

# SimPower

Version dated July 2018

General information

Project components

Plant operation

Inflow and evaporation

Cost properties

Financial parameters

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir

### Project components

#### Development type

- Reservoir
  - Reservoir capacity
  - Initial storage  million m<sup>3</sup>
- Run-of-river

#### Headworks

- River bed level  El m
- Spillway width  m
- Dam
  - Dam volume
  - Type  ▾
  - Maximum topo  El m
  - Sediment level  El m
  - MDL = sediment level +  ×  ▾
  - Geological conditions  ▾
- Weir
  - Normal level  El m
  - Energy dissipator

#### Settling basin

Average ground slope  %

#### Headrace channel

Length  m

Velocity  m/s  Auto

Side slope  h: 1 v

Bed width/wet height

Material

Average ground slope  %

#### Headrace tunnel

Length  m

Diameter range  to  m

Geological conditions  ▾

#### Syphon

Length  m

Diameter range  to  m

Pressure head  m

#### Surgetank Headpond

Average ground slope  %

#### Exposed penstock

Length  m

Diameter range  to  m

#### Pressure (penstock) tunnel

Upper length  m

Lower length  m

Diameter range  to  m

#### Powerhouse

Type  ▾

Average ground slope  %

OK

Cancel

### Project components

**Tailrace channel**

Length  m

Velocity  m/s  Auto

Side slope  h : 1 v

Bed width/wet height

Material

Average ground slope  %

**Tailrace tunnel**

Length  m

Diameter range  to  m

Geological conditions

**Adit tunnel**

Length  m

Diameter  m

Geological conditions

**Access tunnel**

Length  m

Diameter  m

Geological conditions

**Access road**

Length  km

Width  m

Average ground slope  %

**Road repair**

Length  km

Width  m

**Bridges**

Total length  m

Width  m

**Transmission line**

Voltage

Length  km

**Substation**

Number of bays

**Tailwater**

Fixed tailwater level

Tailwater level  El. m

**Land acquisition**

Structures  ha  Auto

Reservoir  ha

Plantation  %

**Miscellaneous**

Catchment area  km<sup>2</sup>

OK

Cancel

## Plant operation

Operation mode

Base ▼

Peak operation time

 hours/day

Plant usage and losses

 %

Transmission losses

 %  Auto, length  km

OK

Cancel



## Inflow data

Starting year: 1998

No. of years: 20

Flow data type:  Monthly  DailyUnit: m<sup>3</sup>/s

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	1	31.689	72.428	22.521	20.388	27.507	42.083	12.272	18.919	39.297	27.447	31.676	34.806
1999	2	32.158	60.745	22.022	19.023	21.776	20.262	12.016	19.467	32.251	26.867	31.448	34.252
2000	3	36.493	35.352	21.664	30.288	17.187	53.242	11.767	16.581	43.571	26.307	28.158	32.479
2001	4	30.642	30.081	35.836	22.498	18.381	36.683	11.522	49.163	32.641	54.821	59.056	87.582
2002	5	29.049	28.603	24.124	19.106	45.215	20.787	38.771	23.175	45.948	32.031	41.854	65.903
2003	6	28.266	27.849	21.562	34.97	23.626	17.511	17.486	28.742	55.079	27.296	62.839	67.289
2004	7	27.645	27.241	20.726	21.616	21.067	16.612	13.273	29.498	35.059	34.761	35.535	72.108
2005	8	27.065	26.67	21.226	21.28	91.104	16.167	15.434	68.123	48.997	60.094	29.909	38.138
2006	9	36.623	26.115	30.831	18.539	33.641	25.621	36.757	28.799	33.742	33.185	28.37	36.355
2007	10	36.178	25.573	31.444	17.722	22.495	17.778	36.774	21.074	30.365	43.028	28.608	66.97
2008	11	46.031	25.042	22.212	34.406	29.126	16.034	30.975	21.264	44.844	29.786	28.996	57.041
2009	12	30.618	24.522	31.306	31.728	21.545	15.443	20.98	51.206	49.29	26.846	26.937	56.815
2010	13	32.304	24.013	22.032	27.078	31.444	15.074	15.52	52.819	45.472	40.133	26.104	36.483
2011	14	27.169	23.514	20.51	19.728	21.969	14.751	21.636	27.593	80.833	28.578	25.51	33.693
2012	15	34.506	58.393	27.475	18.043	19.634	14.443	21.683	68.862	49.876	25.969	27.632	31.148
2013	16	129.8	48.09	30.29	18.035	18.873	14.143	15.565	31.606	35.087	25.051	25.074	30.155
2014	17	77.946	29.278	22.02	17.163	18.415	22.776	56.739	24.586	31.773	25.823	26.133	29.463
2015	18	53.115	25.322	19.524	16.714	18.02	15.653	23.649	111.887	30.627	24.258	24.066	28.839

Insert year

Add year

Delete year

OK

Cancel

Import data

Reservoir evaporation

## Cost properties

EPC cost factor	<input type="text" value="0.98"/>	
Currency	<input type="text" value="USD"/>	
Steel price	<input type="text" value="1000"/>	USD/ton
Land price for structures	<input type="text" value="3.7"/>	USD/m <sup>2</sup>
Land price for reservoir	<input type="text" value="0"/>	USD/m <sup>2</sup>
Plantation price	<input type="text" value="0.1"/>	USD/m <sup>2</sup>
Contingency	<input type="text" value="5"/>	% of total direct costs
Management and administration	<input type="text" value="7"/>	% of total direct costs
Value added tax	<input type="text" value="10"/>	% of total direct costs
Miscellaneous civil works	<input type="text" value="5"/>	% of total civil work costs
Confident level	<input type="text" value="Low"/>	

## Financial parameters

Economic life of project  years

Annual interest rate  %

Salvage value  % of project cost

Feed-in tariffs

Firm energy  cUSD/kWh

Transmission  cUSD/kWh  Auto

Annual escalation rates:

OM&R costs  %

Feed-in tariffs  %

Income tax  %

Loan portion  %

## Run options

 Inflow analysis Simulation Flow dependability from  % to  %, increment  % Desired flow  m<sup>3</sup>/s FSL decrement  m Desired FSL  El. m Cost estimates Financial analysis Optimization criterion Largest IRR Largest NPV Capacity factor  % minimum  ▾



## Print

**Input data**

- 
- Basic data

**Inflow analyses**

- 
- Inflow
- 
- 
- Average inflow, run-off volume
- 
- 
- Inflow - duration
- 
- 
- Draft-required storage

**Simulations**

- 
- Cases basic
- 
- 
- Simulation summary

**Costs and benefits evaluations**

- 
- Cost estimates
- 
- 
- Financial analysis

**Selected case**

- 
- Yearly summary
- 
- 
- Monthly summary
- 
- 
- Daily summary
- 
- 
- Outflow
- 
- 
- Inflow/outflow - duration
- 
- 
- Power - duration
- 
- 
- Turbine charts
- 
- 
- Unit efficiency curves
- 
- 
- Cost estimates
- 
- 
- Cash flows
- 
- 
- Project parameters

Print

Preview

Cancel

Page setup

No. of pages:  
155 Graphs Tables Grey shadow

Select all

Deselect all

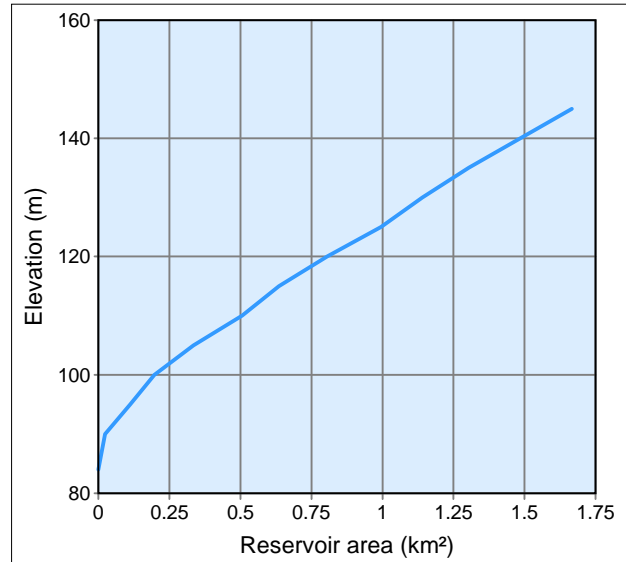
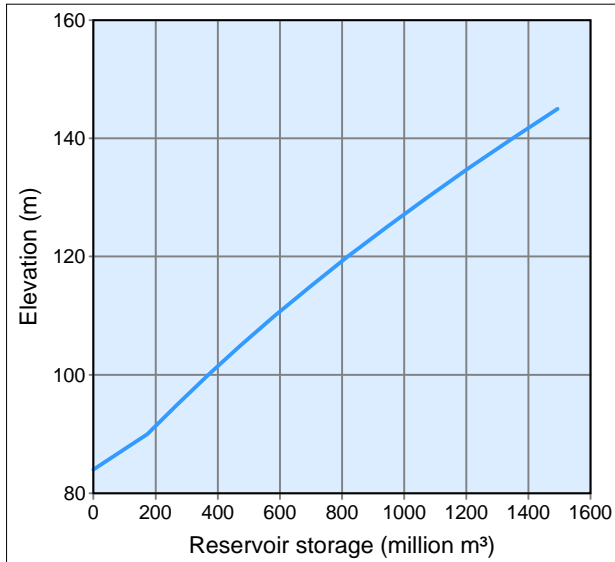
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Basic data

Parameter	Unit	Value	Parameter	Unit	Value
Development type		Reservoir	Tailwater		
Headwork			Level type		Fixed
Spillway width	m	60	Tailwater level	El. m	75
Headwork type		Dam	Land acquisition		
Dam type		Embankment	Structures	ha	Auto
Maximum topo	El. m	140	Reservoir	ha	Auto
Sedimen level	El. m	110	Plantation		20
MOL = sediment level + Geological conditions		D tunnel x 1.5 Very easy	Catchment area	km <sup>2</sup>	512
Headrace tunnel			Plant operation		
Length	m	500	Operation mode		Base
Diameter range	m	2.5 to 8	Plant usage and losses		4%
Geological conditions		Medium	Transmission losses		Auto
Surgetank			Transmission length	km	15
Exposed penstock			Cost properties		
Length	m	200	EPC cost factors		0.98
Diameter range	m	0.5 to 5	Currency		USD
Powerhouse			Steel price	USD/ton	1000
Type		Exposed	Land price for structures	USD/m <sup>2</sup>	3.7
Access road			Plantation price	USD/m <sup>2</sup>	0.1
Length	km	5	Contingency/ total direct cost		5%
Width	m	3.5	Value added tax/ total direct cost		10%
Bridges			Miscellaneous civil works/ total civil work cost		5%
Total length	m	60	Confident level		Low
Width	m	3.5	Project office cost	million USD	0.3
Plant equipment			Financial parameters		
Number of units		2	Economic life of project	years	30
Efficiency factor		1	Annual interest rate		12%
Turbine type		Auto	Salvage value/project cost		0%
Frequency	Hz	50	Feed-in tarif method		Flat
Frequency	Hz	50	· Firm energy	cUSD	11
Rated/design discharge		1	· Transmission	cUSD	Auto
Transmission line			Annual escalation rates		
Voltage	kV	20	· OM&R costs		0%
Length	km	15	· Feed-in tariffs		0%
			Income tax		25%
			Loan portion		75%

**Sample project**  
**Site screening stage**  
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**River: Sample**

## Reservoir storage and area

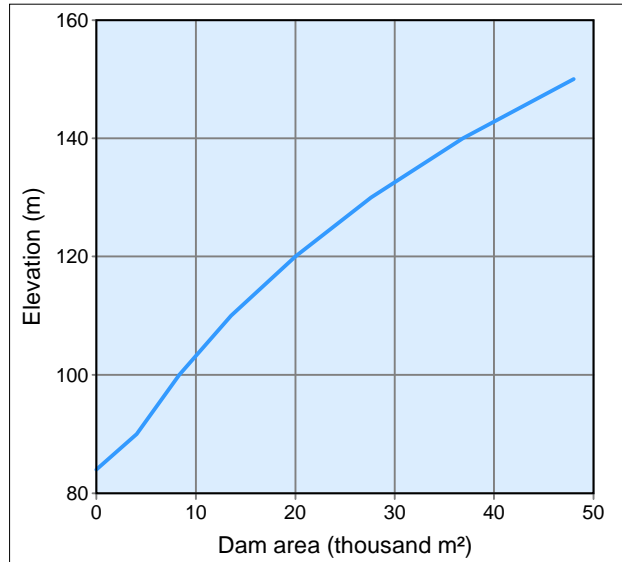
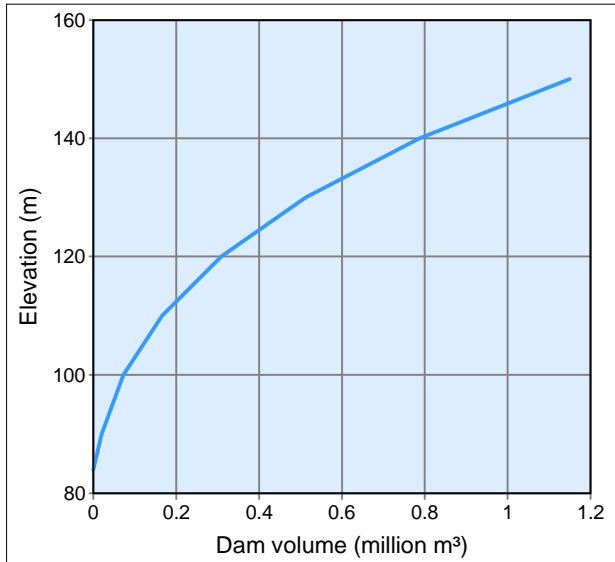


Elevation (El. m)	Reservoir storage (million m³)	Reservoir area (km²)
84.00	0.00	0.000
90.00	174.00	0.023
95.00	269.00	0.111
100.00	369.00	0.197
105.00	474.00	0.335
110.00	584.00	0.506
115.00	699.00	0.635

Elevation (El. m)	Reservoir storage (million m³)	Reservoir area (km²)
120.00	819.00	0.806
125.00	944.00	0.995
130.00	1074.00	1.140
135.00	1209.00	1.303
140.00	1349.00	1.485
145.00	1494.00	1.666

**Sample project**  
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## Dam volume and area

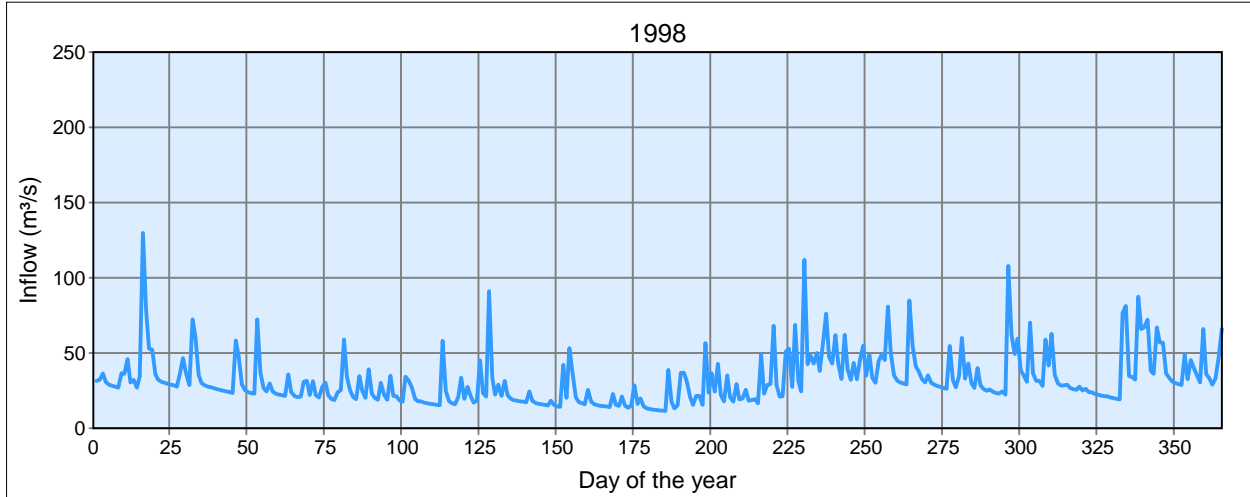


Elevation (m)	Dam volume (million m³)	Dam area (thousand m²)
84.00	0.000	0.000
90.00	0.023	4.050
100.00	0.084	8.332
110.00	0.193	13.546

Elevation (m)	Dam volume (million m³)	Dam area (thousand m²)
120.00	0.360	20.015
130.00	0.597	27.630
140.00	0.918	36.857
150.00	1.341	48.000

**Sample project**  
**Site screening stage**  
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**River: Sample**

## Inflow



Year: 1998

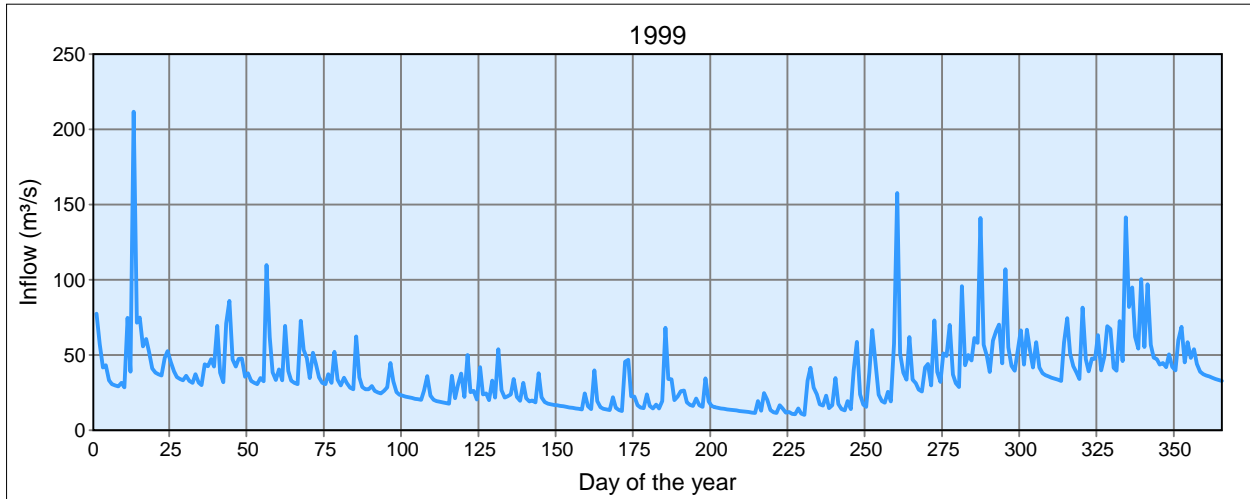
Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	31.69	72.43	22.52	20.39	27.51	42.08	12.27	18.92	39.30	27.45	31.68	34.81
2	32.16	60.75	22.02	19.02	21.78	20.26	12.02	19.47	32.25	26.87	31.45	34.25
3	36.49	35.35	21.66	30.29	17.19	53.24	11.77	16.58	43.57	26.31	28.16	32.48
4	30.64	30.08	35.84	22.50	18.38	36.68	11.52	49.16	32.64	54.82	59.06	87.58
5	29.05	28.60	24.12	19.11	45.22	20.79	38.77	23.18	45.95	32.03	41.85	65.90
6	28.27	27.85	21.56	34.97	23.63	17.51	17.49	28.74	55.08	27.30	62.84	67.29
7	27.65	27.24	20.73	21.62	21.07	16.61	13.27	29.50	35.06	34.76	35.54	72.11
8	27.07	26.67	21.23	21.28	91.10	16.17	15.43	68.12	49.00	60.09	29.91	38.14
9	36.62	26.12	30.83	18.54	33.64	25.62	36.76	28.80	33.74	33.19	28.37	36.36
10	36.18	25.57	31.44	17.72	22.50	17.78	36.77	21.07	30.37	43.03	28.61	66.97
11	46.03	25.04	22.21	34.41	29.13	16.03	30.98	21.26	44.84	29.79	29.00	57.04
12	30.62	24.52	31.31	31.73	21.55	15.44	20.98	51.21	49.29	26.85	26.94	56.82
13	32.30	24.01	22.03	27.08	31.44	15.07	15.52	52.82	45.47	40.13	26.10	36.48
14	27.17	23.51	20.51	19.73	21.97	14.75	21.64	27.59	80.83	28.58	25.51	33.69
15	34.51	58.39	27.48	18.04	19.63	14.44	21.68	68.86	49.88	25.97	27.63	31.15
16	129.80	48.09	30.29	18.04	18.87	14.14	15.57	31.61	35.09	25.05	25.07	30.16
17	77.95	29.28	22.02	17.16	18.42	22.78	56.74	24.59	31.77	25.82	26.13	29.46
18	53.12	25.32	19.52	16.71	18.02	15.65	23.65	111.89	30.63	24.26	24.07	28.84
19	52.10	24.17	18.74	16.35	17.64	15.05	36.69	42.70	29.90	23.56	23.87	49.14
20	35.82	23.55	23.92	16.01	17.28	21.15	24.65	48.37	29.26	23.04	22.88	32.55
21	32.21	23.04	25.36	15.67	24.45	15.04	42.80	43.00	84.87	24.54	22.31	45.47
22	31.01	72.48	59.04	15.35	18.33	13.66	22.20	50.18	54.74	22.55	21.83	39.81
23	30.26	36.88	34.39	58.17	16.90	14.91	18.03	38.11	41.07	107.86	21.38	35.39
24	29.62	26.81	25.10	24.82	16.35	28.53	35.29	56.35	38.07	61.93	21.40	30.39
25	29.00	24.50	20.70	18.26	15.97	16.32	20.77	76.14	32.77	49.45	20.61	66.04
26	28.67	29.76	19.54	16.75	15.63	19.82	17.75	47.57	30.50	59.71	20.11	36.04
27	27.87	24.54	34.66	16.19	15.31	14.51	29.35	43.04	35.31	38.69	19.68	33.30
28	36.85	23.16	24.89	20.83	18.47	13.29	19.36	61.93	30.24	34.74	19.27	29.07
29	46.71		20.20	33.65	15.49	12.84	19.83	42.39	28.96	30.83	76.67	32.97
30	36.18		39.16	19.58	14.68	12.54	25.58	32.81	28.08	70.22	81.34	47.33
31	28.93		23.18		14.29		18.32	62.16		36.66		66.06



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



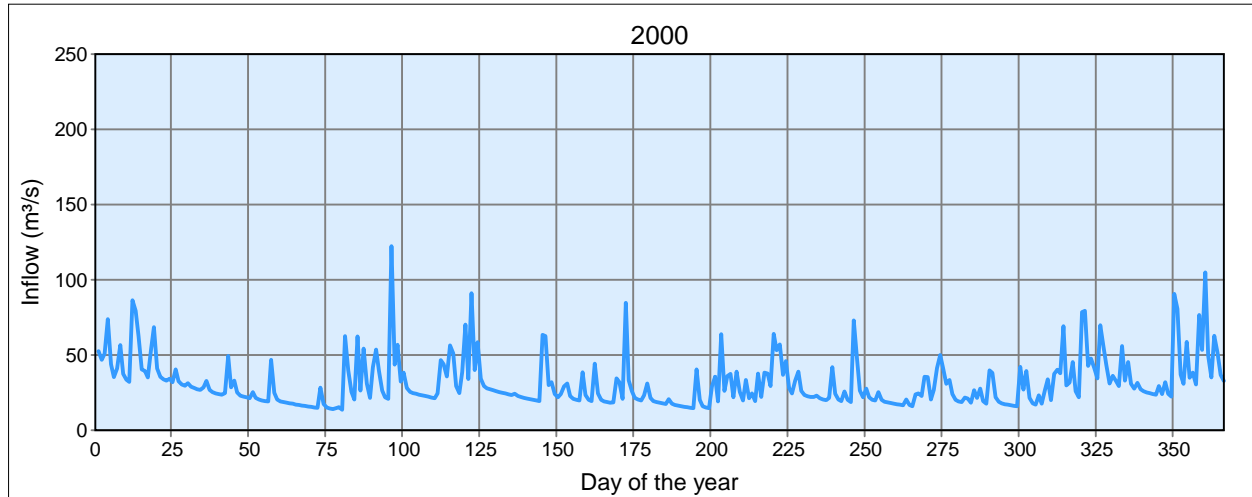
Year: 1999

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	77.47	31.62	40.51	26.23	50.06	15.94	17.17	11.88	19.52	32.17	58.69	81.88
2	57.35	37.36	33.24	25.19	25.37	15.61	14.46	11.64	14.10	51.25	41.80	94.89
3	41.84	31.73	69.36	24.57	26.18	15.29	19.55	19.45	39.79	49.41	37.99	62.18
4	43.39	30.16	39.37	26.34	20.49	14.97	68.27	13.04	58.89	69.99	36.65	54.44
5	33.23	43.98	33.18	28.58	41.95	14.66	34.04	24.87	23.94	37.05	35.78	100.50
6	30.80	42.52	31.48	44.78	23.87	14.35	33.86	20.44	17.10	31.42	35.02	55.40
7	29.83	47.37	30.64	32.58	24.44	14.06	20.11	13.54	15.55	28.87	34.29	97.15
8	29.15	42.35	72.87	25.43	20.12	24.69	22.33	12.04	38.57	95.86	33.58	56.80
9	31.54	69.45	53.56	23.68	33.20	16.04	26.01	11.56	66.53	43.18	32.88	48.35
10	28.65	38.30	47.98	22.96	21.79	14.17	26.55	16.80	45.12	50.04	58.30	47.26
11	74.68	31.92	34.85	22.44	53.79	39.85	18.61	14.47	23.79	46.37	74.47	43.77
12	39.03	71.19	51.54	21.97	26.61	19.41	16.84	11.80	19.46	61.40	51.16	44.76
13	211.71	85.96	44.45	21.51	21.73	15.31	16.22	12.15	18.34	58.21	42.74	41.98
14	71.63	47.19	35.11	21.06	22.58	14.30	21.11	11.04	25.60	141.05	38.41	50.50
15	74.91	42.47	31.69	20.63	23.86	13.88	16.74	10.65	19.25	56.93	34.15	42.13
16	55.86	47.49	30.68	20.20	34.18	13.56	15.65	14.54	57.52	49.43	81.46	39.88
17	60.67	47.72	37.20	26.41	22.26	22.00	34.48	11.15	157.76	38.87	47.34	59.84
18	52.27	35.62	31.47	36.05	19.69	15.04	19.36	10.33	51.07	59.54	39.29	68.76
19	41.16	37.91	52.19	23.10	31.69	13.51	16.25	33.00	38.27	66.01	47.78	45.08
20	38.42	32.92	33.82	20.33	21.42	13.00	15.41	41.48	33.62	70.22	47.54	58.57
21	37.27	31.45	29.86	19.47	19.16	45.59	14.99	28.31	62.04	44.51	63.28	48.12
22	36.43	30.65	34.95	18.99	19.77	47.00	14.66	23.96	33.56	106.93	39.81	53.94
23	48.19	34.76	51.36	18.58	18.55	22.63	14.35	17.29	31.30	55.14	49.06	44.12
24	52.67	32.57	28.34	18.19	37.87	22.47	14.05	16.42	27.05	42.79	69.29	39.04
25	45.27	109.82	27.31	17.81	22.04	16.59	13.76	23.06	25.81	39.62	67.33	37.44
26	39.27	62.03	62.28	36.28	18.75	15.22	13.48	14.82	41.78	52.37	41.63	36.52
27	35.47	38.53	35.16	21.49	17.83	14.72	13.20	16.64	44.19	66.38	39.65	35.73
28	34.17	33.56	28.90	31.10	17.36	23.86	12.92	34.88	29.83	43.79	72.66	34.98
29	33.36		27.35	37.72	16.98	16.29	12.65	17.56	72.93	66.88	45.97	34.26
30	36.30		27.27	22.24	16.63	14.62	12.39	14.08	38.79	52.61	141.64	33.55
31	32.82		29.47		16.28		12.14	13.20		41.85		32.85

**Sample project**  
**Site screening stage**  
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**River: Sample**

## Inflow



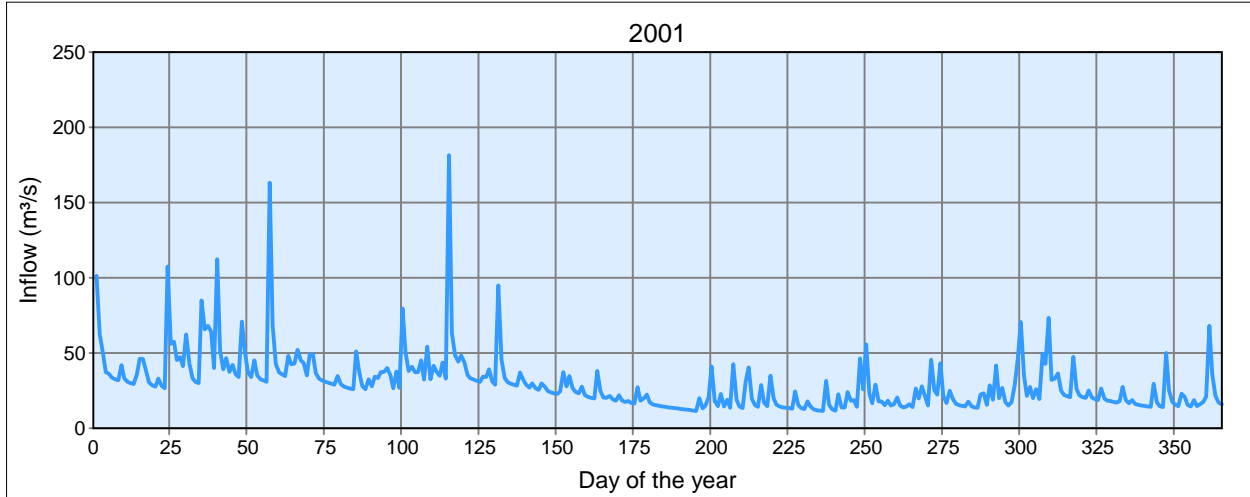
Year: 2000

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	52.68	28.08	18.79	39.58	91.14	31.08	18.34	19.44	18.83	41.28	23.23	30.94
2	47.01	27.43	18.37	26.56	40.12	22.89	17.95	37.65	73.06	30.84	17.78	27.78
3	50.96	26.85	17.99	22.06	58.62	20.99	17.58	22.19	47.94	33.42	26.82	31.54
4	73.82	28.55	17.61	20.86	34.38	20.29	20.76	38.31	26.40	24.05	33.93	27.21
5	43.87	32.78	17.25	122.34	29.34	19.82	17.69	37.78	21.99	20.33	20.16	25.95
6	35.50	26.94	16.89	43.74	27.92	38.59	16.82	29.37	27.81	19.31	37.47	25.29
7	41.07	25.41	16.54	56.91	27.19	23.49	16.38	64.08	21.88	18.79	40.34	24.74
8	56.61	24.70	16.19	32.35	26.59	20.31	16.02	53.18	20.42	21.77	37.85	24.22
9	37.61	24.15	15.86	38.47	26.03	19.38	15.69	57.03	19.80	21.17	69.14	23.71
10	33.62	23.64	15.53	28.12	25.49	44.38	15.36	36.95	25.37	18.48	30.00	29.54
11	32.19	24.71	15.21	25.74	24.96	24.45	15.04	46.02	20.36	26.66	31.87	24.22
12	86.51	49.39	14.89	24.87	24.45	20.37	14.73	28.20	19.09	21.64	45.41	31.95
13	79.51	28.51	28.37	24.29	23.94	19.27	40.58	24.44	18.54	27.75	25.98	24.33
14	62.64	33.17	17.51	23.77	23.44	18.74	20.25	33.20	18.12	19.50	21.96	22.51
15	40.52	25.08	15.21	23.32	24.35	18.33	16.16	38.88	17.74	17.65	78.61	90.73
16	39.34	23.17	14.53	22.80	22.80	18.55	15.14	26.37	17.37	39.84	79.44	80.77
17	35.12	22.43	14.16	22.32	22.14	34.47	14.70	23.62	17.01	38.22	42.83	37.15
18	53.69	21.92	14.81	21.86	21.64	31.90	29.24	22.72	16.66	22.10	47.81	31.05
19	68.52	21.45	15.42	21.40	21.18	20.89	35.53	22.17	20.57	19.11	41.70	58.78
20	41.24	25.41	13.75	24.59	20.74	84.61	19.31	22.29	16.97	17.91	34.55	34.91
21	35.53	21.60	62.69	46.68	20.31	33.24	64.03	23.09	16.02	17.39	69.93	38.29
22	33.88	20.54	39.93	43.99	19.89	26.03	26.37	21.25	23.95	17.00	55.69	30.61
23	33.00	19.99	25.64	35.86	19.48	21.65	36.08	20.55	24.54	16.64	43.38	76.79
24	34.29	19.56	20.55	56.53	63.35	20.48	37.53	20.08	22.90	16.29	31.13	53.55
25	32.08	19.15	62.27	51.05	62.54	19.91	22.03	21.66	35.59	15.95	36.15	104.81
26	40.55	47.01	26.49	29.36	30.09	23.30	38.90	42.06	35.51	42.28	32.81	49.59
27	32.64	24.98	54.40	24.87	32.12	31.11	25.56	24.26	20.46	27.08	29.41	35.28
28	30.63	20.50	31.23	38.80	24.01	21.62	19.92	20.57	26.90	39.51	56.00	62.74
29	29.74	19.33	21.57	70.24	22.11	19.51	33.48	19.54	41.42	21.68	33.10	51.69
30	31.33		41.92	34.08	24.17	18.79	21.47	25.82	50.02	18.03	45.28	36.96
31	28.99		53.73		29.17		24.57	20.20		17.05		32.83

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



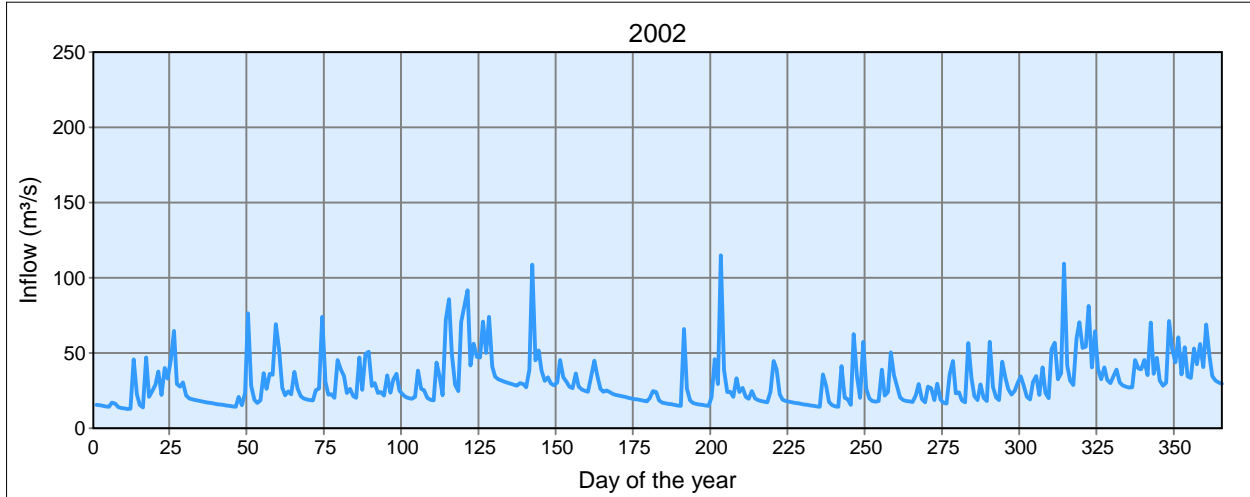
Year: 2001

Unit: m<sup>3</sup>/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	101.28	33.36	37.33	34.29	35.47	37.42	15.33	19.61	24.19	43.14	26.04	16.74
2	62.36	31.03	35.69	33.39	33.31	27.94	14.97	15.43	18.42	21.25	19.48	18.91
3	50.00	30.08	34.79	37.41	32.35	34.69	14.65	14.40	18.75	16.86	49.54	16.37
4	37.45	84.99	48.24	37.56	31.62	26.73	14.35	28.81	14.34	24.97	42.93	15.62
5	36.16	65.77	42.73	40.01	30.96	24.22	14.05	17.13	46.46	19.55	73.40	15.22
6	33.77	68.16	42.96	35.10	34.31	23.28	13.76	14.69	25.86	16.55	32.31	14.89
7	32.76	64.34	52.16	26.69	34.06	27.67	13.47	35.04	55.77	15.46	33.17	14.58
8	32.02	40.00	45.12	37.77	39.25	22.26	13.19	19.77	23.11	14.99	36.49	14.27
9	42.02	112.50	43.47	26.97	31.13	20.89	12.92	15.50	16.71	14.66	24.94	29.62
10	33.19	51.36	35.07	79.65	29.11	20.28	12.65	14.45	29.00	17.70	22.19	17.35
11	31.01	39.24	49.16	50.71	94.96	19.83	12.39	14.01	17.94	14.83	21.31	14.80
12	30.08	46.70	49.15	38.22	45.54	38.19	12.13	13.69	17.76	14.06	20.78	14.08
13	29.40	37.63	36.64	40.83	33.52	24.81	11.88	13.40	15.42	13.68	47.59	50.04
14	35.81	42.11	32.99	37.33	30.75	20.62	11.63	13.13	18.42	22.47	26.29	25.11
15	46.29	35.89	31.76	37.23	29.72	20.20	20.11	24.50	15.22	23.31	21.93	17.74
16	45.97	34.15	30.99	45.21	29.03	21.58	13.20	15.31	16.02	15.53	20.76	15.51
17	38.04	70.98	30.33	32.42	28.41	19.18	15.22	13.36	20.58	28.59	20.19	14.83
18	30.47	50.00	29.70	54.45	37.13	18.42	20.72	12.78	15.27	18.99	25.10	22.96
19	28.56	37.23	29.08	32.60	32.31	21.97	41.20	17.95	14.03	41.82	20.59	20.95
20	27.73	34.25	34.77	41.60	29.10	18.52	18.24	14.52	14.46	20.11	19.41	15.74
21	33.08	45.19	29.36	37.78	27.16	17.57	14.84	12.67	15.93	26.87	18.86	14.51
22	28.29	35.19	27.87	34.94	29.97	18.13	22.90	12.11	14.14	17.31	26.47	18.74
23	26.60	32.75	27.12	43.69	26.60	16.97	14.67	11.81	26.55	15.26	19.94	14.82
24	107.53	31.75	26.53	33.19	25.53	16.47	18.95	11.55	19.86	17.32	18.40	15.94
25	56.23	31.03	25.97	181.52	29.79	27.26	13.78	31.57	28.03	28.82	18.29	17.51
26	57.46	163.20	51.17	63.15	27.73	18.37	42.63	15.82	21.16	45.04	17.51	21.17
27	45.37	68.61	36.90	48.54	24.81	19.78	19.20	12.65	15.16	70.62	17.07	68.22
28	47.26	42.80	28.08	44.34	23.89	22.45	14.56	11.86	45.67	34.89	18.09	35.88
29	41.33		25.99	48.32	23.29	17.34	13.47	22.63	25.37	21.61	27.56	21.56
30	62.44		32.74	43.95	22.79	15.87	31.53	13.86	22.31	27.54	18.68	17.22
31	42.98		28.02		24.46		40.54	14.01		20.01		16.13

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



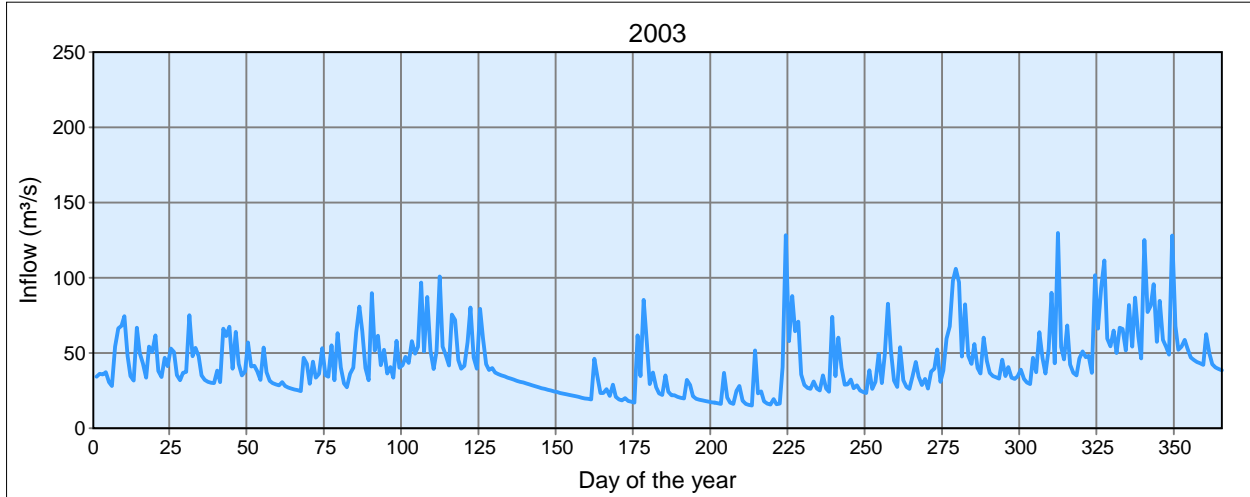
Year: 2002

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	15.66	19.21	52.82	30.09	91.72	33.97	24.05	24.82	19.38	19.35	34.88	27.10
2	15.31	18.76	27.07	23.40	41.80	30.91	18.53	19.95	15.62	17.12	22.17	27.27
3	14.99	18.36	21.87	24.24	56.26	27.64	17.21	18.72	62.64	16.42	40.47	45.29
4	14.67	17.98	24.55	21.69	47.48	26.57	16.67	18.17	34.93	36.00	23.55	39.84
5	14.37	17.61	22.73	35.17	47.15	36.51	16.29	17.77	20.42	44.89	20.04	39.24
6	17.18	17.24	37.49	23.70	70.94	27.85	15.95	17.39	57.44	23.32	52.59	45.35
7	16.52	16.88	26.47	32.39	50.05	25.79	15.62	24.01	26.40	23.97	56.81	35.41
8	14.24	16.53	21.26	36.31	74.10	24.97	15.29	44.85	19.80	18.62	32.51	70.27
9	13.58	16.19	19.94	25.31	41.17	24.40	14.97	39.38	18.25	17.32	36.71	36.30
10	13.23	15.85	19.36	22.61	34.42	34.55	66.11	22.58	17.66	56.75	109.38	46.86
11	12.94	15.52	18.93	20.82	32.59	45.02	26.41	19.11	18.12	33.38	41.77	31.76
12	13.16	15.20	18.53	20.14	31.71	35.09	18.65	18.15	38.93	21.41	31.75	28.44
13	45.73	14.89	25.39	19.67	31.01	26.37	16.91	17.67	21.73	18.85	28.86	30.32
14	22.69	14.58	26.50	20.92	30.36	24.32	16.31	17.28	24.01	29.20	59.69	71.45
15	15.53	14.27	74.10	38.27	29.73	25.09	15.92	16.92	50.44	20.22	70.44	52.48
16	13.95	20.90	30.85	26.32	29.11	24.01	15.58	16.56	35.20	18.22	53.52	43.94
17	47.07	15.31	22.37	25.47	28.51	22.79	15.25	16.22	27.62	57.51	54.45	60.49
18	20.98	23.56	22.61	20.38	30.15	22.18	14.94	15.88	20.56	27.45	81.30	35.73
19	24.72	76.46	20.24	19.10	29.48	21.70	20.67	15.55	18.91	20.55	40.48	53.97
20	28.98	28.29	45.39	18.54	27.35	21.24	45.74	15.23	18.29	18.94	64.47	34.58
21	37.77	18.95	39.26	43.84	39.12	20.80	29.37	14.91	18.00	44.38	39.67	33.46
22	22.22	16.91	34.78	34.10	108.86	20.37	114.94	14.60	17.52	33.42	32.66	53.13
23	40.04	18.58	23.52	22.09	45.21	19.95	38.87	14.30	22.00	26.07	40.52	42.58
24	33.07	36.62	26.16	72.11	51.83	19.53	24.21	35.95	29.40	22.36	32.23	56.04
25	45.37	26.19	21.44	85.76	38.46	19.13	24.41	28.07	19.55	25.03	30.17	40.81
26	64.71	36.22	20.20	48.90	31.52	18.73	20.95	17.55	17.41	30.19	35.01	69.07
27	29.49	35.60	47.10	29.02	33.90	18.34	33.28	15.31	27.63	34.48	38.89	48.49
28	27.70	69.25	25.63	24.87	29.85	17.96	24.01	14.64	26.64	27.78	30.62	34.65
29	30.41		49.48	70.73	28.61	20.04	26.85	14.27	18.76	20.91	28.58	31.74
30	21.85		50.91	81.30	30.45	24.75	21.04	41.31	29.69	19.30	27.72	30.46
31	19.91		28.14		45.31		19.61	20.25		30.67		29.71

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



Year: 2003

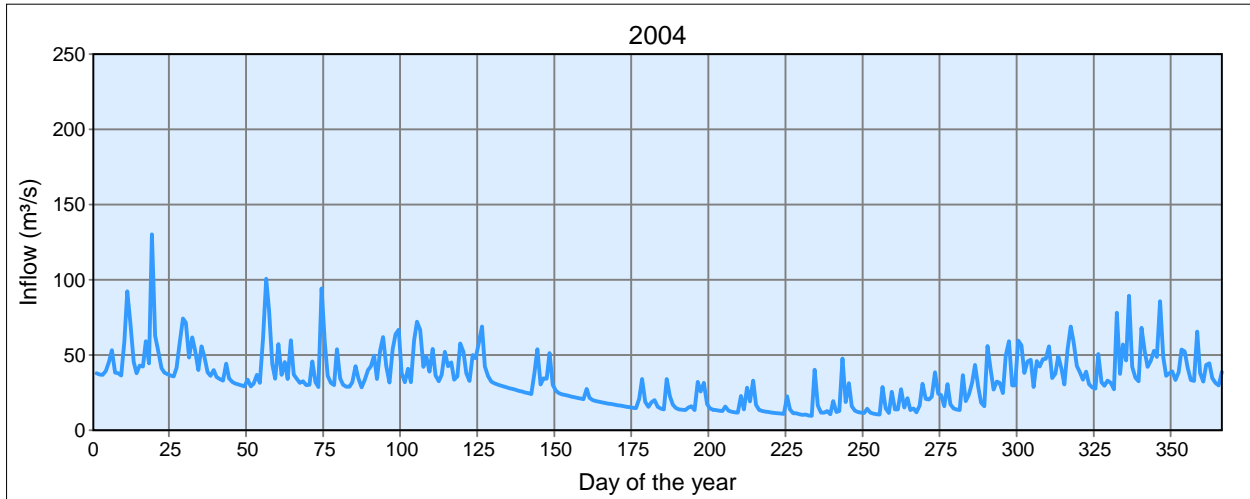
Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34.39	47.86	28.65	51.81	57.24	23.13	27.41	15.30	29.19	30.94	37.43	82.01
2	36.35	53.58	30.72	61.48	80.18	22.65	23.36	51.88	32.36	38.48	63.85	54.27
3	35.80	47.94	28.09	42.02	47.08	22.18	22.22	23.30	26.66	59.66	46.48	86.92
4	37.31	35.10	27.13	52.27	39.67	21.72	35.10	24.46	28.57	67.80	36.42	61.26
5	30.72	32.15	26.50	36.53	79.35	21.27	24.31	17.90	25.26	98.21	52.58	46.33
6	28.09	31.06	25.94	40.70	60.10	20.83	21.92	16.39	24.23	106.12	90.02	125.24
7	54.36	30.34	25.40	33.61	42.76	20.40	21.97	15.84	23.63	97.05	43.22	77.40
8	66.37	30.16	24.87	58.12	38.85	19.98	20.81	19.56	38.60	47.82	129.96	81.55
9	68.28	38.34	46.99	40.23	39.98	19.56	20.24	16.10	26.26	82.33	54.08	95.91
10	74.61	30.66	42.91	42.06	37.17	19.15	19.79	16.49	31.07	48.21	45.85	57.61
11	48.24	66.31	29.69	47.48	36.03	46.27	32.24	40.74	49.49	42.85	68.40	84.76
12	34.83	61.36	44.33	43.54	35.21	34.96	28.88	128.24	30.10	56.05	42.43	58.78
13	31.78	67.55	33.72	57.89	34.47	23.48	21.34	57.96	48.77	40.07	36.94	54.15
14	66.96	39.71	36.17	49.66	33.75	23.49	19.60	88.00	82.74	36.45	35.31	49.09
15	50.03	64.11	53.36	54.11	33.05	25.98	18.94	64.63	52.25	60.21	46.47	128.05
16	43.02	42.91	35.33	96.80	32.36	21.60	18.50	71.02	31.86	44.86	51.11	67.93
17	33.78	35.18	34.39	51.03	31.69	29.01	18.11	35.86	27.57	36.93	47.38	52.22
18	54.45	37.75	55.21	87.30	31.03	20.99	17.73	28.79	53.77	34.85	48.22	54.46
19	50.77	57.11	32.05	51.60	30.39	19.16	17.37	27.00	32.07	33.88	36.76	58.73
20	61.85	41.24	63.25	39.34	29.76	18.50	17.01	26.21	27.54	33.13	101.75	52.82
21	38.16	41.68	40.38	51.09	29.14	20.11	16.65	31.23	26.24	45.68	66.27	47.12
22	34.16	38.05	29.85	100.81	28.53	18.16	16.31	26.40	34.83	34.86	93.34	45.28
23	46.79	32.18	27.41	54.47	27.94	17.86	36.90	25.07	44.06	40.73	111.48	44.18
24	41.34	53.72	36.14	48.64	27.36	17.16	20.54	35.27	34.41	33.77	59.60	43.23
25	53.06	37.40	40.25	41.77	26.79	61.79	17.18	26.41	28.85	32.86	54.55	42.33
26	50.68	31.68	63.63	75.69	26.24	34.65	16.27	24.33	32.82	34.53	65.07	62.68
27	35.50	30.09	80.93	71.84	25.69	85.37	25.05	74.17	26.49	38.88	49.98	49.86
28	32.11	29.29	64.77	45.27	25.16	56.74	28.21	34.86	37.75	32.81	66.92	42.65
29	36.81		40.05	39.61	24.64	29.32	18.46	60.33	39.63	30.42	66.10	40.60
30	37.60		32.09	41.54	24.13	37.13	16.35	40.35	52.42	29.43	51.65	39.54
31	75.07		89.88		23.63		15.68	29.07		46.95		38.68



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



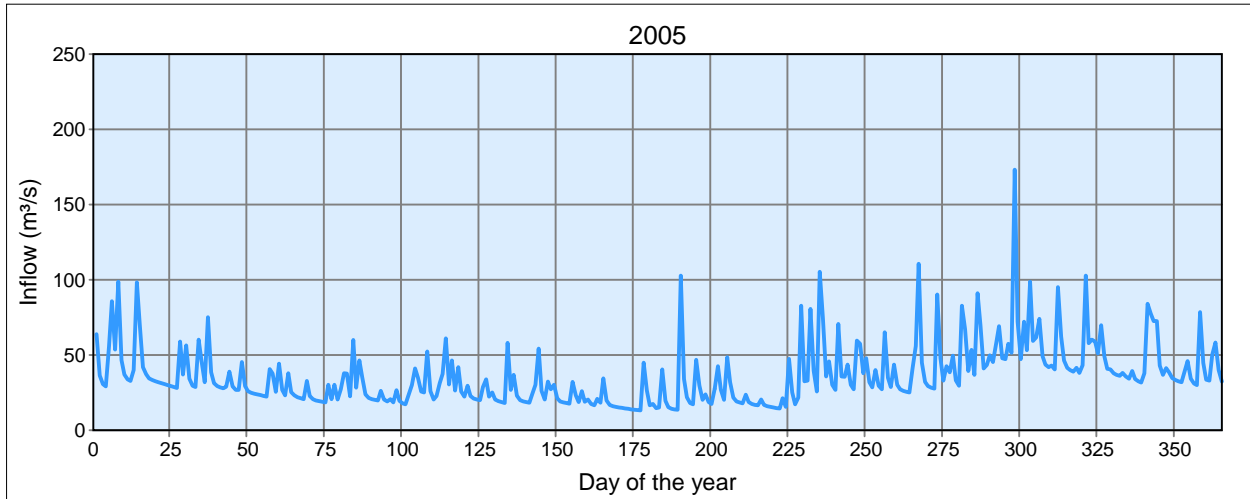
Year: 2004

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	37.87	61.87	36.93	34.15	32.82	23.45	15.53	33.02	31.37	23.41	46.14	89.36
2	37.08	53.06	45.28	53.21	49.98	22.95	14.43	16.86	16.10	16.18	42.36	42.22
3	37.00	40.08	34.17	61.92	48.02	22.48	13.98	13.60	13.01	30.65	47.21	34.92
4	39.56	55.83	59.84	42.71	57.91	22.01	34.11	12.77	12.23	17.31	47.56	32.66
5	45.55	48.82	37.16	31.70	68.94	21.55	22.66	12.41	11.88	14.56	55.83	68.28
6	53.35	38.69	34.23	53.97	42.48	21.10	17.03	12.13	11.61	13.81	34.85	52.52
7	38.42	36.17	31.64	63.82	36.09	20.67	14.72	11.87	14.26	13.44	37.69	42.30
8	37.92	39.97	32.74	66.87	32.48	27.54	14.05	11.63	11.81	36.57	49.47	46.27
9	36.41	35.49	30.19	37.93	31.26	21.53	13.69	11.38	11.16	19.47	40.96	52.94
10	59.31	34.03	30.28	31.97	30.51	20.06	13.39	11.15	10.85	23.86	30.47	48.88
11	92.32	33.19	45.95	40.95	29.86	19.45	15.22	10.92	10.61	31.81	53.61	85.91
12	70.70	44.24	32.04	32.00	29.24	19.01	16.05	22.63	28.85	43.45	69.04	48.48
13	45.67	34.55	28.94	59.87	28.63	18.61	13.39	13.82	14.49	28.87	58.57	36.33
14	37.98	32.19	94.29	72.25	28.04	18.22	32.23	11.45	11.61	18.42	42.85	37.96
15	43.11	31.21	58.31	66.58	27.45	17.84	25.88	11.43	25.63	16.18	38.40	39.22
16	42.42	30.50	36.21	42.23	26.88	17.47	31.48	10.66	14.02	55.90	33.67	33.40
17	59.15	29.86	31.53	49.26	26.33	17.11	17.45	10.34	13.85	41.52	38.99	38.65
18	44.55	29.24	30.13	39.03	25.78	16.75	14.57	10.45	27.22	27.07	30.73	53.61
19	130.24	33.59	53.82	54.19	25.24	16.41	13.80	9.97	15.17	32.40	28.68	52.43
20	62.75	29.20	34.46	36.55	24.72	16.06	13.42	9.72	21.33	31.49	27.83	41.74
21	52.45	31.23	30.31	32.69	24.21	15.73	13.13	40.31	13.53	24.71	50.58	33.54
22	41.27	36.97	29.04	36.82	38.26	15.40	12.85	16.52	14.68	49.53	32.10	32.78
23	38.52	31.46	29.13	52.32	53.84	15.08	15.86	11.86	12.02	59.18	29.68	65.48
24	37.36	60.78	32.04	42.65	30.40	14.77	13.09	11.88	16.37	29.87	33.18	38.09
25	36.52	100.57	42.51	45.21	34.56	21.02	12.36	12.83	30.96	29.76	31.56	32.41
26	35.75	79.54	34.50	33.77	34.43	34.03	12.02	10.78	20.84	59.55	27.21	43.52
27	41.54	43.84	28.56	35.93	51.41	18.75	11.75	19.50	20.57	56.39	78.06	44.57
28	58.62	34.29	33.79	57.72	30.24	15.62	22.93	12.12	22.44	38.24	37.49	34.67
29	74.35	57.37	40.11	52.16	26.33	18.54	13.94	12.80	38.54	45.85	57.06	31.54
30	71.52		42.69	37.91	24.70	20.12	28.29	47.74	24.37	46.91	46.58	29.82
31	48.37		49.67		23.98		19.34	18.73		28.86		38.86

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



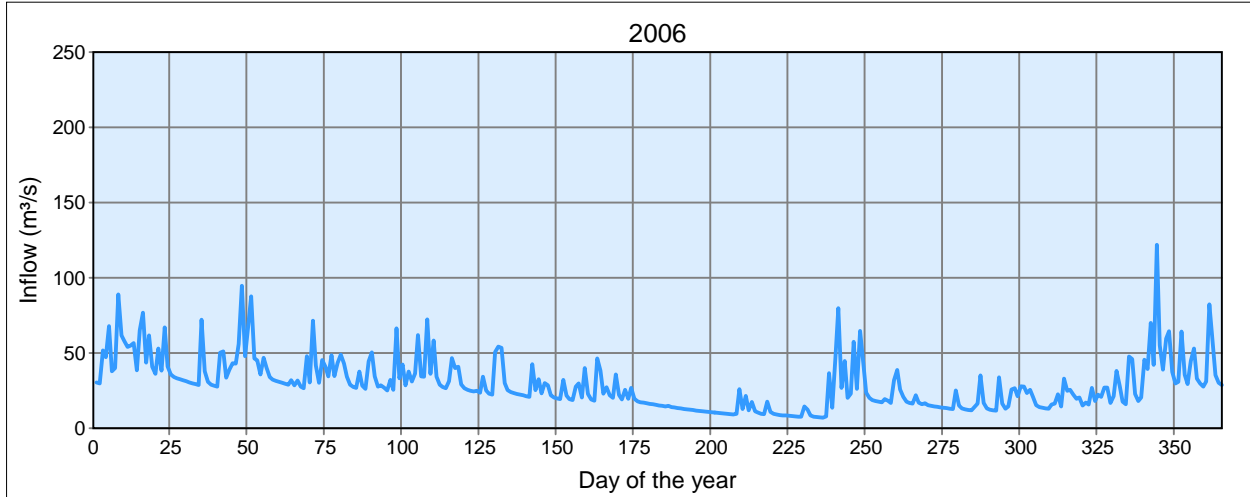
Year: 2005

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	63.84	29.64	44.30	20.21	29.57	18.66	14.70	17.47	43.71	47.97	61.86	34.28
2	36.42	28.70	26.98	19.78	22.78	18.22	15.13	16.95	30.33	33.16	74.14	39.42
3	30.75	60.15	23.34	26.19	21.15	17.83	40.55	16.57	27.36	42.71	49.16	34.11
4	29.20	46.09	37.93	20.56	20.49	32.26	19.62	20.60	59.59	38.56	43.73	32.56
5	55.79	32.01	25.37	19.18	20.02	23.22	15.44	16.91	57.64	49.71	41.99	31.72
6	85.76	75.07	23.24	20.66	28.75	18.68	14.40	15.94	37.87	33.29	43.01	37.99
7	53.59	38.63	21.89	18.66	33.85	26.11	13.97	15.49	47.85	29.71	40.56	84.23
8	98.78	31.28	21.27	26.68	22.54	19.03	13.66	15.15	32.02	82.90	95.20	77.45
9	46.76	29.39	20.80	19.59	25.07	20.45	102.74	14.83	28.57	67.07	62.27	72.70
10	37.15	28.55	32.82	17.95	20.45	17.53	34.02	14.52	39.98	39.38	46.39	72.56
11	33.89	27.92	22.85	17.35	19.39	16.70	21.93	21.25	29.72	53.43	41.68	43.09
12	32.87	29.06	20.63	23.68	18.75	20.80	18.28	15.57	27.33	36.80	40.03	36.93
13	39.95	39.14	19.88	30.14	18.31	18.37	17.40	47.47	65.24	91.10	39.05	41.33
14	98.31	29.16	19.40	41.09	58.23	34.54	47.01	25.28	34.91	69.81	41.64	38.58
15	70.56	26.83	18.99	34.89	26.99	19.92	29.88	17.30	28.73	41.10	38.22	34.74
16	41.90	26.83	18.59	25.90	36.78	16.90	20.29	21.84	43.82	43.50	43.24	33.45
17	37.33	45.32	30.30	25.13	23.03	16.05	23.94	82.91	30.27	49.89	102.71	32.65
18	34.54	29.52	20.66	52.50	20.12	15.63	18.84	32.64	27.26	45.41	58.00	31.95
19	33.45	26.12	30.34	25.96	19.24	15.29	17.58	32.94	26.25	57.72	60.39	39.39
20	32.68	25.05	20.60	20.56	18.75	14.97	27.85	80.70	25.62	69.29	58.97	46.13
21	31.99	24.43	27.44	22.83	18.35	14.65	42.72	39.64	25.07	47.94	51.13	34.34
22	31.32	23.90	37.97	31.28	24.01	14.35	27.11	25.77	41.40	47.36	69.79	31.18
23	30.67	23.40	37.80	37.52	30.23	14.05	20.35	105.33	55.96	57.41	49.26	30.08
24	30.04	22.92	22.73	61.17	54.30	13.76	48.70	74.06	110.59	51.59	40.92	78.50
25	29.41	22.44	60.14	30.60	26.18	13.47	31.93	35.74	45.08	173.14	40.48	44.79
26	28.80	40.70	28.47	46.58	20.56	13.19	21.78	45.75	32.26	72.43	38.05	33.59
27	28.20	37.70	46.58	26.52	32.46	45.02	19.29	30.33	29.35	47.22	36.96	32.96
28	59.03	25.51	35.14	41.92	27.26	26.42	18.50	26.98	28.32	72.12	36.14	50.38
29	37.07		23.99	25.82	30.29	16.72	18.05	70.67	27.66	53.41	38.12	58.31
30	56.34		21.53	22.42	21.36	17.56	23.72	35.76	90.34	98.78	35.78	40.07
31	34.28		20.71		19.36		18.71	35.59		59.46		32.44

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



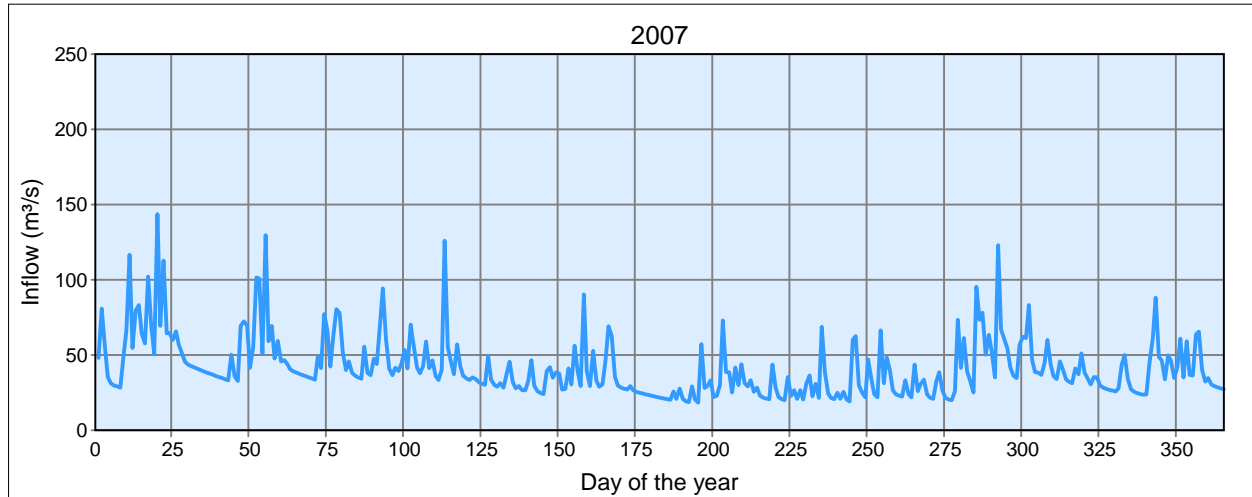
Year: 2006

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	30.49	29.97	30.87	34.60	25.65	32.26	15.63	17.60	20.41	14.00	15.38	47.74
2	29.92	29.35	30.22	27.66	25.04	21.76	15.30	11.38	23.17	13.71	14.10	46.12
3	51.84	28.74	29.60	28.54	24.51	19.46	14.98	10.44	57.54	13.42	13.69	22.80
4	47.36	72.13	28.98	27.06	24.94	18.71	14.67	9.72	26.14	13.14	13.33	18.13
5	68.00	37.86	31.89	25.13	23.72	27.66	14.88	9.42	64.77	12.87	13.04	20.59
6	38.00	30.91	28.61	32.19	34.34	29.78	14.19	17.66	43.52	25.22	15.75	45.62
7	40.01	29.11	31.88	25.64	25.22	20.60	13.82	10.99	23.79	15.30	16.41	39.47
8	88.92	28.29	27.88	66.51	23.12	40.09	13.52	9.58	20.40	13.21	22.73	70.10
9	61.84	27.66	26.68	33.25	22.34	22.92	13.24	9.16	18.83	12.66	14.67	42.09
10	57.86	50.28	47.89	42.42	50.60	19.37	12.96	8.93	18.22	12.29	33.00	121.95
11	54.07	51.15	30.57	28.60	54.29	18.39	12.70	8.73	17.80	12.02	25.01	55.12
12	54.93	33.56	71.51	37.64	53.41	46.50	12.43	8.55	17.43	14.19	25.69	38.97
13	56.61	39.13	41.73	31.12	30.15	38.28	12.17	8.37	19.39	16.37	22.33	59.68
14	38.62	43.19	30.37	36.56	25.36	22.99	11.92	8.20	18.48	35.23	19.60	64.41
15	65.26	42.97	45.38	62.06	24.05	27.31	11.67	8.03	16.98	16.90	20.58	37.46
16	76.89	56.10	40.92	34.56	23.40	22.08	11.43	7.86	31.92	13.24	15.17	29.77
17	43.79	94.68	34.56	34.37	22.89	20.30	11.19	7.70	38.85	12.34	17.11	31.04
18	61.70	47.89	48.46	72.54	22.41	35.79	10.96	14.50	25.87	11.97	15.90	64.37
19	40.87	66.36	34.73	36.16	21.94	22.17	10.73	12.39	20.96	11.70	26.98	35.59
20	36.35	87.61	43.53	58.46	21.49	19.29	10.51	8.64	17.82	33.96	18.14	29.40
21	53.03	46.41	49.11	34.42	21.04	25.64	10.29	7.80	16.94	16.49	22.31	44.75
22	38.30	45.24	43.04	28.98	42.64	19.65	10.08	7.52	16.49	13.14	20.98	53.02
23	67.01	35.92	34.35	27.49	25.34	26.92	9.87	7.34	22.09	14.65	27.17	33.08
24	41.24	47.02	29.04	26.75	32.58	19.69	9.67	7.18	17.19	25.80	27.18	29.94
25	35.80	40.23	27.58	31.42	23.24	18.02	9.46	7.93	16.00	26.74	16.90	27.84
26	34.20	34.12	26.84	46.61	30.18	17.41	9.27	36.69	16.77	21.47	21.27	31.24
27	33.33	32.42	37.73	40.06	28.54	17.00	9.65	13.75	15.45	27.99	38.16	82.33
28	32.60	31.56	28.39	40.86	22.12	16.64	26.05	47.06	14.95	27.74	28.13	60.38
29	31.92		26.19	29.22	20.57	16.30	12.74	79.98	14.61	23.55	17.84	35.44
30	31.26		44.51	26.58	19.93	15.96	21.60	26.94	14.30	25.52	16.00	30.25
31	30.61		50.57		19.48		12.12	44.90		20.89		28.78

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



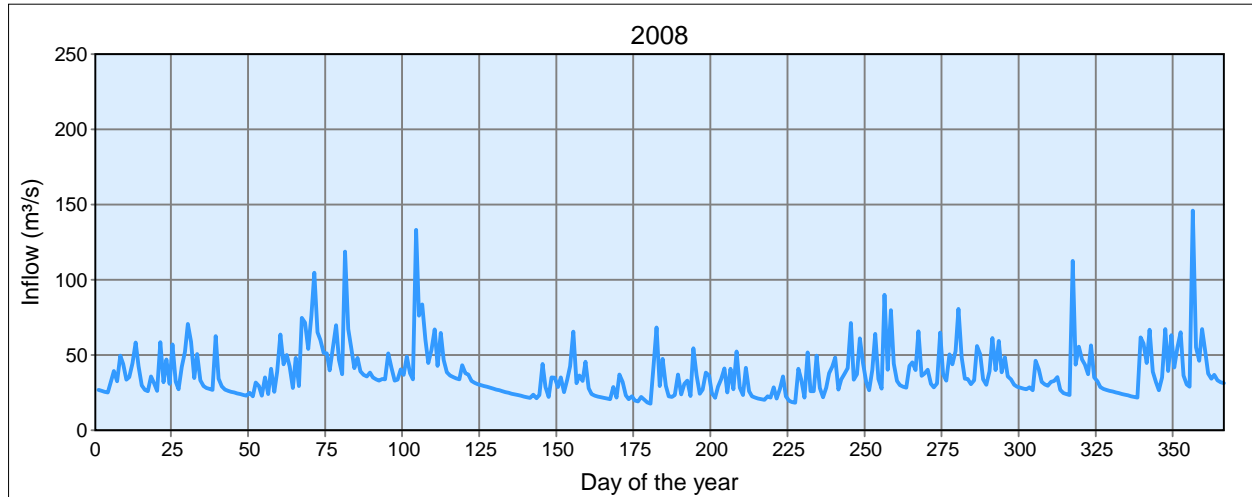
Year: 2007

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	48.17	41.83	45.82	44.06	33.54	27.48	22.05	25.69	19.32	26.38	38.27	27.27
2	80.79	40.96	46.68	69.53	35.08	41.07	21.59	28.28	60.31	21.82	36.97	25.56
3	55.52	40.11	44.24	94.41	34.03	30.58	21.15	23.08	62.64	20.61	44.64	24.81
4	35.48	39.27	40.58	60.37	31.98	56.24	20.71	21.73	29.76	20.04	59.99	24.26
5	31.19	38.46	39.22	40.87	31.06	38.71	20.28	21.12	25.15	26.05	43.59	23.74
6	29.88	37.66	38.31	36.60	30.37	29.35	25.82	20.65	22.06	73.45	36.10	23.93
7	29.13	36.88	37.50	41.65	49.42	90.31	20.84	43.64	47.10	41.45	34.11	45.44
8	28.50	36.11	36.72	39.35	33.72	39.54	27.71	28.32	34.13	61.44	45.73	60.87
9	49.28	35.36	35.95	44.15	30.26	29.53	20.92	22.19	24.21	39.19	39.95	88.11
10	66.31	34.63	35.21	53.55	29.12	52.78	19.31	20.68	22.12	32.51	33.95	48.73
11	116.64	33.91	34.47	41.17	31.40	33.12	18.69	20.06	66.47	25.23	32.27	46.41
12	54.74	33.21	33.76	70.22	28.51	28.96	29.27	35.47	31.30	95.31	31.42	33.86
13	79.56	50.39	49.03	55.51	37.72	30.61	20.45	22.91	48.40	73.43	41.10	49.86
14	83.34	36.03	41.43	41.56	45.66	45.22	18.49	26.68	39.81	78.18	37.44	46.04
15	64.26	32.78	77.37	37.84	32.02	69.18	57.30	20.88	26.77	50.38	51.14	34.72
16	57.79	69.52	65.97	42.90	28.04	62.59	28.10	26.58	23.92	63.52	38.41	42.14
17	102.10	72.44	42.46	59.07	29.39	35.52	29.37	20.54	22.99	52.30	34.35	60.91
18	71.30	69.86	63.87	41.36	26.76	29.93	33.34	31.13	22.43	35.13	30.63	35.12
19	50.41	41.52	80.43	46.40	26.63	28.40	22.17	36.51	33.27	122.98	35.35	59.08
20	143.66	54.98	77.95	36.01	32.51	27.64	22.98	22.71	24.14	67.12	35.27	36.98
21	69.48	101.49	51.69	33.49	46.63	27.03	30.18	31.04	22.05	60.85	29.83	36.47
22	112.76	100.89	40.20	40.23	29.58	29.38	73.14	21.55	43.74	54.30	28.33	63.94
23	64.44	51.15	45.82	126.05	25.95	26.60	38.80	68.69	26.05	41.85	27.57	65.60
24	64.84	129.63	38.23	55.22	24.84	25.64	38.57	38.29	30.64	36.36	26.97	40.20
25	60.12	59.32	36.19	45.51	24.22	25.03	25.13	24.55	33.78	34.74	26.40	32.47
26	65.74	69.46	35.21	37.41	39.35	24.49	41.87	21.61	23.96	56.94	25.86	34.73
27	56.64	47.68	34.43	57.13	42.03	23.98	30.07	20.70	21.74	62.09	28.02	30.61
28	50.98	59.39	55.58	42.56	34.89	23.49	43.97	24.94	20.97	61.25	43.62	29.34
29	45.57		38.13	36.23	38.58	23.00	31.30	20.86	32.58	83.19	50.19	28.61
30	43.81		36.73	34.45	37.70	22.52	29.24	25.51	38.55	46.84	34.07	28.00
31	42.75		47.48		27.01		33.33	20.57		38.79		27.41

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



Year: 2008

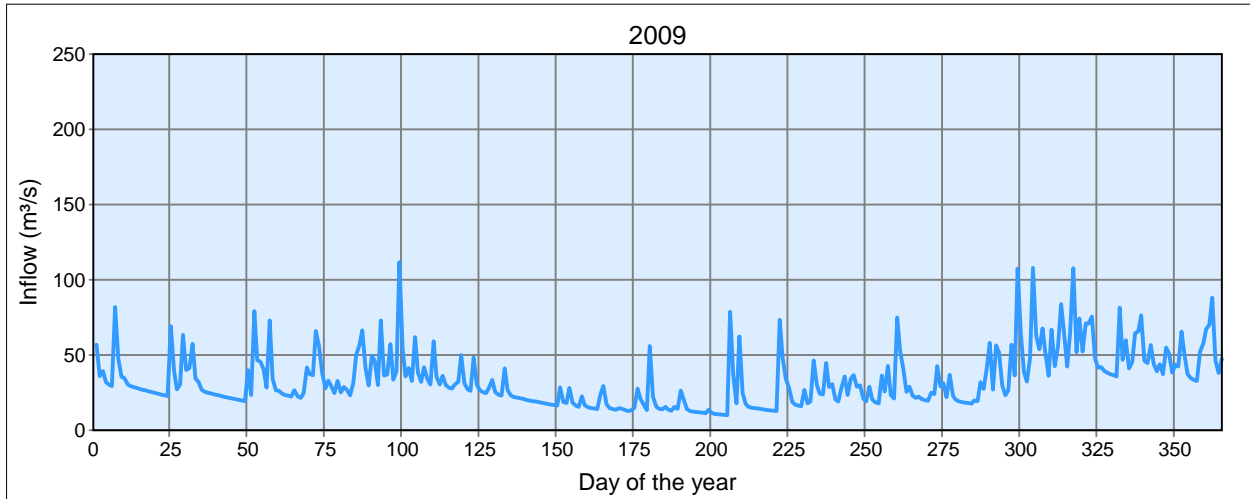
Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	26.84	34.85	43.89	33.10	32.88	33.67	29.56	21.75	71.41	37.34	40.45	22.74
2	26.28	50.68	50.02	34.07	31.56	42.51	47.50	21.20	33.78	33.10	32.30	22.27
3	25.74	33.21	42.50	33.98	30.79	65.71	29.74	20.75	37.23	50.53	30.47	21.81
4	25.20	29.43	28.18	51.14	30.13	31.43	22.59	20.31	61.18	43.97	29.64	61.66
5	32.57	28.24	48.18	41.46	29.50	36.50	22.15	22.72	44.57	52.57	32.25	57.77
6	39.33	27.55	29.49	33.19	29.01	32.87	23.53	21.78	32.12	80.61	32.87	44.86
7	32.58	26.95	74.82	33.79	28.31	45.55	37.10	28.66	26.81	48.47	35.45	66.87
8	49.67	62.66	71.63	40.45	27.71	27.90	23.98	21.09	40.28	34.30	26.86	38.96
9	44.15	34.33	54.20	36.79	27.13	24.18	30.94	27.42	64.12	34.21	24.82	32.06
10	33.70	29.16	76.44	48.93	26.57	23.09	33.10	35.94	34.11	30.73	24.03	26.82
11	35.43	27.14	104.70	37.86	26.01	22.50	22.78	22.58	27.81	33.23	23.48	35.08
12	44.50	26.31	65.23	33.93	25.47	22.01	54.55	19.74	89.95	56.05	112.59	67.35
13	58.35	25.71	60.11	133.33	24.95	21.55	36.59	18.88	40.38	50.57	43.75	39.45
14	42.61	25.17	51.50	76.23	24.43	21.10	24.38	18.40	79.74	33.93	55.71	63.24
15	29.85	24.65	51.16	83.70	23.92	20.67	27.12	40.85	44.20	30.29	47.03	41.74
16	27.00	24.13	39.79	60.27	23.42	28.94	38.36	33.71	32.77	39.29	43.68	55.15
17	26.02	23.63	54.73	44.72	22.94	21.85	36.50	21.82	30.12	61.44	37.19	65.23
18	35.90	23.14	69.78	53.45	22.46	37.12	24.47	51.65	29.12	40.13	56.43	36.50
19	31.46	24.91	46.90	67.01	22.00	32.23	21.85	26.05	28.44	59.47	35.20	30.61
20	26.25	22.72	37.23	42.78	21.54	23.20	29.08	26.05	42.80	38.63	32.76	29.00
21	58.52	31.77	118.69	64.73	23.79	20.63	34.24	49.76	45.09	48.68	28.83	145.98
22	32.05	29.33	67.30	46.78	21.29	22.71	41.05	28.10	40.13	35.94	27.61	55.17
23	47.12	23.15	53.78	38.57	23.48	20.00	25.28	21.93	65.89	33.85	26.93	46.17
24	30.99	35.23	41.37	36.40	44.12	19.16	40.91	28.38	36.39	30.27	26.35	67.41
25	57.17	24.16	48.17	35.39	28.93	22.23	27.28	37.83	37.72	29.10	25.79	52.08
26	32.47	40.83	39.19	34.61	22.26	20.50	52.42	42.40	40.33	28.40	25.26	37.64
27	27.38	25.66	36.88	33.88	35.30	18.54	28.30	48.38	30.91	27.79	24.73	34.34
28	42.15	38.90	35.83	43.24	34.89	17.87	23.39	27.05	28.66	27.21	24.22	36.95
29	52.10	63.77	38.52	37.86	28.94	41.17	41.61	33.99	31.23	28.68	23.72	33.27
30	70.77		35.12	37.02	35.22	68.45	26.05	37.52	64.91	26.57	23.23	32.03
31	58.80		33.90		25.36		22.75	41.44		46.31		31.26



