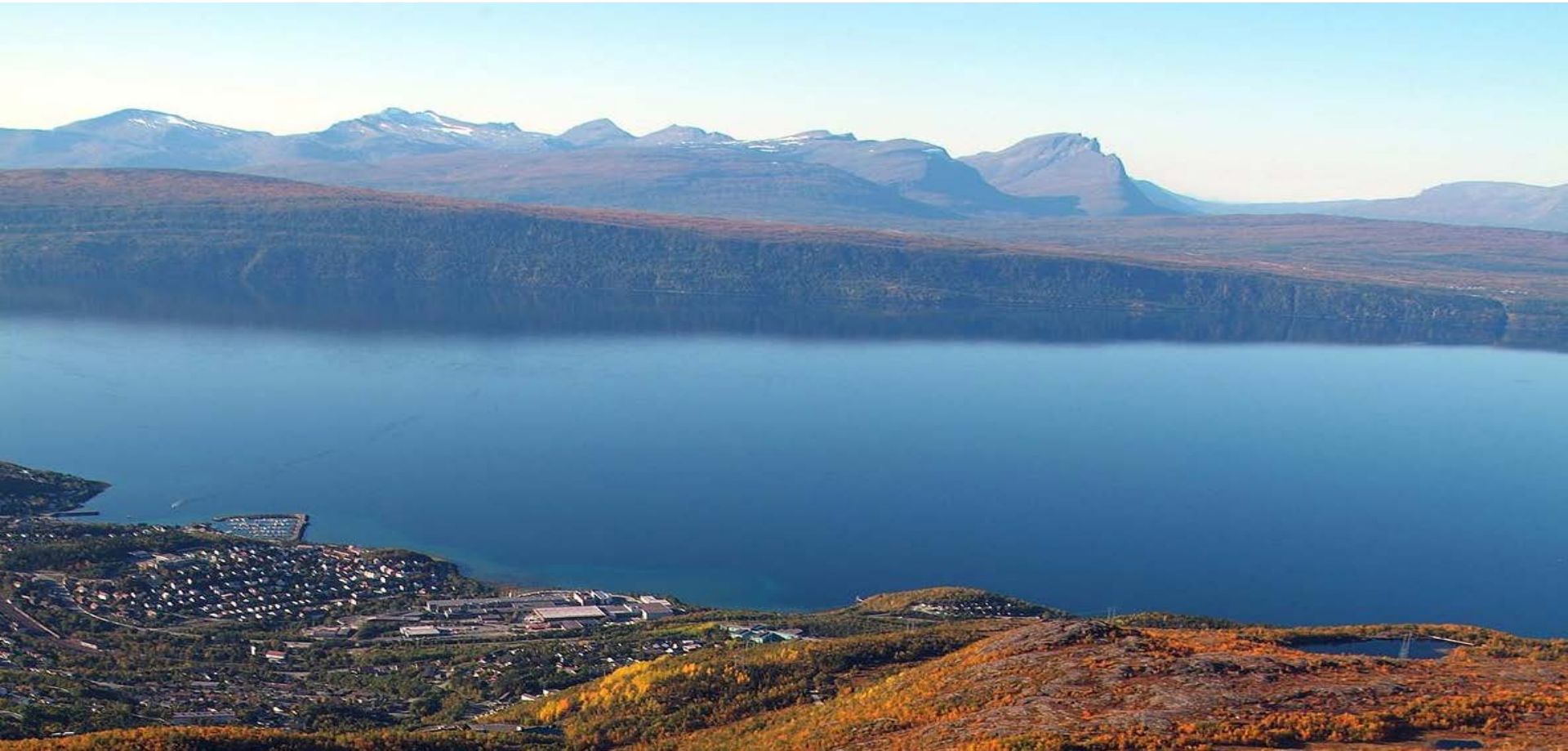
NARVIK VANN KF

09.11.2016, THOMAS BRÆNDVIK, DEPT MANAGER PROJECTS, NARVIK VANN KF



Agenda

- Info about the Norwegian Water Industry
- Historical review of Narvik Vann KF
- Narvik Vann KF today
- Ongoing projects

