



EIB Water and Sanitation Project in Republika Srpska

Projekat vodovodne i kanalizacione infrastrukture u Republici Srpskoj

Sokolac Water and Wastewater Development Project

Projekat razvoja vodovodnog i kanalizacionog sistema Sokolca

Project Preparation Feasibility Study
Studija izvodljivosti za finansiranje projekata

21. July 2015.



Albania



Bosnia & Herzegovina



Croatia



FYRo Macedonia



Kosovo



Montenegro



Serbia



Opening Remarks Uvodne napomene

Milovan Bjelica
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Gradonačelnik Sokolca

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- Introduction
 - Water supply – findings/recommendations
 - Wastewater collection findings/recommendations
 - Wastewater treatment findings/recommendations
 - Evaluation of Development Options
 - Environment Analysis
 - Financial Analysis and Appraisal
 - Implementation Strategy
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- Uvod
 - Vodosnabdijevanje – nalazi/preporuke
 - Prikupljanje otpadnih voda – nalazi/preporuke
 - Tretman otpadnih voda – nalazi/preporuke
 - Analiza razvojnih projekata
 - Analiza životne sredine
 - Finansijska analiza
 - Strategija implementacije



Water supply Vodosnabdevanje

Djordje Andrejevic

Senior Engineer – Water Supply

Odgovorni Inženjer – Vodosnabdevanje

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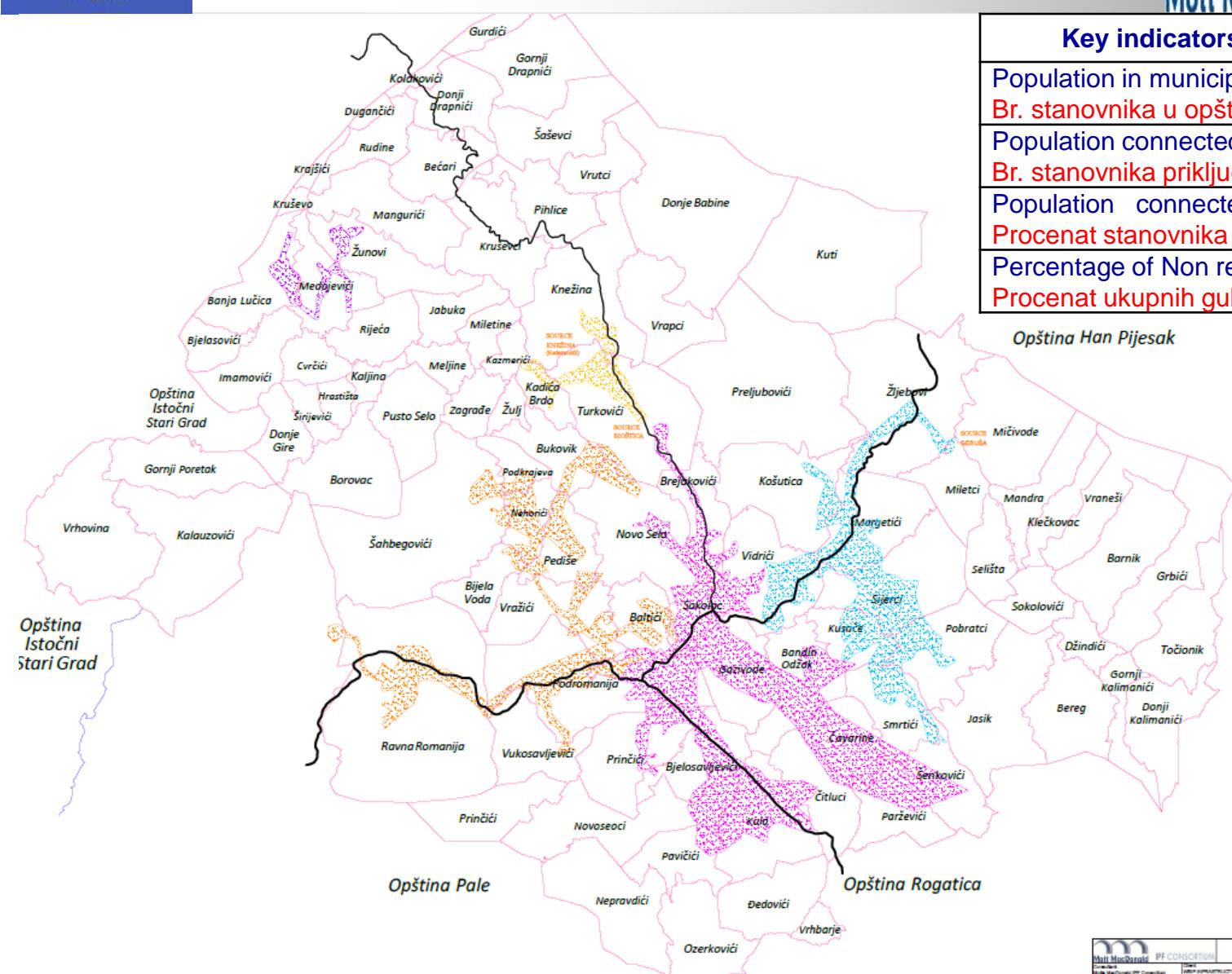


Existing water supply system within Municipality

Postojeci vodovodni sistem u opštinskom području



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Key indicators / Glavni pokazatelji

Population in municipality / Br. stanovnika u opštini	12,442
Population connected to WSS/ Br. stanovnika priključenih na VS	10,981
Population connected to WSS (%) / Procenat stanovnika priključenih na VS	88%
Percentage of Non revenue water / Procenat ukupnih gubitaka	68%

Opština Han Pijesak



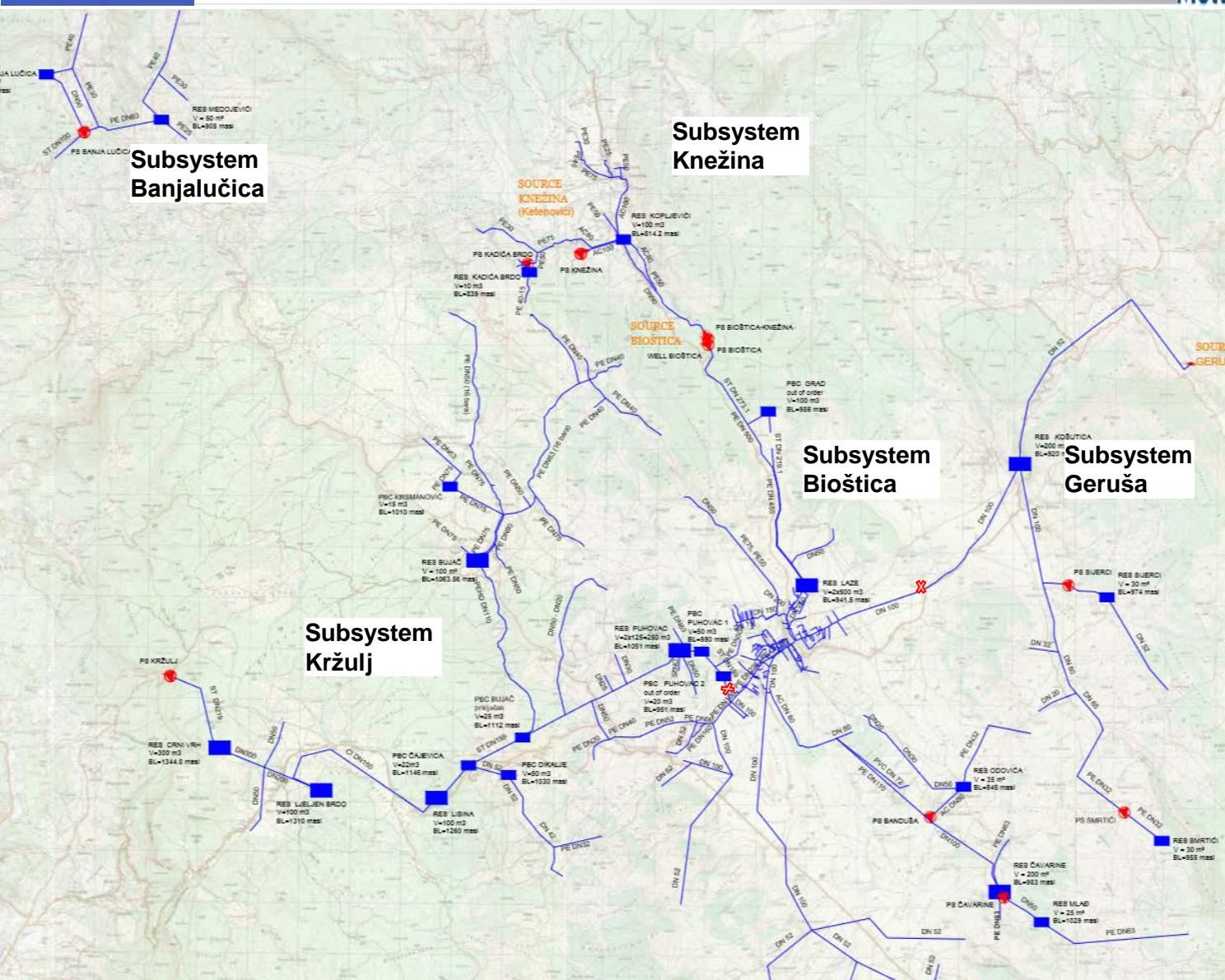


Existing Water Supply System of Sokolac

Postojeći Vodovodni sistem Sokolac



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**System configuration/
Konfiguracija sistema**

5 subsystems
5 podistema

Sources/ Izvorišta

5 karstic springs
5 karstnih izvora

**Subsystem Bioštica/
Podsistem Bioštica**

Spring Bioštica capacity 305 l/s
Kapacitet izdani Bioštica 305 l/s

82% of all connected
82% od svih priključenih



Existing water supply system Postojeći vodovodni sistem



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- 3,785 domestic and 243 commercial customers
3,785 domaćinstva i 243 komercijalnih korisnika
- 280 km of distribution network
280 km vodovodne mreže
- 22 reservoirs and press. break chambers
22 rezervoara i prekidnih komora
- Average requirement 56 l/s, Max 64 l/s
Prosečna potreba 56 l/s, Max 64l/s
- Non Revenue Water (68%)
Neprihodovana voda (68%)
- Connections are metered
Priklučci su mereni

WS Subsystems / Podsistemi	Population suplied / Priklučeno stanovništvo	Source&PS& main capacity (l/s) / Kapacitet izvorišta&PS &potisa	Minimal Source capacity (l/s) / Minimalni kapacitet izvorišta	Average demand (l/s) / Prosečna potreba	Peak demand (l/s) / Maksimalna potreba	NRW (%) / NPV	Chlorination / Hlorisanje
Bioštica	8,995	60	60	39.5	45.4	60%	Reservoir Laze and Knežina
Kržulj	879	15	5	10.5	11.6	88%	Source / Izvorište
Geruša	660	5	4	4.5	4.9	89%	Source / Izvorište
Knežina	380	5	1	0.9	1.0	55%	Source / Izvorište
Banja Lučica	67	4	2	0.5	0.6	81%	Source / Izvorište
Total	10,981	89	72	56.0	63.6	68%	

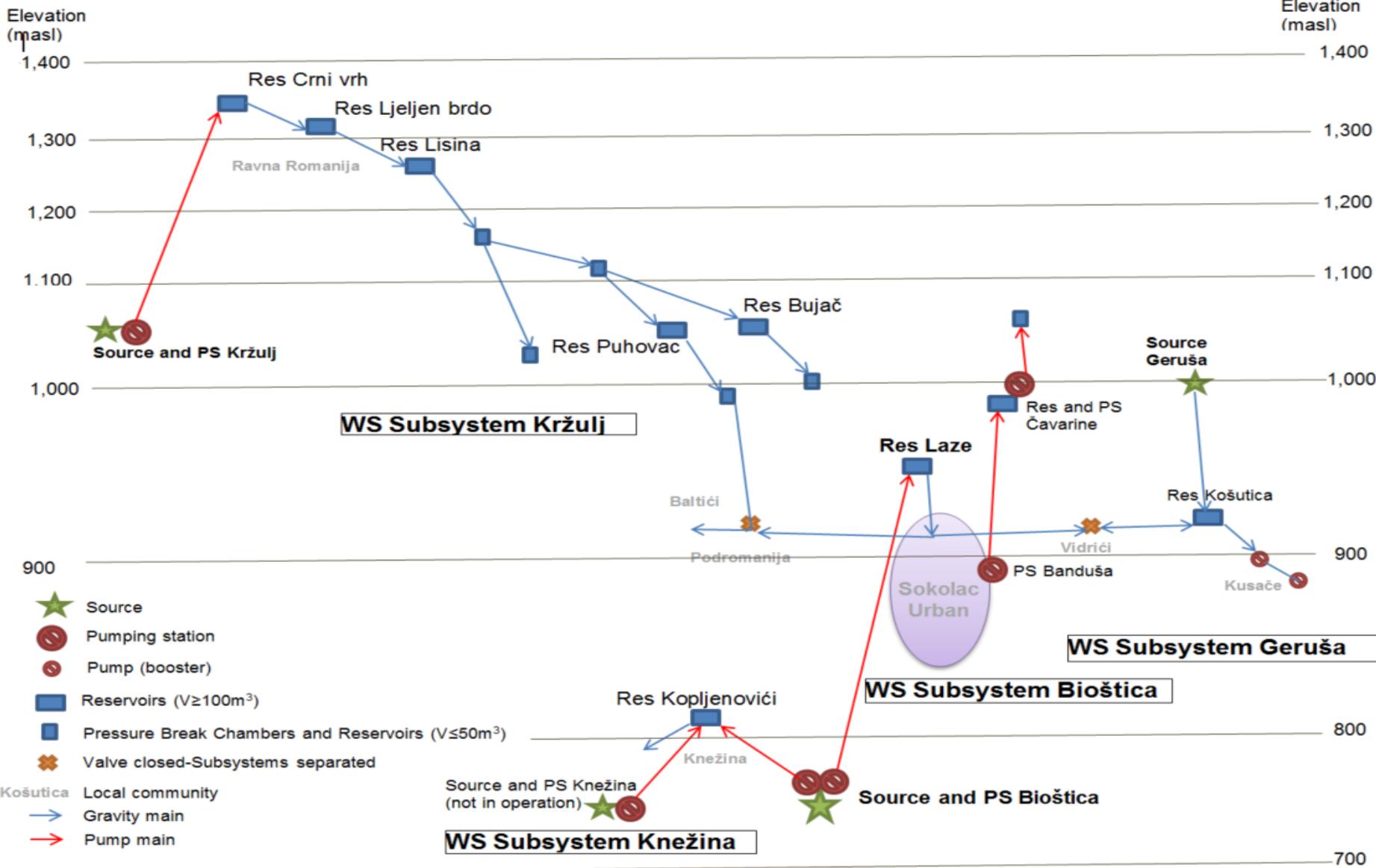


WS System scheme - Vertical presentation

Shema vodovodnog sistema – Vertikalni prikaz



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Non Revenue Water Neprihodovana voda



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**High losses at rural subsystems (80-90%)
Visoki gubici u ruralnim podsistemima (80-90%)**

Causes / Uzroci:

Leakage at old and poorly constructed network
Curenje dotrajalih i loše izvedenih cevovoda

High network pressure
Visoki pritisak u mreži

Overflows at numerous remote reservoirs
and pressure break chambers (Kržulj)
Prelivanje iz brojnih i teško pristupačnih
rezervoara i prekidnih komora (Kržulj)

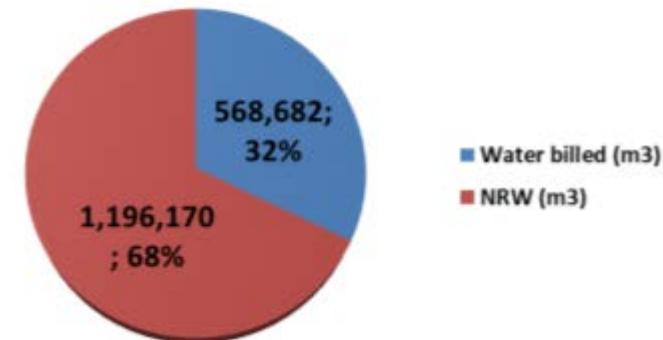
Lack of monitoring
Nedostatak monitoringa

Lack of network maps
Nedostatak karata mreže

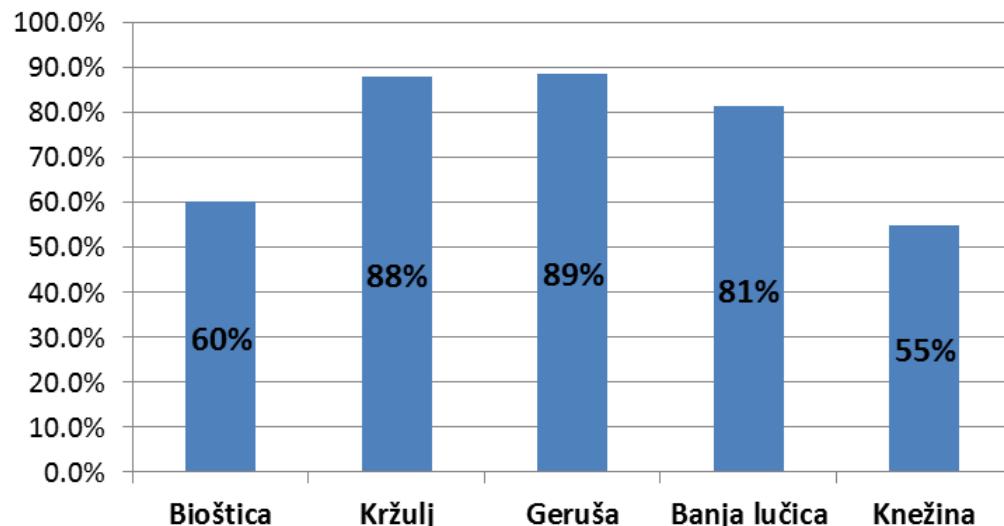
Consequences / Posledice:

High pumping costs
Veliki troškovi pumpanja

**Revenue and Non Revenue Water (%) /
Fakturisana i Nefakturisana voda (%)**



**Non Revenue Water (%) per subsystems /
Nefakturisana voda (%) po podsistemima**





Energy consumption Potrošnja energije

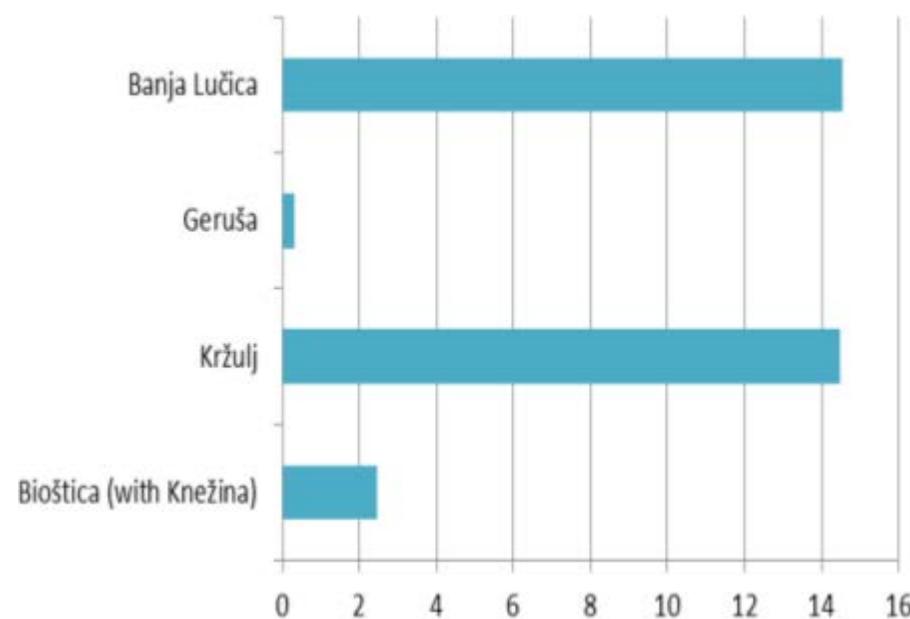


IPF CONSORTIUM

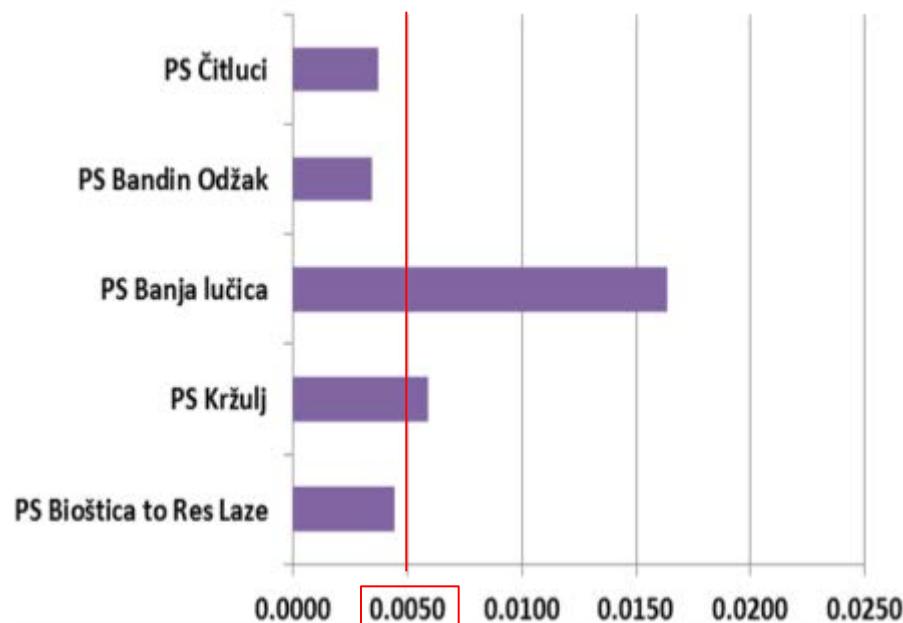
High energy consumption per m³ of Billed water specially for the subsystems Kržulj and Banja lučica is caused by high losses, difficult terrain and old pumps

Visoka potrošnja energije po m³ isporučene vode naročito u podsistemima Kržulj i Banja lučica uzrokovana je visokim gubicima, kao i konfiguracijom terena i dotrajalim pumpama

**Energy consumption kWh per m³ of Billed water /
Potrošna energije kWh po m³ Fakturisane vode**



**Energy efficiency of pumping stations/
Energetska efikasnost pumpnih stanica**

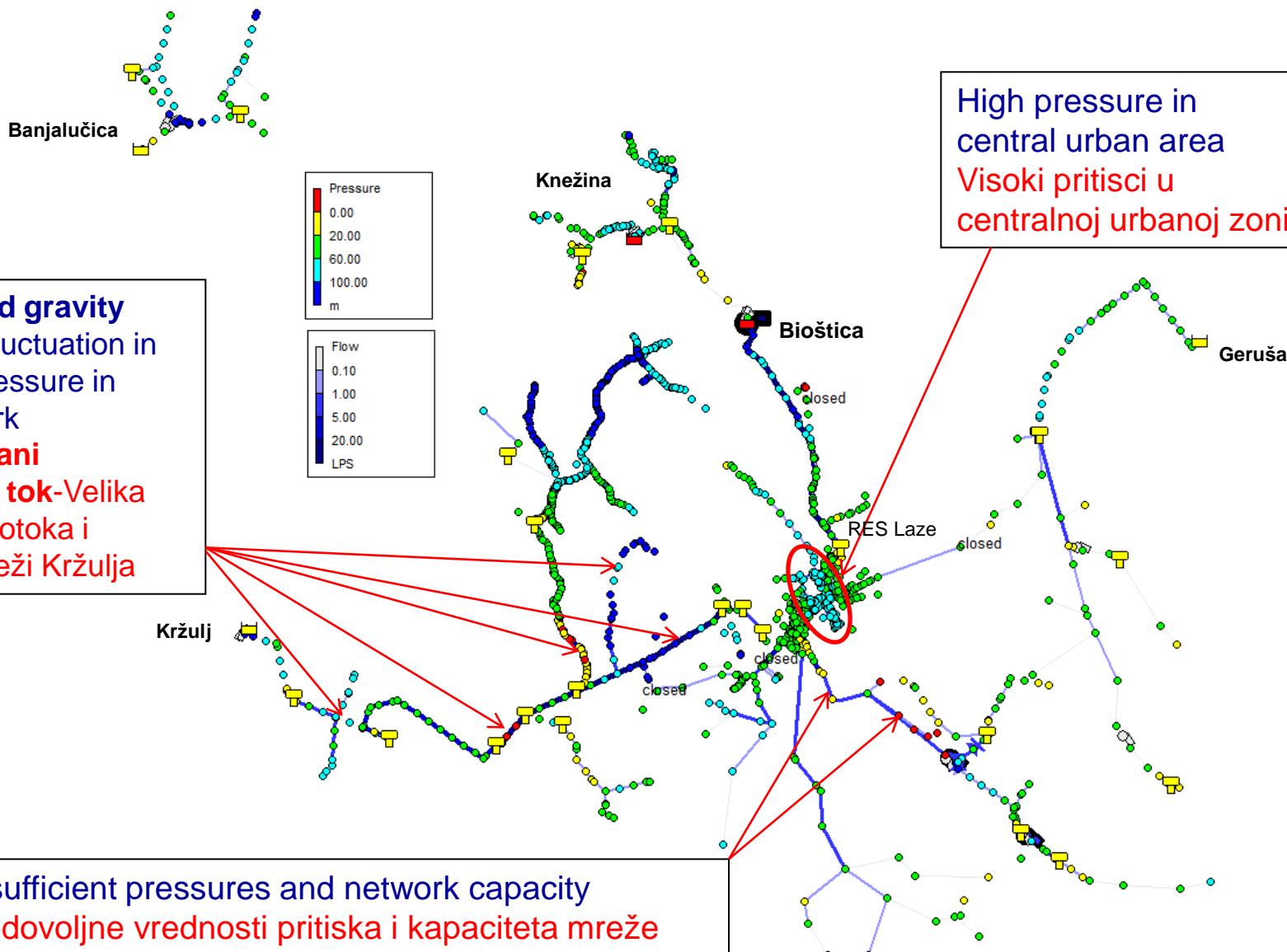




Hydraulic model of existing system Hidraulički model postojećeg sistema



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Main problems:

Glavni problemi:

- High Physical losses (leakages and overflows)
Visoki fizički gubici (curenje i prelivanje)
- Insufficient distribution network flow, pressure and reservoir level monitoring
Nedovoljno merenja protoka, pritiska i nivoa na distributivnoj mreži
- High water losses result in high pumping costs
Visoka Neprihodovana voda resultira velikim troškovima pumpanja
- Insufficient Kržulj source capacity during summer
Nedovoljan kapacitet izvorišta Kržulja tokom leta
- High turbidity problems during the wet season
Visok stepen zamućenosti tokom kišne sezone



Benefits of implemented Component 1

Efekti implementirane Komponente 1



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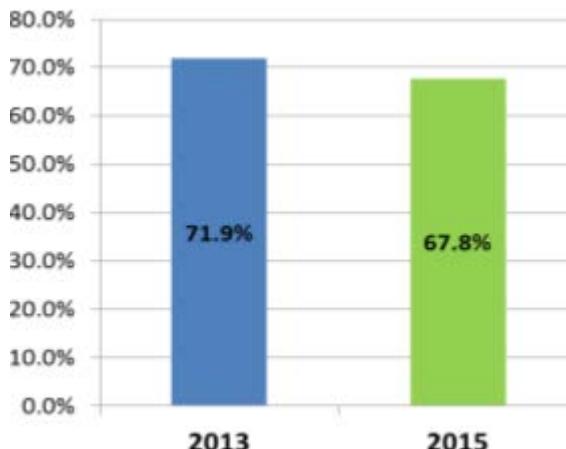
Komponent 1 subprojects / Podprojekti Komponente 1:

- Distribution main Sokolac-Podromanija reconstruction (L=3.1 km) / Rekonstrukcija glavnog distributivnog cevovoda Sokolac-Podromanija
- Pump main and PS Bioštica-Knežina / Potisni cevovod i PS Bioštica-Knežina
- Procurement of 2000 water meters and PS Bioštica pumps / Nabavka 2000 vodomera i pumpi za PS Biošticu

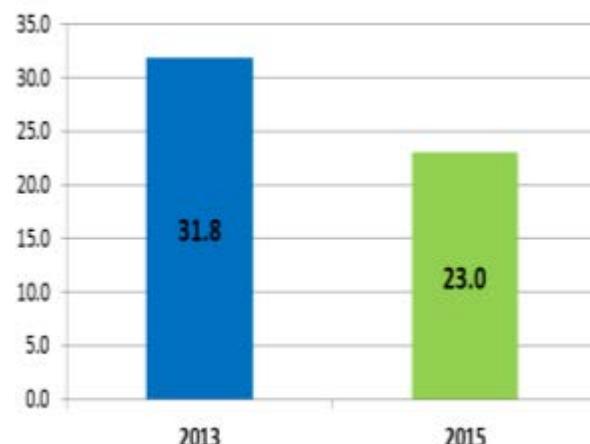
Benefits 2013-2015 / Efekti 2013-2015

- Physical losses reduction (695 m³/day, 8l/s) / Redukcija fizičkih gubitaka
- Better billing at domestic consumers (42 m³/day) / Bolje fakturisanje kod domaćinstava

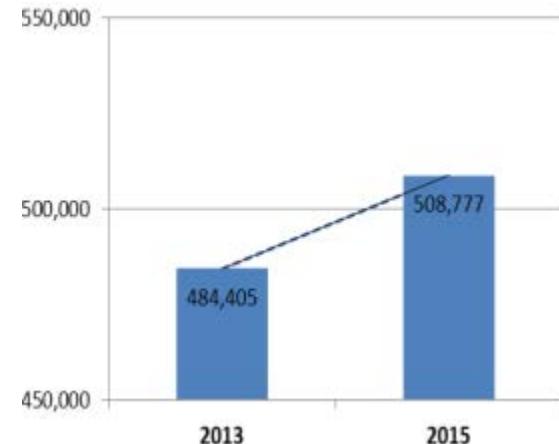
NRW (%) / NPV



Bioštica physical losses (l/s) / Fizički gubici na Bioštici



Billing of domestic consumers (m³/year) / Naplata domaćinstva



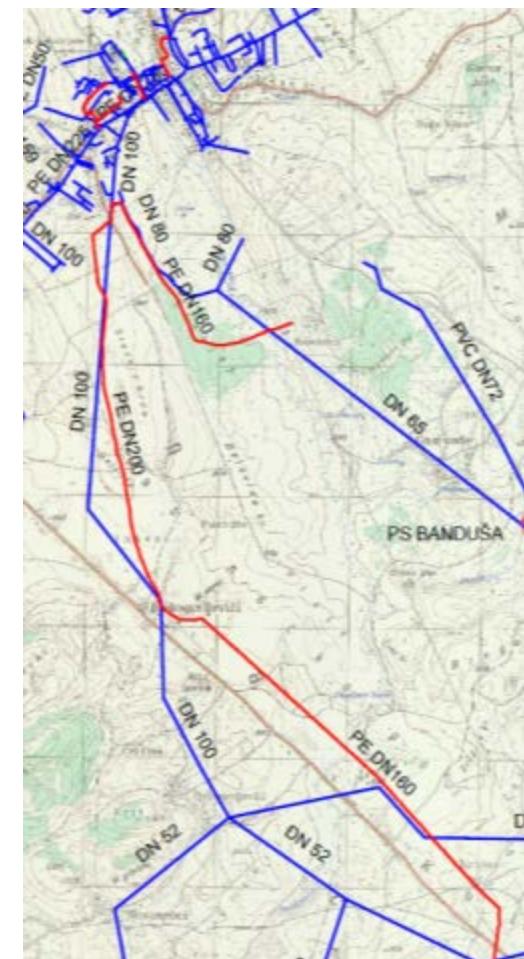
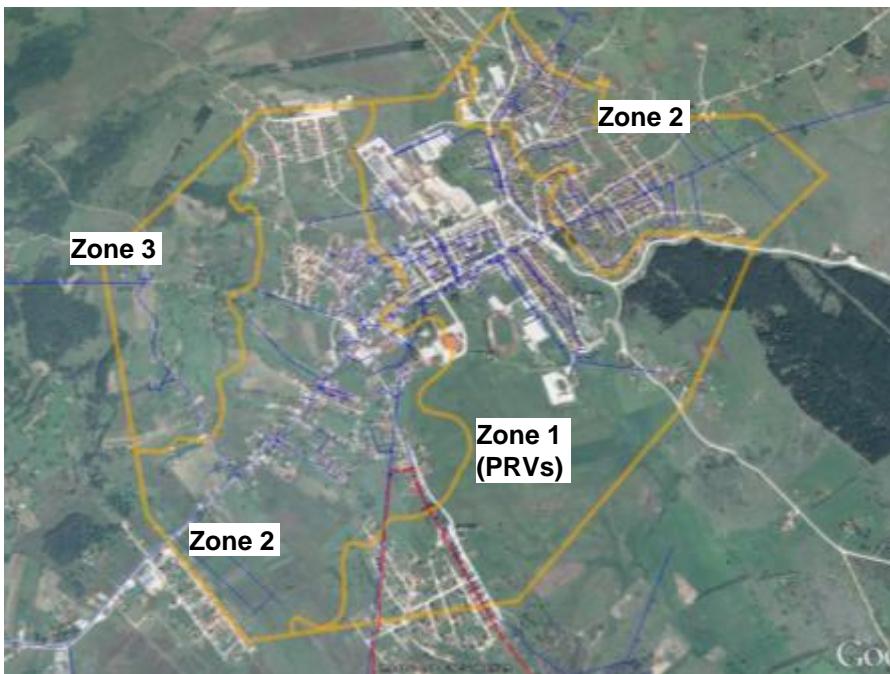


Komponent 2 subprojects / Podprojekti Komponente 2:

- Reconstruction of Distribution mains (Brezjak-Gazivode, Brezjak-Bjelosavljevići, Autobuska stanica-Tranzit, Romanijska) / Rekonstrukcija distributivnih cevovoda
- Distribution network zonning / Zoniranje distributivne mreže

Expected benefits / Očekivani efekti:

- Further Physical losses reduction in Bioštica subsystem / Daljnja redukcija fizičkih gubitaka u podsistemu Bioštice





Water Demand Projections

Projekcije potreba za vodom



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WSS Sokolac Water Requirements Projection / Potrebe za vodom	Unit	Year			
		2015	2025	2035	2045
Population connected / Priključeno stanovništvo	person	10,981	10,709	10,630	10,446
Domestic Per Capita Consumption Billed/ Specifična potrošnja Fakturisana	l/person/day	128	126	118	117
Domestic Demand / Domaćinstva	l/s	16.1	15.6	14.5	14.2
Commercial Demand / Privreda i Institucije	l/s	1.9	2.3	2.4	2.5
Total Demand / Ukupna potrošnja	l/s	18.1	17.9	17.0	16.6
Total Maximal Demand / Maksimalna potrošnja	l/s	25.2	26.6	25.1	24.6
Annual average NRW / Neprihodovana voda	%	67.8	50.0	40.0	35.0
Total Average Requirements / Prosečna potreba	l/s	56.1	35.9	28.2	25.6
Total Maximal Day Requirements / Maksimalna potreba	l/s	63.6	44.5	36.4	33.5



Alternative supply options for Podromanjija from Bioštica Alternativne opcije snabdevanja Podromanije sa Bioštice



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- Presently supplied from Kržulj with problems of source capacity shortage and network hydraulics/
Trenutno snabdevanje sa Kržulja sa problemima kapaciteta izvorišta i hidraulike mreže
- Recommended DO1 (one PS and pump main) /
Preporučena DO1 (jedna PS i potisni cevovod)



Development Options / Razvojne Opcije

DO1

DO2

DO3

Capital Investment Costs / Troškovi kapitalne investicija (€)	128,000	86,200	229,300
Total Development Option Costs (30 years net present value) / Ukupni troškovi razvojne opcije (30 godina) (€)	183,000	186,000	280,000



- Improve distribution network monitoring Phase I and II
Unaprediti merenja na mreži Phase I i II
- Physical losses reduction programme
Program smanjenja Fizičkih gubitaka
- Network reconstruction Phase I and II (14.5km)
Rekonstrukcija mreže Faza I i II (14.5km)
- Alternative supply of Podromanija from Bioštica
Alternativno snabdevanje Podromanije sa Bioštice
- Network extension Đedovci-Gazije
Proširenje mreže Đedovci-Gazije
- Pumping stations Bioštica, Kržulj i Banja lučica rehabilitation
Rehabilitacija pumpnih stanica Bioštica, Kržulj i Banja lučica
- Link from Main pipeline to Brezjak node
Vezni cevovod do čvora Brezjak
- Reservoir Laze extension Phase I (500m3)
Proširenje Rezervoara Laze Faza I (500m3)
- Turbidity treatment (filters) of Bioštica water
Tretman mutnoće (filteri) vode sa Bioštice



Medium Term Development Needs (2025)

Srednjeročne potrebe razvoja (2025)

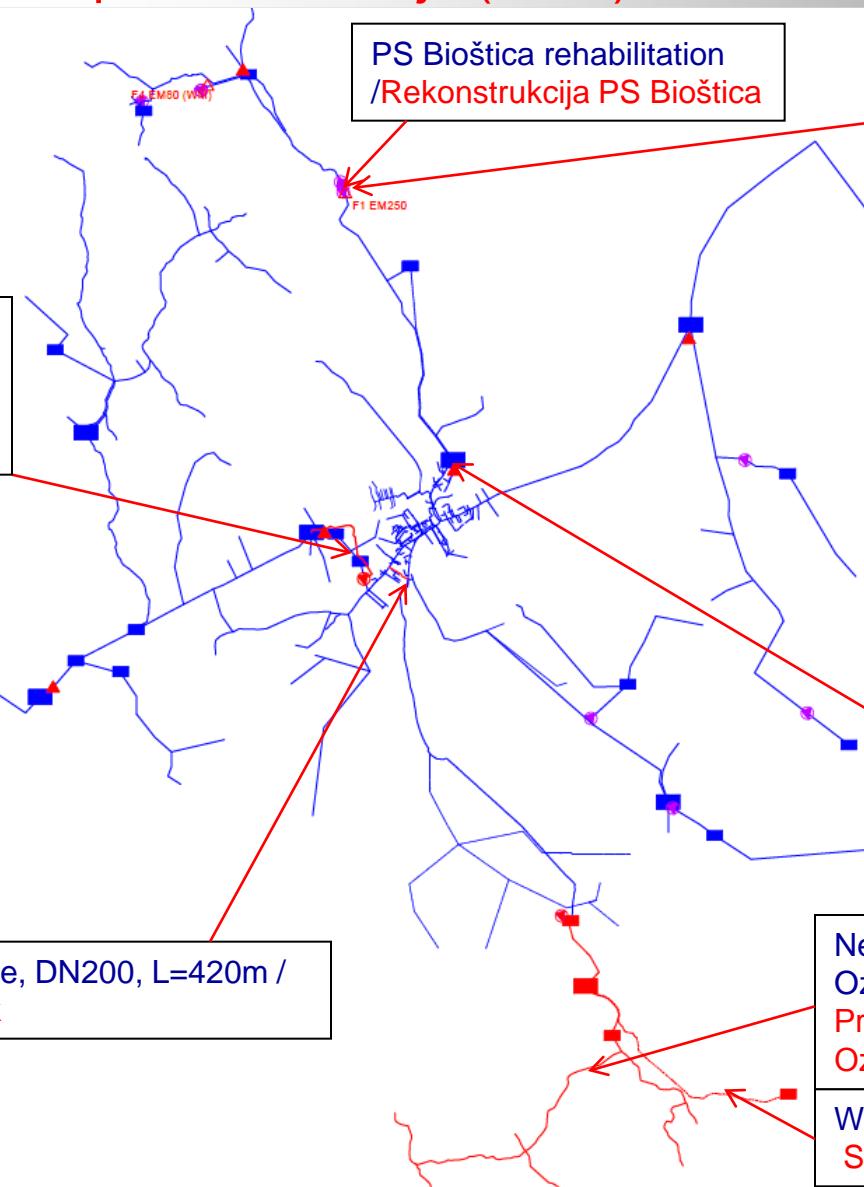
PS Kržulj
Banjalučica
rehabilitation
/Rekonstrukcija
PS Banjalučica



Alternative WS of Podromanija
from Bioštica /
Alternativno vodosnabd.
Podromanje sa Bioštice

PS Kržulj rehabilitation
/Rekonstrukcija PS Kržulj

Distribution main to Brezjak node, DN200, L=420m /
Vezni cevovod do čvora Brezjak



PS Bioštica rehabilitation
/Rekonstrukcija PS Bioštica

Turbidity treatment (filters) of
Bioštica water / Tretman mutnoće
(filteri) vode sa Bioštice

Flow measurement at network
- Phase I and II / Merenje
protoka na mreži –Faza I i II

Water level measurement
at ALL Res and PBC /
Merenje nivoa na SVIM
rezervoarima i prekidnim
komorama

Reservoir Laze extension
Phase I (V=500m3)
/Proširenje Rezervoara
Laze Faza I (500m3)

Network extension to Đedovci,
Ozerkovići and Vrhbarje /
Produženje mreže Đedovci,
Ozerkovići i Vrhbarje

Water export to WSS Stjenice/
Snabdevanje VS Stjenice



In addition to Medium Term Needs, Long Term Development Needs are:

U dodatku na Srednjoročne potrebe razvoja sistema, Dugoročne potrebe razvoja su:

- Further improvements in distribution network monitoring and Physical losses reduction programme

Dalje unaprediti merenja na mreži i Program smanjenja Fizičkih gubitaka

- Network reconstruction - Phase III (30km)

Rekonstrukcija mreže - Faza III (30km)

- Reservoir Laze extension - Phase II (500m3)

Proširenje rezervoara Laze - Faza II (500m3)

- Pump main PS Biostica-Reservoir Laze- Section 1 reconstruction (2km)

Rekonstrukcija Deonice 1 potisnog cevovoda PS Bioštica-Rezervoar Laze (2 km)

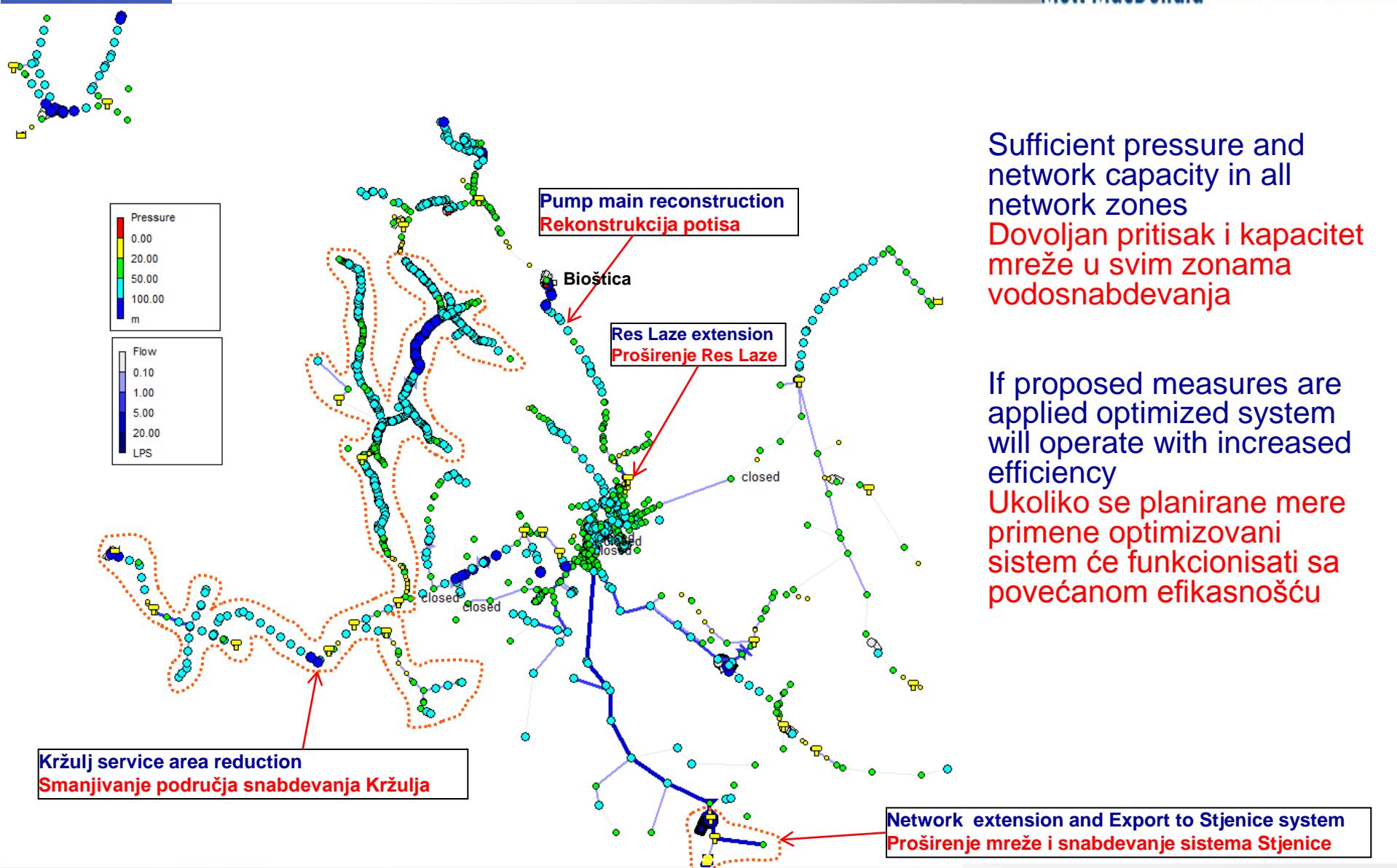


Hydraulic model of future system (2035-2045)

Hidraulički model budućeg sistema (2035-2045)



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Sufficient pressure and network capacity in all network zones
Dovoljan pritisak i kapacitet mreže u svim zonama vodosnabdevanja

If proposed measures are applied optimized system will operate with increased efficiency

Ukoliko se planirane mere primene optimizovani sistem će funkcionisati sa povećanom efikasnošću



Long Term Development Needs

Dugoročne potrebe razvoja



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WSS Long Term Development Needs / Dugoročne potrebe razvoja sistema vodosnabdevanja	Total Cost (€)
Leakage Study, Leak det. equip and Sanitary zone study/ Studija gubitaka i Oprema za det.gub. i Studija sanitarnih zona	102,500
Flow measurement at network and Telemetry- Phase I/ Merenje protoka na mreži i Telemetrija –Faza I	99,115
Water level measurement at reservoirs and PBC - Phase I / Merenje nivoa na rezervoarima i prekidnim komorama-Faza I	56,760
Distribution network reconstruction -Phase I (urgent measures) / Rekonstrukcija distributivne mreže –Faza I (hitne mere)	97,363
Alternative WS of Podromanija from Bioštica source/ Alternativno vodosnabdevanje Podromanije sa izvorišta Bioštice	160,390
GIS of WS network and customers connections / GIS vodovodne mreže i priključaka	170,000
Flow measurement at network and Telemetry -Phase II / Merenje protoka na mreži – Faza II	88,473
PS Bioštica, PS Kržulj and PS Banjalučica rehabilitation /Rekonstrukcija PS Bioštica, PS Kržulj i PS Banjalučica	96,750
Distribution main to Brezjak node, DN200, L=420m / Vezni cevovod do čvora Brezjak	41,431
Distribution network reconstruction -Phase II (L=13.7km) / Rekonstrukcija distributivne mreže – Phase II (13.7 km)	663,168
Network extension to Đedovci, Ozerkovići and Vrhbarje / Produženje mreže Đedovci, Ozerkovići i Vrhbarje	518,246
Reservoir Laze extension Phase I (one chamber V=500m3) /Proširenje Rezervoara Laze Faza I (500m3)	215,000
Turbidity treatment (filters) of Bioštica water / Tretman mutnoće (filteri) vode sa Bioštice	400,000
Medium Term Development Needs (2025) / Srednjoročne potrebe razvoja 2,709,194	
Pump main PS Biostica-Res Laze- Section1 reconst., L=1950m / Potisni cevovod PS Bioštica-Rez Laze- Rekons. Deonice 1	453,113
Distribution network reconstruction -PHASE III (L=30km) / Rekonstrukcija distributivne mreže – Phase III (30 km)	1,290,000
Reservoir Laze extention Phase II (second chamber V=500m3) / Proširenje Rezervoara Laze Faza II (500m3)	161,250
Long Term Development Needs (2035-45) / Dugoročne potrebe razvoja 4,613,557	

Total Cost including 5% contingency, and 2.5% supervision, without VAT / Cena kapitalne investicije, nepredviđenih troškova od 5% i nadzora od 2.5%, bez PDV



Project Investment Cases for Water Supply

Slučajevi finansiranja - Vodosnabdevanje



WS Project Investment Cases Summary / Pregled slučajeva finansiranja vodosnabdevanja