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



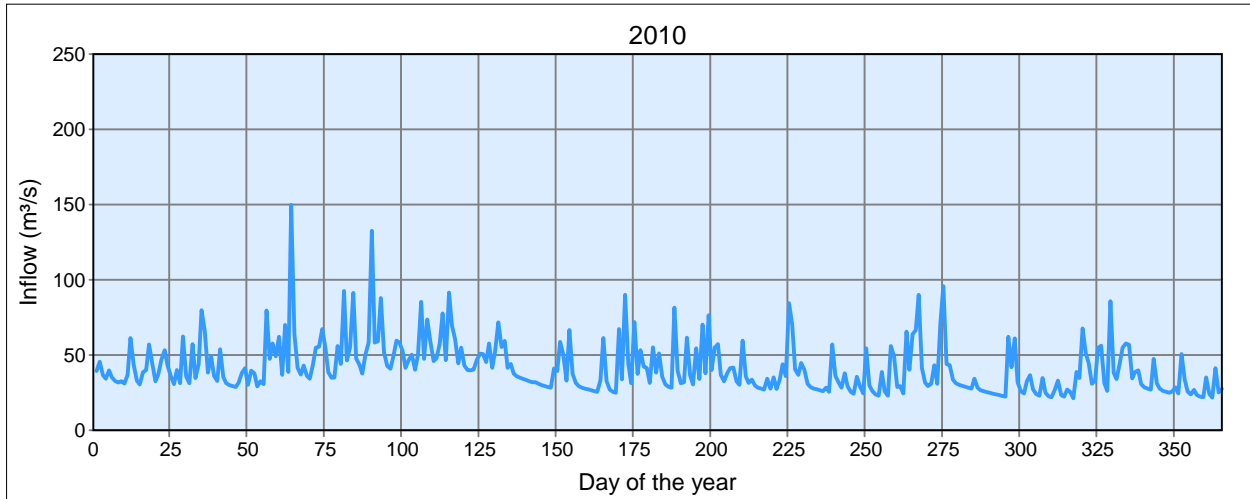
Year: 2009

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	56.92	57.52	26.33	46.23	27.40	18.74	15.82	15.12	23.57	29.25	62.91	41.03
2	36.12	34.52	24.35	30.10	26.21	18.19	14.35	14.77	34.33	31.43	53.80	45.40
3	39.54	32.12	23.58	73.08	48.40	28.21	13.83	14.45	36.63	22.02	67.65	64.57
4	32.17	27.07	23.04	36.42	30.35	18.48	15.58	14.15	29.10	36.76	50.97	65.83
5	30.27	25.68	22.55	37.11	26.51	16.37	13.70	13.85	29.80	23.14	36.32	76.41
6	29.41	25.00	26.74	57.30	25.36	15.71	13.13	13.57	21.11	20.24	66.94	46.23
7	82.06	24.45	22.72	33.74	24.72	22.69	15.59	13.29	19.16	19.36	42.65	44.88
8	47.73	23.94	21.59	39.43	28.48	16.72	14.31	13.01	28.95	18.88	55.27	56.68
9	35.59	23.44	24.70	111.68	33.49	15.34	26.42	12.74	20.49	18.47	83.81	44.20
10	34.66	22.95	41.73	54.63	25.63	14.83	19.93	73.55	18.59	18.08	64.89	39.30
11	30.73	22.47	37.42	35.91	23.75	14.48	14.24	48.32	17.93	17.71	42.39	44.00
12	29.49	22.01	36.62	41.39	23.01	14.17	12.95	34.34	36.47	19.83	64.79	37.25
13	28.76	21.55	65.98	32.81	41.22	23.82	12.50	28.19	25.81	19.39	107.80	54.88
14	28.15	21.10	55.80	62.00	26.81	29.57	12.20	19.09	42.94	31.95	51.97	51.17
15	27.56	20.67	38.01	38.32	23.32	17.39	11.94	17.09	23.46	27.49	74.28	38.27
16	26.98	20.24	28.04	32.18	22.28	14.86	11.69	16.44	21.12	41.87	52.41	43.63
17	26.42	19.82	32.96	42.01	21.72	14.14	11.45	16.04	74.92	58.11	71.13	42.51
18	25.88	19.40	29.10	34.42	21.25	13.77	13.80	26.91	52.72	27.08	70.77	65.63
19	25.34	40.04	24.76	30.54	20.80	14.77	11.59	17.99	40.68	56.48	75.58	49.22
20	24.81	23.53	32.84	59.10	20.37	14.34	10.98	19.15	25.63	51.81	47.68	37.45
21	24.33	79.16	25.10	35.57	19.95	13.50	10.69	46.58	29.08	29.82	41.74	34.65
22	23.80	46.64	28.76	30.63	19.53	12.86	10.45	30.34	23.02	23.23	41.96	33.55
23	23.30	45.52	26.97	36.28	19.13	13.32	10.23	24.38	21.52	26.78	39.41	32.79
24	22.82	40.55	23.24	30.11	18.73	14.88	10.02	23.85	22.50	56.78	38.27	52.43
25	69.23	28.37	31.39	28.47	18.34	27.69	78.89	44.67	20.79	36.44	37.42	57.76
26	39.91	73.15	49.97	27.68	17.96	20.80	36.04	28.91	20.12	107.39	36.63	67.30
27	27.26	34.34	56.49	30.69	17.59	17.06	17.98	30.79	19.66	64.78	35.87	70.36
28	30.57	26.62	66.40	32.25	17.22	13.48	62.52	20.57	24.90	38.65	81.46	88.07
29	63.37		41.79	50.05	16.86	56.01	24.72	19.31	24.18	32.41	47.01	46.52
30	40.14		29.92	31.37	16.51	22.39	17.34	28.47	42.52	48.44	59.83	38.09
31	41.37		49.75		28.58		15.69	35.75		107.84		47.41

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



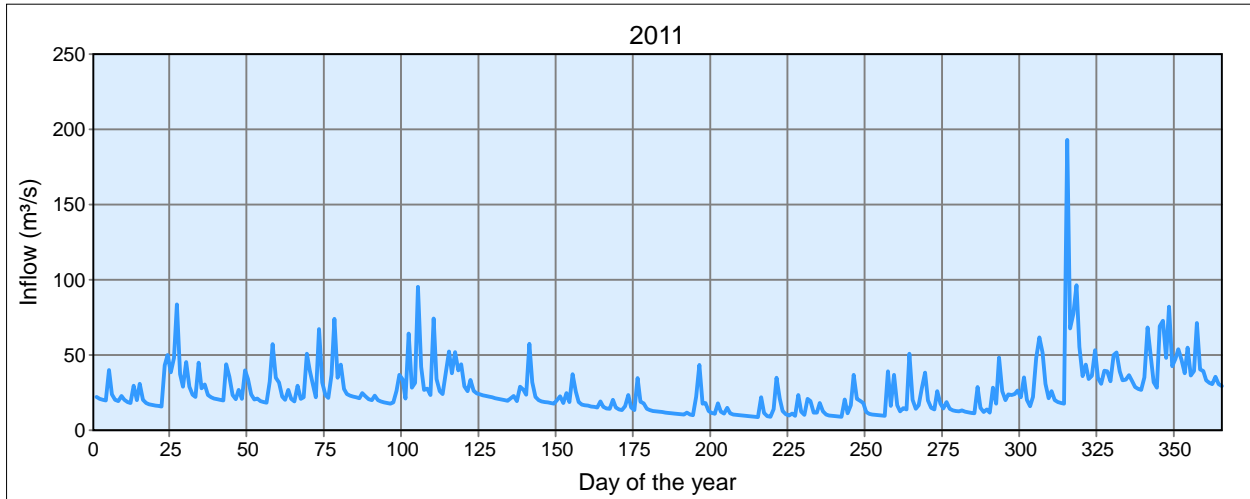
Year: 2010

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	39.33	57.34	62.15	58.32	39.95	50.32	38.27	33.67	29.22	71.91	24.18	56.89
2	45.65	34.67	36.89	59.18	39.82	33.07	51.11	29.67	25.50	95.71	23.18	34.61
3	36.64	43.93	69.98	87.86	40.43	66.55	35.54	28.43	24.39	44.12	34.87	38.85
4	34.34	79.85	38.73	51.87	46.86	37.51	30.49	27.73	35.59	43.22	24.99	39.93
5	39.88	66.31	149.72	42.82	50.99	31.60	29.05	27.13	28.99	33.61	22.75	30.79
6	35.29	38.43	64.21	40.87	50.66	29.36	28.29	34.43	24.52	31.27	21.95	28.59
7	32.77	49.08	41.68	49.00	45.31	28.45	81.44	27.85	54.55	30.32	26.95	27.71
8	31.75	36.35	37.08	59.53	57.74	27.80	39.69	35.08	29.99	29.63	33.15	27.08
9	32.60	32.77	42.99	58.41	41.55	27.22	31.33	27.51	26.22	29.00	23.58	47.53
10	31.12	53.96	36.25	52.95	52.54	26.65	32.06	33.66	23.91	28.40	22.42	31.10
11	36.89	35.40	34.40	41.55	71.79	26.10	61.64	43.98	23.08	27.81	27.11	27.73
12	61.42	31.39	43.63	46.64	55.28	25.55	36.63	35.98	38.70	34.41	25.61	26.28
13	43.68	30.12	54.83	50.22	59.50	33.34	30.48	84.59	25.84	28.35	21.27	25.57
14	33.08	29.38	55.58	40.37	41.50	61.21	54.61	70.22	23.04	26.75	38.80	25.01
15	30.39	28.74	67.28	50.15	44.07	32.88	34.08	40.56	56.01	26.01	34.74	25.79
16	38.70	31.70	54.79	85.37	37.66	27.11	70.33	36.95	49.36	25.43	67.76	28.59
17	40.01	38.24	38.67	47.43	35.84	25.59	37.93	44.77	28.80	24.90	51.21	24.60
18	57.15	41.28	35.05	73.63	34.91	24.88	76.41	40.35	29.34	24.38	44.66	50.64
19	44.55	30.26	35.27	58.50	34.14	67.38	40.14	30.99	24.46	23.88	30.97	33.74
20	32.57	39.60	55.91	46.13	33.43	33.90	54.94	28.74	65.52	23.38	32.83	25.83
21	37.23	37.98	44.04	48.02	32.73	89.97	57.38	27.84	40.26	22.89	54.81	23.94
22	47.24	29.19	92.56	57.68	32.05	44.36	36.98	27.21	63.80	22.42	56.28	26.91
23	53.30	32.75	46.41	77.70	32.08	31.31	32.60	26.63	66.54	62.25	31.42	23.53
24	42.98	30.68	55.40	46.64	30.90	71.95	37.87	26.08	90.17	41.97	26.32	22.52
25	36.09	79.63	91.33	91.53	30.16	37.57	41.35	28.27	41.45	61.07	85.74	21.95
26	30.64	47.41	47.65	69.81	29.52	53.32	41.85	25.65	31.78	31.98	38.50	35.12
27	40.14	57.79	43.69	60.42	28.90	42.45	32.59	56.98	29.46	26.09	34.10	24.22
28	31.43	49.17	37.67	44.62	28.30	41.35	30.34	36.06	31.04	24.57	44.54	21.81
29	62.36		50.56	55.03	41.04	31.69	59.70	32.28	43.29	32.56	55.08	41.33
30	35.72		58.40	42.98	39.38	55.15	35.84	28.44	30.99	36.68	57.70	25.25
31	31.33		132.64		58.76		31.69	37.98		27.41		27.59

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



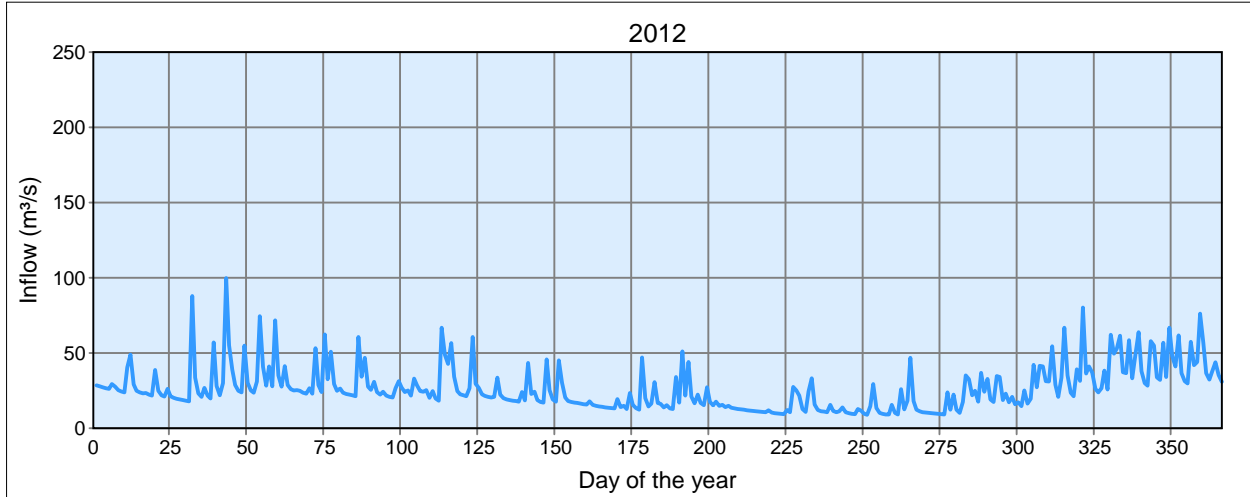
Year: 2011

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	22.21	23.65	31.71	23.14	26.01	18.07	12.69	9.22	11.36	17.86	48.08	36.71
2	20.85	22.26	22.36	20.07	33.51	24.76	12.42	9.03	16.79	14.45	61.86	32.67
3	20.25	45.02	20.26	19.12	26.36	18.84	12.16	8.84	36.94	18.69	51.47	28.78
4	19.80	27.91	26.99	18.62	24.60	37.31	11.91	22.07	21.00	14.38	30.88	27.58
5	40.10	30.57	20.82	18.22	23.87	25.82	11.66	11.62	19.60	13.35	21.36	26.89
6	23.83	23.56	19.33	17.83	23.33	18.81	11.42	9.50	18.13	12.93	26.03	35.23
7	20.43	21.88	29.63	18.56	22.83	17.20	11.18	8.95	12.29	12.64	20.13	68.39
8	19.46	21.20	20.86	26.34	22.36	16.61	10.95	14.10	11.01	13.29	18.70	49.01
9	22.88	20.71	22.01	36.98	21.89	16.38	10.72	34.97	10.59	12.33	18.12	32.03
10	20.34	20.28	50.86	34.00	21.44	15.92	10.50	21.20	10.33	11.94	17.71	28.36
11	18.71	19.85	39.92	21.20	21.00	15.56	11.91	12.97	10.11	11.67	193.03	69.17
12	18.09	43.99	30.35	64.39	20.56	15.23	10.45	10.63	9.90	11.42	67.65	72.86
13	29.60	35.66	21.97	28.43	20.13	19.14	10.00	9.96	9.70	28.73	77.26	48.14
14	20.09	23.38	67.31	31.46	19.71	15.60	22.42	11.06	39.21	15.06	96.46	82.20
15	31.02	20.73	31.84	95.40	21.31	14.68	43.55	9.78	16.26	12.29	55.48	42.71
16	20.37	26.97	23.46	42.30	22.92	14.28	17.74	23.43	36.89	14.03	36.00	47.59
17	18.06	21.06	21.52	26.97	19.52	20.32	18.08	12.43	16.62	11.82	43.78	53.87
18	17.33	39.77	36.87	27.70	28.99	15.15	12.81	10.20	12.60	28.28	34.03	46.76
19	16.90	34.20	74.19	23.63	27.12	13.94	11.63	21.01	14.73	17.64	36.32	37.99
20	16.54	23.96	35.06	74.25	23.75	13.48	11.21	19.45	13.93	48.32	53.22	54.93
21	16.20	20.62	43.83	34.01	57.55	16.09	17.95	11.90	50.96	26.01	34.84	36.54
22	15.86	21.16	27.51	26.03	32.11	23.64	12.35	11.90	20.33	20.12	30.87	39.37
23	43.36	19.50	24.04	24.12	22.29	15.24	11.11	18.29	14.35	23.90	39.60	71.42
24	50.12	18.87	22.99	38.31	20.11	13.44	14.95	12.72	16.81	23.38	39.14	40.51
25	38.60	18.43	22.42	52.36	19.37	34.78	11.44	10.46	28.11	24.15	32.63	39.41
26	48.10	32.42	21.93	37.85	18.90	19.09	10.60	9.86	38.33	26.42	50.08	33.30
27	83.72	57.37	21.47	51.99	18.50	18.00	10.27	9.59	19.97	22.02	51.74	31.61
28	37.26	35.01	24.72	39.88	18.11	14.30	10.03	9.38	15.11	35.23	39.25	30.77
29	29.01		22.63	43.99	17.74	13.37	9.82	9.18	13.97	20.22	33.22	35.68
30	45.36		20.77	29.22	20.36	12.98	9.61	8.99	25.96	15.96	33.80	30.77
31	29.05		20.07		22.59		9.41	20.53		22.22		29.35

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



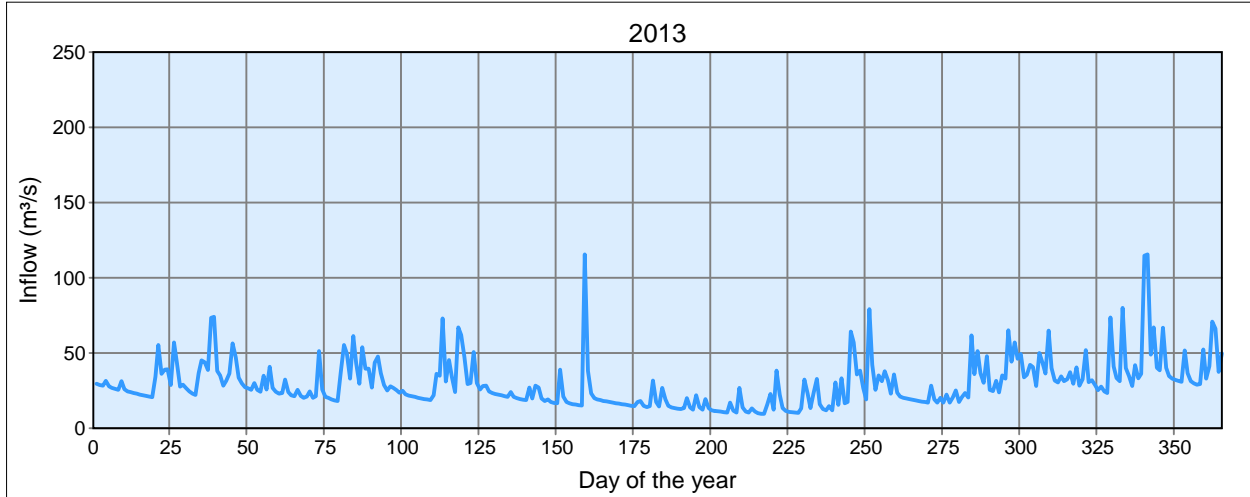
Year: 2012

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	28.59	87.81	27.82	24.04	26.63	20.45	16.94	11.60	10.00	9.50	27.21	58.48
2	27.97	33.73	41.37	22.35	60.60	18.31	16.33	11.36	9.69	9.30	41.65	33.37
3	27.38	23.21	28.83	24.28	29.64	17.61	13.88	11.13	9.47	23.91	41.25	48.91
4	26.81	20.88	26.03	21.78	26.83	17.18	15.34	10.90	13.00	12.38	31.28	64.01
5	26.26	26.84	25.08	20.95	22.69	16.82	13.35	10.67	11.69	22.53	31.10	37.83
6	29.45	21.70	25.38	20.45	21.55	16.46	12.75	11.98	9.63	12.38	54.60	30.18
7	27.83	19.91	25.03	26.63	20.98	16.12	34.17	10.59	9.09	10.30	29.03	28.26
8	25.40	57.00	23.74	31.27	20.52	15.79	17.25	10.16	14.81	17.44	20.92	57.96
9	24.53	28.10	23.10	27.05	20.93	17.95	51.27	9.90	29.44	35.09	33.64	54.85
10	23.96	21.88	26.57	24.02	33.63	15.72	21.75	9.69	13.53	32.64	66.88	33.87
11	40.53	30.11	23.05	25.26	22.56	15.05	44.17	9.49	10.38	21.96	35.07	32.27
12	48.89	99.88	53.24	21.73	20.14	14.67	21.22	12.28	9.62	25.02	23.81	56.86
13	29.14	55.25	28.77	32.97	19.35	14.35	16.64	10.68	9.32	17.78	21.27	34.23
14	25.01	39.09	24.18	28.68	18.88	14.05	22.51	27.47	9.11	36.85	39.18	66.81
15	23.83	28.81	62.52	24.79	18.48	13.76	16.97	25.18	15.70	24.43	31.50	48.00
16	23.21	25.05	32.68	24.41	18.09	13.47	15.40	21.74	10.32	32.81	80.26	41.02
17	23.47	23.94	50.85	25.41	17.72	13.19	27.41	12.75	9.15	19.34	36.47	61.91
18	22.41	54.93	29.48	20.23	24.07	19.56	17.44	10.88	25.95	17.44	41.15	36.68
19	21.84	30.22	25.05	24.79	18.56	14.21	15.31	24.55	12.59	34.69	37.05	31.42
20	38.78	25.16	26.40	19.75	43.54	14.94	17.77	33.21	18.45	34.23	26.29	29.92
21	25.00	23.81	23.79	18.49	22.86	13.00	15.02	15.76	46.81	18.79	23.86	57.62
22	22.04	31.15	22.91	66.81	24.38	23.55	15.67	12.29	18.07	23.09	26.67	42.04
23	21.12	74.55	22.36	49.15	18.92	15.68	14.21	11.44	12.47	17.32	38.30	44.08
24	26.18	40.97	21.88	42.81	17.60	13.41	14.93	11.09	11.23	21.00	25.83	76.21
25	21.46	28.42	21.43	56.61	17.06	12.44	13.67	10.84	10.81	15.94	62.26	57.16
26	20.23	41.02	60.71	34.41	45.85	47.18	13.20	15.56	10.56	17.27	49.60	36.73
27	19.66	28.06	34.36	24.83	25.46	20.00	12.90	11.55	10.33	14.86	52.97	32.35
28	19.22	71.75	46.84	22.65	19.12	14.66	12.62	10.62	10.11	25.30	61.51	38.03
29	18.82	35.15	27.71	21.87	17.63	16.51	12.36	11.40	9.90	16.41	37.31	43.90
30	18.43		25.55	21.35	45.17	30.73	12.10	13.85	9.70	19.65	36.71	35.33
31	18.05		31.06		30.22		11.85	10.75		42.11		31.00

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



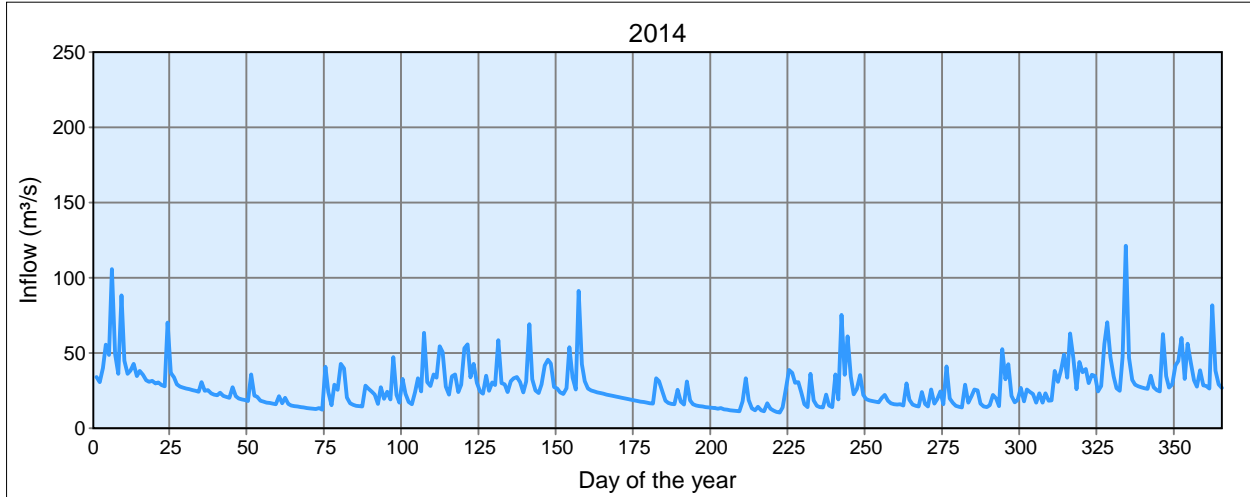
Year: 2013

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	29.68	22.96	23.08	43.58	29.35	21.21	17.46	13.32	17.57	20.44	28.19	34.80
2	28.94	22.27	23.60	47.75	30.17	17.58	14.53	11.08	64.29	16.99	50.06	28.15
3	28.31	36.67	32.44	36.60	50.81	16.61	26.87	10.15	57.02	22.57	43.55	42.06
4	31.55	45.21	24.00	28.94	30.13	16.15	19.25	9.81	35.95	17.15	36.41	33.29
5	28.04	43.97	22.04	25.21	25.81	15.80	14.91	9.58	38.44	20.69	65.10	36.29
6	26.92	38.71	21.30	27.94	28.18	15.46	13.85	15.77	26.70	25.27	40.17	114.64
7	26.26	73.43	25.68	27.00	28.27	15.14	13.43	22.83	19.30	17.50	31.87	115.62
8	25.70	74.03	21.51	25.46	24.56	115.69	13.12	12.41	79.21	20.67	30.43	49.14
9	31.31	38.19	20.38	23.77	23.46	38.14	12.84	38.28	42.27	23.38	34.55	67.08
10	26.08	35.28	21.21	24.98	22.86	23.22	13.45	22.51	25.63	20.53	31.28	40.32
11	24.68	28.29	24.54	22.60	22.37	20.08	20.11	13.41	35.25	61.79	32.57	38.70
12	24.00	31.65	20.24	21.78	21.90	19.17	13.92	11.50	31.31	36.11	37.26	66.91
13	23.47	36.47	21.43	21.26	21.45	18.67	12.54	10.96	37.98	51.32	29.67	40.29
14	22.98	56.44	51.40	20.81	21.00	18.27	22.07	10.67	31.89	36.70	40.46	34.72
15	22.50	47.18	25.93	20.37	24.19	17.89	14.13	10.44	23.08	30.21	28.33	33.10
16	22.03	33.72	20.80	19.95	20.99	17.51	12.43	10.22	35.77	47.89	32.57	32.25
17	21.58	29.79	20.44	19.54	20.04	17.15	19.53	13.29	23.79	25.67	51.97	31.55
18	21.13	27.39	19.16	19.13	19.53	16.79	13.39	32.35	21.18	24.77	30.73	30.89
19	20.69	26.78	18.60	18.73	19.11	16.45	12.04	23.36	20.35	31.67	32.04	51.74
20	34.34	25.61	18.19	21.91	18.71	16.10	11.59	13.50	19.85	23.94	28.89	36.72
21	55.40	30.12	37.56	36.17	27.10	15.77	11.31	23.75	19.42	35.13	25.49	31.40
22	36.14	25.63	55.29	35.03	19.99	15.44	11.06	32.87	19.02	33.12	27.76	29.90
23	38.95	24.37	49.58	73.06	28.31	15.12	10.83	16.17	18.62	65.11	24.61	29.11
24	39.26	35.06	33.01	31.24	27.06	14.81	10.61	12.83	18.23	44.41	23.61	29.36
25	28.94	25.87	61.29	45.26	19.85	17.60	17.18	12.00	17.86	57.05	73.62	52.42
26	57.21	40.87	43.23	34.06	18.19	18.26	11.76	14.79	17.49	46.16	41.26	33.08
27	43.77	26.96	29.69	24.20	19.31	14.96	10.57	12.11	17.12	49.45	33.40	41.36
28	27.78	24.37	53.90	67.02	17.57	14.10	26.90	30.48	28.49	33.86	31.28	70.90
29	29.08		39.60	61.93	16.96	14.77	13.84	15.56	19.16	35.56	80.08	66.22
30	26.82		39.61	47.39	16.56	31.77	11.21	33.30	17.12	42.22	40.01	37.50
31	24.62		27.02		39.03		10.53	16.65		40.71		49.91

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



Year: 2014

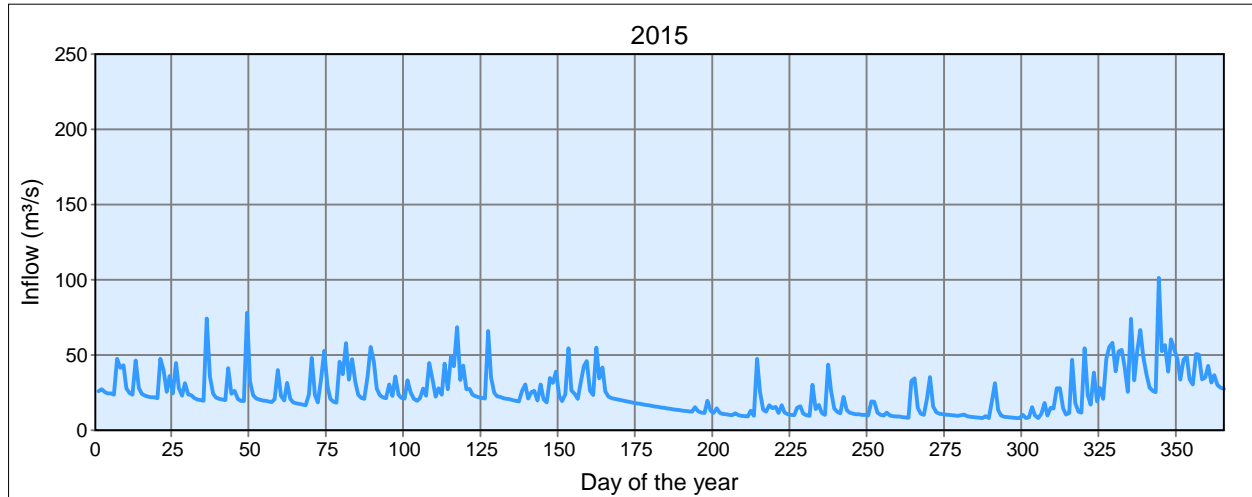
Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	34.25	25.43	21.33	22.34	55.78	22.92	33.27	13.31	61.15	24.62	17.22	46.81
2	30.79	24.90	16.78	16.34	33.91	26.71	31.39	12.08	34.40	16.13	23.22	32.30
3	39.96	24.38	20.42	27.25	42.89	53.92	24.86	14.39	22.72	41.09	17.10	29.09
4	55.61	30.74	16.31	19.73	30.35	33.62	18.40	12.02	26.18	19.99	23.36	28.01
5	48.75	24.99	15.27	24.27	24.61	25.92	16.90	11.38	35.36	16.97	18.43	27.33
6	105.84	25.45	14.83	19.20	23.14	91.29	16.34	16.72	22.22	15.01	18.60	26.75
7	49.38	23.29	14.49	47.32	34.94	42.73	15.96	13.07	19.42	14.39	38.21	26.19
8	36.22	22.50	14.19	22.17	24.90	31.26	25.64	11.85	18.58	14.04	30.90	34.96
9	88.36	21.98	13.89	17.17	30.62	26.48	17.64	10.93	18.11	28.99	39.07	27.29
10	45.06	23.70	13.60	32.86	28.91	25.16	15.87	10.57	17.72	17.02	49.11	25.42
11	36.26	21.58	13.32	23.14	58.59	24.49	31.11	13.83	17.35	21.42	33.82	24.65
12	38.32	20.82	13.05	17.50	30.09	23.95	18.62	25.99	20.26	25.91	63.08	62.64
13	42.93	20.33	12.77	16.16	29.28	23.45	16.00	38.82	22.22	25.13	46.98	34.70
14	34.77	27.44	13.53	24.20	24.02	22.96	15.25	36.84	18.39	16.54	25.99	27.02
15	38.25	21.25	12.49	33.35	31.28	22.48	14.86	30.19	16.74	14.68	44.06	29.28
16	35.52	19.75	41.00	24.44	33.31	22.02	14.53	30.69	16.16	14.09	37.22	41.72
17	32.11	19.14	24.00	63.48	34.26	21.56	14.23	24.04	15.78	15.38	39.40	44.71
18	30.94	18.71	15.41	30.76	30.67	21.11	13.93	15.94	16.00	22.25	30.14	60.00
19	31.63	18.31	29.04	28.13	23.94	20.68	13.64	14.17	15.25	19.97	35.57	32.83
20	29.89	35.70	25.74	35.86	31.14	20.25	13.36	36.33	29.75	14.84	34.87	56.19
21	30.45	21.72	42.83	33.68	69.16	19.83	13.08	18.60	19.10	52.56	24.65	43.63
22	28.75	21.05	39.79	54.56	32.57	19.41	13.44	15.02	15.81	32.75	28.19	32.04
23	27.96	18.45	20.47	50.83	25.28	19.01	12.69	14.11	14.94	42.67	56.12	27.70
24	70.25	17.67	16.56	27.66	23.52	18.62	12.34	13.89	14.52	21.51	70.49	38.61
25	36.81	17.22	15.57	22.35	29.24	18.23	12.07	22.56	24.09	17.26	47.21	28.61
26	33.98	16.85	15.12	34.62	41.77	17.85	11.82	15.27	16.22	18.72	34.47	28.17
27	29.21	16.50	14.78	35.70	45.62	17.48	11.57	14.09	14.50	26.83	26.80	26.53
28	27.84	16.15	14.47	23.99	42.98	17.12	11.33	35.91	25.81	18.05	24.94	81.84
29	27.11		28.39	29.11	27.61	16.76	17.89	19.13	16.38	25.80	47.55	38.46
30	26.52		26.28	53.34	26.54	16.41	33.29	75.42	19.44	24.25	121.33	29.16
31	25.97		24.41		23.82		18.74	35.56		22.85		26.96



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



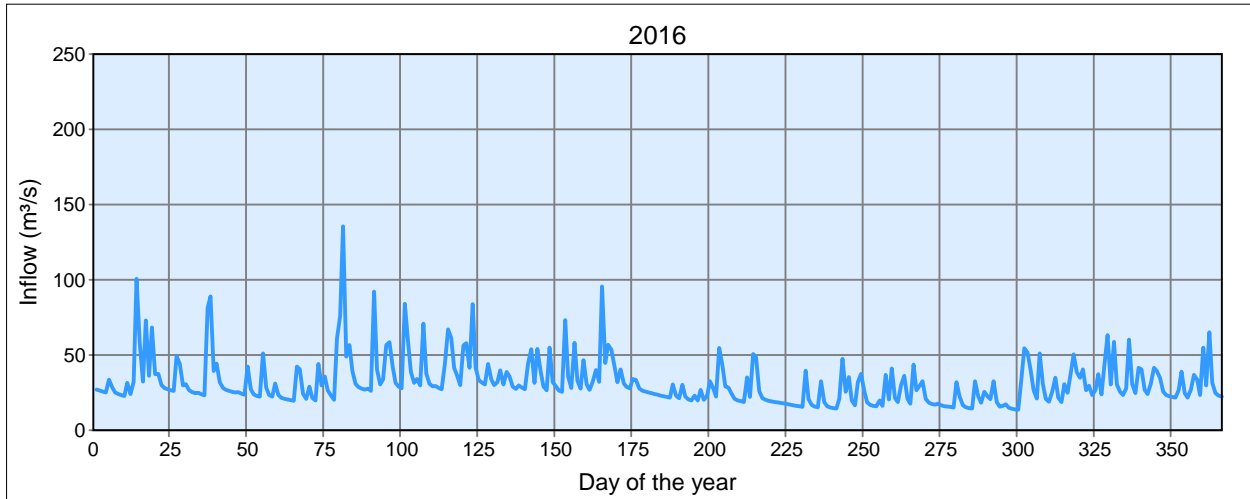
Year: 2015

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	26.10	21.31	22.89	27.63	27.54	23.91	15.59	9.77	11.68	10.77	8.13	74.01
2	27.36	20.57	19.77	23.25	23.79	54.59	15.26	47.63	11.14	10.52	10.94	33.32
3	25.40	20.09	31.61	22.05	22.70	26.40	14.95	25.56	10.86	10.30	18.15	52.33
4	24.61	19.66	20.98	21.46	22.12	24.38	14.64	13.79	10.62	10.08	9.90	66.60
5	24.56	74.36	18.66	30.62	21.64	20.94	14.33	12.43	10.40	9.87	15.08	49.49
6	23.66	35.66	17.92	22.81	21.18	31.59	14.03	16.81	10.18	9.67	14.67	37.49
7	47.59	24.29	17.49	35.72	65.95	42.64	13.74	14.86	9.97	10.12	28.05	28.36
8	41.46	21.79	17.11	23.74	35.07	46.08	13.46	15.53	19.30	10.53	27.92	26.20
9	43.30	20.96	16.75	21.67	24.90	26.38	13.18	11.63	19.04	9.40	14.47	25.36
10	28.06	20.46	23.67	21.16	22.61	23.59	12.90	16.62	11.91	9.03	10.54	101.31
11	24.78	20.02	48.24	33.22	22.13	54.95	12.64	11.75	10.40	8.81	11.56	52.56
12	23.76	41.40	23.52	25.24	21.37	34.58	12.37	10.66	9.95	8.62	46.80	56.73
13	46.44	24.30	18.57	20.85	20.87	41.74	15.41	10.28	11.85	8.44	17.94	39.05
14	28.12	26.13	33.96	19.70	20.63	25.84	12.64	10.03	9.99	8.26	12.32	60.51
15	24.28	21.00	52.94	21.50	20.05	22.47	11.91	14.95	9.48	9.53	11.78	54.00
16	23.16	19.70	29.75	27.78	19.60	21.48	11.58	16.08	9.22	8.26	54.60	47.34
17	22.56	19.44	20.99	23.04	19.19	20.93	19.65	11.11	9.24	18.89	23.20	33.65
18	22.07	78.18	19.03	44.88	26.21	20.48	13.07	10.00	8.88	31.36	17.24	46.91
19	22.02	32.57	18.34	34.01	30.57	20.05	11.60	9.63	8.67	13.44	38.38	49.18
20	21.26	23.32	45.62	22.48	21.12	19.63	14.57	30.34	8.48	9.92	19.24	33.96
21	47.58	21.23	37.27	27.89	25.46	19.22	11.67	14.10	32.82	9.10	28.22	30.59
22	40.31	20.48	57.87	23.68	26.36	18.82	10.94	16.99	34.59	8.80	20.94	50.61
23	25.50	20.00	33.63	44.28	19.99	18.43	10.62	11.53	15.00	8.59	47.70	50.34
24	36.04	19.57	47.22	27.38	30.45	18.05	10.38	10.33	11.14	8.41	55.30	33.91
25	24.59	19.17	32.30	49.30	20.69	17.68	10.16	43.73	10.25	8.24	58.07	35.29
26	44.85	18.77	23.66	42.53	18.54	17.31	11.24	26.29	21.37	8.06	39.26	42.94
27	27.99	20.64	21.67	68.54	34.85	16.95	10.05	14.54	35.45	10.31	52.44	31.84
28	23.09	40.17	20.94	33.48	31.45	16.60	9.66	12.13	15.90	8.30	53.43	36.74
29	31.43		35.33	43.01	38.98	16.25	9.42	11.48	12.04	8.57	42.14	30.04
30	23.90		55.44	27.33	22.85	15.92	9.22	22.22	11.12	15.43	25.67	28.31
31	23.36		45.69		19.49		13.01	13.51		9.94		27.51

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



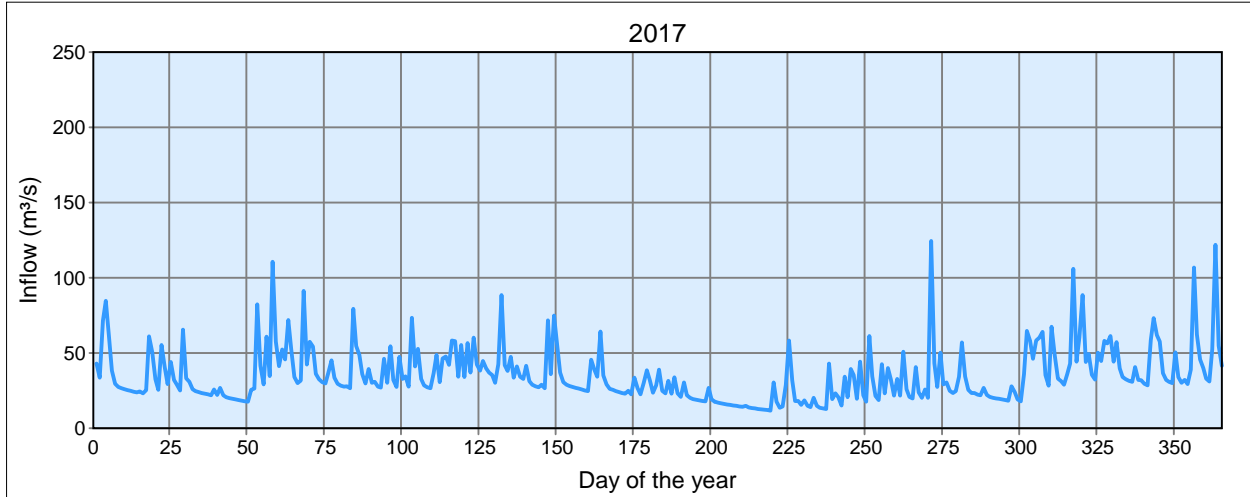
Year: 2016

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	27.17	25.42	21.63	40.64	41.65	73.28	23.68	50.62	35.37	16.67	21.08	60.16
2	26.40	24.76	20.93	30.47	83.89	35.70	23.19	48.53	19.92	16.19	51.02	30.77
3	25.81	24.99	20.45	33.90	41.80	28.18	22.71	26.08	16.74	15.83	30.40	24.84
4	25.26	23.90	20.02	56.76	33.34	58.27	22.24	21.50	32.10	15.49	21.06	41.45
5	33.70	23.29	19.60	58.54	31.73	33.01	21.78	20.30	37.56	15.17	18.98	40.49
6	29.10	81.27	42.46	42.47	30.43	27.81	30.42	19.73	26.22	32.13	25.74	26.95
7	25.17	89.02	40.48	31.52	44.10	46.75	23.01	19.30	18.67	22.53	35.05	24.01
8	24.02	39.48	24.28	28.98	33.88	30.44	21.26	18.89	16.97	16.71	21.75	30.93
9	23.41	44.28	20.89	28.02	30.06	26.93	30.36	18.50	16.37	15.36	18.93	41.56
10	22.90	31.90	29.01	84.21	32.07	32.36	22.40	18.11	15.98	14.85	30.65	39.40
11	31.60	28.07	21.53	59.06	39.84	40.01	20.55	18.02	19.90	14.50	25.00	34.78
12	24.10	26.89	19.79	38.71	30.39	32.17	19.87	17.44	16.31	32.56	37.91	25.65
13	32.36	26.22	44.16	31.54	38.77	95.53	22.98	17.03	37.01	22.70	50.47	23.54
14	100.57	25.65	29.84	34.11	35.89	44.65	19.83	16.67	20.48	18.41	38.58	22.75
15	57.93	25.12	35.69	29.89	29.01	56.87	26.99	16.33	41.10	25.63	34.96	22.22
16	32.33	25.48	26.66	70.97	27.52	53.64	20.32	15.99	21.39	22.67	40.55	21.75
17	72.94	24.29	23.32	37.81	29.90	42.37	22.80	15.66	18.71	20.71	26.70	26.68
18	36.39	23.66	20.42	31.07	28.42	31.94	32.67	39.75	30.13	32.75	29.58	38.92
19	68.30	42.38	61.00	29.30	27.21	40.61	28.19	20.73	36.24	18.76	23.48	24.84
20	37.44	27.23	76.05	29.44	44.56	31.13	22.38	16.88	20.83	15.86	26.79	21.83
21	37.47	23.92	135.53	28.08	53.92	28.86	54.71	15.89	17.65	16.21	37.26	26.95
22	30.02	22.91	48.92	27.35	31.65	27.96	43.01	15.44	43.59	17.38	23.88	36.97
23	28.14	22.34	56.71	43.86	54.14	34.23	29.18	32.68	26.68	15.02	42.95	33.70
24	27.32	51.27	39.74	67.17	39.48	33.39	28.46	18.89	29.67	14.33	63.18	23.51
25	26.71	28.29	30.84	61.33	29.19	27.98	24.49	16.04	32.61	13.96	30.47	54.94
26	26.15	23.58	28.69	41.62	26.80	26.51	20.87	15.24	20.89	13.66	58.78	29.85
27	49.21	22.32	27.81	36.05	54.84	25.80	19.85	14.84	18.38	34.60	30.49	65.19
28	44.26	31.22	27.17	30.19	32.09	25.23	19.43	14.51	17.60	54.54	25.59	31.54
29	29.86	23.46	27.77	56.55	29.19	24.70	18.93	20.86	17.17	51.81	23.49	24.82
30	30.81		26.32	57.94	26.46	24.19	35.11	47.51	17.75	39.68	27.63	23.16
31	26.63		92.21		25.50		22.23	25.71		26.74		22.46

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow



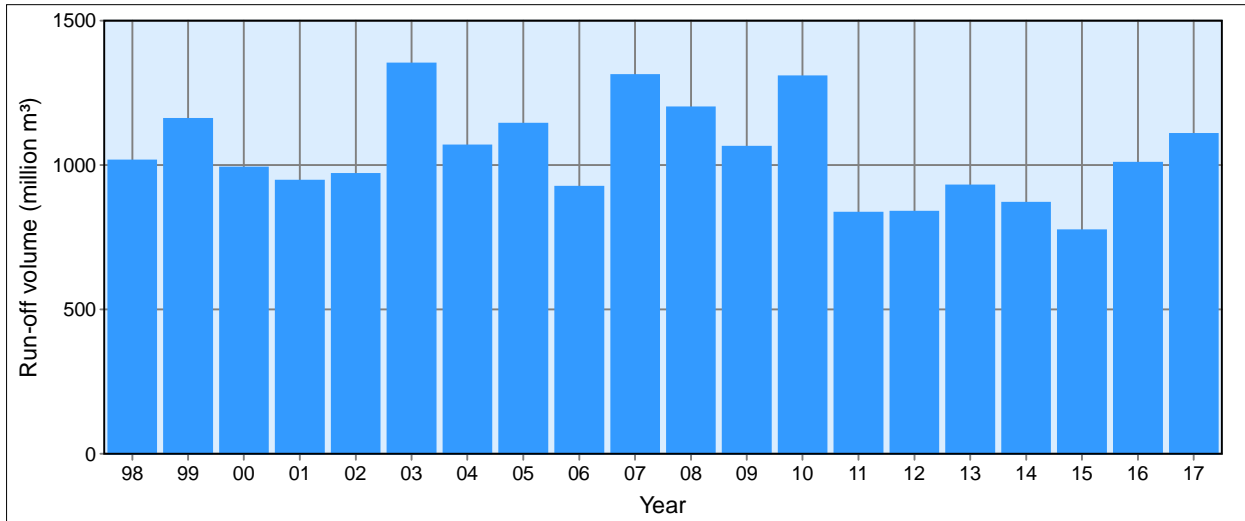
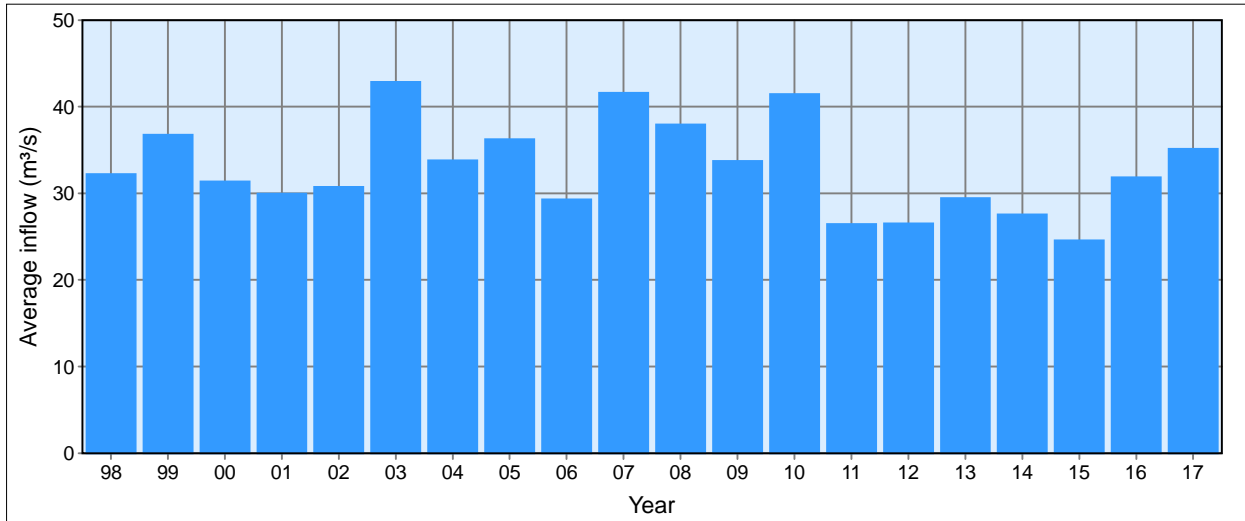
Year: 2017

Unit: m³/s

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	43.02	26.09	41.38	31.03	56.70	30.66	28.65	13.55	20.71	50.29	58.44	31.70
2	33.64	24.75	52.35	27.82	37.15	28.95	38.92	13.24	39.40	29.19	60.38	31.00
3	71.50	24.09	45.74	27.07	60.38	28.15	24.91	12.96	35.41	30.62	64.12	40.81
4	84.77	23.56	71.87	46.15	42.41	27.53	23.23	12.69	19.72	24.95	35.37	32.17
5	60.72	23.06	52.76	30.26	38.40	26.95	31.53	12.43	44.26	23.48	28.45	32.11
6	38.50	22.58	34.11	54.50	44.67	26.39	22.98	12.17	22.07	24.77	67.45	29.63
7	29.60	22.12	30.10	32.22	39.80	25.84	33.92	11.92	17.62	34.43	48.65	28.67
8	27.46	25.81	31.83	27.57	37.12	25.31	23.32	30.54	61.29	57.04	33.20	58.64
9	26.60	22.18	91.34	47.45	35.51	24.78	20.98	17.74	34.51	34.47	31.29	73.30
10	25.99	26.99	42.43	32.94	30.20	45.56	30.46	13.64	21.53	25.66	29.00	62.04
11	25.45	21.96	57.44	34.55	42.57	39.08	22.11	14.56	18.77	23.61	36.06	57.82
12	24.92	20.66	54.23	27.65	88.64	34.28	20.20	28.90	42.60	23.45	42.97	36.73
13	24.40	20.08	36.31	73.60	42.03	64.31	19.51	58.34	23.27	22.45	106.01	32.23
14	23.89	19.63	32.53	41.10	38.16	35.17	19.05	32.14	40.17	21.89	44.29	30.85
15	24.65	19.22	30.78	52.84	47.64	29.30	18.65	18.22	32.53	26.87	60.43	30.08
16	23.20	18.82	29.94	32.77	33.76	26.23	18.26	18.29	21.82	22.25	88.60	50.41
17	25.41	18.43	36.80	28.53	41.17	25.69	17.88	15.51	32.82	21.02	44.03	34.19
18	61.18	18.04	45.18	27.26	34.44	24.72	26.98	18.65	21.85	20.44	49.45	30.20
19	50.79	17.67	33.75	26.73	32.89	24.13	19.36	15.04	50.97	19.99	35.52	32.17
20	32.69	25.72	29.63	36.63	41.60	23.61	17.63	14.12	26.07	19.57	32.36	29.41
21	25.75	26.49	28.37	48.76	31.38	23.12	17.02	20.18	21.05	19.16	50.39	39.03
22	55.44	82.42	27.66	30.75	28.97	24.96	16.62	14.92	19.77	18.76	44.72	106.88
23	40.77	41.47	28.04	46.42	28.04	22.71	16.27	13.71	40.82	18.37	58.05	62.33
24	29.39	29.26	26.72	47.74	27.39	33.71	15.93	13.25	23.83	27.91	56.47	45.73
25	44.04	60.86	79.42	42.29	29.03	26.68	15.60	12.94	20.31	24.22	61.28	40.18
26	32.16	34.73	54.80	58.34	26.80	22.59	15.27	43.03	25.90	19.14	44.38	32.98
27	28.98	110.71	48.82	58.01	71.68	30.18	14.95	19.51	20.35	17.88	57.34	31.10
28	25.28	57.68	36.10	34.42	36.03	38.57	14.64	23.35	124.64	36.06	39.87	52.61
29	65.66		30.01	55.52	74.94	32.29	14.34	20.75	43.15	64.71	34.17	121.85
30	33.28		39.56	34.19	55.00	23.66	14.98	15.24	27.49	58.19	32.54	55.02
31	30.95		30.22		37.11		13.97	34.41		46.29		41.53

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Yearly average inflow and run-off volume



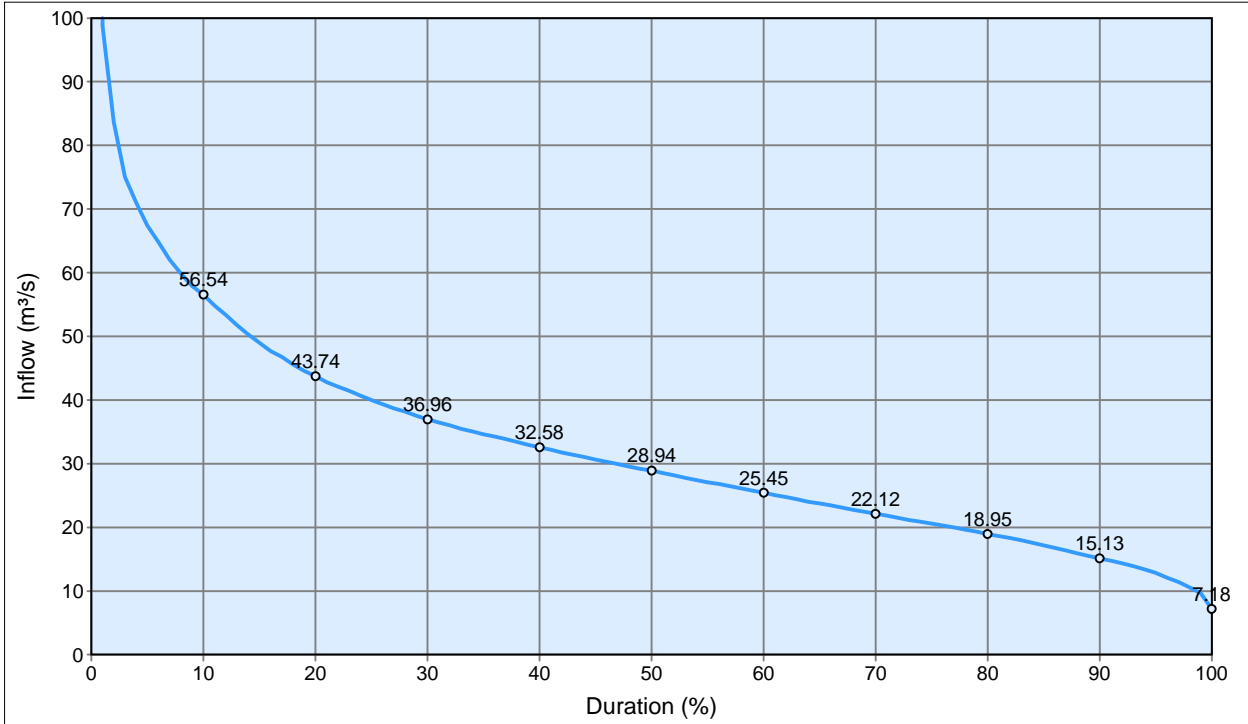
Year	Average inflow (m³/s)	Run-off volume (million m³)	Year	Average inflow (m³/s)	Run-off volume (million m³)
1998	32.217	1016.003	2008	37.936	1199.617
1999	36.753	1159.050	2009	33.719	1063.372
2000	31.350	991.361	2010	41.448	1307.100
2001	29.972	945.203	2011	26.461	834.485
2002	30.734	969.238	2012	26.514	838.437
2003	42.869	1351.912	2013	29.451	928.756
2004	33.778	1068.152	2014	27.568	869.392
2005	36.250	1143.178	2015	24.550	774.213
2006	29.311	924.336	2016	31.862	1007.558
2007	41.593	1311.688	2017	35.128	1107.781

Average inflow: 32.973 m³/s

Average run-off volume: 1040.542 million m³/year

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Inflow - duration

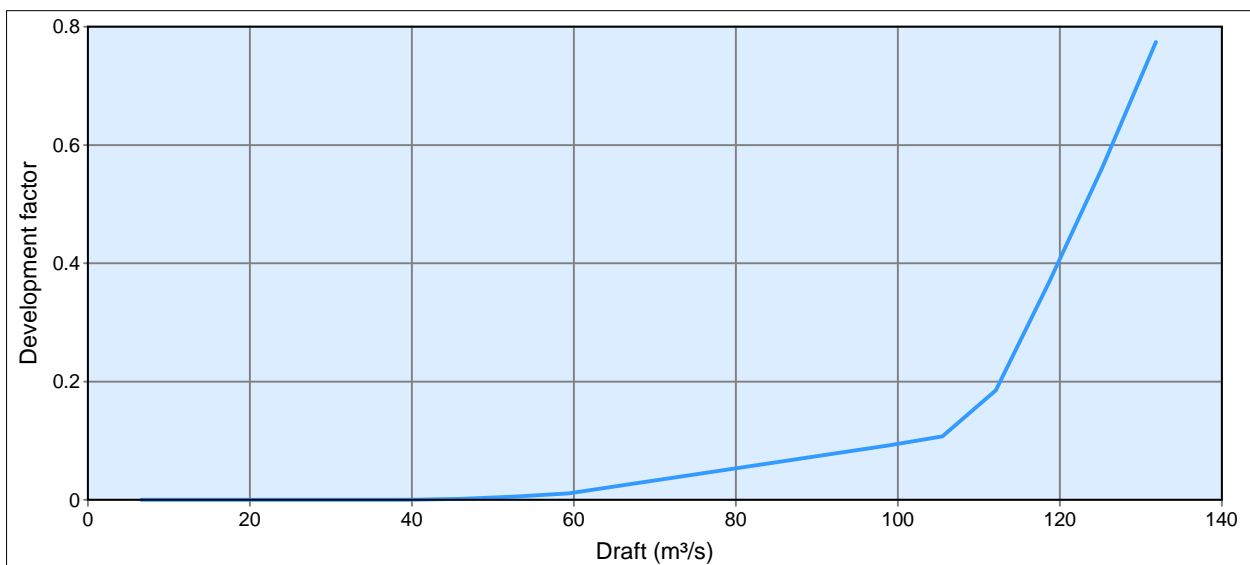
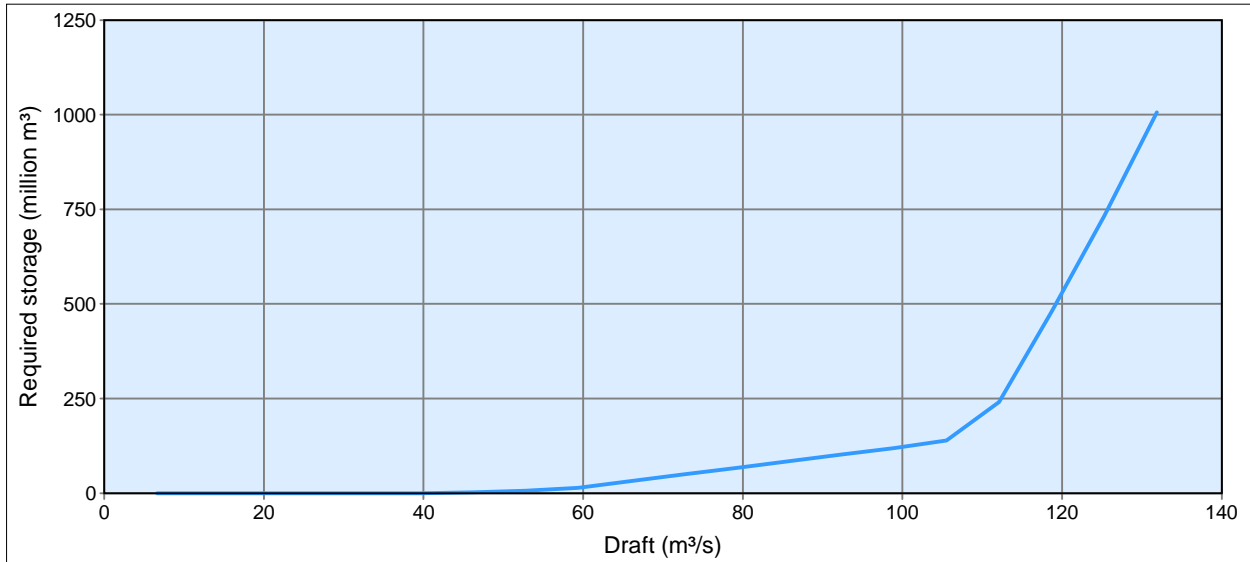


Duration (%)	Inflow (m³/s)	Duration (%)	Inflow (m³/s)	Duration (%)	Inflow (m³/s)	Duration (%)	Inflow (m³/s)
1	98.784	26	39.338	51	28.548	76	20.299
2	83.702	27	38.691	52	28.186	77	19.990
3	75.073	28	38.164	53	27.809	78	19.612
4	71.021	29	37.534	54	27.454	79	19.336
5	67.406	30	36.958	55	27.079	80	18.948
6	64.793	31	36.501	56	26.814	81	18.648
7	62.040	32	36.018	57	26.483	82	18.340
8	59.832	33	35.473	58	26.115	83	17.959
9	57.912	34	35.050	59	25.799	84	17.577
10	56.543	35	34.601	60	25.449	85	17.176
11	54.836	36	34.252	61	25.066	86	16.753
12	53.357	37	33.863	62	24.734	87	16.343
13	51.765	38	33.392	63	24.382	88	15.927
14	50.298	39	32.966	64	24.022	89	15.506
15	49.011	40	32.584	65	23.754	90	15.129
16	47.678	41	32.175	66	23.449	91	14.738
17	46.766	42	31.755	67	23.102	92	14.350
18	45.596	43	31.403	68	22.749	93	13.920
19	44.574	44	31.021	69	22.441	94	13.407
20	43.739	45	30.632	70	22.116	95	12.815
21	42.831	46	30.294	71	21.828	96	12.083
22	42.083	47	29.937	72	21.515	97	11.455
23	41.433	48	29.535	73	21.153	98	10.589
24	40.682	49	29.191	74	20.855	99	9.695
25	40.010	50	28.935	75	20.569	100	7.183

Average inflow: 32.973 m³/s

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Draft - required storage

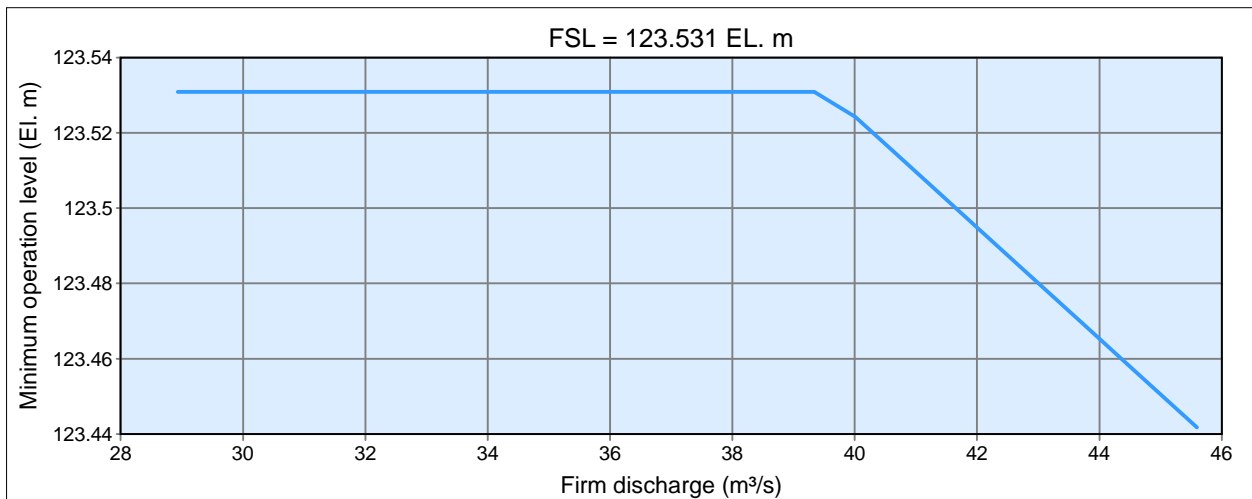
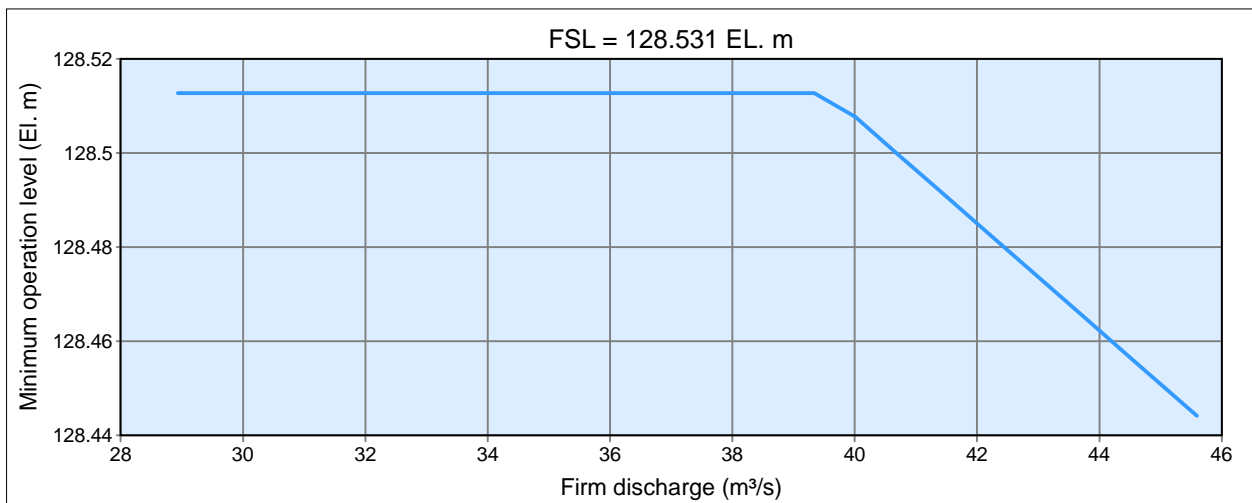
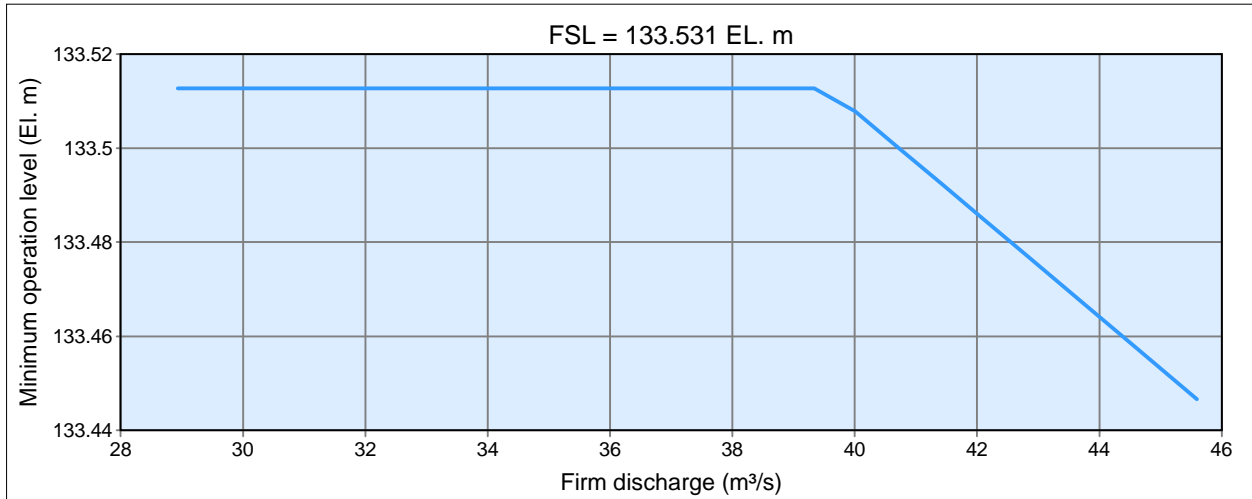


Draft (m³/s)	Required storage (million m³)	Development factor	Draft (m³/s)	Required storage (million m³)	Development factor
6.595	0.000	0.000	72.540	49.244	0.047
13.189	0.000	0.000	79.135	66.764	0.064
19.784	0.000	0.000	85.729	84.285	0.081
26.378	0.000	0.000	92.324	101.805	0.098
32.973	0.000	0.000	98.918	119.326	0.115
39.567	0.000	0.000	105.513	139.686	0.134
46.162	2.438	0.002	112.107	240.689	0.231
52.756	6.853	0.007	118.702	479.279	0.461
59.351	14.203	0.014	125.297	732.510	0.704
65.946	31.724	0.031	131.891	1005.829	0.967



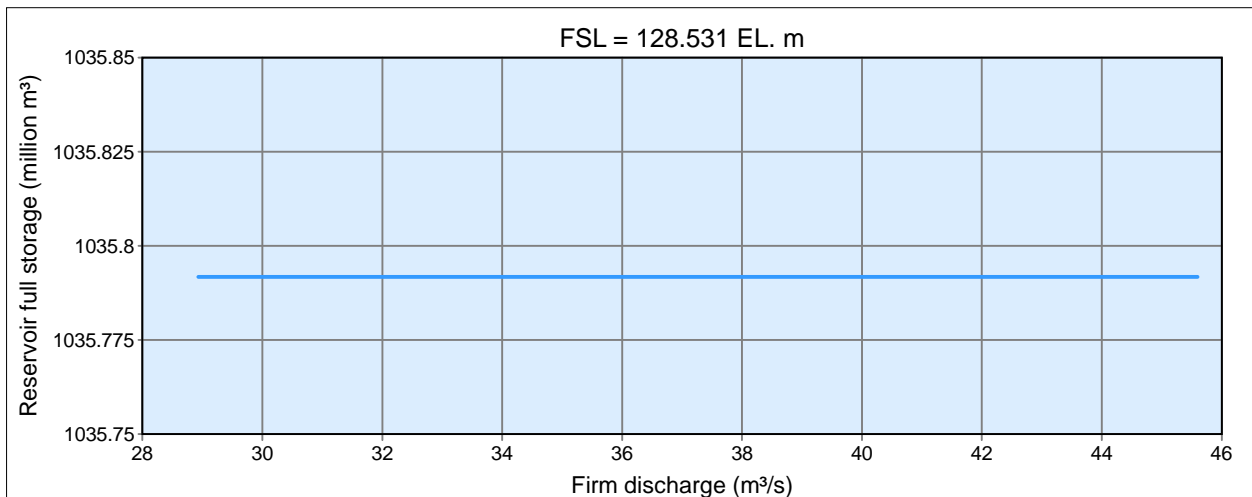
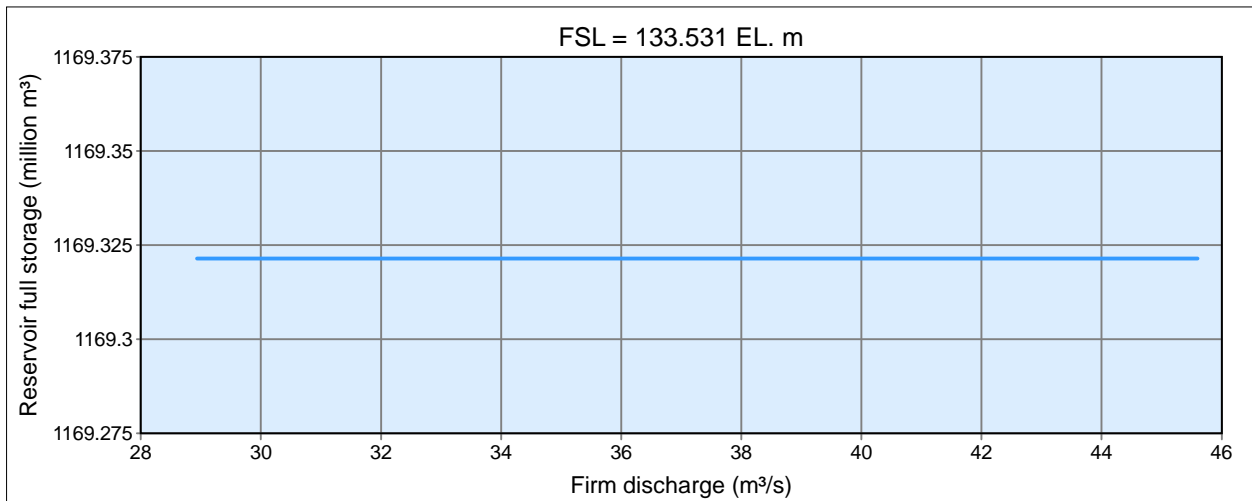
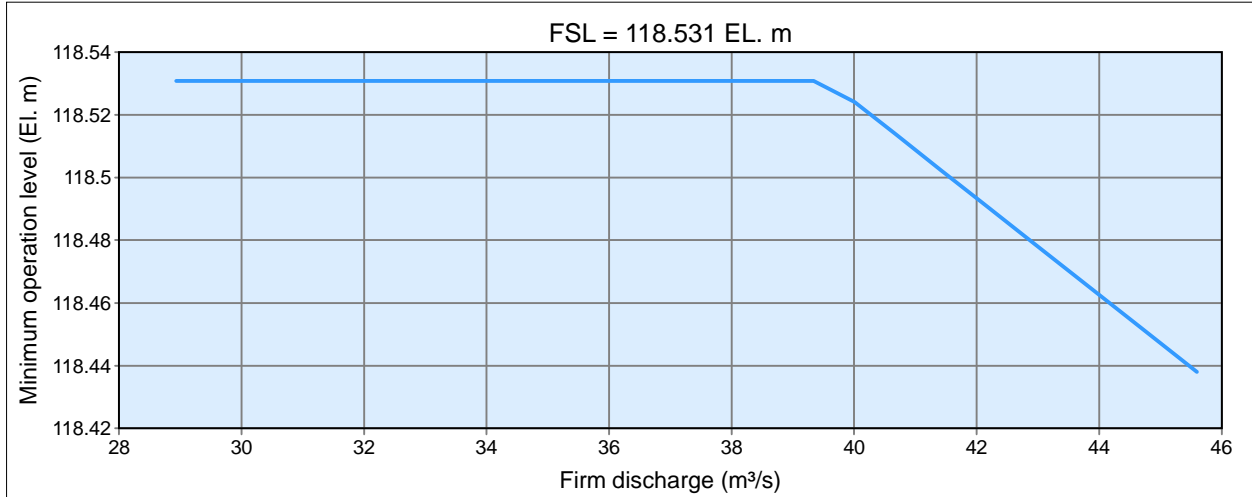
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Cases basic



