [View] – [Tabular View...] – [Topo ID] “2007_2”

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Republic of Tunisia

The Study
on
Integrated Basin Management
Focused on Flood Control
in
Mejerda River

Training
on
Inundation Analysis Model (MIKE FLOOD)
for
the Mejerda River Basin

June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

Contents of Training

- Lecture Type
  - 1-1: What is MIKE FLOOD
  - 1-2: Overview of the Mejerda Model
  - 2: MIKE11 Mejerda Model
  - 3: MIKE21 Mejerda Model
  - 4: MIKE FLOOD Mejerda Model
- Software practices using simple sample models (demo version)
- Practices how to operate and update the Mejerda inundation analysis model

MIKE21

2

Practice Items : MIKE 21 Mejerda Model

U1 : Open and close boundaries (Change elevation data in some cells)

U2 : Make a MIKE 21 Model (Cold Start)

U3 : Make a MIKE 21 Model (Hot Start)

3

Practice Items : MIKE 21 Mejerda Model

D1 : Make a MIKE 21 Model (Cold Start)

D2 : Post Processing : Overlay result dfs2 file and GIS shp file

D3 : Post Processing : Make video file

D4 : Post Processing : Extract maximum inundation depth in cells

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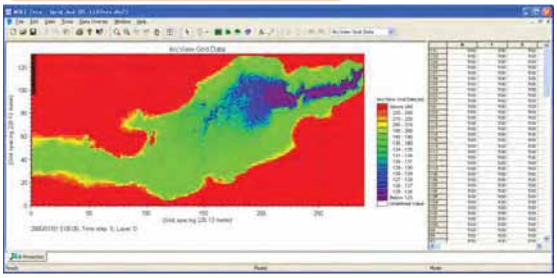
MIKE 21 Mejerda Model : Practice U1

U1. Open and close boundaries (Change elevation data in some cells) (Upstream Model)

grid-Up-practice.dfs2



MIKE 21 Mejerda Model : Practice U1

U1. Open and close boundaries (Change elevation data in some cells) (Upstream Model)

grid-Up-practice.dfs2

- Open boundary
  - 500 ➔ 200 (mNGT)
- Close boundary
  - 200 ➔ 500
- Check land value
  - [Edit] – [Items...]

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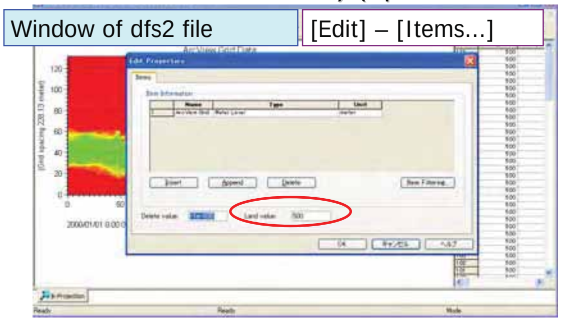
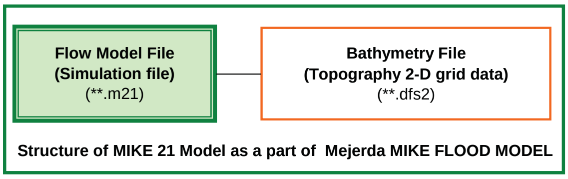
MIKE 21 Mejerda Model : Practice U1

U1. Open and close boundaries (Change elevation data in some cells) (Upstream Model)



MIKE 21 Mejerda Model : Practice U2

U2. Make a MIKE 21 Model (Upstream Model)



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MIKE 21 Mejerda Model : Practice U2

U2. Make a MIKE 21 Model (Cold Start) (Upstream Model)

prac_Up_OptOpe_10y.m21

- Flow Model File (**.m21)
- Make a new Flow Model File (**.m21)
  - prac_Up_OptOpe_10y.m21
- Select bathymetry file
  - grid-Up.dfs2
- Input parameters (Cold Start)
  - Simulation period : 3 days (from 11/Jan/90 12:00)