Did you know…

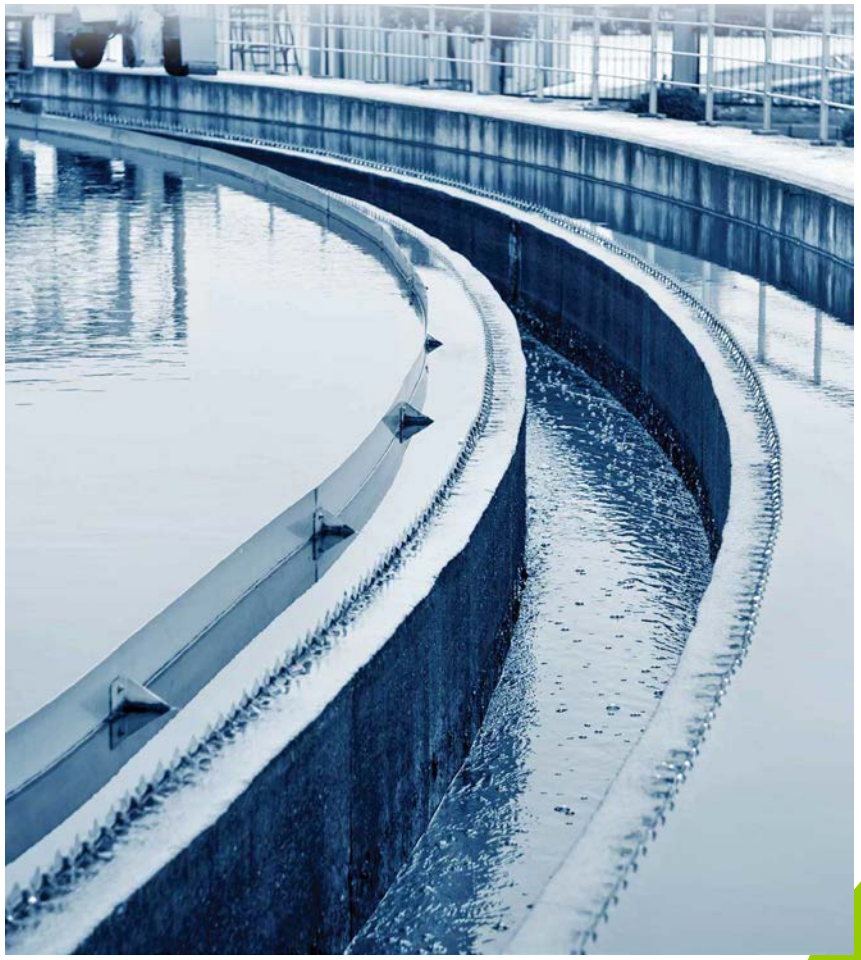
- More than 70% of the earth's surface is covered by water. Only 2.5% is freshwater...
- The UN believes that 1 billion people do not have access to clean water...
- The world's water consumption is expected to increase by approx. 50% in the coming decade, due to population growth and increasing living standards…
- The increasing water need will require investments of almost USD 800 billion up until 2020.

Did you know…

- The length of the Norwegian main pipeline network (water, sewage and surface water pipelines) is equivalent to 2.5 times around the Equator.
- On average, Norwegian households pay NOK 3,000 in water fees and NOK 3,400 for sewage per annum.
- It would cost approx. NOK 1,000 billion to reconstruct the entire Norwegian water and sewage network today.
- Almost NOK 500 billion will be invested in Norway in installations, pipes and equipment up until 2030. The largest costs are due to the network not coping with the increased amount of precipitation.
- The Norwegian water industry realises more than NOK 15 billion per annum and employees approx. 10,000 persons. In addition there are contractor activities.

Clean water is not a certainty

- Running water was installed in Norway in the last part of the 1800s and toilets during the 1900s.
- Important reason why the lifespan in Norway has increased from just 50 years at the end of the 1800s to over 80 today.
- The Norwegian water industry currently comprises 1600 waterworks, 2600 treatment facilities and many technological companies.
- Water is a critical infrastructure in society. Therefore we work a lot on mapping risk and risk reduction.