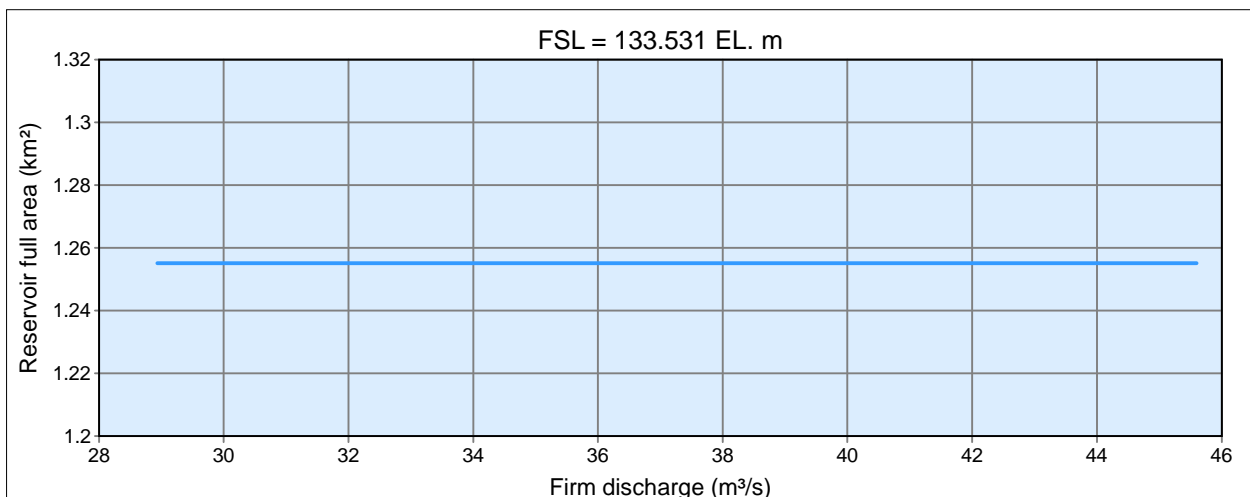
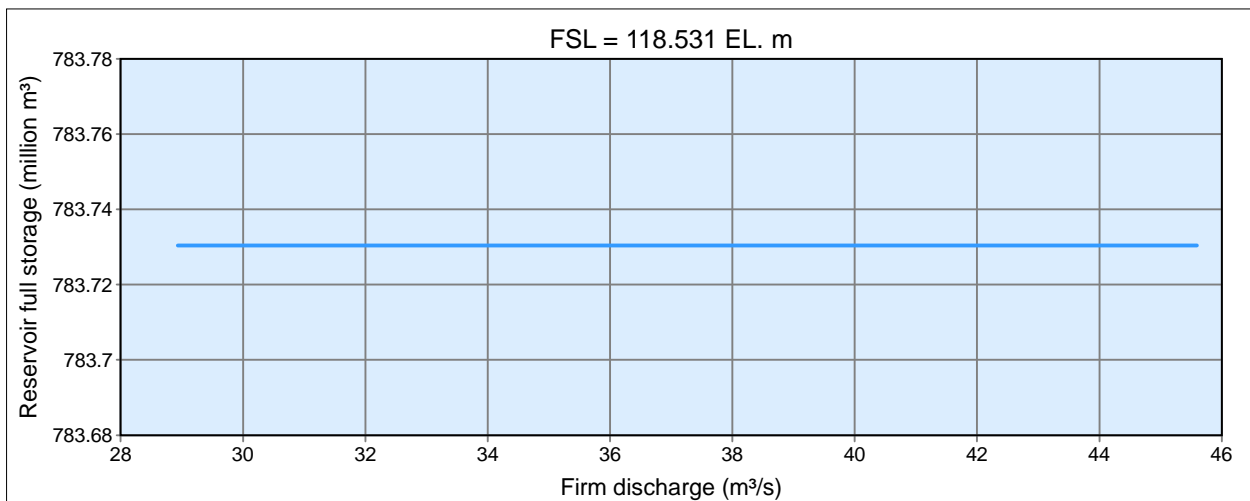
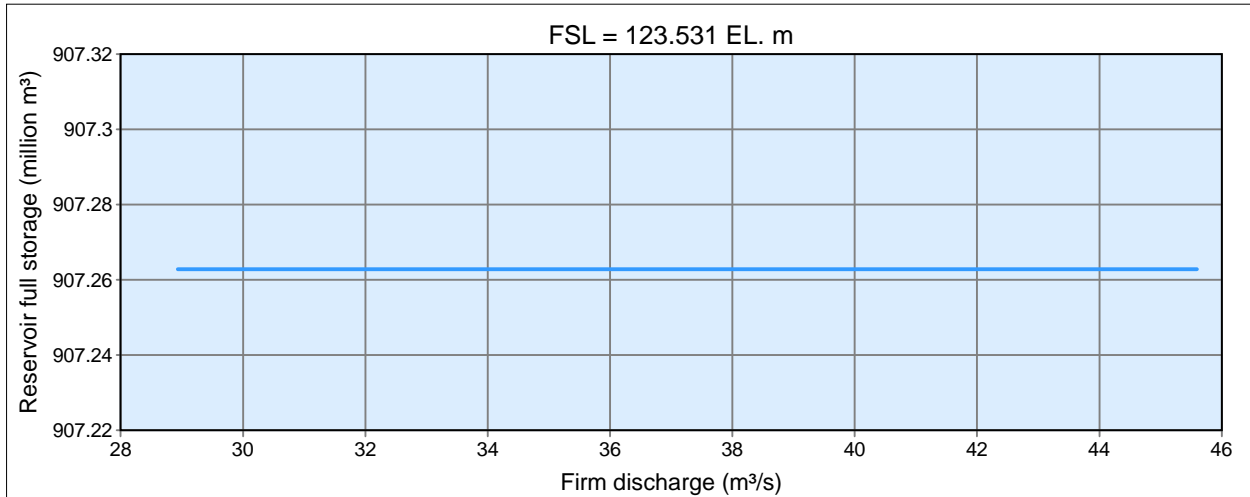
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### Cases basic



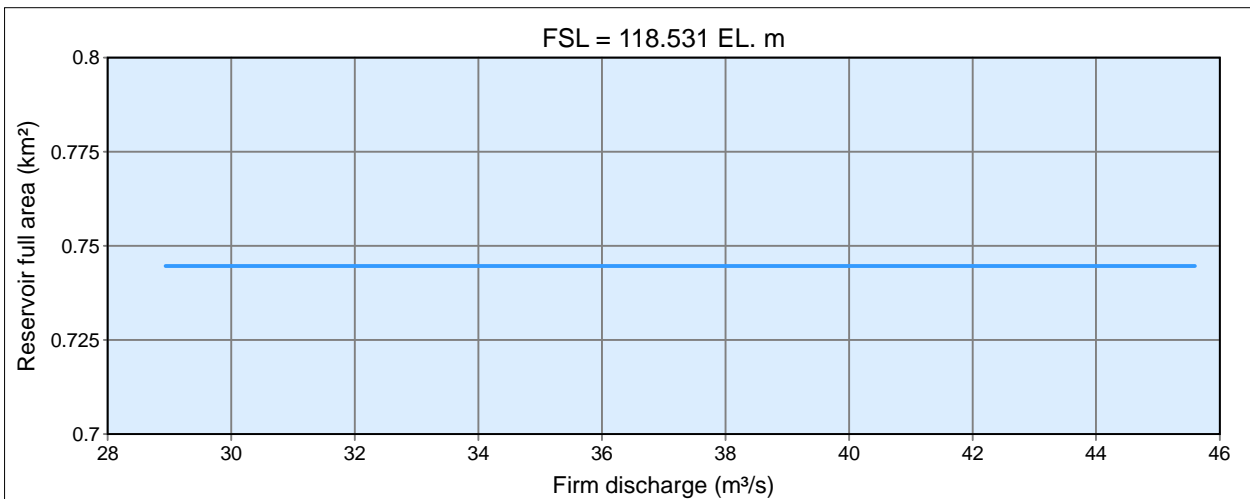
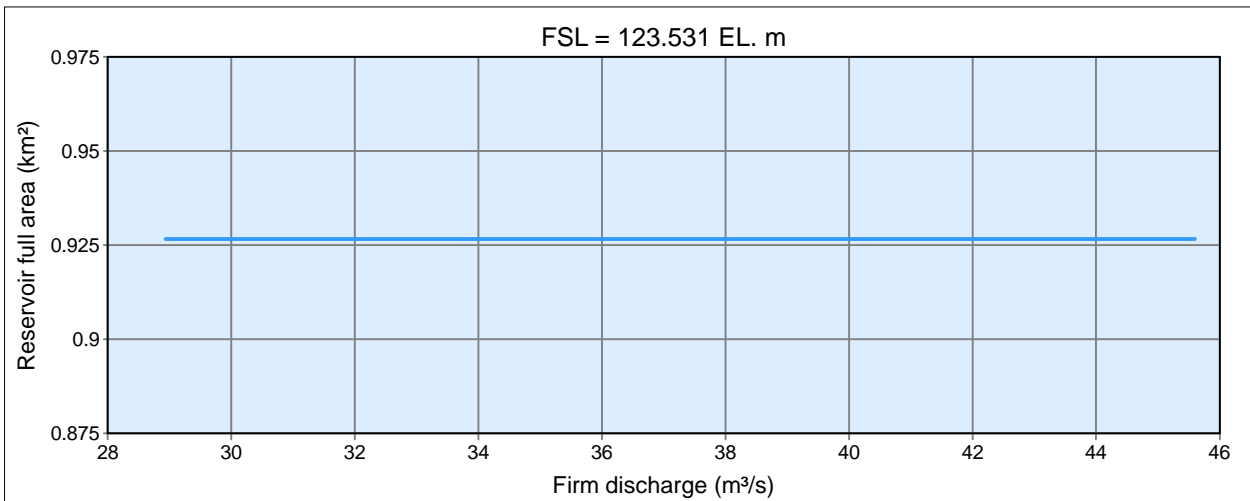
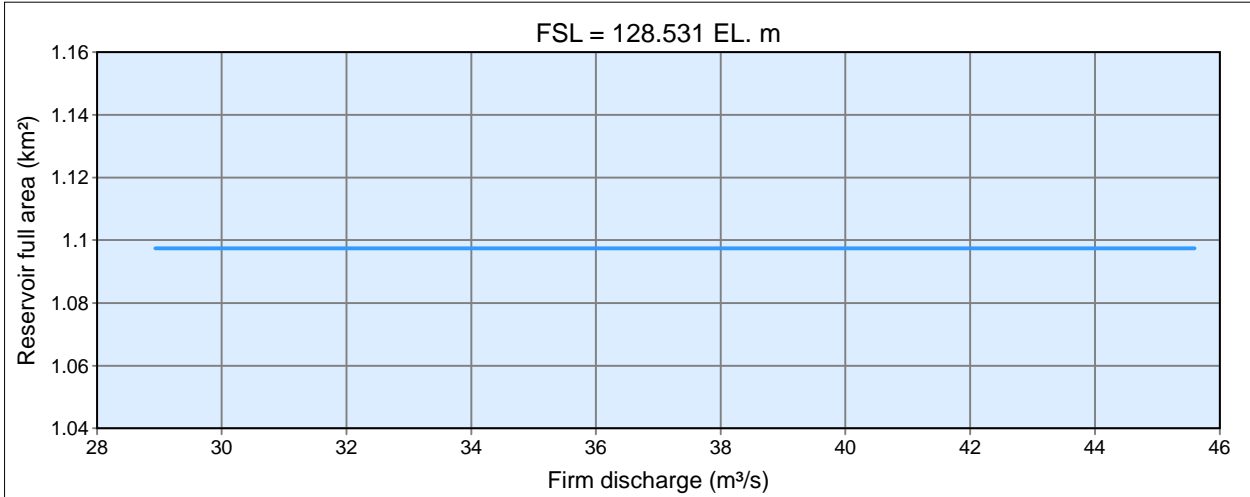
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### Cases basic



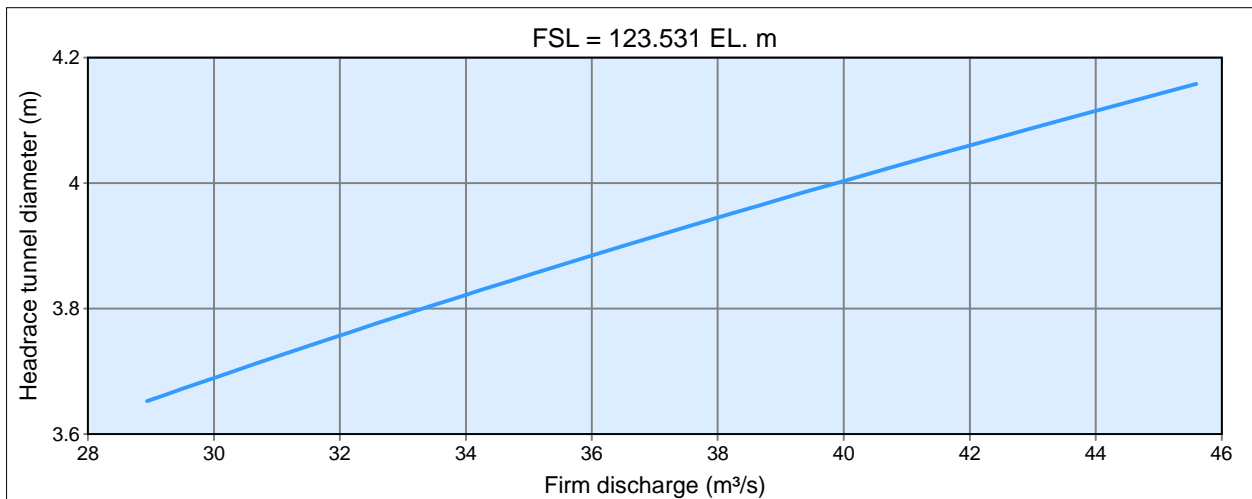
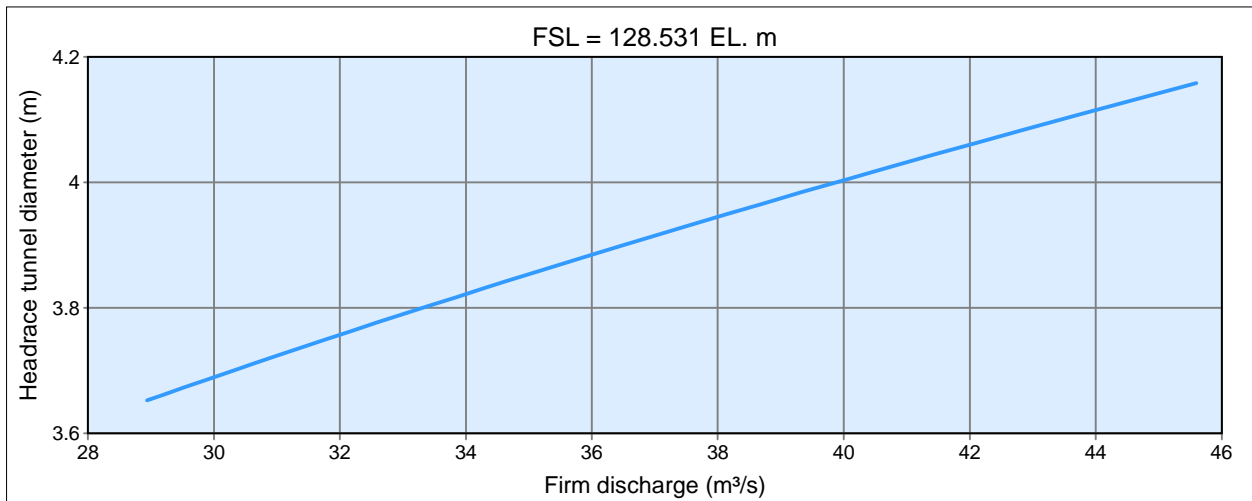
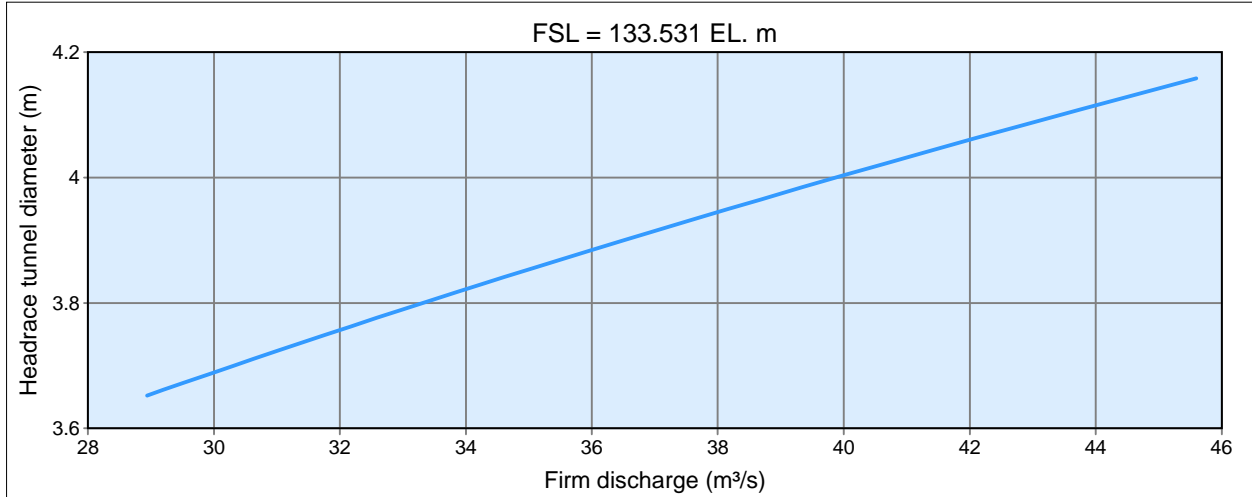
**Sample project**  
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### Cases basic



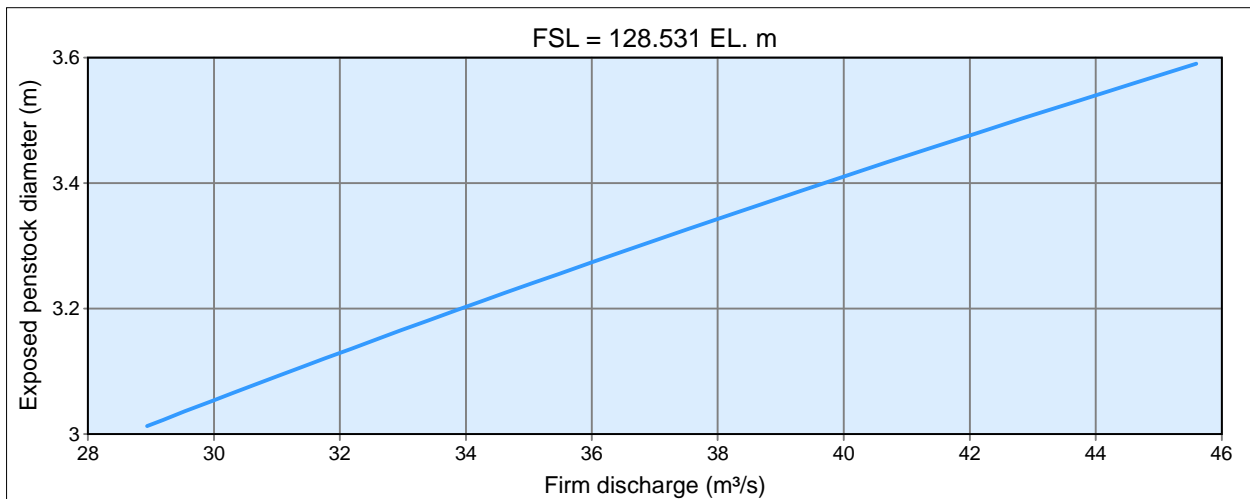
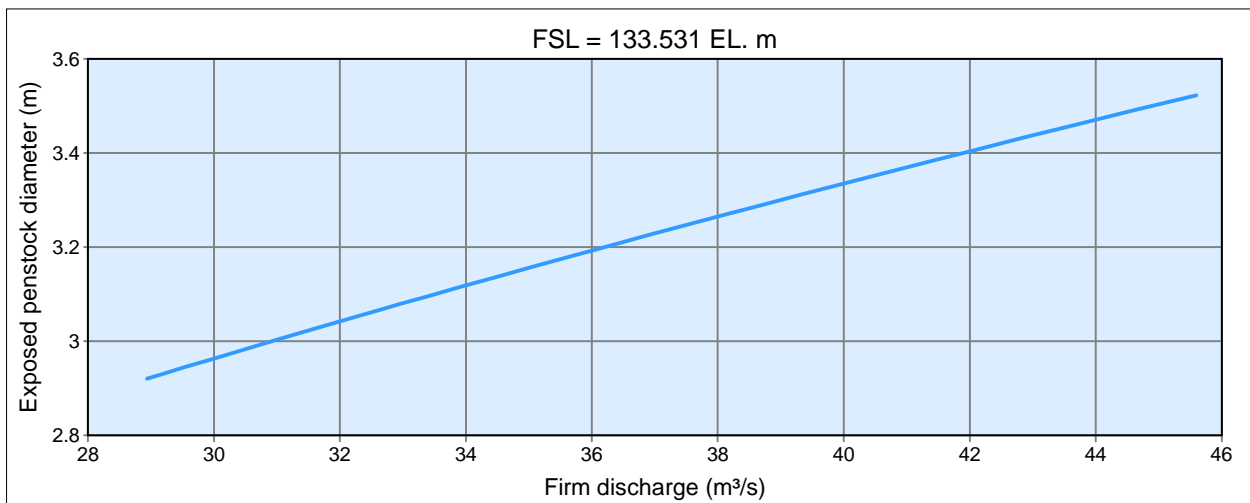
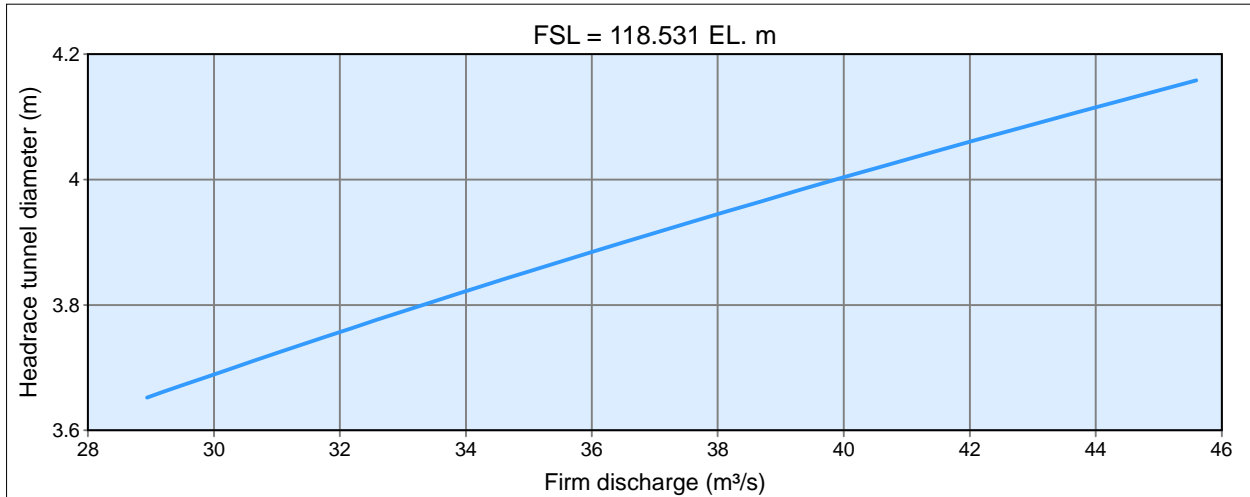
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### Cases basic



**Sample project**  
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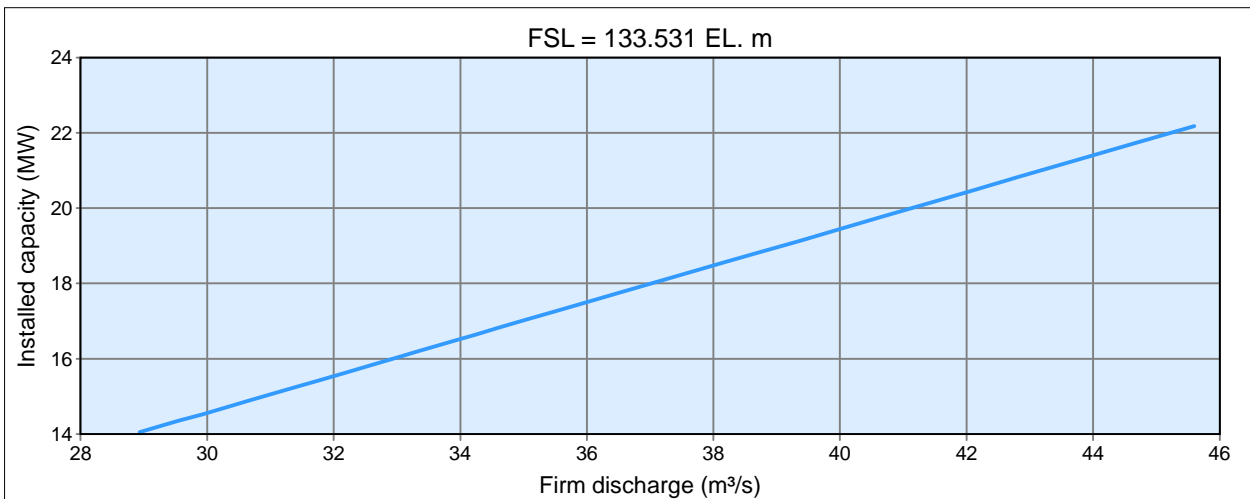
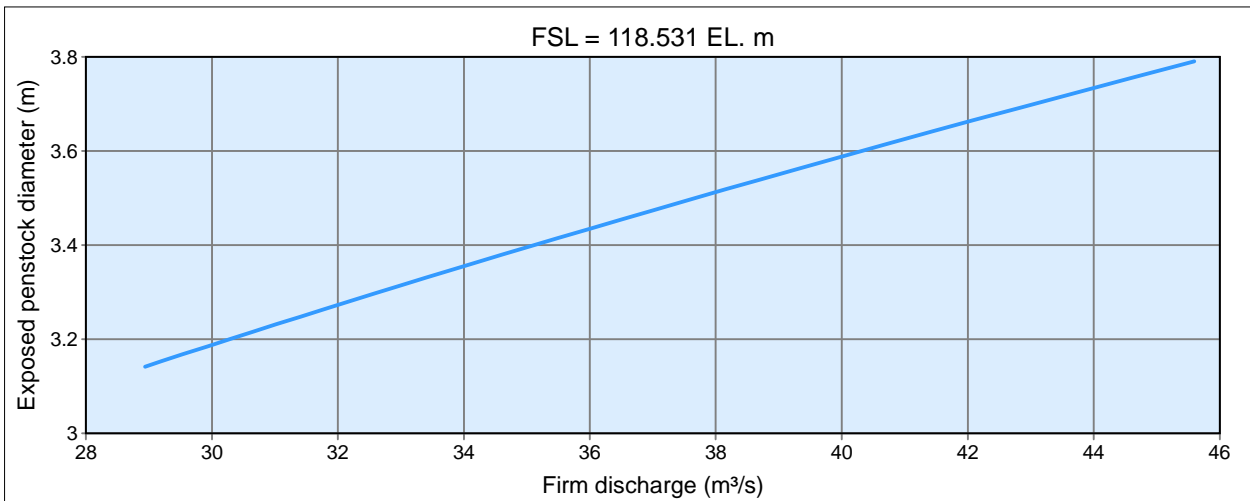
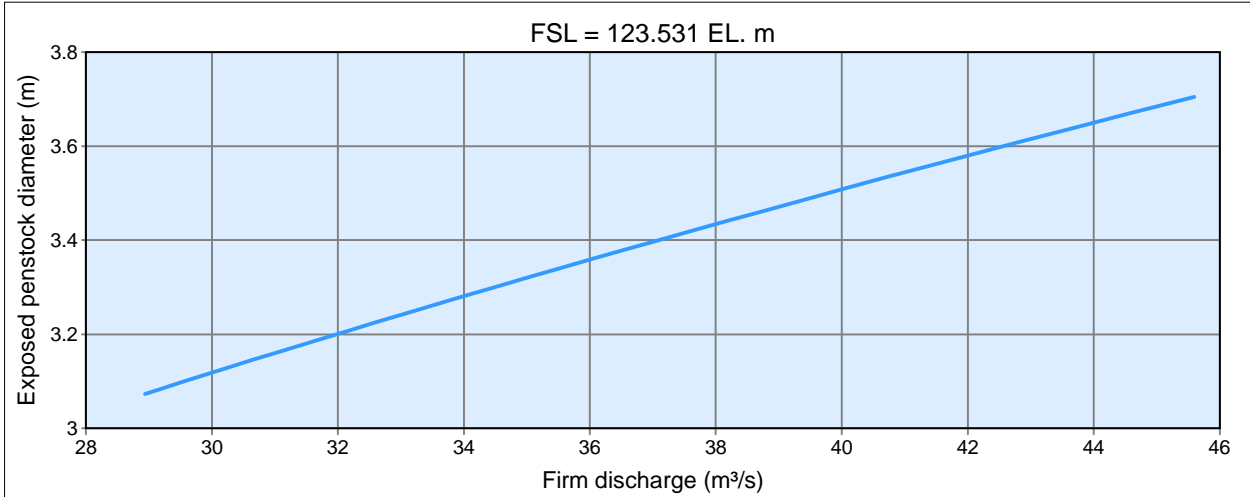
### Cases basic





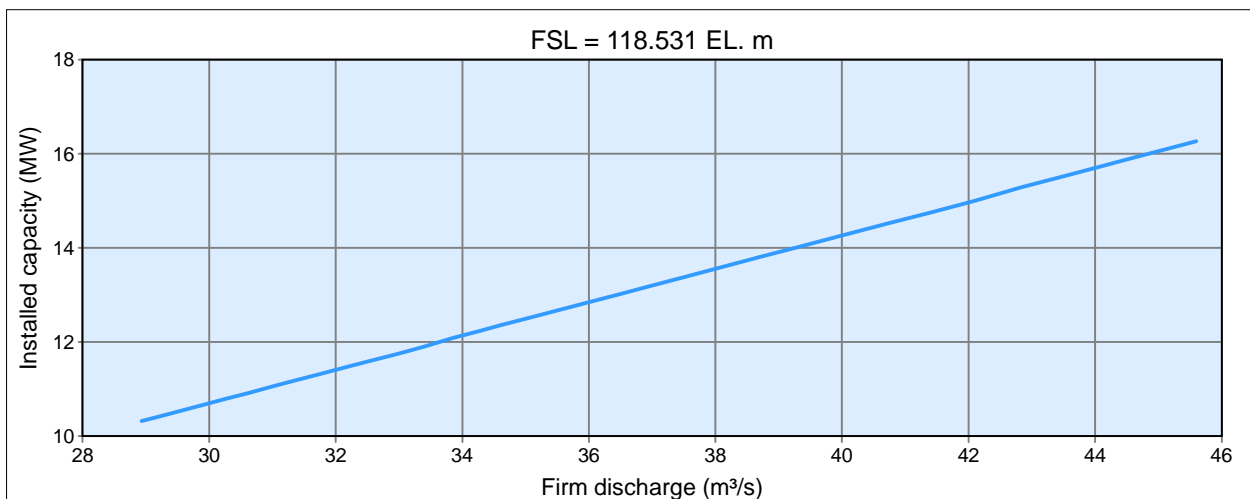
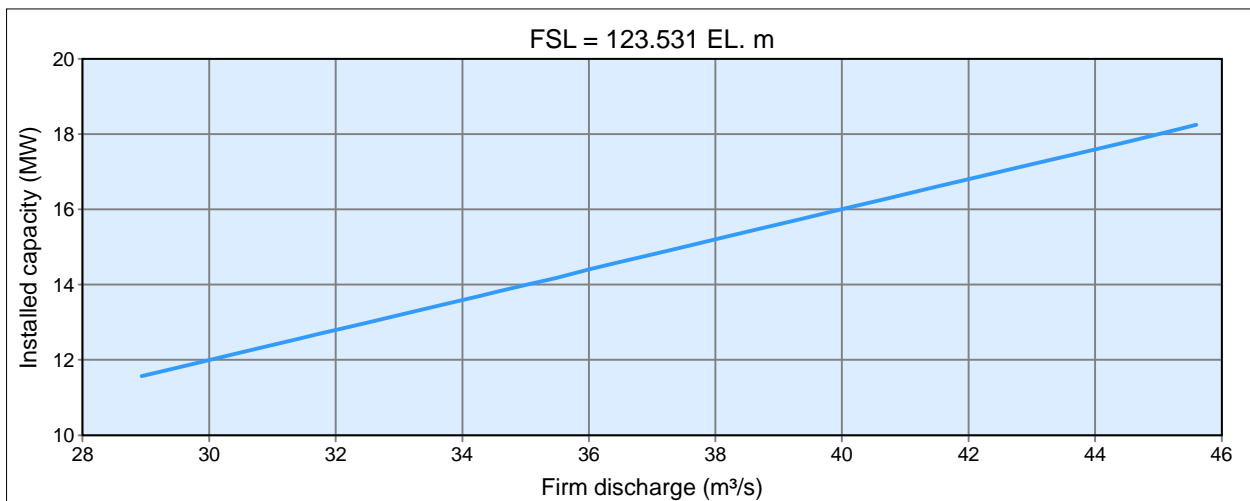
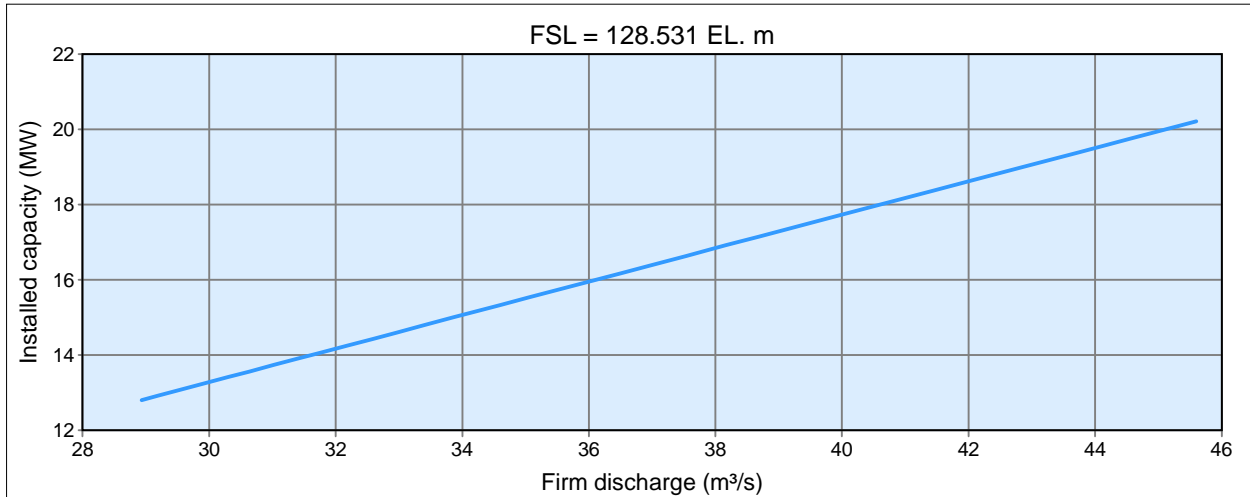
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### Cases basic



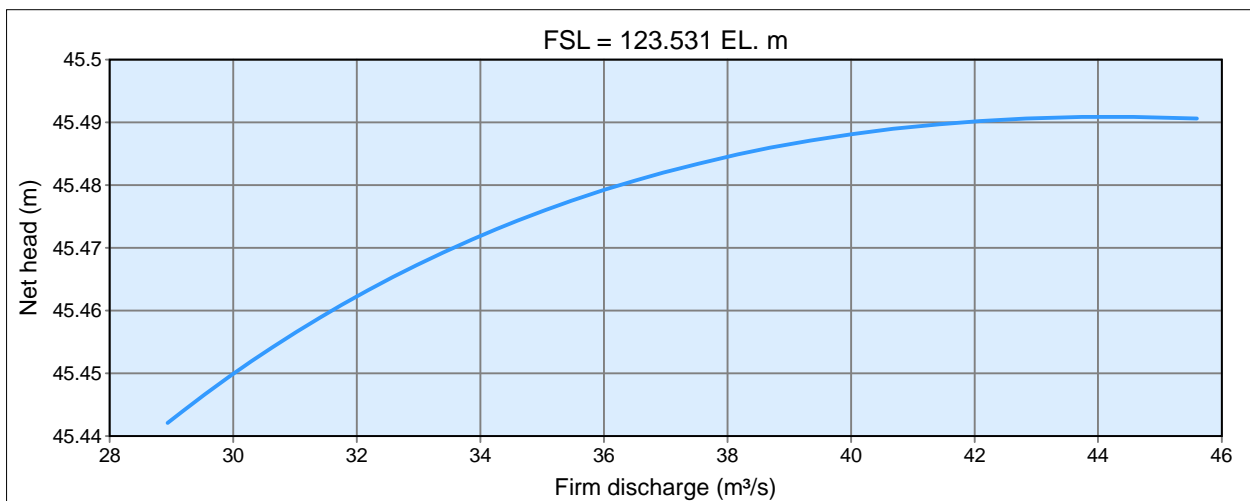
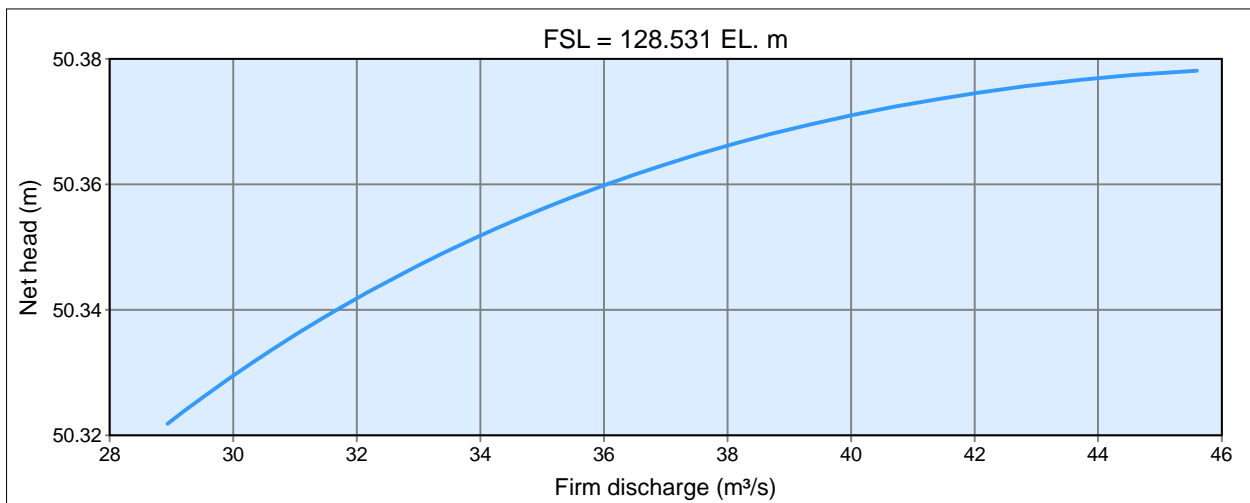
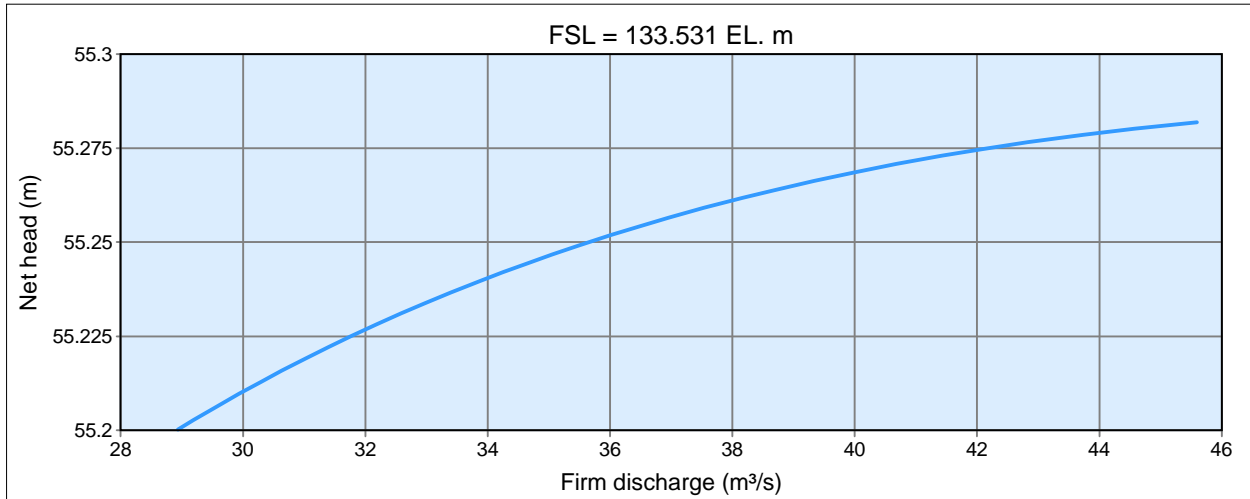
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### Cases basic



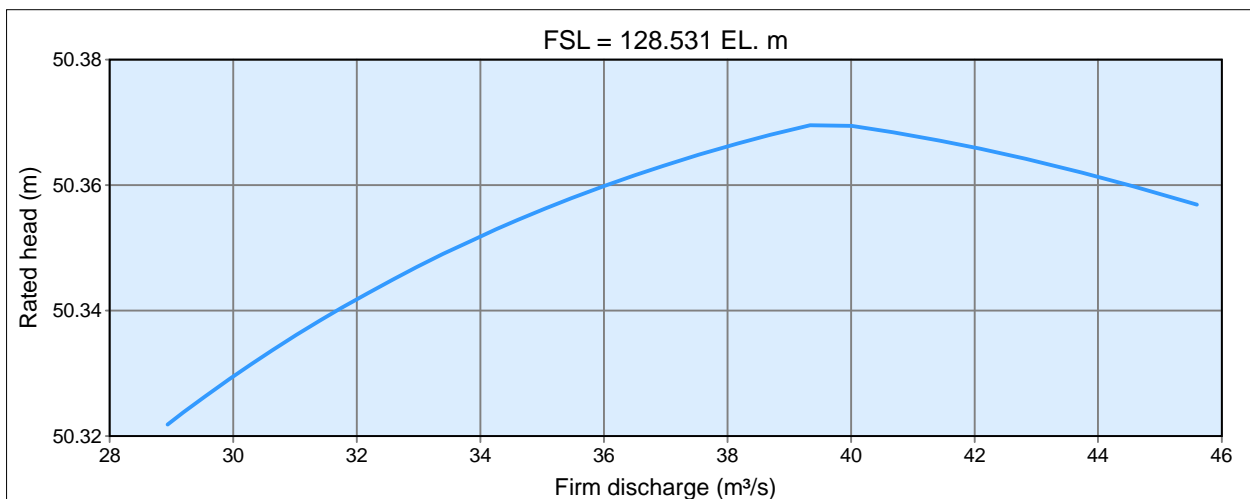
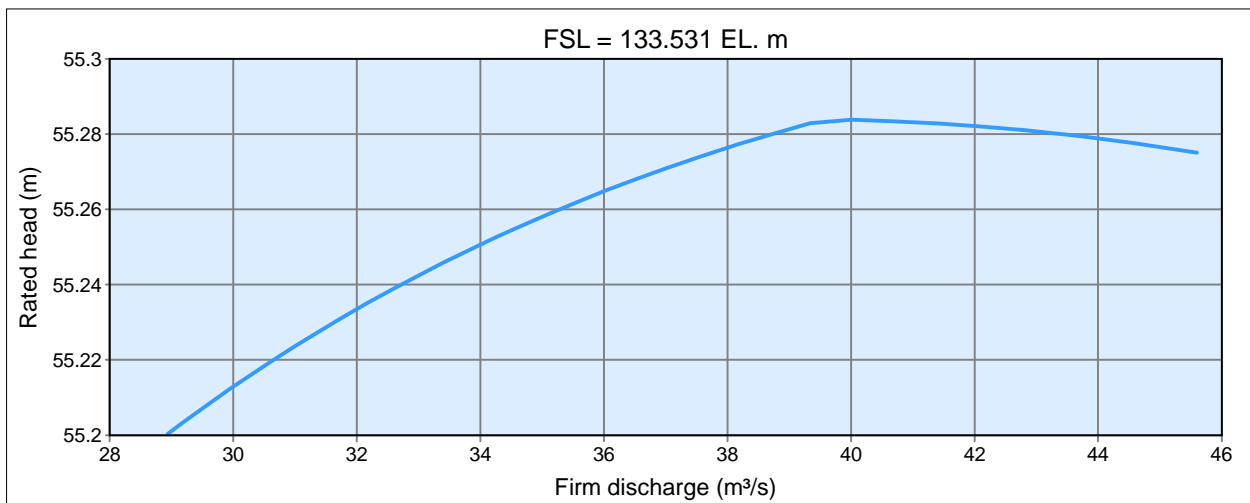
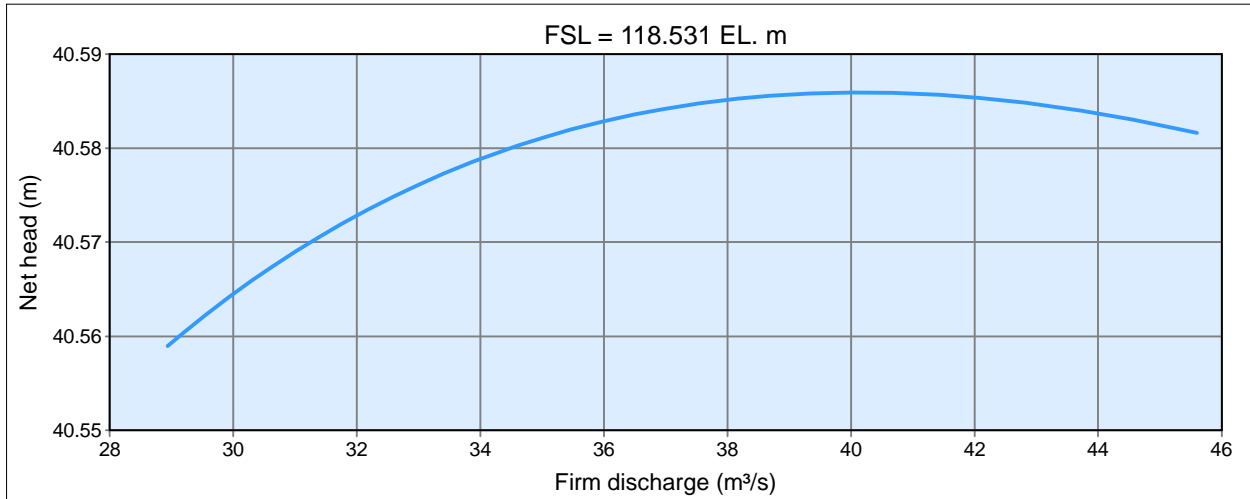
Sample project  
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Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

### Cases basic



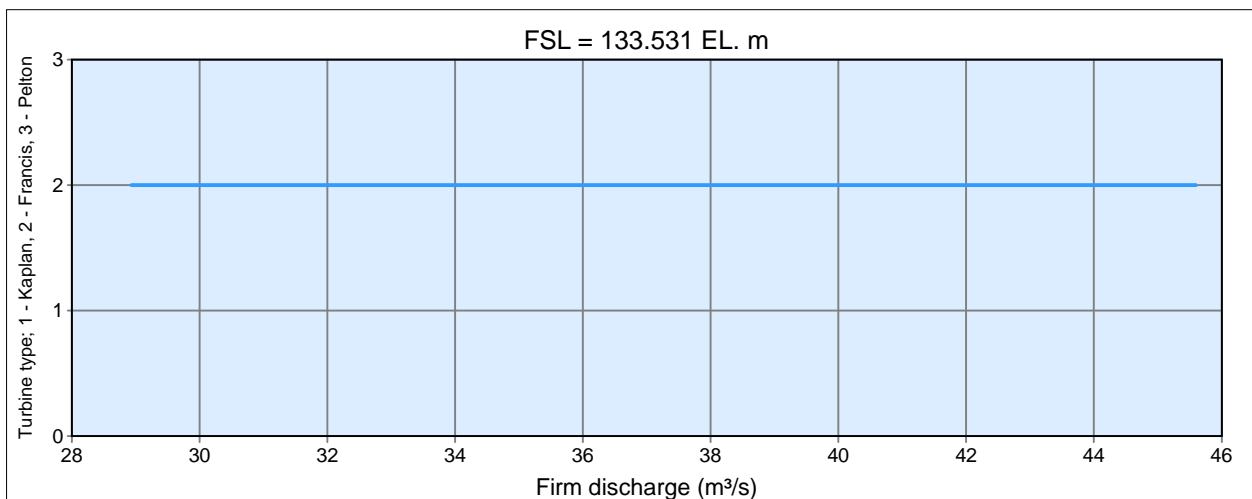
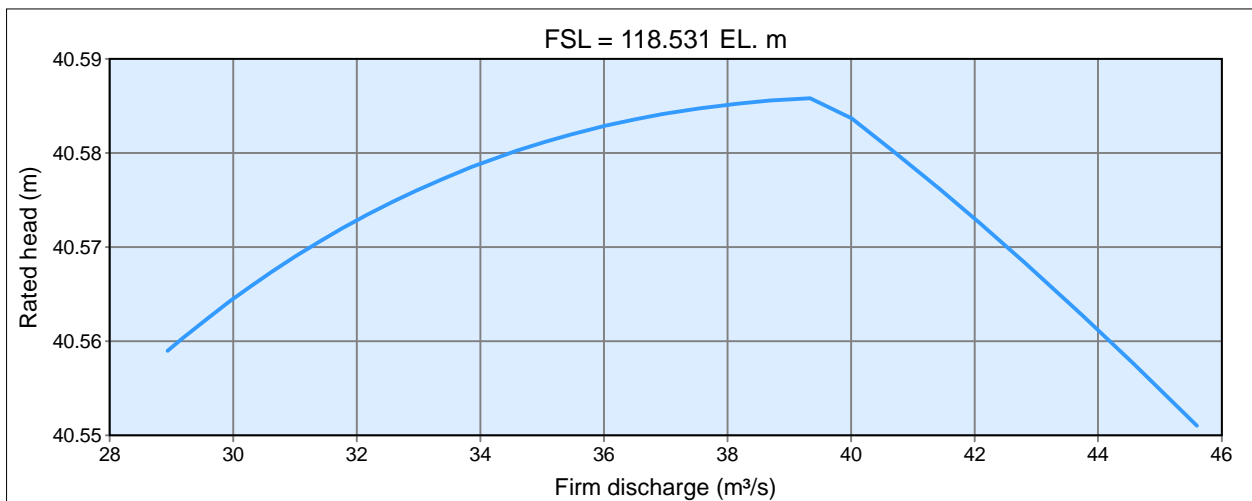
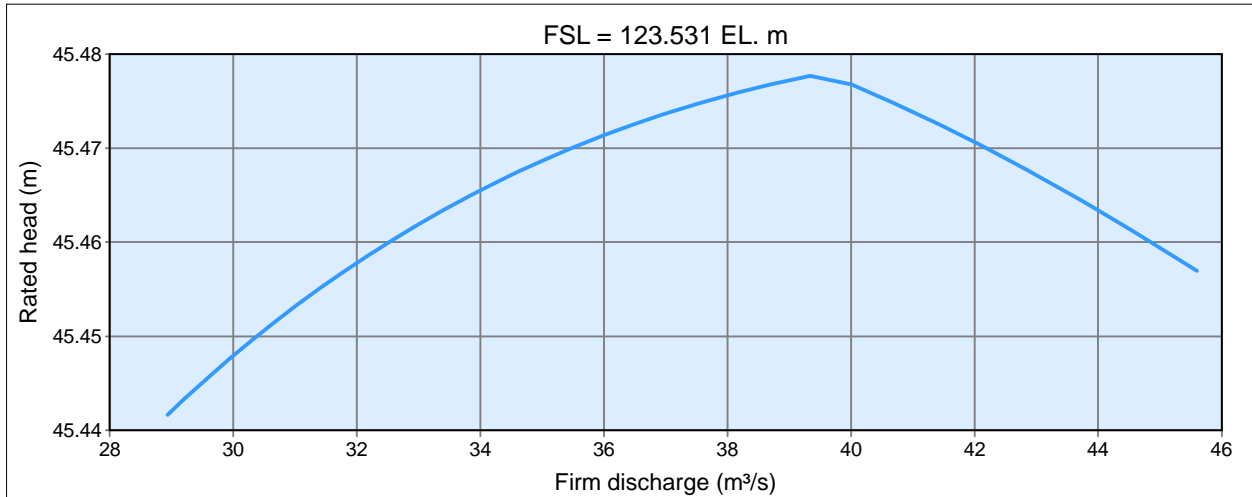
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**River: Sample**

### Cases basic



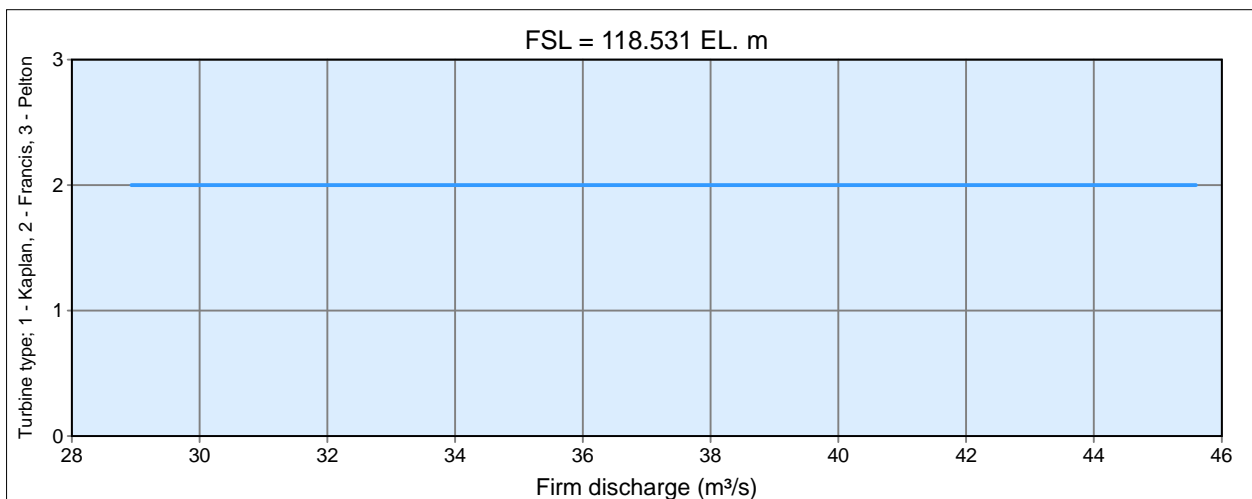
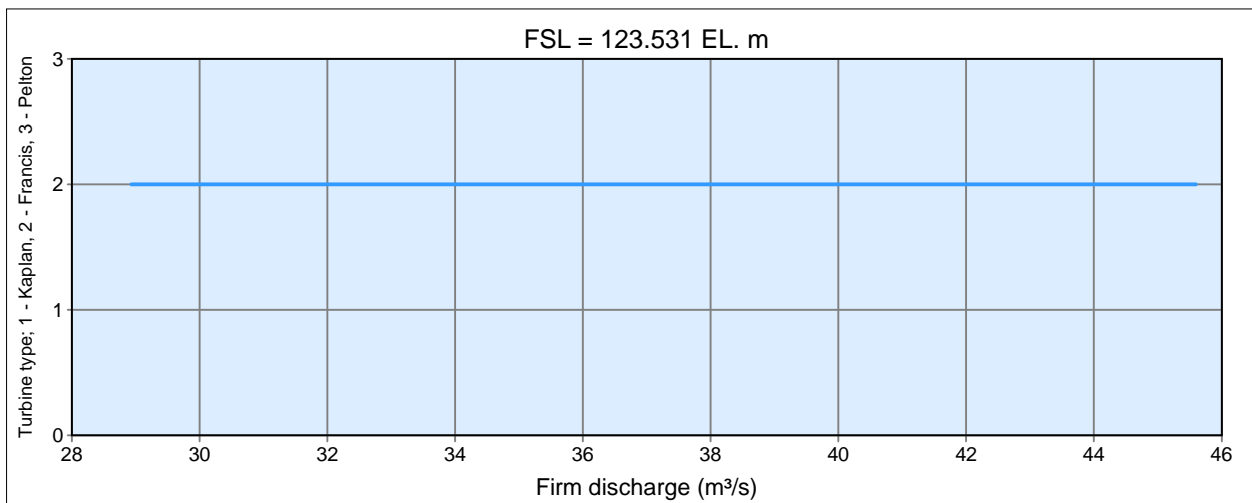
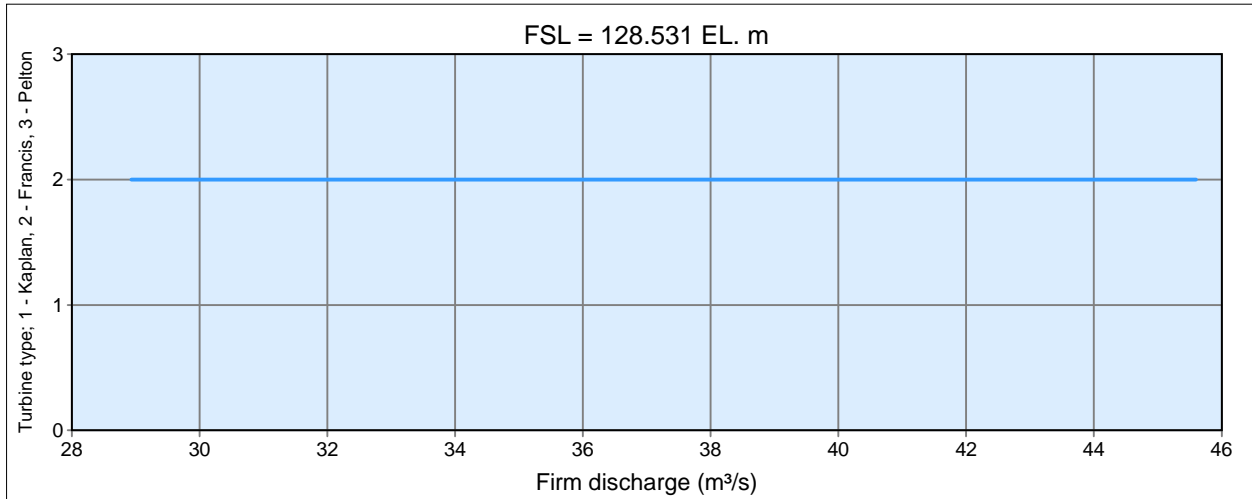
Sample project  
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Alternative: A scheme with a reservoir  
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### Cases basic



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**Site screening stage**  
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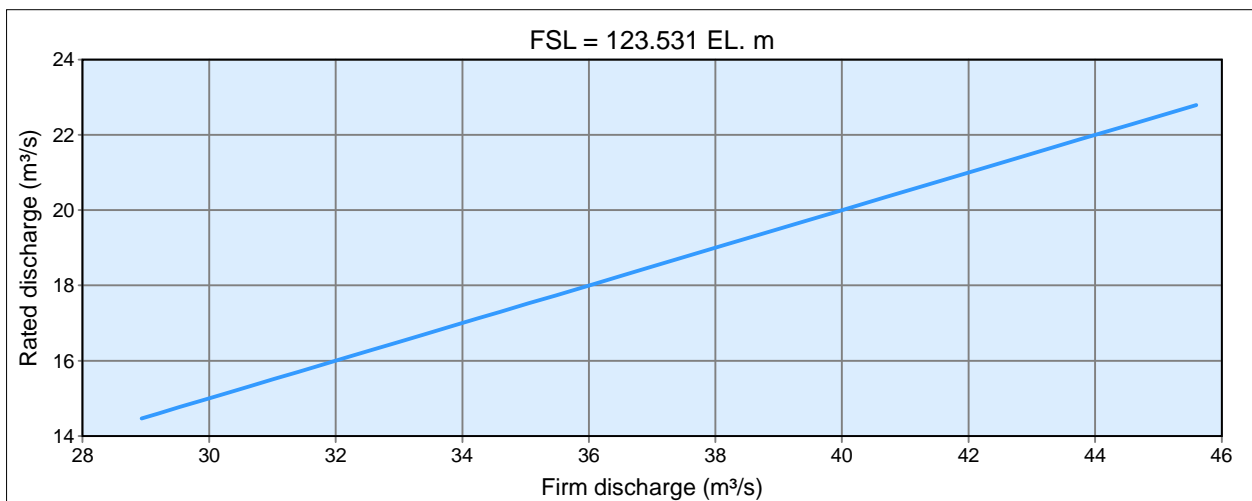
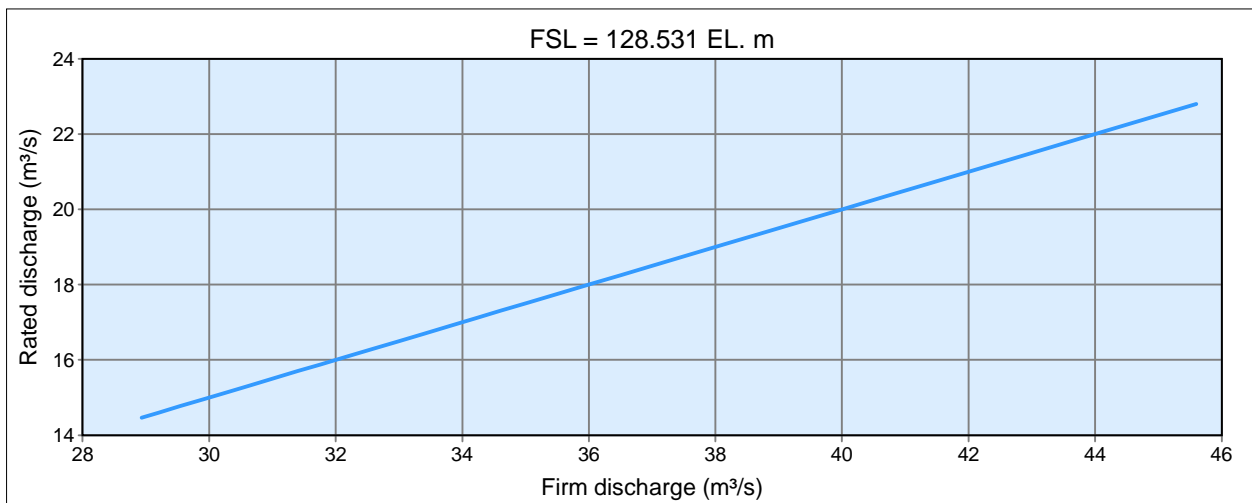
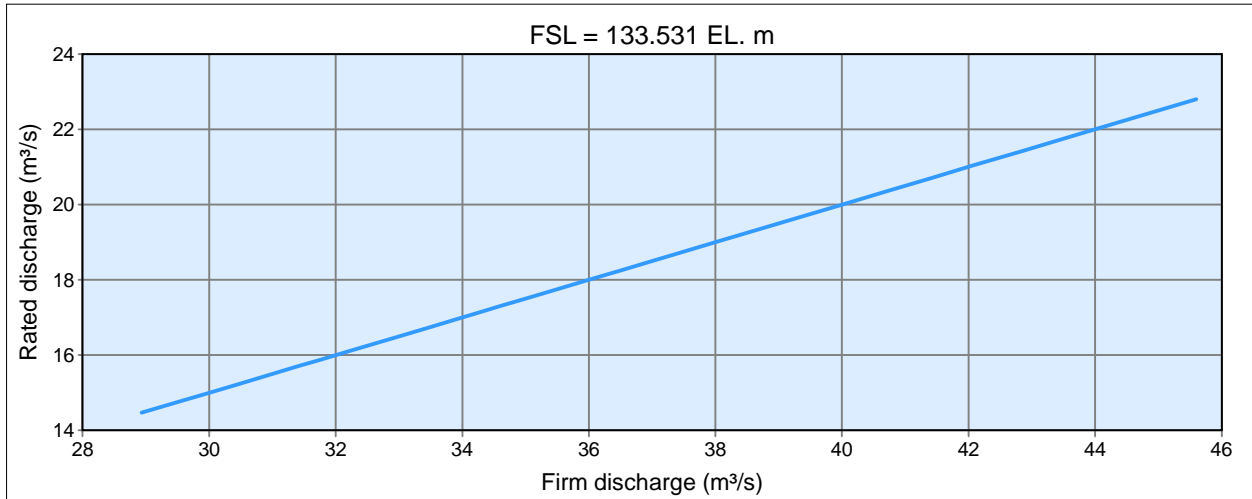
### Cases basic





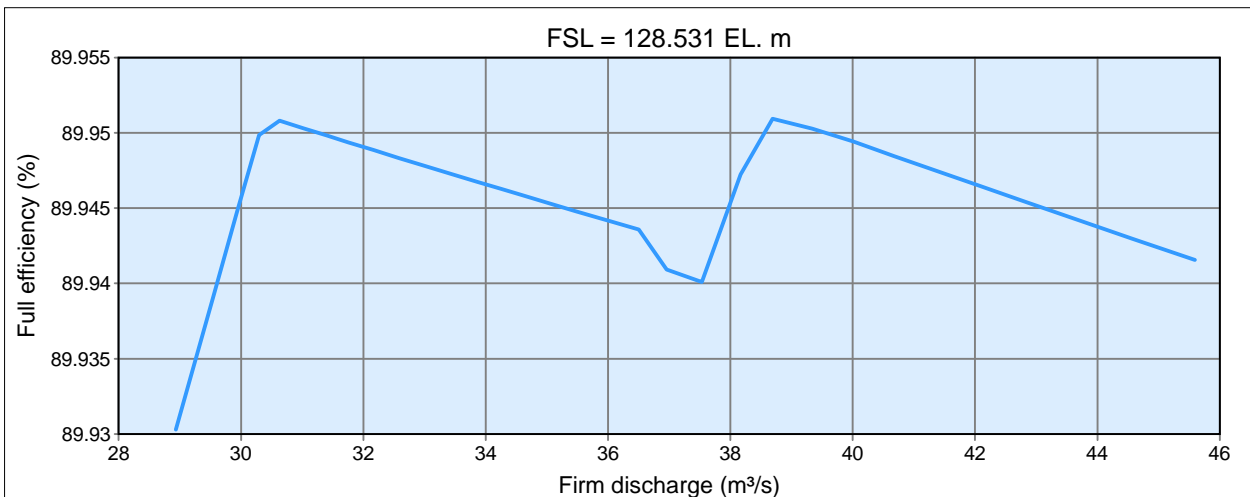
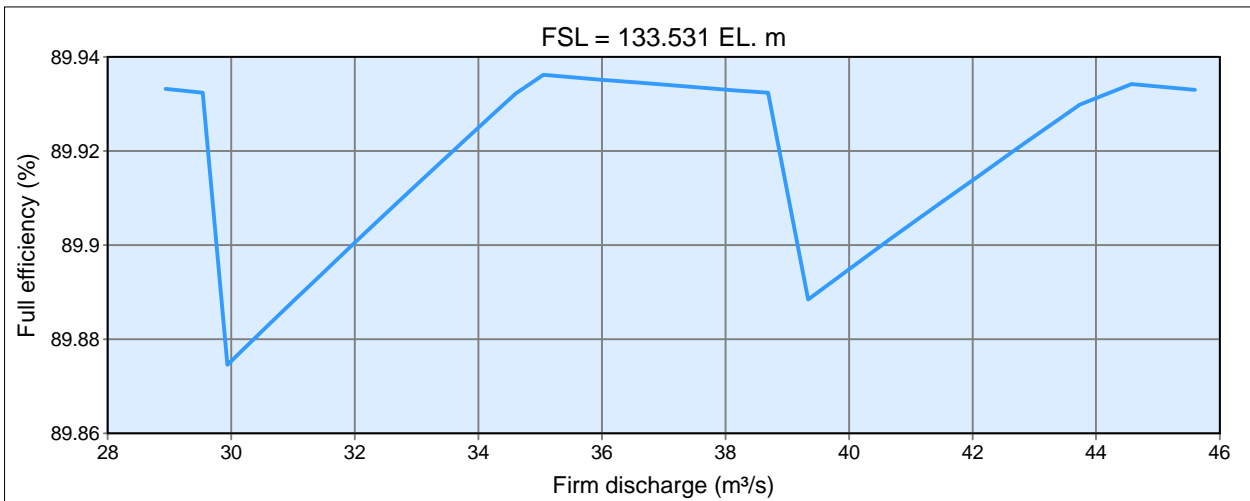
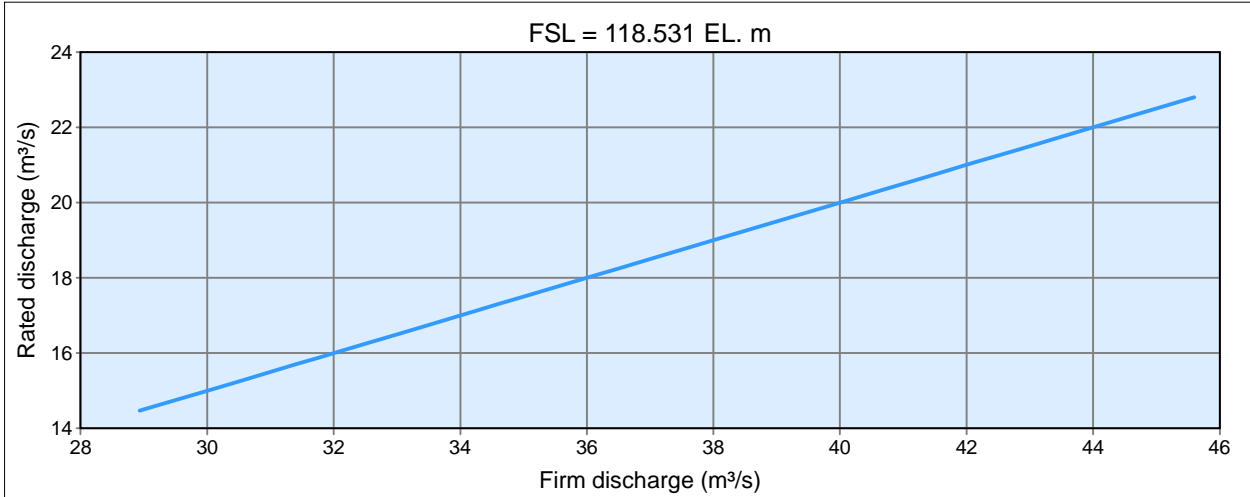
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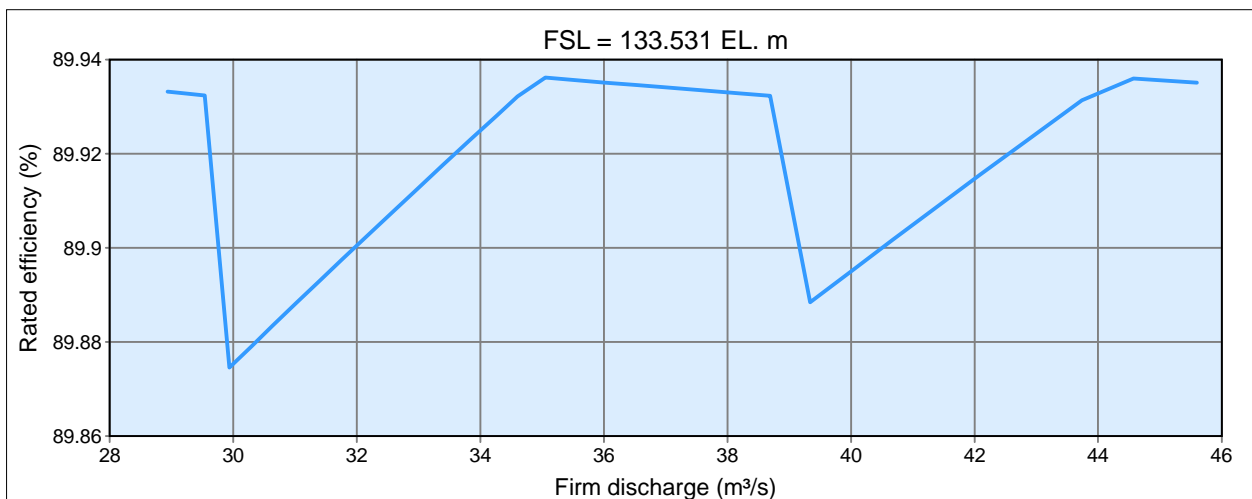
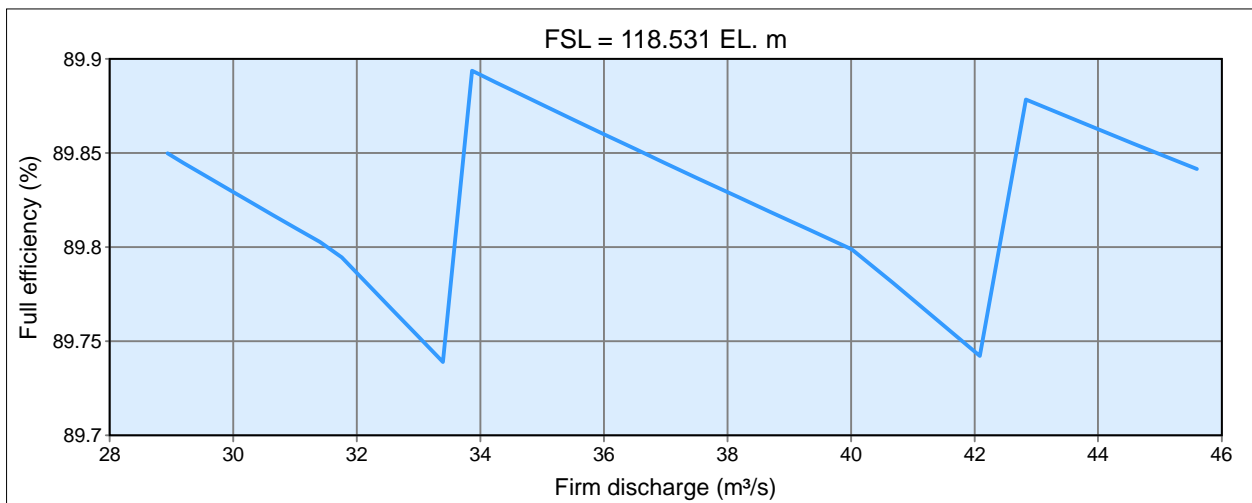
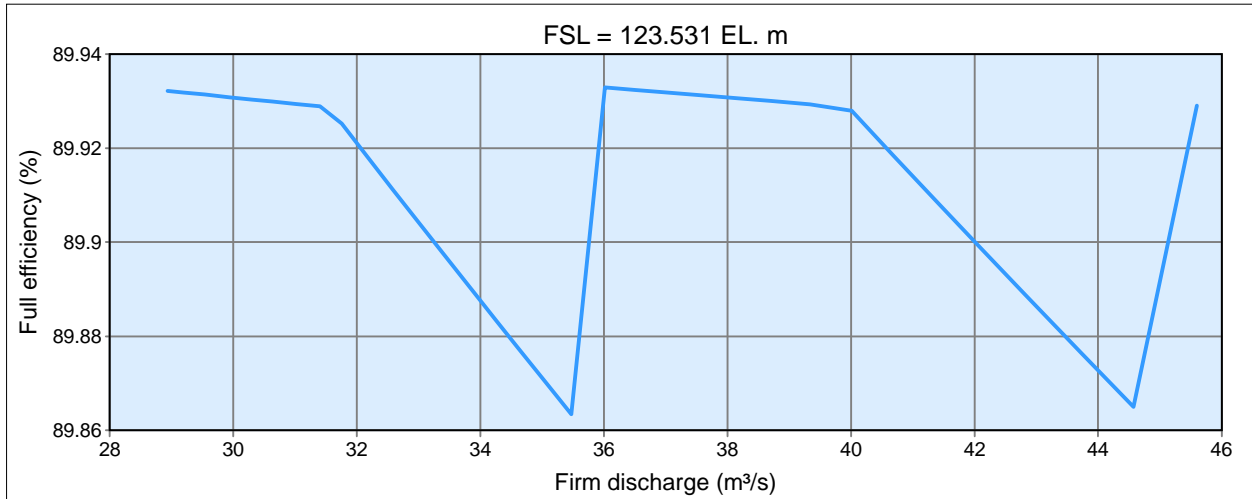
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### Cases basic