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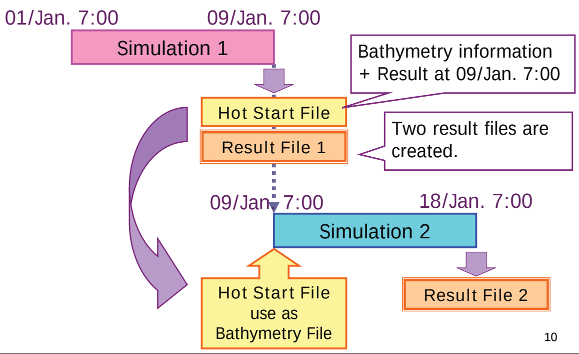
MIKE 21 Mejerda Model : Practice U2



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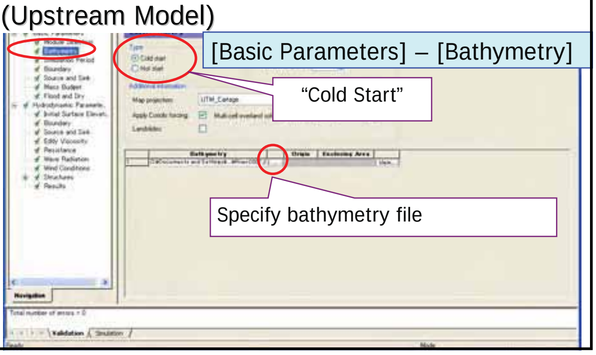
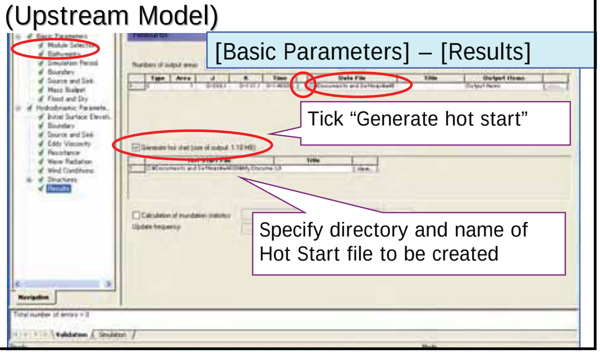
MIKE 21 Mejerda Model : Practice U2

U2. Make a MIKE 21 Model (Cold Start) (Upstream Model)



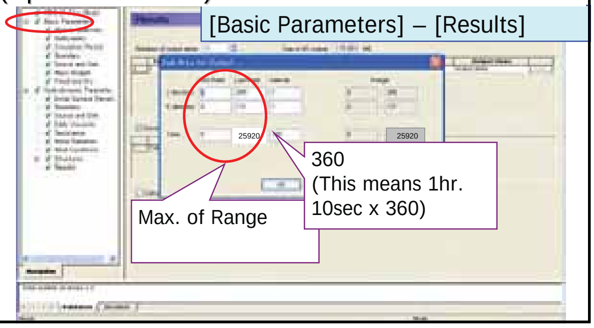
MIKE 21 Mejerda Model : Practice U2

U2. Make a MIKE 21 Model (Cold Start) (Upstream Model)



MIKE 21 Mejerda Model : Practice U2

U2. Make a MIKE 21 Model (Cold Start) (Upstream Model)



MIKE 21 Mejerda Model : Practice U3

U3. Make a MIKE 21 Model (Hot Start) (Upstream Model)

prac_Up_OptOpe_10y-hot.m21

- Flow Model File (**.m21)
- Copy a "cold start" Flow Model File (**.m21)
  - Original: prac_Up_OptOpe_10y.m21
  - Copy: prac_Up_OptOpe_10y-hot.m21
- Select hot start file as a bathymetry file
  - HotS_Up_StOpe_010.dfs2
- Input parameters (Hot Start)
  - Simulation period : 3 day