Tomorrow’s major challenges

- Climate changes and more precipitation challenge the capacity of the current water and sewage network, threatens security of supplies and leads to major water damage.
- Large population growth and urbanisation require considerable upgrades to installations and pipelines in many Norwegian cities.
- A large maintenance lag means that 1/3 of the water disappears on route to consumers.
- Almost NOK 500 billion must be invested up until 2030. NOK 200 billion is for maintenance. NOK 300 billion is for new investments.

Experts fear a water catastrophe in Norwegian municipalities

Inhabitant financed scheme

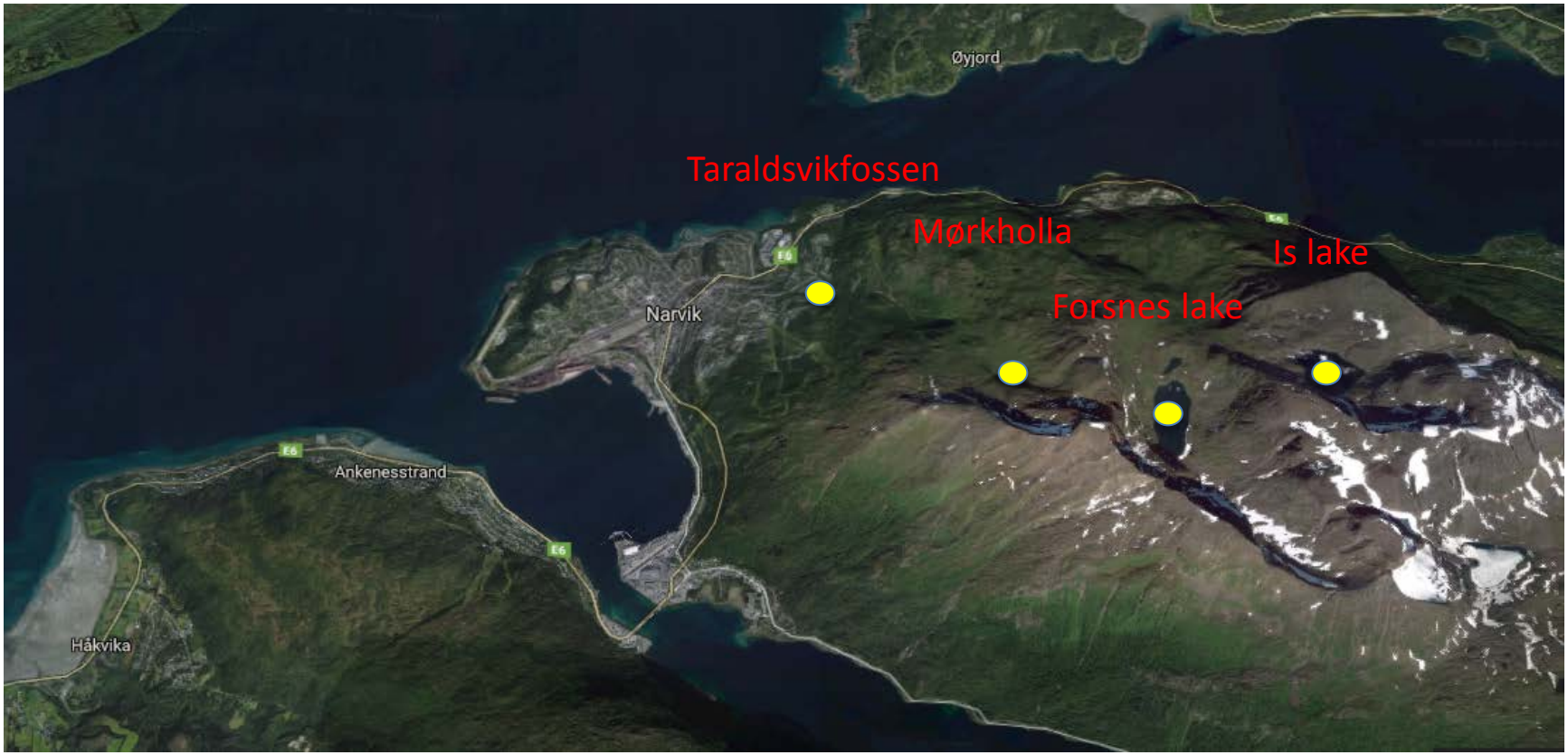
- Water and sewage is paid for by the inhabitants through municipal fees.
- You pay approx. 3 cents for a litre of tap water and NOK 3 for a shower – as opposed to NOK 15-20 per litre for drinking water from the shop.
- The fees vary from municipality to municipality due to local conditions.
- Each municipality determines its fee.