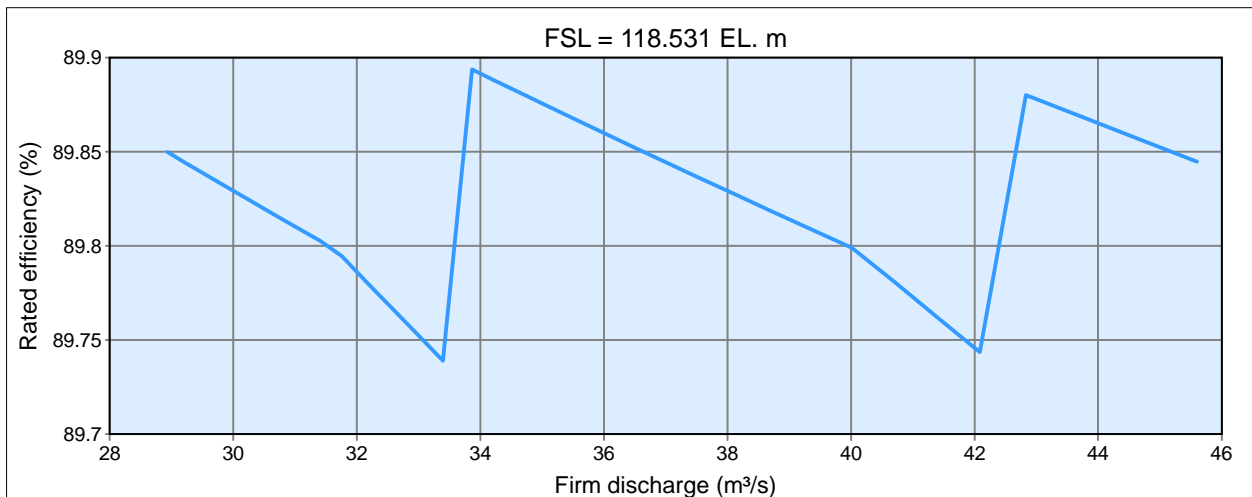
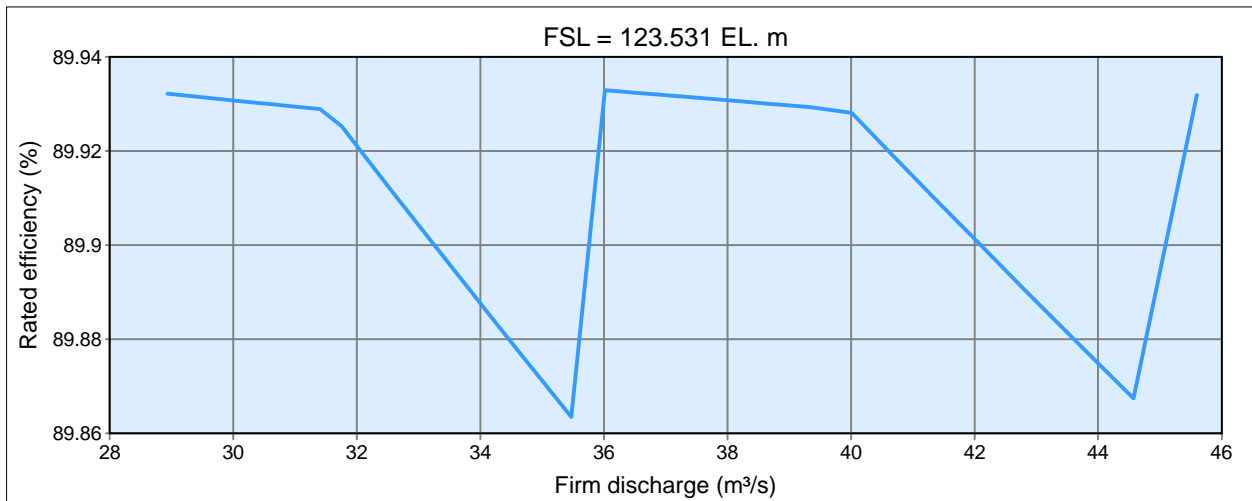
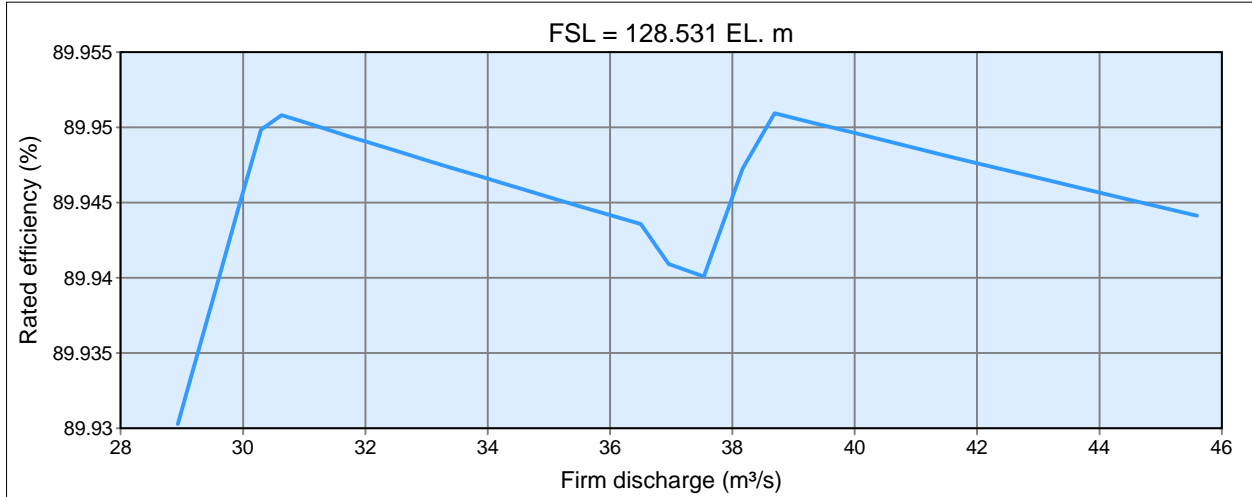
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Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

### Cases basic



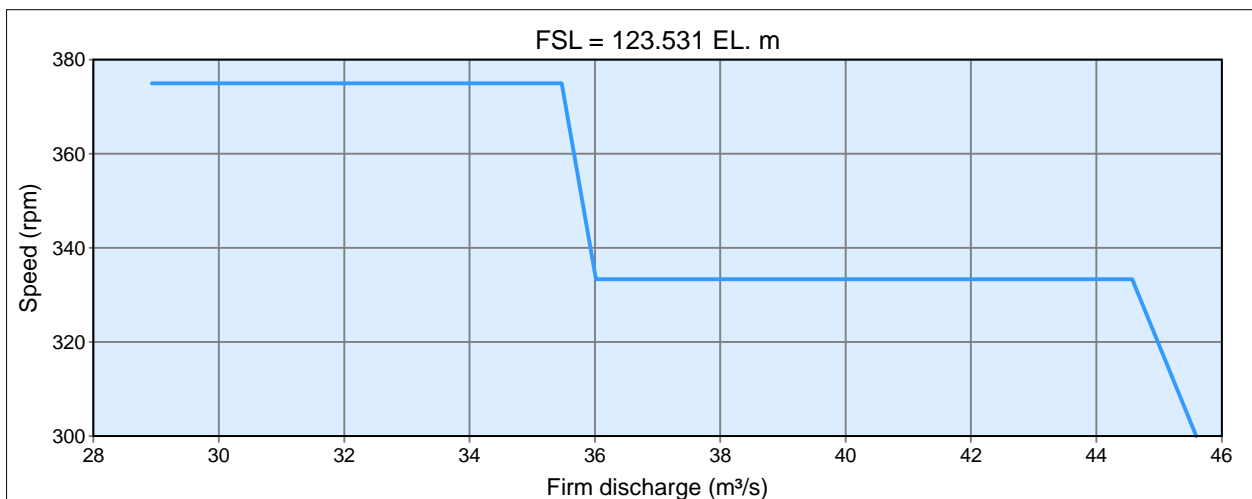
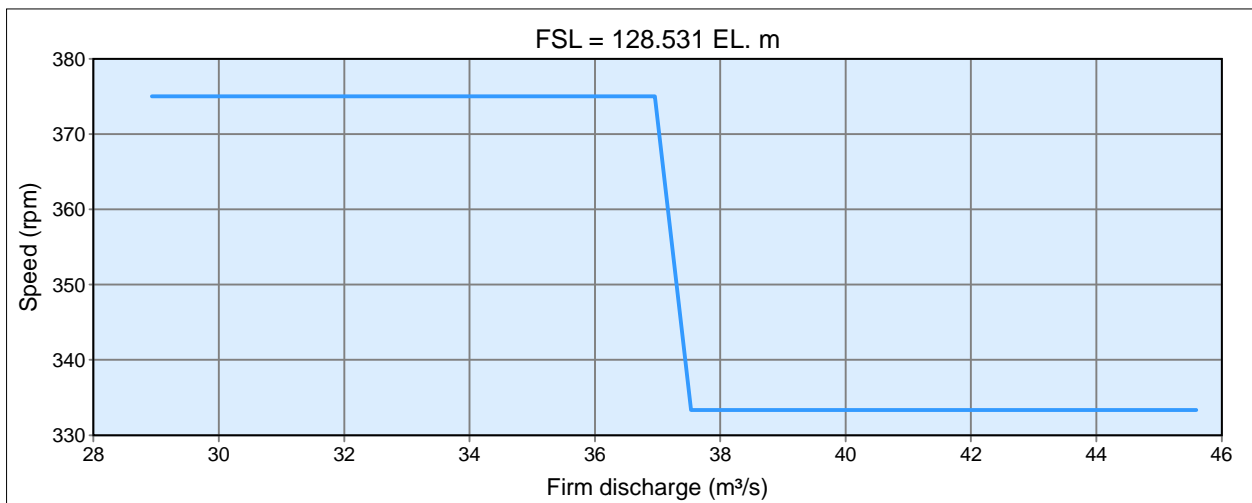
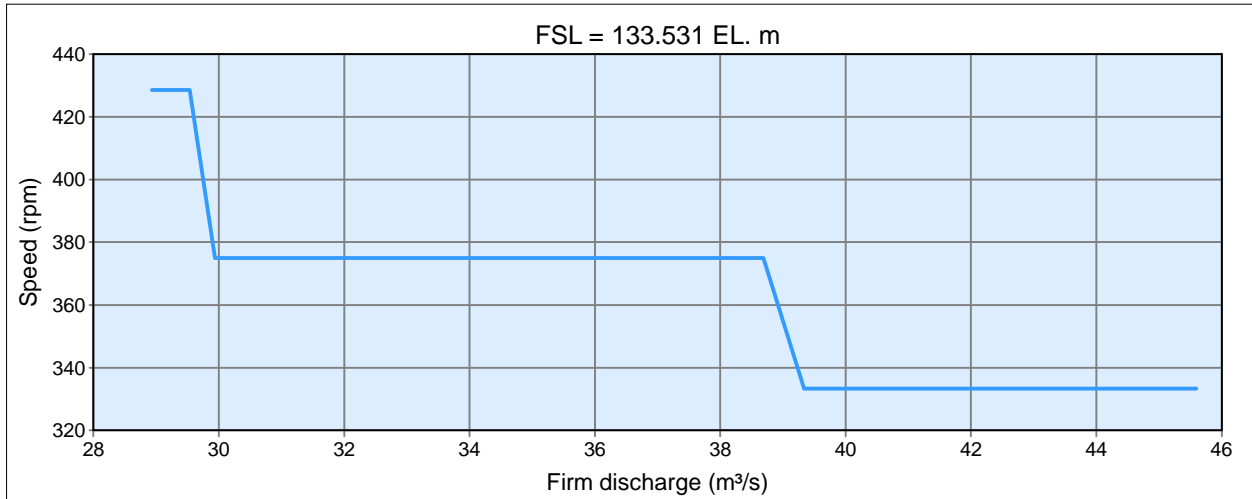
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### Cases basic



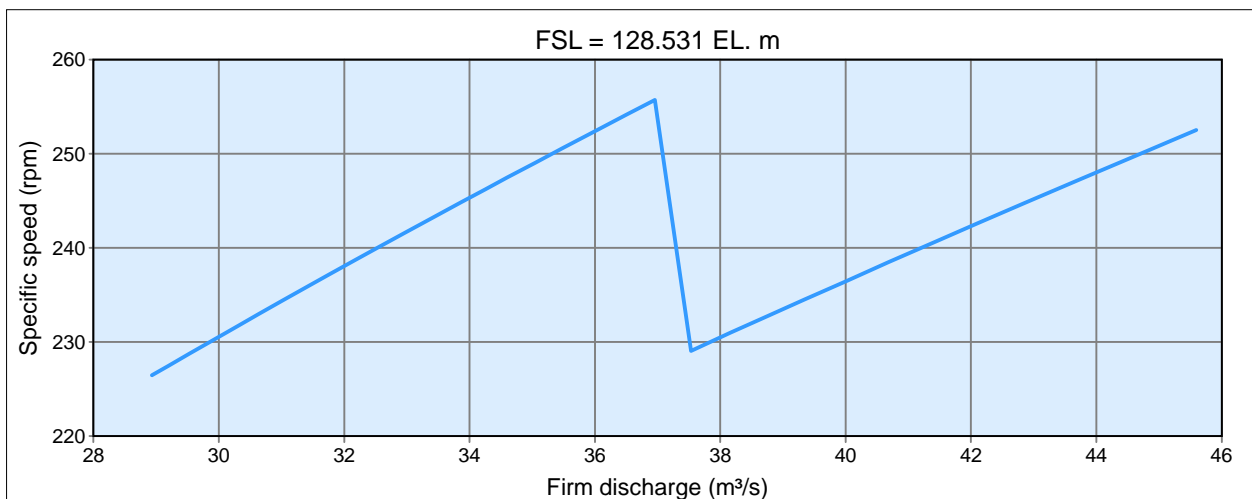
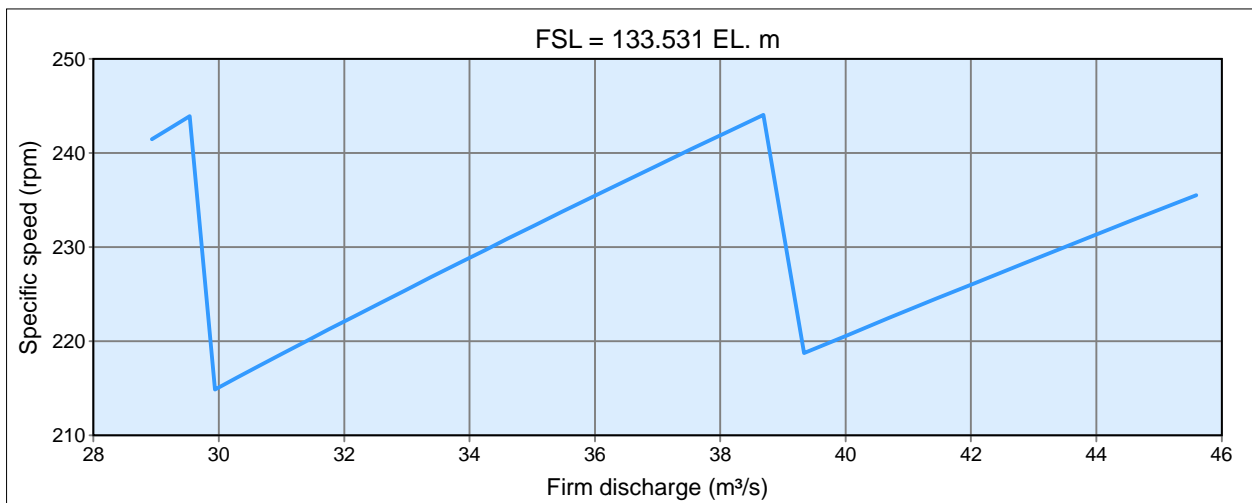
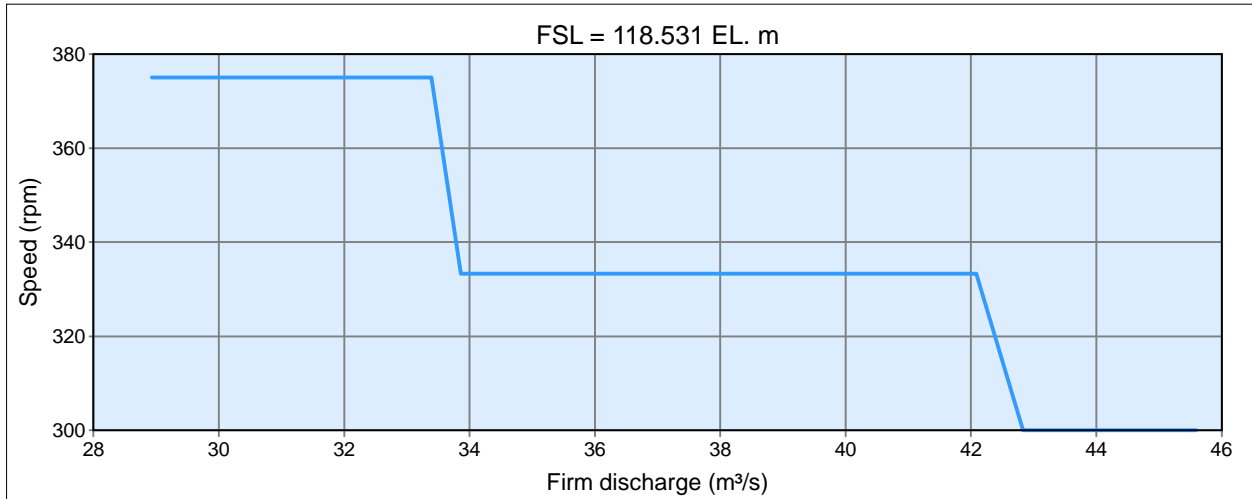
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### Cases basic



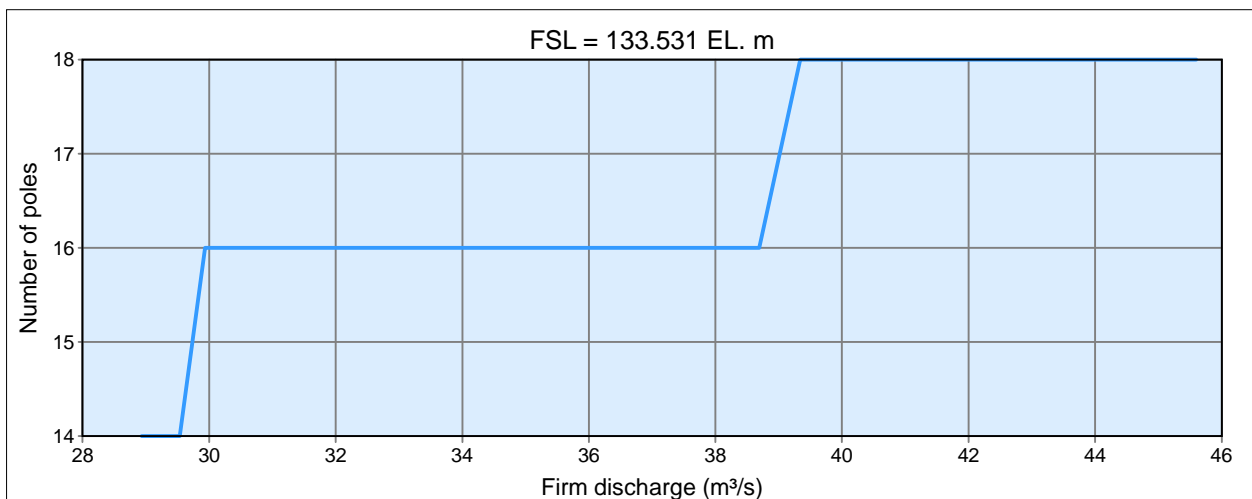
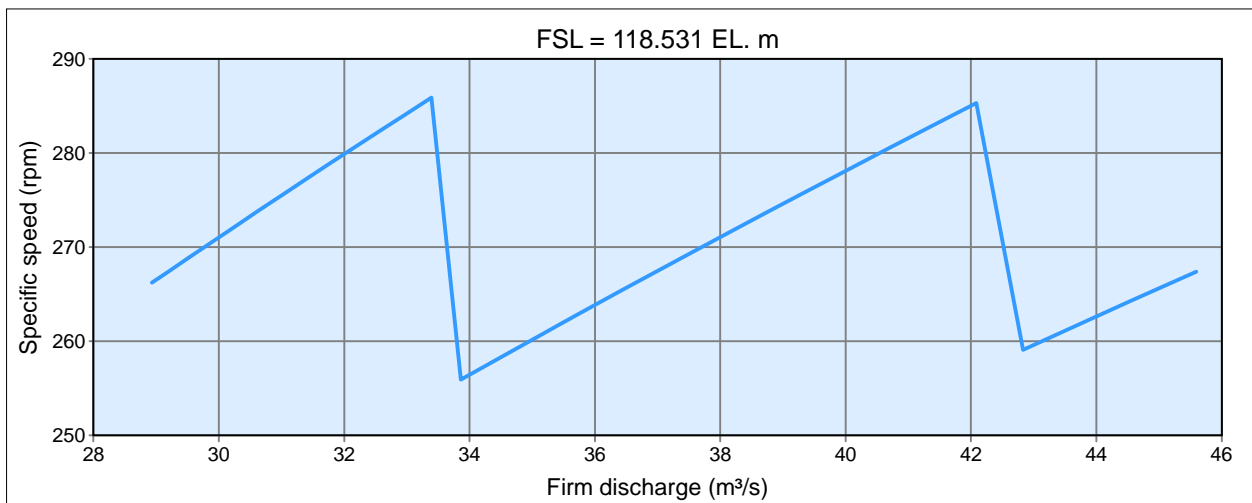
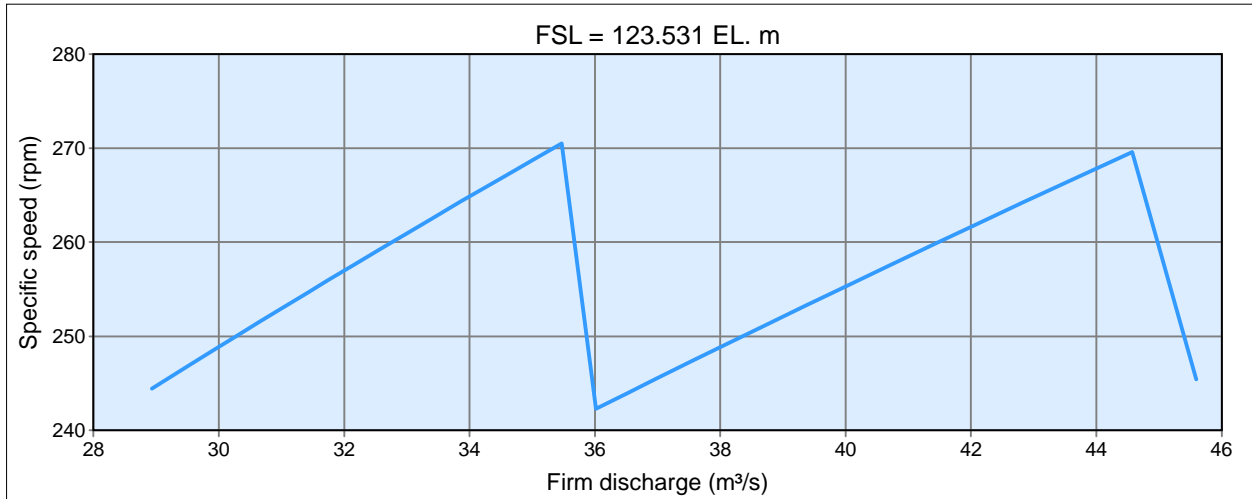
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### Cases basic



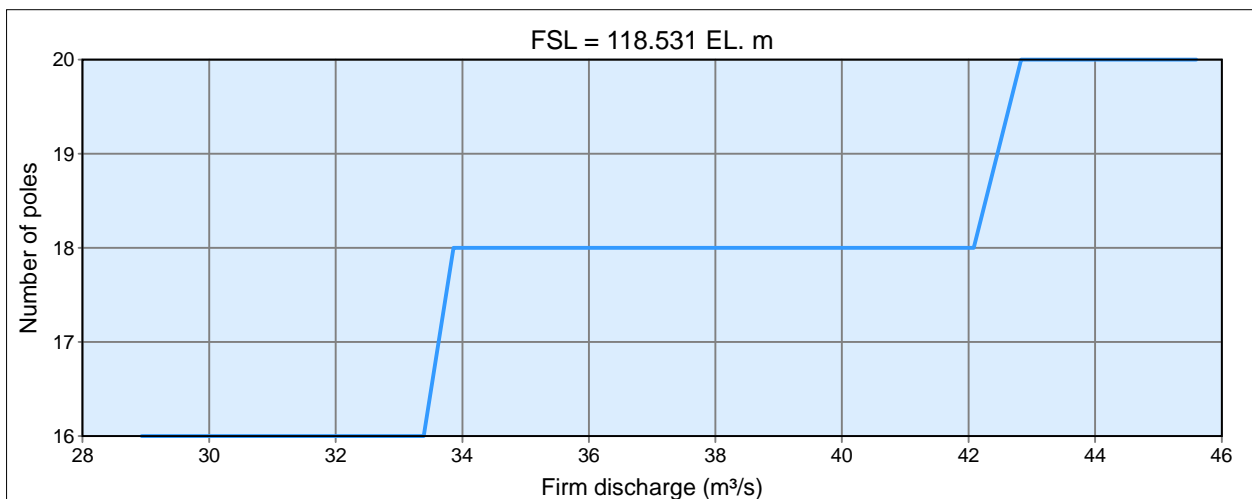
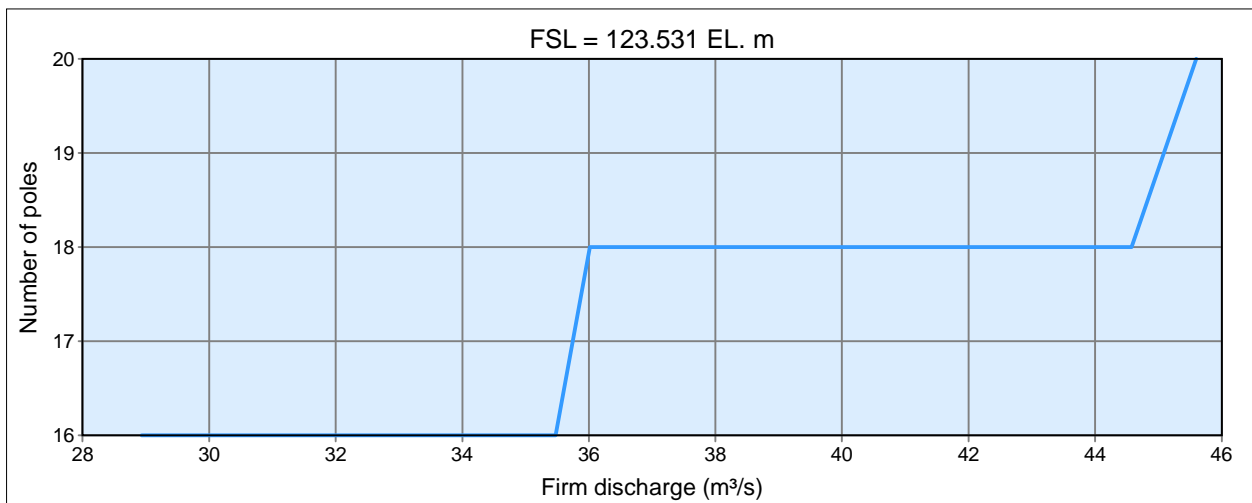
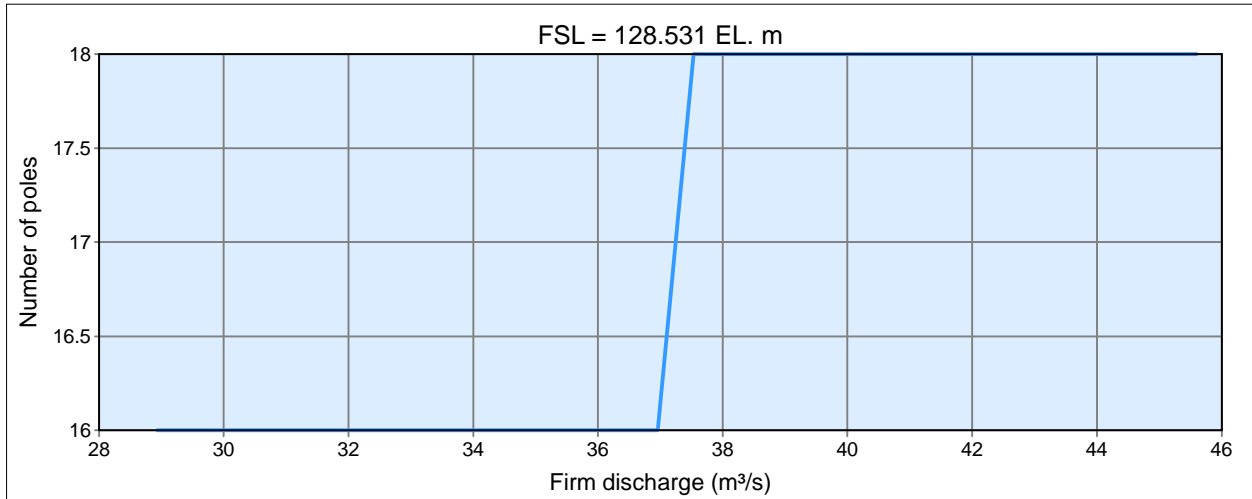
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### Cases basic



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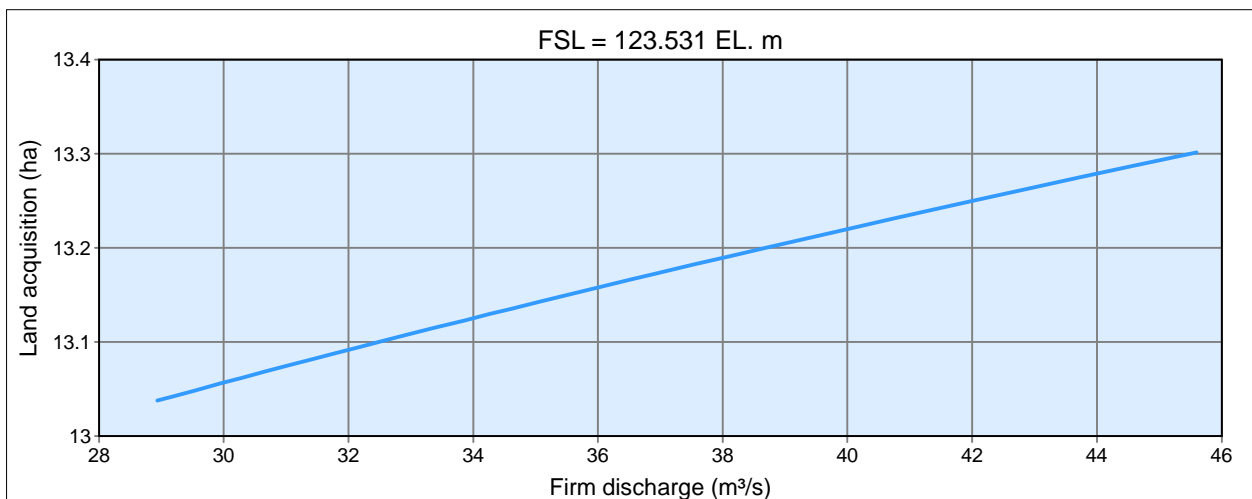
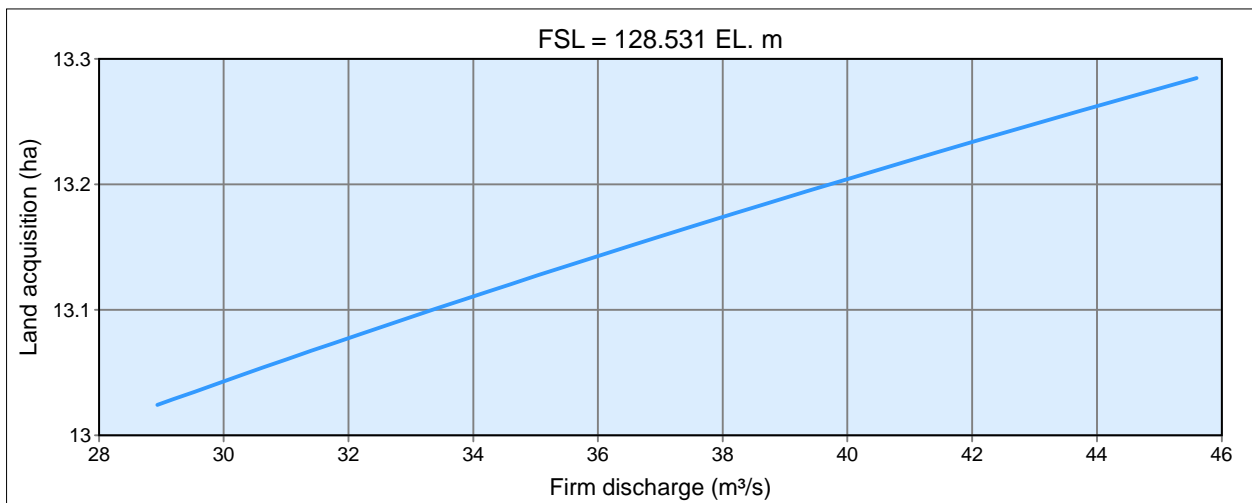
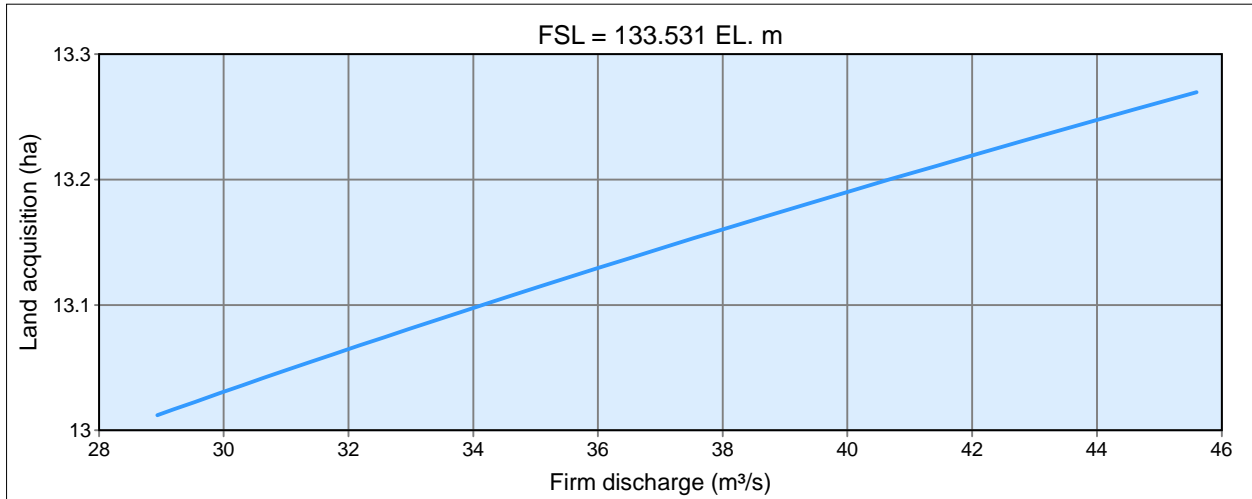
### Cases basic





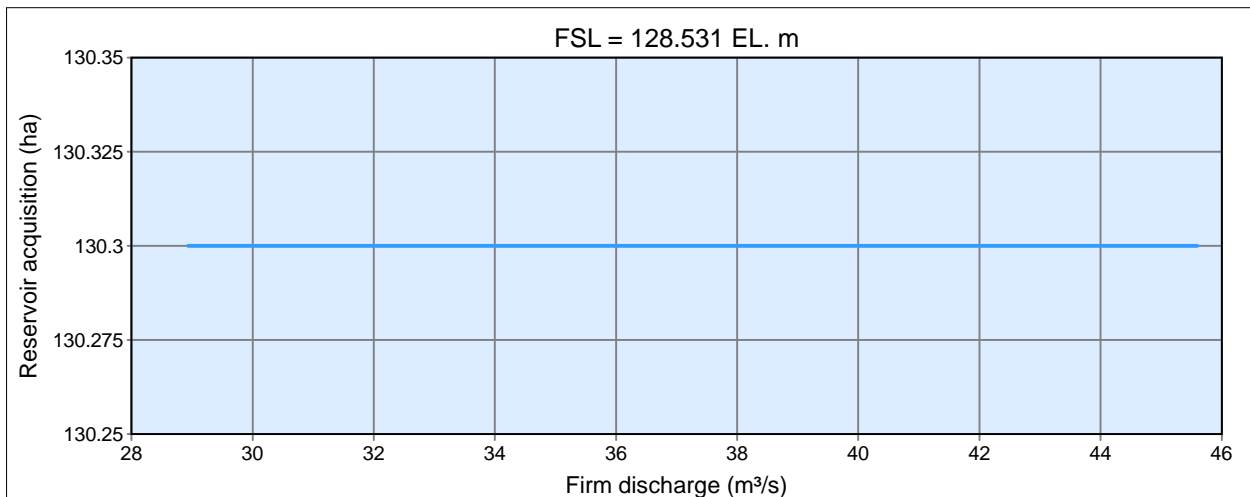
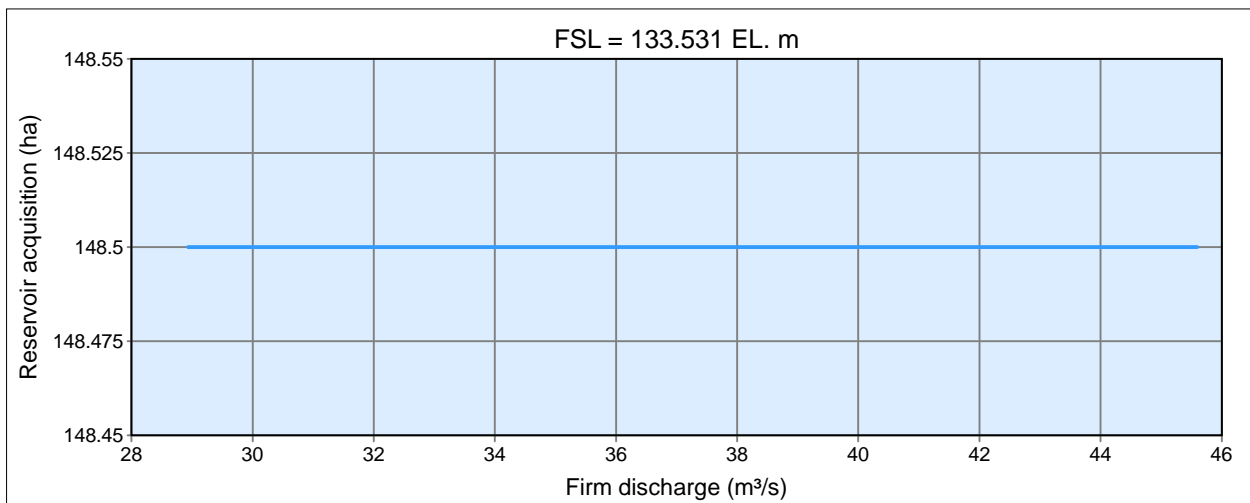
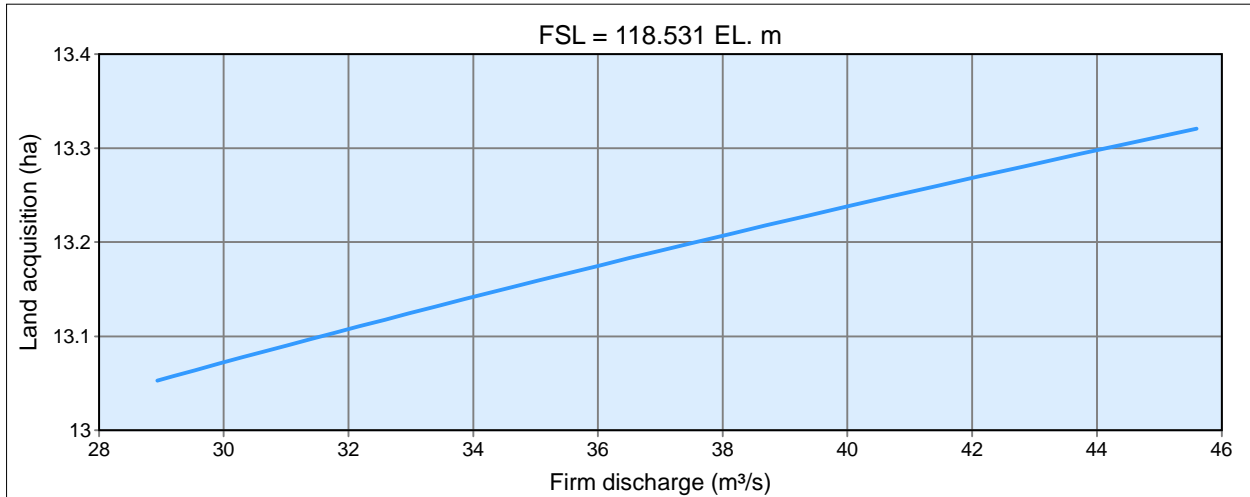
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### Cases basic



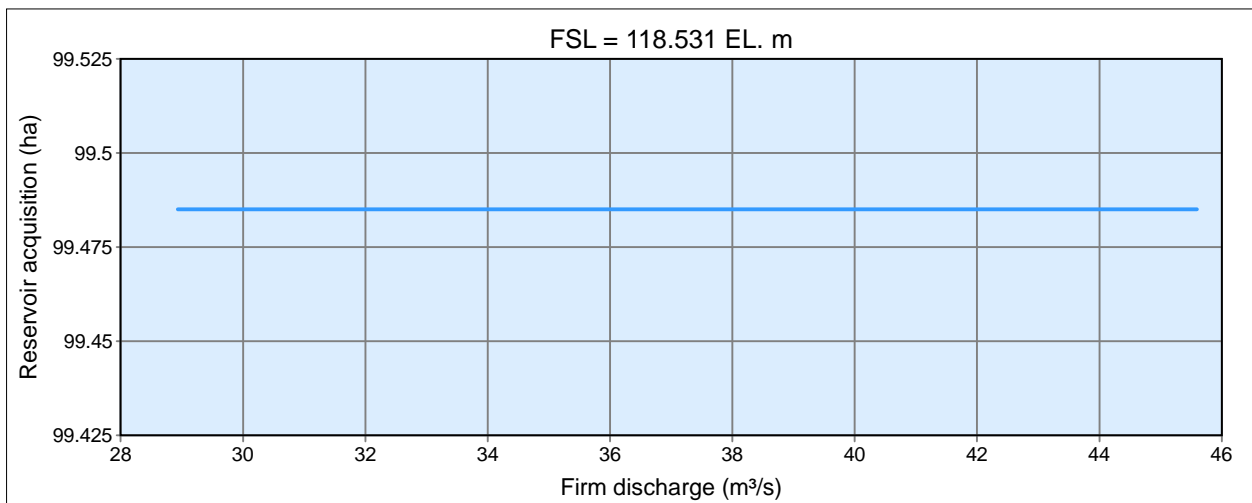
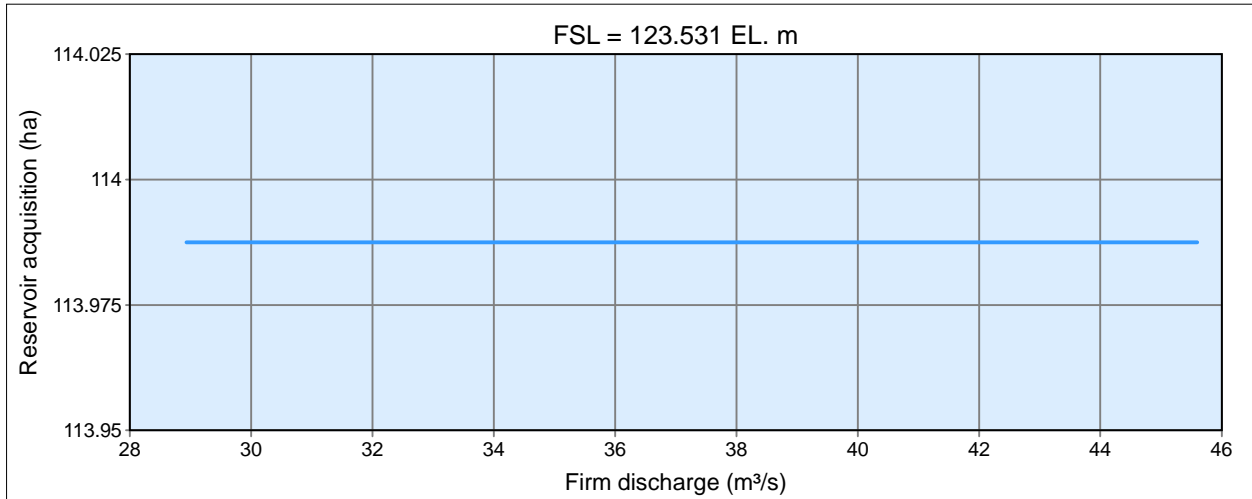
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### Cases basic



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### Cases basic



Sample project  
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## Cases basic

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Minimum operation level (El. m)	Reservoir full storage (million m <sup>3</sup> )	Reservoir full area (km <sup>2</sup> )	Headrace tunnel diameter (m)	Exposed penstock diameter (m)	Installed capacity (MW)	Net head (m)
28.935	133.531	1169.333	1.255	1 x 3.67	1 x 2.95	14.05	55.20
29.191	133.531	1169.333	1.255	1 x 3.68	1 x 2.96	14.18	55.20
29.535	133.531	1169.333	1.255	1 x 3.70	1 x 2.98	14.34	55.21
29.937	133.531	1169.333	1.255	1 x 3.72	1 x 3.00	14.53	55.21
30.294	133.531	1169.333	1.255	1 x 3.73	1 x 3.02	14.70	55.22
30.632	133.531	1169.333	1.255	1 x 3.75	1 x 3.04	14.87	55.22
31.021	133.531	1169.333	1.255	1 x 3.77	1 x 3.05	15.06	55.22
31.403	133.531	1169.333	1.255	1 x 3.78	1 x 3.07	15.25	55.23
31.755	133.531	1169.333	1.255	1 x 3.80	1 x 3.09	15.42	55.23
32.175	133.531	1169.333	1.255	1 x 3.82	1 x 3.11	15.63	55.24
32.584	133.531	1169.333	1.255	1 x 3.83	1 x 3.13	15.83	55.24
32.966	133.531	1169.333	1.255	1 x 3.85	1 x 3.15	16.02	55.24
33.392	133.531	1169.333	1.255	1 x 3.87	1 x 3.17	16.23	55.25
33.863	133.531	1169.333	1.255	1 x 3.89	1 x 3.19	16.46	55.25
34.252	133.531	1169.333	1.255	1 x 3.91	1 x 3.21	16.65	55.25
34.601	133.531	1169.333	1.255	1 x 3.92	1 x 3.23	16.82	55.26
35.050	133.531	1169.333	1.255	1 x 3.94	1 x 3.25	17.04	55.26
35.473	133.531	1169.333	1.255	1 x 3.96	1 x 3.27	17.25	55.26
36.018	133.531	1169.333	1.255	1 x 3.98	1 x 3.29	17.51	55.26
36.501	133.531	1169.333	1.255	1 x 4.00	1 x 3.31	17.75	55.27
36.958	133.531	1169.333	1.255	1 x 4.02	1 x 3.33	17.97	55.27
37.534	133.531	1169.333	1.255	1 x 4.04	1 x 3.36	18.25	55.27
38.164	133.531	1169.333	1.255	1 x 4.07	1 x 3.39	18.56	55.28
38.691	133.531	1169.333	1.255	1 x 4.09	1 x 3.41	18.82	55.28
39.338	133.531	1169.333	1.255	1 x 4.11	1 x 3.44	19.12	55.28
40.010	133.525	1169.333	1.255	1 x 4.14	1 x 3.47	19.45	55.29
40.682	133.516	1169.333	1.255	1 x 4.16	1 x 3.50	19.78	55.29
41.433	133.505	1169.333	1.255	1 x 4.19	1 x 3.53	20.15	55.29
42.083	133.496	1169.333	1.255	1 x 4.22	1 x 3.56	20.47	55.29
42.831	133.486	1169.333	1.255	1 x 4.24	1 x 3.59	20.83	55.30
43.739	133.474	1169.333	1.255	1 x 4.28	1 x 3.63	21.28	55.30
44.574	133.462	1169.333	1.255	1 x 4.31	1 x 3.66	21.69	55.30
45.596	133.448	1169.333	1.255	1 x 4.34	1 x 3.70	22.18	55.30

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Rated head (m)	No. of units x turbine type	Rated discharge (m <sup>3</sup> /s)	Full efficiency (%)	Rated efficiency (%)	Speed (rpm)	Specific speed (rpm)
28.935	55.20	2 x Francis	14.468	89.95	89.95	428.6	241.5
29.191	55.20	2 x Francis	14.596	89.95	89.95	428.6	242.5
29.535	55.21	2 x Francis	14.768	89.95	89.95	428.6	243.9
29.937	55.21	2 x Francis	14.969	89.88	89.88	375.0	214.9
30.294	55.22	2 x Francis	15.147	89.88	89.88	375.0	216.1
30.632	55.22	2 x Francis	15.316	89.89	89.89	375.0	217.3
31.021	55.22	2 x Francis	15.511	89.90	89.90	375.0	218.7
31.403	55.23	2 x Francis	15.702	89.90	89.90	375.0	220.0
31.755	55.23	2 x Francis	15.878	89.91	89.91	375.0	221.2
32.175	55.24	2 x Francis	16.088	89.91	89.91	375.0	222.7
32.584	55.24	2 x Francis	16.292	89.92	89.92	375.0	224.1
32.966	55.24	2 x Francis	16.483	89.93	89.93	375.0	225.4
33.392	55.25	2 x Francis	16.696	89.93	89.93	375.0	226.8
33.863	55.25	2 x Francis	16.932	89.94	89.94	375.0	228.4
34.252	55.25	2 x Francis	17.126	89.94	89.94	375.0	229.7
34.601	55.26	2 x Francis	17.301	89.95	89.95	375.0	230.9
35.050	55.26	2 x Francis	17.525	89.96	89.96	375.0	232.3
35.473	55.26	2 x Francis	17.737	89.95	89.95	375.0	233.7
36.018	55.26	2 x Francis	18.009	89.95	89.95	375.0	235.5
36.501	55.27	2 x Francis	18.251	89.95	89.95	375.0	237.1
36.958	55.27	2 x Francis	18.479	89.95	89.95	375.0	238.5
37.534	55.27	2 x Francis	18.767	89.95	89.95	375.0	240.4
38.164	55.28	2 x Francis	19.082	89.95	89.95	375.0	242.4
38.691	55.28	2 x Francis	19.346	89.95	89.95	375.0	244.0
39.338	55.28	2 x Francis	19.669	89.90	89.90	333.3	218.7
40.010	55.28	2 x Francis	20.005	89.90	89.90	333.3	220.6
40.682	55.28	2 x Francis	20.341	89.91	89.91	333.3	222.4
41.433	55.28	2 x Francis	20.717	89.92	89.92	333.3	224.5
42.083	55.28	2 x Francis	21.042	89.93	89.93	333.3	226.2
42.831	55.28	2 x Francis	21.416	89.94	89.94	333.3	228.2
43.739	55.28	2 x Francis	21.870	89.95	89.95	333.3	230.6
44.574	55.28	2 x Francis	22.287	89.95	89.96	333.3	232.8
45.596	55.28	2 x Francis	22.798	89.95	89.95	333.3	235.5

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Number of poles	Land acquisition (ha)	Reservoir acquisition (ha)
28.935	14	13.01	148.50
29.191	14	13.02	148.50
29.535	14	13.02	148.50
29.937	16	13.03	148.50
30.294	16	13.04	148.50
30.632	16	13.04	148.50
31.021	16	13.05	148.50
31.403	16	13.05	148.50
31.755	16	13.06	148.50
32.175	16	13.07	148.50
32.584	16	13.07	148.50
32.966	16	13.08	148.50
33.392	16	13.09	148.50
33.863	16	13.10	148.50
34.252	16	13.10	148.50
34.601	16	13.11	148.50
35.050	16	13.11	148.50
35.473	16	13.12	148.50
36.018	16	13.13	148.50
36.501	16	13.14	148.50
36.958	16	13.14	148.50
37.534	16	13.15	148.50
38.164	16	13.16	148.50
38.691	16	13.17	148.50
39.338	18	13.18	148.50
40.010	18	13.19	148.50
40.682	18	13.20	148.50
41.433	18	13.21	148.50
42.083	18	13.22	148.50
42.831	18	13.23	148.50
43.739	18	13.24	148.50
44.574	18	13.26	148.50
45.596	18	13.27	148.50

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Minimum operation level (El. m)	Reservoir full storage (million m <sup>3</sup> )	Reservoir full area (km <sup>2</sup> )	Headrace tunnel diameter (m)	Exposed penstock diameter (m)	Installed capacity (MW)	Net head (m)
28.935	128.531	1035.802	1.097	1 x 3.67	1 x 3.02	12.81	50.32
29.191	128.531	1035.802	1.097	1 x 3.68	1 x 3.03	12.92	50.32
29.535	128.531	1035.802	1.097	1 x 3.70	1 x 3.05	13.08	50.33
29.937	128.531	1035.802	1.097	1 x 3.72	1 x 3.07	13.26	50.33
30.294	128.531	1035.802	1.097	1 x 3.73	1 x 3.09	13.41	50.34
30.632	128.531	1035.802	1.097	1 x 3.75	1 x 3.10	13.57	50.34
31.021	128.531	1035.802	1.097	1 x 3.77	1 x 3.12	13.74	50.34
31.403	128.531	1035.802	1.097	1 x 3.78	1 x 3.14	13.91	50.34
31.755	128.531	1035.802	1.097	1 x 3.80	1 x 3.16	14.07	50.35
32.175	128.531	1035.802	1.097	1 x 3.82	1 x 3.18	14.25	50.35
32.584	128.531	1035.802	1.097	1 x 3.83	1 x 3.20	14.43	50.35
32.966	128.531	1035.802	1.097	1 x 3.85	1 x 3.22	14.60	50.36
33.392	128.531	1035.802	1.097	1 x 3.87	1 x 3.24	14.79	50.36
33.863	128.531	1035.802	1.097	1 x 3.89	1 x 3.26	15.00	50.36
34.252	128.531	1035.802	1.097	1 x 3.91	1 x 3.28	15.18	50.36
34.601	128.531	1035.802	1.097	1 x 3.92	1 x 3.30	15.33	50.37
35.050	128.531	1035.802	1.097	1 x 3.94	1 x 3.32	15.53	50.37
35.473	128.531	1035.802	1.097	1 x 3.96	1 x 3.34	15.72	50.37
36.018	128.531	1035.802	1.097	1 x 3.98	1 x 3.37	15.96	50.37
36.501	128.531	1035.802	1.097	1 x 4.00	1 x 3.39	16.18	50.38
36.958	128.531	1035.802	1.097	1 x 4.02	1 x 3.41	16.38	50.38
37.534	128.531	1035.802	1.097	1 x 4.04	1 x 3.44	16.63	50.38
38.164	128.531	1035.802	1.097	1 x 4.07	1 x 3.46	16.92	50.38
38.691	128.531	1035.802	1.097	1 x 4.09	1 x 3.49	17.15	50.38
39.338	128.531	1035.802	1.097	1 x 4.11	1 x 3.52	17.44	50.39
40.010	128.525	1035.802	1.097	1 x 4.14	1 x 3.55	17.74	50.39
40.682	128.515	1035.802	1.097	1 x 4.16	1 x 3.58	18.03	50.39
41.433	128.504	1035.802	1.097	1 x 4.19	1 x 3.61	18.37	50.39
42.083	128.495	1035.802	1.097	1 x 4.22	1 x 3.64	18.66	50.39
42.831	128.485	1035.802	1.097	1 x 4.24	1 x 3.67	18.99	50.39
43.739	128.472	1035.802	1.097	1 x 4.28	1 x 3.71	19.39	50.40
44.574	128.460	1035.802	1.097	1 x 4.31	1 x 3.74	19.76	50.40
45.596	128.445	1035.802	1.097	1 x 4.34	1 x 3.79	20.21	50.40

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Rated head (m)	No. of units x turbine type	Rated discharge (m <sup>3</sup> /s)	Full efficiency (%)	Rated efficiency (%)	Speed (rpm)	Specific speed (rpm)
28.935	50.32	2 x Francis	14.468	89.93	89.93	375.0	226.4
29.191	50.32	2 x Francis	14.596	89.93	89.93	375.0	227.4
29.535	50.33	2 x Francis	14.768	89.94	89.94	375.0	228.8
29.937	50.33	2 x Francis	14.969	89.95	89.95	375.0	230.3
30.294	50.34	2 x Francis	15.147	89.95	89.95	375.0	231.7
30.632	50.34	2 x Francis	15.316	89.95	89.95	375.0	232.9
31.021	50.34	2 x Francis	15.511	89.95	89.95	375.0	234.4
31.403	50.34	2 x Francis	15.702	89.95	89.95	375.0	235.8
31.755	50.35	2 x Francis	15.878	89.95	89.95	375.0	237.1
32.175	50.35	2 x Francis	16.088	89.95	89.95	375.0	238.7
32.584	50.35	2 x Francis	16.292	89.95	89.95	375.0	240.2
32.966	50.36	2 x Francis	16.483	89.95	89.95	375.0	241.6
33.392	50.36	2 x Francis	16.696	89.95	89.95	375.0	243.1
33.863	50.36	2 x Francis	16.932	89.95	89.95	375.0	244.8
34.252	50.36	2 x Francis	17.126	89.95	89.95	375.0	246.2
34.601	50.37	2 x Francis	17.301	89.95	89.95	375.0	247.5
35.050	50.37	2 x Francis	17.525	89.95	89.95	375.0	249.1
35.473	50.37	2 x Francis	17.737	89.95	89.95	375.0	250.6
36.018	50.37	2 x Francis	18.009	89.95	89.95	375.0	252.5
36.501	50.38	2 x Francis	18.251	89.95	89.95	375.0	254.1
36.958	50.38	2 x Francis	18.479	89.94	89.94	375.0	255.7
37.534	50.38	2 x Francis	18.767	89.94	89.94	333.3	229.1
38.164	50.38	2 x Francis	19.082	89.95	89.95	333.3	231.0
38.691	50.38	2 x Francis	19.346	89.96	89.96	333.3	232.5
39.338	50.39	2 x Francis	19.669	89.95	89.95	333.3	234.5
40.010	50.39	2 x Francis	20.005	89.95	89.95	333.3	236.5
40.682	50.38	2 x Francis	20.341	89.95	89.95	333.3	238.5
41.433	50.38	2 x Francis	20.717	89.95	89.95	333.3	240.7
42.083	50.38	2 x Francis	21.042	89.95	89.95	333.3	242.5
42.831	50.38	2 x Francis	21.416	89.95	89.95	333.3	244.7
43.739	50.38	2 x Francis	21.870	89.95	89.95	333.3	247.3
44.574	50.37	2 x Francis	22.287	89.95	89.95	333.3	249.6
45.596	50.37	2 x Francis	22.798	89.94	89.95	333.3	252.5

Plant type: reservoir

Headwork type: dam

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Number of poles	Land acquisition (ha)	Reservoir acquisition (ha)
28.935	16	13.02	130.30
29.191	16	13.03	130.30
29.535	16	13.03	130.30
29.937	16	13.04	130.30
30.294	16	13.05	130.30
30.632	16	13.05	130.30
31.021	16	13.06	130.30
31.403	16	13.07	130.30
31.755	16	13.07	130.30
32.175	16	13.08	130.30
32.584	16	13.09	130.30
32.966	16	13.09	130.30
33.392	16	13.10	130.30
33.863	16	13.11	130.30
34.252	16	13.11	130.30
34.601	16	13.12	130.30
35.050	16	13.13	130.30
35.473	16	13.13	130.30
36.018	16	13.14	130.30
36.501	16	13.15	130.30
36.958	16	13.16	130.30
37.534	18	13.17	130.30
38.164	18	13.18	130.30
38.691	18	13.18	130.30
39.338	18	13.19	130.30
40.010	18	13.20	130.30
40.682	18	13.21	130.30
41.433	18	13.23	130.30
42.083	18	13.23	130.30
42.831	18	13.25	130.30
43.739	18	13.26	130.30
44.574	18	13.27	130.30
45.596	18	13.28	130.30

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Minimum operation level (El. m)	Reservoir full storage (million m <sup>3</sup> )	Reservoir full area (km <sup>2</sup> )	Headrace tunnel diameter (m)	Exposed penstock diameter (m)	Installed capacity (MW)	Net head (m)
28.935	123.531	907.271	0.939	1 x 3.67	1 x 3.09	11.57	45.44
29.191	123.531	907.271	0.939	1 x 3.68	1 x 3.11	11.67	45.44
29.535	123.531	907.271	0.939	1 x 3.70	1 x 3.12	11.81	45.45
29.937	123.531	907.271	0.939	1 x 3.72	1 x 3.14	11.97	45.45
30.294	123.531	907.271	0.939	1 x 3.73	1 x 3.16	12.11	45.45
30.632	123.531	907.271	0.939	1 x 3.75	1 x 3.18	12.25	45.45
31.021	123.531	907.271	0.939	1 x 3.77	1 x 3.20	12.40	45.46
31.403	123.531	907.271	0.939	1 x 3.78	1 x 3.22	12.56	45.46
31.755	123.531	907.271	0.939	1 x 3.80	1 x 3.24	12.70	45.46
32.175	123.531	907.271	0.939	1 x 3.82	1 x 3.26	12.87	45.46
32.584	123.531	907.271	0.939	1 x 3.83	1 x 3.28	13.03	45.47
32.966	123.531	907.271	0.939	1 x 3.85	1 x 3.30	13.18	45.47
33.392	123.531	907.271	0.939	1 x 3.87	1 x 3.32	13.35	45.47
33.863	123.531	907.271	0.939	1 x 3.89	1 x 3.34	13.54	45.47
34.252	123.531	907.271	0.939	1 x 3.91	1 x 3.36	13.69	45.47
34.601	123.531	907.271	0.939	1 x 3.92	1 x 3.38	13.83	45.47
35.050	123.531	907.271	0.939	1 x 3.94	1 x 3.40	14.01	45.48
35.473	123.531	907.271	0.939	1 x 3.96	1 x 3.42	14.18	45.48
36.018	123.531	907.271	0.939	1 x 3.98	1 x 3.45	14.41	45.48
36.501	123.531	907.271	0.939	1 x 4.00	1 x 3.47	14.60	45.48
36.958	123.531	907.271	0.939	1 x 4.02	1 x 3.49	14.79	45.48
37.534	123.531	907.271	0.939	1 x 4.04	1 x 3.52	15.02	45.48
38.164	123.531	907.271	0.939	1 x 4.07	1 x 3.55	15.27	45.48
38.691	123.531	907.271	0.939	1 x 4.09	1 x 3.58	15.48	45.49
39.338	123.531	907.271	0.939	1 x 4.11	1 x 3.60	15.74	45.49
40.010	123.524	907.271	0.939	1 x 4.14	1 x 3.64	16.01	45.49
40.682	123.514	907.271	0.939	1 x 4.16	1 x 3.67	16.28	45.49
41.433	123.503	907.271	0.939	1 x 4.19	1 x 3.70	16.58	45.49
42.083	123.494	907.271	0.939	1 x 4.22	1 x 3.73	16.83	45.49
42.831	123.483	907.271	0.939	1 x 4.24	1 x 3.76	17.13	45.49
43.739	123.469	907.271	0.939	1 x 4.28	1 x 3.80	17.49	45.49
44.574	123.457	907.271	0.939	1 x 4.31	1 x 3.84	17.82	45.49
45.596	123.442	907.271	0.939	1 x 4.34	1 x 3.88	18.25	45.49

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Rated head (m)	No. of units x turbine type	Rated discharge (m <sup>3</sup> /s)	Full efficiency (%)	Rated efficiency (%)	Speed (rpm)	Specific speed (rpm)
28.935	45.44	2 x Francis	14.468	89.95	89.95	375.0	244.5
29.191	45.44	2 x Francis	14.596	89.95	89.95	375.0	245.5
29.535	45.45	2 x Francis	14.768	89.95	89.95	375.0	247.0
29.937	45.45	2 x Francis	14.969	89.95	89.95	375.0	248.6
30.294	45.45	2 x Francis	15.147	89.95	89.95	375.0	250.1
30.632	45.45	2 x Francis	15.316	89.95	89.95	375.0	251.5
31.021	45.46	2 x Francis	15.511	89.95	89.95	375.0	253.1
31.403	45.46	2 x Francis	15.702	89.95	89.95	375.0	254.6
31.755	45.46	2 x Francis	15.878	89.94	89.94	375.0	256.0
32.175	45.46	2 x Francis	16.088	89.93	89.93	375.0	257.7
32.584	45.47	2 x Francis	16.292	89.92	89.92	375.0	259.3
32.966	45.47	2 x Francis	16.483	89.92	89.92	375.0	260.8
33.392	45.47	2 x Francis	16.696	89.91	89.91	375.0	262.5
33.863	45.47	2 x Francis	16.932	89.90	89.90	375.0	264.3
34.252	45.47	2 x Francis	17.126	89.89	89.89	375.0	265.8
34.601	45.47	2 x Francis	17.301	89.88	89.88	375.0	267.2
35.050	45.48	2 x Francis	17.525	89.87	89.87	375.0	268.9
35.473	45.48	2 x Francis	17.737	89.86	89.86	375.0	270.5
36.018	45.48	2 x Francis	18.009	89.95	89.95	333.3	242.3
36.501	45.48	2 x Francis	18.251	89.95	89.95	333.3	243.9
36.958	45.48	2 x Francis	18.479	89.95	89.95	333.3	245.4
37.534	45.48	2 x Francis	18.767	89.95	89.95	333.3	247.3
38.164	45.48	2 x Francis	19.082	89.95	89.95	333.3	249.4
38.691	45.49	2 x Francis	19.346	89.95	89.95	333.3	251.1
39.338	45.49	2 x Francis	19.669	89.95	89.95	333.3	253.2
40.010	45.49	2 x Francis	20.005	89.94	89.95	333.3	255.3
40.682	45.48	2 x Francis	20.341	89.93	89.93	333.3	257.5
41.433	45.48	2 x Francis	20.717	89.92	89.92	333.3	259.9
42.083	45.48	2 x Francis	21.042	89.91	89.91	333.3	261.9
42.831	45.47	2 x Francis	21.416	89.90	89.90	333.3	264.2
43.739	45.47	2 x Francis	21.870	89.88	89.88	333.3	267.0
44.574	45.47	2 x Francis	22.287	89.87	89.87	333.3	269.6
45.596	45.46	2 x Francis	22.798	89.95	89.95	300.0	245.4

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Number of poles	Land acquisition (ha)	Reservoir acquisition (ha)
28.935	16	13.04	114.00
29.191	16	13.04	114.00
29.535	16	13.05	114.00
29.937	16	13.06	114.00
30.294	16	13.06	114.00
30.632	16	13.07	114.00
31.021	16	13.07	114.00
31.403	16	13.08	114.00
31.755	16	13.09	114.00
32.175	16	13.09	114.00
32.584	16	13.10	114.00
32.966	16	13.11	114.00
33.392	16	13.12	114.00
33.863	16	13.12	114.00
34.252	16	13.13	114.00
34.601	16	13.14	114.00
35.050	16	13.14	114.00
35.473	16	13.15	114.00
36.018	18	13.16	114.00
36.501	18	13.17	114.00
36.958	18	13.17	114.00
37.534	18	13.18	114.00
38.164	18	13.19	114.00
38.691	18	13.20	114.00
39.338	18	13.21	114.00
40.010	18	13.22	114.00
40.682	18	13.23	114.00
41.433	18	13.24	114.00
42.083	18	13.25	114.00
42.831	18	13.26	114.00
43.739	18	13.28	114.00
44.574	18	13.29	114.00
45.596	20	13.30	114.00

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Minimum operation level (El. m)	Reservoir full storage (million m <sup>3</sup> )	Reservoir full area (km <sup>2</sup> )	Headrace tunnel diameter (m)	Exposed penstock diameter (m)	Installed capacity (MW)	Net head (m)
28.935	118.531	783.741	0.756	1 x 3.67	1 x 3.18	10.32	40.56
29.191	118.531	783.741	0.756	1 x 3.68	1 x 3.19	10.41	40.56
29.535	118.531	783.741	0.756	1 x 3.70	1 x 3.21	10.53	40.56
29.937	118.531	783.741	0.756	1 x 3.72	1 x 3.23	10.67	40.56
30.294	118.531	783.741	0.756	1 x 3.73	1 x 3.25	10.80	40.57
30.632	118.531	783.741	0.756	1 x 3.75	1 x 3.27	10.92	40.57
31.021	118.531	783.741	0.756	1 x 3.77	1 x 3.29	11.06	40.57
31.403	118.531	783.741	0.756	1 x 3.78	1 x 3.31	11.19	40.57
31.755	118.531	783.741	0.756	1 x 3.80	1 x 3.33	11.32	40.57
32.175	118.531	783.741	0.756	1 x 3.82	1 x 3.35	11.47	40.57
32.584	118.531	783.741	0.756	1 x 3.83	1 x 3.37	11.61	40.57
32.966	118.531	783.741	0.756	1 x 3.85	1 x 3.39	11.74	40.58
33.392	118.531	783.741	0.756	1 x 3.87	1 x 3.41	11.89	40.58
33.863	118.531	783.741	0.756	1 x 3.89	1 x 3.44	12.09	40.58
34.252	118.531	783.741	0.756	1 x 3.91	1 x 3.46	12.23	40.58
34.601	118.531	783.741	0.756	1 x 3.92	1 x 3.47	12.35	40.58
35.050	118.531	783.741	0.756	1 x 3.94	1 x 3.50	12.51	40.58
35.473	118.531	783.741	0.756	1 x 3.96	1 x 3.52	12.66	40.58
36.018	118.531	783.741	0.756	1 x 3.98	1 x 3.54	12.85	40.58
36.501	118.531	783.741	0.756	1 x 4.00	1 x 3.57	13.02	40.58
36.958	118.531	783.741	0.756	1 x 4.02	1 x 3.59	13.18	40.58
37.534	118.531	783.741	0.756	1 x 4.04	1 x 3.62	13.39	40.58
38.164	118.531	783.741	0.756	1 x 4.07	1 x 3.65	13.61	40.59
38.691	118.531	783.741	0.756	1 x 4.09	1 x 3.67	13.80	40.59
39.338	118.531	783.741	0.756	1 x 4.11	1 x 3.70	14.03	40.59
40.010	118.524	783.741	0.756	1 x 4.14	1 x 3.74	14.27	40.59
40.682	118.514	783.741	0.756	1 x 4.16	1 x 3.77	14.50	40.59
41.433	118.502	783.741	0.756	1 x 4.19	1 x 3.80	14.76	40.59
42.083	118.492	783.741	0.756	1 x 4.22	1 x 3.83	14.99	40.59
42.831	118.481	783.741	0.756	1 x 4.24	1 x 3.87	15.29	40.58
43.739	118.467	783.741	0.756	1 x 4.28	1 x 3.91	15.61	40.58
44.574	118.454	783.741	0.756	1 x 4.31	1 x 3.94	15.90	40.58
45.596	118.438	783.741	0.756	1 x 4.34	1 x 3.99	16.26	40.58

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Cases basic

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Rated head (m)	No. of units × turbine type	Rated discharge (m <sup>3</sup> /s)	Full efficiency (%)	Rated efficiency (%)	Speed (rpm)	Specific speed (rpm)
28.935	40.56	2 × Francis	14.468	89.89	89.89	375.0	266.2
29.191	40.56	2 × Francis	14.596	89.88	89.88	375.0	267.4
29.535	40.56	2 × Francis	14.768	89.87	89.87	375.0	268.9
29.937	40.56	2 × Francis	14.969	89.86	89.86	375.0	270.8
30.294	40.57	2 × Francis	15.147	89.85	89.85	375.0	272.4
30.632	40.57	2 × Francis	15.316	89.85	89.85	375.0	273.9
31.021	40.57	2 × Francis	15.511	89.84	89.84	375.0	275.6
31.403	40.57	2 × Francis	15.702	89.83	89.83	375.0	277.3
31.755	40.57	2 × Francis	15.878	89.82	89.82	375.0	278.8
32.175	40.57	2 × Francis	16.088	89.80	89.80	375.0	280.6
32.584	40.57	2 × Francis	16.292	89.78	89.78	375.0	282.4
32.966	40.58	2 × Francis	16.483	89.77	89.77	375.0	284.1
33.392	40.58	2 × Francis	16.696	89.75	89.75	375.0	285.9
33.863	40.58	2 × Francis	16.932	89.94	89.94	333.3	255.9
34.252	40.58	2 × Francis	17.126	89.93	89.93	333.3	257.4
34.601	40.58	2 × Francis	17.301	89.93	89.93	333.3	258.7
35.050	40.58	2 × Francis	17.525	89.92	89.92	333.3	260.3
35.473	40.58	2 × Francis	17.737	89.91	89.91	333.3	261.9
36.018	40.58	2 × Francis	18.009	89.90	89.90	333.3	263.9
36.501	40.58	2 × Francis	18.251	89.89	89.89	333.3	265.7
36.958	40.58	2 × Francis	18.479	89.88	89.88	333.3	267.3
37.534	40.58	2 × Francis	18.767	89.87	89.87	333.3	269.4
38.164	40.59	2 × Francis	19.082	89.86	89.86	333.3	271.6
38.691	40.59	2 × Francis	19.346	89.85	89.85	333.3	273.5
39.338	40.59	2 × Francis	19.669	89.84	89.84	333.3	275.8
40.010	40.58	2 × Francis	20.005	89.82	89.82	333.3	278.1
40.682	40.58	2 × Francis	20.341	89.80	89.80	333.3	280.5
41.433	40.58	2 × Francis	20.717	89.78	89.78	333.3	283.1
42.083	40.57	2 × Francis	21.042	89.75	89.75	333.3	285.3
42.831	40.57	2 × Francis	21.416	89.92	89.93	300.0	259.1
43.739	40.56	2 × Francis	21.870	89.91	89.91	300.0	261.8
44.574	40.56	2 × Francis	22.287	89.89	89.90	300.0	264.3
45.596	40.55	2 × Francis	22.798	89.88	89.88	300.0	267.4

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Number of poles	Land acquisition (ha)	Reservoir acquisition (ha)
28.935	16	13.05	99.50
29.191	16	13.06	99.50
29.535	16	13.06	99.50
29.937	16	13.07	99.50
30.294	16	13.08	99.50
30.632	16	13.08	99.50
31.021	16	13.09	99.50
31.403	16	13.10	99.50
31.755	16	13.10	99.50
32.175	16	13.11	99.50
32.584	16	13.12	99.50
32.966	16	13.12	99.50
33.392	16	13.13	99.50
33.863	18	13.14	99.50
34.252	18	13.15	99.50
34.601	18	13.15	99.50
35.050	18	13.16	99.50
35.473	18	13.17	99.50
36.018	18	13.18	99.50
36.501	18	13.18	99.50
36.958	18	13.19	99.50
37.534	18	13.20	99.50
38.164	18	13.21	99.50
38.691	18	13.22	99.50
39.338	18	13.23	99.50
40.010	18	13.24	99.50
40.682	18	13.25	99.50
41.433	18	13.26	99.50
42.083	18	13.27	99.50
42.831	20	13.28	99.50
43.739	20	13.29	99.50
44.574	20	13.31	99.50
45.596	20	13.32	99.50

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 113.531 El. m

Firm discharge (m <sup>3</sup> /s)	Minimum operation level (El. m)	Reservoir full storage (million m <sup>3</sup> )	Reservoir full area (km <sup>2</sup> )	Headrace tunnel diameter (m)	Exposed penstock diameter (m)	Installed capacity (MW)	Net head (m)
28.935	113.531	665.210	0.597	1 × 3.67	1 × 3.28	9.05	35.67

Plant type: reservoir

Headwork type: dam

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 113.531 El. m

Firm discharge (m <sup>3</sup> /s)	Rated head (m)	No. of units × turbine type	Rated discharge (m <sup>3</sup> /s)	Full efficiency (%)	Rated efficiency (%)	Speed (rpm)	Specific speed (rpm)
28.935	35.67	2 × Francis	14.468	89.68	89.68	375.0	293.1

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Cases basic

FSL = 113.531 El. m

Firm discharge (m <sup>3</sup> /s)	Number of poles	Land acquisition (ha)	Reservoir acquisition (ha)
28.935	16	13.07	80.60

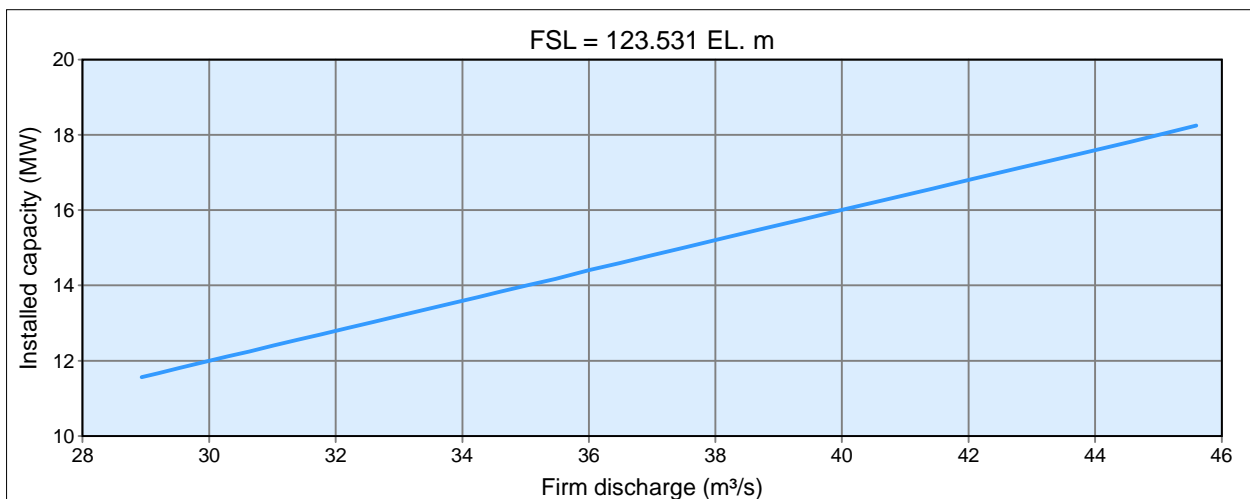
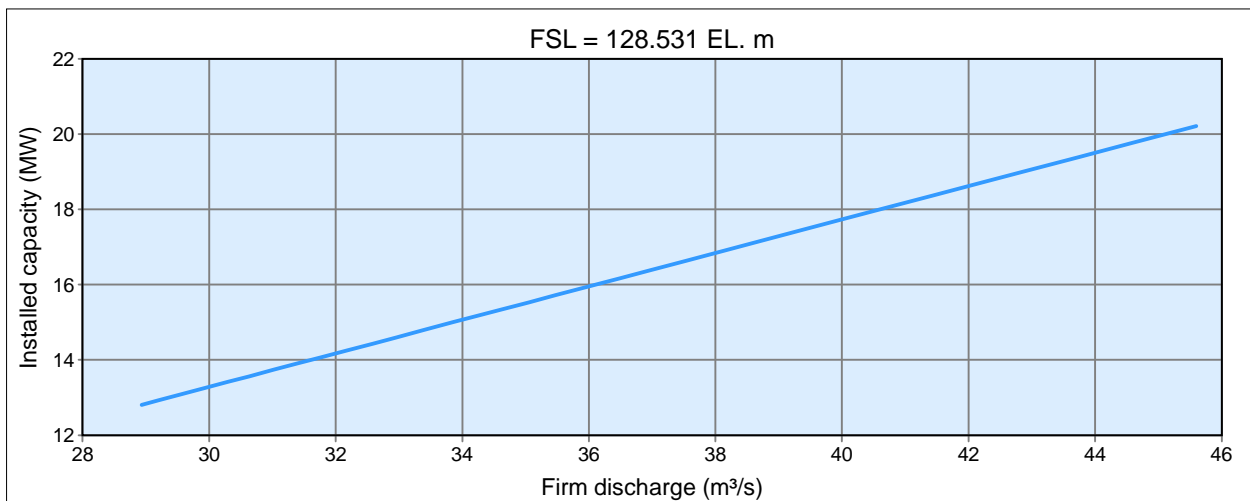
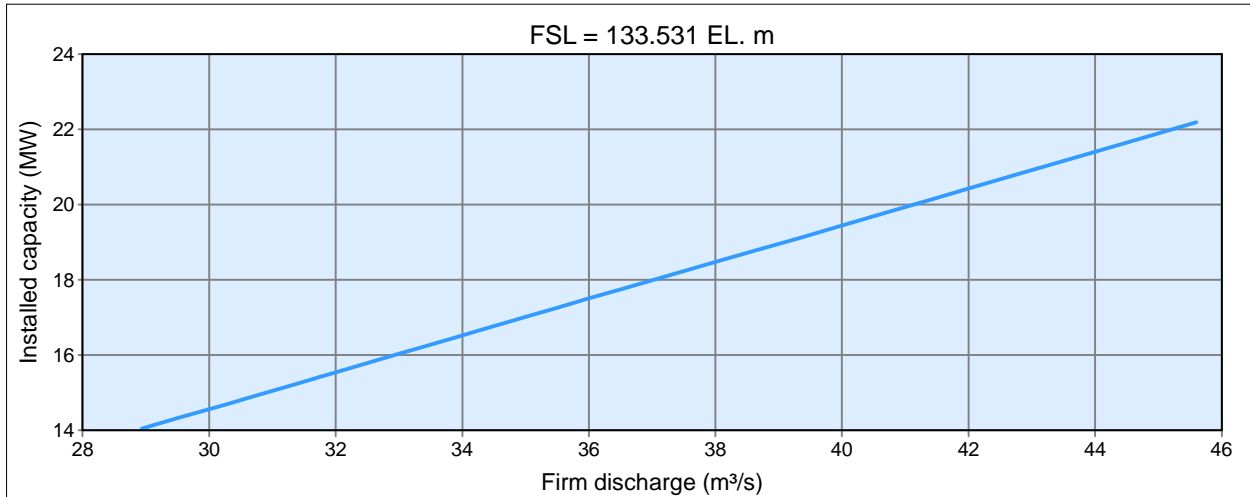
Plant type: reservoir