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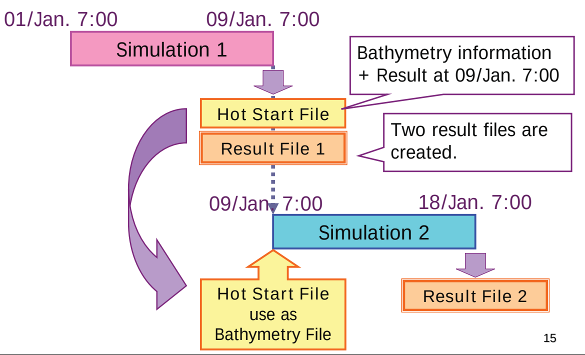
MIKE 21 Mejerda Model : Practice U3



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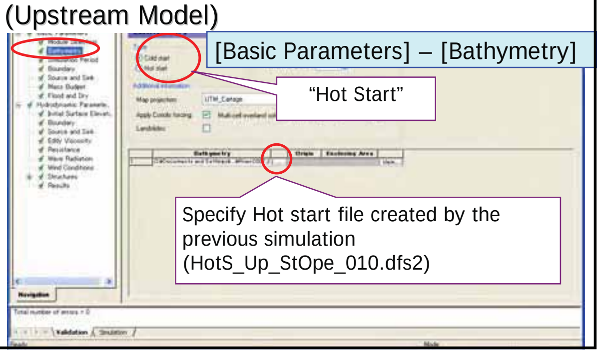
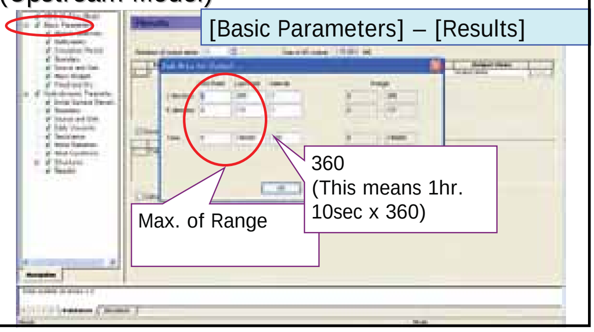
MIKE 21 Mejerda Model : Practice U3

U3. Make a MIKE 21 Model (Hot Start) (Upstream Model)



MIKE 21 Mejerda Model : Practice U3

U3. Make a MIKE 21 Model (Hot Start) (Upstream Model)



MIKE 21 Mejerda Model : Practice D1

D1. Make a MIKE 21 Model (Cold Start) (Downstream Model)

prac_Dn_OptOpe_10y.m21

- Flow Model File (**.m21)
- Make a new Flow Model File (**.m21)
  - prac_Dn_OptOpe_10y.m21
- Select bathymetry file
  - grid-dn.dfs2
- Input parameters (Cold Start)
  - Simulation period : 3 days (12/Jan/90 7:00-)

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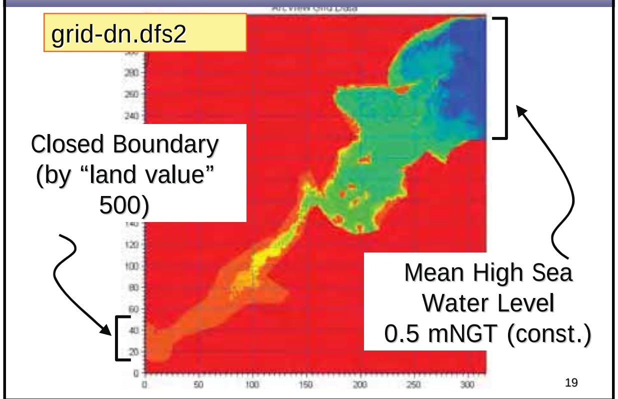
MIKE 21 Mejerda Model : Practice D1