Total Costs exclude VAT, but
include contingency, supervision
and design costs (€) / Ukupni
troškovi bez PDV-a

Leak detection study / Studija gubitaka	40,000
Leak detection equipment / Oprema za detekciju kvarova na mreži	42,500
Sanitary zone study for rural sources/ Studija sanitarnih zona za seoska izvorišta	20,000
Distribution network reconstruction -PHASE I (urgent measures: L=840m, air valves and flow control valves) / Rekonstrukcija distributivne mreže – Faza I (hitne mere: L=840m, vazdušni ventili i ventili za kontrolu protoka)	97,363

MINIMUM CASE / MINIMALNI SLUČAJ

199,863

Flow measurement at Distibution network (Primary and Secondary balance) and Telemetry- Phase I / Merenje protoka na distributivnoj mreži (Primarni i sekundarni bilans) i Telemetrija (daljinski prenos signala)-Faza I	99,115
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Water level measurement at reservoirs and pressure break chambers (22 locations) and Telemetry- Phase I / Merenje nivoa u rezervoarima i prekidnim komorama (22 lokacije) i Telemetrija – Faza I	56,760
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BASE CASE TOTAL / OSNOVNI SLUČAJ UKUPNO

355,738

Alternative water supply of Podromanija (Res Puhovac) from Bioštica source: PS Puhovac and pump main to Res Puhovac / Alternativno vodosnabdevanje Podromanija (Res Puhovac) sa izvorišta Bioštice: PS Puhovac i potisni cevovod to rezervoara Puhovac	160,390
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HIGH CASE / VIŠI SLUČAJ

516,128

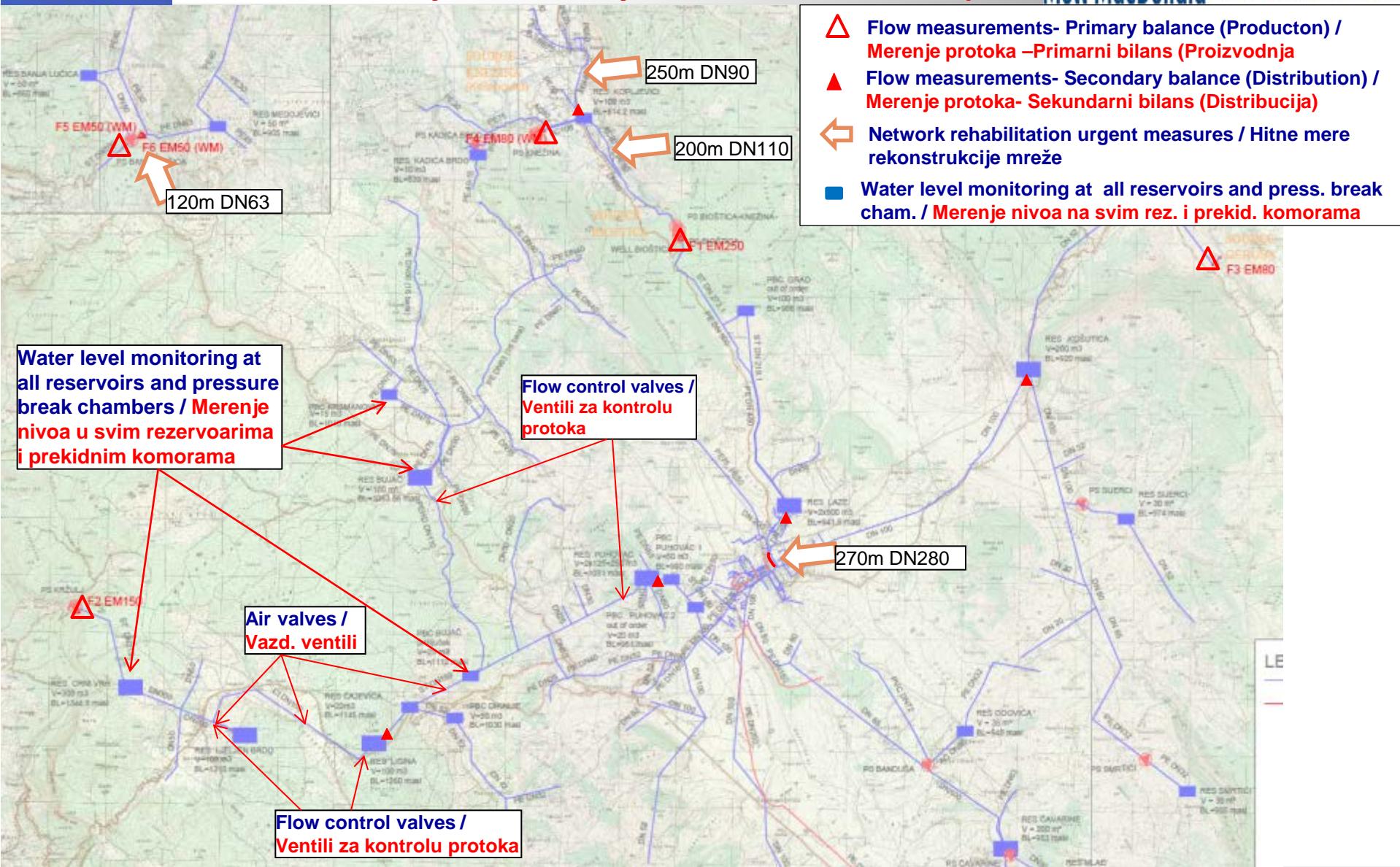


Base Case Project - Water Supply

Osnovni slučaj finansiranja - Vodosnabdevanje



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- △ Flow measurements- Primary balance (Producton) / Merenje protoka –Primarni bilans (Proizvodnja)
- ▲ Flow measurements- Secondary balance (Distribution) / Merenje protoka- Sekundarni bilans (Distribucija)
- ← Network rehabilitation urgent measures / Hitne mere rekonstrukcije mreže
- Water level monitoring at all reservoirs and press. break cham. / Merenje nivoa na svim rez. i prekid. komorama

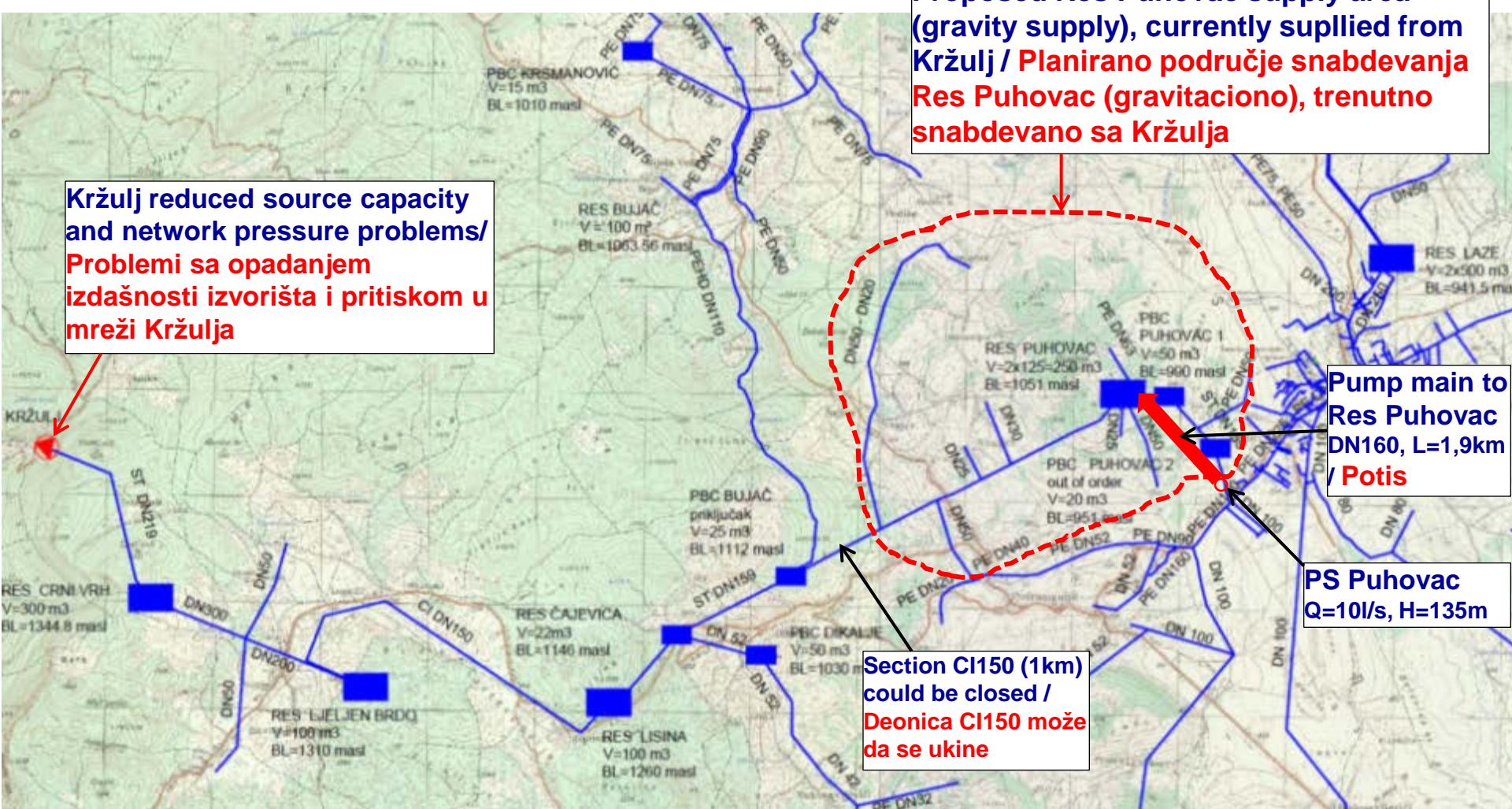


High Case Project – Water Supply

Viši slučaj finansiranja - Vodosnabdevanje



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Base Case Project benefits:

Benefiti Osnovnog slučaja finansiranja :

- Improved WUC capacity for leakage detection and reduction
- Poboljšana sposobnost vodovoda u vezi otkrivanja i redukcije gubitaka
- Water losses reduction and reduced operating costs - electricity
- Redukcija fizičkih gubitaka i operativnih troškova -električna energija
- Improved system monitoring
- Poboljšan monitoring nad sistemom
- Improved sanitary protection of rural sources
- Poboljšana sanitarna zaštita za seoska izvorišta

Plus High Case project benefits include:

Dodatni Benefiti Višeg slučaj uključuju:

- WS system recomposition and pressure optimization
- Rekompozicija sistema vodosnabdevanja i optimizacija pritisaka

Benefits of Long term investment Plan:

Benefiti dugoročnog plana investicija:

- Phased system optimisation, increased operating efficiencies and improved water quality
- Fazna optimizacija sistema, povećana operativna efikasnost i poboljšan kvalitet vode



Wastewater collection and treatment

Kanalisanje i tretman otpadnih voda

Bogdan Trbojević

Senior Engineer – Water and Wastewater
Odgovorni Inženjer – Odvođenje otpadnih voda
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Michael Gray

Senior Water and Wastewater Process Expert
Ekspert za prečišćavanje pitkih i otpadnih voda
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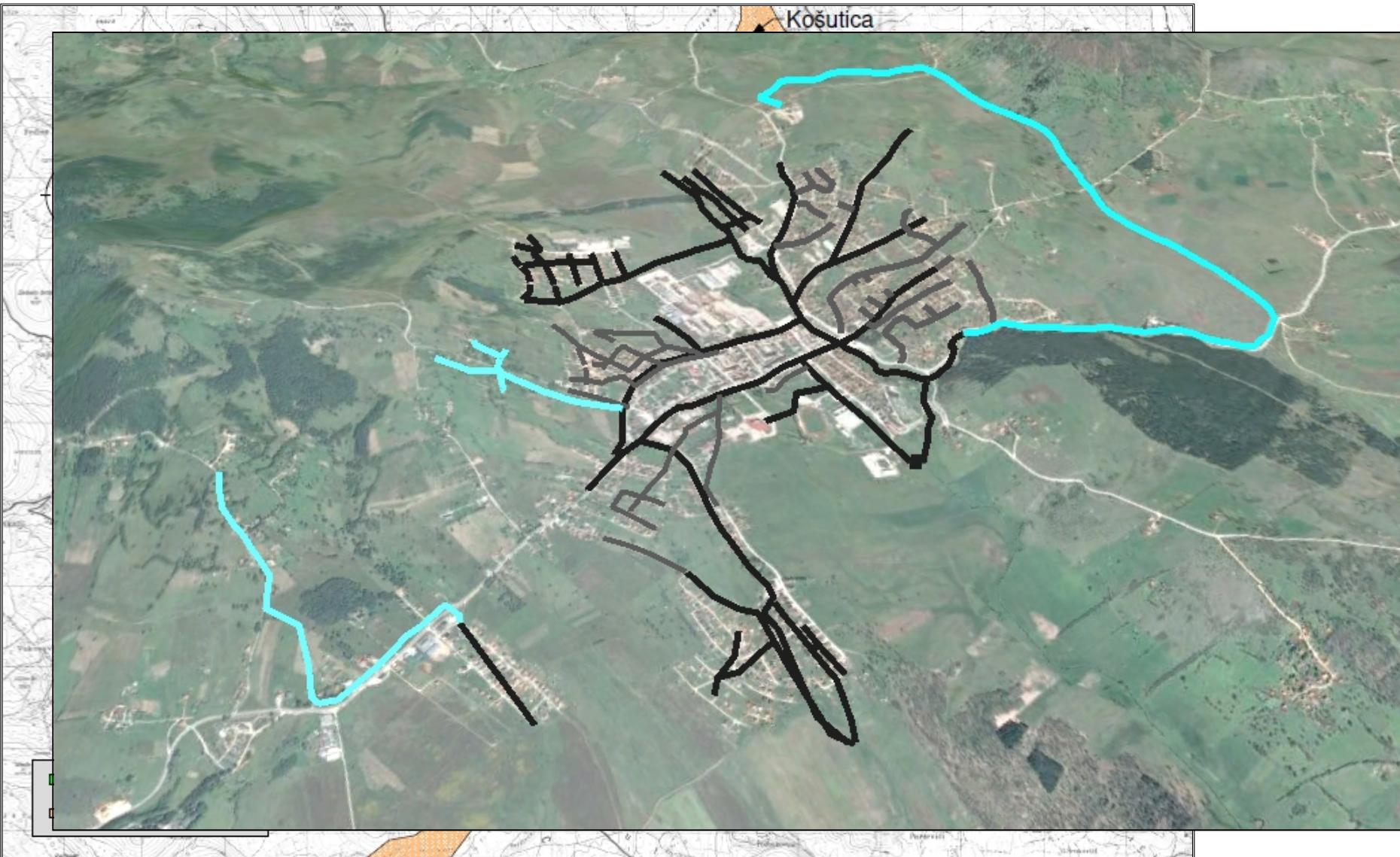


Existing Sewers and Service Area

Postojeća mreža fekalne kanalizacije



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Existing Sewers and Service Area

Postojeća mreža fekalne kanalizacije



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- početak gradnje sistema je u periodu 1960-1965, a značajne za gradnju su i godine posle 1995)
- dužina mreže je preko 26 km (bez kućnih priključaka) gde je:
 - Priključeno 83% stanov. servisnog područja sa kanalizacijom
 - Kanalizacijom je pokriveno oko 25% područja koje ima vodosnabdevanje
 - Priključeno je ukupno 64% stanovnika opštine
- prečnici su uglavnom od 200 do 300mm
- sistem je projektovan kao separatni, tako i funkcioniše ali treba istaći da značajan deo atmosferske kanalizacije nije izgrađen
- sistem je gravitacioni (nema PS)
- nema tretmana otp. voda
- First sewer construction in the period 1925-40 with most significant development in the 1960s
- Existing network is approximately 26 km (no house conn. include) and collects sewage from:
 - 83% of pop. of WW service area
 - 65% of the service area
 - 39% of the total Municipality population
- Pipe diameters range from 200 to 300mm
- Originally designed as separate sewage system but collects storm water drainage
- Gravity system (no pumping stations)
- No sewage treatment



- Neadekvatno održavanje-ispiranje kanalizacije se vrši samo ako ima kvarova
- Začepljenje kanalizacije – zbog odlaganja čvrstog otpada u kolektore i promene prečnika na kolektorima (iz većeg u manji)
- Priključenje odvoda kišnice iz domaćinstava na sistem fekalne kanalizacije kao i priključenje kućnih odvoda sanit. kan. na atmosferske kolektore
- Procena je da oko 10% stanovnika naselja Sokolac nije priključeno iz raznih razloga na kanalizacioni sistem
- Nepoznavanje sistema u dovoljnoj meri
- Inadequate maintenance - washout is undertaken only after breakages
- Blockages of sewers – attributed to solid waste disposal and arbitrary change of pipe diameter
- House drainage connections to sewerage system and sewer house connections to storm sewer
- It is estimated that around 10% of Sokolac urban area population is not connected to the sewer system
- Unfamiliarity with the system



Existing Storm Sewers and Service Area

Postojeća mreža atmosferske kanalizacije



- Ukupna dužina atmosferske mreže je 2.7 km, bez otvorenih kanala
- Ne postoji glavni kolektor
- Sistem je gravitacioni
- Sistem se ne proširuje od izgradnje

- Neadekvatno održavanje-ispiranje kanalizacije se vrši samo pri najvećim kvarovima
- Atmosferska kanalizacija nema potpunu funkciju usled neodržavanja
- Veliki broj ispusta-3 evidentirana
- Nepotpunost sistema
- Procena je da oko 30% područja naselja Sokolac ima atmosfersku kan.
- Nepoznavanje sistema u dovoljnoj meri

- The total length of storm sewer is 2.7 km, with no open channel
- There is no major collector
- It is gravity system
- The system has not been expanded since construction

- Inadequate maintenance - washout is undertaken only after huge breakages
- Storm sewer does not have full function due to lack of maintenance
- A large number of outlets 3-registered
- Underdevelopment of the system
- It is estimated that around 30% of Sokolac urban area is connected to the storm sewer system
- Unfamiliarity with the system



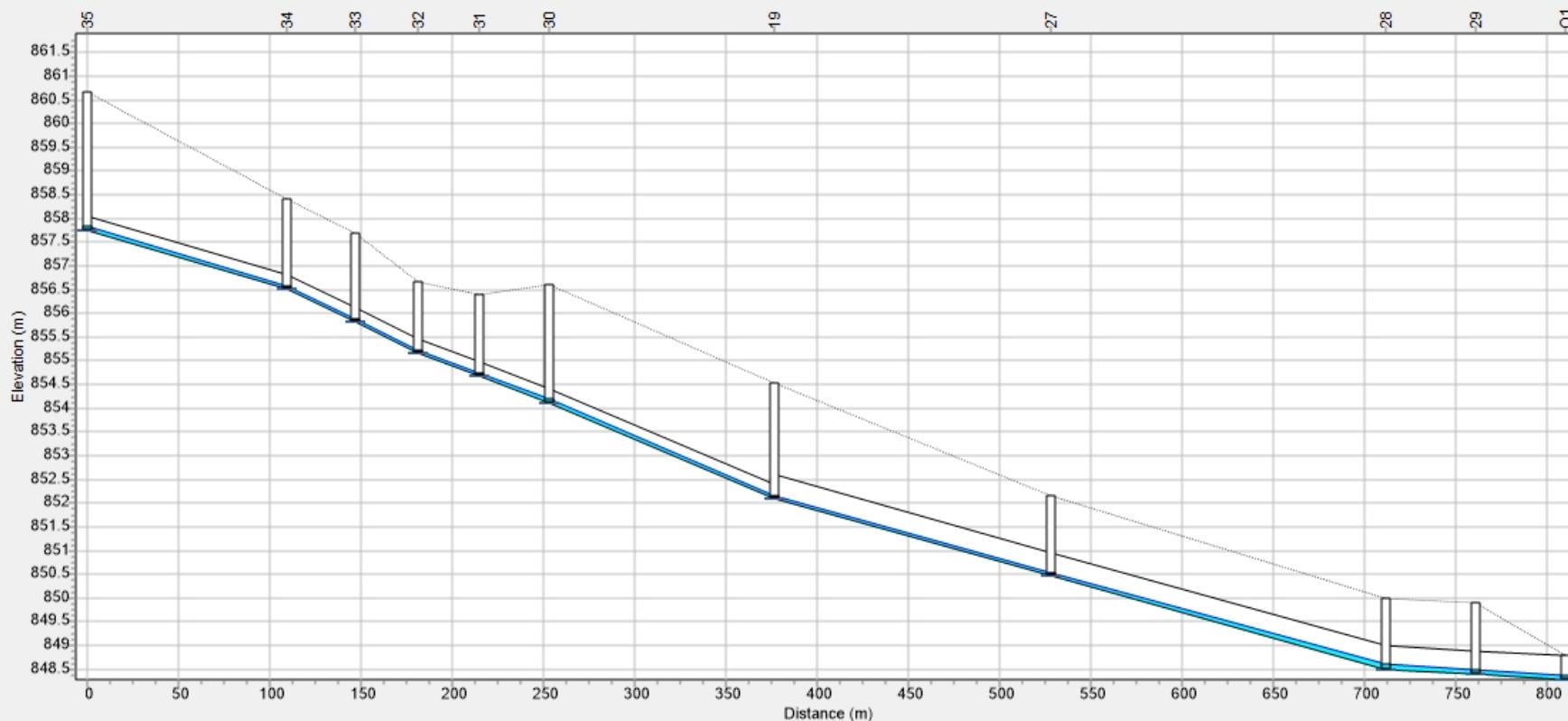
- Zašto se vrši hidrauličko modeliranje?**

- Utvrdjivanje svih dotoka u sistem, "uskih grla" a radi planiranja razvoja sistema u budućnosti**

- Why do we need hydraulic modeling ?**

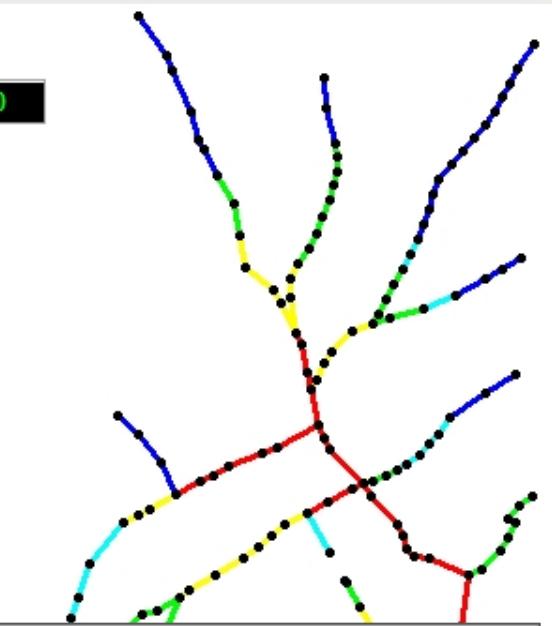
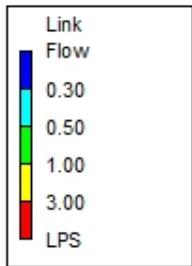
- For determination of exact flows in the system, it's "bottlenecks" and for planning of development of**

Water Elevation Profile: Node 35 - O1



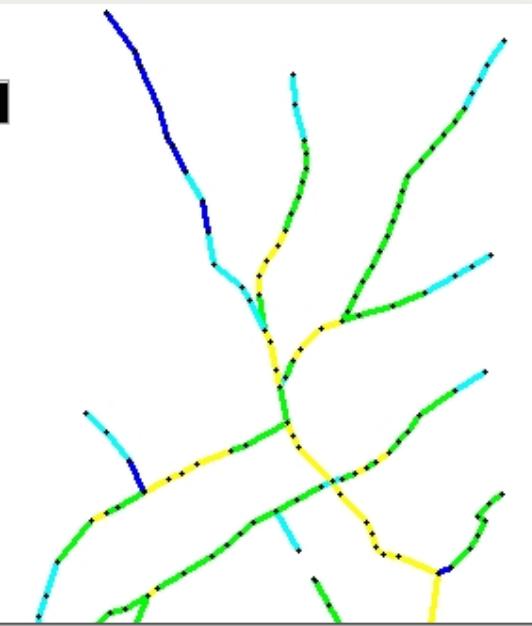
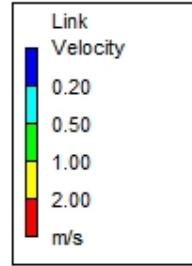