Some history

The waterworks history from 1902

- Narvik was established as a separate town in 1902 and approx. 3000 people lived here.
- It was not possible to establish municipal water supply due to the economy.
- Consul Gustaf Emil Broms came to rescue, in association with LKAB. In 1899 he acquired the Taraldsvik estate with the associated rights.
- Established a private waterworks about 1900 and started to deliver to the houses in Taraldsvik. Water pipelines were later laid in the main street.
- NSB also established a small waterworks and sold water for 2 cents per bucket and 20 cents per barrel.
- In December 1947 a contract was signed between Narvik municipality, Aktieselskapet Taraldsvik and LKAB for the take-over of AS Taraldsvik Vannverk.

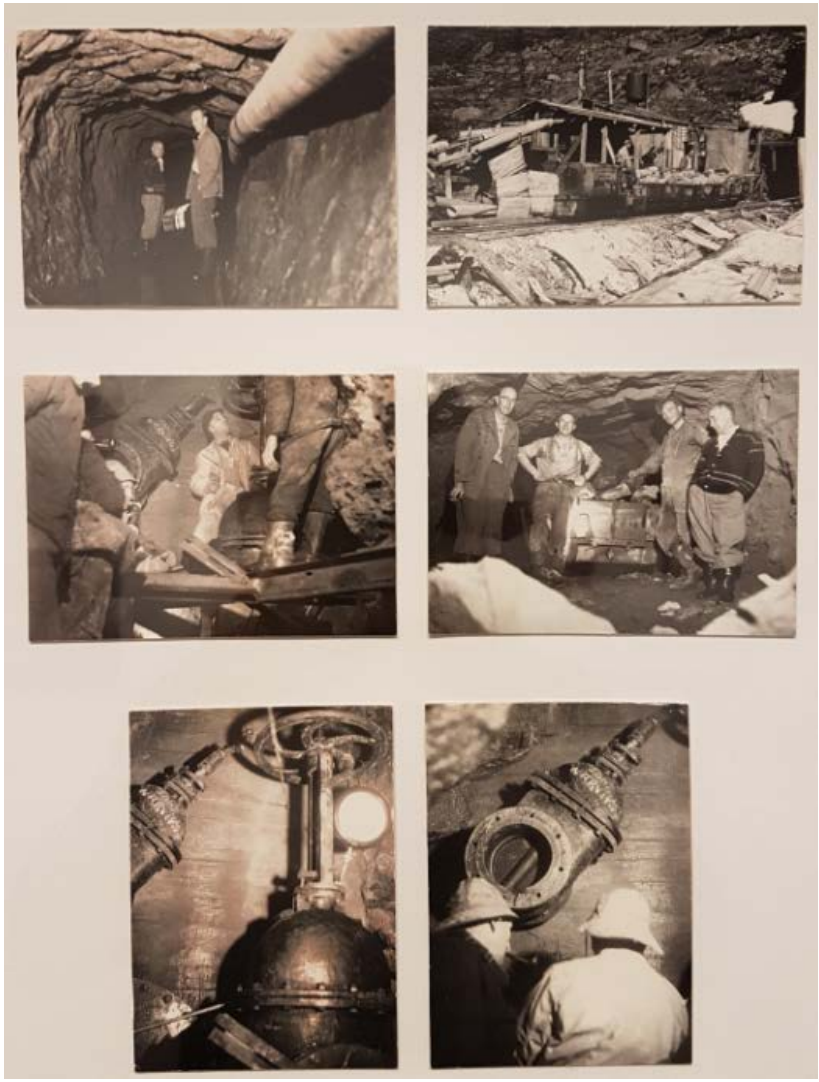
Waterwork history after 1947 - Locations