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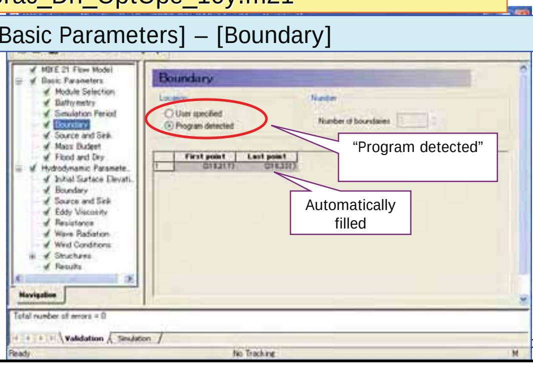
MIKE 21 Mejerda Model : Practice D1

prac_Dn_OptOpe_10y.m21

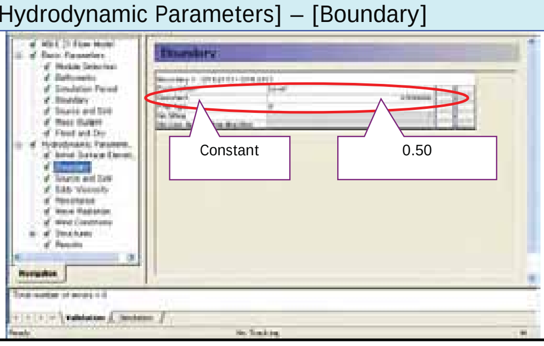
[Basic Parameters] – [Boundary]



MIKE 21 Mejerda Model : Practice D1

prac_Dn_OptOpe_10y.m21

[Hydrodynamic Parameters] – [Boundary]



MIKE 21 Mejerda Model : Practice D2

D2. Post Processing : Overlay result dfs2 file and GIS shp file (Downstream Model)

Dn_OptOpe2030_D2t_020yLL_3-18.dfs2

- MIKE21 Result File (**.m21)
- Make a new “Result View” file (**.rev) (MIKE ZERO)
  - prac_rev.rev
- Select MIKE21 result file
  - [Projects] – [Add Files to Project] – Press “new file” icon – [MIKE21 Result File] – Select “Dn_OptOpe2030_D2t_020yLL_3-18.dfs2”

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MIKE 21 Mejerda Model : Practice D2

D2. Post Processing : Overlay result dfs2 file and GIS shp file (Downstream Model)

Dn_OptOpe2030_D2t_020yLL_3-18.dfs2

- Select MIKE21 result file
  - [Projects] – [Work Area] – “browse” – “D_Carthage” – “Carthage_UTM_Zone_32N” (or UTM_Carthage)
  - [Projects] – [Add Files to Project] – Press “new” icon – [Shape file] – Select GIS shape file of the Mejerda River “Topo2007_mejerda-down.shp”

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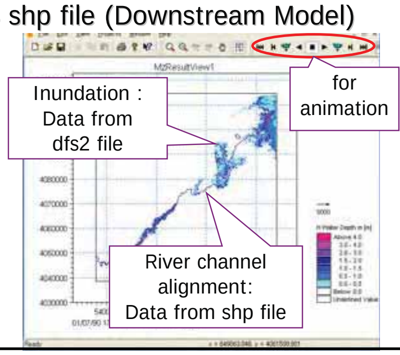
MIKE 21 Mejerda Model : Practice D2

D2. Post Processing : Overlay result dfs2 file and GIS shp file (Downstream Model)



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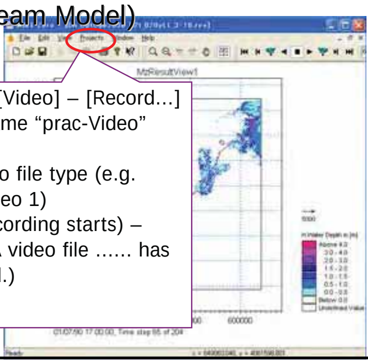
MIKE 21 Mejerda Model : Practice D3

D3. Post Processing : Make video file (Downstream Model)