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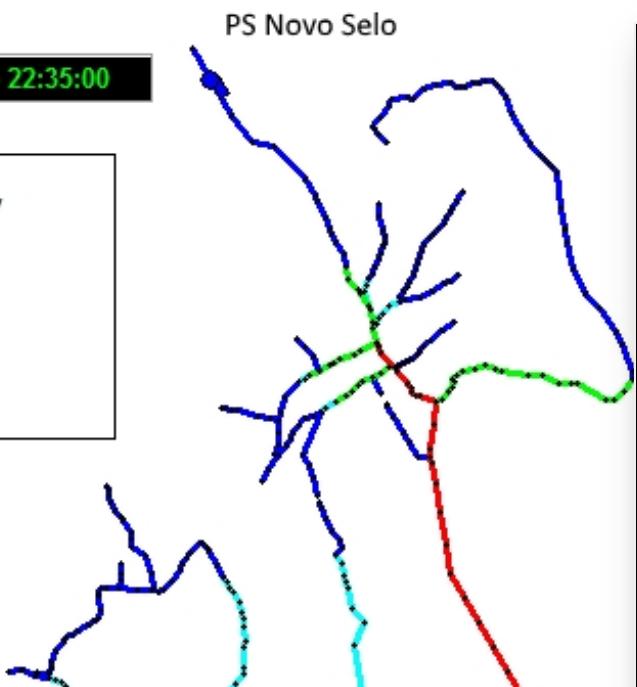
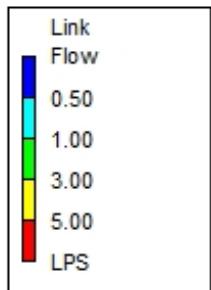
- Existing sewer network has sufficient capacity, pipes capacities used are below 25%
- Pipe velocities are in range 0,4-1,4 m/s
- Average flow at outfalls is 13.1 l/s, max 22.3 l/s in DWF

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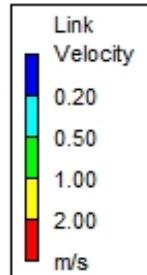
- Postojeća mreža ima kapacitete za veće proticaje, jer je ispunjenost cevi ispod 25% pri maksimalnom dotoku
- Brzine u cijevima su u opsegu 0,4-1,4 m/s
- Prosečan dotok na izlivima je 13.1 l/s, a max 22.3 l/s za vreme suvog vremena

09/07/2045 22:35:00



- Existing sewer network has sufficient capacity
- Pipe velocities are in range 0.3-1.0 m/s
- Average flow at outfalls is 15.6 l/s in , max 24.1 l/s DWF

09/07/2045 22:35:00



- Postojeća mreža ima kapacitete za veće proticaje
- Brzine u cijevima su u opsegu 0.3- 1 m/s
- Prosečan dotok na glavnom izlivu je 15.6 l/s, a max 24.1 l/s za vreme suvog vremena



Model results – Present system

Rezultati modelovanja – Budući sistem



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- Uključuje i PS

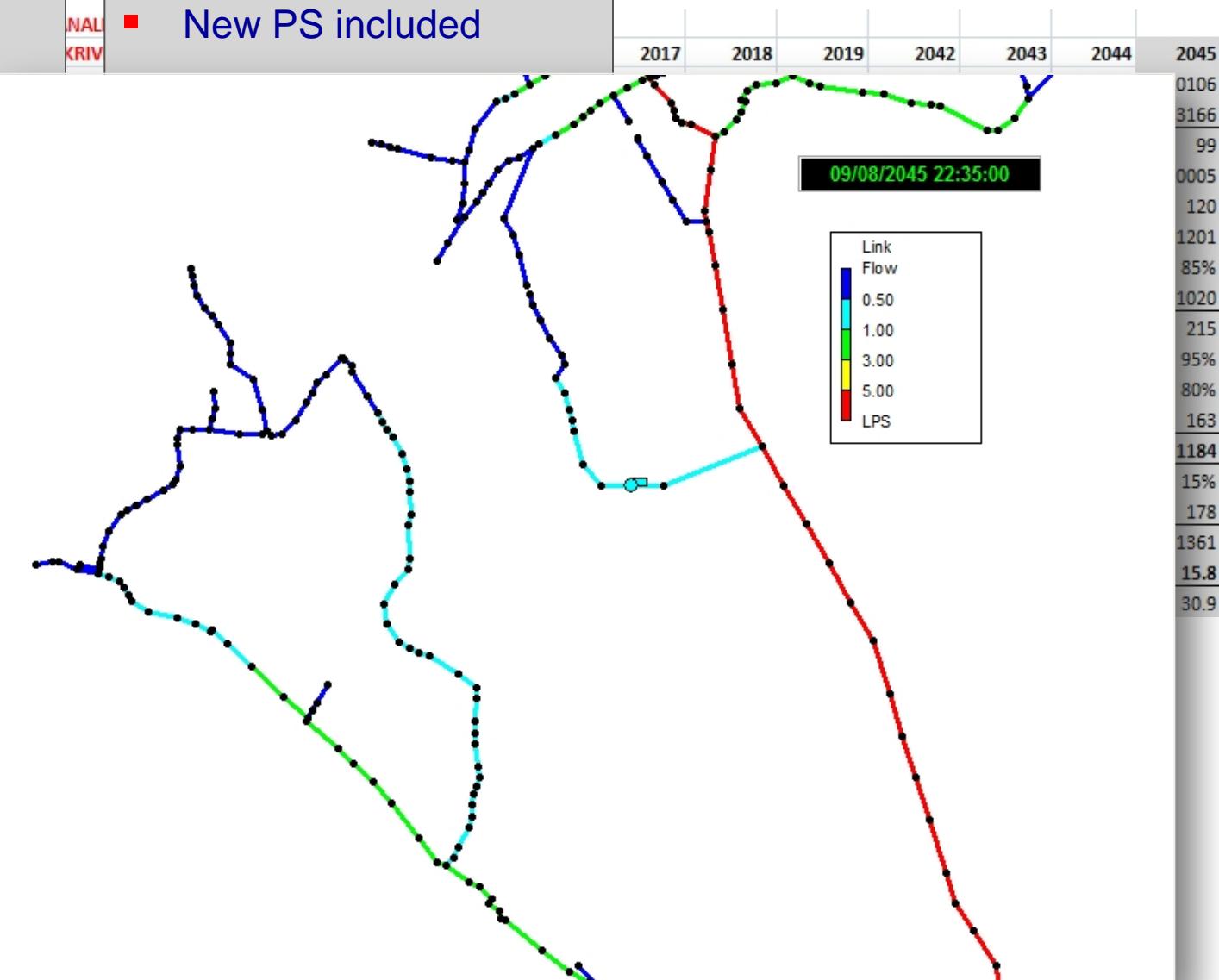
PPOV

Novo Se

Košutica

alternativa – PS Brezj

- New PS included



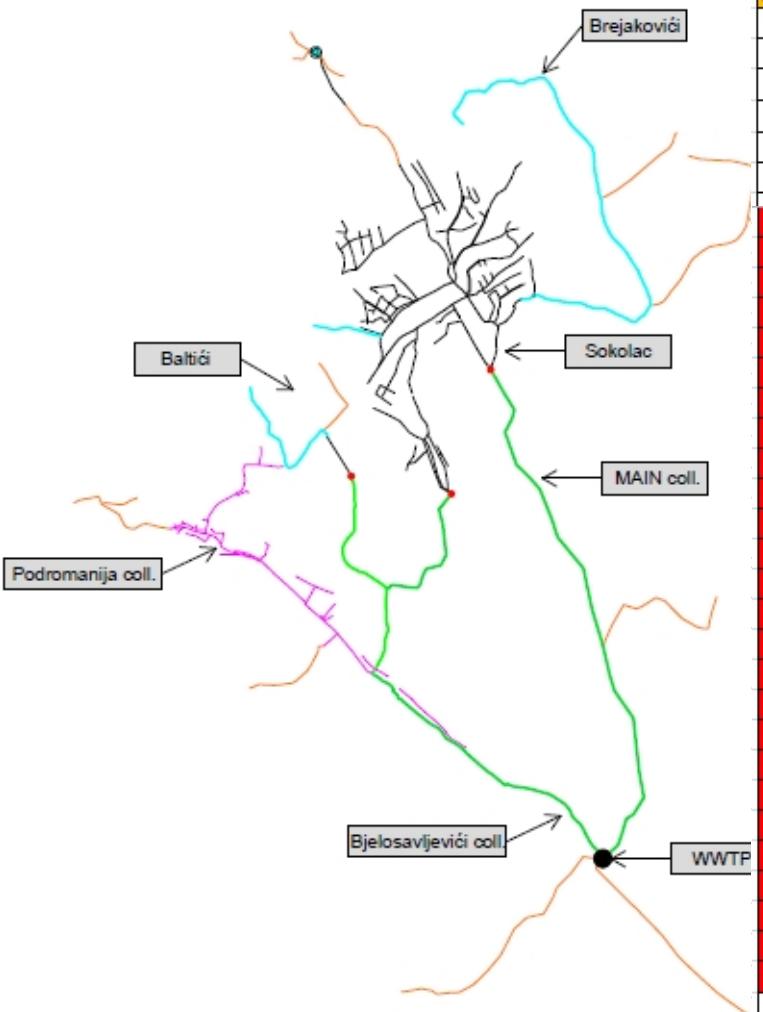


Sewer extension – options

Novi kanalizacioni kolektori - opcije



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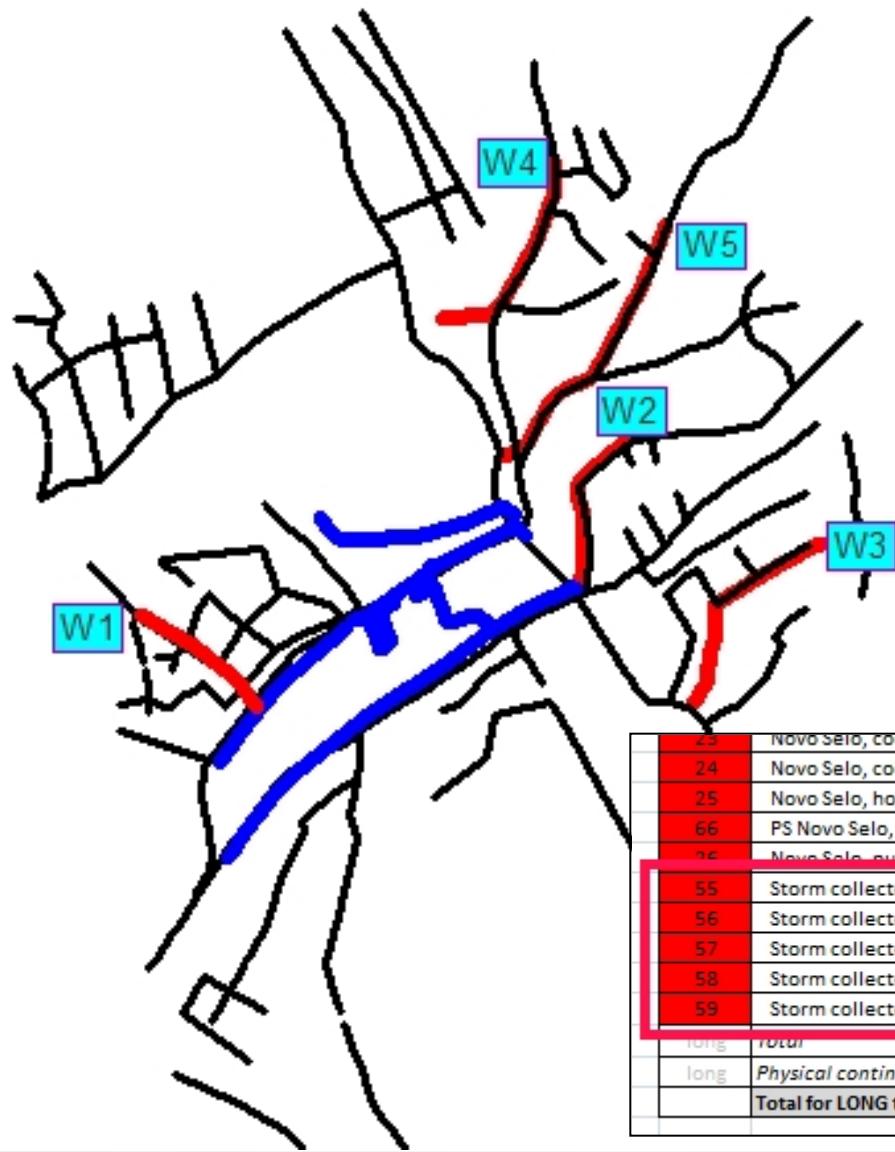


Medium term development project / Kratkoročni razvojni projekat		Capital investment costs (euro) / Troškovi investicije	Capital investment costs (KM) / Troškovi investicije
Ref. No.	WASTEWATER / KANALIZACIJA		
62	minor repairs of collectors	10,000	19,563
33	Sokolac MAIN COLLECTOR Q, 5090m, Ø400	335,940	657,213
64	PS Podromanija (WWTP PS), 15.67 l/s, 15 m, 5 kw	52,000	101,730
35	Stari Baltići, additional house connections, 625m, Ø160	47,750	93,415
28	Brejakovići, additional house connections, 445m, Ø160	29,303	57,327
21		11,270	22,540
9	Košutica, collector T5, 1650m, Ø250	79,200	154,942
10	Košutica, house connections, 750m, Ø160	33,000	64,559
65	PS Košutica, 0.25 l/s, 44 m, 0.25 kw	21,500	42,061
68	Košutica, pumping main, 675m, DN100	43,875	85,834
11	Margetići, collector T6, 2950m, Ø200	135,700	265,475
12	Margetići, house connections, 500m, Ø160	22,000	43,039
13	Vidrići, collector T7, 2270m, Ø250	177,060	346,390
14	Vidrići, house connections, 1500m, Ø160	66,000	129,118
15	Vidrići, collector T8, 1710m, Ø200	78,660	153,886
16	Vidrići, house connections, 875m, Ø160	38,500	75,319
17	Nadići, collector T9, 940m, Ø200	43,240	84,492
18	Nadići, house connections, 250m, Ø160	11,000	21,520
19	Podromanija, collector T10, 1395m, Ø200	64,170	125,538
20	Podromanija, house connections, 625m, Ø160	27,500	53,799
21	Baltići, collector T11, 800m, Ø250	51,200	100,165
22	Baltići, house connections, 375m, Ø160	20,625	40,350
23	Novo Selo, collector T12, 800m, Ø250	47,200	92,339
24	Novo Selo, collector T13, 860m, Ø200	47,300	92,535
25	Novo Selo, house connections, 500m, Ø160	27,500	53,799
66	PS Novo Selo, 0.16 l/s, 15 m, 0.15 kw	21,500	42,061
26	Novo Selo, pumping main, 560m, DN100	36,400	71,211
55	Storm collector W1, 325m, Ø400	30,225	59,130
56	Storm collector W2, 370m, Ø400	34,410	67,318
57	Storm collector W3, 460m, Ø400	42,780	83,692
58	Storm collector W4, 465m, Ø400	43,245	84,602
59	Storm collector W5, 640m, Ø400	59,520	116,441
long	<i>Total</i>	3,516,958	6,880,365
long	<i>Physical contingency / Nepredviđeni troškovi</i>	263,772	516,027
	<i>Total for LONG term wastewater components</i>	3,780,730	7,396,393

Cena kapitalne investicije, nepredviđenih troškova i nadzora



Razvoj atmosferske kanalizacije / Development of storm sewers



Component	Description	Length	Diameter	Cost
23	Novo Selo, collector T12, 800m, Ø250	800m	Ø250	47,200
24	Novo Selo, collector T13, 860m, Ø200	860m	Ø200	47,300
25	Novo Selo, house connections, 500m, Ø160	500m	Ø160	27,500
66	PS Novo Selo, 0.16 l/s, 15 m, 0.15 kw	15 m	0.15 kw	21,500
26	Novo Selo, pumping main, 550m, DN100	550m	DN100	26,400
55	Storm collector W1, 325m, Ø400	325m	Ø400	30,225
56	Storm collector W2, 370m, Ø400	370m	Ø400	34,410
57	Storm collector W3, 460m, Ø400	460m	Ø400	42,780
58	Storm collector W4, 465m, Ø400	465m	Ø400	43,245
59	Storm collector W5, 640m, Ø400	640m	Ø400	59,520
Total				3,152,758
long	Physical contingency / Nepredviđeni troškovi			384,940
Total for LONG term wastewater components				5,517,476



- Pri izboru su korišćeni sledeći inženjerski kriterijumi:
- Veličina
- Postojeća infrastruktura (put, voda, struja...)
- Postojeći objekti na parceli i namena parcele i objekata
- Tip vlasništva (javno, privatno, u sporu...)
- Veličina zemljanih radova...
- Pumpanje otp. voda da/ne
- Cena zemljišta
- Želja/savet lokalne opš. uprave
- Blizina drugih ind. objekata
- Drugi ograničavajući faktori (npr. prelazak preko nadvožnjaka)

- The following engineering criteria were used:
- Size
- Existing infrastructure (access road, water supply, power mains...)
- Existing construction and use of land and buildings
- Ownership of property (public, private...)
- Earth works size
- Pumping yes/no
- Land costs
- Municipality advice
- Proximity to other facilities
- Other limiting factors (such as bridge crossing)



WWTP site selection

Izbor lokacije za PPOV



No.	Area (ha)	In use	Type of use	Installations	Infrastructure	Proprietor	Elevation	Earth works	Demolition	Pumping	Other remarks	Municipality	Cadastral No.
1	4,72	no	uncultivated terrain	no	road	partially Mun.	834-836	no	no	local PS	430m x 110m, close to road, power and water	acc.	480 and 481
2	2.15	yes	grassland	no	road	private	843-840	some	no	local PS	195m x 110m, close to road, power and water	acc.	n.a.
3	1,43	yes	grassland	no	road, power	private	851-848	some	no	local PS	130m x 110m, close to road, power	acc.	n.a.
4	0.88	yes	grassland	no	road	private	855-848	yes	no	local PS	135m x 65m, close to road, power	acc.	n.a.
5	2.71	no	uncultivated terrain	no	road, power	private	837-835	some	no	local PS	285m x 95m, close to road, power, water	acc.	n.a.





WWTP site selection

Izbor lokacije za PPOV



**Konačan izbor –
lokacija je br. 1 – neposredno uz
Rešetnicu**

**Final selection –
location is no. 1 – nearest to
Rešetnica stream**

•Ukupna raspoloživa površina je preko 5 ha, sastoji se iz jedne sekcije, gde bi se polovina sekcije koristila za odlaganje mulja,

•Total area available for future WWTP is close to 5 ha, made of 1 sections, where half of section can be used for sludge disposal,

•Predložena lokacija je na javnom zemljištu i delimično je prepoznata u planovima,

•The proposed WWTP site is on public land and is partly recognized as potential site in previous development plans,

•Predložena lokacija je na 2 katastarske parcele označene kao 480 i 481

•WWTP site proposed is located at 2 cadastral lots marked as 480 and 481 KO Sopilje,

•Predložena lokacija je nekorišćeno poljoprivredno zemljište na desnoj obali Rešetnice, u blizini infrastrukture

•The site proposed is uncultivated land without any infrastructure facilities made on the right bank of rešetnica stream, but potential to use nearby infrastructure,

•Predložena lokacija je oko 600 m uzvodno od postojećeg ponora Rešetnice

•The site proposed is the upstream of existing rešetnica sink hole, at distance of 600 meters,

•Predložena lokacija je 4,5 km od centra grada i 500m od najbližih kuća

•Nearest private houses are 500 meters away from WWTP site,

•WWTP site proposed is 4,5km away from city center

•Neophodno je lokalno pumpanje u proces

•Local pumping to treatment is necessary,

•Land purchase costs are estimated at €1.5/m²



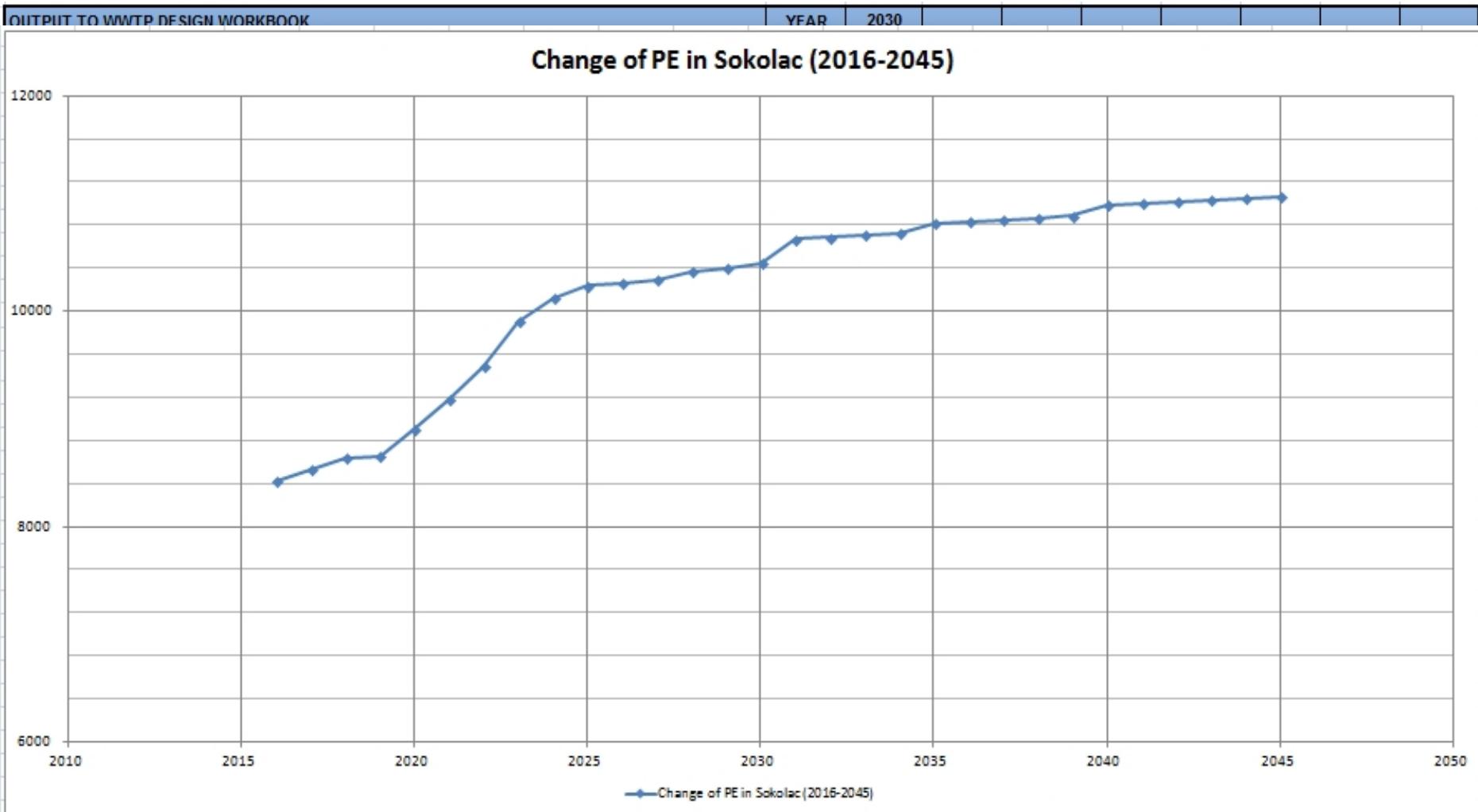
Sokolac WWTP – Flow and load data

PPOV Sokolac – Protoci i ulazni podaci



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FAZA I – 2030. god.