Waterworks history after 1947

- 1950 The Taraldsviksfossen intake dam was built – taken out of operation in 1984
- 1952 Tunnel from Mørkholla with output into Forsnes lake was blasted
- 1969 The chlorine facility was built in Fossestua – was taken out of operation in 1985
- 1974 Tunnel in the mountain side above Forsnes lake with output into Is lake was blasted
- The merger of Narvik and Ankenes municipalities also involved a coordination of technical standards
- 1985 Taraldsviksfossen water treatment facility was completed, with what was then Norway's largest facility for disinfection via UV
- 1990 Upgrading the site as regards pressure and security of supplies
- 1997 Central operational control started to be used
- 1999 Taraldsviksfossen water treatment facility was upgraded
- 2000 Taraldsviksfossen elevated basin was constructed.

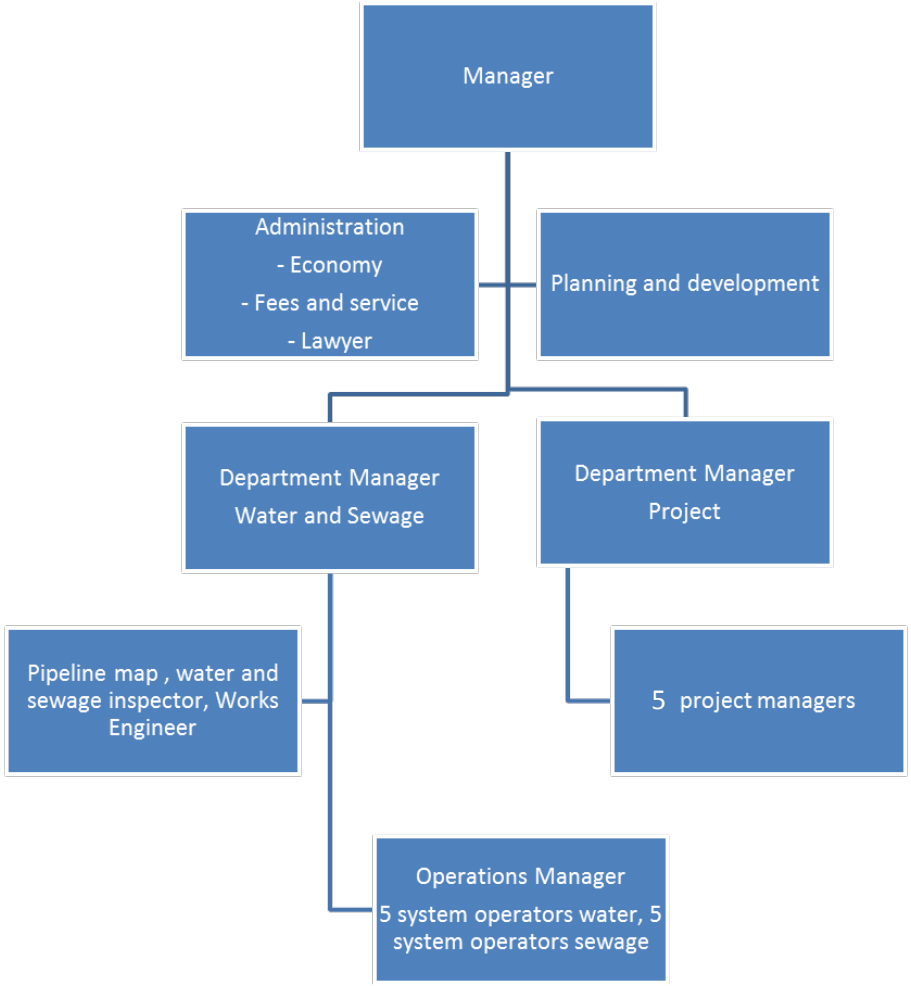
Tunnel work, Mørkholla – Forsnes lake



Narvik Vann KF

- Until 31.12.2015, Narvik VAR had 36 employees working in the water, sewage and sanitation department.
- From 01.01.2016 we are 28 employees left in Water and Sewage, changed name to Narvik Vann. Household waste transferred to HRS *(HRS is an inter-municipal company established in 1990, owned by 11 municipalities in northern Nordland and Troms county. HRS production includes collection, receipt, sorting and processing of household waste, industrial waste and hazardous waste).*
- In 2015 the company has an annual turnover of approx. NOK 84 million within water and sewage and invests approx. NOK 40 million per annum within water and sewage.