[Projects] – [Video] – [Record…]
– vide file name "prac-Video"
– [OK]
– Select video file type (e.g. Microsoft Video 1)
– [OK] – (recording starts) – (Message : A video file …… has been created.)
– [OK]

MIKE 21 Mejerda Model : Practice D4

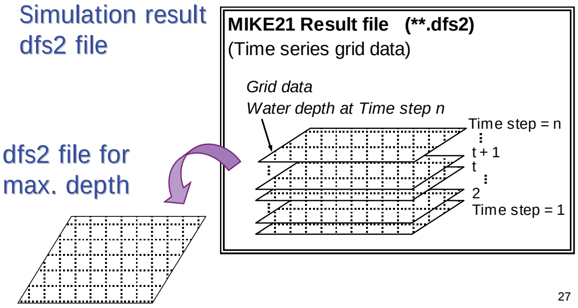
D4. Post Processing : Extract maximum inundation depth in cells (Downstream Model)

Dn_OptOpe2030_D2t_020yLL_3-18.dfs2

- MIKE 21 Result File (**.dfs2)
- MIKE ZERO Toolbox
- Procedures
  - See separate papers

MIKE 21 Mejerda Model : Practice D4

D4. Post Processing : Extract maximum inundation depth in cells (Downstream Model)



Republic of Tunisia

The Study
on
Integrated Basin Management
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Training on Inundation Analysis Model (MIKE FLOOD) for the Mejerda River Basin

June 2008
Nippon Koei Co., Ltd.

Hydrology/Hydraulics/Runoff and Sediment Analyses
TOTSUKA Natsuko

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MIKE FLOOD

2

Practice Items : MIKE FLOOD Mejerda Model

U1 : Make a MIKE FLOOD Model (Improved dam operation)

U2 : Make a MIKE FLOOD Model (River Improvement) (Modify linking chainages, including modifying positions of Mark 1 & 3 of cross section)

3

MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)

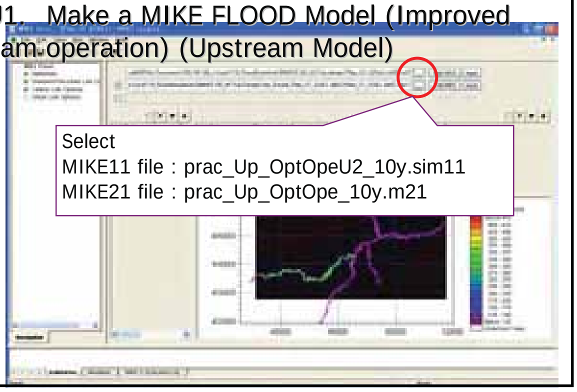
prac_up_OptOpe.couple

- MIKE FLOOD definition file (**.couple)
- Improved Dam Operation + Present Channel
- Make a new "*.couple" file
  - prac_up_OptOpe.couple
- Specify MIKE11 (**.sim11) and MIKE21 (**.m21) files
  - MIKE11: prac_Up_OptOpeU2_10y-mf.sim11
  - MIKE21: prac_Up_OptOpe_10y-mf.m21

4

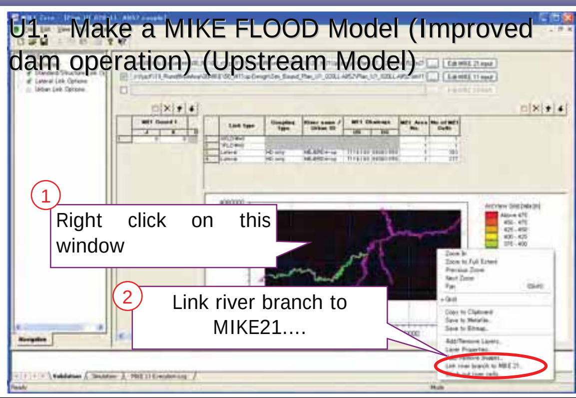
MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)