Sokolac WWTP Phase 1 – Options and cost

Faza 1 PPOV Sokolac – Opcije i troškovi

Option Opcije	Investment Costs, EURO thousand Investicioni troškovi u hiljadama evra			Annual Running Costs, EURO thousand Godišnje troškovi u hiljadama evra		
	Civil Cost Troškovi gradnje	Equipment Cost Cena opreme	Total Investment Cost Ukupni troškovi gradnje	Maintenance Costs Održavanje	Staff Costs Osobna troškovima	Electricity Troškovi električne energije
Oxidation ditch (extended aeration) Oksidacioni jarak sa produženom aeracijom	726	844	1,570	21	24	10
Batch Decant (Oxidation Ditch - Extended)						
						
						
Primarno talozenje+laguna+tršćana polja						
	10	55	0.35			
	3	45	0.36			
	0	86	0.44			
	2	39	0.50			

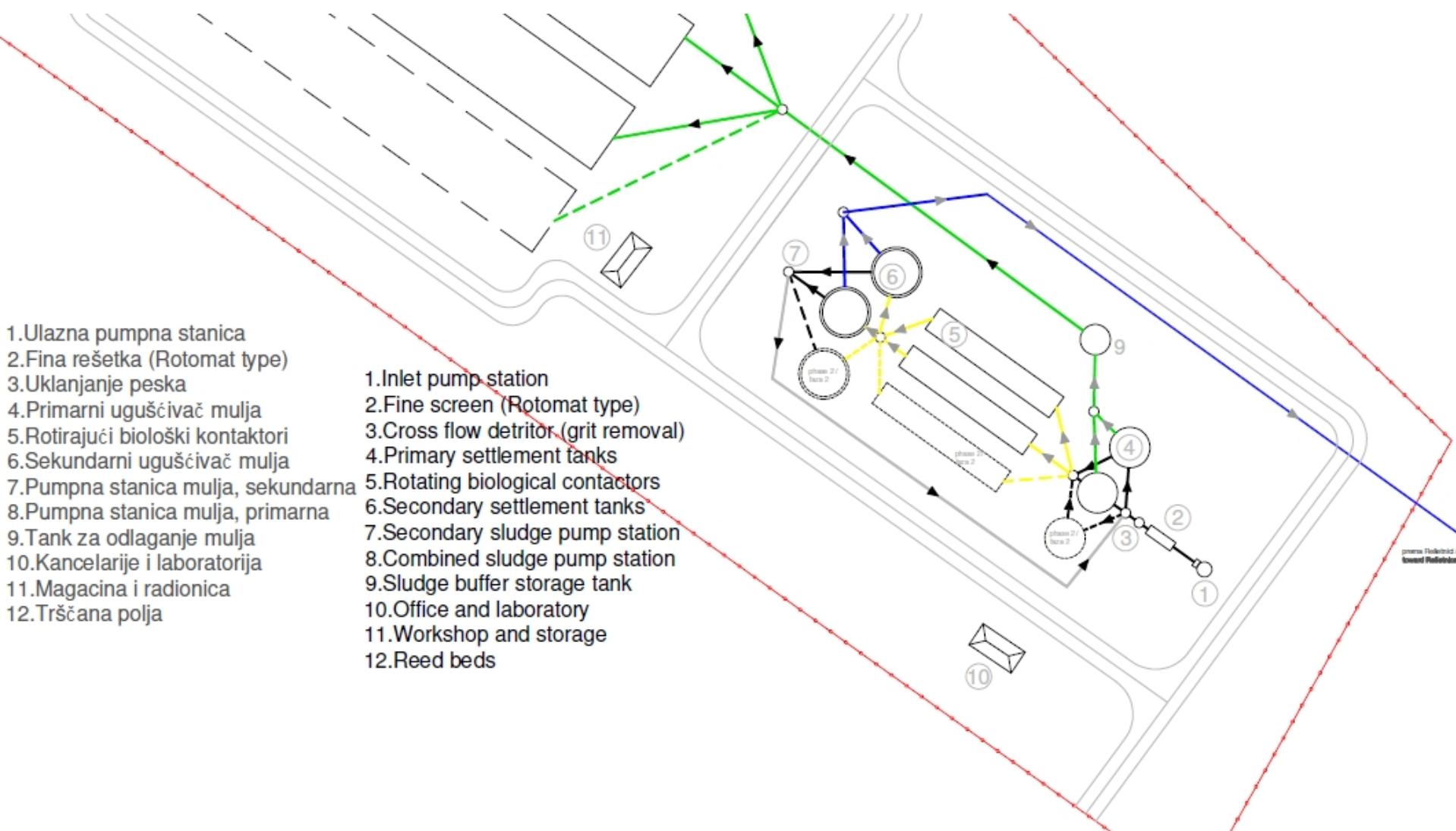


Sokolac WWTP – Layout, year 2030.-proposal

PPOV Sokolac – Osnova, godina 2030.-predlog



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Sokolac WWTP – Process flow diagram

PPOV Sokolac – Šema tehnološkog procesa



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No	Installation	Objekat	Dimensions/Dimenzije
1	Inlet pump station	Ulagana pumpna stanica	dia. 3 m
2	Fine screen (Rotomat type)	Fina rešetka (Rotomat type)	6 m x 2 m
3	Cross flow detritor (grit removal)	Uklanjanje peska	dia. 2 m
4	Primary settlement tanks	Primarni uguščivač mulja	2+1 x dia. 9 m
5	Rotating biological contactors (3 per stream)	Rotirajući biološki kontaktori	2+1 x 32 m x 5 m
6	Secondary settlement tanks	Sekundarni uguščivač mulja	2+1 x dia. 9 m
7	Secondary sludge pump station	Pumpna stanica mulja, sekundarna	dia. 3 m
8	Combined sludge pump station	Pumpna stanica mulja, primarna	dia. 3 m
9	Sludge buffer storage tank	Tank za odlaganje mulja	dia. 6 m
10	Sludge reed bed	Tršćana polja	4 x 15 m x 85 m



Cost of long term requirements – wastewater

Cena dugoročnih investicija u kanalizaciju



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Long term development project / Dugoročni razvojni projekti		8	Prinčići, house connections, 250m, Ø160	11,000	21,520
		9	Košutica, collector T5, 1650m, Ø250	79,200	154,942
62 minor repairs of collector		10	Košutica, house connections, 750m, Ø160	33,000	64,559
33 Sokolac MAIN COLLECTOR		65	PS Košutica, 0.25 l/s, 44 m, 0.25 kw	21,500	42,061
64 PS Podromanija (WWTP PS)		68	Košutica, pumping main, 675m, DN100	43,875	85,834
35 Stari Baltiči, additional h		11	Margetići, collector T6, 2950m, Ø200	135,700	265,475
28 Brejakovići, additional hc		12	Margetići, house connections, 500m, Ø160	22,000	43,039
31 Majdani-Baltiči, addition		13	Vidrići, collector T7, 2270m, Ø250	177,060	346,390
54 Sokolac new house conn		14	Vidrići, house connections, 1500m, Ø160	66,000	129,118
61 removal of existing indivi		15	Vidrići, collector T8, 1710m, Ø200	78,660	153,886
63 removal of septic tanks, &		16	Vidrići, house connections, 875m, Ø160	38,500	75,319
60 removal of existing main		17	Nadići, collector T9, 940m, Ø200	43,240	84,592
67 WWTP phase I		18	Nadići, house connections, 250m, Ø160	11,000	21,520
29 Brezjak, collector T14, 135		19	Podromanija, collector T10, 1395m, Ø200	64,170	125,538
32 Majdani-Podromanija, co		20	Podromanija, house connections, 625m, Ø160	27,500	53,799
36 Podromanija main collect		21	Baltiči, collector T11, 800m, Ø250	51,200	100,165
37 Podromanija collectors A:		22	Baltiči, house connections, 375m, Ø160	20,625	40,350
38 Podromanija collector B1,		23	Novo Selo, collector T12, 800m, Ø250	47,200	92,339
39 Podromanija collector B2,		24	Novo Selo, collector T13, 860m, Ø200	47,300	92,535
53 Podromanija, house conn		25	Novo Selo, house connections, 500m, Ø160	27,500	53,799
40 Podromanija collector C, 1		66	PS Novo Selo, 0.16 l/s, 15 m, 0.15 kw	21,500	42,061
41 Podromanija collector D/I		26	Novo Selo, pumping main, 560m, DN100	36,400	71,211
42 Podromanija collector E/E		55	Storm collector W1, 325m, Ø400	30,225	59,130
43 Podromanija collector G,		56	Storm collector W2, 370m, Ø400	34,410	67,318
44 Podromanija collector H,		57	Storm collector W3, 460m, Ø400	42,780	83,692
45 Podromanija collector I, 3		58	Storm collector W4, 465m, Ø400	43,245	84,602
46 Podromanija collector J, 2		59	Storm collector W5, 640m, Ø400	59,520	116,441
47 Podromanija collector K, 1	long	Total		3,516,958	6,880,365
48 Podromanija collector L/L	long	Physical contingency / Nepredviđeni troškovi		263,772	516,027
		Total for LONG term wastewater components		3,780,730	7,396,393

Cena kapitalne investicije, nepredviđenih troškova od 5% i nadzora od 2.5% - Total Cost including 5% contingency, and 2.5% supervision.



Odvođenje otpadnih voda - rezime

Minimalni projekat podrazumeva izgradnju glavnog kolektora do budućeg postrojenja i PS, sa izgradnjom manjeg broja kućnih priključaka. Cena ovih radova je procenjena na maksimalno 398.000 evra (778.000 KM).

Osnovnim projektom predlaže se izgradnja novih kućnih priključaka u Baltićima, Majdanima i Brejakovićima (projektna dokumentacija je za ove lokacije urađena ili se izrađuje). Cena predviđenih radova procenjena je na 121.000 evra (odnosno oko 238.000 KM). Ukupna cena, koja podrazumeva i troškove za prethodni podprojekat je oko 519.000 evra.

Veliki projekat uključuje predloženo u prethodne 2 stavke ali i izgradnju dodatnih kućnih priključaka i uklanjanje individualnih izliva duž Rešetnice. Cena predviđenih radova procenjena je na 195.000 evra (odnosno oko 380.000 KM). Ukupna cena, koja podrazumeva i troškove za prethodni podprojekat je oko 1.398.000 evra.

Minimum project involves the construction of main collector towards future WWTP with PS and the construction of a small number of house connections. The costs of these works are estimated at a maximum of 398,000 euros (778,000 KM).

Base project proposes the construction of new house connections in the Baltici, Majdani and Brejakovici (project documentation for these locations is in progress). The costs of the planned works are estimated at 121,000 euros (or approximately 238,000 KM). The total price, which includes the costs of the preliminary sub-project is about 519,000 euros.

High project includes those components proposed in the previous two cases as well as the construction of additional house connections and removal of individual outfalls along Rešetnica stream. The costs of the planned works are estimated at 195,000 euros (or approximately 380,000 KM). The total price, which includes the costs of the sub-project is about 1.4 milion of euros.



Development options – wastewater

Razvojne opcije - kanalizacija



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	euro			KM		
	Min	Base	High	Min	Osnovni	Visoki
minor repairs of collectors - manje popravke kolektora	10,000	10,000	10,000	19,563	19,563	19,563
Sokolac MAIN COLLECTOR Q, 5090m, Ø400 - GLAVNI KOLEKTOR	335,940	335,940	335,940	657,213	657,213	657,213
PS Podromanija (WWTP PS), 15.67 l/s, 15 m, 5 kw - Pumpna stanica PODROMANIJA	52,000	52,000	52,000	101,730	101,730	101,730
Stari Baltiči, additional house connections, 625m, Ø160 - Kućni priključci	-	47,750	47,750	-	93,415	93,415
Brejakovići, additional house connections, 445m, Ø160 - Kućni priključci	-	29,303	29,303	-	57,327	57,327
Majdani-Baltiči, additional house connections, 390m, Ø160 - Kućni priključci	-	44,378	44,378	-	86,818	86,818
Sokolac new house connections, 2625m, Ø160 - Kućni priključci	-	-	157,500	-	-	308,124
removal of existing individual outfalls, 50 - uklanjanje individualnih izliva	-	-	37,500	-	-	73,363
Physical contingency and supervision - nepredviđeni radovi i nadzor	29,846	38,953	53,578	58,388	76,205	104,816
Total for wastewater components - Ukupno za projekte u kanalizaciji	427,786	558,324	767,949	836,894	1,092,271	1,502,369

Cena kapitalne investicije, nepredviđenih troškova od 5% i nadzora od 2.5%



- Increase in population connected to sewer in suburban area (total increase for some 15%)
- Most of Sokolac's wastewater transferred to a single discharge point
- Expanding the sewer system of Sokolac
- 85% Wastewater collected disposal at WWTP location
- Povećanje br. stanovnika u prigradskom području koji su priključeni na kanalizaciju (ukupno povećanje oko 15%)
- Najveće količine prikupljenih otpadnih voda iz Sokolca se evakuišu na jedno mesto ispusta
- Širi se kanalizacioni sistem Sokolca
- Odvođenje preko 85% prikupljenih otpadnih voda na lokaciju budućeg PPOV



WS and WWS Investment Cases Summary

Pregled slučajeva finansiranja projekata vodosnabdevanja i otpadnih voda



WS and WWS Investment Cases Summary / Pregled slučajeva finansiranja projekata vodosnabdevanja i otpadnih voda	Total Cost excluding VAT, but including contingency, supervision and design costs (€) / Ukupni troškovi bez PDV-a (€)	Total Cost excluding VAT, but including contingency, supervision and design costs (KM) / Ukupni troškovi bez PDV-a (KM)
Minimum Case Water Supply / Minimalni slučaj vodosnabdevanje	199,863	390,999
Minimum Case Wastewater / Minimalni slučaj otpadne vode	427,786	836,894
Minimum Case TOTAL / Minimalni slučaj UKUPNO	627,649	1,227,893
Base Case Water Supply / Osnovni slučaj vodosnabdevanje	355,738	695,944
Base Case Wastewater / Osnovni slučaj otpadne vode	558,324	1,092,271
Base Case TOTAL / Osnovni slučaj UKUPNO	914,062	1,788,215
High Case Water Supply / Viši slučaj vodosnabdevanje	516,128	1,009,721
High Case Wastewater / Viši slučaj otpadne vode	767,949	1,502,369
High Case TOTAL / Viši slučaj UKUPNO	1,284,077	2,512,090

Cena kapitalne investicije, nepredviđenih troškova od 5% i nadzora od 2.5% - Total Cost including 5% contingency, and 2.5% supervision.



		Minimum Minimalni euro	Base Osnovni euro	High Veliki euro
WATER SUPPLY	VODOSNABDEVANJE			
Total for water supply components	Ukupno za projekte u vodosnabdevanju	199,863	355,738	516,128
WASTEWATER	KANALIZACIJA			
Total for wastewater components	Ukupno za projekte u kanalizaciji	427,786	558,324	767,949
Total	UKUPNO	627,648	914,062	1,284,076
Price escalation	Povećanje cena usled inflacije	6,268	7,994	15,686
Total investment cost	Ukupni troškovi investicije	633,916	922,056	1,299,762
VAT	PDV	107,766	156,749	220,960
Total inc. VAT	Ukupno sa PDV	741,682	1,078,805	1,520,722

Cena kapitalne investicije, nepredviđenih troškova od 5%, nadzora od 2.5%, povećanja cene usled inflacije od 2.5% na godišnjem nivou i PDV-a od 17%

The price include costs of capital investments, contingency of 5%, supervision of 2.5%, increase in prices due to inflation of 2.5% per annum and VAT of 17%

Povećanje cene usled inflacije započinje sa godišnjom inflacijom od 1% u 2018. godini i povećava se na 2.5% godišnje do 2021. godine
Increases in prices due to inflation starting at around 1% per annum in 2018 and increasing to 2.5% per annum by 2021



		Minimum Minimalni KM	Base Osnovni KM	High Veliki KM
WATER SUPPLY	VODOSNABDEVANJE			
Total for water supply components	Ukupno za projekte u vodosnabdevanju	390,999	695,944	1,009,721
WASTEWATER	KANALIZACIJA			
Total for wastewater components	Ukupno za projekte u kanalizaciji	836,894	1,092,271	1,502,369
Total	UKUPNO	1,227,893	1,788,215	2,512,090
Price escalation	Povećanje cena usled inflacije	12,262	15,639	30,687
Total investment cost	Ukupni troškovi investicije	1,240,155	1,803,854	2,542,777
VAT	PDV	210,826	306,655	432,272
Total inc. VAT	Ukupno sa PDV	1,450,981	2,110,509	2,975,049

Cena kapitalne investicije, nepredviđenih troškova od 5%, nadzora od 2.5%, povećanja cene usled inflacije od 2.5% na godišnjem nivou i PDV-a od 17%

The price include costs of capital investments, contingency of 5%, supervision of 2.5%, increase in prices due to inflation of 2.5% per annum and VAT of 17%

Povećanje cene usled inflacije započinje sa godišnjom inflacijom od 1% u 2018. godini i povećava se na 2.5% godišnje do 2021. godine
Increases in prices due to inflation starting at around 1% per annum in 2018 and increasing to 2.5% per annum by 2021



Environment Životna sredina

Karina Zachodni
Senior Environmentalist
Odgovorni Ekspert za zaštitu životne sredine

WYG-IPF3

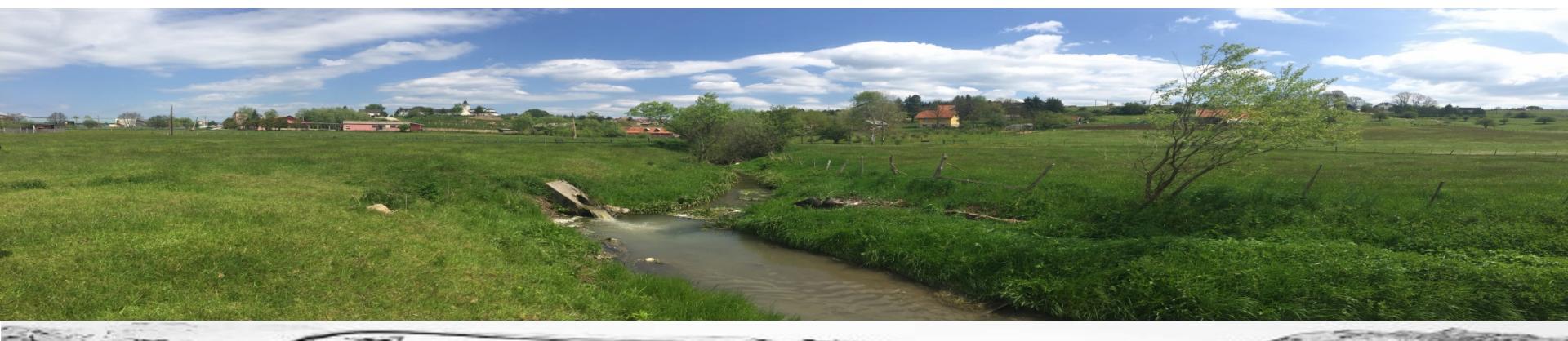


Environmental review - content

- Legal review
- Water
- Water quality, health
- Wastewater
- WWTP location
- Impact of developments:
- Benefits and
- Summary Impact Assessment

Pregled životne sredine - sadržaj

- Pravni aspekti
- Vode
- Kvalitet vode i zdravlje
- Otpadne vode
- Alternativne lokacije za PPOV
- Uticaj razvoja:
- Koristi i
- Kratka procjena uticaja





Existing legislative

- **Environment protection** (EU Directive 85/337/EEC)
- **Water** (WFD)
- **Nature** (92/45/EEC and 79/409/EEC)
- **Waste** (WFD 2006/12/EC)
- **Spatial Planning**
- **Cultural heritage**
 - Drinking water
 - Discharges to surface waters
 - Discharges to sewage
 - Waste
 - Sewage sludge disposal

Postojeća regulativa

- **Zaštita životne sredine** (Direktiva EU 85/337/EEC)
- **Voda** (ODV)
- **Priroda** (92/45/EEC i 79/409/EEC)
- **Otpad** (WFD 2006/12/EC)
- **Prostorno uređenje**
- **Kulturno naslijeđe**
- Voda za piće
- Ispuštanje u površinske vode
- Ispuštanje u kanalizaciju
- Otpad
- **Odlaganje kanalizacionog mulja**



- Environmental Impact Assessment in Law on Protection of Environment (OGRS, no. 53/02)
- EIA contents (OGRS, 118/05), projects with obligatory EIA, criteria for obligation and scope of EIA (OGRS, 07/06)
- Procedure (up to 285 days):
 - Screening
 - Deciding on need for EIA
 - Scope and contents of EIA study
 - Public discussion
 - Revision of EIA study
 - Decision on request for EIA consent
- **Procjena uticaja na životnu sredinu u Zakonu o zaštiti životne sredine (SGRS; br. 53/02)**
- **Sadržaj PUŽS (SGRS, 118/05), projekti za koje se sprovodi PUŽS, obaveza sprovođenja i obim PUŽS (SGRS, 07/06)**
- **Procedura (do 285 dana):**
 - Prethodna PUŽS
 - Odluka o potrebi za PUŽS
 - Sadržaj studije o PUŽS
 - Javna rasprava
 - Revizija studije o PUŽS
 - Odobravanje PUŽS



Pre-treatment of Industrial WW

Predtretman industrijskih otpadnih voda



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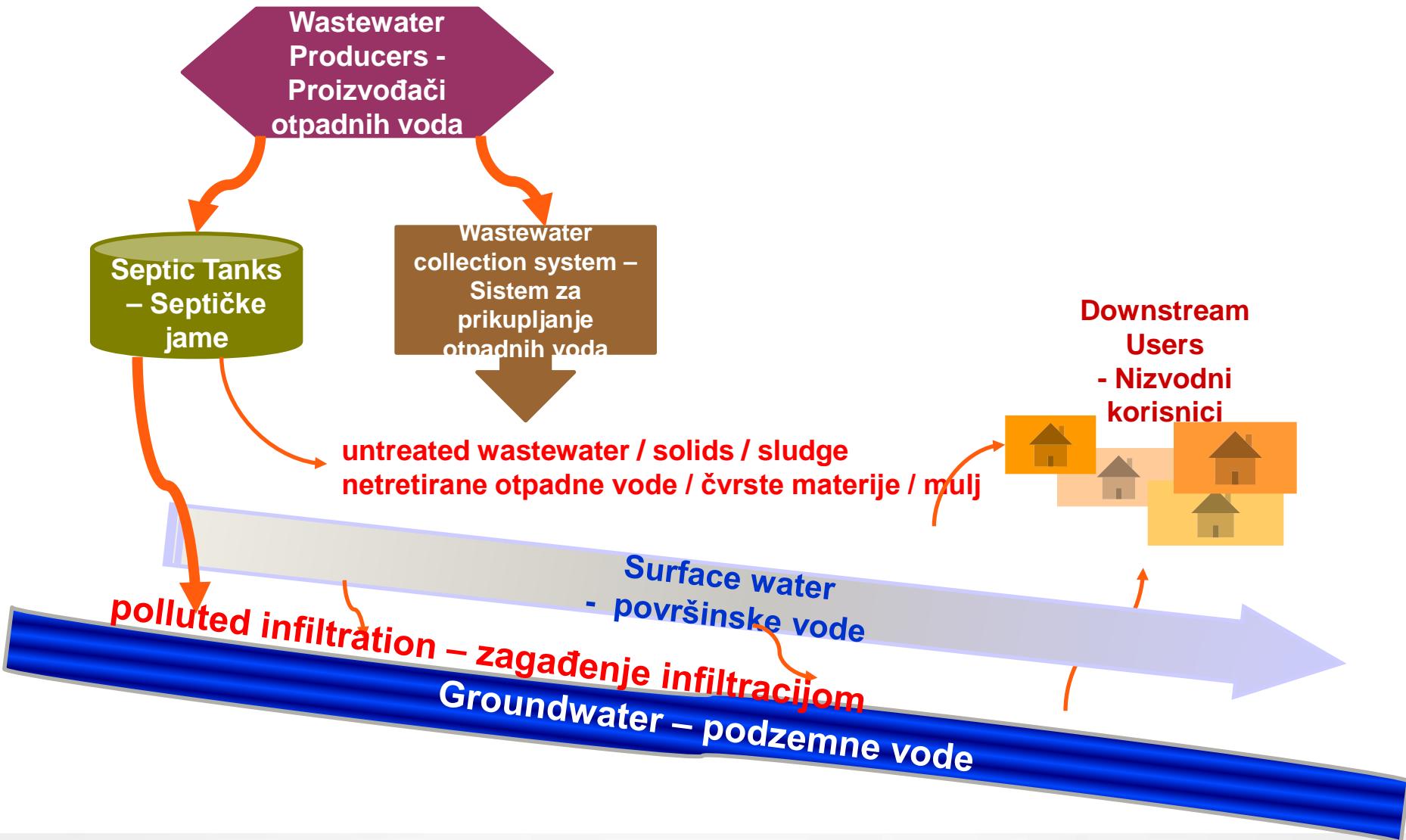
Local environmental legislation Lokalna zakonska regulativa u polju životne sredine



- **Decision on water and sewage in Municipality of Sokolac (OG of City of Eastern Sarajevo no. 6/2014)**
 - ✓ Zones of sanitary protection for water sources
 - ✓ Wastewater collected by separate sewerage system
 - ✓ Atmospheric waters by a separate system to the closest surface water
 - ✓ All new sewerage systems separate
- **Decision on communal order (OG of City of Eastern Sarajevo no. 10/2013)**
 - ✓ Prohibits discharge of wastes in public areas and in water courses and river banks
 - ✓ Frequency of emptying of septic tanks minimum 1 in a year
- **Local nature protection legislation**
 - ✓ “Pećina pod lipom” and Girska pecina under protection (OG of City of Eastern Sarajevo no. 12/2015).
- **Odluka o vodovodu i kanalaizaciji u opštini Sokolac (SG Grada Istočno Sarajevo, br. 6/2014)**
 - ✓ Zone sanitarnе zaštite vodoizvorišta
 - ✓ Otpadne vode se prikupljaju separatnim kanalizacionim sistemom
 - ✓ Atmosferske vode odvode se separatnim sistemom do najbližeg površinskog vodotoka
 - ✓ Svi novi kanalizacioni sistemi su separatni
- **Odluka o komunalnom redu (SG Grada Istočno Sarajevo, br. 10/2013)**
 - ✓ Zabranjuje odlaganje otpada na javne površine, u vodotoke i na obale rijeka.
 - ✓ Učestalost pražnjenja septičkih jama minimum jednom godišnje.
- **Lokalno ekološko zakonodavstvo**
 - ✓ “Pećina pod lipom” i Girska pećina su stavljenе pod zaštitu (SG Grada Istočno Sarajevo, br. 12/2015).