Headwork type: dam

Operation mode: base

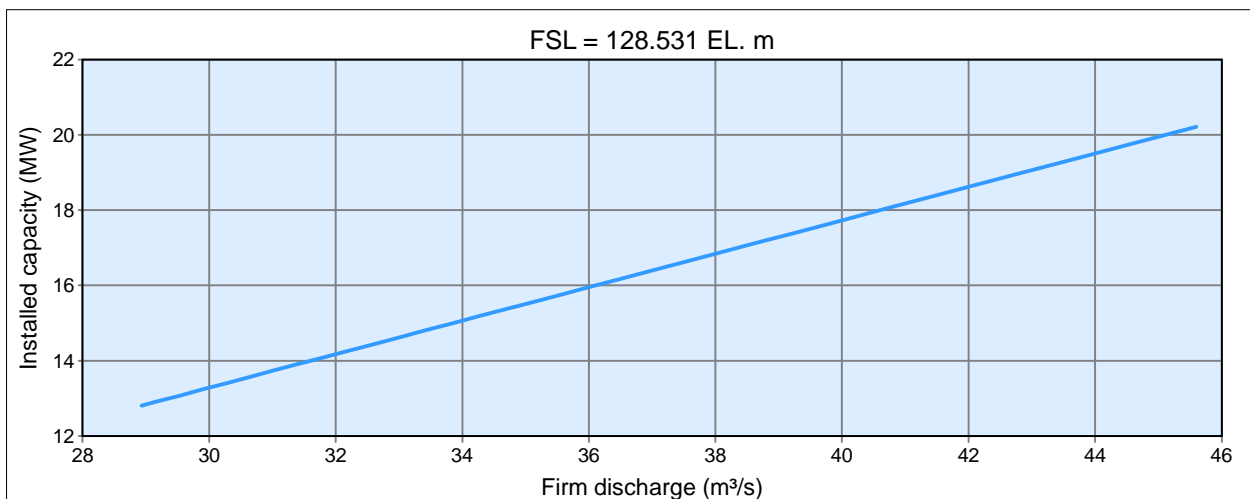
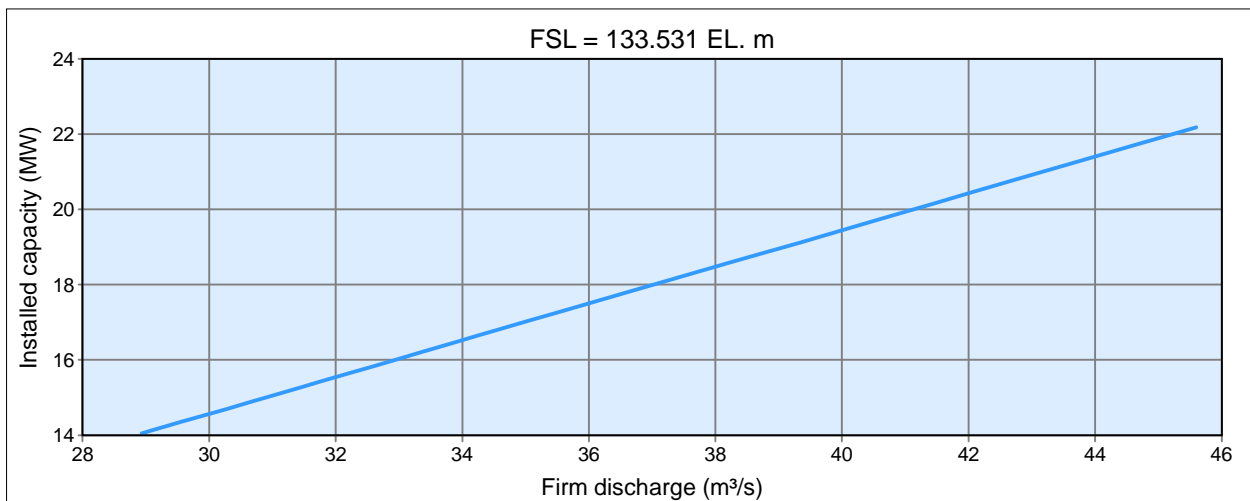
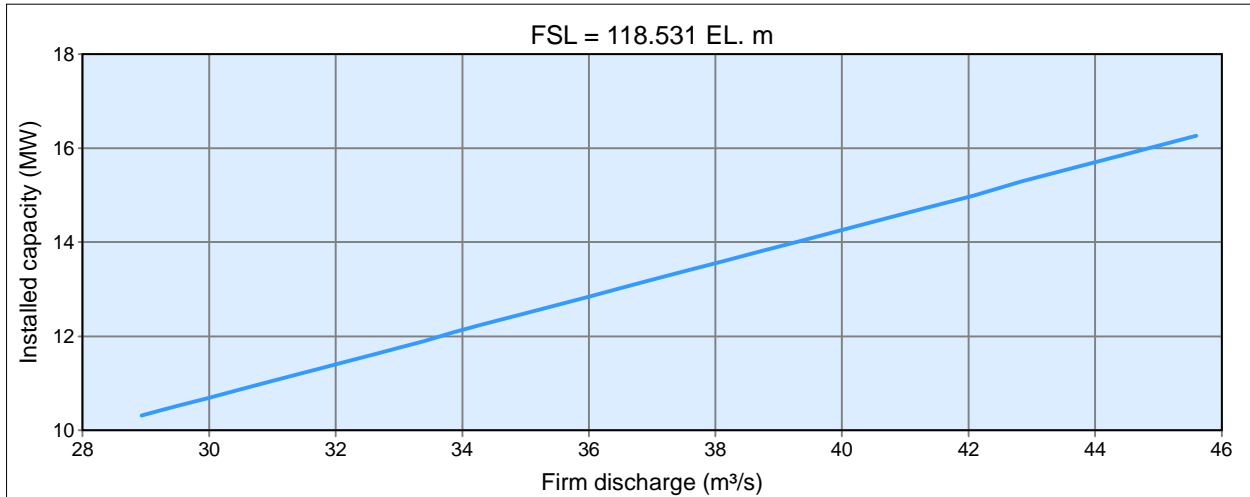
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



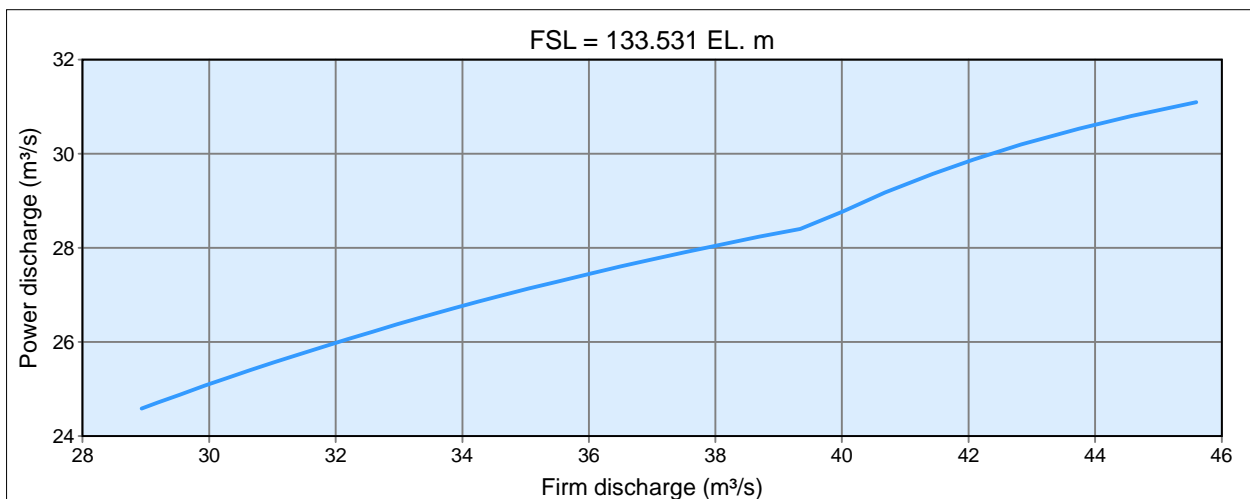
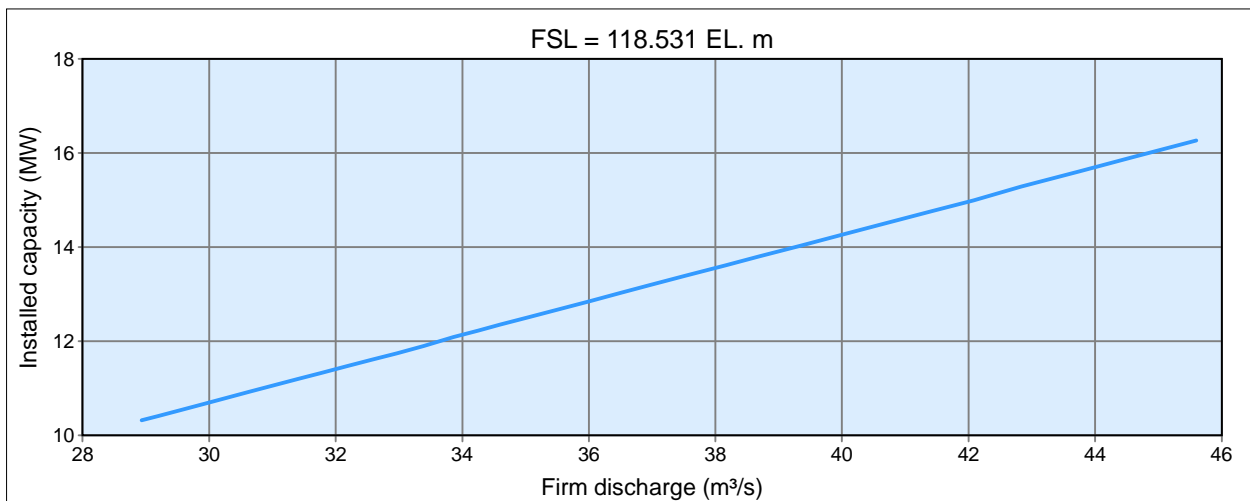
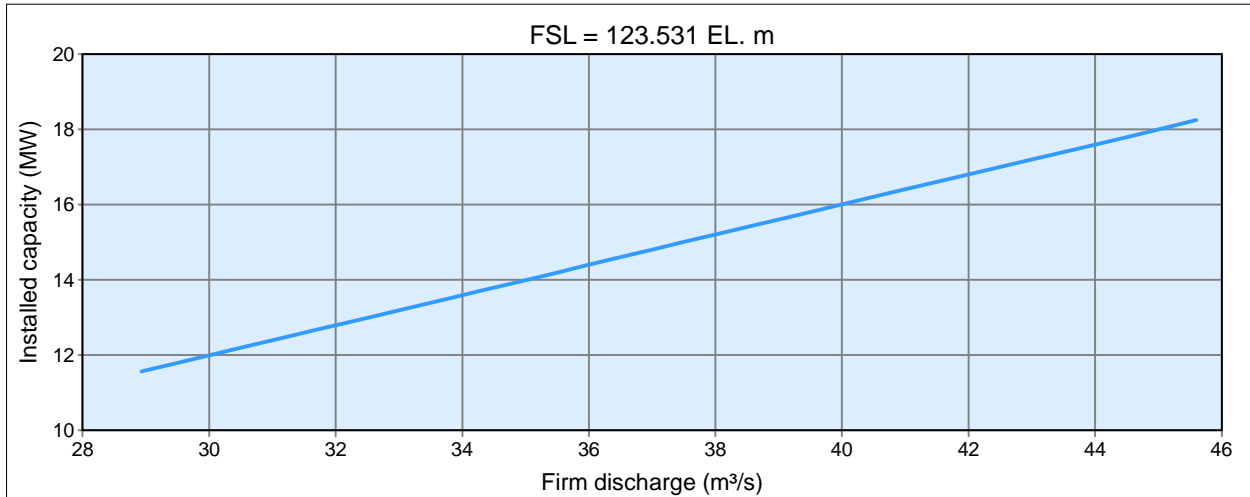
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



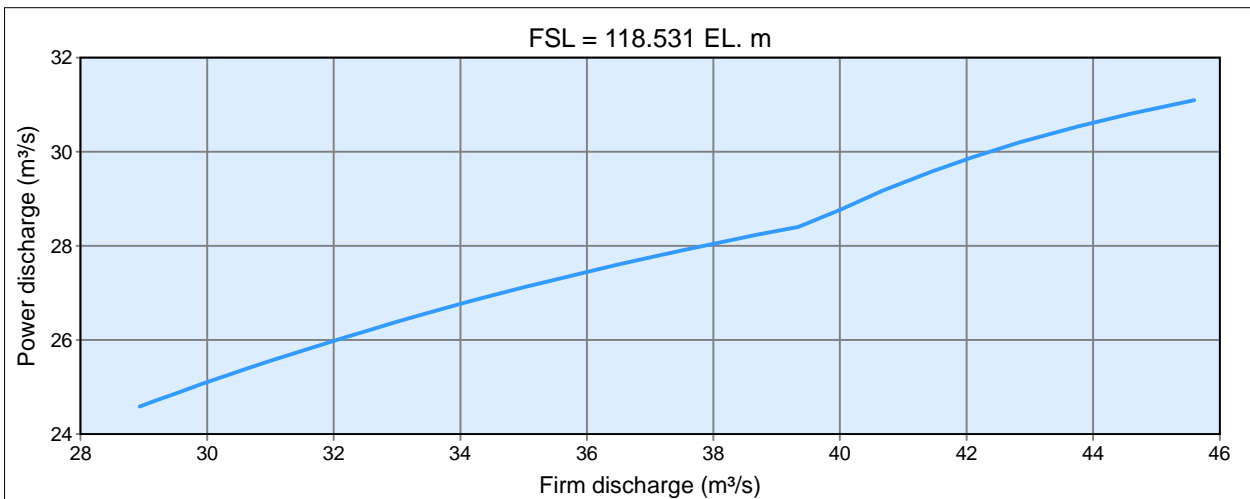
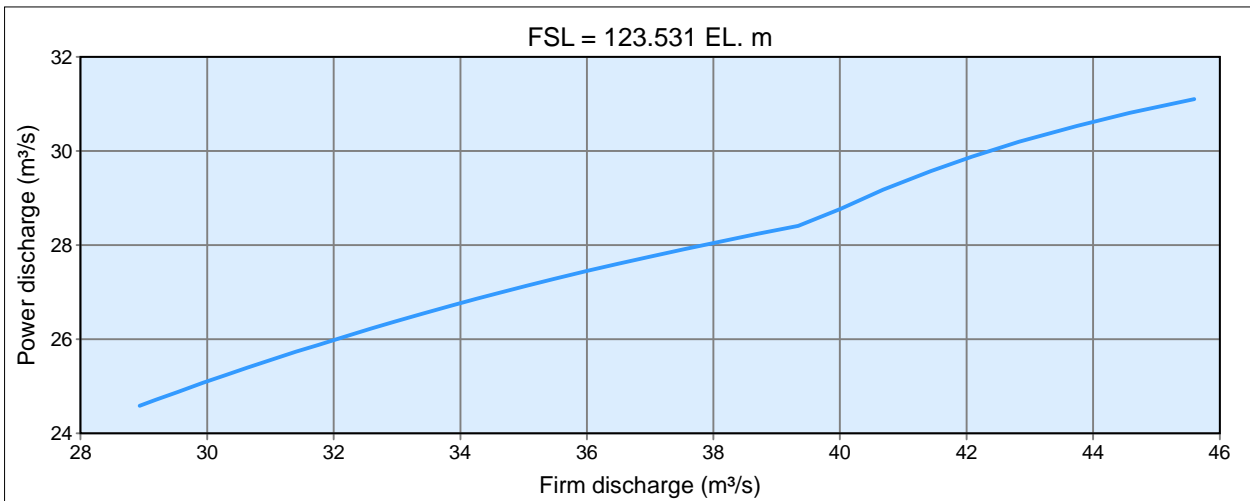
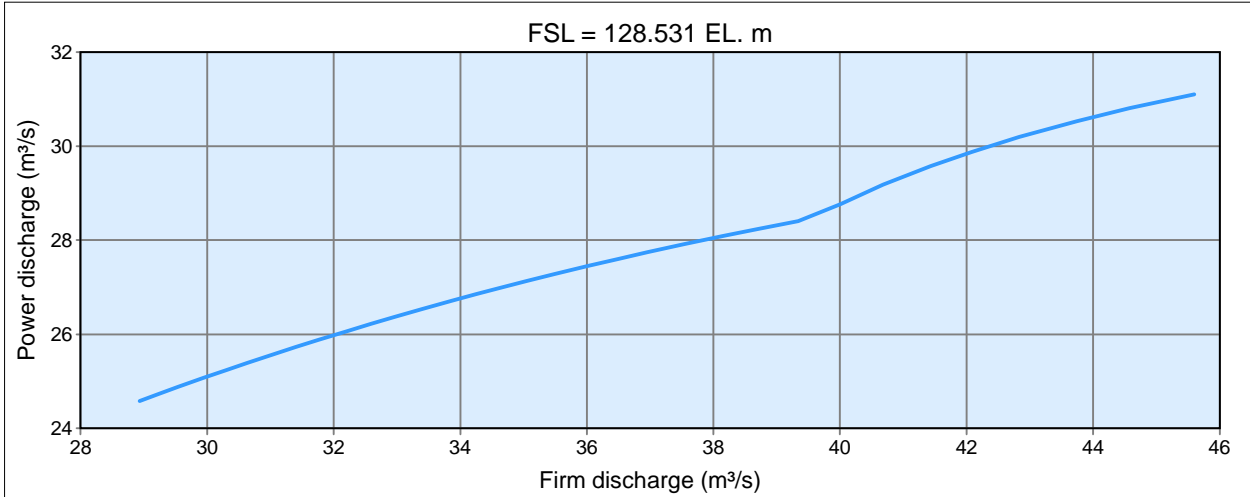
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



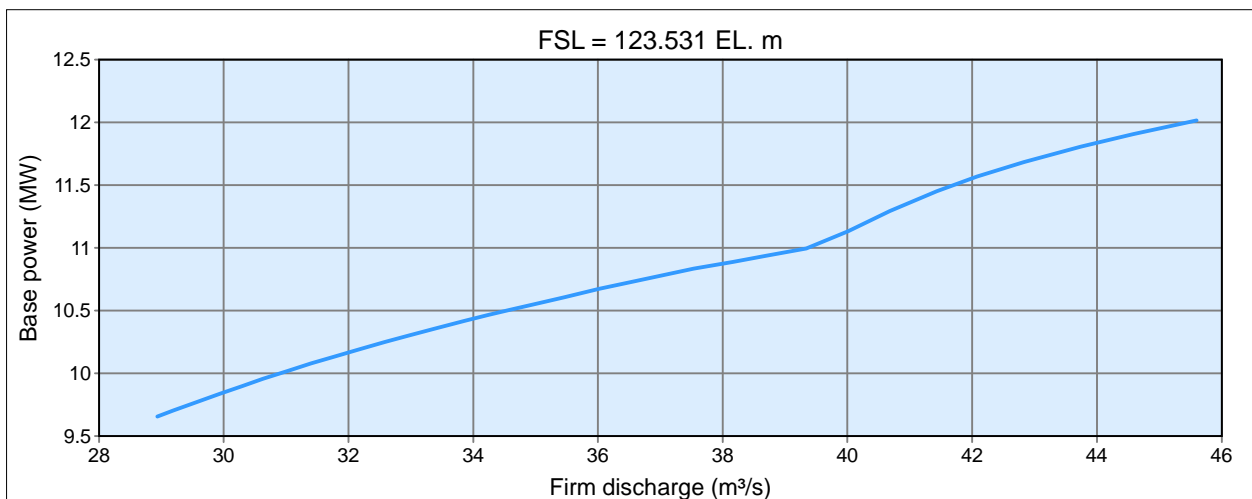
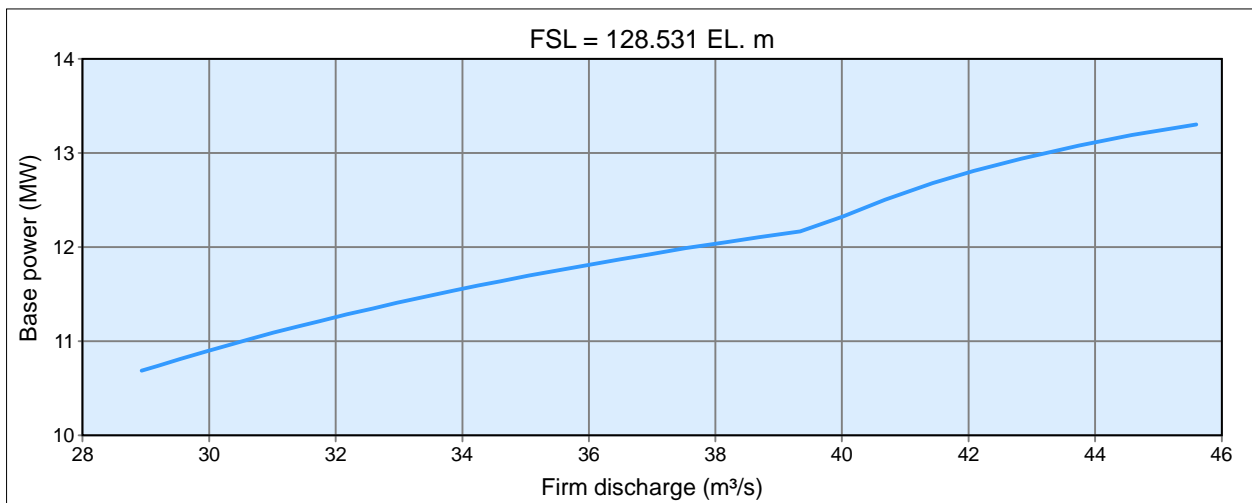
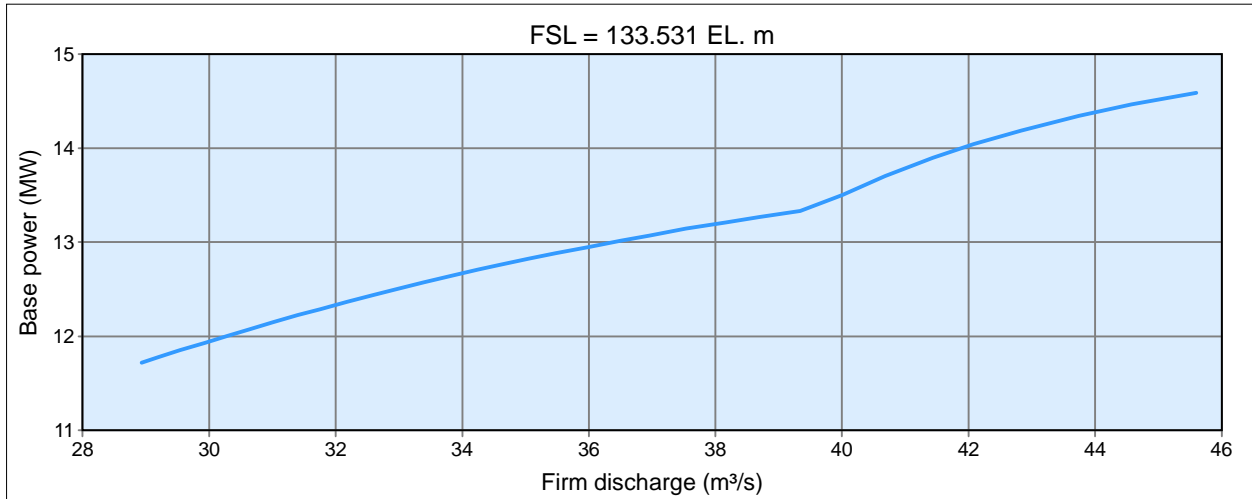
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



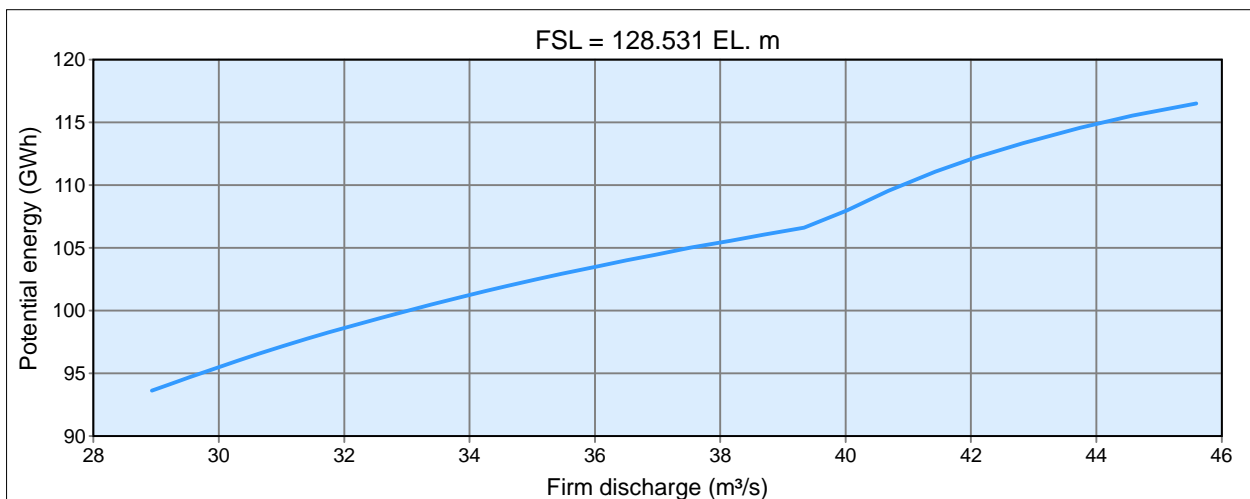
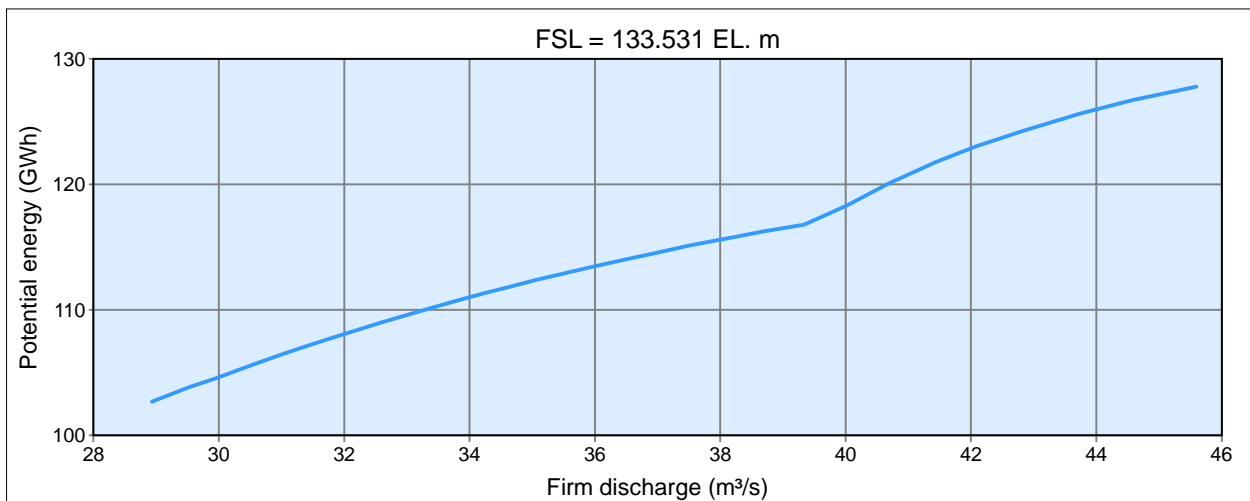
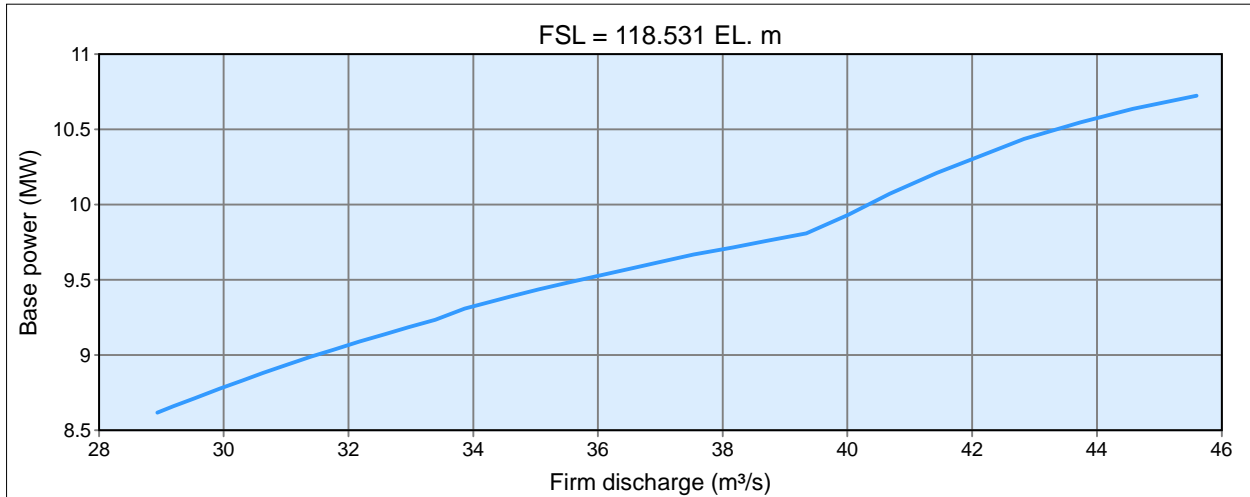
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

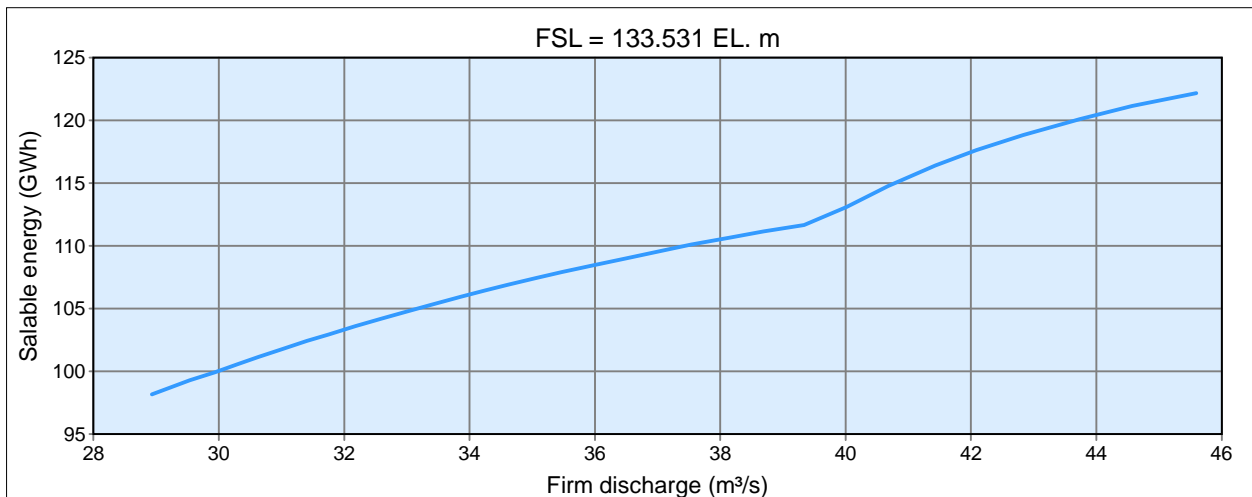
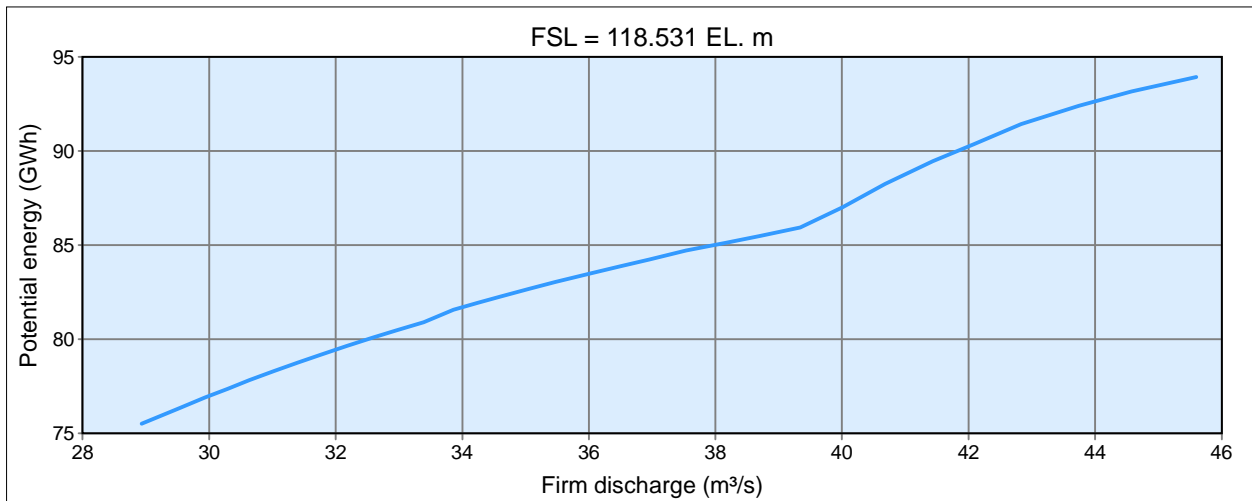
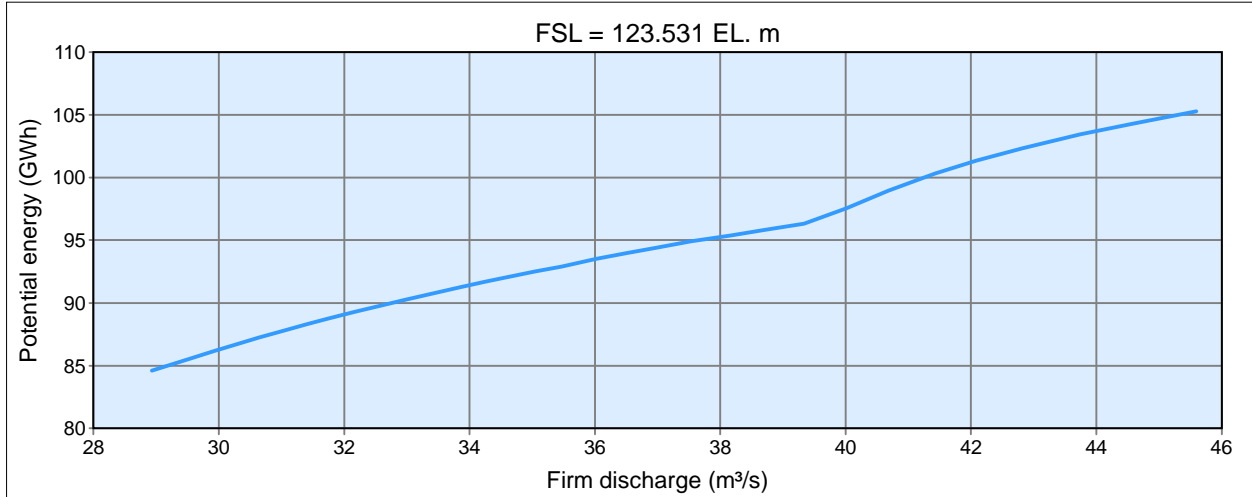
### Simulation summary (average values)





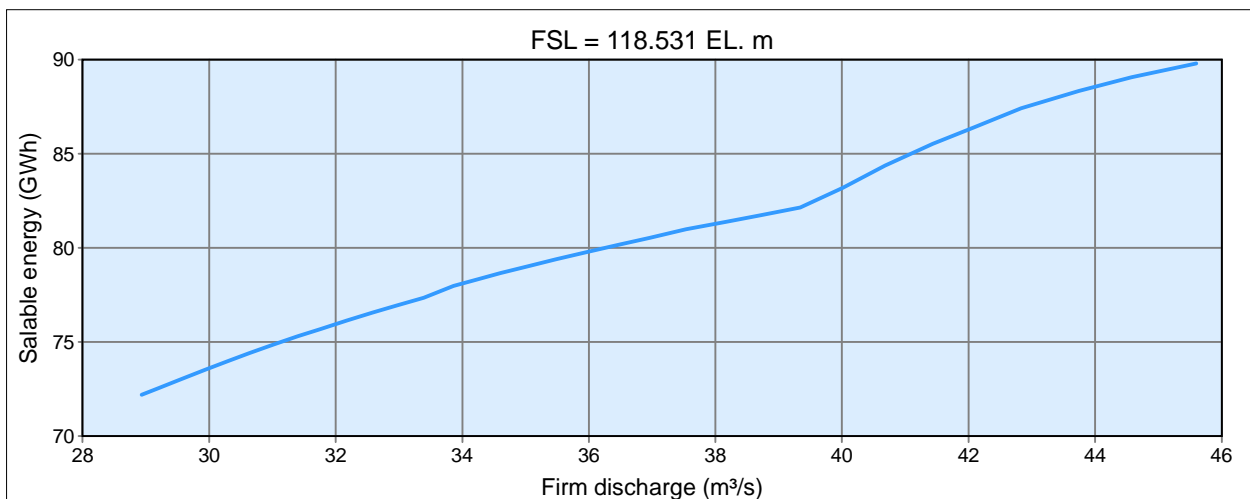
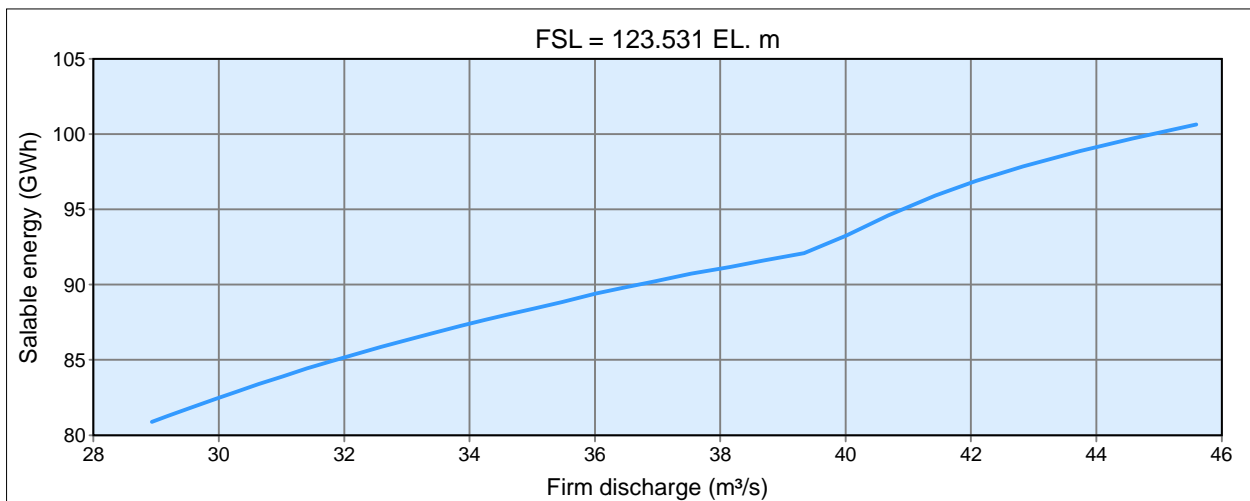
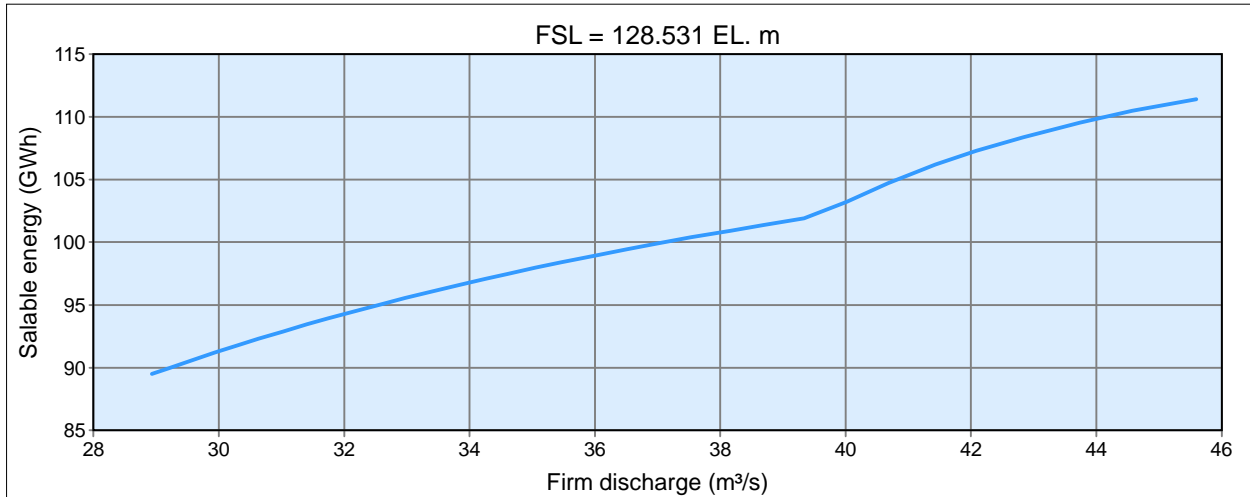
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



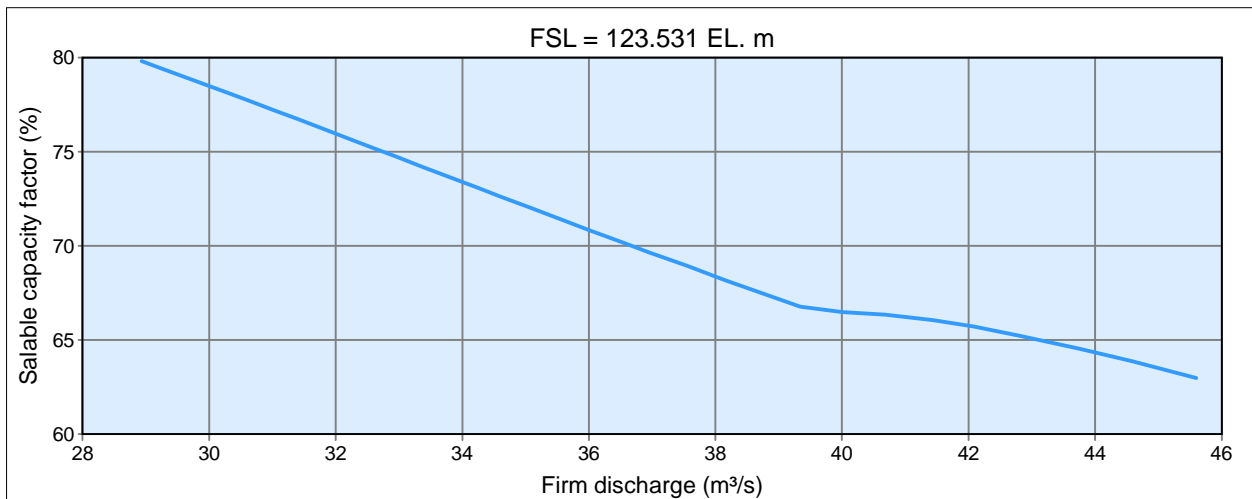
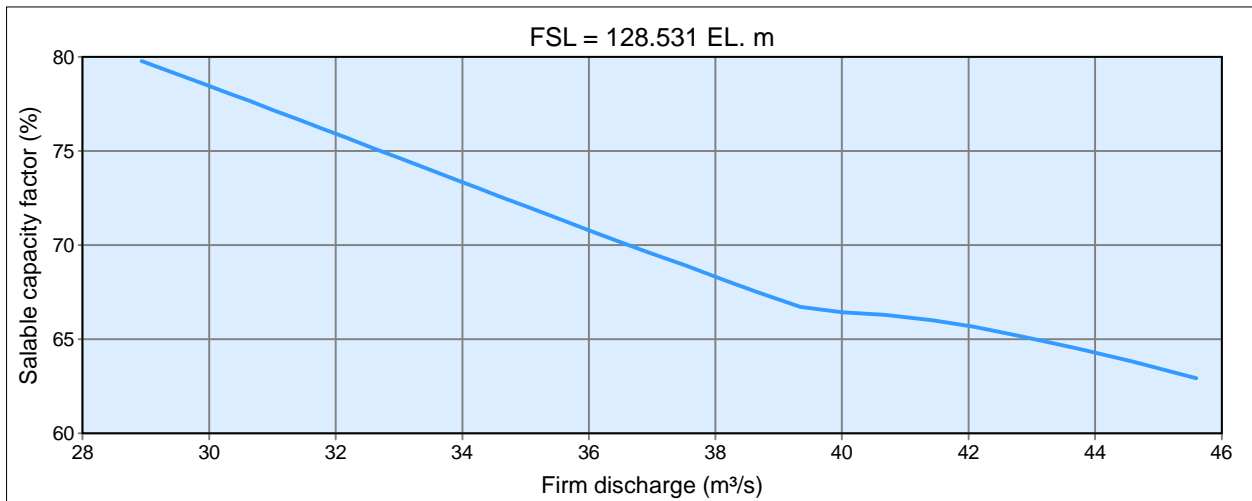
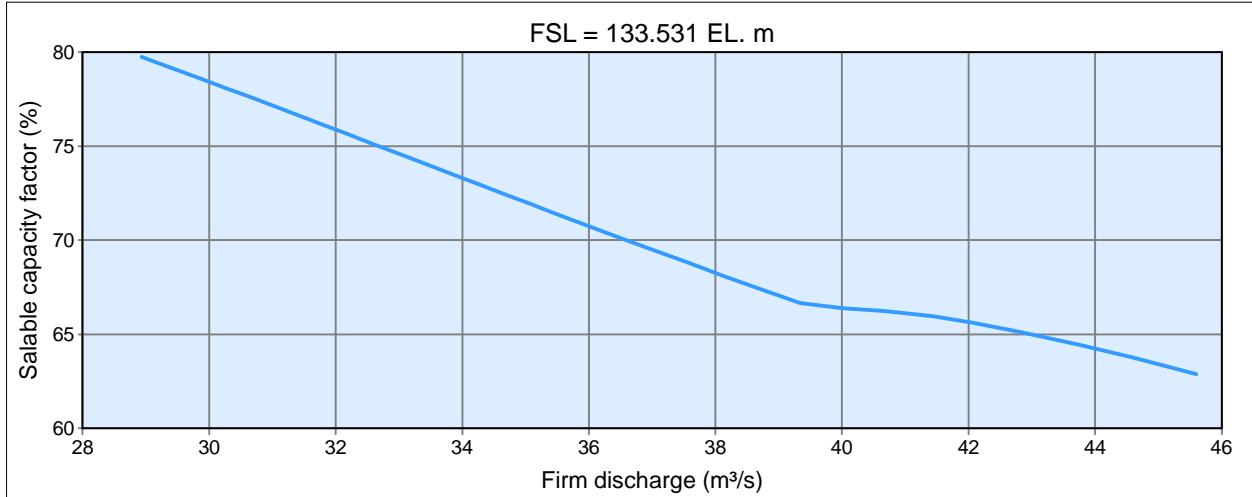
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



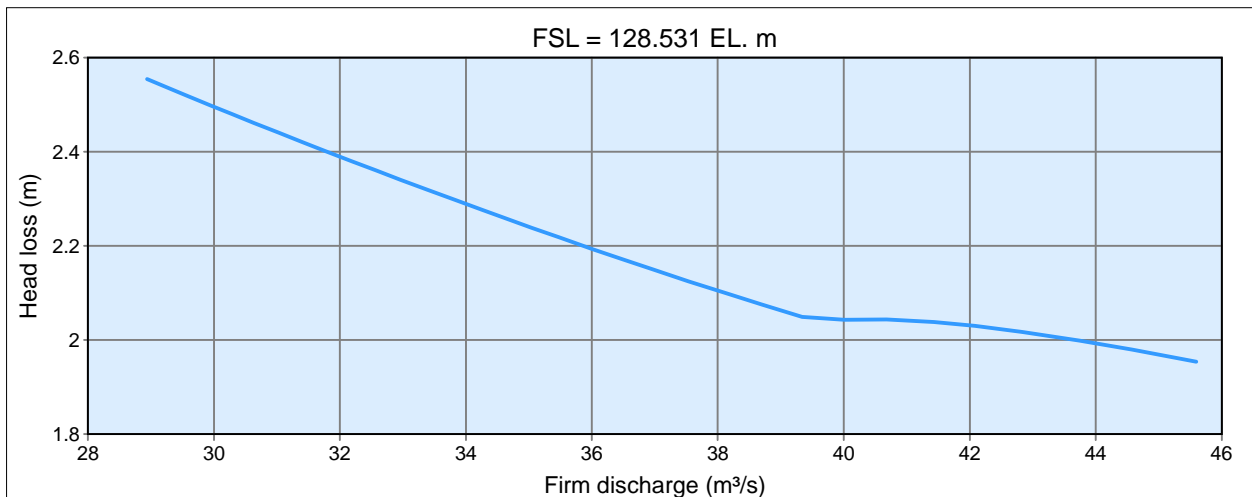
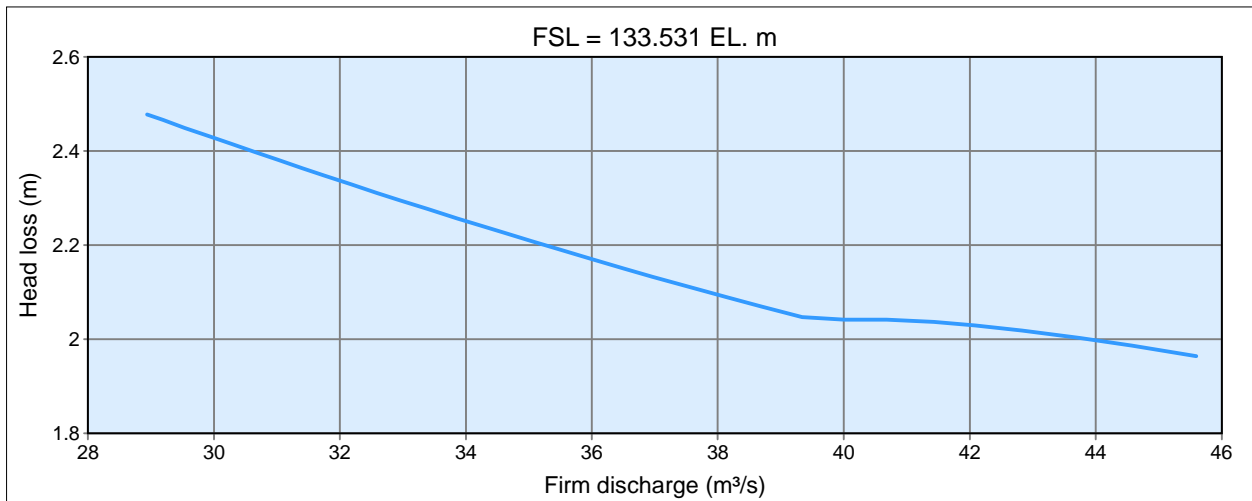
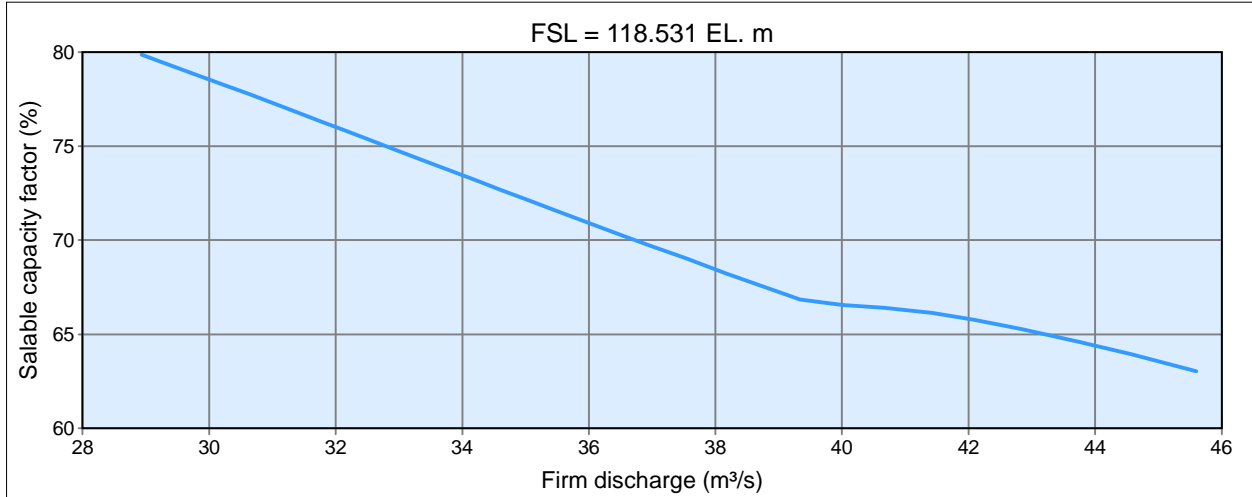
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



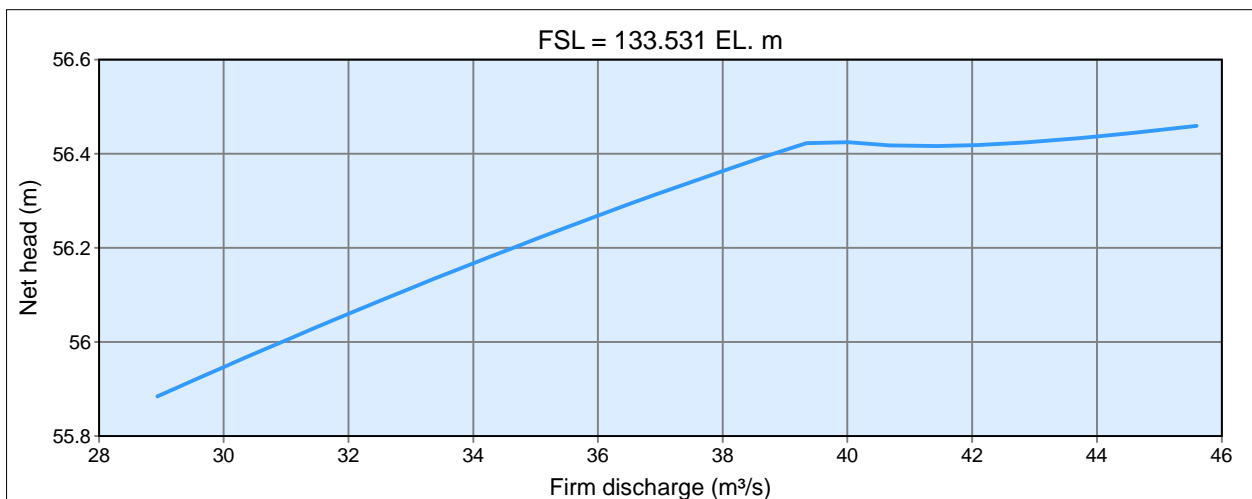
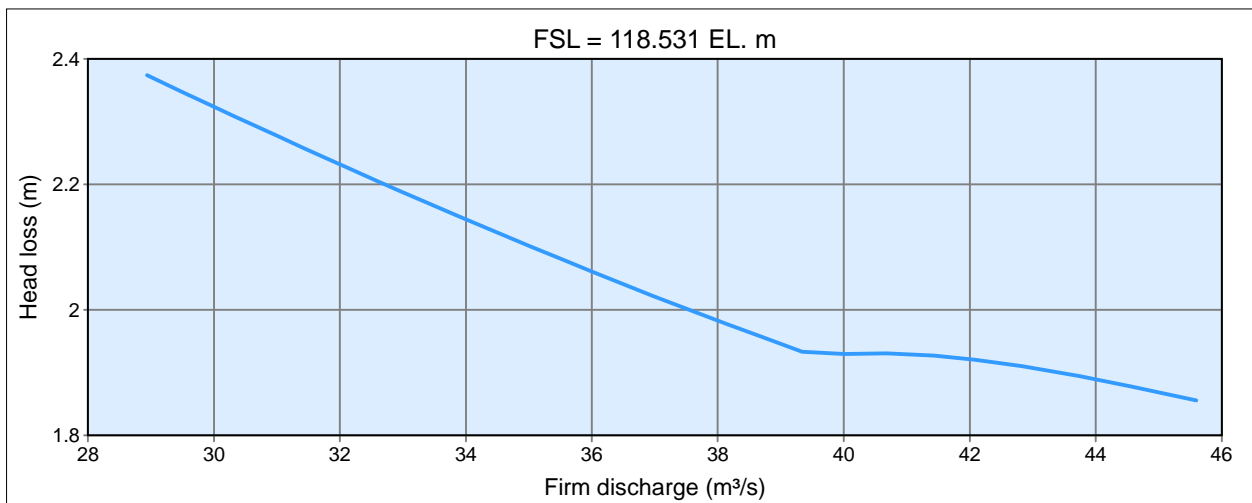
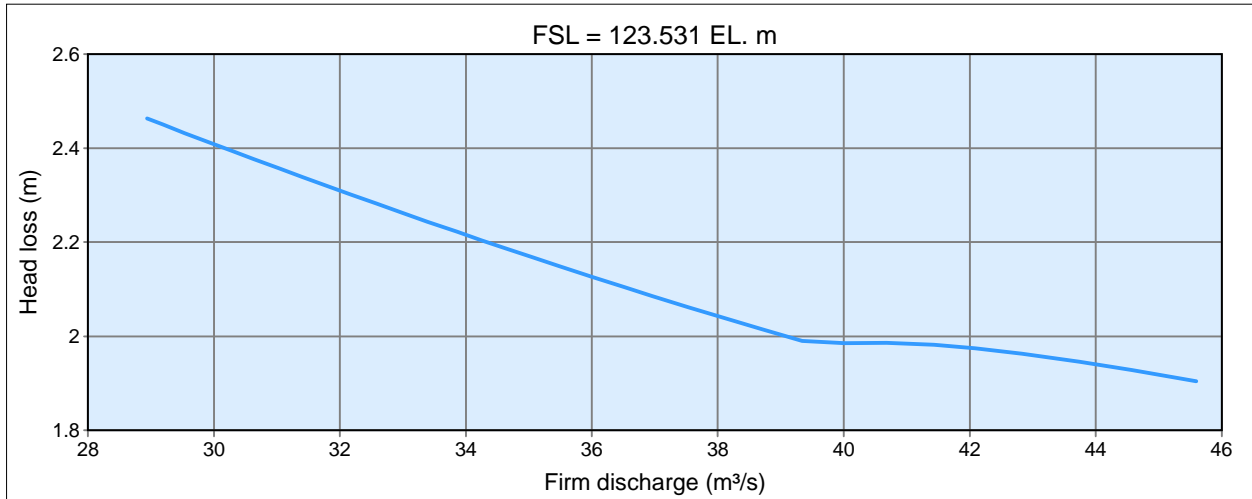
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



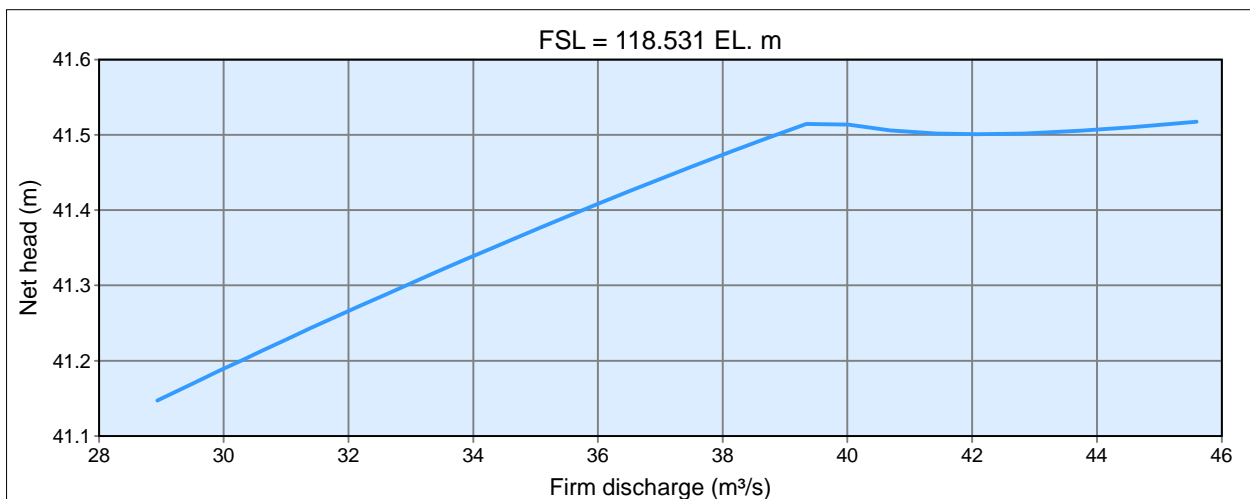
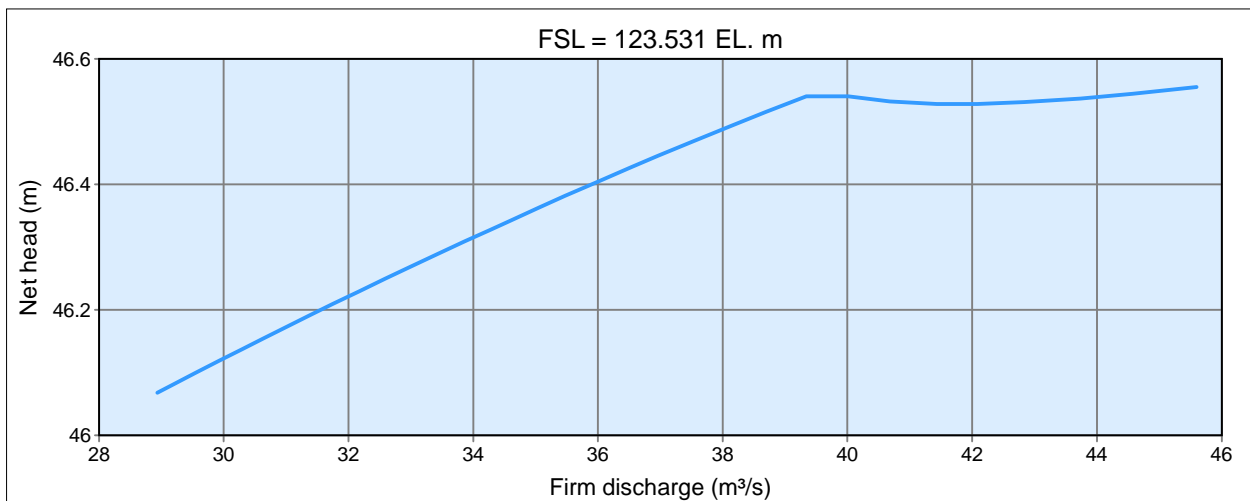
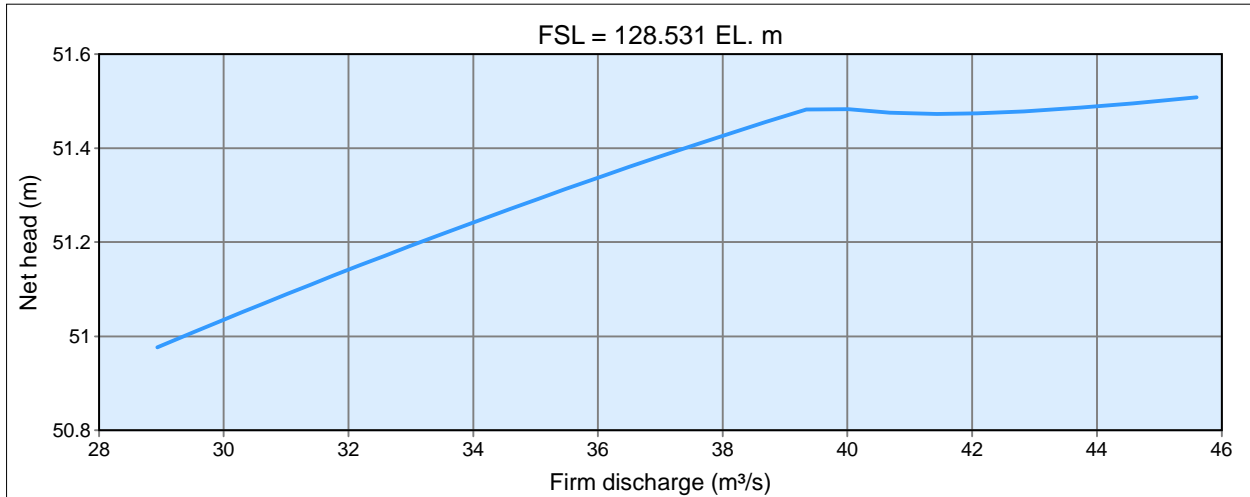
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Simulation summary (average values)



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
28.935	14.051	133.531	24.586	11.720	102.678
29.191	14.176	133.531	24.712	11.777	103.181
29.535	14.344	133.531	24.879	11.852	103.840
29.937	14.529	133.531	25.070	11.929	104.517
30.294	14.704	133.531	25.237	12.004	105.167
30.632	14.870	133.531	25.391	12.075	105.791
31.021	15.061	133.531	25.564	12.151	106.457
31.403	15.249	133.531	25.730	12.226	107.113
31.755	15.422	133.531	25.880	12.290	107.672
32.175	15.628	133.531	26.055	12.366	108.345
32.584	15.829	133.531	26.220	12.437	108.967
32.966	16.016	133.531	26.371	12.502	109.535
33.392	16.226	133.531	26.536	12.573	110.153
33.863	16.457	133.531	26.713	12.648	110.809
34.252	16.648	133.531	26.855	12.708	111.337
34.601	16.819	133.531	26.979	12.760	111.789
35.050	17.039	133.531	27.134	12.824	112.357
35.473	17.246	133.531	27.275	12.882	112.863
36.018	17.511	133.531	27.451	12.953	113.481
36.501	17.748	133.531	27.604	13.015	114.021
36.958	17.970	133.531	27.742	13.072	114.522
37.534	18.251	133.531	27.912	13.145	115.163
38.164	18.559	133.531	28.091	13.211	115.736
38.691	18.816	133.531	28.235	13.269	116.244
39.338	19.120	133.531	28.404	13.331	116.787
40.010	19.449	133.526	28.770	13.503	118.294
40.682	19.778	133.519	29.180	13.702	120.036
41.433	20.147	133.512	29.574	13.898	121.748
42.083	20.465	133.505	29.878	14.044	123.028
42.831	20.832	133.497	30.194	14.187	124.274
43.739	21.277	133.486	30.532	14.342	125.629
44.574	21.685	133.477	30.806	14.466	126.716
45.596	22.183	133.465	31.097	14.589	127.789

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Simulation summary (average values)

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Salable capacity factor (%)	Head loss (m)	Net head (m)
28.935	79.743	2.647	55.884
29.191	79.427	2.632	55.899
29.535	78.997	2.612	55.919
29.937	78.501	2.588	55.943
30.294	78.048	2.567	55.963
30.632	77.635	2.548	55.983
31.021	77.133	2.526	56.005
31.403	76.654	2.504	56.027
31.755	76.190	2.485	56.046
32.175	75.655	2.461	56.070
32.584	75.124	2.439	56.092
32.966	74.632	2.418	56.112
33.392	74.084	2.396	56.135
33.863	73.479	2.371	56.160
34.252	72.981	2.351	56.180
34.601	72.532	2.333	56.198
35.050	71.958	2.310	56.221
35.473	71.417	2.288	56.242
36.018	70.719	2.261	56.269
36.501	70.110	2.238	56.293
36.958	69.546	2.216	56.315
37.534	68.859	2.189	56.342
38.164	68.057	2.160	56.371
38.691	67.423	2.137	56.394
39.338	66.661	2.108	56.423
40.010	66.378	2.102	56.425
40.682	66.235	2.102	56.418
41.433	65.953	2.095	56.416
42.083	65.610	2.086	56.418
42.831	65.110	2.073	56.424
43.739	64.444	2.053	56.434
44.574	63.778	2.032	56.444
45.596	62.877	2.005	56.460

Plant type: reservoir

Headwork type: dam

Operation mode: base



Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Simulation summary (average values)

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
28.935	12.806	128.531	24.586	10.686	93.619
29.191	12.921	128.531	24.712	10.739	94.083
29.535	13.075	128.531	24.879	10.808	94.691
29.937	13.255	128.531	25.070	10.888	95.393
30.294	13.415	128.531	25.237	10.956	95.987
30.632	13.566	128.531	25.391	11.020	96.552
31.021	13.739	128.531	25.564	11.089	97.153
31.403	13.909	128.531	25.730	11.156	97.745
31.755	14.065	128.531	25.880	11.214	98.249
32.175	14.252	128.531	26.055	11.283	98.856
32.584	14.434	128.531	26.220	11.347	99.416
32.966	14.604	128.531	26.371	11.406	99.928
33.392	14.793	128.531	26.536	11.469	100.483
33.863	15.003	128.531	26.713	11.537	101.074
34.252	15.176	128.531	26.855	11.591	101.549
34.601	15.331	128.531	26.979	11.637	101.955
35.050	15.530	128.531	27.134	11.696	102.467
35.473	15.718	128.531	27.275	11.748	102.929
36.018	15.960	128.531	27.451	11.813	103.494
36.501	16.175	128.531	27.604	11.869	103.986
36.958	16.378	128.531	27.742	11.921	104.441
37.534	16.633	128.531	27.912	11.988	105.026
38.164	16.915	128.531	28.091	12.049	105.561
38.691	17.150	128.531	28.235	12.103	106.031
39.338	17.437	128.531	28.404	12.167	106.592
40.010	17.736	128.526	28.770	12.323	107.953
40.682	18.034	128.519	29.180	12.503	109.528
41.433	18.367	128.511	29.574	12.679	111.073
42.083	18.656	128.504	29.878	12.811	112.227
42.831	18.988	128.495	30.194	12.940	113.349
43.739	19.390	128.485	30.532	13.079	114.566
44.574	19.761	128.475	30.806	13.191	115.546
45.596	20.214	128.462	31.097	13.302	116.521

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Salable capacity factor (%)	Head loss (m)	Net head (m)
28.935	79.774	2.554	50.977
29.191	79.458	2.540	50.991
29.535	79.029	2.521	51.010
29.937	78.534	2.499	51.032
30.294	78.082	2.480	51.051
30.632	77.669	2.462	51.069
31.021	77.168	2.441	51.090
31.403	76.689	2.421	51.110
31.755	76.227	2.402	51.129
32.175	75.692	2.380	51.150
32.584	75.162	2.360	51.171
32.966	74.670	2.340	51.191
33.392	74.123	2.319	51.212
33.863	73.519	2.296	51.235
34.252	73.023	2.277	51.254
34.601	72.573	2.260	51.271
35.050	72.001	2.238	51.293
35.473	71.461	2.218	51.313
36.018	70.764	2.193	51.338
36.501	70.156	2.171	51.360
36.958	69.592	2.150	51.381
37.534	68.906	2.125	51.406
38.164	68.105	2.098	51.433
38.691	67.471	2.075	51.455
39.338	66.711	2.049	51.482
40.010	66.427	2.043	51.483
40.682	66.282	2.044	51.475
41.433	65.998	2.038	51.473
42.083	65.654	2.030	51.474
42.831	65.154	2.017	51.478
43.739	64.486	1.999	51.486
44.574	63.820	1.980	51.495
45.596	62.917	1.954	51.508

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Simulation summary (average values)

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
28.935	11.567	123.531	24.586	9.656	84.599
29.191	11.670	123.531	24.712	9.703	85.013
29.535	11.808	123.531	24.879	9.765	85.557
29.937	11.969	123.531	25.070	9.837	86.184
30.294	12.113	123.531	25.237	9.898	86.715
30.632	12.248	123.531	25.391	9.956	87.224
31.021	12.404	123.531	25.564	10.018	87.768
31.403	12.558	123.531	25.730	10.079	88.303
31.755	12.698	123.531	25.880	10.130	88.755
32.175	12.866	123.531	26.055	10.192	89.295
32.584	13.029	123.531	26.220	10.249	89.793
32.966	13.181	123.531	26.371	10.301	90.249
33.392	13.350	123.531	26.536	10.357	90.743
33.863	13.538	123.531	26.713	10.417	91.268
34.252	13.693	123.531	26.855	10.465	91.689
34.601	13.831	123.531	26.979	10.507	92.050
35.050	14.010	123.531	27.134	10.558	92.504
35.473	14.178	123.531	27.275	10.605	92.914
36.018	14.410	123.531	27.451	10.674	93.516
36.501	14.604	123.531	27.604	10.725	93.961
36.958	14.787	123.531	27.742	10.772	94.376
37.534	15.018	123.531	27.912	10.833	94.906
38.164	15.270	123.531	28.091	10.887	95.380
38.691	15.482	123.531	28.235	10.935	95.801
39.338	15.741	123.531	28.404	10.993	96.308
40.010	16.010	123.526	28.770	11.133	97.535
40.682	16.277	123.518	29.180	11.294	98.941
41.433	16.575	123.510	29.574	11.452	100.320
42.083	16.833	123.503	29.878	11.569	101.347
42.831	17.130	123.494	30.194	11.683	102.344
43.739	17.490	123.483	30.532	11.807	103.423
44.574	17.822	123.472	30.806	11.906	104.290
45.596	18.246	123.459	31.097	12.017	105.262

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Salable capacity factor (%)	Head loss (m)	Net head (m)
28.935	79.812	2.463	46.068
29.191	79.497	2.450	46.081
29.535	79.069	2.432	46.099
29.937	78.575	2.412	46.119
30.294	78.123	2.394	46.137
30.632	77.711	2.377	46.154
31.021	77.211	2.358	46.173
31.403	76.734	2.339	46.192
31.755	76.272	2.322	46.209
32.175	75.738	2.301	46.230
32.584	75.209	2.282	46.249
32.966	74.718	2.264	46.267
33.392	74.172	2.244	46.287
33.863	73.569	2.222	46.309
34.252	73.074	2.204	46.327
34.601	72.625	2.188	46.342
35.050	72.054	2.168	46.363
35.473	71.514	2.149	46.381
36.018	70.818	2.126	46.405
36.501	70.211	2.105	46.426
36.958	69.649	2.086	46.445
37.534	68.964	2.062	46.469
38.164	68.164	2.036	46.495
38.691	67.531	2.015	46.515
39.338	66.772	1.990	46.541
40.010	66.488	1.985	46.541
40.682	66.340	1.986	46.532
41.433	66.055	1.982	46.528
42.083	65.709	1.974	46.528
42.831	65.207	1.963	46.531
43.739	64.538	1.946	46.537
44.574	63.871	1.928	46.544
45.596	62.967	1.904	46.555

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Simulation summary (average values)

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
28.935	10.317	118.531	24.586	8.618	75.500
29.191	10.408	118.531	24.712	8.659	75.866
29.535	10.530	118.531	24.879	8.714	76.345
29.937	10.673	118.531	25.070	8.777	76.898
30.294	10.799	118.531	25.237	8.830	77.365
30.632	10.919	118.531	25.391	8.881	77.813
31.021	11.057	118.531	25.564	8.936	78.291
31.403	11.193	118.531	25.730	8.990	78.762
31.755	11.317	118.531	25.880	9.035	79.160
32.175	11.465	118.531	26.055	9.089	79.635
32.584	11.609	118.531	26.220	9.139	80.072
32.966	11.743	118.531	26.371	9.185	80.472
33.392	11.893	118.531	26.536	9.234	80.905
33.863	12.087	118.531	26.713	9.309	81.558
34.252	12.225	118.531	26.855	9.352	81.936
34.601	12.349	118.531	26.979	9.389	82.258
35.050	12.508	118.531	27.134	9.435	82.666
35.473	12.658	118.531	27.275	9.477	83.033
36.018	12.852	118.531	27.451	9.529	83.481
36.501	13.023	118.531	27.604	9.573	83.872
36.958	13.185	118.531	27.742	9.615	84.235
37.534	13.389	118.531	27.912	9.668	84.700
38.164	13.612	118.531	28.091	9.715	85.114
38.691	13.798	118.531	28.235	9.757	85.481
39.338	14.027	118.531	28.404	9.808	85.925
40.010	14.265	118.526	28.770	9.932	87.005
40.682	14.501	118.518	29.180	10.073	88.244
41.433	14.764	118.509	29.574	10.212	89.456
42.083	14.992	118.501	29.878	10.315	90.358
42.831	15.287	118.492	30.194	10.437	91.429
43.739	15.608	118.481	30.532	10.547	92.389
44.574	15.904	118.470	30.806	10.635	93.160
45.596	16.265	118.456	31.097	10.723	93.924