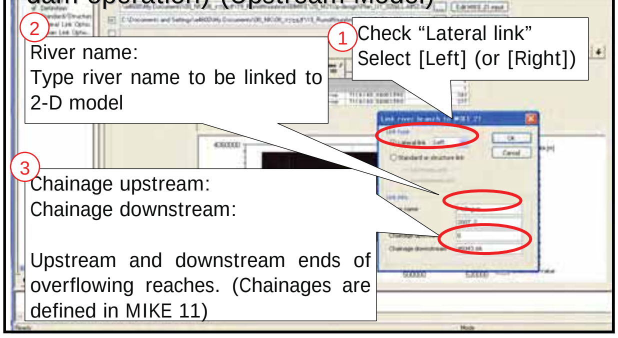
MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)



MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)



MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)

River Name	Chainage Upstream	Chainage Downstream
MEJERDA-up	7119.190	145950.120
Mellegue	16725.350	45043.660
BouHeurtma	6400.700	17334.270
Tessa	2772.070	20209.790

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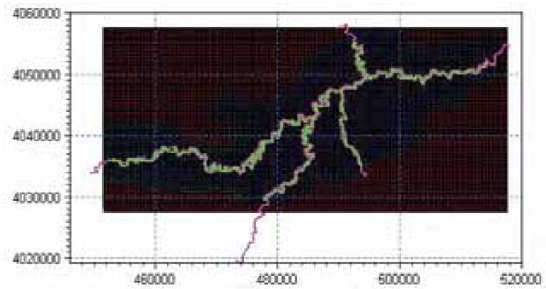
MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)



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MIKE Fl. Mejerda Model : Practice U1

U1. Make a MIKE FLOOD Model (Improved dam operation) (Upstream Model)

prac_up_OptOpe.couple

- Specify simulation period (MIKE11 and MIKE21)
  - 2 / Jan., 1990 12:00 ~ 3 days

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MIKE Fl. Mejerda Model : Practice U2

U2. Make a MIKE FLOOD Model (River Improvement) (Upstream Model)

prac_up_afterPro.couple

- MIKE FLOOD definition file (**.couple)
- Improved Dam Operation + Present Channel & Levee (Cross Section UP-124 to UP-90
- Modify linking chainages
- modify positions of Mark 1 & 3 of cross section

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MIKE Fl. Mejerda Model : Practice U2

U2. Make a MIKE FLOOD Model (River Improvement) (Upstream Model)

prac_up_afterPro.couple

- Copy “*.couple” file
  - Original : prac_up_OptOpe.couple
  - Copy : prac_up_afterPro.couple
- MIKE 11 and MIKE21
  - MIKE 11 :
    Folder Name : Sim_Bound_OptOpe_U2_010-afterPro
    File Name: Prac_Up_OptOpeU2_010-afterPro.sim11
  - MIKE 21 : Prac_Up_OptOpe_10y-afterPro.m21

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MIKE Fl. Mejerda Model : Practice U2

U2. Make a MIKE FLOOD Model (River Improvement) (Upstream Model)

prac_up_afterPro.couple

- Open MIKE11 sim file
- Change cross section file
  - before: CS2007_MejUp.xns11
  - after : CS2007_MejUp-afterPro.xns11
- Change chainage on MIKE FLOOD: Mejerda-Up
  - Levee : Cross Section UP-124 to UP-90
  - New Link : 7119.19 – 105187.7
    117460.26 – 145950.12

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MIKE Fl. Mejerda Model : Practice U2

U2. Make a MIKE FLOOD Model (River Improvement) (Upstream Model)

prac_up_afterPro.couple

- Result file name
  - MIKE 11 : Prac_Up_OptOpeU2_010-afterPro.res11
  - MIKE 21 : Res_OptOpe_10y-afterPro.dfs2
- Open MIKE11 Cross section file
- Change positions of Mark 1 and 3
  - Cross Section : UP-124 to UP-90

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