Existing Situation Postojeće stanje





Wastewater Otpadne vode



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- Approximately 39% municipal population connected to sewage network
- 83% of urban population connected to sewage network
- Remaining inhabitants use percolating septic tanks or discharge directly into water courses
- 3 large discharge points, main Resetnica
- No WW treatment

Main
discharge,
Resetnica
sinkhole



- Oko 39% stanovnika opštine priključeno je na kanalizacionu mrežu
- 83% gradskog stanovništva priključeno na kanalizacionu mrežu
- Preostali stanovnici koriste procjedne septičke jame ili ispuštaju otpadne vode direktno u vodotoke
- 3 glavna ispusta, glavni je Rešetnica
- Nema tretmana otpadnih voda

Discharge
point to
Rogatica





Environmental red flags:

- 2.2km of existing asbestos pipes needs replacing
- Safe disposal of asbestos pipes to be implemented in Phase 1
- Control of construction impacts (traffic, dust, noise, solid waste)



Ekološki rizici:

- 2.2 km postojećih AC cijevi potrebno zamijeniti
- Bezbjedno odlaganje azbestnih cijevi implementirati u Fazi 1
- Kontrola uticaja gradnje (saobraćaj, prašina, buka, čvrsti otpad)





WWTP Site Lokacija za PPOV



No nearby properties

Close to Resetnica sinkhole

Good road access

Nema objekata u blizini

Blizu ponora Rešetnice

Dobar prilazni put





- Izuzetno visok nivo neobračunate vode
- Česti problemi sa kvalitetom vode - zamućenost, rezidualni Cl
- Dotrajale AC cijevi
- Nesanitarne prakse sanacije kvarova
- Extremely High NRW
- Frequent WQ Failures– Turbidity, Residual Cl
- Decaying AC pipes
- Insanitary Repair Practices

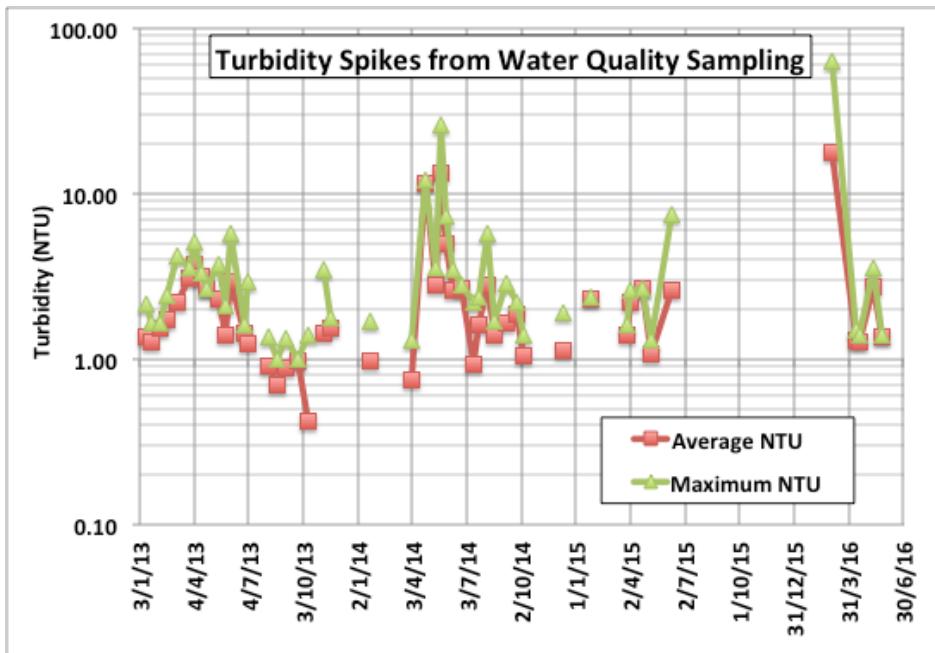


Frequent Water Quality Lapses

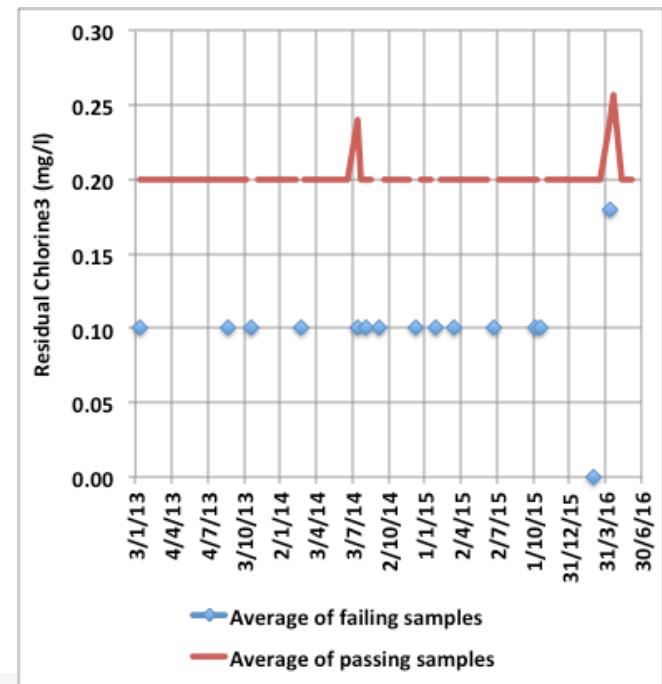
Česti problemi sa kvalitetom vode



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- Bakterijska kontaminacija
- Bacterial contamination
- Visoka zamućenost
- High Turbidity
- Low Residual Chlorine
- Nizak rezidualni hlor



- Unaprijediti zaštitu izvora
- Improve source protection
- Bistrenje i filterisanje za uklanjanje zamućenosti i organskih materija
- Clarify and filter to remove turbidity and organics
- Osigurati adekvatno i kontinuirano doziranje hlora
- Provide adequate and continuous chlorination dosing



Summary of impacts – PIP

Kratak pregled uticaja projekta



IPF CONSORTIUM

PIP components / Komponente prioritetnog investicionog projekta	Minimum			Base			High		
		C	O		C	O		C	O
Wastewater investments / Investicije u kanalizaciju									
Minor repairs of collectors/ Manje sanacije kolektora	Y			Y			Y		
Pumping stations and rising mains/Pumpne stanice i potisni cjevovodi									
Sokolac MAIN COLLECTOR Q, 5090m, Ø400 / GLAVNI KOLEKTOR Sokolac	5,090			5,090			5,090		
PS Podromanija (WWTP PS), 15.67 l/s, 15 m	5.0 kW			5.0 kW			5.0 kW		
Additional house connections, Ø160 / Dodani kućni priključci									
Stari Baltići, 625m	N			625			625		
Brejakovići, 445m	N			445			445		
Majdani-Baltići, 390m	N			390			390		
Sokolac, 2625m	N			N			2625		
Removal of existing individual outfalls / Uklanjanje postpjecišnih pojedinačnih ispusta	N			N			50		
WWTP / PPOV	N			N			Y		
Water supply investments / Investicije u vodovod									
Leak detection study / Studija za otkrivanje curenja	Y			Y			Y		
Leak detection equipment / Oprema za otkrivanje curenja	Y			Y			Y		
Sanitary zone study for rural sources / Studija sanitarnih zona za ruralne izvore	Y			Y			Y		
Urgent distribution network reconstruction / Hitna rekonstrukcija distributivne mreže	840			840			840		
Flow measurement at Distribution network/ Mjerenje protoka u distr. mreži	N			Y			Y		
Water level telemetry reservoirs and pressure break chambers / Telemetrija nivoa vode u rezervoarima i prekidnim komorama	N			22			22		
PS Puhovac and pump main from Bioštica to Res Puhovac / PS Puhovac i potisni cjevovod od Bioštice do R Puhovac	N			N			Y		
Sludge Disposal / Odlaganje mulja									
Disposal to landfill / Odlaganje na deponije	N			N			Y		
OR use for agriculture or land reclamation / ILI upotreba u poljoprivredi ili za melioraciju zemljišta	N			N			Y		



Financial Appraisal **Finansijska Ocena**

Results of Financial Appraisal of proposed development project
Rezultati finansijske ocene predloženog razvojnog projekta

Sohail Hassan
Senior Project Manager – WYG IPF3
Stariji projektni menadžer – WYG IPF3

Ivan Jankovic
Senior Financial Analyst – WYG IPF3
Finansijski analitičar – WYG IPF3



Presentation Contents

Sadržaj Izlaganja



IPF CONSORTIUM

- **Water Company / Vodovod**

Tariffs and billed volumes / Cene i fakturisane količine

Operating revenues and expenses / Operativni prihodi i rashodi

Operating result / Poslovni rezultat

Balance Sheet structure / Struktura bilansa stanja

Cash Flow structure / Struktura tokova gotovine

- **Municipality / Opština**

Municipality borrowing capacity / Mogućnost zaduženja Opštine

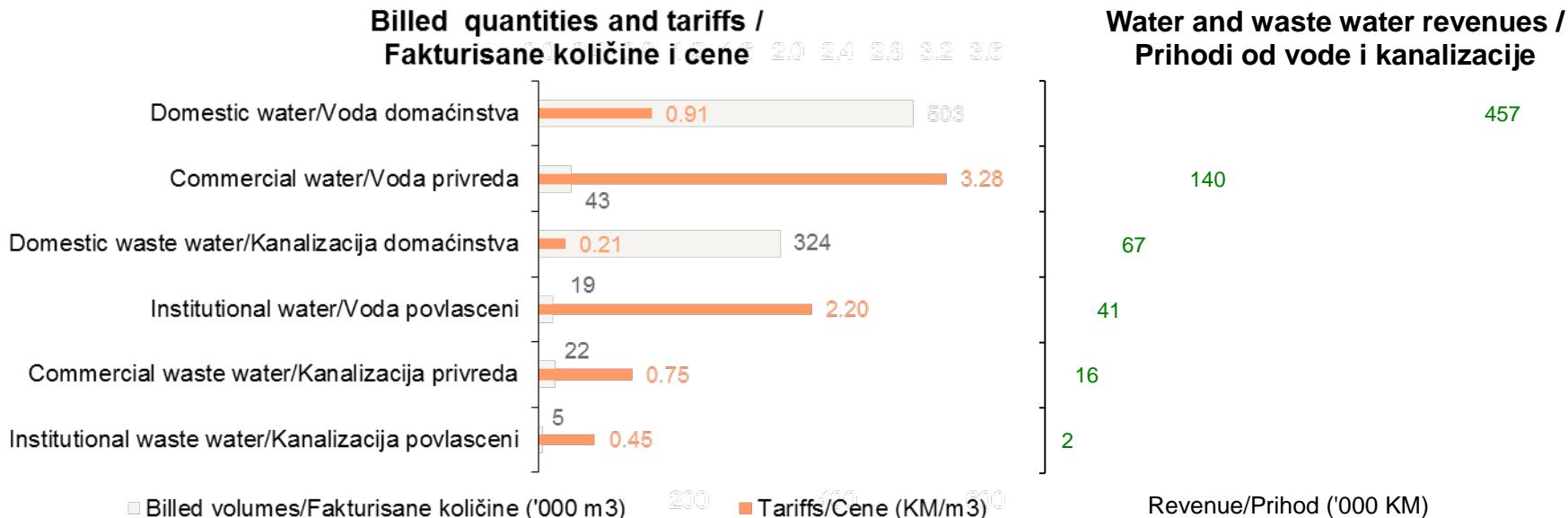


Tariffs and billed volumes

Cene i fakturisane količine



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- Top revenues are provided by drinking water delivery to domestic and commercial customers. This is due to very high consumption by domestic customers, and high prices for commercial customers. / Najveći prihodi se ostvaruju od isporuke vode usled visoke potrošnje vode kod domaćinstava, kao i visoke tarife za privredne subjekte.
- On average, ratio of domestic vs. institutional vs. commercial tariffs equals 1.0:1.8:2.5, while for water vs. wastewater tariffs this ratio equals 4.4. This implies high imbalance in the tariff scheme. / Odnos cena za domaćinstva, povlašćene potrošače i privredu je 1.0:1.8:2.5, dok je odnos cena vodosnabdevanja i kanalizacije 4.4. Pomenuti odnosi predstavljaju izraženu neuravnoteženost cena.
- Current distribution of tariffs results in strong financial support from commercial to domestic customers. Also, the highest potential for revenue increase is hidden in tariff scheme for domestic customers. / Trenutna raspodela tarifa stvara značajan nivo finansiranja domaćinstava od strane privrede, kao i značajan potencijal za povećanje prihoda od strane domaćinstava.
- In the future, tariffs should move towards elimination of subsidy as well as OPEX and CAPEX coverage. / Buduće promene cena bi trebalo da eliminišu finansiranje domaćinstava, kao i da pokriju operativne troškove i investiciona ulaganja.

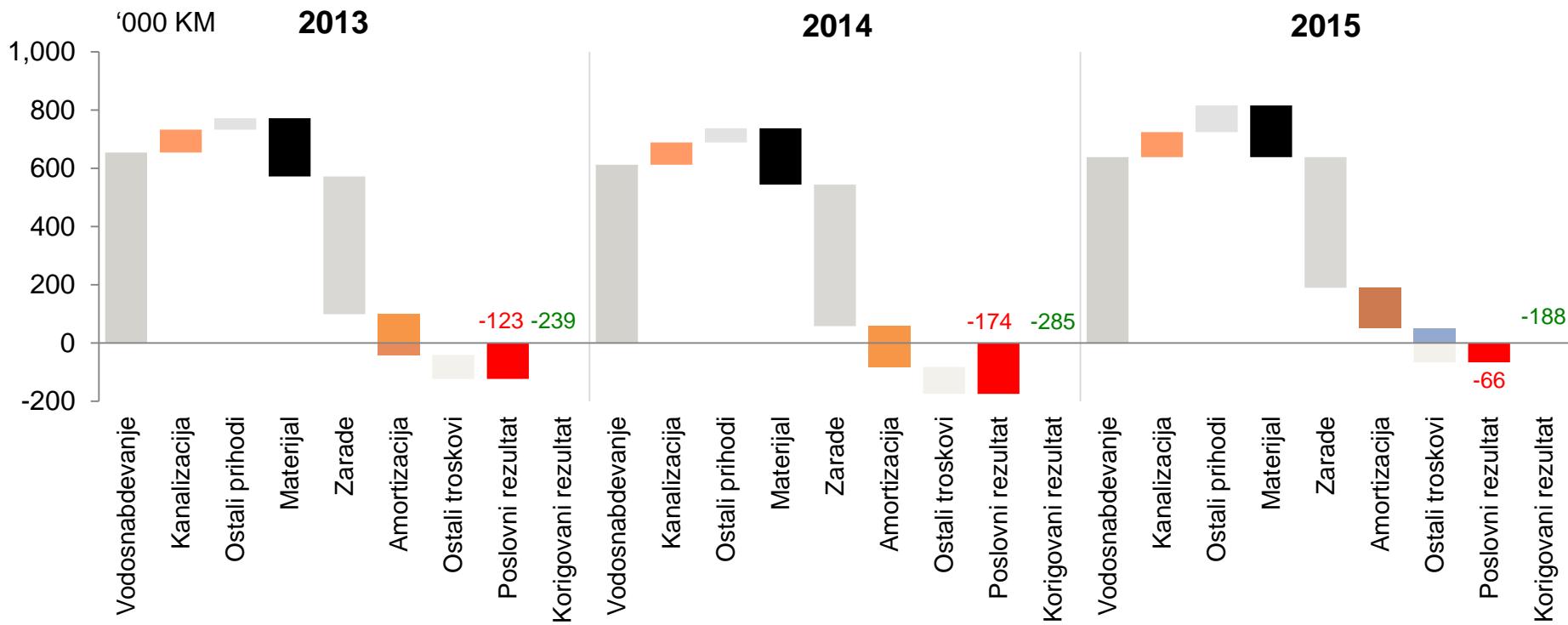


Operating revenues and expenses

Operativni prihodi i rashodi



IPF CONSORTIUM



- Water service provides around 80% of operating revenues. / Vodosnabdevanje čini oko 80% poslovnih prihoda.
- Wastewater makes 10% of operating revenues. / Prihod od kanalizacije čini oko 10% poslovnih prihoda.
- Wages make 63% of operating costs, while following the bankruptcy the depreciation expense has not been reported. / Zarade čine 63% operativnih troškova, dok trosak amortizacije nije uziman u obzir nakon odlaska u stečaj.
- Including depreciation and bed debt expense, the operating result would be negative and vary between 190 and 290 thousand KM. / Sa amortizacijom i troškom nenaplativih potraživanja, operativni trošak bi bio između 190 i 290,000 KM.
- Improved result in 2015 is the result of increased tariffs and improved water meter maintenance. / Poboljšanje poslovanja u 2015 je rezultat povećanih prihoda, a najviše usled povećanja tarifa i prihoda od održavanja vodomera.

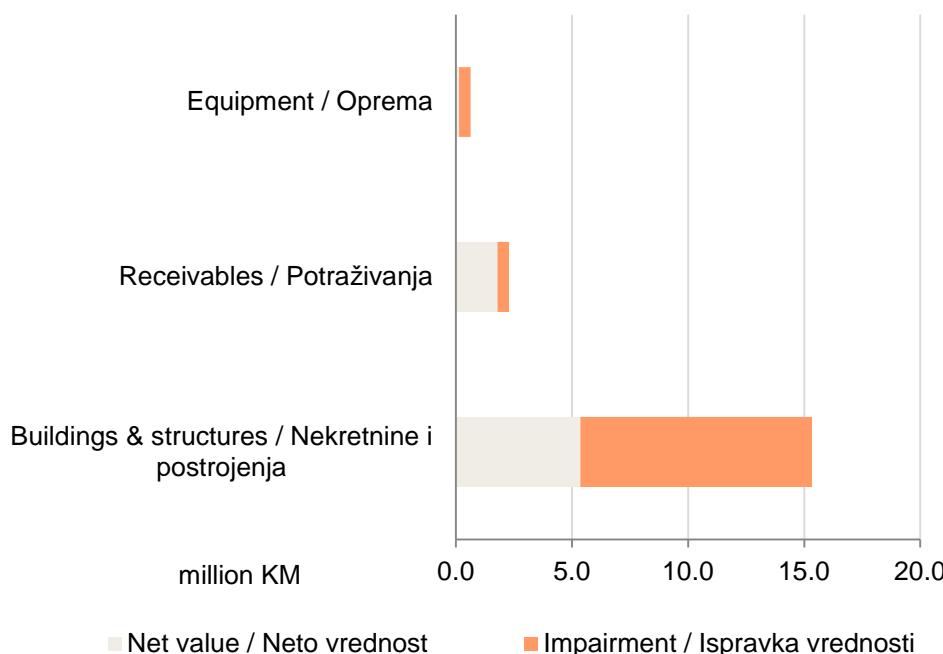


Balance Sheet Structure Struktura bilansa stanja

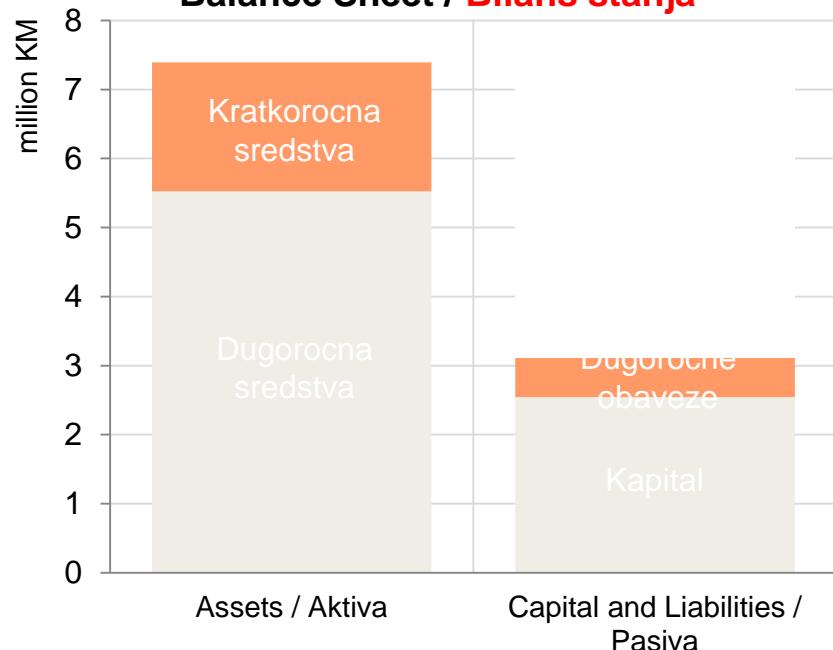


IPF CONSORTIUM

Structure of assets / Struktura aktive



Balance Sheet / Bilans stanja



- Receivables make 24% of total assets while long-term assets make 75%. / Potraživanja čine 24% vrednosti ukupne aktive dok osnovna sredstva čine 75%.
- Long term assets are depreciated to important extent: buildings 65%, equipment 77%. / Osnovna sredstva su u velikoj meri amortizovana: građevinski objekti 65%, oprema 77%.
- Currently there is a large discrepancy between short-term assets and liabilities. / Trenutno postoji velika neusklađenost između kratkoročnih sredstava i kratkoročnih obaveza.
- Inside short-term assets there is large percentage of old unimpaired receivables. Current receivables days equal more than 2 years. / U okviru kratkoročnih sredstava se nalazi značajan iznos starih i neispravljenih potraživanja. Trenutna potraživanja su sa danima vezivanja kupaca preko 2 godine.