Narvik Vann - Organisation



Narvik Vann KFs objective

- The company shall deliver water and sewage services of high quality and in accordance with the current laws and regulations. The delivery area is North Norway (In practice Narvik municipality).

- The company shall see to Narvik municipality's operational and investment assignments and delivery responsibility within water and sewage and any related municipal engineering assignments.

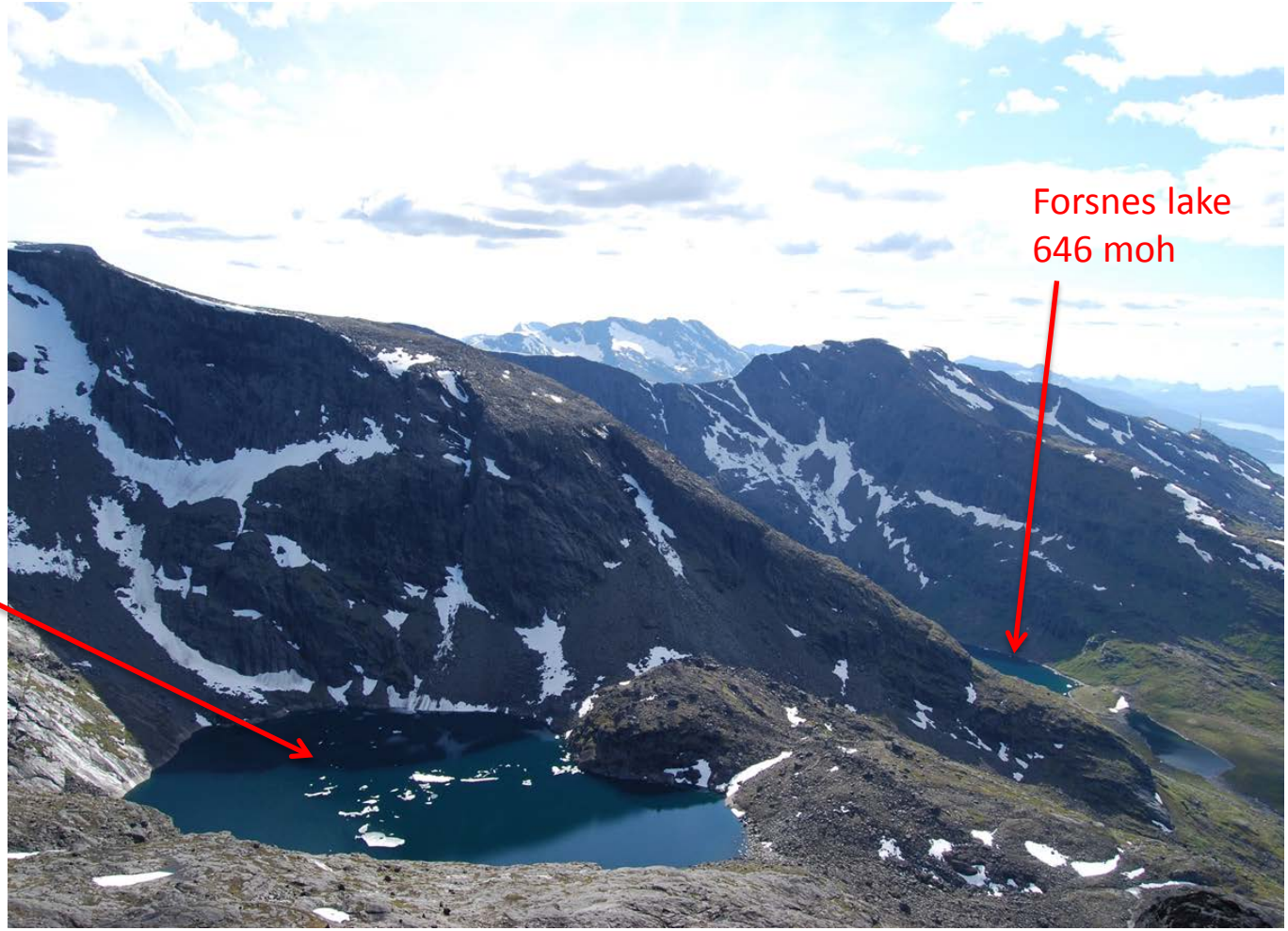
Current installations for water and sewage