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Salable capacity factor (%)	Head loss (m)	Net head (m)
28.935	79.860	2.374	41.157
29.191	79.545	2.362	41.169
29.535	79.119	2.346	41.185
29.937	78.626	2.327	41.204
30.294	78.176	2.310	41.221
30.632	77.765	2.294	41.237
31.021	77.266	2.276	41.255
31.403	76.790	2.259	41.272
31.755	76.329	2.243	41.288
32.175	75.797	2.224	41.307
32.584	75.269	2.206	41.325
32.966	74.779	2.189	41.342
33.392	74.234	2.170	41.361
33.863	73.632	2.150	41.381
34.252	73.138	2.133	41.397
34.601	72.690	2.119	41.412
35.050	72.120	2.100	41.431
35.473	71.582	2.082	41.449
36.018	70.887	2.060	41.471
36.501	70.282	2.041	41.490
36.958	69.721	2.023	41.508
37.534	69.037	2.000	41.531
38.164	68.238	1.976	41.554
38.691	67.607	1.957	41.574
39.338	66.849	1.933	41.598
40.010	66.563	1.929	41.597
40.682	66.413	1.931	41.587
41.433	66.125	1.927	41.582
42.083	65.778	1.920	41.581
42.831	65.274	1.910	41.582
43.739	64.604	1.894	41.587
44.574	63.935	1.878	41.592
45.596	63.030	1.855	41.601

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 113.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
28.935	9.053	113.531	24.586	7.568	66.302

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Simulation summary (average values)

FSL = 113.531 El. m

<b>Firm discharge (m<sup>3</sup>/s)</b>	<b>Salable capacity factor (%)</b>	<b>Head loss (m)</b>	<b>Net head (m)</b>
28.935	79.922	2.287	36.243

Plant type: reservoir

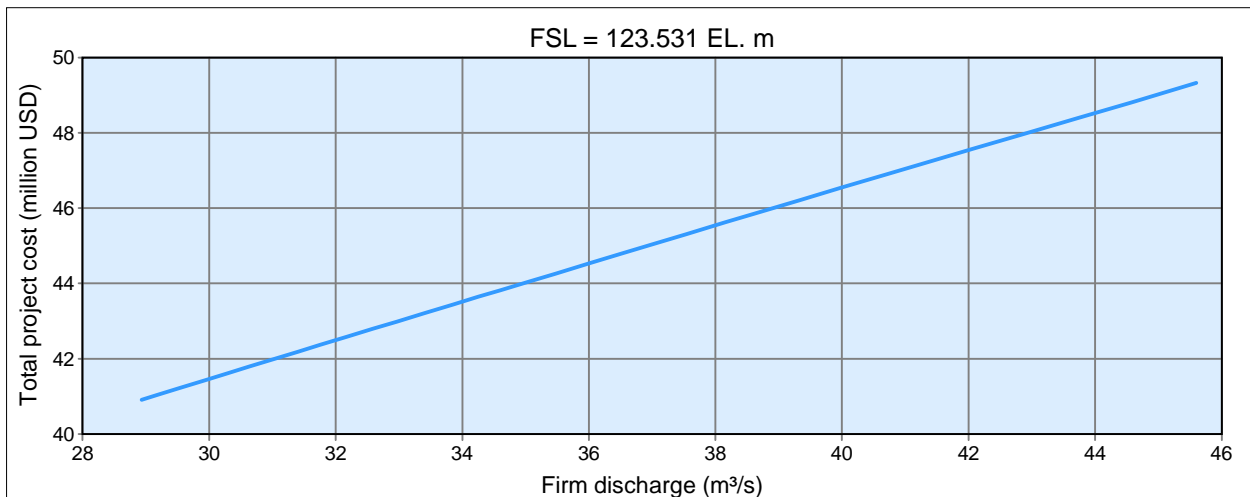
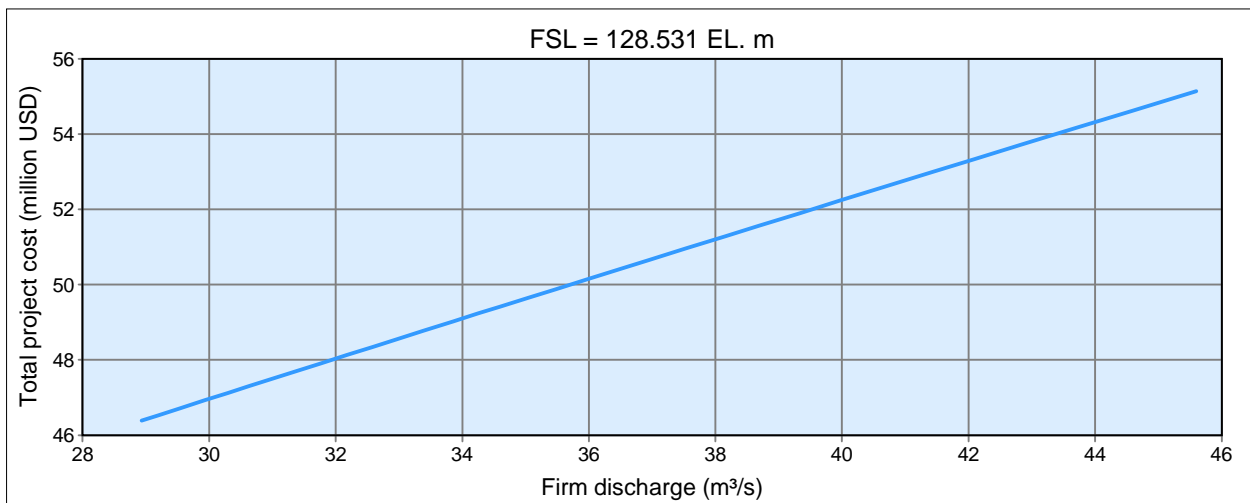
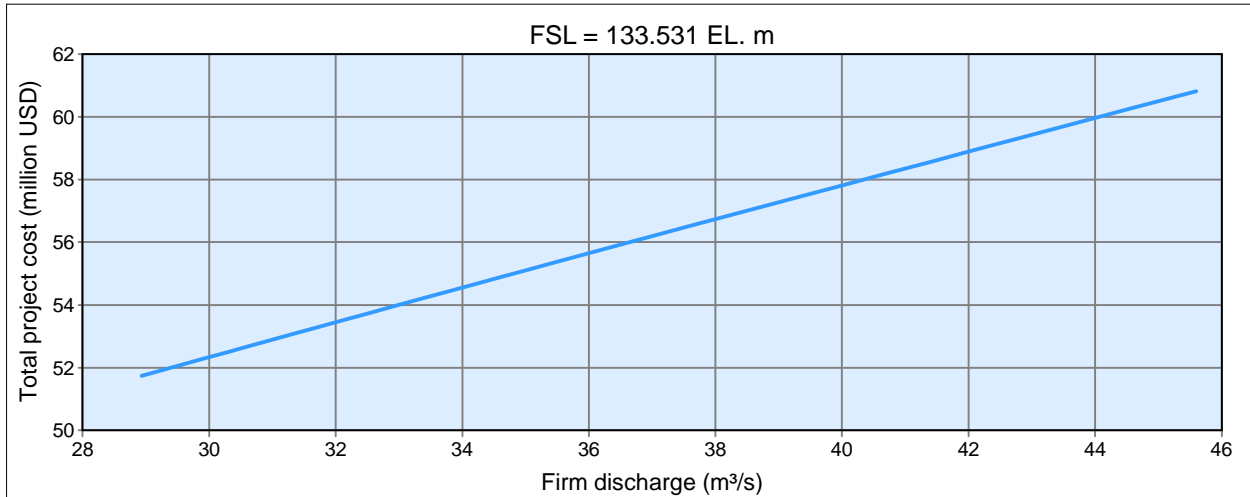
Headwork type: dam

Operation mode: base



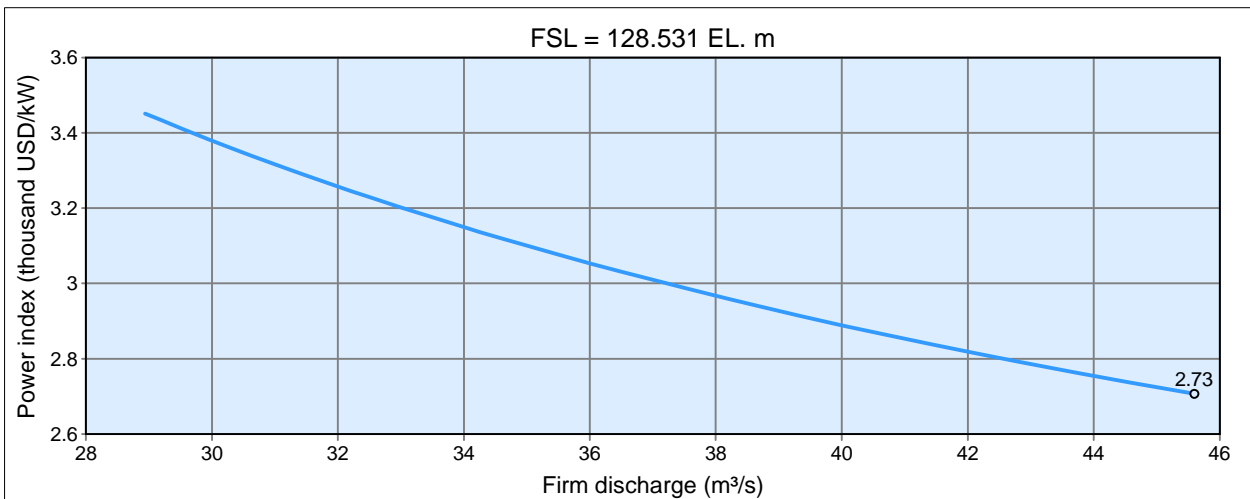
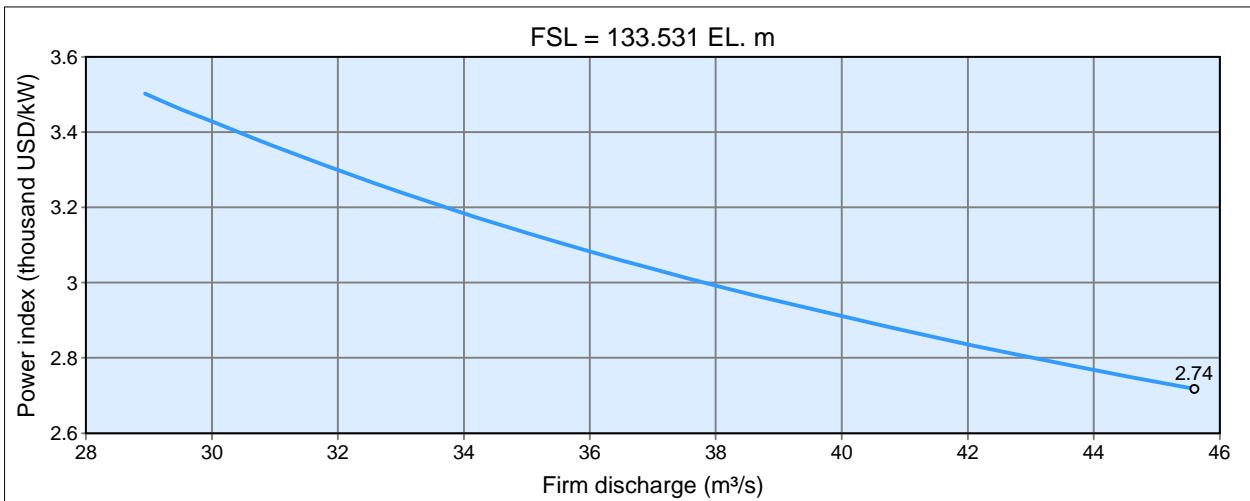
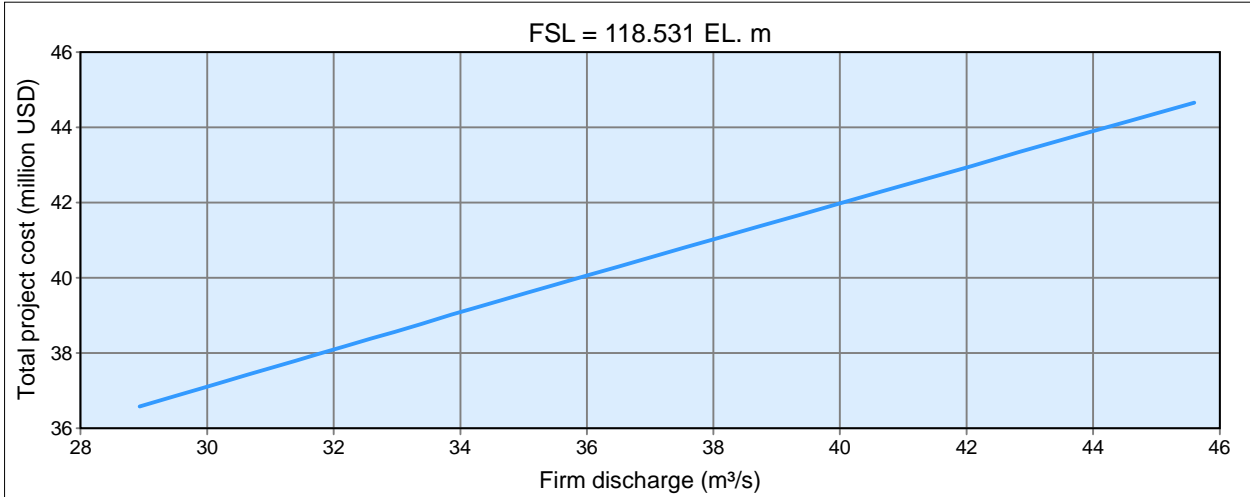
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices



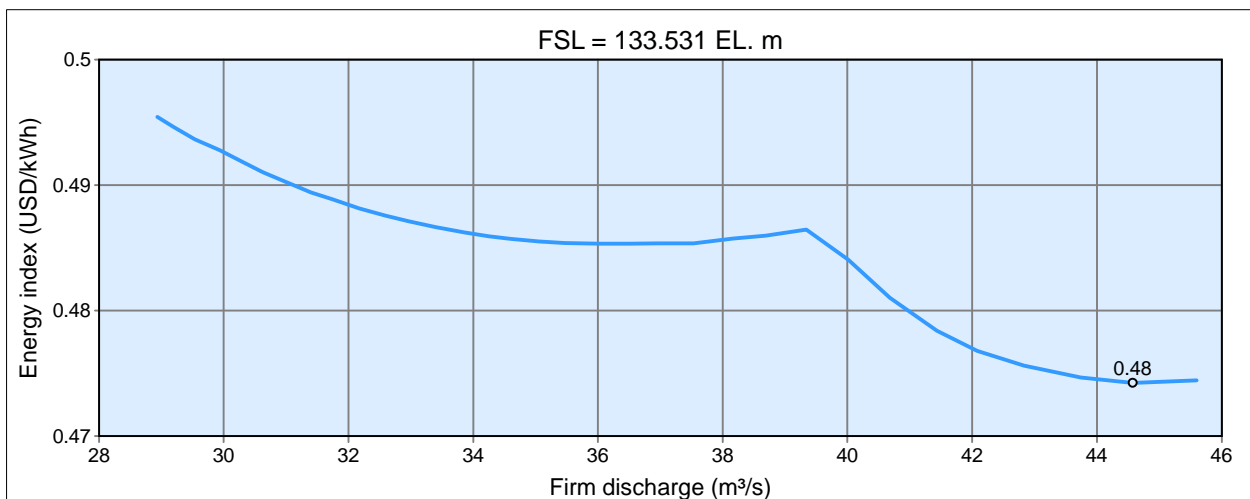
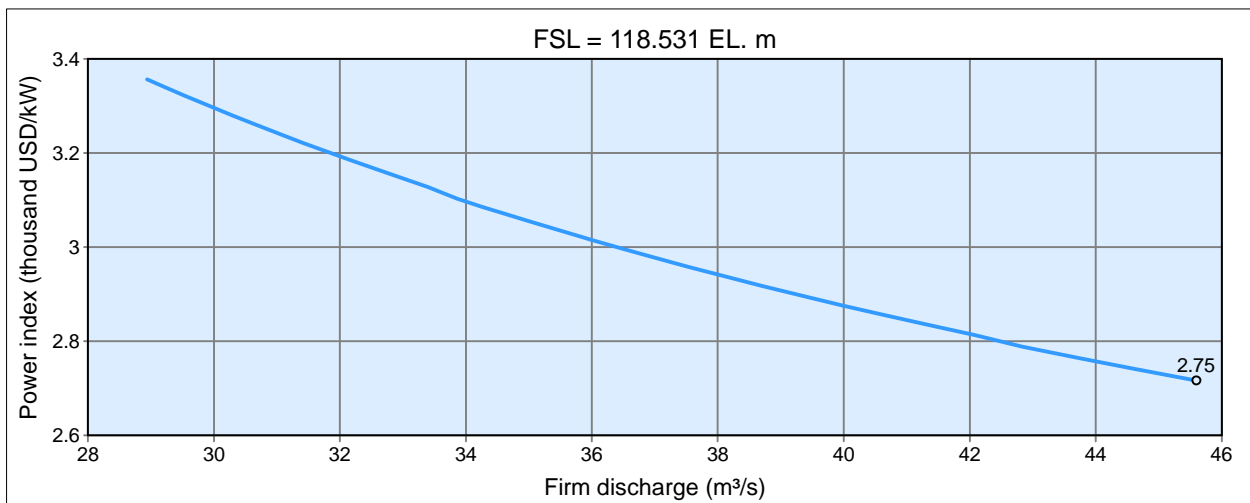
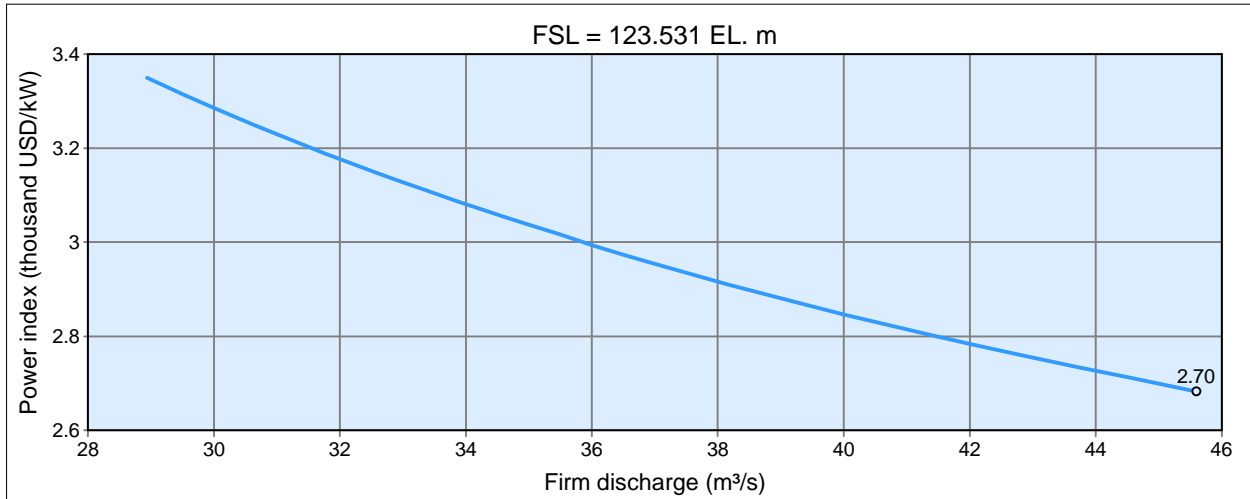
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices



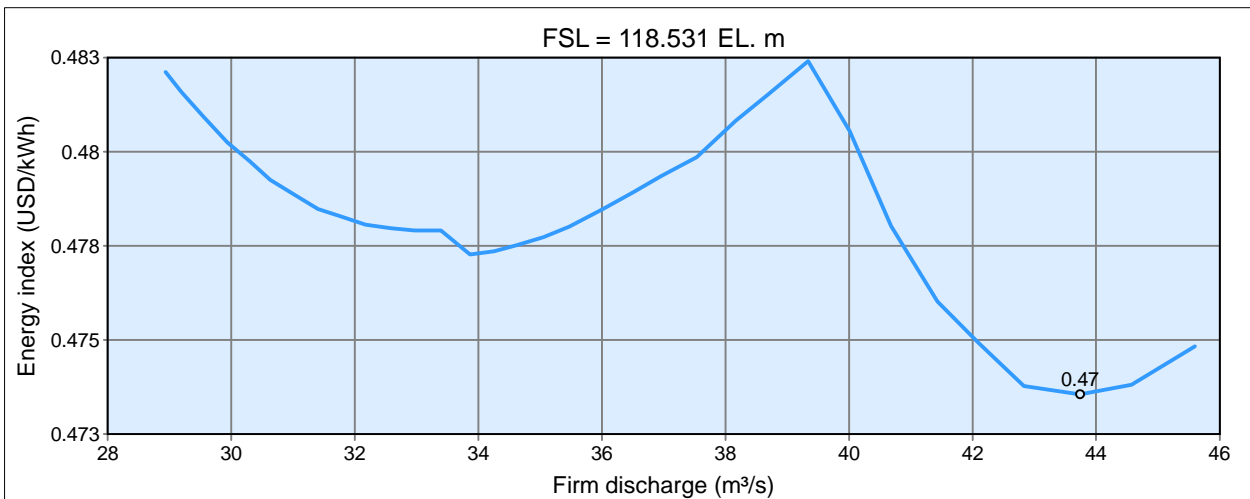
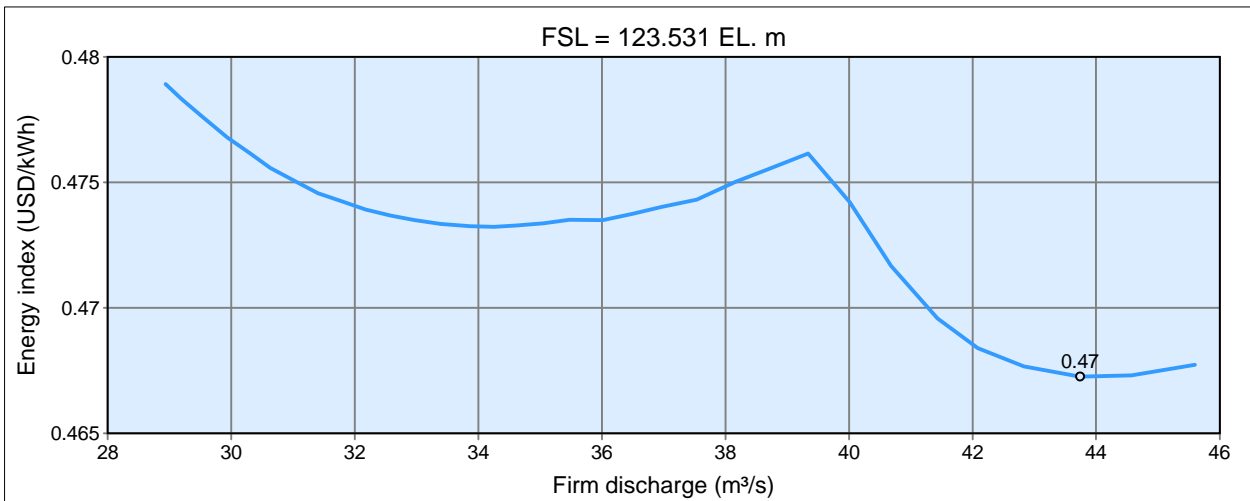
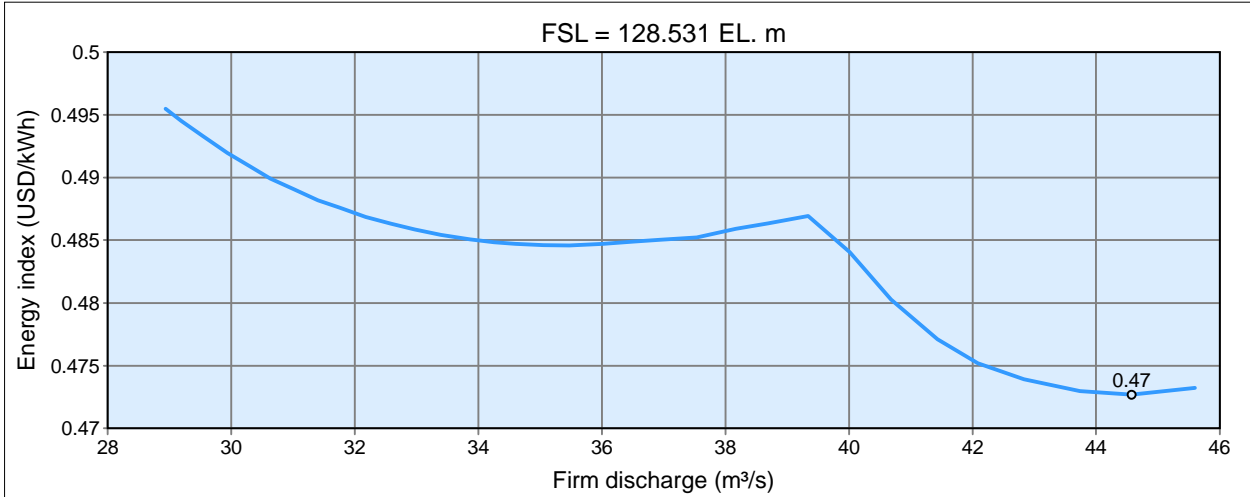
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	28.935	29.191	29.535	29.937	30.294	30.632
<b>EPC COST</b>	41.02	41.14	41.29	41.47	41.63	41.78
1. Civil works	30.85	30.89	30.94	31.01	31.06	31.12
· Dam and intake	23.32	23.32	23.33	23.33	23.34	23.34
· Headrace tunnel	2.89	2.91	2.93	2.95	2.97	2.99
· Surgetank	0.98	0.99	1.00	1.01	1.02	1.03
· Penstock foundations	0.14	0.14	0.14	0.14	0.14	0.14
· Exposed powerhouse	1.49	1.50	1.52	1.54	1.55	1.57
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.47	1.47	1.47	1.48	1.48	1.48
2. Metal works	1.74	1.75	1.77	1.80	1.82	1.84
· Penstock steel pipe	0.95	0.96	0.97	0.98	0.99	1.01
· Gates and trasracks	0.79	0.79	0.80	0.81	0.82	0.83
3. Equipment	7.80	7.85	7.93	8.02	8.10	8.18
· Plant equipment	7.32	7.38	7.46	7.54	7.62	7.70
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.35	0.35	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	10.72	10.75	10.79	10.83	10.87	10.91
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	2.05	2.06	2.06	2.07	2.08	2.09
3. Value added tax	4.10	4.11	4.13	4.15	4.16	4.18
4. Management and administration	2.87	2.88	2.89	2.90	2.91	2.92
5. Interest during construction	1.18	1.18	1.19	1.19	1.20	1.20
<b>TOTAL PROJECT COST</b>	51.74	51.89	52.08	52.30	52.50	52.68
Power index (thousand USD/kW)	3.68	3.66	3.63	3.60	3.57	3.54
Energy index (USD/kWh)	0.504	0.503	0.502	0.500	0.499	0.498

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

Firm discharge (m³/s)	31.021	31.403	31.755	32.175	32.584	32.966
<b>EPC COST</b>	41.95	42.12	42.28	42.47	42.65	42.82
1. Civil works	31.18	31.24	31.29	31.36	31.42	31.48
· Dam and intake	23.35	23.35	23.36	23.36	23.37	23.37
· Headrace tunnel	3.01	3.03	3.05	3.07	3.09	3.11
· Surgetank	1.05	1.06	1.07	1.08	1.10	1.11
· Penstock foundations	0.14	0.14	0.14	0.14	0.14	0.15
· Exposed powerhouse	1.59	1.61	1.62	1.64	1.66	1.68
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.48	1.49	1.49	1.49	1.50	1.50
2. Metal works	1.86	1.88	1.90	1.93	1.95	1.98
· Penstock steel pipe	1.02	1.03	1.04	1.06	1.07	1.08
· Gates and trasracks	0.84	0.85	0.86	0.87	0.88	0.89
3. Equipment	8.27	8.35	8.43	8.53	8.62	8.71
· Plant equipment	7.79	7.88	7.96	8.05	8.14	8.23
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	10.95	10.99	11.03	11.08	11.12	11.16
1. Land acquisition	0.52	0.52	0.52	0.52	0.52	0.52
2. Contingencies	2.10	2.11	2.11	2.12	2.13	2.14
3. Value added tax	4.20	4.21	4.23	4.25	4.26	4.28
4. Management and administration	2.94	2.95	2.96	2.97	2.99	3.00
5. Interest during construction	1.20	1.21	1.21	1.22	1.22	1.23
<b>TOTAL PROJECT COST</b>	52.90	53.11	53.31	53.54	53.77	53.98
Power index (thousand USD/kW)	3.51	3.48	3.46	3.43	3.40	3.37
Energy index (USD/kWh)	0.497	0.496	0.495	0.494	0.493	0.493

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

Firm discharge (m³/s)	33.392	33.863	34.252	34.601	35.050	35.473
<b>EPC COST</b>	43.01	43.21	43.39	43.54	43.74	43.92
1. Civil works	31.54	31.62	31.68	31.73	31.80	31.86
· Dam and intake	23.38	23.38	23.39	23.39	23.40	23.41
· Headrace tunnel	3.13	3.16	3.18	3.20	3.22	3.24
· Surgetank	1.12	1.14	1.15	1.16	1.18	1.19
· Penstock foundations	0.15	0.15	0.15	0.15	0.15	0.15
· Exposed powerhouse	1.70	1.72	1.74	1.76	1.78	1.80
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.50	1.51	1.51	1.51	1.51	1.52
2. Metal works	2.00	2.03	2.05	2.08	2.10	2.13
· Penstock steel pipe	1.10	1.11	1.12	1.14	1.15	1.16
· Gates and trasracks	0.91	0.92	0.93	0.94	0.95	0.96
3. Equipment	8.81	8.91	9.00	9.08	9.18	9.27
· Plant equipment	8.33	8.43	8.52	8.60	8.70	8.80
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.36	0.36	0.36	0.36
<b>MANAGEMENT COST</b>	11.21	11.26	11.31	11.34	11.39	11.44
1. Land acquisition	0.52	0.52	0.52	0.52	0.52	0.52
2. Contingencies	2.15	2.16	2.17	2.18	2.19	2.20
3. Value added tax	4.30	4.32	4.34	4.35	4.37	4.39
4. Management and administration	3.01	3.02	3.04	3.05	3.06	3.07
5. Interest during construction	1.23	1.24	1.24	1.25	1.25	1.26
<b>TOTAL PROJECT COST</b>	54.22	54.48	54.69	54.88	55.13	55.36
Power index (thousand USD/kW)	3.34	3.31	3.29	3.26	3.24	3.21
Energy index (USD/kWh)	0.492	0.492	0.491	0.491	0.491	0.491

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	36.018	36.501	36.958	37.534	38.164	38.691
<b>EPC COST</b>	44.16	44.37	44.57	44.82	45.09	45.32
1. Civil works	31.95	32.02	32.09	32.17	32.27	32.35
· Dam and intake	23.41	23.42	23.43	23.43	23.44	23.45
· Headrace tunnel	3.27	3.29	3.32	3.34	3.38	3.40
· Surgetank	1.21	1.22	1.24	1.26	1.28	1.29
· Penstock foundations	0.15	0.15	0.15	0.15	0.15	0.15
· Exposed powerhouse	1.83	1.85	1.87	1.90	1.93	1.95
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.52	1.52	1.53	1.53	1.54	1.54
2. Metal works	2.16	2.19	2.22	2.25	2.29	2.32
· Penstock steel pipe	1.18	1.20	1.21	1.23	1.25	1.27
· Gates and trasracks	0.98	0.99	1.00	1.02	1.04	1.05
3. Equipment	9.40	9.50	9.61	9.73	9.87	9.99
· Plant equipment	8.92	9.03	9.13	9.26	9.40	9.51
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.36	0.36	0.36	0.36	0.36	0.36
<b>MANAGEMENT COST</b>	11.50	11.55	11.60	11.66	11.73	11.79
1. Land acquisition	0.52	0.52	0.52	0.52	0.52	0.52
2. Contingencies	2.21	2.22	2.23	2.24	2.25	2.27
3. Value added tax	4.42	4.44	4.46	4.48	4.51	4.53
4. Management and administration	3.09	3.11	3.12	3.14	3.16	3.17
5. Interest during construction	1.26	1.27	1.28	1.28	1.29	1.30
<b>TOTAL PROJECT COST</b>	55.66	55.92	56.17	56.48	56.82	57.11
Power index (thousand USD/kW)	3.18	3.15	3.13	3.09	3.06	3.04
Energy index (USD/kWh)	0.490	0.490	0.490	0.490	0.491	0.491

Plant type: reservoir

Headwork type: dam

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	39.338	40.010	40.682	41.433	42.083	42.831
<b>EPC COST</b>	45.60	45.89	46.18	46.50	46.79	47.11
1. Civil works	32.45	32.55	32.65	32.76	32.86	32.97
· Dam and intake	23.46	23.47	23.48	23.49	23.49	23.51
· Headrace tunnel	3.43	3.47	3.50	3.53	3.56	3.60
· Surgetank	1.32	1.34	1.36	1.38	1.40	1.43
· Penstock foundations	0.15	0.15	0.16	0.16	0.16	0.16
· Exposed powerhouse	1.98	2.01	2.05	2.08	2.11	2.15
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.55	1.55	1.55	1.56	1.56	1.57
2. Metal works	2.36	2.40	2.44	2.49	2.52	2.57
· Penstock steel pipe	1.29	1.31	1.34	1.36	1.38	1.41
· Gates and trasracks	1.07	1.09	1.10	1.12	1.14	1.16
3. Equipment	10.13	10.28	10.43	10.59	10.74	10.90
· Plant equipment	9.65	9.80	9.95	10.11	10.26	10.42
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.36	0.37	0.37	0.37	0.37	0.37
<b>MANAGEMENT COST</b>	11.86	11.93	12.00	12.08	12.15	12.23
1. Land acquisition	0.52	0.52	0.52	0.52	0.52	0.52
2. Contingencies	2.28	2.29	2.31	2.33	2.34	2.36
3. Value added tax	4.56	4.59	4.62	4.65	4.68	4.71
4. Management and administration	3.19	3.21	3.23	3.26	3.27	3.30
5. Interest during construction	1.30	1.31	1.32	1.33	1.34	1.35
<b>TOTAL PROJECT COST</b>	57.45	57.82	58.18	58.59	58.94	59.34
Power index (thousand USD/kW)	3.00	2.97	2.94	2.91	2.88	2.85
Energy index (USD/kWh)	0.492	0.489	0.485	0.481	0.479	0.477

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 133.531 El. m

Unit: million USD

<b>Firm discharge (m³/s)</b>	<b>43.739</b>	<b>44.574</b>	<b>45.596</b>
<b>EPC COST</b>	<b>47.50</b>	<b>47.86</b>	<b>48.29</b>
1. Civil works	33.10	33.22	33.37
· Dam and intake	23.52	23.53	23.54
· Headrace tunnel	3.64	3.68	3.73
· Surgetank	1.46	1.48	1.52
· Penstock foundations	0.16	0.16	0.16
· Exposed powerhouse	2.19	2.23	2.28
· Road	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30
· Miscellaneous civil works	1.58	1.58	1.59
2. Metal works	2.62	2.67	2.74
· Penstock steel pipe	1.44	1.46	1.50
· Gates and trasracks	1.19	1.21	1.24
3. Equipment	11.10	11.28	11.51
· Plant equipment	10.62	10.81	11.03
· Transmission line	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30
· Project office	0.30	0.30	0.30
5. Engineering and supervision	0.37	0.37	0.37
<b>MANAGEMENT COST</b>	<b>12.33</b>	<b>12.42</b>	<b>12.53</b>
1. Land acquisition	0.52	0.52	0.52
2. Contingencies	2.37	2.39	2.41
3. Value added tax	4.75	4.79	4.83
4. Management and administration	3.32	3.35	3.38
5. Interest during construction	1.36	1.37	1.38
<b>TOTAL PROJECT COST</b>	<b>59.83</b>	<b>60.27</b>	<b>60.82</b>
Power index (thousand USD/kW)	2.81	2.78	>>2.74
Energy index (USD/kWh)	0.476	>>0.476	0.476

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	28.935	29.191	29.535	29.937	30.294	30.632
<b>EPC COST</b>	36.73	36.84	36.99	37.17	37.32	37.47
1. Civil works	26.91	26.94	27.00	27.06	27.11	27.16
· Dam and intake	19.70	19.70	19.71	19.71	19.72	19.72
· Headrace tunnel	2.89	2.91	2.93	2.95	2.97	2.99
· Surgetank	0.98	0.98	1.00	1.01	1.02	1.03
· Penstock foundations	0.13	0.13	0.13	0.13	0.13	0.13
· Exposed powerhouse	1.37	1.38	1.40	1.41	1.43	1.44
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.28	1.28	1.29	1.29	1.29	1.29
2. Metal works	1.69	1.71	1.73	1.75	1.77	1.79
· Penstock steel pipe	0.91	0.91	0.93	0.94	0.95	0.96
· Gates and trasracks	0.79	0.79	0.80	0.81	0.82	0.83
3. Equipment	7.50	7.55	7.63	7.72	7.80	7.87
· Plant equipment	7.02	7.08	7.15	7.24	7.32	7.39
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.34	0.34	0.34	0.34	0.34
<b>MANAGEMENT COST</b>	9.65	9.68	9.72	9.76	9.80	9.84
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.84	1.84	1.85	1.86	1.87	1.87
3. Value added tax	3.67	3.68	3.70	3.72	3.73	3.75
4. Management and administration	2.57	2.58	2.59	2.60	2.61	2.62
5. Interest during construction	1.06	1.06	1.07	1.07	1.08	1.08
<b>TOTAL PROJECT COST</b>	46.39	46.53	46.71	46.93	47.12	47.30
Power index (thousand USD/kW)	3.62	3.60	3.57	3.54	3.51	3.49
Energy index (USD/kWh)	0.495	0.495	0.493	0.492	0.491	0.490

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	31.021	31.403	31.755	32.175	32.584	32.966
<b>EPC COST</b>	37.63	37.80	37.95	38.13	38.30	38.47
1. Civil works	27.22	27.28	27.33	27.40	27.46	27.52
· Dam and intake	19.73	19.73	19.74	19.74	19.75	19.75
· Headrace tunnel	3.01	3.03	3.05	3.07	3.09	3.11
· Surgetank	1.04	1.06	1.07	1.08	1.09	1.11
· Penstock foundations	0.13	0.13	0.13	0.13	0.13	0.13
· Exposed powerhouse	1.46	1.48	1.49	1.51	1.53	1.54
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.30	1.30	1.30	1.30	1.31	1.31
2. Metal works	1.81	1.84	1.86	1.88	1.91	1.93
· Penstock steel pipe	0.97	0.98	1.00	1.01	1.02	1.03
· Gates and trasracks	0.84	0.85	0.86	0.87	0.88	0.89
3. Equipment	7.95	8.04	8.11	8.20	8.29	8.37
· Plant equipment	7.48	7.56	7.63	7.73	7.81	7.90
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.34	0.34	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	9.88	9.92	9.96	10.00	10.04	10.09
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.88	1.89	1.90	1.91	1.92	1.92
3. Value added tax	3.76	3.78	3.79	3.81	3.83	3.85
4. Management and administration	2.63	2.65	2.66	2.67	2.68	2.69
5. Interest during construction	1.09	1.09	1.10	1.10	1.10	1.11
<b>TOTAL PROJECT COST</b>	47.51	47.72	47.91	48.13	48.35	48.55
Power index (thousand USD/kW)	3.46	3.43	3.41	3.38	3.35	3.32
Energy index (USD/kWh)	0.489	0.488	0.488	0.487	0.486	0.486

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	33.392	33.863	34.252	34.601	35.050	35.473
<b>EPC COST</b>	38.65	38.85	39.01	39.16	39.35	39.53
1. Civil works	27.58	27.65	27.71	27.76	27.83	27.89
· Dam and intake	19.76	19.76	19.77	19.77	19.78	19.79
· Headrace tunnel	3.13	3.16	3.18	3.20	3.22	3.24
· Surgetank	1.12	1.14	1.15	1.16	1.17	1.19
· Penstock foundations	0.13	0.13	0.13	0.13	0.13	0.14
· Exposed powerhouse	1.56	1.58	1.60	1.61	1.63	1.65
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.31	1.32	1.32	1.32	1.33	1.33
2. Metal works	1.95	1.98	2.00	2.02	2.05	2.08
· Penstock steel pipe	1.05	1.06	1.07	1.08	1.10	1.11
· Gates and trasracks	0.91	0.92	0.93	0.94	0.95	0.96
3. Equipment	8.47	8.57	8.65	8.73	8.82	8.91
· Plant equipment	7.99	8.09	8.17	8.25	8.35	8.44
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	10.13	10.18	10.22	10.26	10.31	10.35
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.93	1.94	1.95	1.96	1.97	1.98
3. Value added tax	3.86	3.88	3.90	3.92	3.94	3.95
4. Management and administration	2.71	2.72	2.73	2.74	2.75	2.77
5. Interest during construction	1.11	1.12	1.12	1.13	1.13	1.14
<b>TOTAL PROJECT COST</b>	48.78	49.03	49.23	49.42	49.66	49.88
Power index (thousand USD/kW)	3.30	3.27	3.24	3.22	3.20	3.17
Energy index (USD/kWh)	0.485	0.485	0.485	0.485	0.485	0.485

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	36.018	36.501	36.958	37.534	38.164	38.691
<b>EPC COST</b>	39.76	39.96	40.15	40.40	40.66	40.88
1. Civil works	27.97	28.04	28.11	28.19	28.28	28.36
· Dam and intake	19.79	19.80	19.81	19.81	19.82	19.83
· Headrace tunnel	3.27	3.29	3.32	3.34	3.38	3.40
· Surgetank	1.21	1.22	1.24	1.25	1.27	1.29
· Penstock foundations	0.14	0.14	0.14	0.14	0.14	0.14
· Exposed powerhouse	1.68	1.70	1.72	1.74	1.77	1.79
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.33	1.34	1.34	1.34	1.35	1.35
2. Metal works	2.11	2.14	2.16	2.20	2.23	2.26
· Penstock steel pipe	1.13	1.14	1.16	1.18	1.20	1.21
· Gates and trasracks	0.98	0.99	1.00	1.02	1.04	1.05
3. Equipment	9.03	9.13	9.23	9.35	9.49	9.60
· Plant equipment	8.55	8.66	8.75	8.88	9.01	9.12
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35	0.36	0.36	0.36
<b>MANAGEMENT COST</b>	10.41	10.46	10.51	10.57	10.63	10.69
1. Land acquisition	0.51	0.52	0.52	0.52	0.52	0.52
2. Contingencies	1.99	2.00	2.01	2.02	2.03	2.04
3. Value added tax	3.98	4.00	4.02	4.04	4.07	4.09
4. Management and administration	2.78	2.80	2.81	2.83	2.85	2.86
5. Interest during construction	1.14	1.15	1.16	1.16	1.17	1.18
<b>TOTAL PROJECT COST</b>	50.17	50.42	50.66	50.96	51.29	51.57
Power index (thousand USD/kW)	3.14	3.12	3.09	3.06	3.03	3.01
Energy index (USD/kWh)	0.485	0.485	0.485	0.485	0.486	0.486

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	39.338	40.010	40.682	41.433	42.083	42.831
<b>EPC COST</b>	41.15	41.43	41.71	42.02	42.29	42.60
1. Civil works	28.45	28.55	28.65	28.76	28.85	28.96
· Dam and intake	19.84	19.85	19.86	19.87	19.87	19.89
· Headrace tunnel	3.43	3.47	3.50	3.53	3.56	3.60
· Surgetank	1.31	1.33	1.35	1.38	1.40	1.42
· Penstock foundations	0.14	0.14	0.14	0.14	0.14	0.14
· Exposed powerhouse	1.82	1.85	1.88	1.91	1.94	1.97
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.35	1.36	1.36	1.37	1.37	1.38
2. Metal works	2.30	2.34	2.38	2.42	2.46	2.51
· Penstock steel pipe	1.23	1.25	1.28	1.30	1.32	1.34
· Gates and trasracks	1.07	1.09	1.10	1.12	1.14	1.16
3. Equipment	9.74	9.88	10.02	10.18	10.32	10.48
· Plant equipment	9.26	9.40	9.55	9.70	9.84	10.00
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.36	0.36	0.36	0.36	0.36	0.36
<b>MANAGEMENT COST</b>	10.75	10.82	10.89	10.97	11.04	11.11
1. Land acquisition	0.52	0.52	0.52	0.52	0.52	0.52
2. Contingencies	2.06	2.07	2.09	2.10	2.11	2.13
3. Value added tax	4.12	4.14	4.17	4.20	4.23	4.26
4. Management and administration	2.88	2.90	2.92	2.94	2.96	2.98
5. Interest during construction	1.18	1.19	1.20	1.21	1.21	1.22
<b>TOTAL PROJECT COST</b>	51.90	52.25	52.60	52.99	53.33	53.72
Power index (thousand USD/kW)	2.98	2.95	2.92	2.89	2.86	2.83
Energy index (USD/kWh)	0.487	0.484	0.480	0.477	0.475	0.474

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Preliminary cost estimates and evaluation indices

FSL = 128.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	43.739	44.574	45.596
EPC COST	42.98	43.32	43.74
1. Civil works	29.09	29.21	29.35
· Dam and intake	19.90	19.91	19.92
· Headrace tunnel	3.64	3.68	3.73
· Surgetank	1.45	1.48	1.51
· Penstock foundations	0.14	0.15	0.15
· Exposed powerhouse	2.01	2.04	2.09
· Road	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30
· Miscellaneous civil works	1.39	1.39	1.40
2. Metal works	2.56	2.61	2.67
· Penstock steel pipe	1.37	1.40	1.43
· Gates and trasracks	1.19	1.21	1.24
3. Equipment	10.67	10.84	11.05
· Plant equipment	10.19	10.36	10.58
· Transmission line	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30
· Project office	0.30	0.30	0.30
5. Engineering and supervision	0.37	0.37	0.37
MANAGEMENT COST	11.21	11.29	11.40
1. Land acquisition	0.52	0.52	0.52
2. Contingencies	2.15	2.17	2.19
3. Value added tax	4.30	4.33	4.37
4. Management and administration	3.01	3.03	3.06
5. Interest during construction	1.23	1.24	1.25
TOTAL PROJECT COST	54.19	54.62	55.14
Power index (thousand USD/kW)	2.79	2.76	>>2.73
Energy index (USD/kWh)	0.473	>>0.473	0.473

Plant type: reservoir

Headwork type: dam

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	28.935	29.191	29.535	29.937	30.294	30.632
<b>EPC COST</b>	32.34	32.45	32.59	32.76	32.91	33.05
1. Civil works	22.88	22.92	22.97	23.03	23.08	23.13
· Dam and intake	16.00	16.00	16.01	16.01	16.02	16.02
· Headrace tunnel	2.89	2.91	2.93	2.95	2.97	2.99
· Surgetank	0.97	0.98	0.99	1.01	1.02	1.03
· Penstock foundations	0.12	0.12	0.12	0.12	0.12	0.12
· Exposed powerhouse	1.25	1.26	1.27	1.29	1.30	1.31
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.09	1.09	1.09	1.10	1.10	1.10
2. Metal works	1.65	1.66	1.68	1.70	1.72	1.74
· Penstock steel pipe	0.86	0.87	0.88	0.89	0.90	0.91
· Gates and trasracks	0.79	0.79	0.80	0.81	0.82	0.83
3. Equipment	7.18	7.24	7.31	7.39	7.47	7.54
· Plant equipment	6.71	6.76	6.83	6.91	6.99	7.06
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.33	0.33	0.33	0.33	0.34	0.34
<b>MANAGEMENT COST</b>	8.57	8.59	8.63	8.67	8.71	8.74
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.62	1.62	1.63	1.64	1.65	1.65
3. Value added tax	3.23	3.24	3.26	3.28	3.29	3.30
4. Management and administration	2.26	2.27	2.28	2.29	2.30	2.31
5. Interest during construction	0.94	0.95	0.95	0.95	0.96	0.96
<b>TOTAL PROJECT COST</b>	40.91	41.04	41.22	41.43	41.61	41.79
Power index (thousand USD/kW)	3.54	3.52	3.49	3.46	3.44	3.41
Energy index (USD/kWh)	0.484	0.483	0.482	0.481	0.480	0.479

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	31.021	31.403	31.755	32.175	32.584	32.966
<b>EPC COST</b>	33.21	33.37	33.51	33.68	33.85	34.01
1. Civil works	23.19	23.24	23.30	23.36	23.42	23.47
· Dam and intake	16.03	16.03	16.04	16.04	16.05	16.05
· Headrace tunnel	3.01	3.03	3.05	3.07	3.09	3.11
· Surgetank	1.04	1.05	1.06	1.08	1.09	1.10
· Penstock foundations	0.12	0.12	0.12	0.12	0.12	0.12
· Exposed powerhouse	1.33	1.35	1.36	1.38	1.39	1.41
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.10	1.11	1.11	1.11	1.12	1.12
2. Metal works	1.77	1.79	1.81	1.83	1.86	1.88
· Penstock steel pipe	0.92	0.94	0.95	0.96	0.97	0.98
· Gates and trasracks	0.84	0.85	0.86	0.87	0.88	0.89
3. Equipment	7.62	7.70	7.77	7.86	7.94	8.02
· Plant equipment	7.14	7.22	7.29	7.38	7.46	7.54
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.34	0.34	0.34	0.34	0.34
<b>MANAGEMENT COST</b>	8.78	8.82	8.86	8.90	8.94	8.98
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.66	1.67	1.68	1.68	1.69	1.70
3. Value added tax	3.32	3.34	3.35	3.37	3.39	3.40
4. Management and administration	2.32	2.34	2.35	2.36	2.37	2.38
5. Interest during construction	0.97	0.97	0.97	0.98	0.98	0.99
<b>TOTAL PROJECT COST</b>	41.99	42.19	42.37	42.58	42.79	42.99
Power index (thousand USD/kW)	3.39	3.36	3.34	3.31	3.28	3.26
Energy index (USD/kWh)	0.478	0.478	0.477	0.477	0.477	0.476

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	33.392	33.863	34.252	34.601	35.050	35.473
<b>EPC COST</b>	34.18	34.37	34.53	34.67	34.85	35.03
1. Civil works	23.53	23.60	23.66	23.71	23.77	23.83
· Dam and intake	16.06	16.07	16.07	16.08	16.08	16.09
· Headrace tunnel	3.13	3.16	3.18	3.20	3.22	3.24
· Surgetank	1.12	1.13	1.15	1.16	1.17	1.18
· Penstock foundations	0.12	0.12	0.12	0.12	0.12	0.12
· Exposed powerhouse	1.42	1.44	1.46	1.47	1.49	1.50
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.12	1.12	1.13	1.13	1.13	1.13
2. Metal works	1.90	1.93	1.95	1.97	2.00	2.02
· Penstock steel pipe	0.99	1.01	1.02	1.03	1.04	1.06
· Gates and trasracks	0.91	0.92	0.93	0.94	0.95	0.96
3. Equipment	8.10	8.20	8.28	8.35	8.44	8.53
· Plant equipment	7.63	7.72	7.80	7.87	7.96	8.05
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.34	0.34	0.34	0.34	0.35
<b>MANAGEMENT COST</b>	9.02	9.07	9.11	9.15	9.19	9.23
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.71	1.72	1.73	1.73	1.74	1.75
3. Value added tax	3.42	3.44	3.45	3.47	3.49	3.50
4. Management and administration	2.39	2.41	2.42	2.43	2.44	2.45
5. Interest during construction	0.99	1.00	1.00	1.01	1.01	1.02
<b>TOTAL PROJECT COST</b>	43.20	43.44	43.64	43.82	44.05	44.26
Power index (thousand USD/kW)	3.24	3.21	3.19	3.17	3.14	3.12
Energy index (USD/kWh)	0.476	0.476	0.476	0.476	0.476	0.476

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	36.018	36.501	36.958	37.534	38.164	38.691
<b>EPC COST</b>	35.25	35.45	35.63	35.87	36.12	36.33
1. Civil works	23.91	23.98	24.04	24.13	24.21	24.29
· Dam and intake	16.10	16.10	16.11	16.12	16.12	16.13
· Headrace tunnel	3.27	3.29	3.32	3.34	3.38	3.40
· Surgetank	1.20	1.22	1.23	1.25	1.27	1.29
· Penstock foundations	0.12	0.12	0.12	0.12	0.13	0.13
· Exposed powerhouse	1.52	1.54	1.56	1.58	1.61	1.63
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.14	1.14	1.14	1.15	1.15	1.16
2. Metal works	2.05	2.08	2.10	2.14	2.17	2.20
· Penstock steel pipe	1.07	1.09	1.10	1.12	1.14	1.15
· Gates and trasracks	0.98	0.99	1.00	1.02	1.04	1.05
3. Equipment	8.65	8.75	8.84	8.96	9.08	9.19
· Plant equipment	8.17	8.27	8.36	8.48	8.61	8.71
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	9.29	9.34	9.38	9.44	9.51	9.56
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.76	1.77	1.78	1.79	1.81	1.82
3. Value added tax	3.53	3.55	3.56	3.59	3.61	3.63
4. Management and administration	2.47	2.48	2.49	2.51	2.53	2.54
5. Interest during construction	1.02	1.03	1.03	1.04	1.05	1.05
<b>TOTAL PROJECT COST</b>	44.54	44.79	45.02	45.31	45.63	45.89
Power index (thousand USD/kW)	3.09	3.07	3.04	3.02	2.99	2.96
Energy index (USD/kWh)	0.476	0.477	0.477	0.477	0.478	0.479

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

<b>Firm discharge (m³/s)</b>	<b>39.338</b>	<b>40.010</b>	<b>40.682</b>	<b>41.433</b>	<b>42.083</b>	<b>42.831</b>
<b>EPC COST</b>	36.59	36.86	37.13	37.43	37.69	37.98
1. Civil works	24.38	24.47	24.57	24.67	24.76	24.87
· Dam and intake	16.14	16.15	16.16	16.17	16.18	16.19
· Headrace tunnel	3.43	3.47	3.50	3.53	3.56	3.60
· Surgetank	1.31	1.33	1.35	1.37	1.40	1.42
· Penstock foundations	0.13	0.13	0.13	0.13	0.13	0.13
· Exposed powerhouse	1.65	1.68	1.71	1.74	1.76	1.79
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.16	1.17	1.17	1.17	1.18	1.18
2. Metal works	2.24	2.28	2.32	2.36	2.40	2.44
· Penstock steel pipe	1.17	1.19	1.21	1.23	1.25	1.28
· Gates and trasracks	1.07	1.09	1.10	1.12	1.14	1.16
3. Equipment	9.32	9.46	9.59	9.74	9.87	10.02
· Plant equipment	8.84	8.98	9.11	9.26	9.39	9.54
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35	0.35	0.36	0.36
<b>MANAGEMENT COST</b>	9.62	9.69	9.76	9.83	9.90	9.97
1. Land acquisition	0.51	0.51	0.51	0.52	0.52	0.52
2. Contingencies	1.83	1.84	1.86	1.87	1.88	1.90
3. Value added tax	3.66	3.69	3.71	3.74	3.77	3.80
4. Management and administration	2.56	2.58	2.60	2.62	2.64	2.66
5. Interest during construction	1.06	1.07	1.07	1.08	1.09	1.10
<b>TOTAL PROJECT COST</b>	46.22	46.55	46.89	47.26	47.58	47.95
Power index (thousand USD/kW)	2.94	2.91	2.88	2.85	2.83	2.80
Energy index (USD/kWh)	0.480	0.477	0.474	0.471	0.470	0.469

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 123.531 El. m

Unit: million USD

<b>Firm discharge (m<sup>3</sup>/s)</b>	<b>43.739</b>	<b>44.574</b>	<b>45.596</b>
<b>EPC COST</b>	<b>38.34</b>	<b>38.67</b>	<b>39.09</b>
1. Civil works	24.99	25.11	25.25
· Dam and intake	16.20	16.21	16.23
· Headrace tunnel	3.64	3.68	3.73
· Surgetank	1.45	1.47	1.51
· Penstock foundations	0.13	0.13	0.13
· Exposed powerhouse	1.83	1.86	1.90
· Road	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30
· Miscellaneous civil works	1.19	1.20	1.20
2. Metal works	2.49	2.54	2.60
· Penstock steel pipe	1.30	1.33	1.36
· Gates and trasracks	1.19	1.21	1.24
3. Equipment	10.20	10.37	10.58
· Plant equipment	9.72	9.89	10.10
· Transmission line	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30
· Project office	0.30	0.30	0.30
5. Engineering and supervision	0.36	0.36	0.36
<b>MANAGEMENT COST</b>	<b>10.06</b>	<b>10.14</b>	<b>10.24</b>
1. Land acquisition	0.52	0.52	0.52
2. Contingencies	1.92	1.93	1.95
3. Value added tax	3.83	3.87	3.91
4. Management and administration	2.68	2.71	2.74
5. Interest during construction	1.11	1.12	1.13
<b>TOTAL PROJECT COST</b>	<b>48.40</b>	<b>48.81</b>	<b>49.33</b>
Power index (thousand USD/kW)	2.77	2.74	>>2.70
Energy index (USD/kWh)	>>0.468	0.468	0.469

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	28.935	29.191	29.535	29.937	30.294	30.632
<b>EPC COST</b>	28.88	28.98	29.11	29.27	29.42	29.55
1. Civil works	19.81	19.84	19.89	19.95	20.00	20.05
· Dam and intake	13.21	13.21	13.21	13.22	13.22	13.23
· Headrace tunnel	2.89	2.91	2.93	2.95	2.97	2.99
· Surgetank	0.97	0.98	0.99	1.00	1.01	1.03
· Penstock foundations	0.11	0.11	0.11	0.11	0.11	0.11
· Exposed powerhouse	1.13	1.14	1.15	1.16	1.18	1.19
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	0.94	0.94	0.95	0.95	0.95	0.95
2. Metal works	1.60	1.61	1.63	1.65	1.67	1.69
· Penstock steel pipe	0.81	0.82	0.83	0.84	0.85	0.86
· Gates and trasracks	0.79	0.79	0.80	0.81	0.82	0.83
3. Equipment	6.84	6.89	6.96	7.04	7.11	7.18
· Plant equipment	6.37	6.42	6.48	6.56	6.63	6.70
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.33	0.33	0.33	0.33	0.33	0.33
<b>MANAGEMENT COST</b>	7.71	7.73	7.77	7.81	7.84	7.87
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.44	1.45	1.46	1.46	1.47	1.48
3. Value added tax	2.89	2.90	2.91	2.93	2.94	2.95
4. Management and administration	2.02	2.03	2.04	2.05	2.06	2.07
5. Interest during construction	0.85	0.85	0.85	0.86	0.86	0.87
<b>TOTAL PROJECT COST</b>	36.58	36.71	36.88	37.08	37.26	37.42
Power index (thousand USD/kW)	3.55	3.53	3.50	3.47	3.45	3.43
Energy index (USD/kWh)	0.485	0.484	0.483	0.482	0.482	0.481

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m³/s)	31.021	31.403	31.755	32.175	32.584	32.966
<b>EPC COST</b>	29.70	29.85	29.99	30.16	30.32	30.47
1. Civil works	20.10	20.16	20.21	20.27	20.33	20.38
· Dam and intake	13.23	13.24	13.24	13.25	13.26	13.26
· Headrace tunnel	3.01	3.03	3.05	3.07	3.09	3.11
· Surgetank	1.04	1.05	1.06	1.08	1.09	1.10
· Penstock foundations	0.11	0.11	0.11	0.11	0.11	0.11
· Exposed powerhouse	1.20	1.21	1.23	1.24	1.25	1.27
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	0.96	0.96	0.96	0.97	0.97	0.97
2. Metal works	1.71	1.74	1.76	1.78	1.80	1.82
· Penstock steel pipe	0.87	0.88	0.89	0.91	0.92	0.93
· Gates and trasracks	0.84	0.85	0.86	0.87	0.88	0.89
3. Equipment	7.25	7.33	7.40	7.48	7.56	7.63
· Plant equipment	6.78	6.85	6.92	7.00	7.08	7.15
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.33	0.33	0.33	0.33	0.33	0.33
<b>MANAGEMENT COST</b>	7.91	7.95	7.98	8.02	8.06	8.10
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.49	1.49	1.50	1.51	1.52	1.52
3. Value added tax	2.97	2.99	3.00	3.02	3.03	3.05
4. Management and administration	2.08	2.09	2.10	2.11	2.12	2.13
5. Interest during construction	0.87	0.87	0.88	0.88	0.89	0.89
<b>TOTAL PROJECT COST</b>	37.61	37.80	37.98	38.18	38.38	38.57
Power index (thousand USD/kW)	3.40	3.38	3.36	3.33	3.31	3.28
Energy index (USD/kWh)	0.480	0.480	0.480	0.479	0.479	0.479

Plant type: reservoir

Headwork type: dam

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	33.392	33.863	34.252	34.601	35.050	35.473
<b>EPC COST</b>	30.63	30.83	30.98	31.12	31.29	31.46
1. Civil works	20.44	20.50	20.56	20.61	20.67	20.73
· Dam and intake	13.27	13.27	13.28	13.28	13.29	13.29
· Headrace tunnel	3.13	3.16	3.18	3.20	3.22	3.24
· Surgetank	1.11	1.13	1.14	1.15	1.17	1.18
· Penstock foundations	0.11	0.11	0.11	0.11	0.11	0.11
· Exposed powerhouse	1.28	1.30	1.31	1.32	1.34	1.36
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	0.97	0.98	0.98	0.98	0.98	0.99
2. Metal works	1.85	1.87	1.89	1.91	1.94	1.96
· Penstock steel pipe	0.94	0.95	0.96	0.97	0.99	1.00
· Gates and trasracks	0.91	0.92	0.93	0.94	0.95	0.96
3. Equipment	7.71	7.82	7.89	7.96	8.05	8.13
· Plant equipment	7.23	7.34	7.42	7.48	7.57	7.65
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.33	0.34	0.34	0.34	0.34	0.34
<b>MANAGEMENT COST</b>	8.14	8.19	8.23	8.26	8.31	8.35
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.53	1.54	1.55	1.56	1.56	1.57
3. Value added tax	3.06	3.08	3.10	3.11	3.13	3.15
4. Management and administration	2.14	2.16	2.17	2.18	2.19	2.20
5. Interest during construction	0.90	0.90	0.91	0.91	0.91	0.92
<b>TOTAL PROJECT COST</b>	38.77	39.02	39.21	39.38	39.60	39.81
Power index (thousand USD/kW)	3.26	3.23	3.21	3.19	3.17	3.14
Energy index (USD/kWh)	0.479	0.478	0.479	0.479	0.479	0.479

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	36.018	36.501	36.958	37.534	38.164	38.691
<b>EPC COST</b>	31.67	31.85	32.03	32.25	32.50	32.70
1. Civil works	20.80	20.87	20.93	21.01	21.10	21.17
· Dam and intake	13.30	13.31	13.31	13.32	13.33	13.34
· Headrace tunnel	3.27	3.29	3.32	3.34	3.38	3.40
· Surgetank	1.20	1.21	1.23	1.25	1.27	1.28
· Penstock foundations	0.11	0.11	0.11	0.11	0.11	0.11
· Exposed powerhouse	1.37	1.39	1.41	1.43	1.45	1.47
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	0.99	0.99	1.00	1.00	1.00	1.01
2. Metal works	1.99	2.02	2.04	2.08	2.11	2.14
· Penstock steel pipe	1.01	1.03	1.04	1.06	1.07	1.09
· Gates and trasracks	0.98	0.99	1.00	1.02	1.04	1.05
3. Equipment	8.23	8.33	8.42	8.53	8.65	8.75
· Plant equipment	7.76	7.85	7.94	8.05	8.17	8.27
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.34	0.34	0.34	0.34	0.34
<b>MANAGEMENT COST</b>	8.40	8.45	8.49	8.55	8.61	8.66
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.58	1.59	1.60	1.61	1.62	1.63
3. Value added tax	3.17	3.19	3.20	3.23	3.25	3.27
4. Management and administration	2.22	2.23	2.24	2.26	2.27	2.29
5. Interest during construction	0.92	0.93	0.93	0.94	0.95	0.95
<b>TOTAL PROJECT COST</b>	40.07	40.30	40.52	40.80	41.10	41.35
Power index (thousand USD/kW)	3.12	3.09	3.07	3.05	3.02	3.00
Energy index (USD/kWh)	0.480	0.481	0.481	0.482	0.483	0.484

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	39.338	40.010	40.682	41.433	42.083	42.831
<b>EPC COST</b>	32.94	33.20	33.46	33.74	33.99	34.29
1. Civil works	21.26	21.35	21.44	21.54	21.63	21.73
· Dam and intake	13.34	13.35	13.36	13.37	13.38	13.39
· Headrace tunnel	3.43	3.47	3.50	3.53	3.56	3.60
· Surgetank	1.30	1.33	1.35	1.37	1.39	1.42
· Penstock foundations	0.11	0.11	0.11	0.12	0.12	0.12
· Exposed powerhouse	1.49	1.51	1.54	1.56	1.58	1.61
· Road	0.26	0.26	0.26	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30	0.30	0.30	0.30
· Miscellaneous civil works	1.01	1.02	1.02	1.03	1.03	1.03
2. Metal works	2.17	2.21	2.25	2.29	2.33	2.37
· Penstock steel pipe	1.11	1.13	1.14	1.17	1.18	1.21
· Gates and trasracks	1.07	1.09	1.10	1.12	1.14	1.16
3. Equipment	8.87	9.00	9.12	9.27	9.39	9.55
· Plant equipment	8.39	8.52	8.65	8.79	8.91	9.07
· Transmission line	0.48	0.48	0.48	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30	0.30	0.30	0.30
· Project office	0.30	0.30	0.30	0.30	0.30	0.30
5. Engineering and supervision	0.34	0.35	0.35	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	8.72	8.78	8.85	8.92	8.98	9.05
1. Land acquisition	0.51	0.51	0.51	0.51	0.51	0.51
2. Contingencies	1.65	1.66	1.67	1.69	1.70	1.71
3. Value added tax	3.29	3.32	3.35	3.37	3.40	3.43
4. Management and administration	2.31	2.32	2.34	2.36	2.38	2.40
5. Interest during construction	0.96	0.97	0.97	0.98	0.99	1.00
<b>TOTAL PROJECT COST</b>	41.66	41.99	42.31	42.66	42.97	43.35
Power index (thousand USD/kW)	2.97	2.94	2.92	2.89	2.87	2.84
Energy index (USD/kWh)	0.485	0.483	0.479	0.477	0.476	0.474

Plant type: reservoir

Headwork type: dam

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Preliminary cost estimates and evaluation indices

FSL = 118.531 El. m

Unit: million USD

Firm discharge (m <sup>3</sup> /s)	43.739	44.574	45.596
<b>EPC COST</b>	<b>34.64</b>	<b>34.95</b>	<b>35.34</b>
1. Civil works	21.85	21.96	22.10
· Dam and intake	13.41	13.42	13.43
· Headrace tunnel	3.64	3.68	3.73
· Surgetank	1.44	1.47	1.50
· Penstock foundations	0.12	0.12	0.12
· Exposed powerhouse	1.64	1.67	1.71
· Road	0.26	0.26	0.26
· Bridges	0.30	0.30	0.30
· Miscellaneous civil works	1.04	1.05	1.05
2. Metal works	2.42	2.46	2.52
· Penstock steel pipe	1.23	1.25	1.28
· Gates and trasracks	1.19	1.21	1.24
3. Equipment	9.72	9.87	10.07
· Plant equipment	9.24	9.40	9.59
· Transmission line	0.48	0.48	0.48
4. Other costs	0.30	0.30	0.30
· Project office	0.30	0.30	0.30
5. Engineering and supervision	0.35	0.35	0.35
<b>MANAGEMENT COST</b>	<b>9.14</b>	<b>9.22</b>	<b>9.31</b>
1. Land acquisition	0.51	0.51	0.52
2. Contingencies	1.73	1.75	1.77
3. Value added tax	3.46	3.50	3.53
4. Management and administration	2.42	2.45	2.47
5. Interest during construction	1.01	1.01	1.02
<b>TOTAL PROJECT COST</b>	<b>43.78</b>	<b>44.17</b>	<b>44.65</b>
Power index (thousand USD/kW)	2.80	2.78	>>2.75
Energy index (USD/kWh)	>>0.474	0.474	0.475

Plant type: reservoir

Headwork type: dam

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Preliminary cost estimates and evaluation indices

FSL = 113.531 El. m

Unit: million USD

<b>Firm discharge (m<sup>3</sup>/s)</b>	<b>28.935</b>
<b>EPC COST</b>	<b>25.30</b>
1. Civil works	16.66
· Dam and intake	10.34
· Headrace tunnel	2.89
· Surgetank	0.97
· Penstock foundations	0.10
· Exposed powerhouse	1.01
· Road	0.26
· Bridges	0.30
· Miscellaneous civil works	0.79
2. Metal works	1.55
· Penstock steel pipe	0.76
· Gates and trasracks	0.79
3. Equipment	6.47
· Plant equipment	6.00
· Transmission line	0.48
4. Other costs	0.30
· Project office	0.30
5. Engineering and supervision	0.32
<b>MANAGEMENT COST</b>	<b>6.82</b>
1. Land acquisition	0.50
2. Contingencies	1.26
3. Value added tax	2.53
4. Management and administration	1.77
5. Interest during construction	0.75
<b>TOTAL PROJECT COST</b>	<b>32.12</b>
Power index (thousand USD/kW)	3.55
Energy index (USD/kWh)	0.484

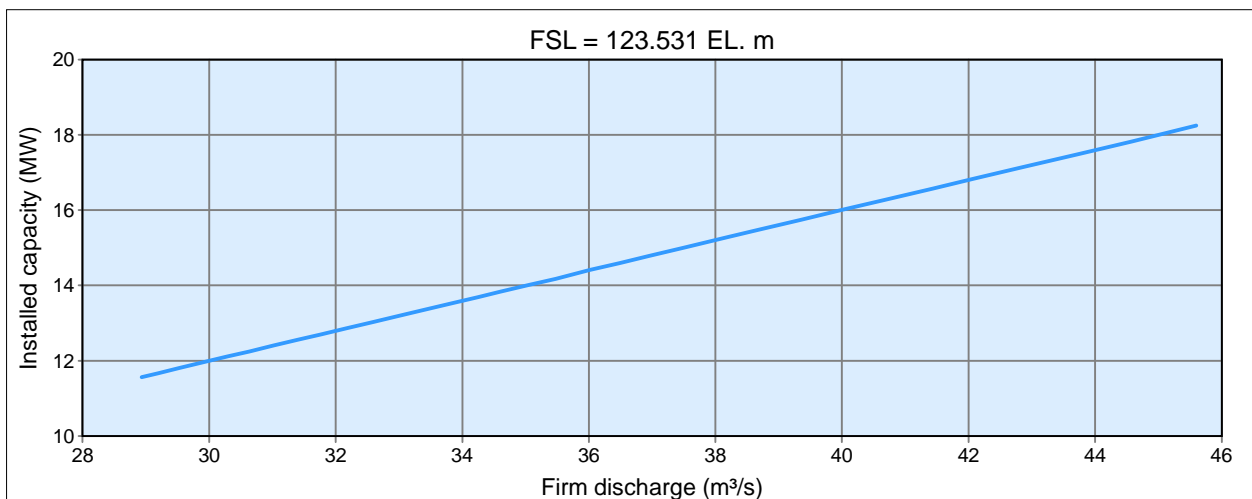
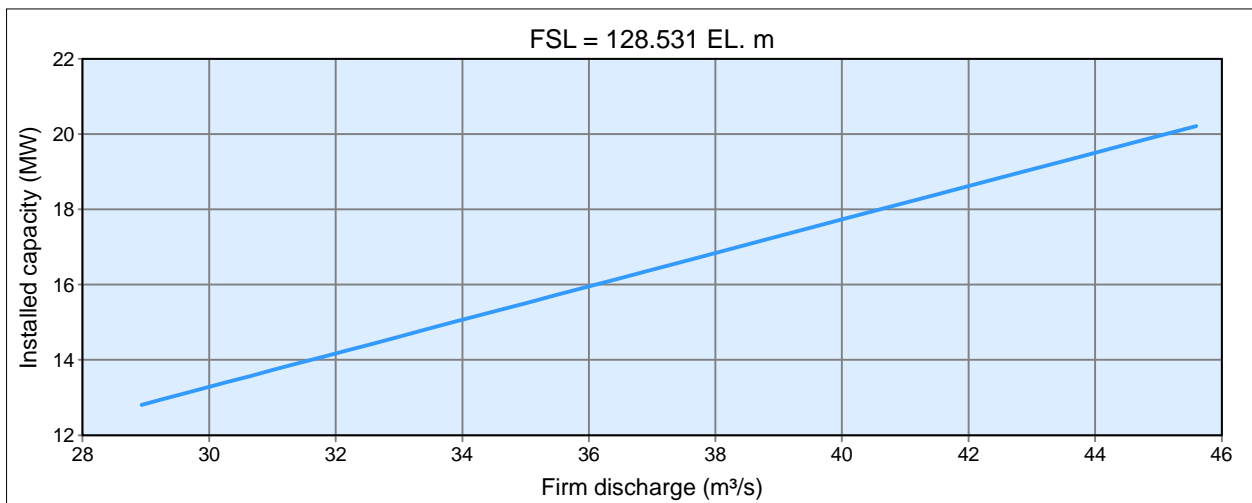
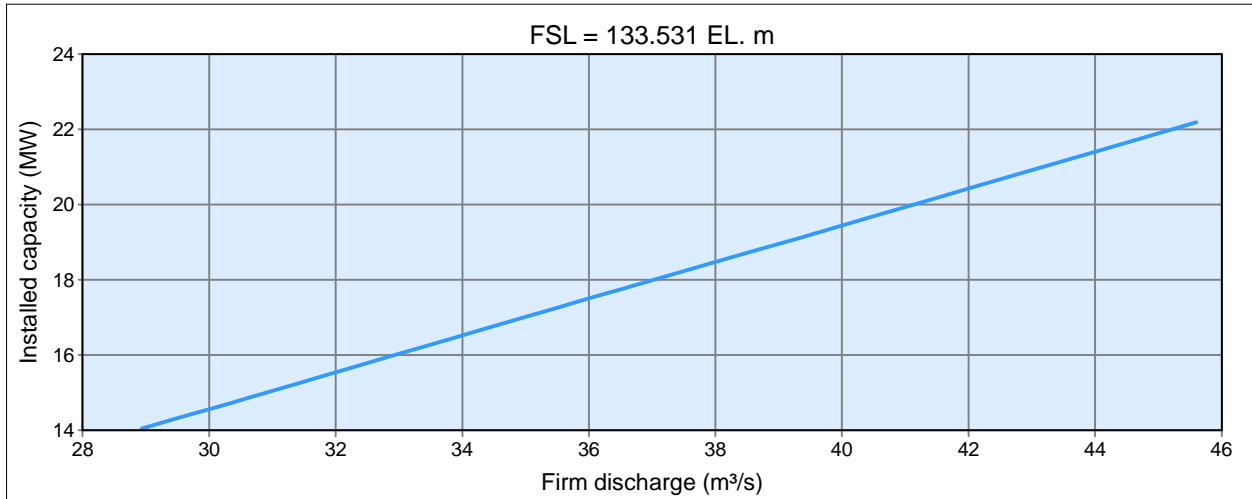
Plant type: reservoir