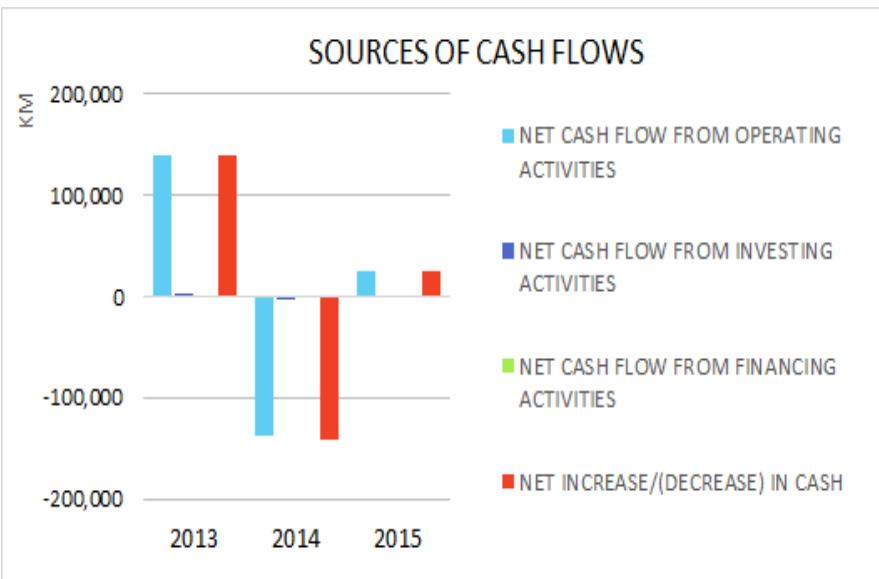


Structure of Cash Flow

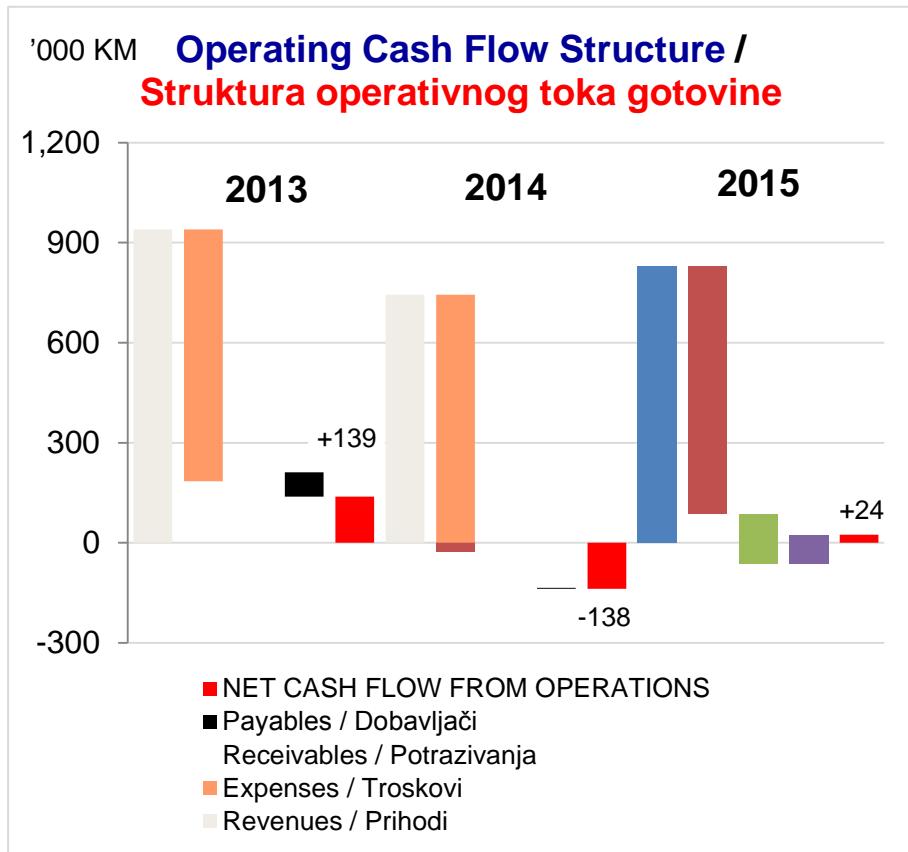
Struktura tokova gotovine



IPF CONSORTIUM



- Annual cash flows depends almost exclusively on operating activities, with extremely small effects from investing and financing activities. / Tokovi gotovine zavise najviše od operativnih aktivnosti dok su investiranje i finansiranje bez značajnog uticaja.
- Recently, total annual cash flow have varied between 140,000 KM of inflow in 2013 and the same level of outflow in 2014. / U poslednjim godinama, ukupni godišnji gotovinski tok je varirao između 140,000 KM priliva u 2013 i istog nivoa odliva u 2014.



- Cash flow from operations depends mostly on variations in revenues and expenses. Minor adjustments are provided by changes in receivables and payables. / Operativni tokovi gotovine zavise najviše od operativnih prihoda i rashoda dok manje promene dolaze od naplate potraživanja i plaćanja dobavljačima.



- Investment Costs:

- Prices including VAT and local inflation

Min	Base	High
KM 000	KM 000	KM 000
1,451	2,110	2,975

- Financing Plan:

	Min	Base	High
Loan	50%	50%	50%
Equity Contribution	50%	50%	50%

- Unfavourable prospects for grant contributions

- Investicioni troškovi:

- Cijene uključuju PDV i lokalnu inflaciju

Min	Osnovni	Max
KM 000	KM 000	KM 000
1,451	2,110	2,975

- Finansijski plan:

	Min	Osnovni	Max
Kredit	50%	50%	50%
Doprinos korisnika	50%	50%	50%

- Nepovoljni izgledi za doprinose u vidu donacija

Prepostavljeni uslovi kredita od EIB i projekcije EURIBOR-a

- Assumed Terms and Conditions of EIB Variable Rate Loan
- Prepostavljeni uslovi kredita od EIB-a sa varirajucom stopom
- Current 6 month EURIBOR Rate 0.20%
- Sadašnji 6-mesecni EURIBOR 0.20%

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total interest rate	1.1%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	4.5%
Fixed EIB rate	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Projected variable rate, 6m EURIBOR	0.2%	0.6%	1.1%	1.6%	2.1%	2.6%	3.1%	3.6%	3.6%



Assumed Terms and Conditions of EIB and Commercial Loans

Prepostavljeni uslovi kredita od EIB



IPF CONSORTIUM

Assumed conditions EIB:

- 25 years loan maturity period
- 8 years grace period
- Variable interest rate until 2022
- Fixed interest rate of 4.5% from 2023

Assumed conditions commercial:

- 10 years loan maturity period
- 1 year grace period
- Fixed interest rate of 7.0%

Min Case: Loan 0.725 KM m
Equity Contribution 0.725 KM m

Base Case: Loan 1.055 KM m
Equity Contribution 1.055 KM m

High Case: Loan 1.487 KM m
Equity Contribution 1.487 KM m

- Met from Vodovod Revenues
- Debt Service Coverage Ratio of over 1.2

Prepostavljeni uslovi (EIB):

- period dospijeća zajma 25 godina
- grejs period 8 godina
- promenljiva kamatna stopa do 2022
- fiksna kamatna stopa od 4.5% do 2023

Prepostavljeni uslovi (komercijalni):

- period dospijeća zajma 10 godina
- grejs period 1 godina
- fiksna kamatna stopa od 7.0%

Minim. projekat: Kredit 0.725 KM m
Doprinos korisnika 0.725 KM m

Osnovni projekat: Kredit 1.055 KM m
Doprinos korisnika 1.055 KM m

Maksim. Projekat: Kredit 1.487 KM m
Doprinos korisnika 1.487 KM m

- Pokrivaju se iz prihoda Vodovoda
- Koeficijent pokrivenosti servisiranja duga preko 1.2



Debt Service Implications for Vodovod

Implikacije servisiranja duga po Vodovod



IPF CONSORTIUM

Annual Repayments in KM

Min Case - Max 168,616 in 2025

Base Case - Max 244,831 in 2025

High Case - Max 346,683 in 2025

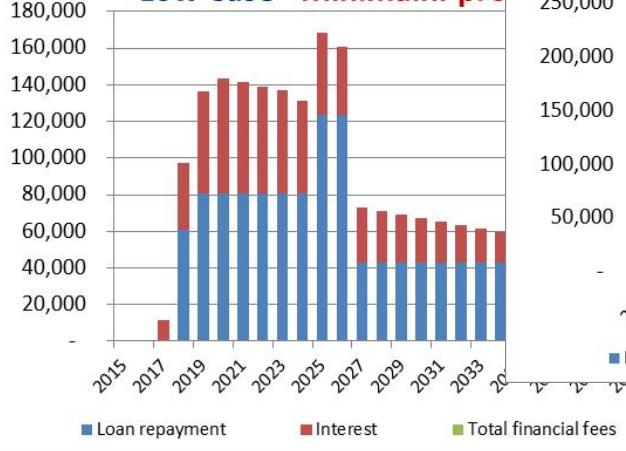
Godišnje servisiranje kredita u KM

Minimalni projekat - Max 168,616 u 2025

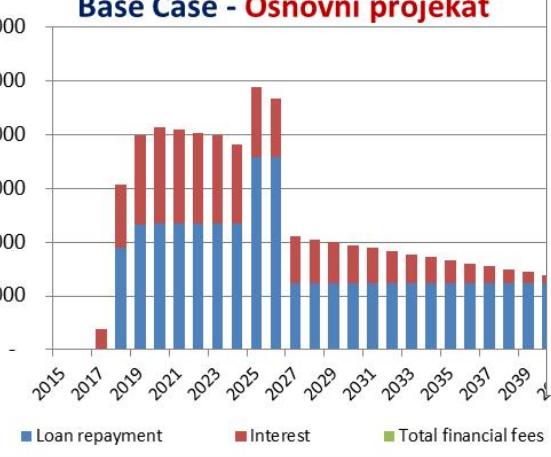
Osnovni projekat - Max 244,831 u 2025

Max projekat - Max 346,683 u 2025

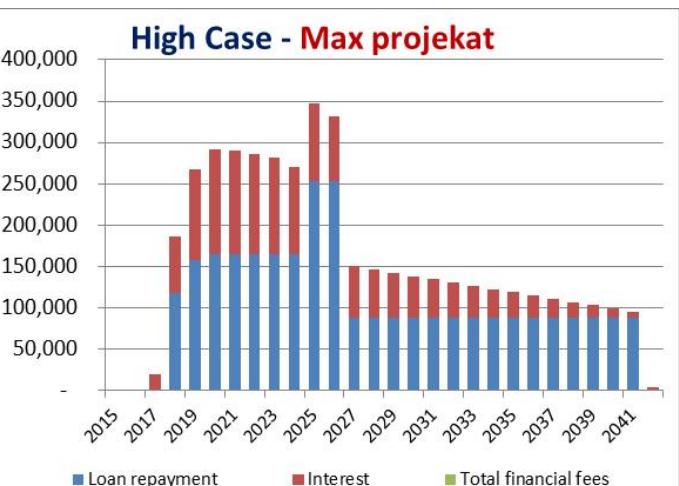
Low Case - Minimalni pro



Base Case - Osnovni projekat



High Case - Max projekat





Municipality Borrowing Capacity / Mogućnost zaduženja Opštine



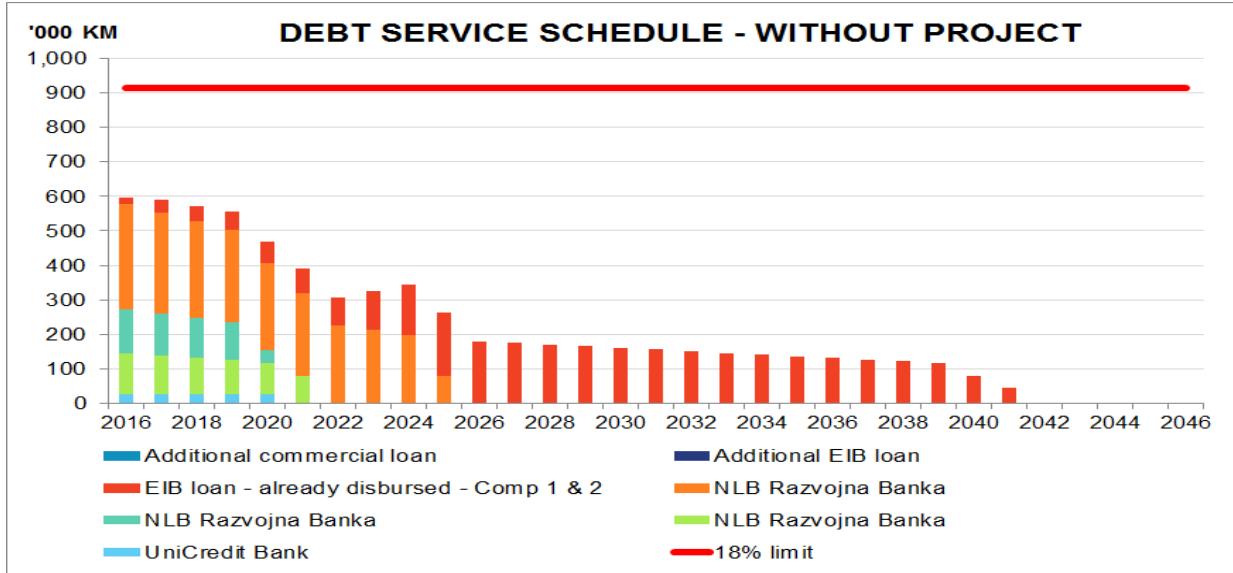
IPF CONSORTIUM

18% of current revenues in 2015 amounted to 912 thousand KM. / 18% tekućih prihoda Opštine u 2015 iznosi 912 hiljada KM.

Debt servicing requires around 12% of 2015 current revenues. / Otplata kredita iznosi oko 12% tekućih prihoda iz 2015.

Debt capacity comes from grace period and low interest rate. / Mogućnost zaduženja je rezultat grace perioda i male kamatne stope.

Current Borrowing decision allows 2.97 million KM. / Trenutna Odluka o zaduženju iznosi 2.97 miliona KM.





Financing Strategy Low Case Option

Finansijska strategija bez investicija



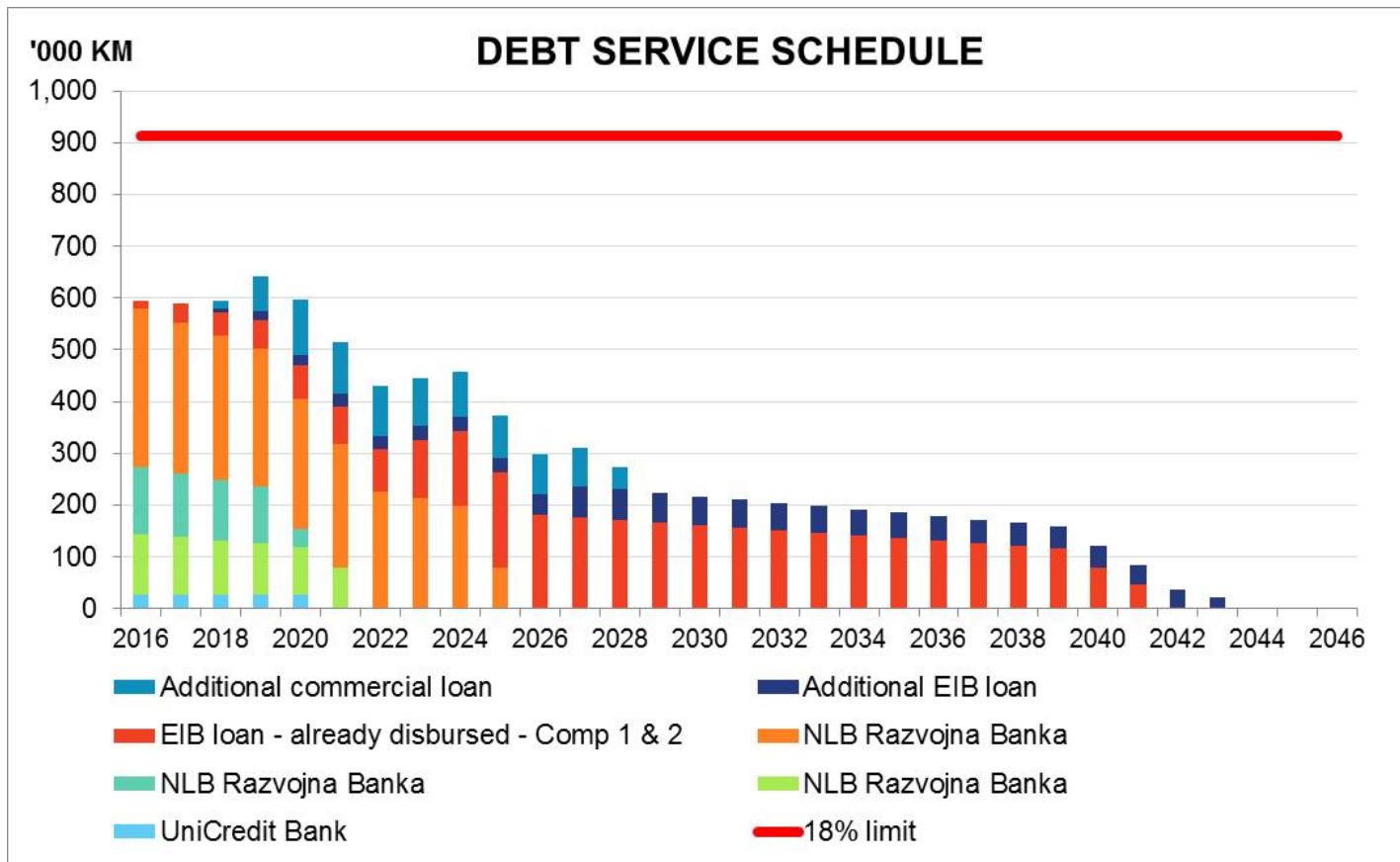
IPF CONSORTIUM

Annual Debt Service Permissible

18% of Current Revenues

Godisnje dugovno dozvoljeno opterecenje

18% od Redovnih Prihoda





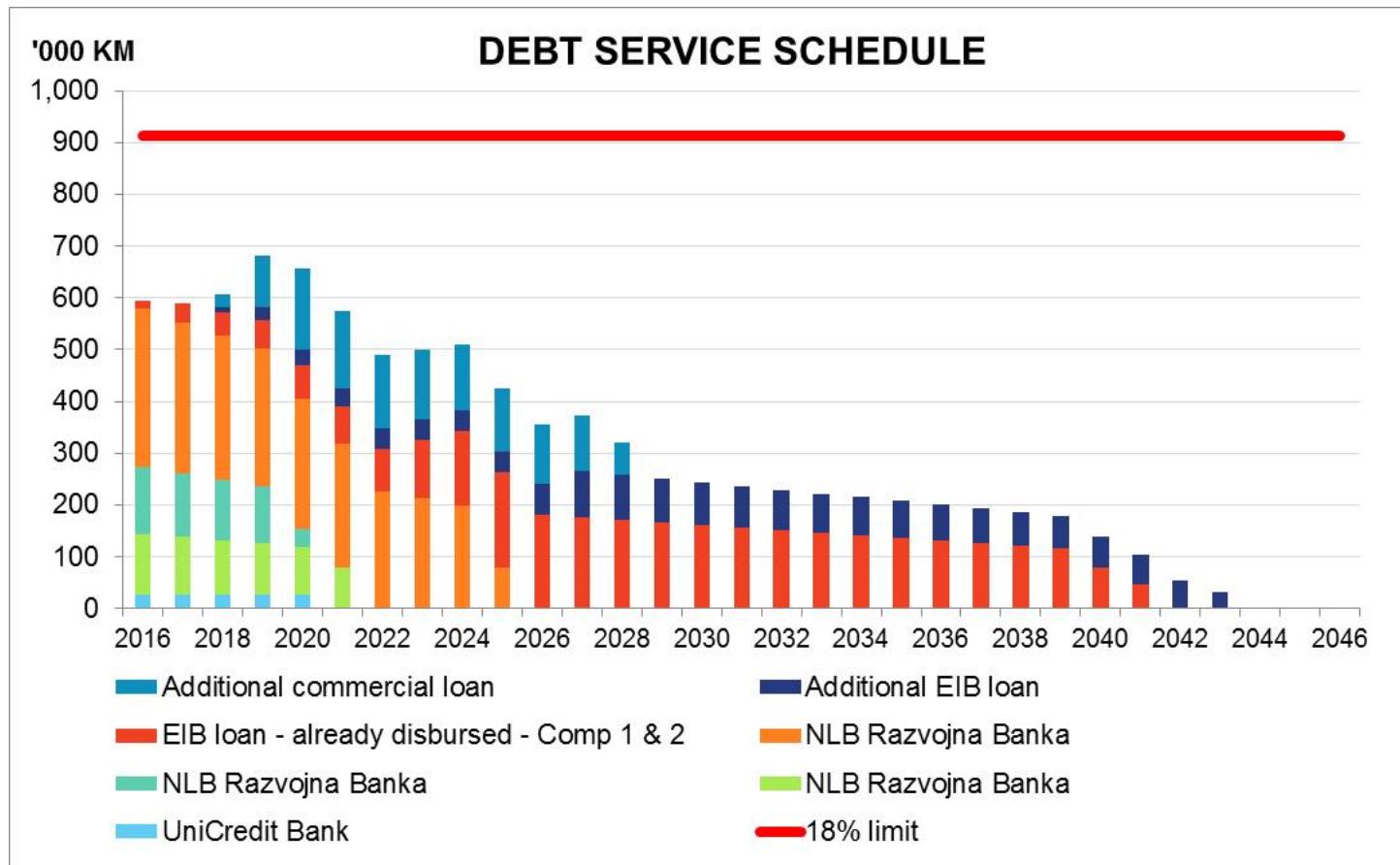
Financing Strategy Base Case Option

Finansijska Strategija Osnovna Opcija



IPF CONSORTIUM

Annual Debt Service Permissible
18% of Current Revenues
Godisnje dugovno dozvoljeno opterecenje
18% od Redovnih Prihoda





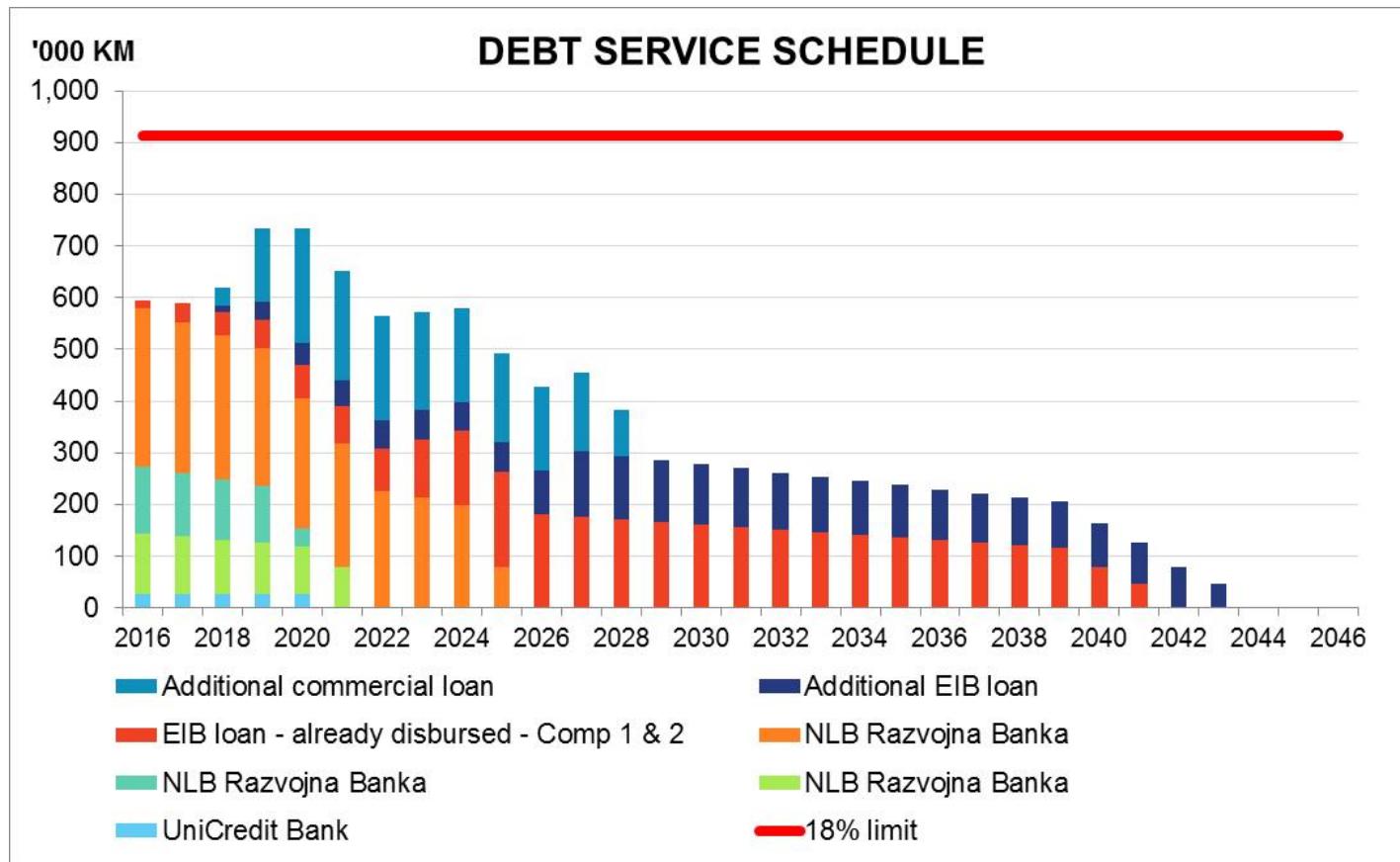
Financing Strategy High Case Option

Finansijska Strategija Visoka Opcija



IPF CONSORTIUM

Annual Debt Service Permissible
18% of Current Revenues
Godisnje dugovno dozvoljeno opterecenje
18% od Redovnih Prihoda





Model assumptions / Prepostavke modela



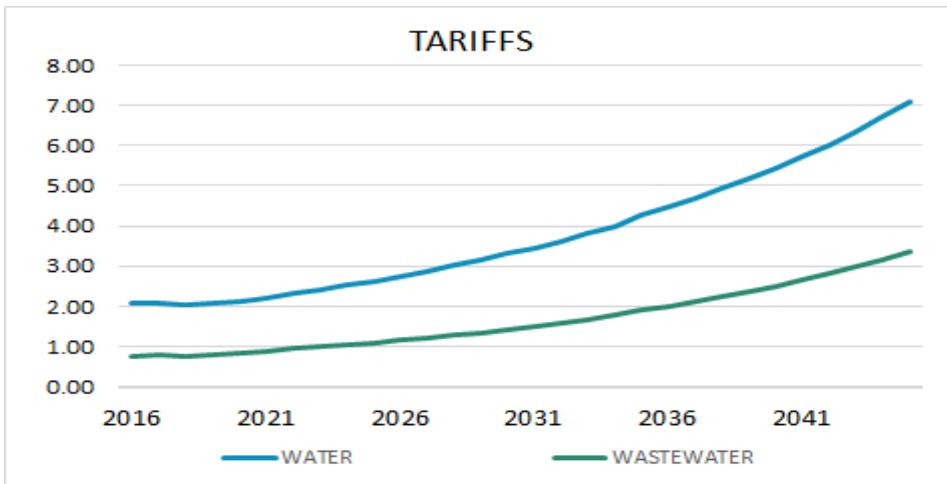
IPF CONSORTIUM

- Collection rate has to be increased to 97% within the next 5 years. /
Procenat naplate potrazivanja mora porasti na 97% tokom narednih 5 godina.
- Receivables days must decrease to 60 within the next 10 years. /
Broj dana vezivanja kupaca mora da se smanji na 60 dana tokom narednih 10 godina.
- Water company fully repays the EIB loan Components I to III. /
Vodovod samostalno servisira dugovanja po komponentama I do III EIB kredita.
- Investment in fixed assets remains at the level of annual depreciation with 80% of discretionary CAPEX. / Investicije u dugoročna sredstva su na nivou troska amortizacije sa dodatnih 80% preostalog gotovinskog toka nakon servisiranja duga.
- Cost coverage ratio for both services is kept at the level of between 1.1 and 1.15. /
Stepen pokriva troskova za usluge vode i kanalizacije se zadrzava izmedju 1.1 i 1.15.
- Following these assumptions, the model has been used for finding appropriate tariffs in 3 different project scenarios taking into account grant funding, and increase in staff . / Nakon ovih prepostavki, modelom su trazene odgovarajuće cene usluga za 3 moguća projektna scenarija uključujući grant sredstva i povecanje broja zaposlenih.



Scenario 1 / Scenario 1

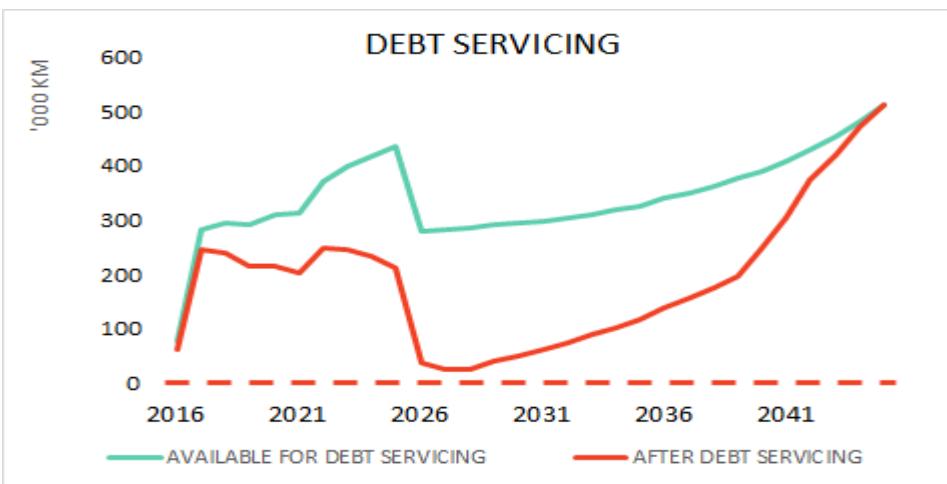
- The first scenario (optimistic) includes grant funding and minor increase in number of staff (increase up to 40 employees before 2020). / Prvi scenario (optimistični) podrazumeva grant sredstva i mali rast broja zaposlenih (40 zaposlenih do 2020).



Tariffs will have to grow at the rate of around 3.8% per annum for water, and 4.7% per annum for wastewater service. / Cene će morati da na godišnjem nivou rastu oko 3.8% za vodu i 4.7% za kanalizaciju.

Debt servicing will be at a satisfactory level with DSCR above 1.2 except in few years when it will be supported with accumulated cash. / Servisiranje duga će biti zadovoljavajuće sa koeficijentom pokrića duga iznad 1.2 osim u par godina gde će biti podržano akumuliranim gotovinom.

Discretionary CAPEX will reduce relative age of long-term assets to 49%. / Investiciona ulaganja nakon servisiranja duga će smanjiti relativnu starost dugoročnih sredstava na nivo od 49%.



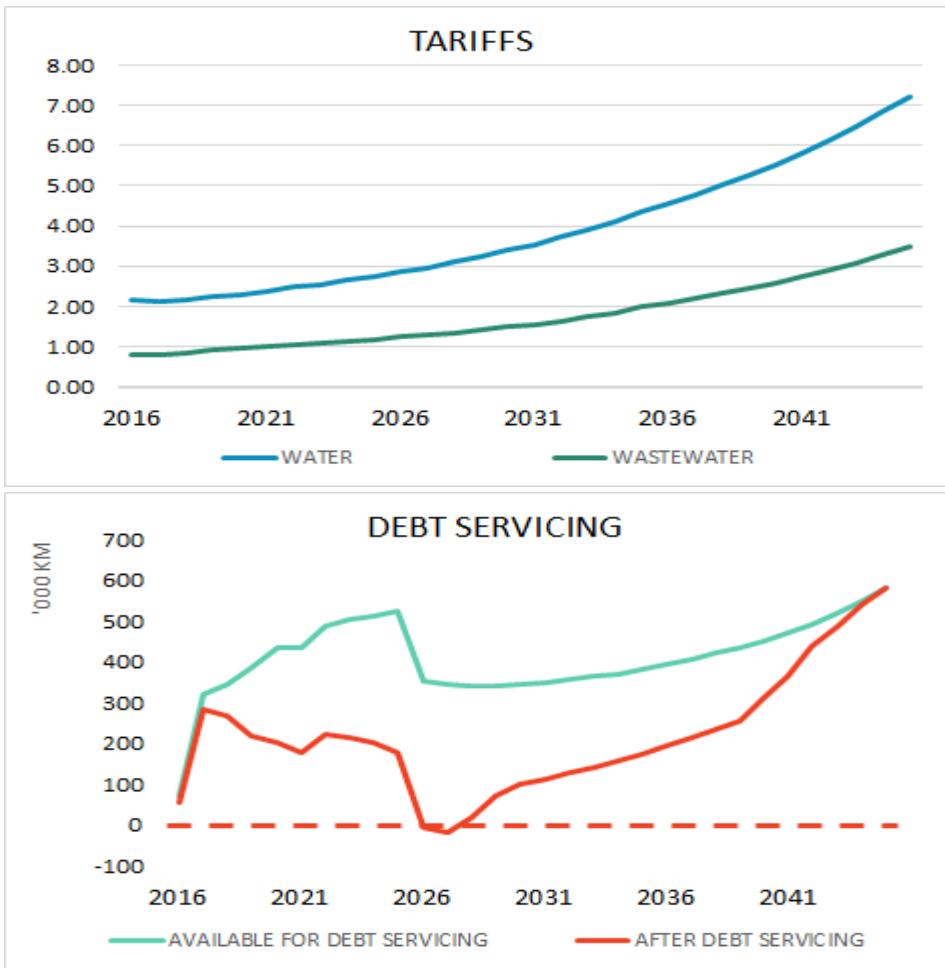


Scenario 2 / Scenario 2



IPF CONSORTIUM

- The second scenario (no-grant) excludes grant funding and keeps a minor increase in number of staff. / Drugi scenario (bez grant sredstava) isključuje grant sredstva i zadržava mali rast broja zaposlenih.



Tariffs will have to grow at the rate of around 4.0% per annum for water, and 5.0% per annum for wastewater service. / Cene će morati da na godišnjem nivou rastu oko 4.0% za vodu i 5.0% za kanalizaciju.

Debt servicing will be at a satisfactory level with DSCR above 1.2 except in few years when it will be supported with accumulated cash. / Servisiranje duga će biti zadovoljavajuće sa koeficijentom pokrića duga iznad 1.2 osim u par godina gde će biti podržano akumuliranim gotovinom.

Discretionary CAPEX will reduce relative age of long-term assets to 45%. / Investiciona ulaganja nakon servisiranja duga će smanjiti relativnu starost dugoročnih sredstava na nivo od 45%.

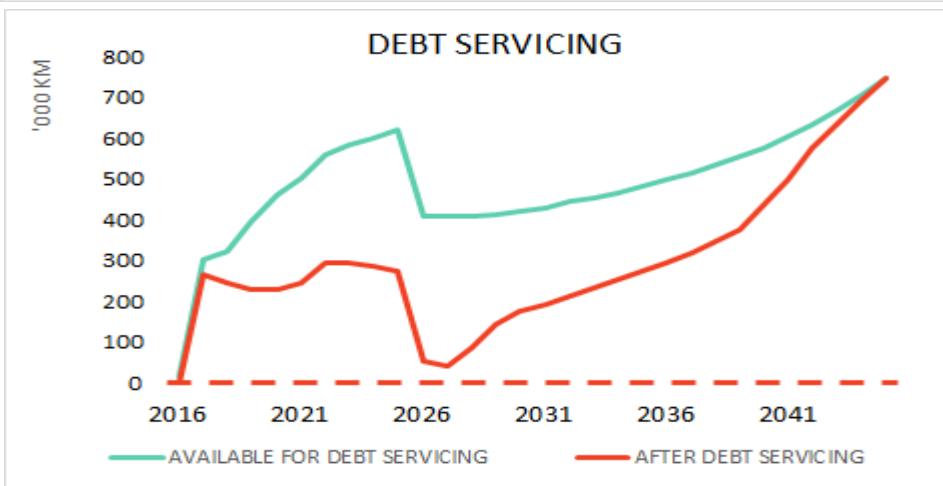
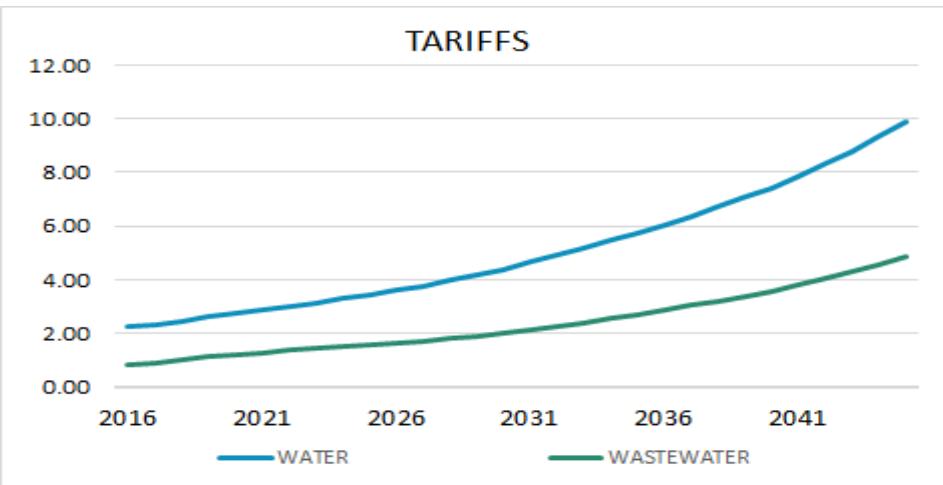


Scenario 3 / Scenario 3



IPF CONSORTIUM

- The third scenario (increased staff) excludes grant funding and doubles number of staff in 5 years. / Treći scenario (povećanje broja zaposlenih) isključuje grant sredstva i duplira broj zaposlenih u roku od 5 godina.



Tariffs will have to grow at the rate of around 5.2% per annum for water, and 6.0% per annum for wastewater service. / Cene će morati da na godišnjem nivou rastu oko 5.2% za vodu i 6.0% za kanalizaciju.

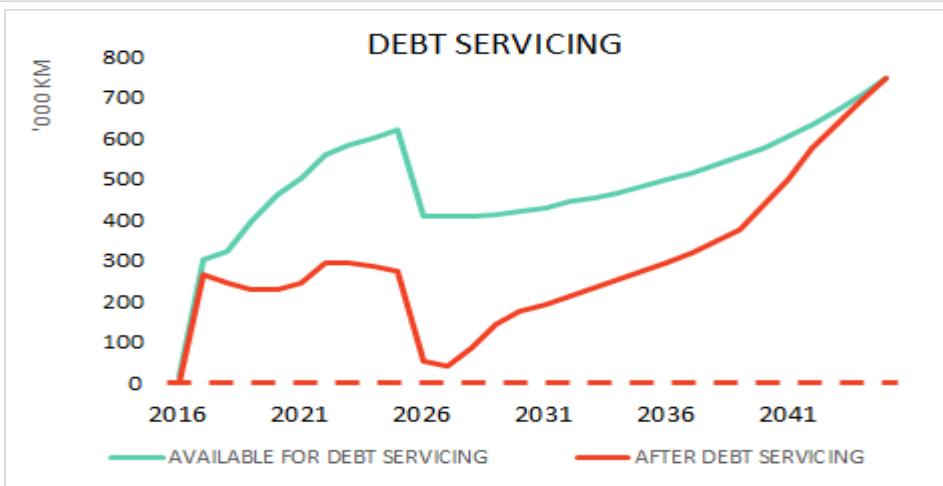
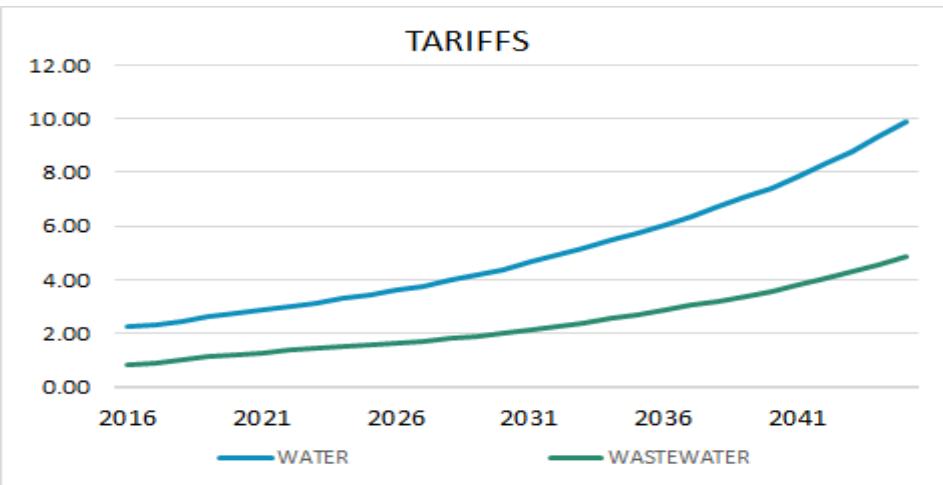
Debt servicing will be at a satisfactory level with DSCR above 1.2 except in few years when it will be supported with accumulated cash. / Servisiranje duga će biti zadovoljavajuće sa koeficijentom pokrića duga iznad 1.2 osim u par godina gde će biti podržano akumuliranim gotovinom.

Discretionary CAPEX will reduce relative age of long-term assets to 42%. / Investiciona ulaganja nakon servisiranja duga će smanjiti relativnu starost dugoročnih sredstava na nivo od 42%.



Scenario 3 / Scenario 3

- The third scenario (increased staff) excludes grant funding and doubles number of staff in 5 years. / Treći scenario (povećanje broja zaposlenih) isključuje grant sredstva i duplira broj zaposlenih u roku od 5 godina.



Tariffs will have to grow at the rate of around 5.2% per annum for water, and 6.0% per annum for wastewater service. / Cene će morati da na godišnjem nivou rastu oko 5.2% za vodu i 6.0% za kanalizaciju.

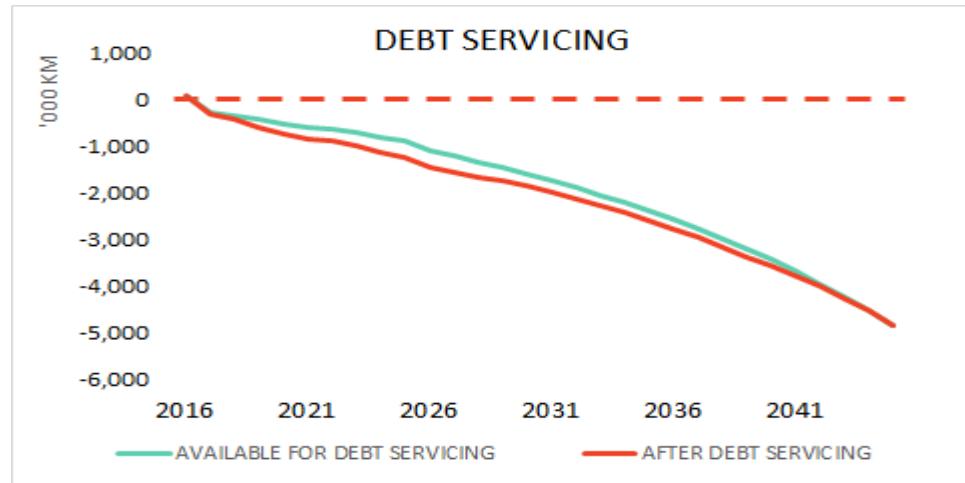
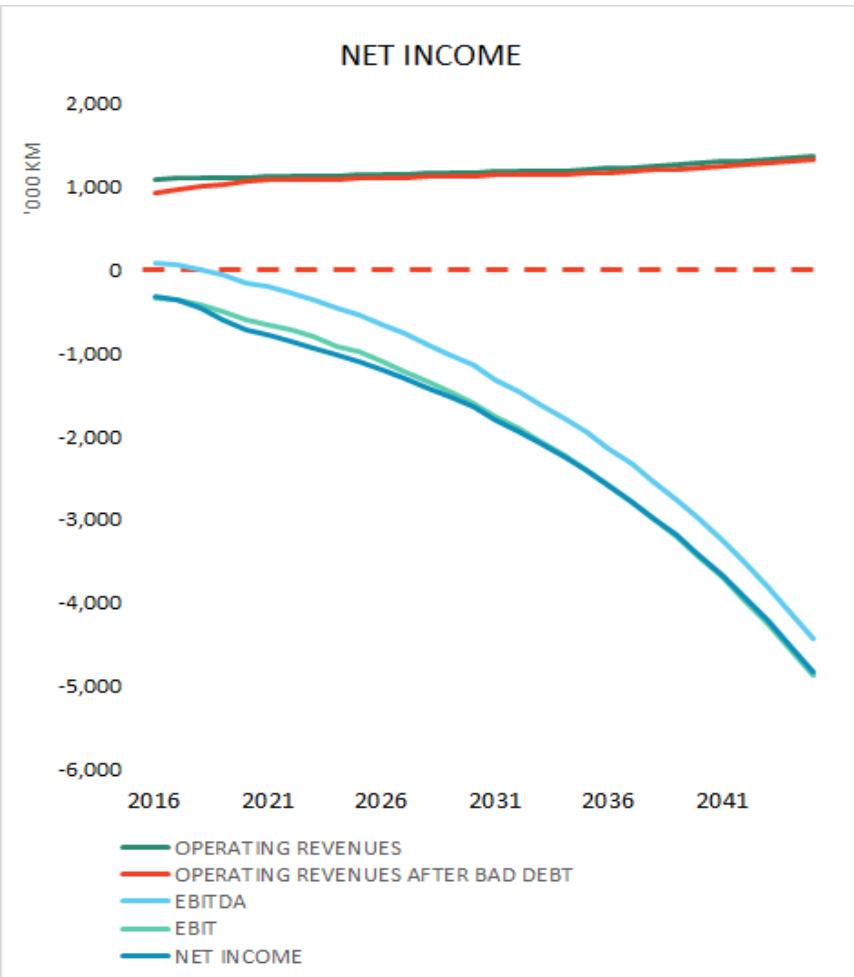
Debt servicing will be at a satisfactory level with DSCR above 1.2 except in few years when it will be supported with accumulated cash. / Servisiranje duga će biti zadovoljavajuće sa koeficijentom pokrića duga iznad 1.2 osim u par godina gde će biti podržano akumuliranim gotovinom.

Discretionary CAPEX will reduce relative age of long-term assets to 42%. / Investiciona ulaganja nakon servisiranja duga će smanjiti relativnu starost dugoročnih sredstava na nivo od 42%.



Scenario 4 / Scenario 4

- The fourth scenario (no change in tariffs) equals the third scenario with unchanged tariffs. / Četvrti scenario (nepromenjene tarife) jednak je trećem scenariju uz nepromenjene tarife.



In this case, the Company would very soon start with generating loss and fail in repaying its obligations. / U ovom slučaju, izvesno je da bi Vodovod vrlo brzo počeo da generiše gubitke i ne bi bio u mogućnosti da servisira svoja dugovanja.



Incremental project costs:

- Water supply and wastewater investment costs
- Water supply and wastewater incremental operating costs
- Cost of removal of septic tanks

Incremental project benefits:

- Secured water supply services
- Health benefits
- Increased development potential
- Resource cost saving

Results of the analysis:

- EIRR: 14.2%
- Benefit costs ratio: 2.5

Inkrementalni troškovi projekta:

- Investicije u vodosnabdevanje i otpadne vode
- Inkrementalni operativni troškovi vodosnabdevanja i otpadnih voda
- Troškovi uklanjanja septičkih jama

Inkrementalne koristi projekta:

- Pouzdano vodosnabdevanje
- Zdravstvene koristi
- Povećanje razvojnog potencijala
- Ušteda troškova resursa

Rezultati analize:

- EIRR: 14.2%
- Racio koristi/troškovi: 2.5



- Affordability Criteria – 3% to 4% of average household income for water and sewerage
- Current tariffs - account for about 2.6% of average household income
- Projected tariffs:
- Base Case would be 3.1% of household income in 2020
- Increasing to 3.3% of household income in 2030

- Kriterijum priuštivosti – 3% do 4% prosečnih prihoda domaćinstava za vodu i kanalizaciju
- Trenutne tarife – iznose oko 2.6% prosečnih prihoda domaćinstava
- Predviđene tarife:
- Osnovni projekat 3.1% od prihoda domaćinstava u 2020. godini
- Smanjenje na 3.3% od prihoda domaćinstava u 2030. godini



- Real and inflation linked tariff increases are needed and services remain affordable
- Vodovod is financially sustainable, meeting all debt financing needs and operating costs
- Serious funding issues – Lack of availability of grant finance

- **Potrebna su određena realna povećanja tarifa (iznad stope inflacije) ali da pri tome usluge ostanu priuštive**
- **Vodovod je finansijski održiv, ispunjava sve obaveze otplaćivanja duga i pokriva operativne troškove**
- **Ozbiljna pitanja vezana za finansiranje – nedostupnost grant investicija**



Implementation strategy

Strategija sprovođenja projekta



IPF CONSORTIUM

Sokolac - Priority Investment Project	2016	2017	2018	2019
Preparation of Technical Assistance Tender Dossier		■		
Contract forecast and procurement notice		■		
Expression of interest / short-listing		■		
Tender and tender evaluation		■		
Contract award		■		
Consultant mobilisation			■	
Provision of consultancy services			■■■■■	■■■■■
Works Contract WVS				
Ongoing project -collectors and house connections - Implementation	■■■■■			
Prepare Tender Dossier (main collector and PS)	■■■■■	■		
Contract forecast and procurement notice		■		
Tender and tender evaluation		■		
Contract award		■		
Mobilisation of contractor		■		
Main collector and PS construction		■■■■■	■■■■■	
Construction of additional house connection to sewerage		■■■■■	■■■■■	
Works Contract VS				
Project documentation preparation and Project Appraisal	■■■■■			
Prepare Tender Dossier	■■■■■	■■■■■		
Contract forecast and procurement notice		■■■■■		
Tender and tender evaluation		■■■■■		
Contract award		■■■■■		
Distribution network reconstruction -PHASE I (urgent measures)			■■■■■	■■■■■
Flow measurement at Distribution network (Primary and Secondary balance) and Telemetry- Phase I			■■■■■	■■■■■
Water level measurement at reservoirs and pressure break chambers (22 locations) and Telemetry- Phase I			■■■■■	■■■■■
Service contracts and Equipment procurement				
Tender procedure and contract award	■■■■■			
Leakage study	■■■■■			
Sanitary zone study for rural sources		■■■■■		
Leak detection equipment procurement		■■■■■		



**Questions?
Pitanja?**