Headwork type: dam

Operation mode: base

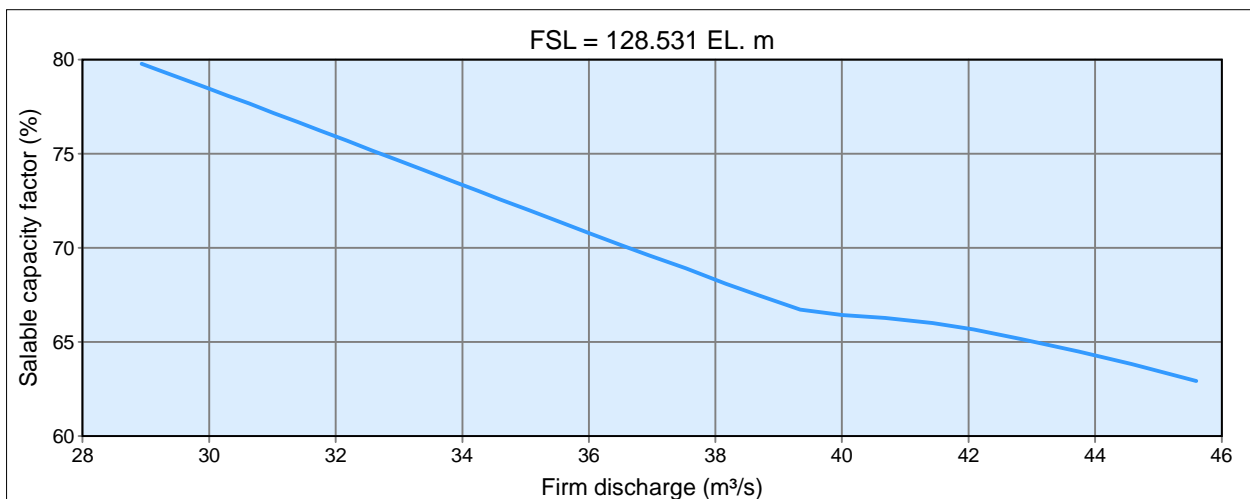
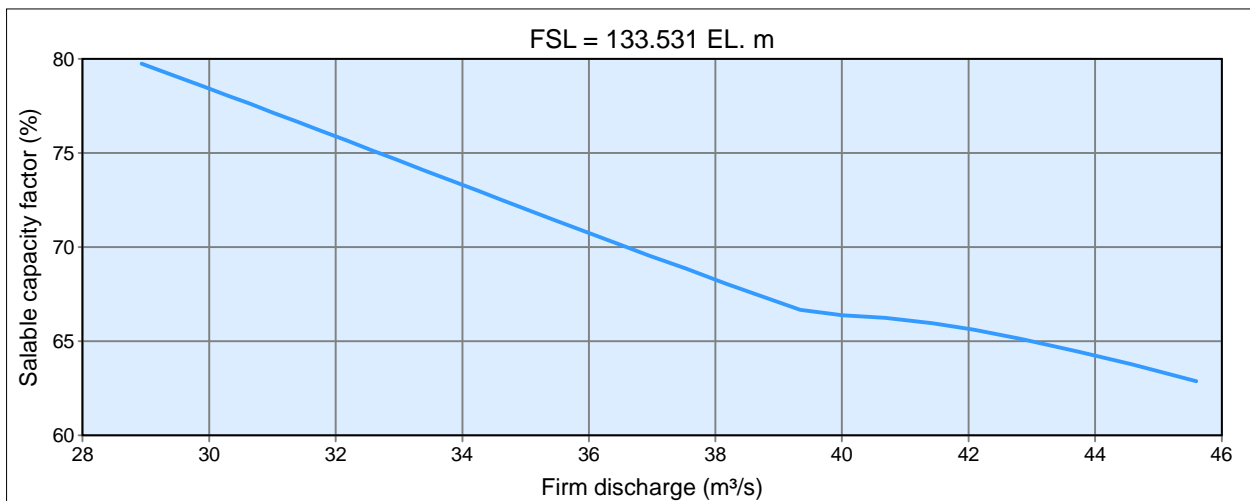
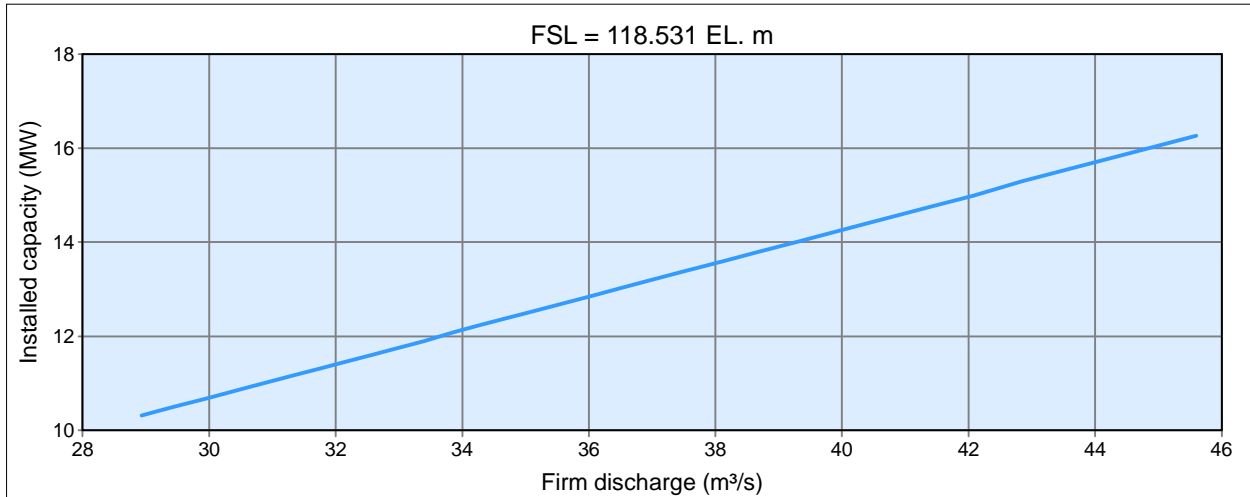
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



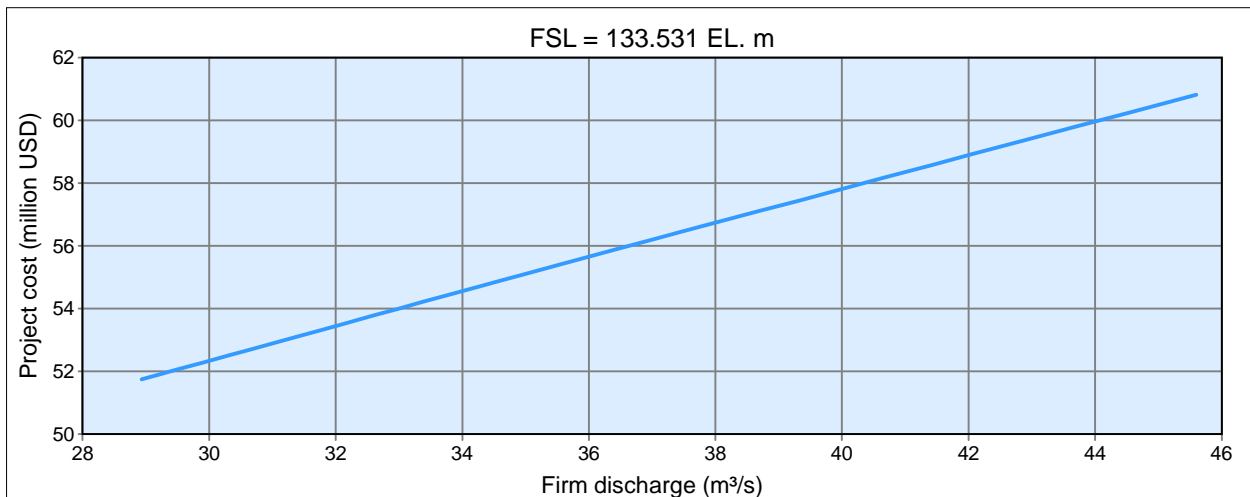
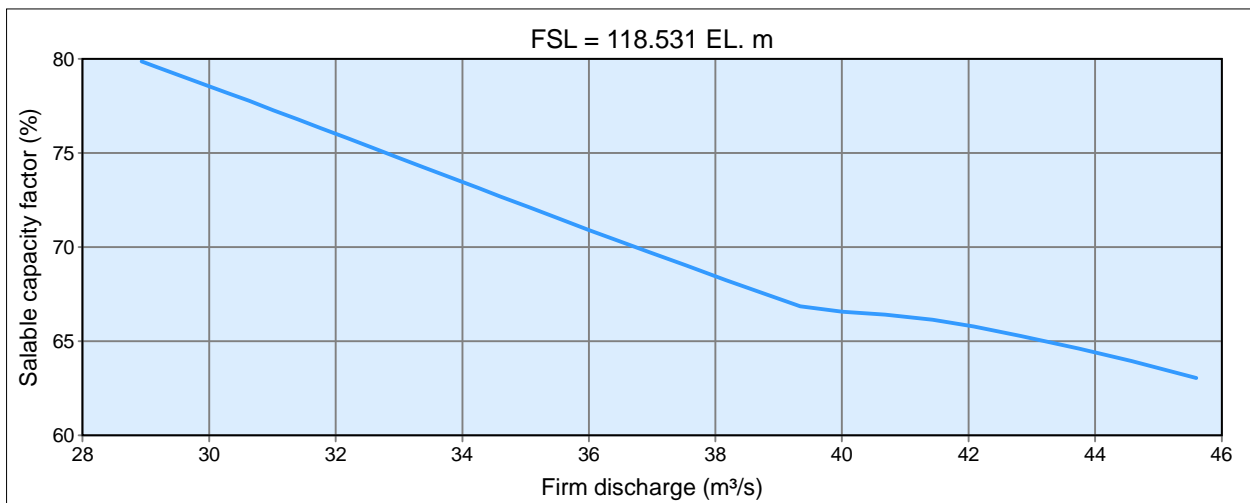
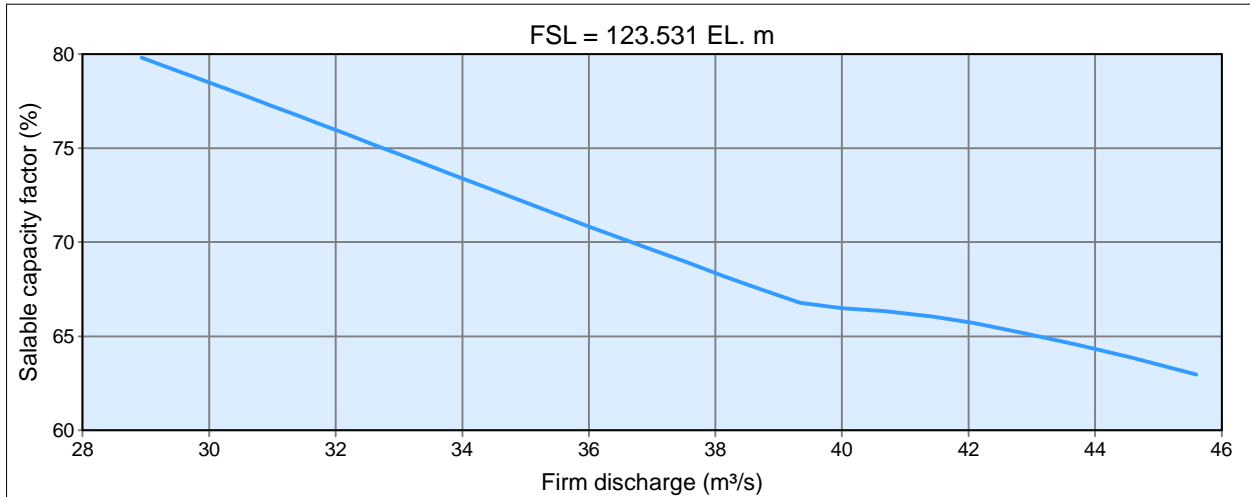
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

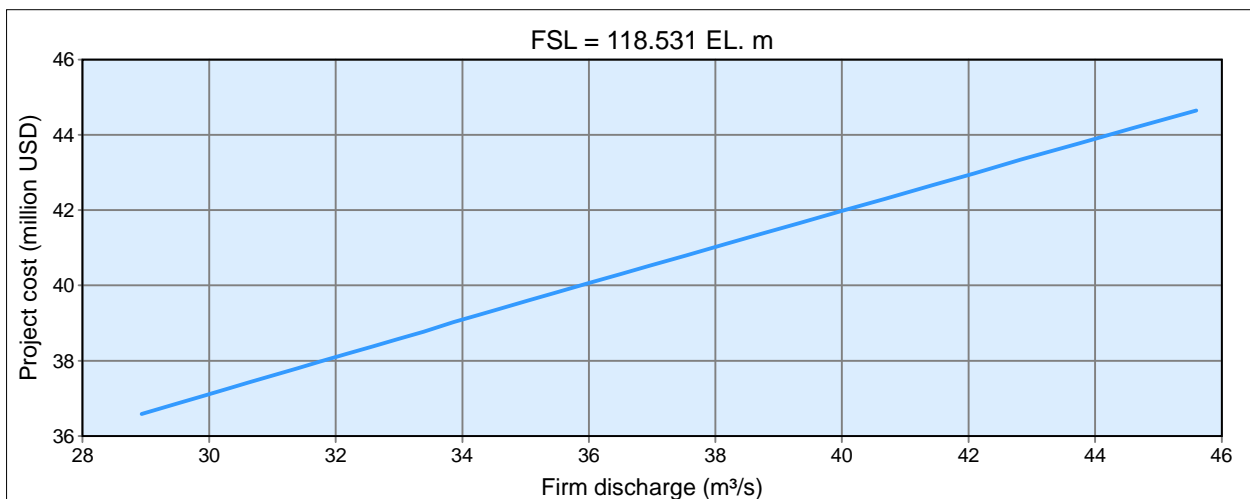
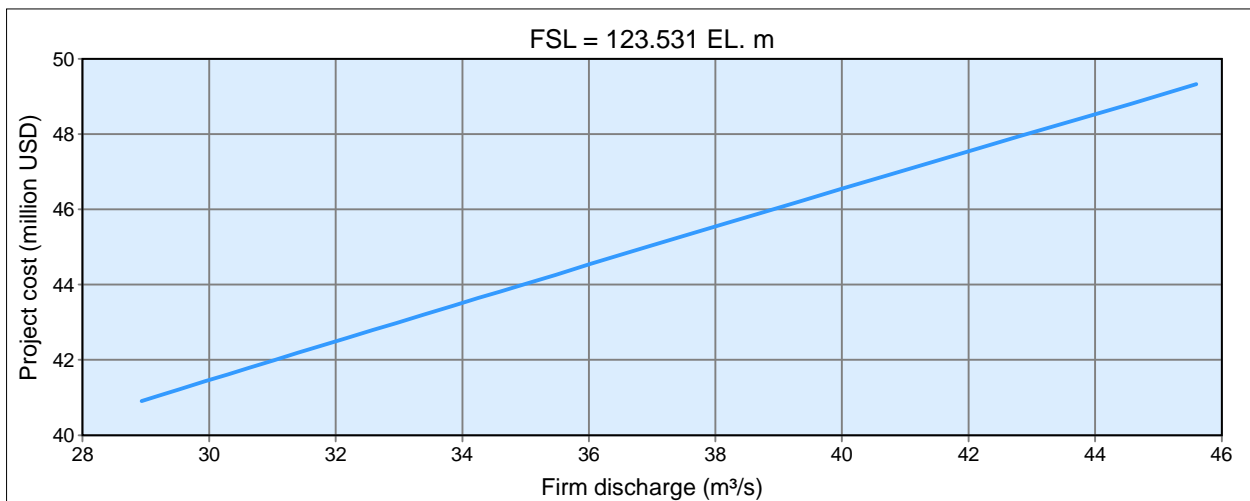
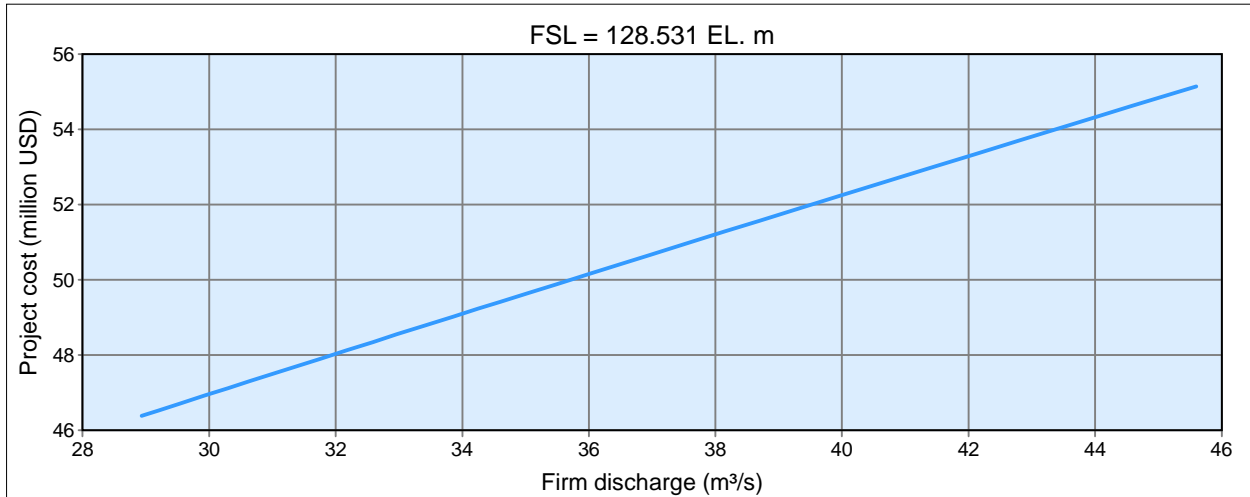
### Financial analysis





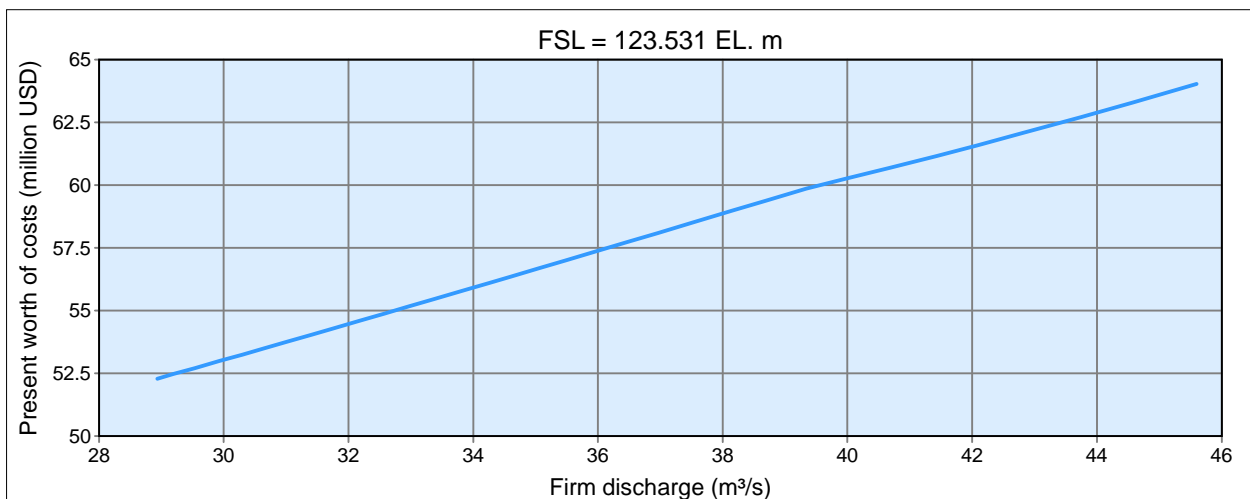
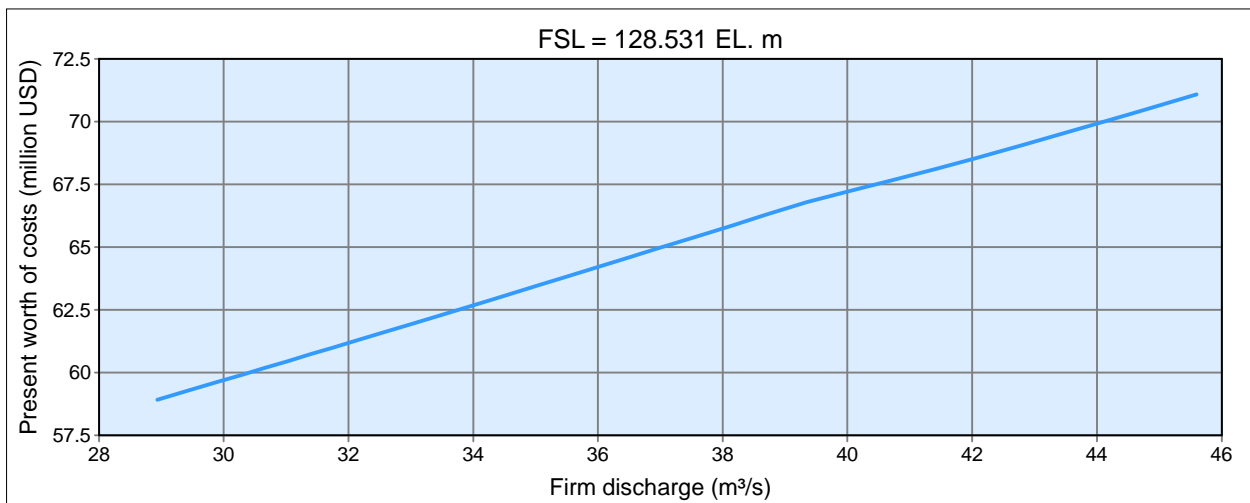
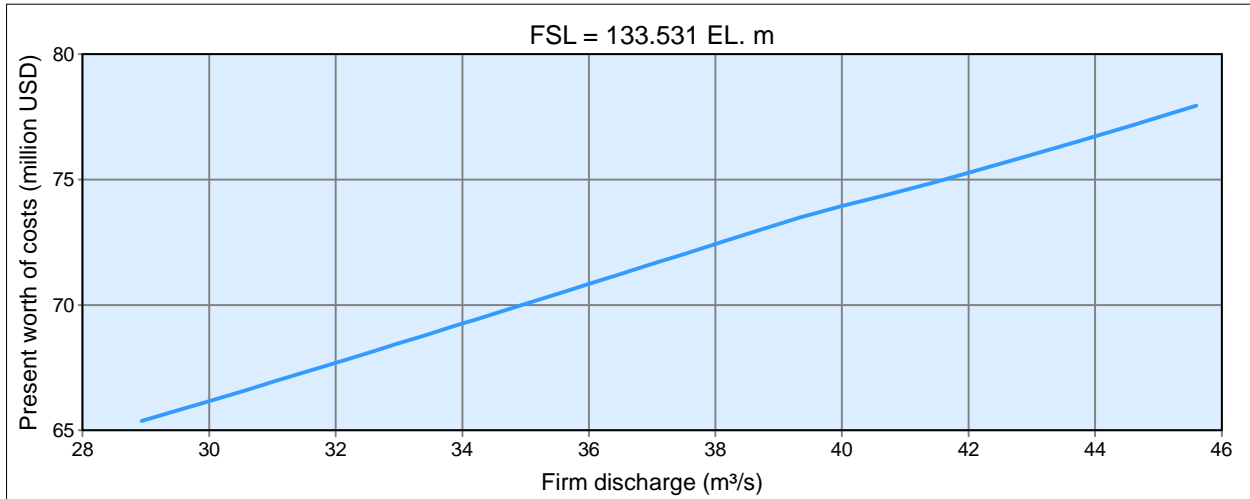
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



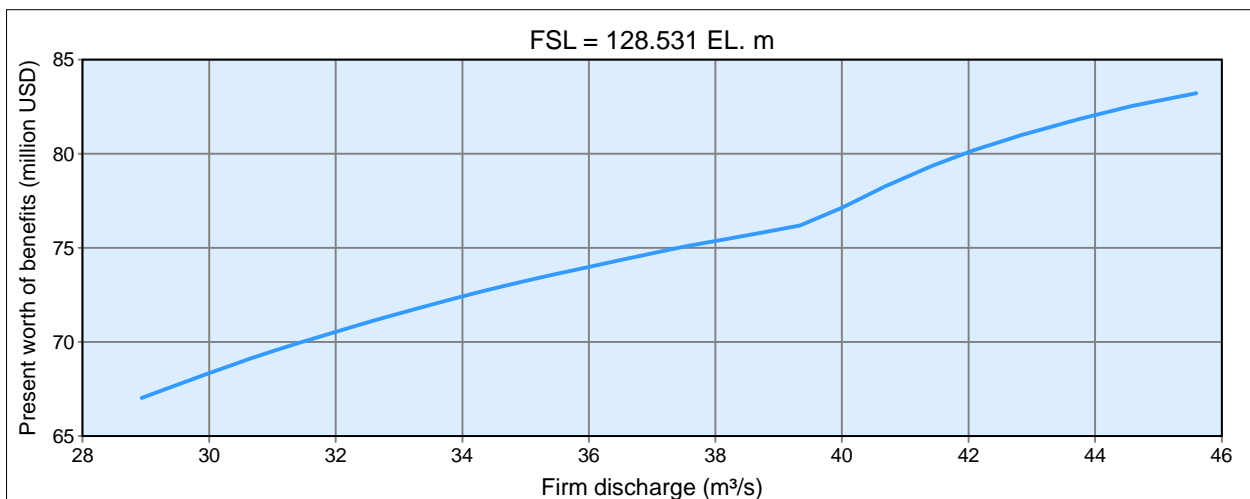
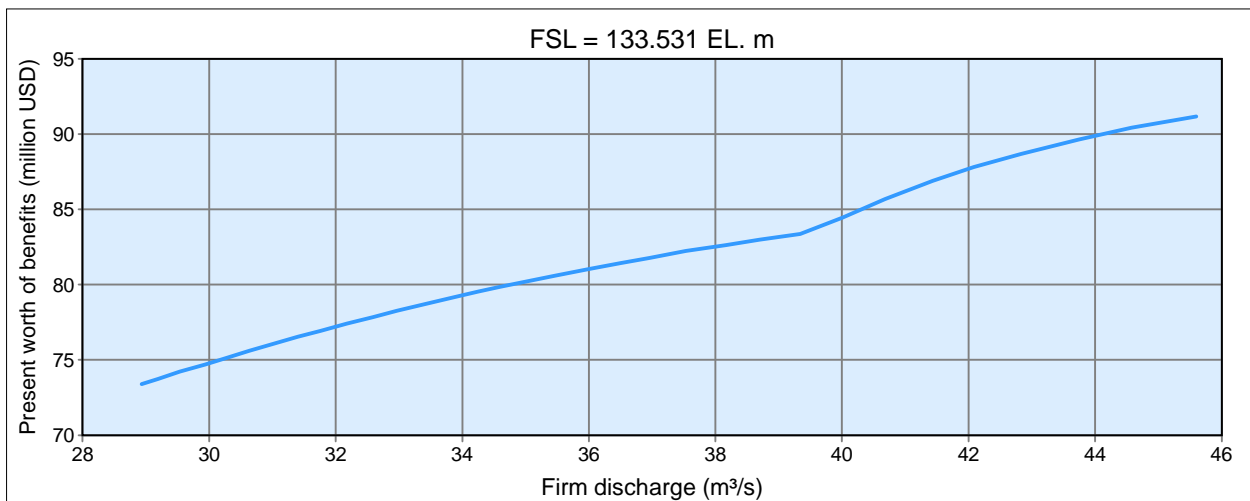
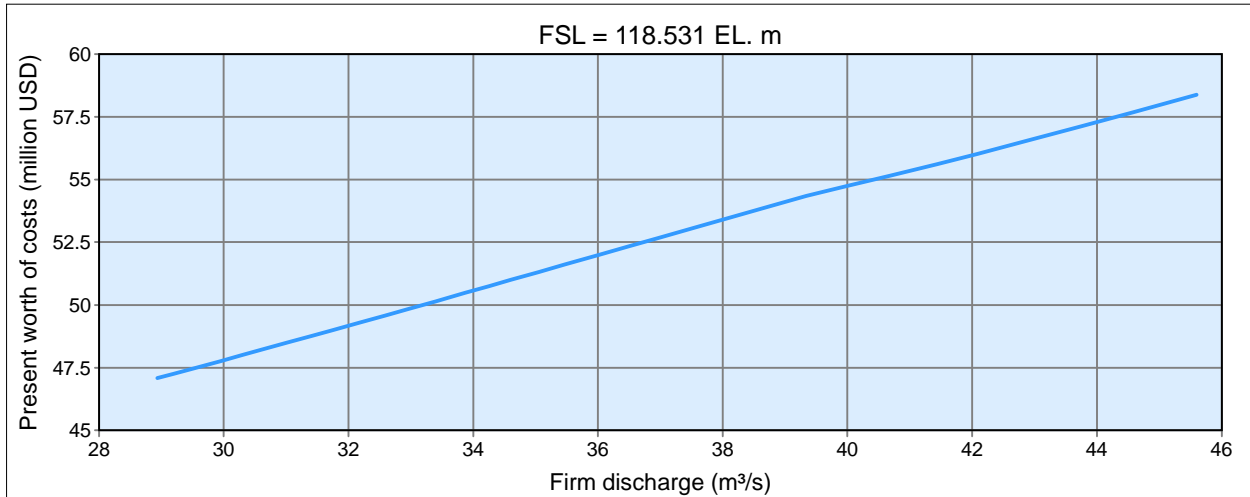
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



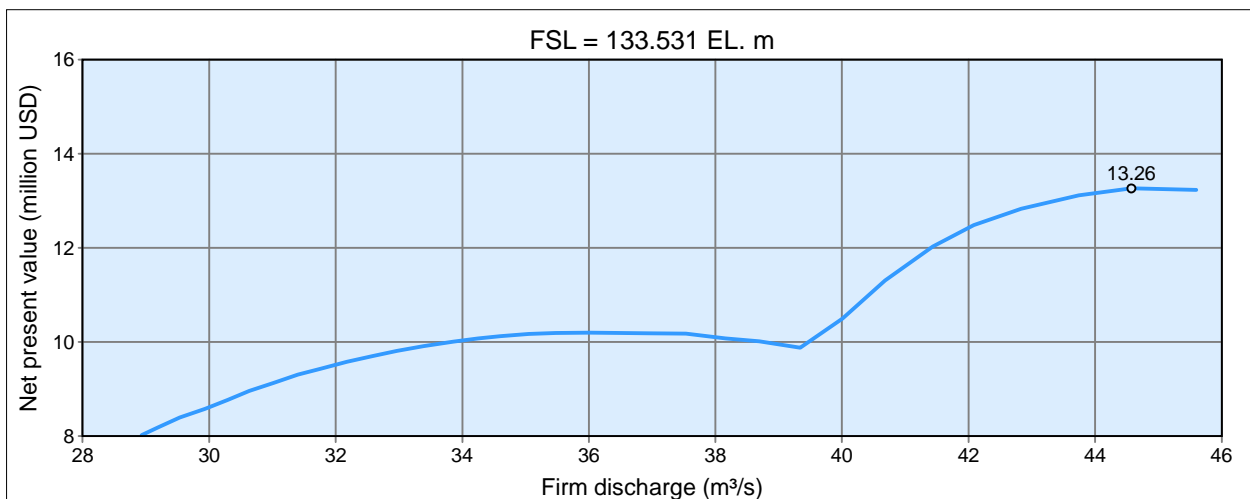
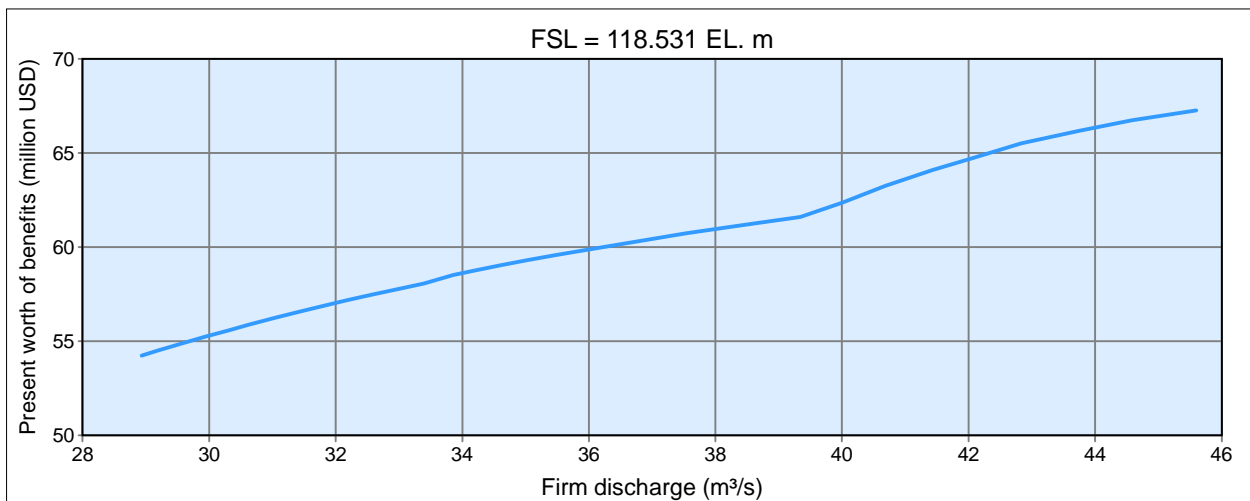
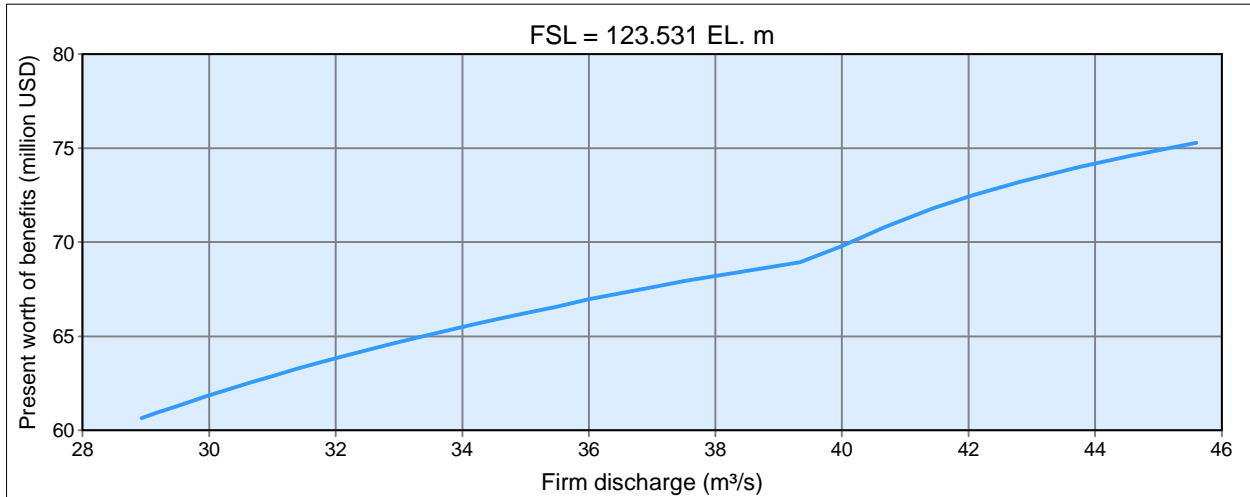
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



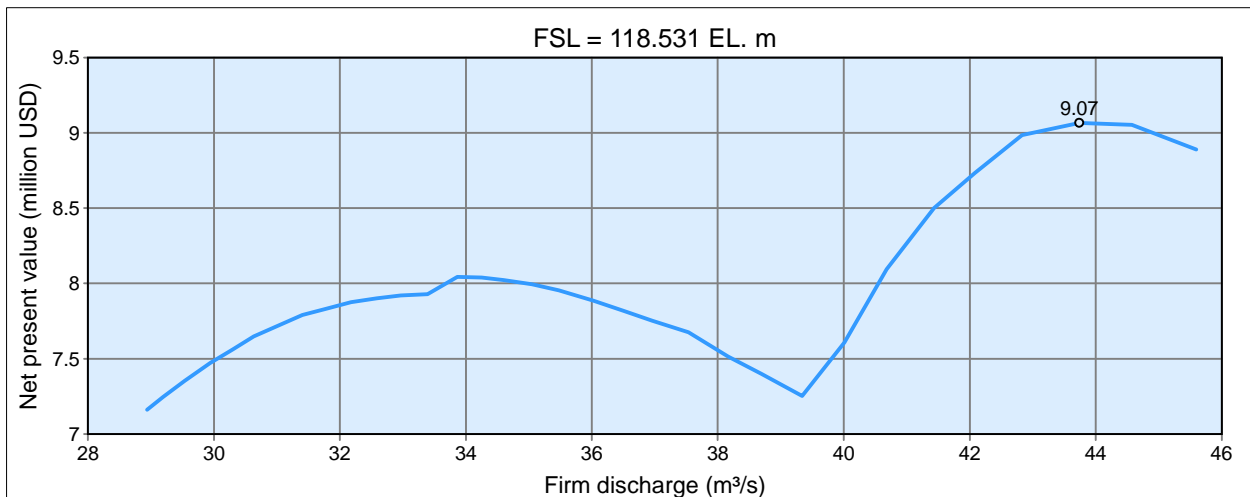
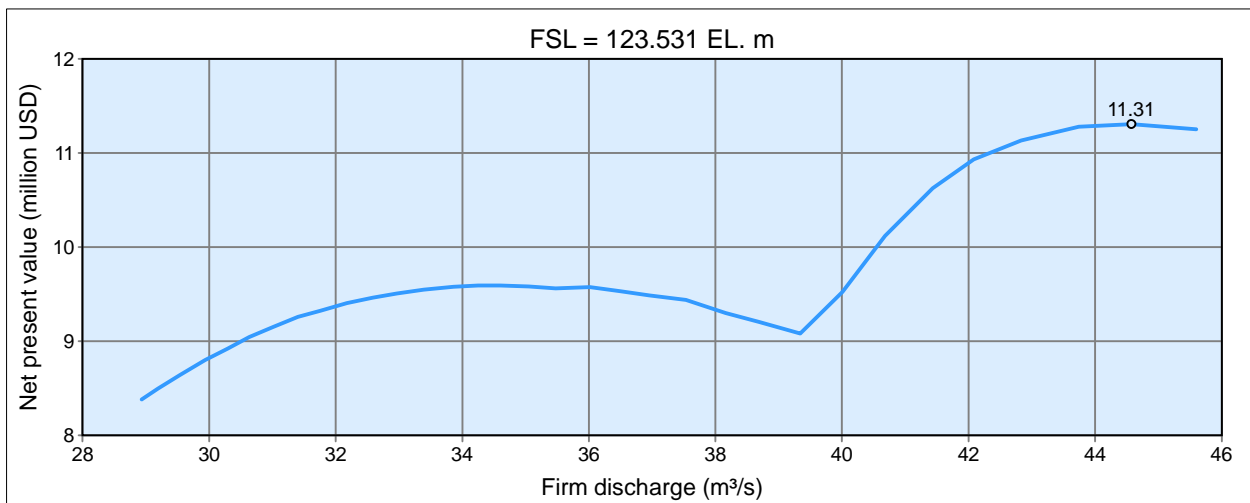
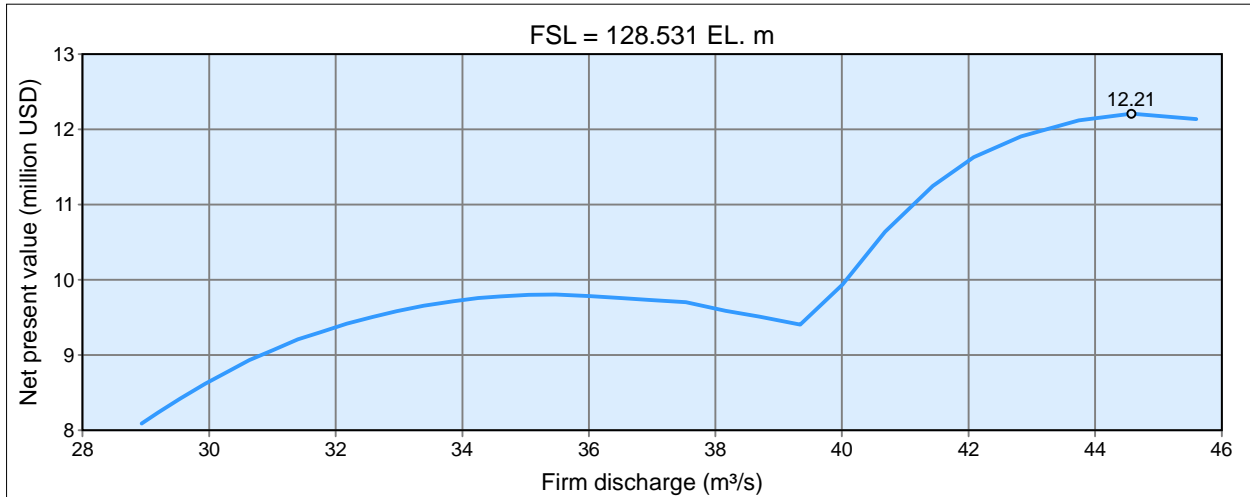
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



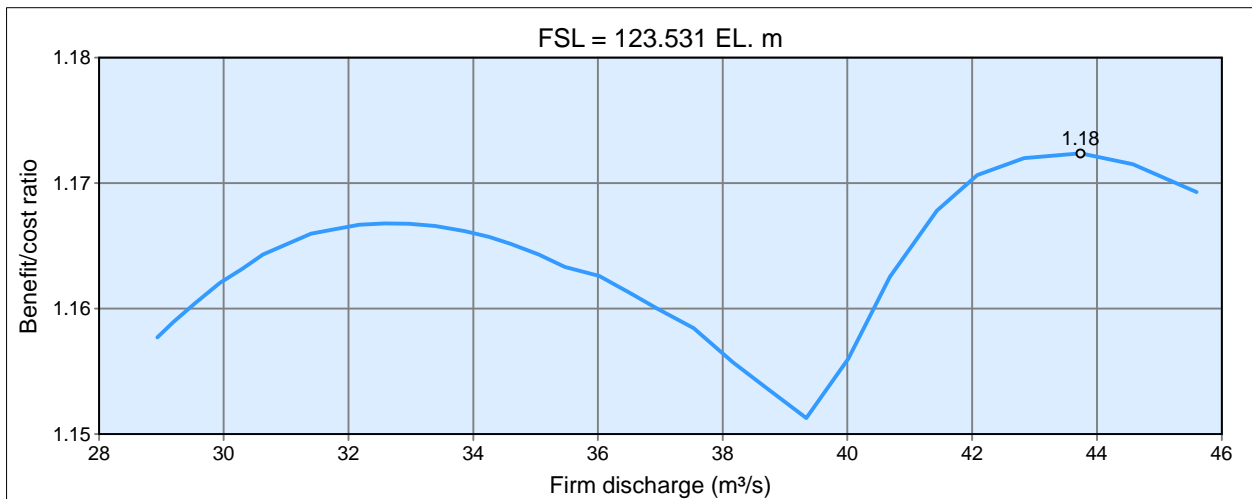
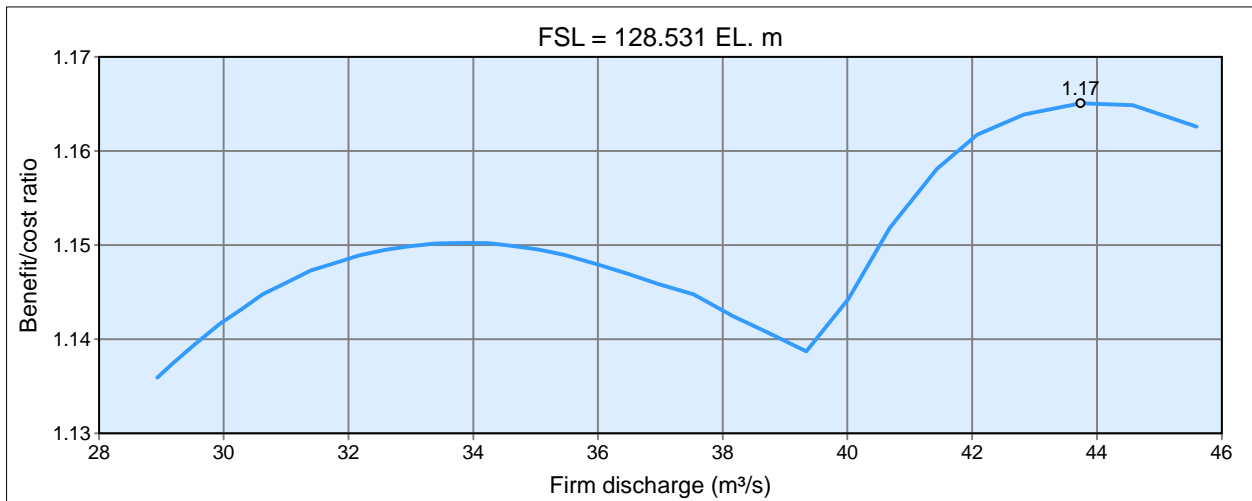
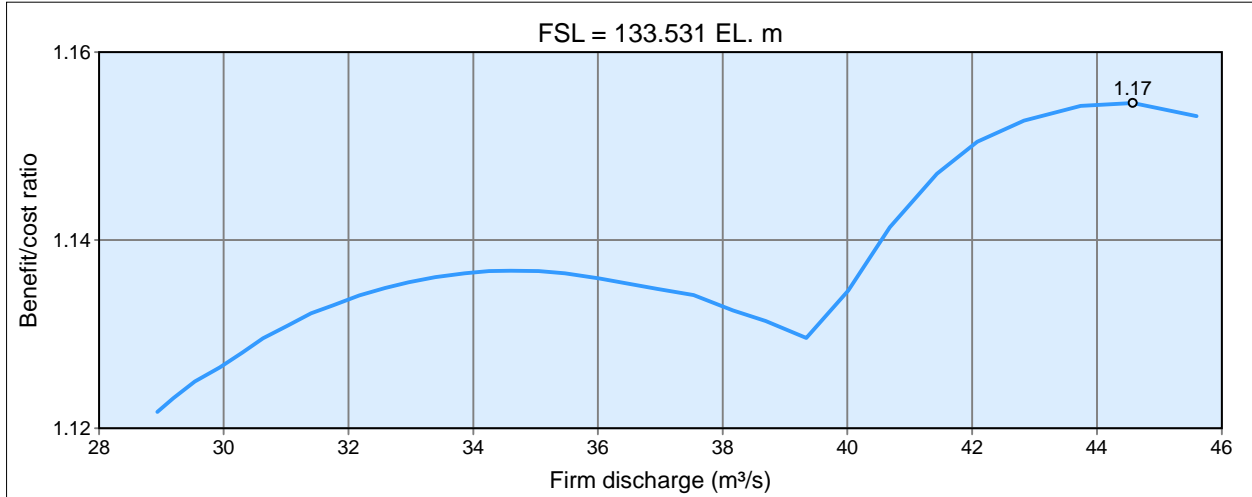
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



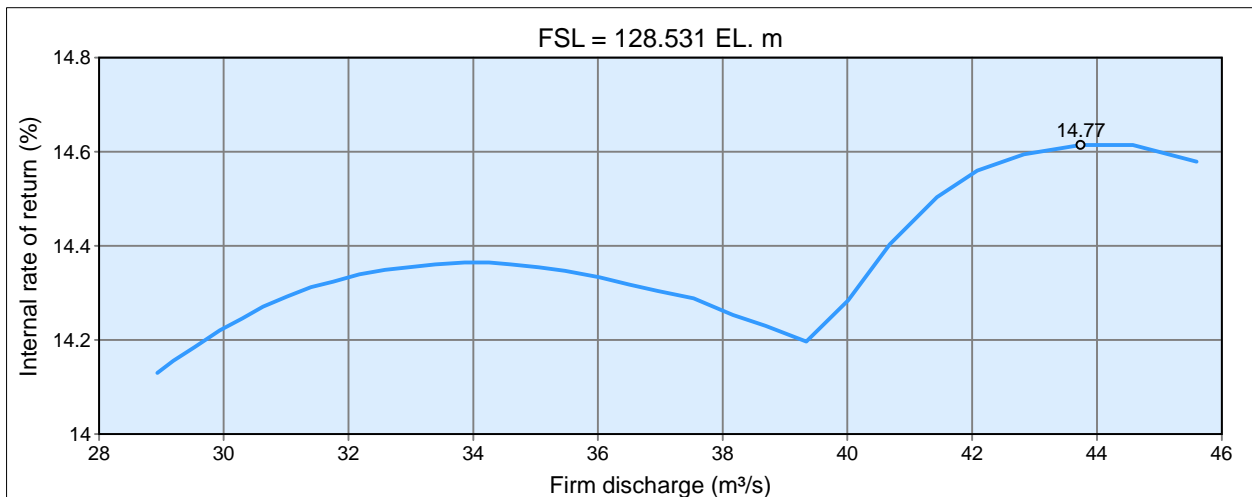
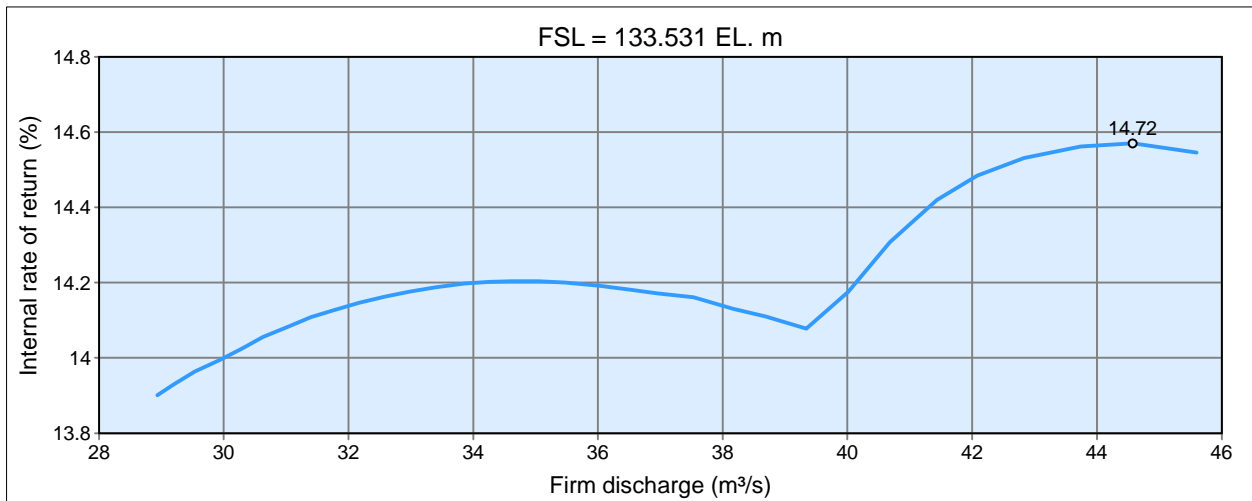
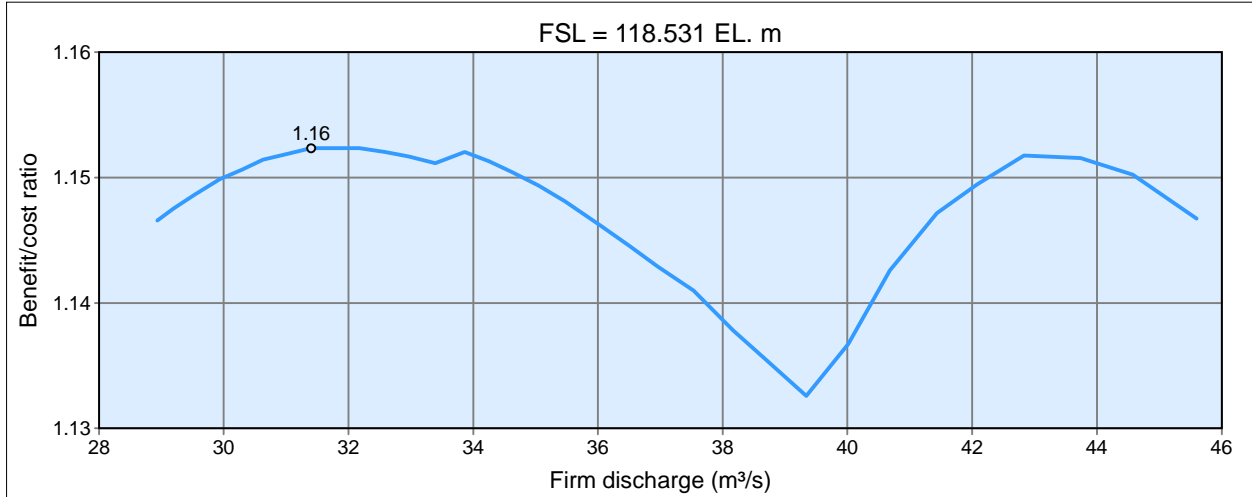
Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

### Financial analysis



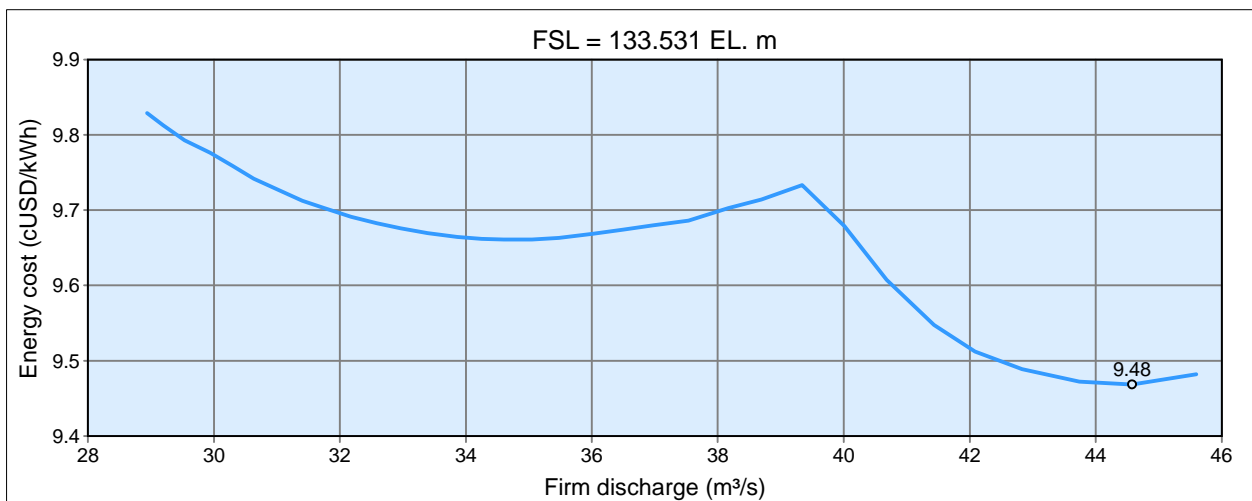
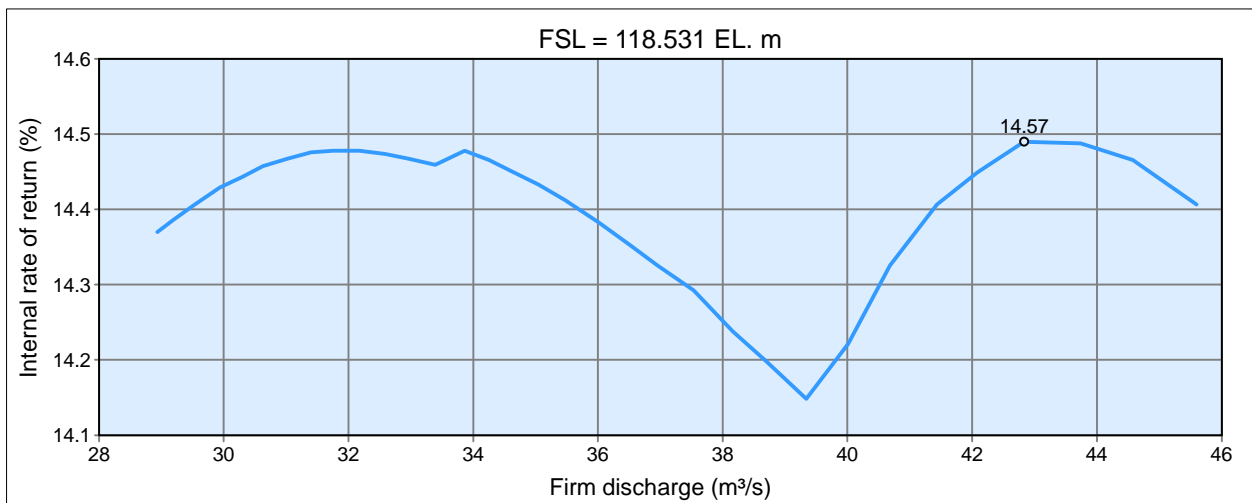
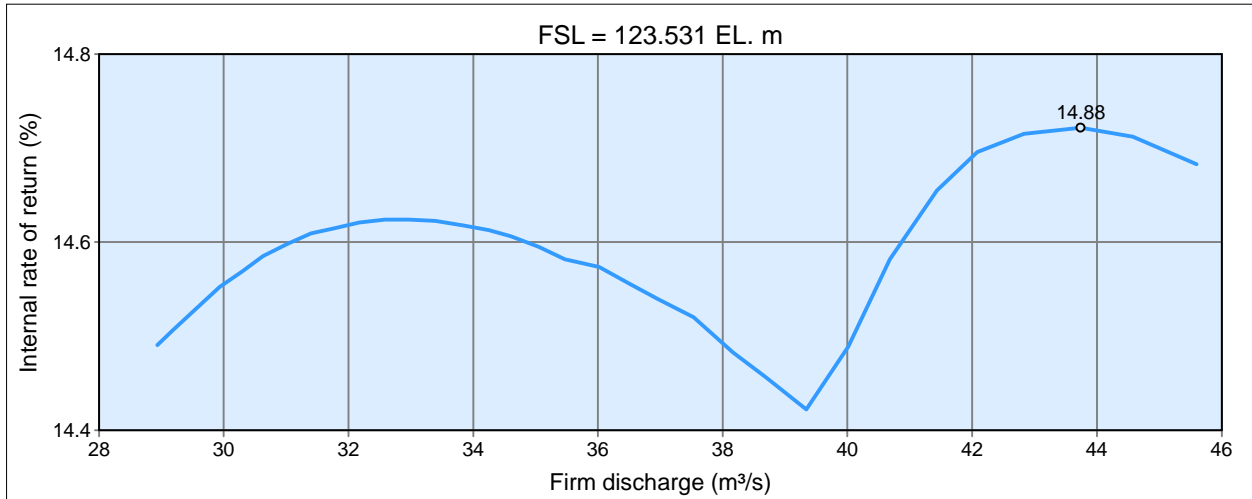
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

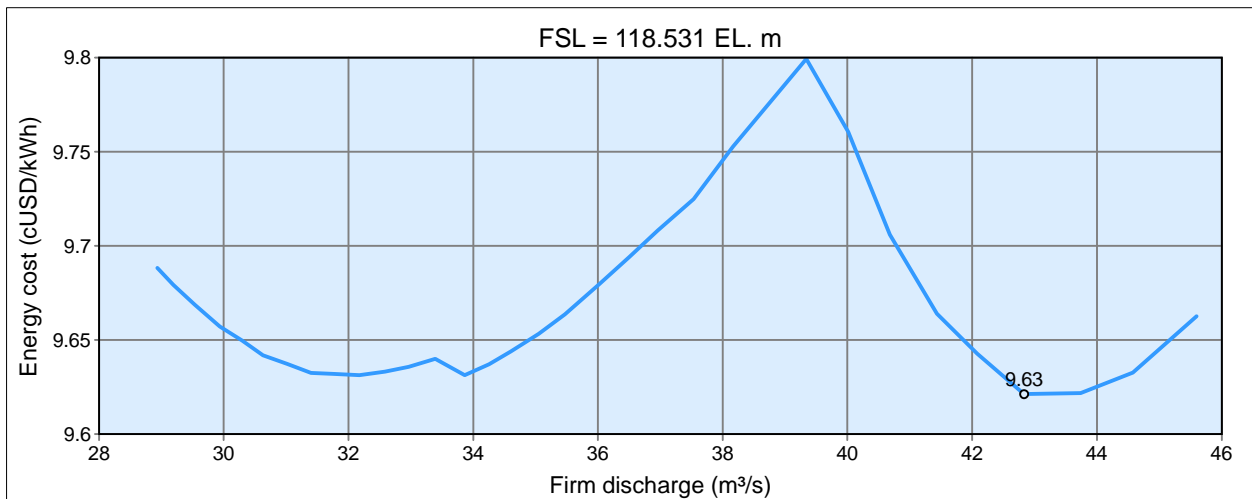
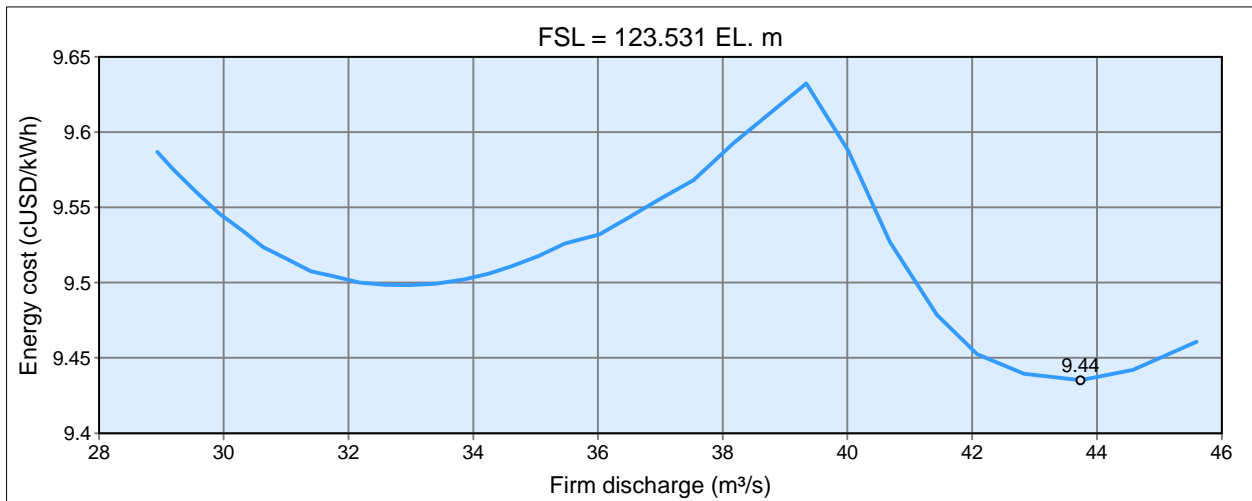
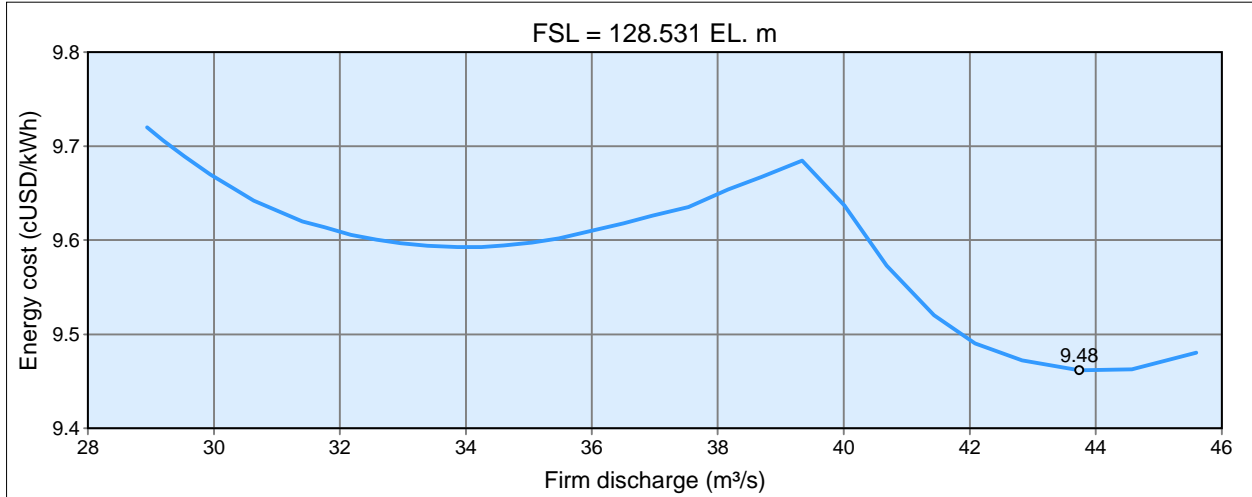
### Financial analysis





**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Financial analysis



Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Salable capacity factor (%)	Project cost (million USD)	Present worth of costs (million USD)	Present worth of benefits (million USD)
28.935	14.051	79.743	51.742	65.373	73.391
29.191	14.176	79.427	51.886	65.565	73.748
29.535	14.344	78.997	52.078	65.823	74.215
29.937	14.529	78.501	52.296	66.119	74.696
30.294	14.704	78.048	52.496	66.390	75.157
30.632	14.870	77.635	52.685	66.645	75.599
31.021	15.061	77.133	52.901	66.943	76.072
31.403	15.249	76.654	53.114	67.234	76.537
31.755	15.422	76.190	53.310	67.507	76.933
32.175	15.628	75.655	53.543	67.830	77.410
32.584	15.829	75.124	53.770	68.148	77.850
32.966	16.016	74.632	53.981	68.445	78.253
33.392	16.226	74.084	54.217	68.778	78.690
33.863	16.457	73.479	54.477	69.146	79.154
34.252	16.648	72.981	54.691	69.452	79.528
34.601	16.819	72.532	54.883	69.727	79.848
35.050	17.039	71.958	55.130	70.082	80.249
35.473	17.246	71.417	55.361	70.417	80.607
36.018	17.511	70.719	55.658	70.850	81.044
36.501	17.748	70.110	55.922	71.234	81.425
36.958	17.970	69.546	56.170	71.597	81.779
37.534	18.251	68.859	56.483	72.053	82.231
38.164	18.559	68.057	56.825	72.562	82.635
38.691	18.816	67.423	57.110	72.984	82.994
39.338	19.120	66.661	57.453	73.496	83.376
40.010	19.449	66.378	57.817	73.948	84.445
40.682	19.778	66.235	58.180	74.375	85.683
41.433	20.147	65.953	58.586	74.874	86.899
42.083	20.465	65.610	58.936	75.324	87.807
42.831	20.832	65.110	59.338	75.863	88.690
43.739	21.277	64.444	59.826	76.530	89.649
44.574	21.685	63.778	60.272	77.156	90.418
45.596	22.183	62.877	60.816	77.942	91.175

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 133.531 El. m

Firm discharge (m <sup>3</sup> /s)	Net present value (million USD)	Benefit/cost ratio	Internal rate of return (%)	Energy cost (cUSD/kWh)
28.935	8.02	1.123	13.92	9.91
29.191	8.18	1.125	13.96	9.90
29.535	8.39	1.128	14.00	9.87
29.937	8.58	1.130	14.03	9.85
30.294	8.77	1.132	14.07	9.83
30.632	8.95	1.134	14.11	9.81
31.021	9.13	1.136	14.14	9.79
31.403	9.30	1.138	14.17	9.77
31.755	9.43	1.140	14.19	9.76
32.175	9.58	1.141	14.22	9.75
32.584	9.70	1.142	14.24	9.74
32.966	9.81	1.143	14.25	9.73
33.392	9.91	1.144	14.27	9.72
33.863	10.01	1.145	14.28	9.72
34.252	10.08	1.145	14.28	9.71
34.601	10.12	1.145	14.28	9.71
35.050	10.17	1.145	14.28	9.71
35.473	10.19	1.145	14.28	9.72
36.018	10.19	1.144	14.27	9.72
36.501	10.19	1.143	14.26	9.73
36.958	10.18	1.142	14.25	9.74
37.534	10.18	1.141	14.23	9.74
38.164	10.07	1.139	14.20	9.76
38.691	10.01	1.137	14.17	9.78
39.338	9.88	1.134	14.13	9.80
40.010	10.50	1.142	14.25	9.73
40.682	11.31	1.152	14.41	9.65
41.433	12.03	1.161	14.54	9.58
42.083	12.48	1.166	14.62	9.53
42.831	12.83	1.169	14.68	9.51
43.739	13.12	1.171	14.71	9.49
44.574	>>13.26	>>1.172	>>14.72	<<9.48
45.596	13.23	1.170	14.69	9.50

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Salable capacity factor (%)	Project cost (million USD)	Present worth of costs (million USD)	Present worth of benefits (million USD)
28.935	12.806	79.774	46.386	58.916	67.009
29.191	12.921	79.458	46.525	59.103	67.338
29.535	13.075	79.029	46.711	59.354	67.770
29.937	13.255	78.534	46.929	59.647	68.268
30.294	13.415	78.082	47.122	59.910	68.690
30.632	13.566	77.669	47.303	60.157	69.090
31.021	13.739	77.168	47.512	60.445	69.517
31.403	13.909	76.689	47.717	60.728	69.936
31.755	14.065	76.227	47.905	60.991	70.293
32.175	14.252	75.692	48.130	61.304	70.723
32.584	14.434	75.162	48.348	61.611	71.119
32.966	14.604	74.670	48.551	61.898	71.482
33.392	14.793	74.123	48.778	62.219	71.875
33.863	15.003	73.519	49.028	62.575	72.292
34.252	15.176	73.023	49.234	62.869	72.628
34.601	15.331	72.573	49.419	63.135	72.915
35.050	15.530	72.001	49.656	63.477	73.277
35.473	15.718	71.461	49.879	63.800	73.604
36.018	15.960	70.764	50.166	64.218	74.002
36.501	16.175	70.156	50.420	64.589	74.349
36.958	16.378	69.592	50.659	64.939	74.670
37.534	16.633	68.906	50.961	65.379	75.083
38.164	16.915	68.105	51.292	65.871	75.460
38.691	17.150	67.471	51.567	66.278	75.791
39.338	17.437	66.711	51.904	66.777	76.185
40.010	17.736	66.427	52.254	67.217	77.152
40.682	18.034	66.282	52.604	67.634	78.272
41.433	18.367	65.998	52.994	68.120	79.369
42.083	18.656	65.654	53.331	68.557	80.188
42.831	18.988	65.154	53.718	69.078	80.982
43.739	19.390	64.486	54.186	69.723	81.843
44.574	19.761	63.820	54.616	70.328	82.536
45.596	20.214	62.917	55.140	71.087	83.223

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 128.531 El. m

Firm discharge (m <sup>3</sup> /s)	Net present value (million USD)	Benefit/cost ratio	Internal rate of return (%)	Energy cost (cUSD/kWh)
28.935	8.09	1.137	14.16	9.80
29.191	8.24	1.139	14.19	9.78
29.535	8.42	1.142	14.23	9.76
29.937	8.62	1.145	14.27	9.74
30.294	8.78	1.147	14.31	9.72
30.632	8.93	1.148	14.34	9.70
31.021	9.07	1.150	14.37	9.69
31.403	9.21	1.152	14.39	9.68
31.755	9.30	1.153	14.40	9.67
32.175	9.42	1.154	14.42	9.66
32.584	9.51	1.154	14.44	9.65
32.966	9.58	1.155	14.44	9.65
33.392	9.66	1.155	14.45	9.64
33.863	9.72	1.155	14.46	9.64
34.252	9.76	1.155	14.46	9.64
34.601	9.78	1.155	14.45	9.64
35.050	9.80	1.154	14.44	9.65
35.473	9.80	1.154	14.43	9.65
36.018	9.78	1.152	14.42	9.66
36.501	9.76	1.151	14.40	9.67
36.958	9.73	1.150	14.38	9.68
37.534	9.70	1.148	14.36	9.69
38.164	9.59	1.146	14.32	9.72
38.691	9.51	1.144	14.29	9.73
39.338	9.41	1.141	14.25	9.76
40.010	9.94	1.148	14.36	9.70
40.682	10.64	1.157	14.50	9.62
41.433	11.25	1.165	14.63	9.55
42.083	11.63	1.170	14.70	9.51
42.831	11.90	1.172	14.74	9.49
43.739	12.12	>>1.174	>>14.77	<<9.48
44.574	>>12.21	1.174	14.77	9.48
45.596	12.14	1.171	14.72	9.50

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Salable capacity factor (%)	Project cost (million USD)	Present worth of costs (million USD)	Present worth of benefits (million USD)
28.935	11.567	79.812	40.909	52.284	60.663
29.191	11.670	79.497	41.042	52.464	60.958
29.535	11.808	79.069	41.221	52.706	61.343
29.937	11.969	78.575	41.429	52.990	61.788
30.294	12.113	78.123	41.614	53.244	62.165
30.632	12.248	77.711	41.789	53.482	62.526
31.021	12.404	77.211	41.990	53.761	62.911
31.403	12.558	76.734	42.187	54.033	63.290
31.755	12.698	76.272	42.368	54.287	63.610
32.175	12.866	75.738	42.583	54.589	63.992
32.584	13.029	75.209	42.792	54.884	64.345
32.966	13.181	74.718	42.987	55.160	64.667
33.392	13.350	74.172	43.204	55.469	65.016
33.863	13.538	73.569	43.444	55.811	65.387
34.252	13.693	73.074	43.642	56.094	65.685
34.601	13.831	72.625	43.818	56.349	65.939
35.050	14.010	72.054	44.046	56.677	66.259
35.473	14.178	71.514	44.260	56.988	66.549
36.018	14.410	70.818	44.544	57.399	66.973
36.501	14.604	70.211	44.789	57.756	67.287
36.958	14.787	69.649	45.019	58.093	67.579
37.534	15.018	68.964	45.310	58.516	67.953
38.164	15.270	68.164	45.627	58.988	68.286
38.691	15.482	67.531	45.891	59.379	68.581
39.338	15.741	66.772	46.215	59.859	68.938
40.010	16.010	66.488	46.552	60.286	69.809
40.682	16.277	66.340	46.887	60.692	70.809
41.433	16.575	66.055	47.261	61.162	71.788
42.083	16.833	65.709	47.583	61.585	72.517
42.831	17.130	65.207	47.954	62.088	73.222
43.739	17.490	64.538	48.403	62.709	73.985
44.574	17.822	63.871	48.814	63.290	74.597
45.596	18.246	62.967	49.329	64.031	75.283

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 123.531 El. m

Firm discharge (m <sup>3</sup> /s)	Net present value (million USD)	Benefit/cost ratio	Internal rate of return (%)	Energy cost (cUSD/kWh)
28.935	8.38	1.160	14.54	9.62
29.191	8.49	1.162	14.56	9.61
29.535	8.64	1.164	14.59	9.59
29.937	8.80	1.166	14.63	9.57
30.294	8.92	1.168	14.65	9.56
30.632	9.04	1.169	14.68	9.55
31.021	9.15	1.170	14.70	9.54
31.403	9.26	1.171	14.71	9.53
31.755	9.32	1.172	14.72	9.53
32.175	9.40	1.172	14.73	9.52
32.584	9.46	1.172	14.74	9.52
32.966	9.51	1.172	14.74	9.52
33.392	9.55	1.172	14.73	9.52
33.863	9.58	1.172	14.73	9.52
34.252	9.59	1.171	14.72	9.53
34.601	9.59	1.170	14.71	9.53
35.050	9.58	1.169	14.69	9.54
35.473	9.56	1.168	14.67	9.55
36.018	9.57	1.167	14.66	9.56
36.501	9.53	1.165	14.63	9.57
36.958	9.49	1.163	14.61	9.59
37.534	9.44	1.161	14.58	9.60
38.164	9.30	1.158	14.52	9.63
38.691	9.20	1.155	14.48	9.65
39.338	9.08	1.152	14.43	9.68
40.010	9.52	1.158	14.53	9.63
40.682	10.12	1.167	14.67	9.55
41.433	10.63	1.174	14.78	9.49
42.083	10.93	1.178	14.84	9.46
42.831	11.13	1.179	14.87	9.45
43.739	11.28	>>1.180	>>14.88	<<9.44
44.574	>>11.31	1.179	14.87	9.45
45.596	11.25	1.176	14.82	9.47

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Installed capacity (MW)	Salable capacity factor (%)	Project cost (million USD)	Present worth of costs (million USD)	Present worth of benefits (million USD)
28.935	10.317	79.860	36.582	47.078	54.239
29.191	10.408	79.545	36.709	47.251	54.498
29.535	10.530	79.119	36.880	47.485	54.838
29.937	10.673	78.626	37.079	47.757	55.230
30.294	10.799	78.176	37.256	48.001	55.561
30.632	10.919	77.765	37.423	48.230	55.878
31.021	11.057	77.266	37.615	48.498	56.217
31.403	11.193	76.790	37.803	48.759	56.550
31.755	11.317	76.329	37.976	49.003	56.832
32.175	11.465	75.797	38.181	49.292	57.167
32.584	11.609	75.269	38.381	49.575	57.476
32.966	11.743	74.779	38.567	49.839	57.759
33.392	11.893	74.234	38.774	50.135	58.064
33.863	12.087	73.632	39.023	50.482	58.527
34.252	12.225	73.138	39.212	50.754	58.793
34.601	12.349	72.690	39.382	50.999	59.021
35.050	12.508	72.120	39.600	51.314	59.308
35.473	12.658	71.582	39.805	51.612	59.567
36.018	12.852	70.887	40.069	51.996	59.882
36.501	13.023	70.282	40.302	52.338	60.157
36.958	13.185	69.721	40.522	52.659	60.412
37.534	13.389	69.037	40.800	53.064	60.739
38.164	13.612	68.238	41.102	53.514	61.029
38.691	13.798	67.607	41.355	53.887	61.286
39.338	14.027	66.849	41.664	54.344	61.597
40.010	14.265	66.563	41.985	54.757	62.365
40.682	14.501	66.413	42.305	55.150	63.245
41.433	14.764	66.125	42.662	55.605	64.106
42.083	14.992	65.778	42.970	56.012	64.745
42.831	15.287	65.274	43.346	56.518	65.504
43.739	15.608	64.604	43.776	57.116	66.183
44.574	15.904	63.935	44.171	57.675	66.727
45.596	16.265	63.030	44.652	58.373	67.264

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base



Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Financial analysis

FSL = 118.531 El. m

Firm discharge (m <sup>3</sup> /s)	Net present value (million USD)	Benefit/cost ratio	Internal rate of return (%)	Energy cost (cUSD/kWh)
28.935	7.16	1.152	14.42	9.71
29.191	7.25	1.153	14.44	9.70
29.535	7.35	1.155	14.47	9.69
29.937	7.47	1.156	14.49	9.67
30.294	7.56	1.157	14.51	9.66
30.632	7.65	1.159	14.53	9.65
31.021	7.72	1.159	14.54	9.65
31.403	7.79	>>1.160	14.55	9.64
31.755	7.83	1.160	14.55	9.64
32.175	7.88	1.160	14.55	9.64
32.584	7.90	1.159	14.55	9.64
32.966	7.92	1.159	14.54	9.64
33.392	7.93	1.158	14.53	9.65
33.863	8.04	1.159	14.55	9.64
34.252	8.04	1.158	14.54	9.65
34.601	8.02	1.157	14.52	9.65
35.050	7.99	1.156	14.50	9.67
35.473	7.95	1.154	14.48	9.68
36.018	7.89	1.152	14.44	9.70
36.501	7.82	1.149	14.40	9.72
36.958	7.75	1.147	14.37	9.74
37.534	7.67	1.145	14.33	9.76
38.164	7.51	1.140	14.27	9.79
38.691	7.40	1.137	14.22	9.82
39.338	7.25	1.133	14.16	9.85
40.010	7.61	1.139	14.25	9.80
40.682	8.10	1.147	14.37	9.73
41.433	8.50	1.153	14.47	9.68
42.083	8.73	1.156	14.52	9.65
42.831	8.99	1.159	>>14.57	<<9.63
43.739	>>9.07	1.159	14.57	9.63
44.574	9.05	1.157	14.54	9.64
45.596	8.89	1.152	14.47	9.68

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Financial analysis

FSL = 113.531 El. m

<b>Firm discharge (m<sup>3</sup>/s)</b>	<b>Installed capacity (MW)</b>	<b>Salable capacity factor (%)</b>	<b>Project cost (million USD)</b>	<b>Present worth of costs (million USD)</b>	<b>Present worth of benefits (million USD)</b>
28.935	9.053	79.922	32.118	41.673	47.747

Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Financial analysis

FSL = 113.531 El. m

Firm discharge (m <sup>3</sup> /s)	Net present value (million USD)	Benefit/cost ratio	Internal rate of return (%)	Energy cost (cUSD/kWh)
28.935	>>6.07	>>1.146	>>14.34	<<9.79

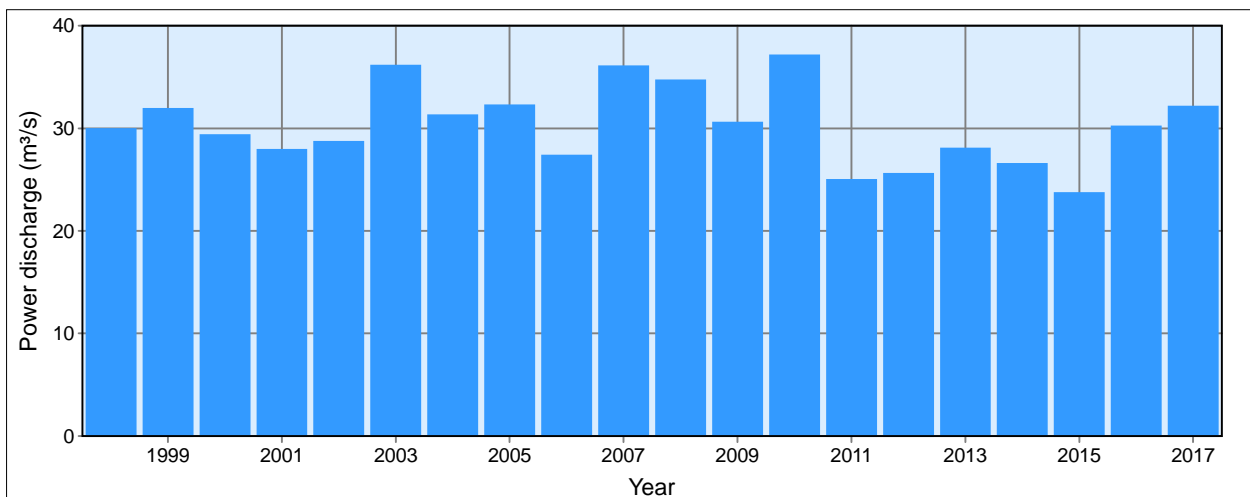
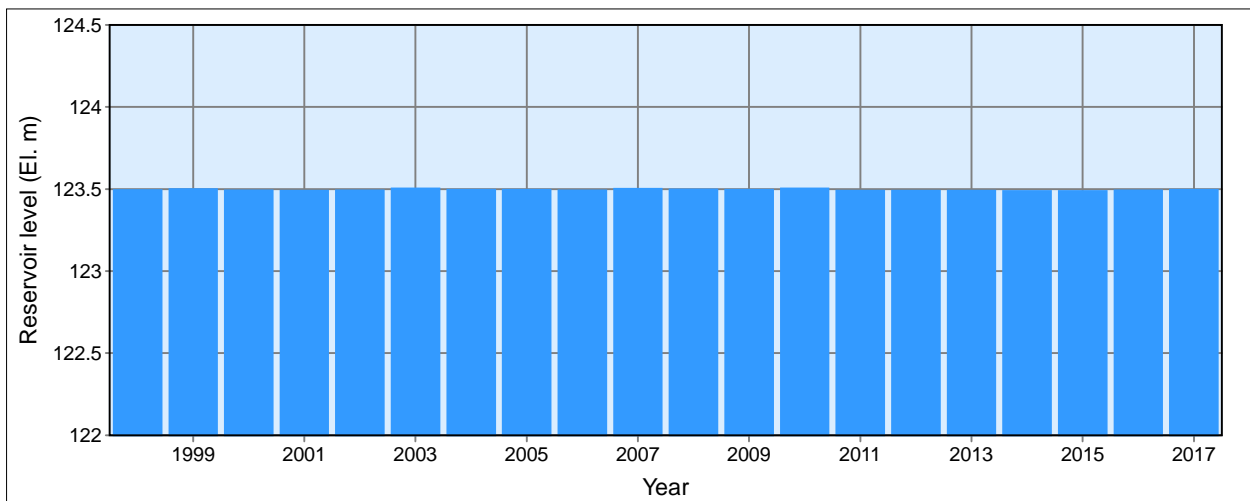
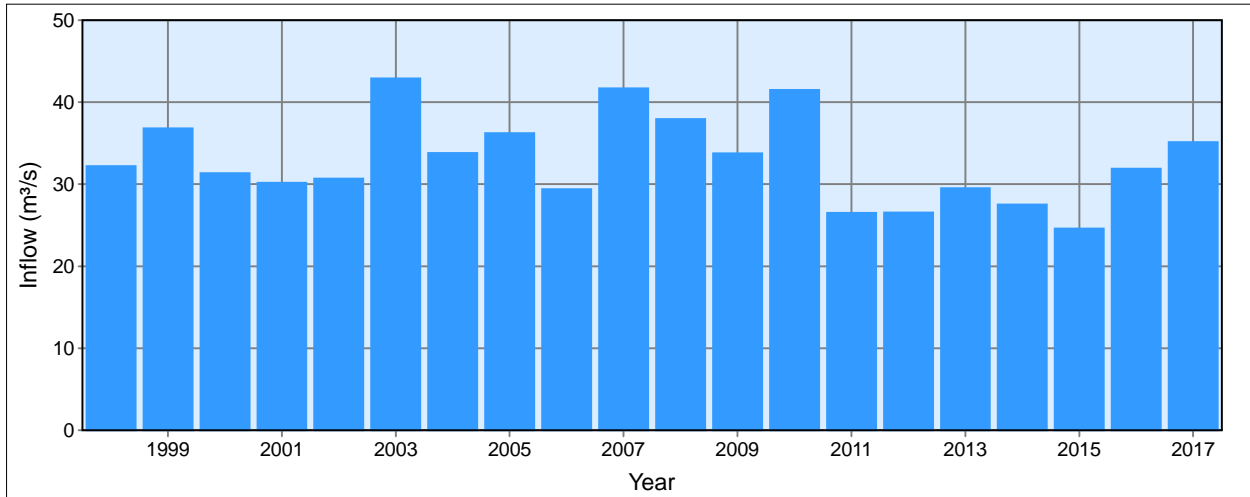
Plant type: reservoir  
Economic life: 30 years

Headwork type: dam  
Annual interest rate: 12.00%

Operation mode: base

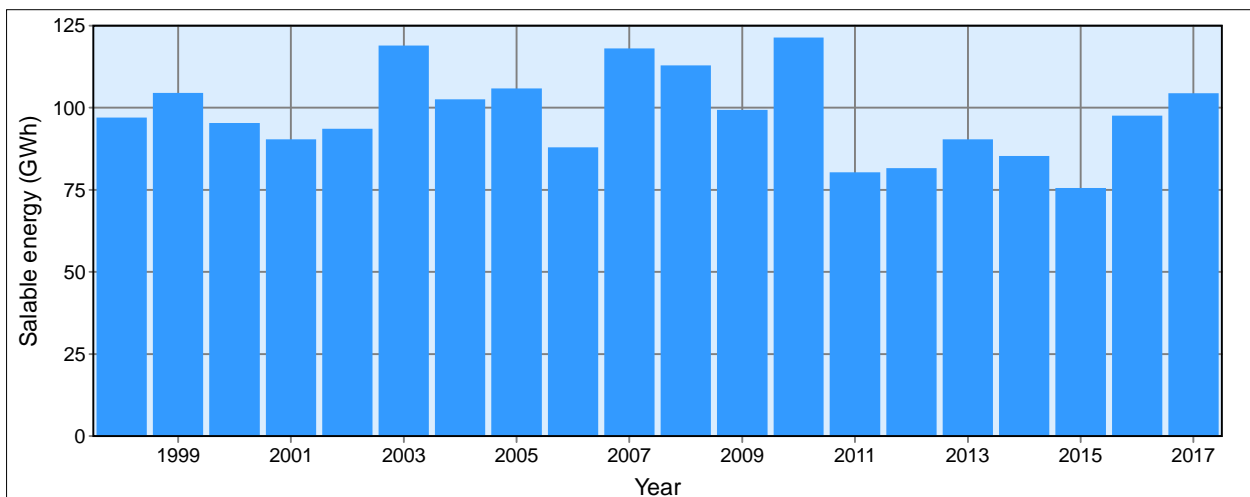
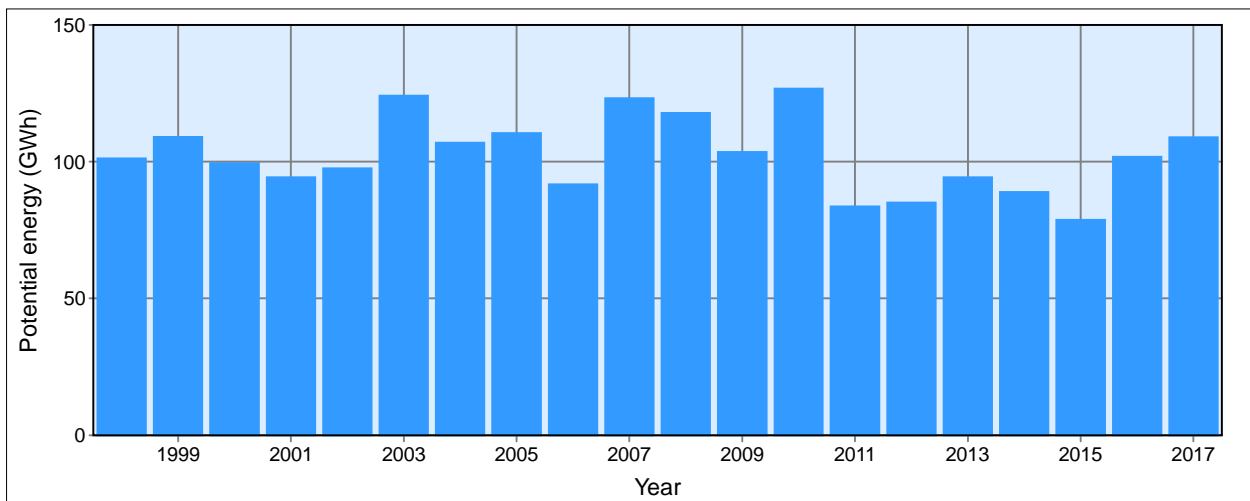
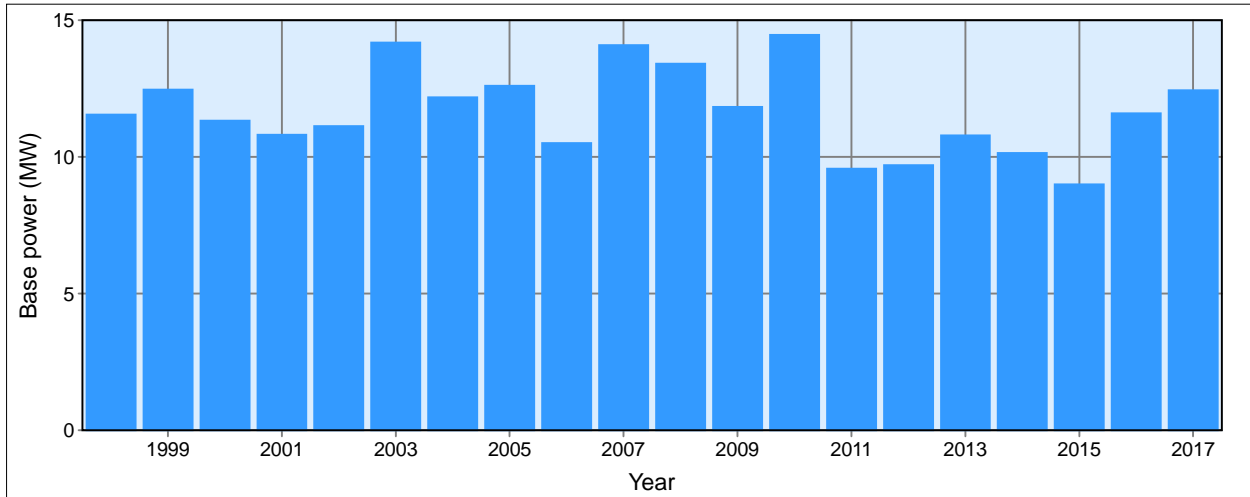
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: yearly summary (average values)



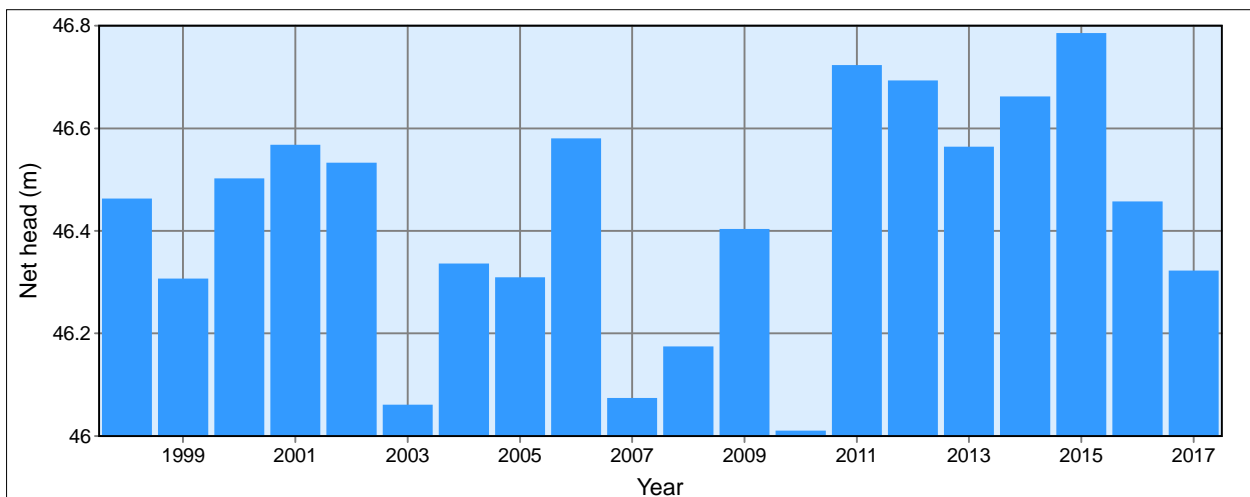
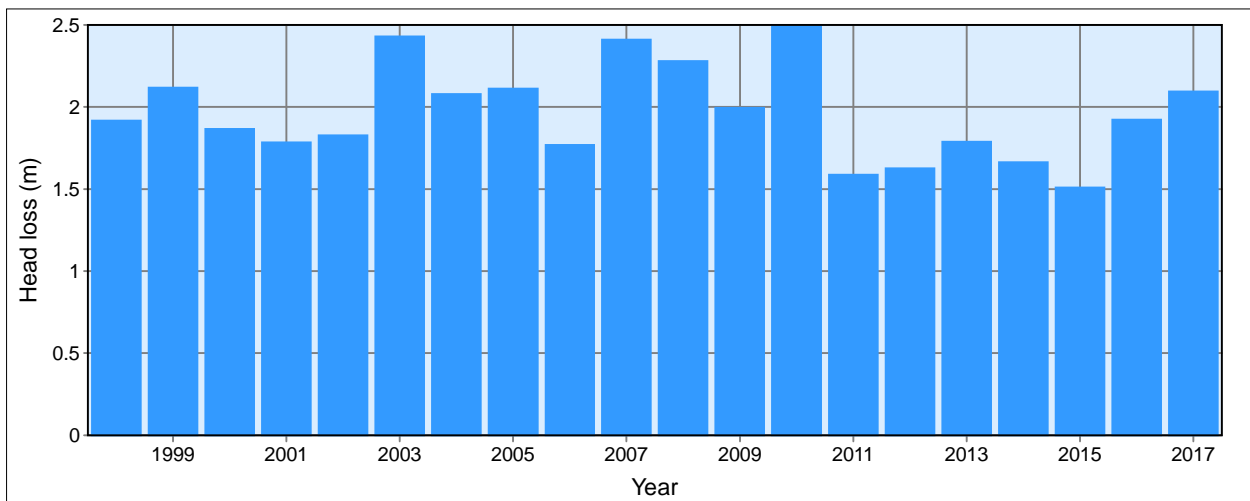
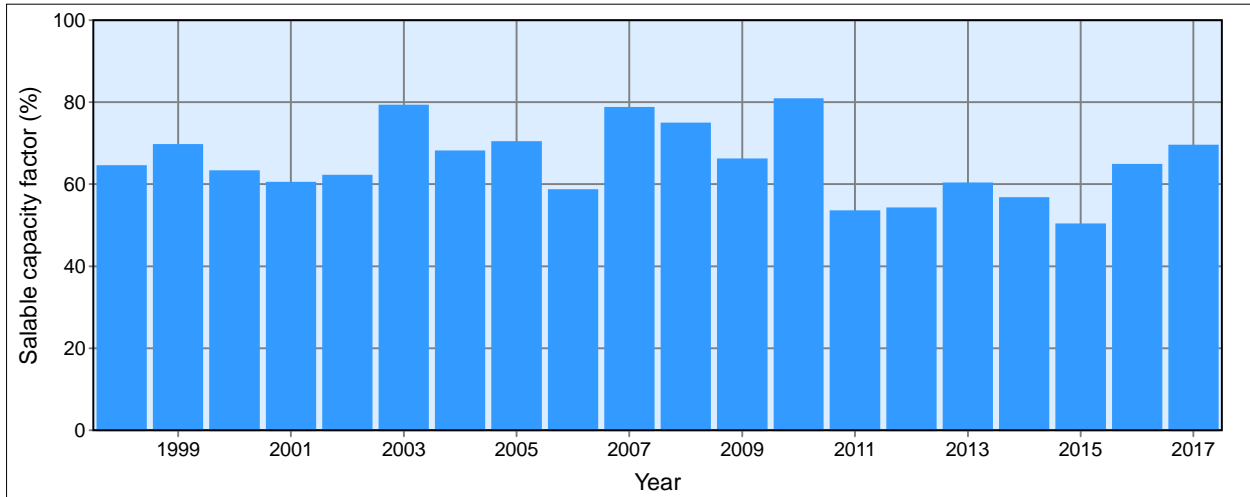
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: yearly summary (average values)



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: yearly summary (average values)



Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: yearly summary (average values)

Year	Inflow (m <sup>3</sup> /s)	Reservoir level (El. m)	Power discharge (m <sup>3</sup> /s)	Base power (MW)	Potential energy (GWh)
1998	32.188	123.492	29.906	11.540	101.166
1999	36.791	123.499	31.880	12.459	108.991
2000	31.333	123.491	29.331	11.316	99.439
2001	30.146	123.490	27.901	10.803	94.260
2002	30.696	123.491	28.679	11.120	97.549
2003	42.882	123.504	36.088	14.181	124.098
2004	33.806	123.496	31.264	12.179	106.909
2005	36.210	123.496	32.220	12.595	110.385
2006	29.398	123.491	27.312	10.498	91.666
2007	41.659	123.501	36.043	14.076	123.159
2008	37.913	123.496	34.657	13.402	117.782
2009	33.739	123.496	30.525	11.827	103.543
2010	41.474	123.503	37.075	14.463	126.644
2011	26.506	123.489	24.962	9.568	83.659
2012	26.560	123.489	25.561	9.695	85.052
2013	29.512	123.490	28.017	10.780	94.244
2014	27.539	123.488	26.527	10.140	88.923
2015	24.572	123.488	23.656	8.999	78.727
2016	31.891	123.491	30.182	11.592	101.749
2017	35.130	123.495	32.092	12.430	108.930

Plant type: reservoir

Firm discharge: 42.83 m<sup>3</sup>/s

Headwork type: dam

Full supply level: 123.53 El. m

Operation mode: base

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: yearly summary (average values)

Year	Salable energy (GWh)	Salable capacity factor (%)	Head loss (m)	Net head (m)
1998	96.722	64.406	1.916	46.576
1999	104.203	69.538	2.118	46.381
2000	95.071	63.156	1.866	46.625
2001	90.119	60.292	1.783	46.707
2002	93.264	62.063	1.827	46.664
2003	118.647	79.146	2.430	46.074
2004	102.213	67.975	2.078	46.418
2005	105.536	70.297	2.112	46.384
2006	87.639	58.593	1.769	46.723
2007	117.749	78.563	2.410	46.090
2008	112.608	74.799	2.280	46.216
2009	98.994	66.011	1.994	46.502
2010	121.081	80.720	2.492	46.011
2011	79.984	53.403	1.587	46.902
2012	81.316	54.108	1.625	46.864
2013	90.105	60.168	1.787	46.703
2014	85.017	56.594	1.663	46.825
2015	75.268	50.228	1.508	46.980
2016	97.280	64.699	1.921	46.569
2017	104.145	69.378	2.094	46.401

Plant type: reservoir

Firm discharge: 42.83 m<sup>3</sup>/s

Headwork type: dam

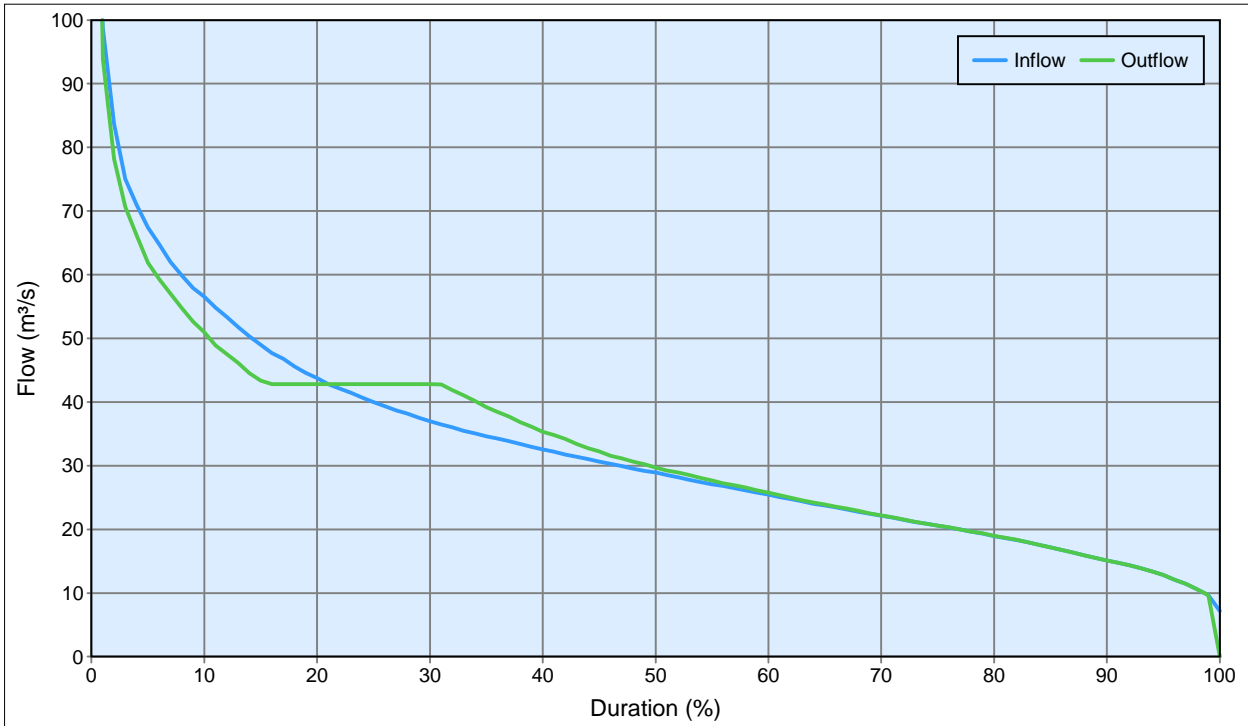
Full supply level: 123.53 El. m

Operation mode: base



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

## Selected case: inflow/outflow - duration



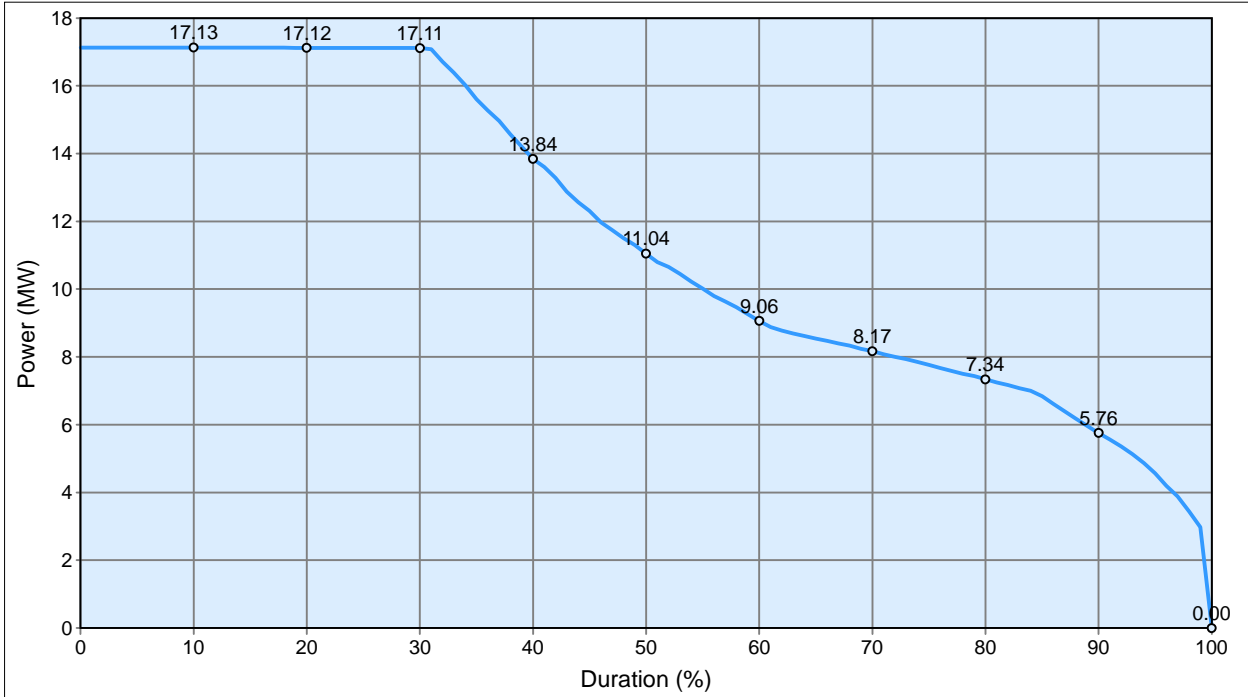
Duration (%)	Inflow (m³/s)	Outflow (m³/s)	Duration (%)	Inflow (m³/s)	Outflow (m³/s)	Duration (%)	Inflow (m³/s)	Outflow (m³/s)	Duration (%)	Inflow (m³/s)	Outflow (m³/s)
1	98.784	93.893	26	39.338	42.831	51	28.548	29.218	76	20.299	20.323
2	83.702	78.184	27	38.691	42.831	52	28.186	28.929	77	19.990	20.012
3	75.073	70.651	28	38.164	42.831	53	27.809	28.516	78	19.612	19.645
4	71.021	66.220	29	37.534	42.831	54	27.454	28.069	79	19.336	19.360
5	67.406	61.869	30	36.958	42.831	55	27.079	27.655	80	18.948	18.988
6	64.793	59.314	31	36.501	42.754	56	26.814	27.234	81	18.648	18.664
7	62.040	57.021	32	36.018	41.833	57	26.483	26.908	82	18.340	18.362
8	59.832	54.729	33	35.473	41.054	58	26.115	26.567	83	17.959	17.979
9	57.912	52.611	34	35.050	40.169	59	25.799	26.134	84	17.577	17.577
10	56.543	50.963	35	34.601	39.170	60	25.449	25.737	85	17.176	17.176
11	54.836	48.890	36	34.252	38.425	61	25.066	25.363	86	16.753	16.753
12	53.357	47.551	37	33.863	37.710	62	24.734	24.968	87	16.343	16.343
13	51.765	46.160	38	33.392	36.853	63	24.382	24.565	88	15.927	15.927
14	50.298	44.550	39	32.966	36.112	64	24.022	24.216	89	15.506	15.506
15	49.011	43.375	40	32.584	35.348	65	23.754	23.915	90	15.129	15.129
16	47.678	42.831	41	32.175	34.845	66	23.449	23.570	91	14.738	14.738
17	46.766	42.831	42	31.755	34.196	67	23.102	23.234	92	14.350	14.350
18	45.596	42.831	43	31.403	33.392	68	22.749	22.894	93	13.920	13.920
19	44.574	42.831	44	31.021	32.765	69	22.441	22.514	94	13.407	13.407
20	43.739	42.831	45	30.632	32.237	70	22.116	22.204	95	12.815	12.815
21	42.831	42.831	46	30.294	31.562	71	21.828	21.897	96	12.083	12.083
22	42.083	42.831	47	29.937	31.121	72	21.515	21.563	97	11.455	11.455
23	41.433	42.831	48	29.535	30.655	73	21.153	21.204	98	10.589	10.589
24	40.682	42.831	49	29.191	30.224	74	20.855	20.886	99	9.695	9.695
25	40.010	42.831	50	28.935	29.712	75	20.569	20.599	100	7.183	0.000

Average inflow: 32.973 m³/s

Average outflow: 32.950 m³/s

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: power - duration

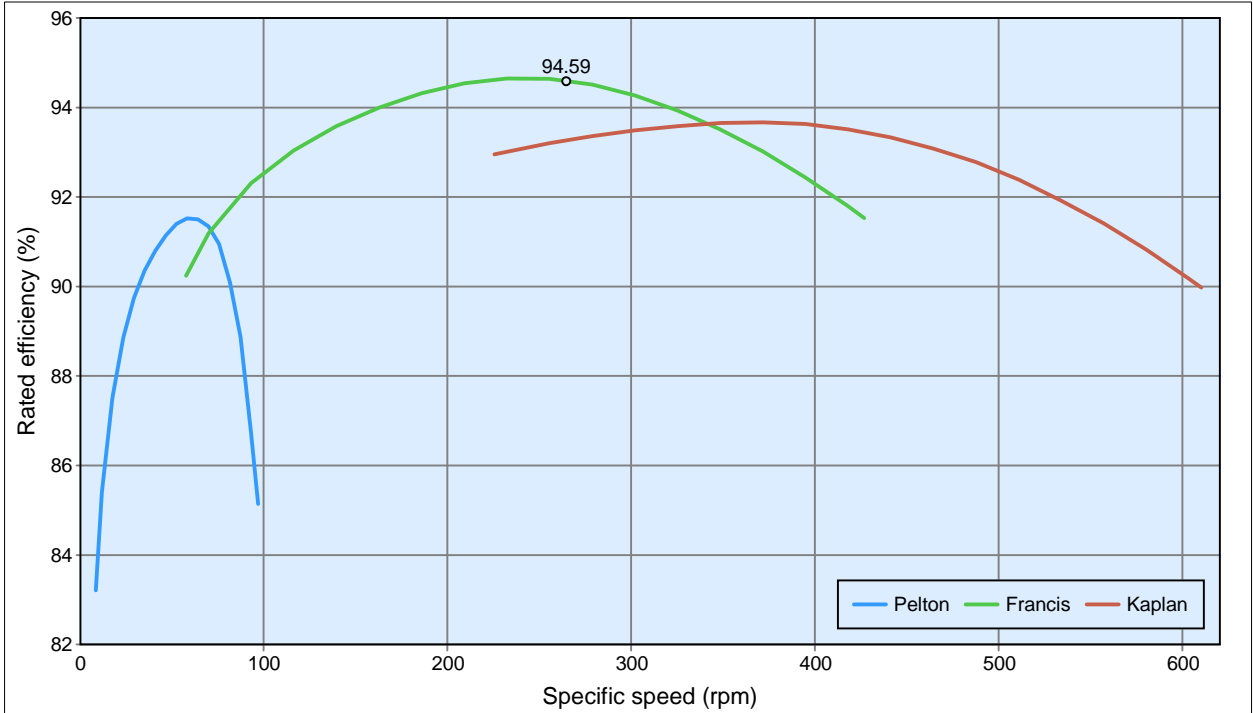
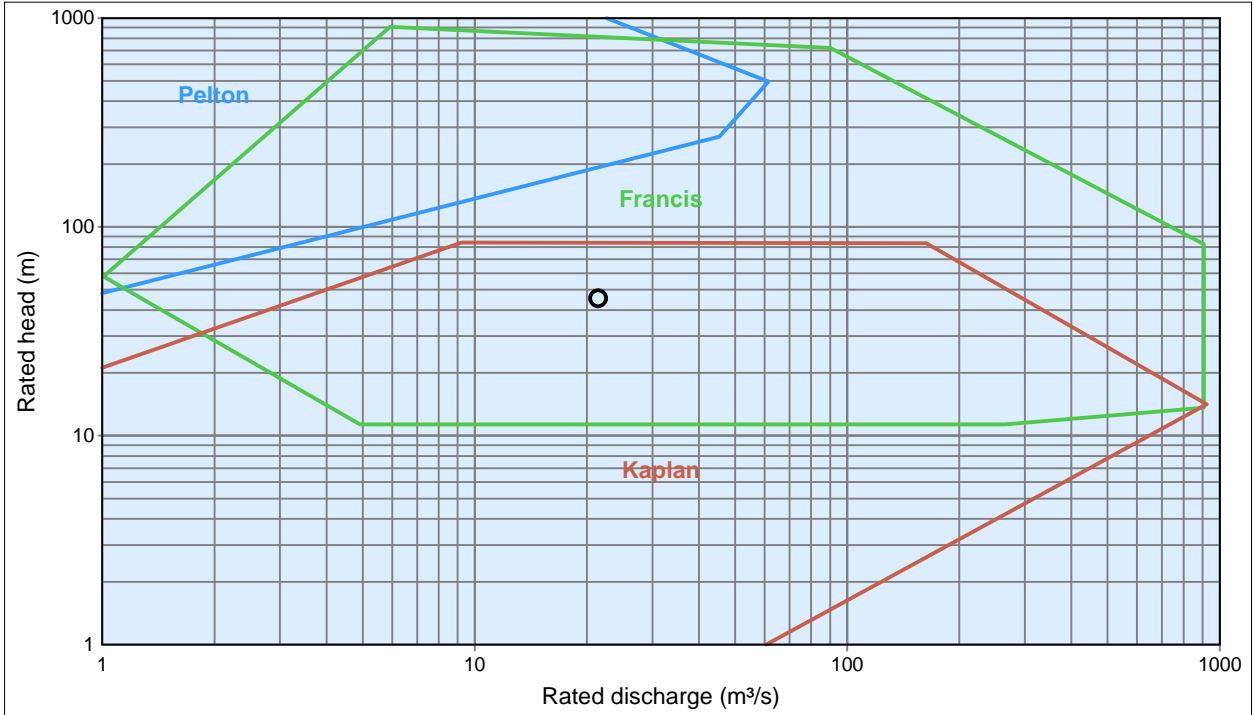


Duration (%)	Base power (MW)	Duration (%)	Base power (MW)	Duration (%)	Base power (MW)	Duration (%)	Base power (MW)
1	17.130	26	17.120	51	11.043	76	7.763
2	17.130	27	17.119	52	10.798	77	7.671
3	17.130	28	17.118	53	10.653	78	7.585
4	17.130	29	17.116	54	10.444	79	7.505
5	17.130	30	17.115	55	10.221	80	7.435
6	17.130	31	17.113	56	10.012	81	7.338
7	17.130	32	17.084	57	9.802	82	7.250
8	17.130	33	16.707	58	9.641	83	7.169
9	17.130	34	16.389	59	9.472	84	7.079
10	17.130	35	16.025	60	9.256	85	6.997
11	17.130	36	15.601	61	9.061	86	6.839
12	17.129	37	15.280	62	8.879	87	6.615
13	17.128	38	14.968	63	8.780	88	6.400
14	17.127	39	14.566	64	8.695	89	6.182
15	17.127	40	14.210	65	8.620	90	5.958
16	17.126	41	13.844	66	8.543	91	5.760
17	17.125	42	13.605	67	8.474	92	5.560
18	17.125	43	13.280	68	8.402	93	5.356
19	17.124	44	12.877	69	8.328	94	5.132
20	17.123	45	12.567	70	8.239	95	4.866
21	17.122	46	12.307	71	8.173	96	4.564
22	17.121	47	11.966	72	8.081	97	4.201
23	17.121	48	11.743	73	8.006	98	3.880
24	17.121	49	11.510	74	7.940	99	3.444
25	17.121	50	11.295	75	7.846	100	2.980

Average base power: 11.675 MW

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: turbine efficiency charts



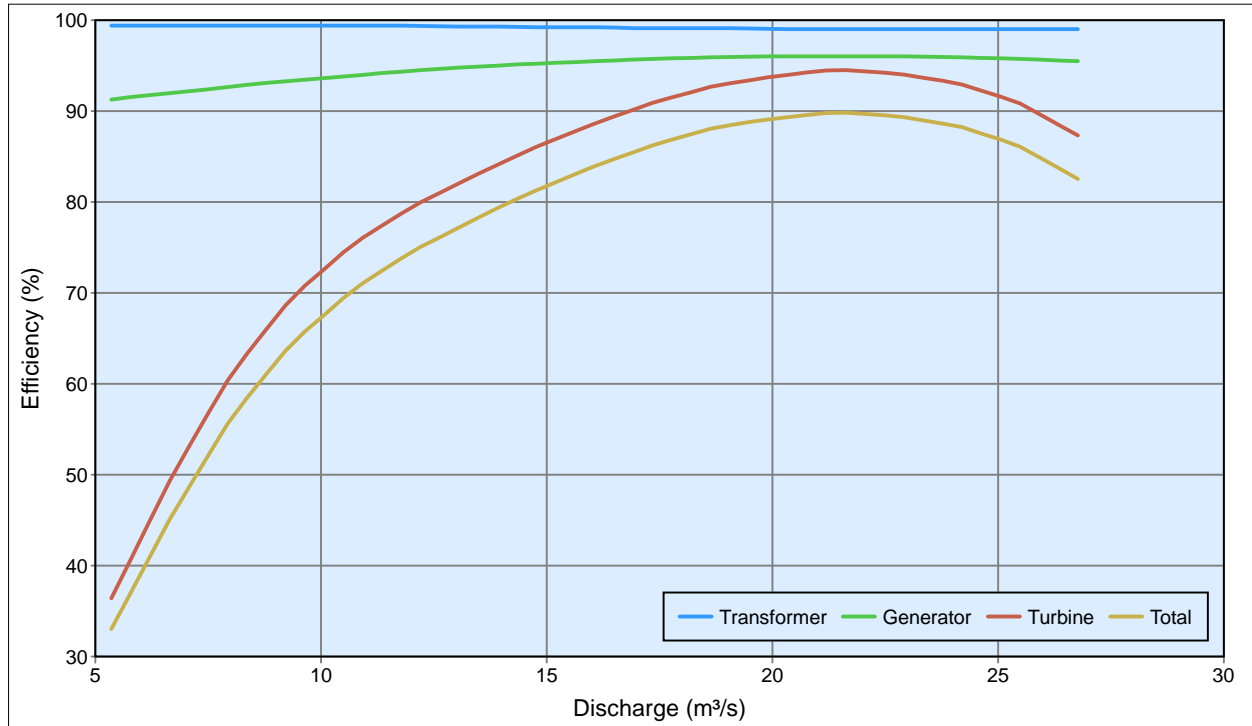
Type: Francis  
Speed: 333.3 rpm

Number of units: 2  
Specific speed: 264.2 rpm

Rated discharge: 21.42 m³/s  
Rated efficiency: 94.59%

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: unit efficiency curves at rated head



Discharge (m³/s)	Efficiency (%)				Discharge (m³/s)	Efficiency (%)			
	Turbine	Generator	Transformer	Total		Turbine	Generator	Transformer	Total
5.782	40.715	91.532	99.400	37.044	16.490	89.387	95.566	99.160	84.706
6.210	45.013	91.744	99.400	41.049	16.918	90.144	95.655	99.120	85.468
6.639	49.311	91.956	99.400	45.073	17.347	90.900	95.730	99.100	86.236
7.067	53.053	92.168	99.400	48.605	17.775	91.498	95.790	99.100	86.857
7.495	56.716	92.403	99.400	52.093	18.203	92.073	95.849	99.100	87.457
7.924	60.378	92.642	99.400	55.600	18.631	92.648	95.905	99.100	88.054
8.352	63.292	92.881	99.400	58.433	19.060	93.042	95.935	99.100	88.456
8.780	65.955	93.090	99.400	61.029	19.488	93.375	95.965	99.080	88.783
9.209	68.619	93.269	99.400	63.616	19.916	93.708	95.995	99.040	89.092
9.637	70.772	93.448	99.400	65.738	20.345	93.984	96.000	99.000	89.322
10.065	72.618	93.627	99.400	67.582	20.773	94.226	96.000	99.000	89.553
10.494	74.465	93.809	99.400	69.435	21.201	94.468	96.000	99.000	89.783
10.922	76.054	93.991	99.400	71.055	21.630	94.514	96.000	99.000	89.826
11.350	77.385	94.173	99.400	72.439	22.058	94.362	96.000	99.000	89.682
11.779	78.717	94.327	99.400	73.806	22.486	94.211	96.000	99.000	89.538
12.207	79.947	94.476	99.360	75.047	22.915	93.992	95.995	99.000	89.325
12.635	81.006	94.625	99.320	76.131	23.343	93.659	95.965	99.000	88.981
13.063	82.066	94.760	99.300	77.221	23.771	93.326	95.935	99.000	88.637
13.492	83.110	94.879	99.300	78.302	24.200	92.910	95.905	99.000	88.213
13.920	84.109	94.999	99.300	79.343	24.628	92.244	95.849	99.000	87.531
14.348	85.108	95.114	99.260	80.350	25.056	91.578	95.790	99.000	86.845
14.777	86.088	95.205	99.220	81.320	25.484	90.847	95.730	99.000	86.098
15.205	86.935	95.295	99.200	82.183	25.913	89.667	95.655	99.000	84.913
15.633	87.783	95.386	99.200	83.063	26.341	88.487	95.566	99.000	83.717
16.062	88.630	95.476	99.200	83.944	26.769	87.306	95.476	99.000	82.523

Turbine type: Francis

Number of units: 2

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

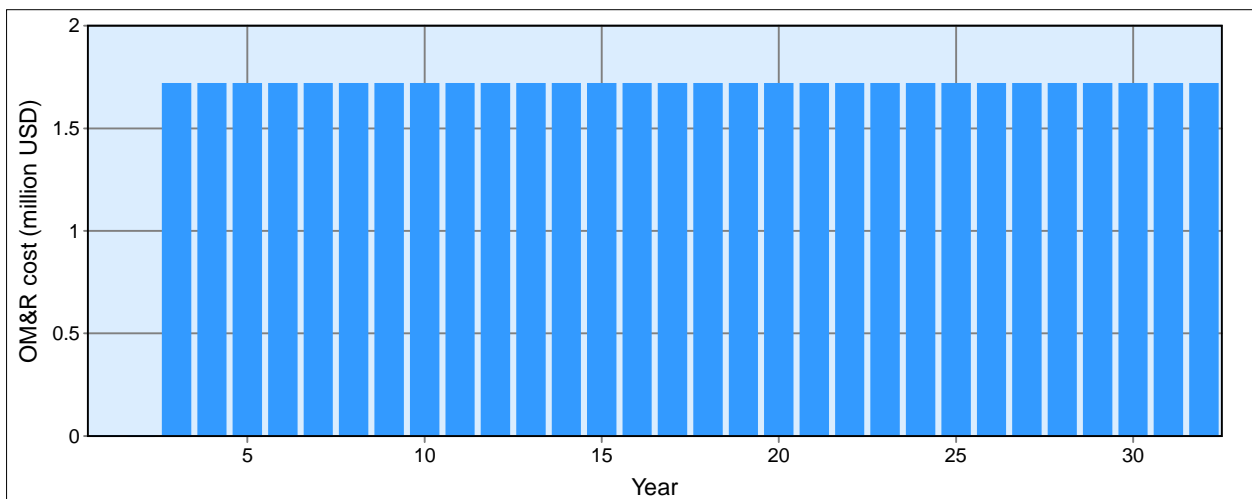
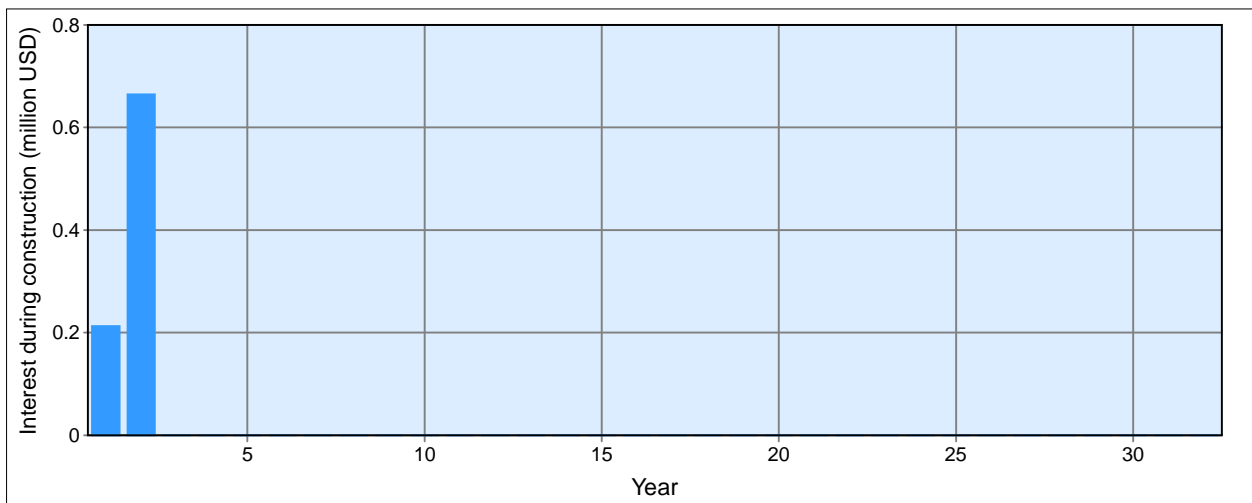
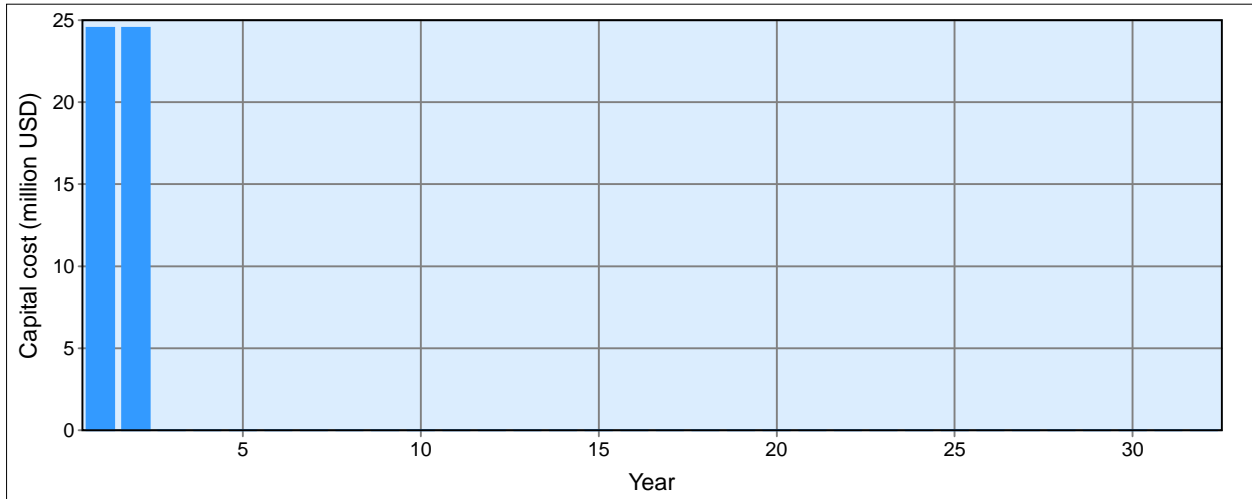
### Selected case: preliminary cost estimates

Unit: million USD

	Optimistic	Moderate	Pessimistic
<b>EPC COST</b>	28.93	37.98	51.29
1. Civil works	18.63	24.87	35.33
· Dam and intake	12.30	16.19	23.31
· Headrace tunnel	2.75	3.60	5.15
· Surgetank	1.08	1.42	2.03
· Penstock foundations	0.04	0.13	0.22
· Exposed powerhouse	1.12	1.79	2.26
· Road	0.20	0.26	0.33
· Bridges	0.25	0.30	0.35
· Miscellaneous civil works	0.89	1.18	1.68
2. Metal works	2.37	2.44	2.51
· Penstock steel pipe	1.23	1.28	1.32
· Gates and trasracks	1.14	1.16	1.19
3. Equipment	7.49	10.02	12.55
· Plant equipment	7.16	9.54	11.93
· Transmission line	0.33	0.48	0.62
4. Other costs	0.23	0.30	0.40
· Project office	0.23	0.30	0.40
5. Engineering and supervision	0.21	0.36	0.50
<b>MANAGEMENT COST</b>	7.50	9.97	13.61
1. Land acquisition	0.31	0.52	0.83
2. Contingencies	1.45	1.90	2.56
3. Value added tax	2.89	3.80	5.13
4. Management and administration	2.03	2.66	3.59
5. Interest during construction	0.83	1.10	1.50
<b>TOTAL PROJECT COST</b>	36.43	47.95	64.90
<b>EVALUATION INDICES</b>			
1. Power index (thousand USD/kW)	2.13	2.80	3.79
2. Energy index (USD/kWh)	0.356	0.469	0.634
3. Energy cost (cUSD/kWh)	6.60	9.45	13.89
4. Net present value (million USD)	29.86	11.13	(18.04)
5. Benefit/cost ratio	1.69	1.18	0.80
6. Financial internal rate of return (%)	21.95	14.87	8.46
7. Break event period (years)	2 + 4	2 + 6	2 + 11

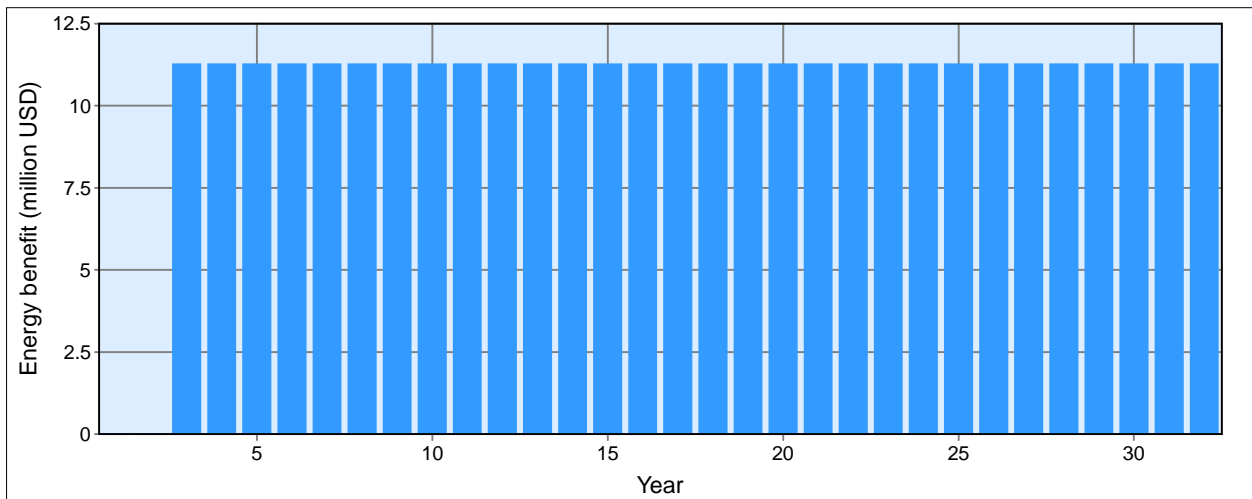
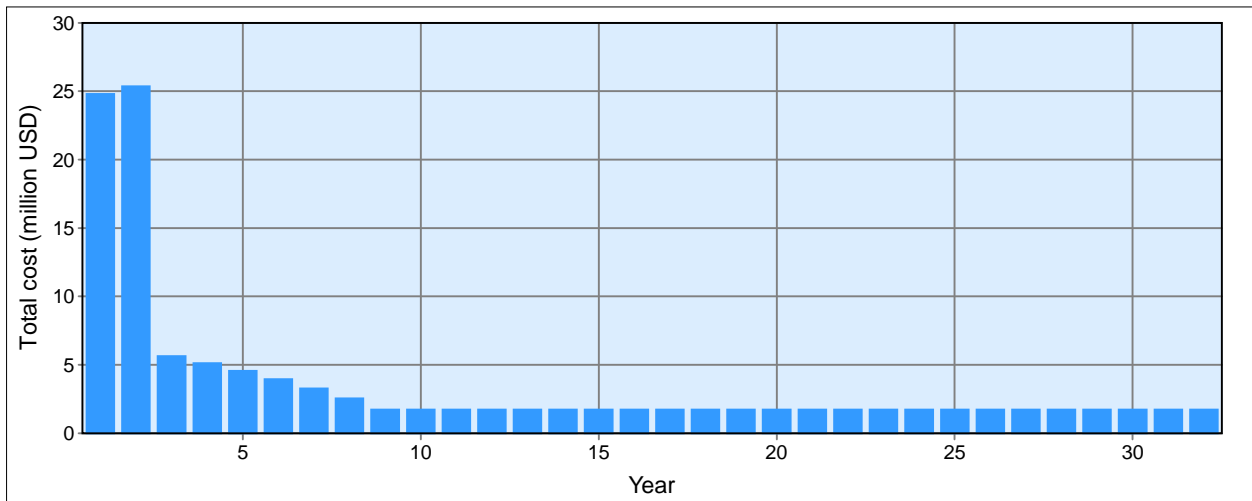
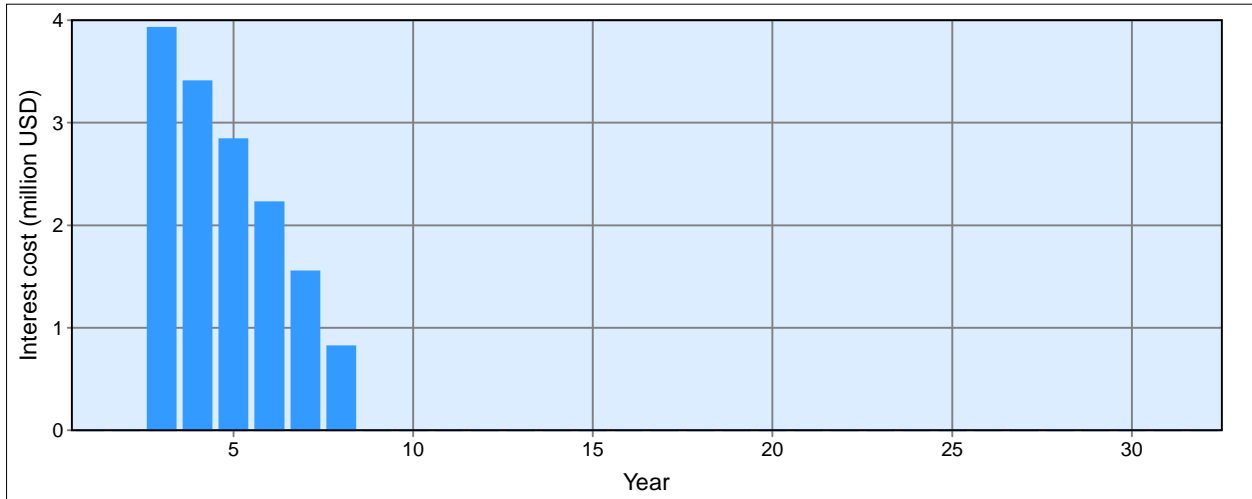
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: cash flows



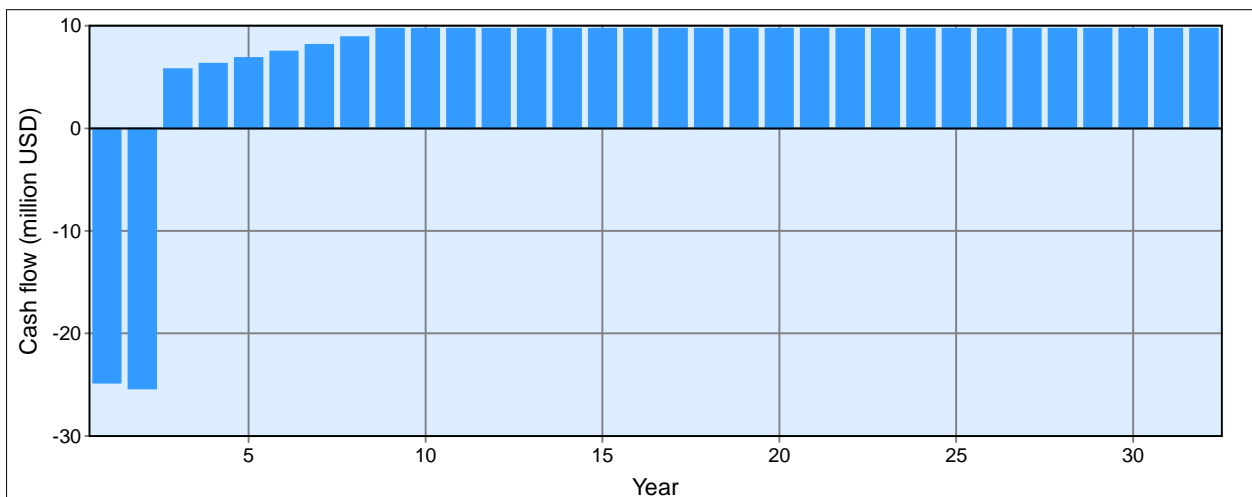
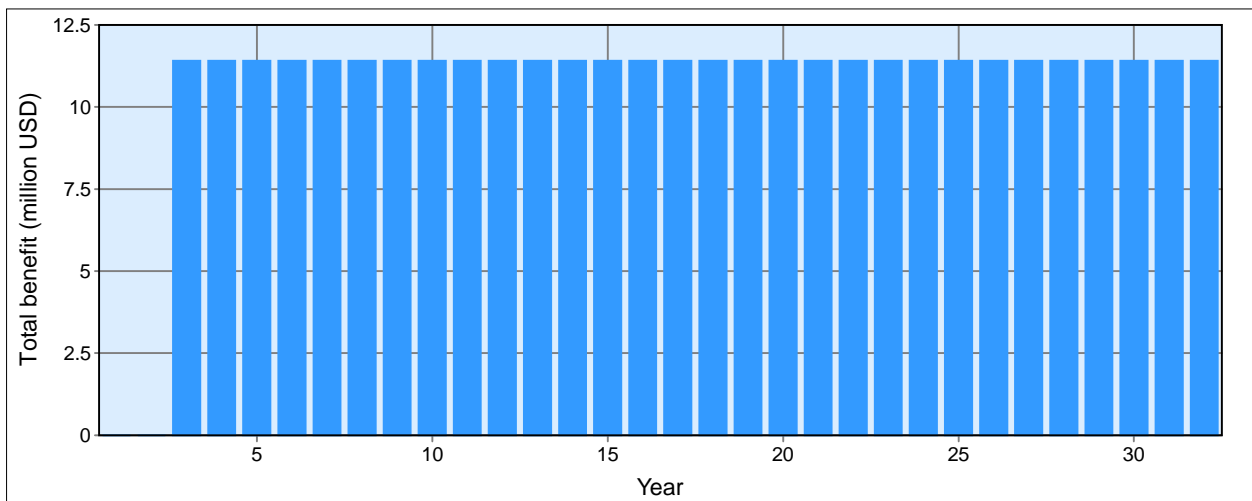
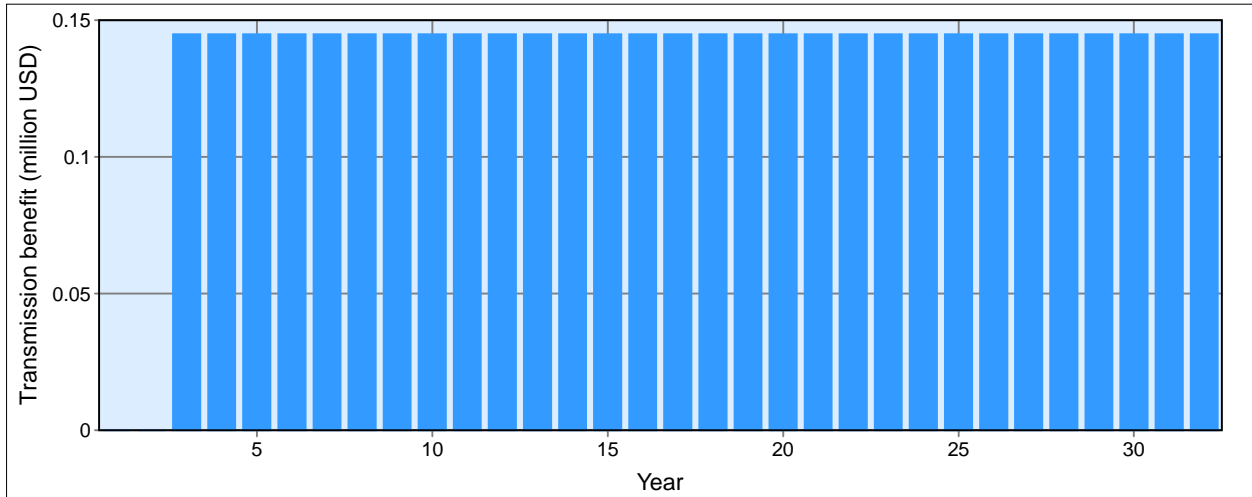
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: cash flows



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

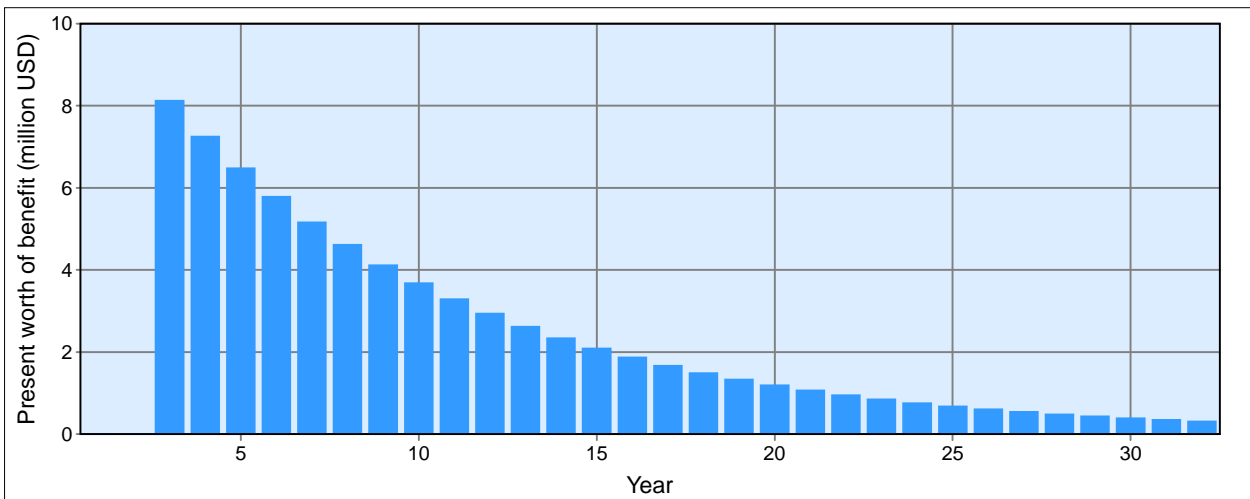
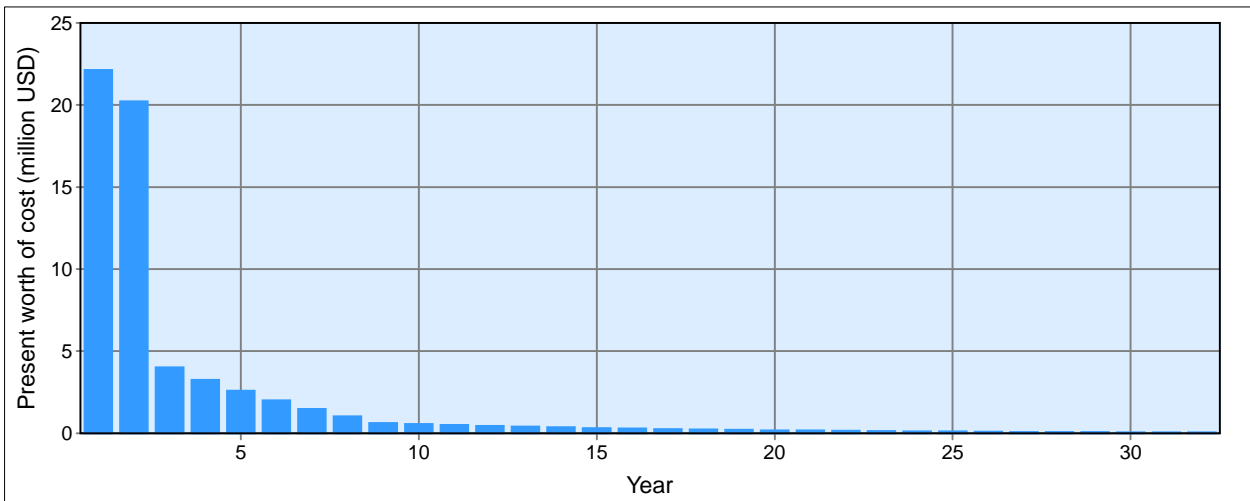
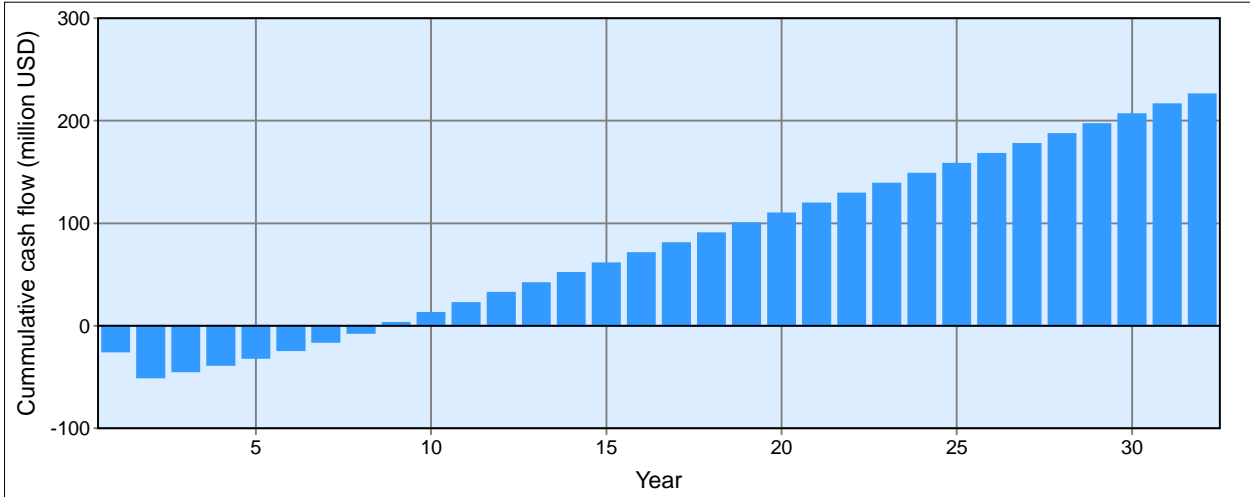
### Selected case: cash flows





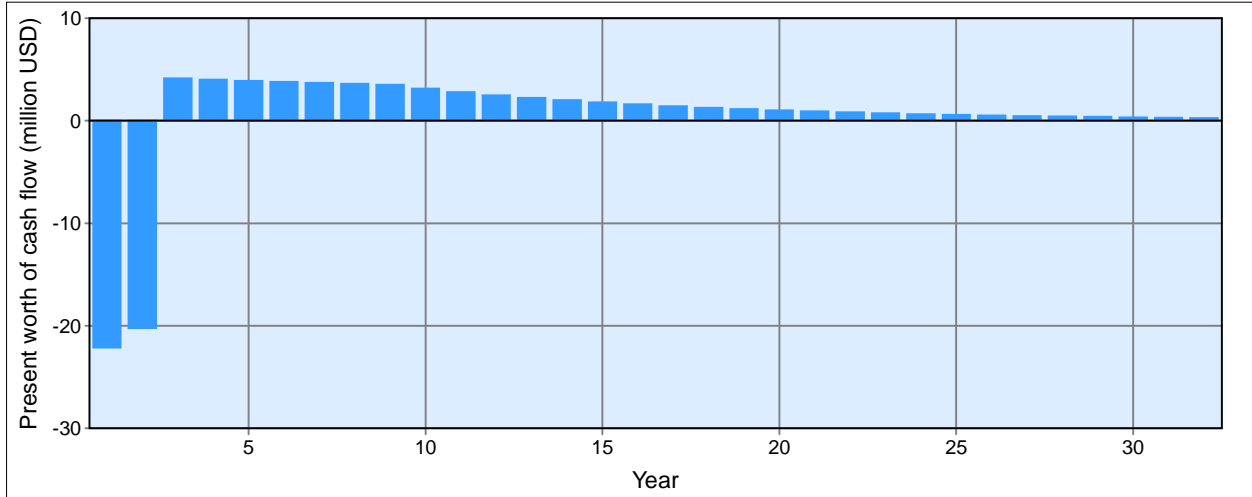
**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: cash flows



**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: cash flows



Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: cash flows

Unit: million USD

Year	Capital cost	Interest during construction	OM&R cost	Interest cost	Total cost	Energy benefit	Transmission benefit
1	24.53	0.27			24.79		
2	24.53	0.83			25.36		
3			1.72	3.92	5.64	11.26	0.14
4			1.72	3.40	5.12	11.26	0.14
5			1.72	2.84	4.55	11.26	0.14
6			1.72	2.22	3.94	11.26	0.14
7			1.72	1.55	3.27	11.26	0.14
8			1.72	0.82	2.53	11.26	0.14
9			1.72		1.72	11.26	0.14
10			1.72		1.72	11.26	0.14
11			1.72		1.72	11.26	0.14
12			1.72		1.72	11.26	0.14
13			1.72		1.72	11.26	0.14
14			1.72		1.72	11.26	0.14
15			1.72		1.72	11.26	0.14
16			1.72		1.72	11.26	0.14
17			1.72		1.72	11.26	0.14
18			1.72		1.72	11.26	0.14
19			1.72		1.72	11.26	0.14
20			1.72		1.72	11.26	0.14
21			1.72		1.72	11.26	0.14
22			1.72		1.72	11.26	0.14
23			1.72		1.72	11.26	0.14
24			1.72		1.72	11.26	0.14
25			1.72		1.72	11.26	0.14
26			1.72		1.72	11.26	0.14
27			1.72		1.72	11.26	0.14
28			1.72		1.72	11.26	0.14
29			1.72		1.72	11.26	0.14
30			1.72		1.72	11.26	0.14
31			1.72		1.72	11.26	0.14
32			1.72		1.72	11.26	0.14

Economic life: 30 years

Net present value: 11.13 million USD

Annual interest rate: 12.00%

Benefit/cost ratio: 1.179

Internal rate of return: 14.87%

Sample project  
Site screening stage  
Preliminary site assessment  
Alternative: A scheme with a reservoir  
River: Sample

## Selected case: cash flows

Unit: million USD

Year	Total benefit	Cash flow	Cummulative cash flow	Present worth of cost	Present worth of benefit	Present worth of cash flow
1		(24.79)	(24.79)	22.14		(22.14)
2		(25.36)	(50.15)	20.21		(20.21)
3	11.40	5.76	(44.38)	4.01	8.12	4.10
4	11.40	6.28	(38.10)	3.25	7.25	3.99
5	11.40	6.85	(31.25)	2.58	6.47	3.89
6	11.40	7.46	(23.79)	1.99	5.78	3.78
7	11.40	8.14	(15.65)	1.48	5.16	3.68
8	11.40	8.87	(6.78)	1.02	4.61	3.58
9	11.40	9.69	2.91	0.62	4.11	3.49
10	11.40	9.69	12.59	0.55	3.67	3.12
11	11.40	9.69	22.28	0.49	3.28	2.78
12	11.40	9.69	31.97	0.44	2.93	2.49
13	11.40	9.69	41.66	0.39	2.61	2.22
14	11.40	9.69	51.34	0.35	2.33	1.98
15	11.40	9.69	61.03	0.31	2.08	1.77
16	11.40	9.69	70.72	0.28	1.86	1.58
17	11.40	9.69	80.40	0.25	1.66	1.41
18	11.40	9.69	90.09	0.22	1.48	1.26
19	11.40	9.69	99.78	0.20	1.32	1.12
20	11.40	9.69	109.47	0.18	1.18	1.00
21	11.40	9.69	119.15	0.16	1.06	0.90
22	11.40	9.69	128.84	0.14	0.94	0.80
23	11.40	9.69	138.53	0.13	0.84	0.71
24	11.40	9.69	148.22	0.11	0.75	0.64
25	11.40	9.69	157.90	0.10	0.67	0.57
26	11.40	9.69	167.59	0.09	0.60	0.51
27	11.40	9.69	177.28	0.08	0.53	0.45
28	11.40	9.69	186.96	0.07	0.48	0.41
29	11.40	9.69	196.65	0.06	0.43	0.36
30	11.40	9.69	206.34	0.06	0.38	0.32
31	11.40	9.69	216.03	0.05	0.34	0.29
32	11.40	9.69	225.71	0.05	0.30	0.26

Economic life: 30 years

Net present value: 11.13 million USD

Annual interest rate: 12.00%

Benefit/cost ratio: 1.179

Internal rate of return: 14.87%

**Sample project**  
**Site screening stage**  
**Preliminary site assessment**  
**Alternative: A scheme with a reservoir**  
**River: Sample**

### Selected case: project parameters

Parameter	Unit	Value	Parameter	Unit	Value
Optimization scenario		CF » 65.00% w/ largest IRR	Unit rated head	m	45.47
Project development			Unit full efficiency	%	89.90
Development type		Reservoir	Unit rated efficiency	%	89.90
Headwork type		Dam	Turbine type		Francis
Operation mode		Base	Turbine speed	rpm	333.3
Inflow			Turbine specific speed	rpm	264.2
Average inflow	m <sup>3</sup> /s	32.97	Number of generator poles		18
Average annual runoff volume	m <sup>3</sup>	1040.54 mio	Power and energy		
Project components			Installed capacity	MW	17.13
Full supply level	El. m	123.53	Firm discharge	m <sup>3</sup> /s	42.83
Minimum operation level	El. m	123.48	Dependability	%	21.00
Tail water level	El. m	75.00	Development factor		0.00
Reservoir			Gross head	m	48.53
· Reservoir full storage	m <sup>3</sup>	907.27 mio	Net head	m	45.49
· Reservoir full area	km <sup>2</sup>	0.94	Rated head	m	45.47
Dam			Plant usage and losses	%	4.00
· Crest level	El. m	130.00	Transmission losses	%	0.39
· Height from river bed	m	46.00	Average reservoir level	El. m	123.49
Headrace tunnel			Average power discharge	m <sup>3</sup> /s	30.19
· Length	m	500	Average base power	MW	11.68
· Diameter	m	1 x 4.24	Average potential energy	GWh/year	102.34
Exposed penstock			Average salable energy	GWh/year	97.85
· Length	m	200	Average salable capacity factor	%	65.21
· Diameter	m	1 x 3.76	Average head loss	m	1.96
· Average thickness	mm	11.60	Average net head	m	46.53
· Velocity	m/s	3.85	Cost estimates (moderate)		
Powerhouse type		Exposed	Total project cost	USD	47.95 mio
Road			Power index	USD/kW	2.80 bio
· Length	km	5.00	Energy index	USD/kWh	0.47
· Width	m	3.50	Financial analysis (moderate)		
Bridges			Economic life of project	years	30
· Total length	m	60.00	Annual interest rate	%	12.00
· Width	m	3.50	Salvage value/project cost	%	0.00
Transmission line			Feed-in tariff method		Flat
· Length	km	15.00	Energy tariff	cUSD/kWh	11.00
· Voltage	kV	20	Transmission tariff	cUSD/kWh	0.14
Land acquisition			Loan portion	%	75.00
· Structures	ha	13.26	Present worth of costs	USD	62.09 mio
· Reservoir	ha	114.00	Present worth of benefits	USD	73.22 mio
Equipment			Net present value	USD	11.13 mio
No. of units		2	Benefit/cost ratio		1.18
Unit capacity	MW	8.57	Financial internal rate of return	%	14.87
Unit rated discharge	m <sup>3</sup> /s	21.42	Energy cost	cUSD/kWh	9.45
			Break event period	years	2 + 6