- 5 waterworks
- 7 elevated basins
- 4 treatment facilities
- 51 sewage pump stations
- 7 large inteceptors for sludge

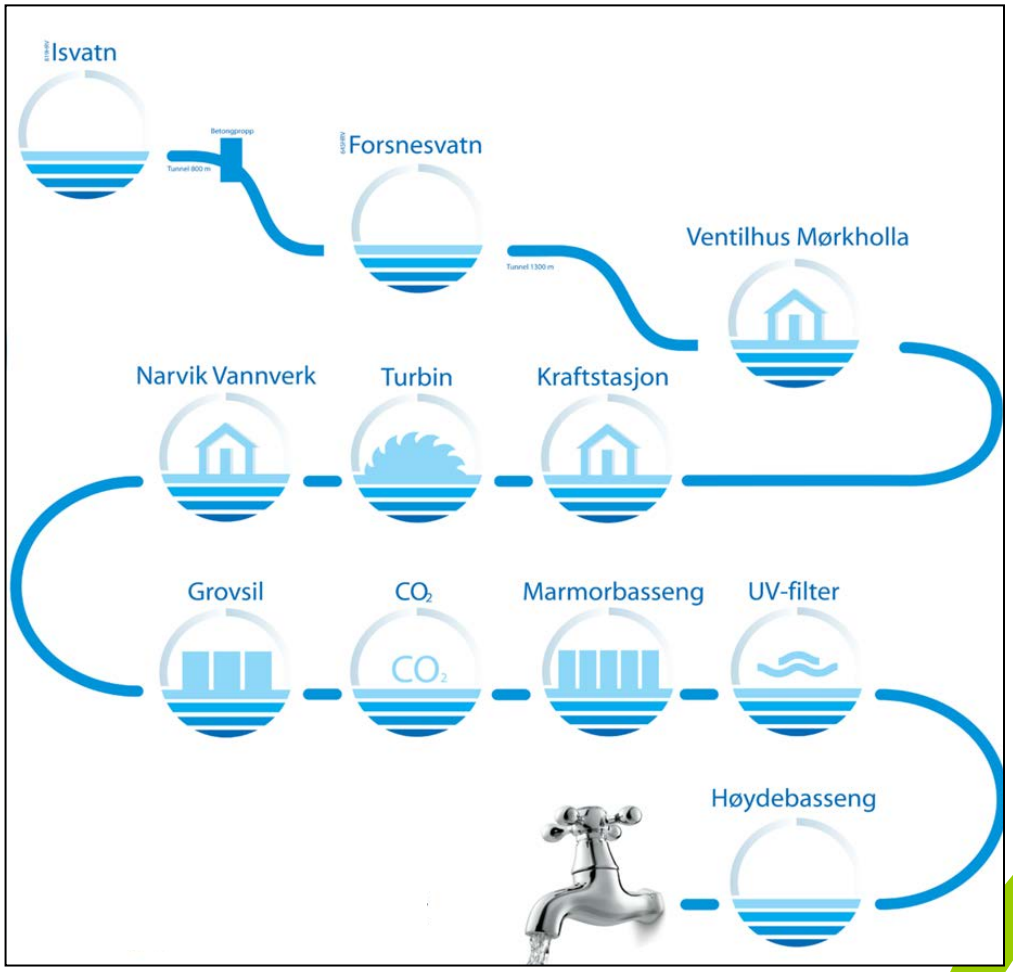
Waterworks - key figures

	Produced 2014	Number of subscribers
Narvik waterworks	2 981 864 m^3	5423
Bjerkvik waterworks	423 247 m^3	680
Djupvik waterworks	7 568 m^3	9
Vidrek waterworks	10 042 m^3	51
Skjomen waterworks	22 625 m^3	**134**

Watersource – Is lake/Forsnes lake



Narvik waterwork



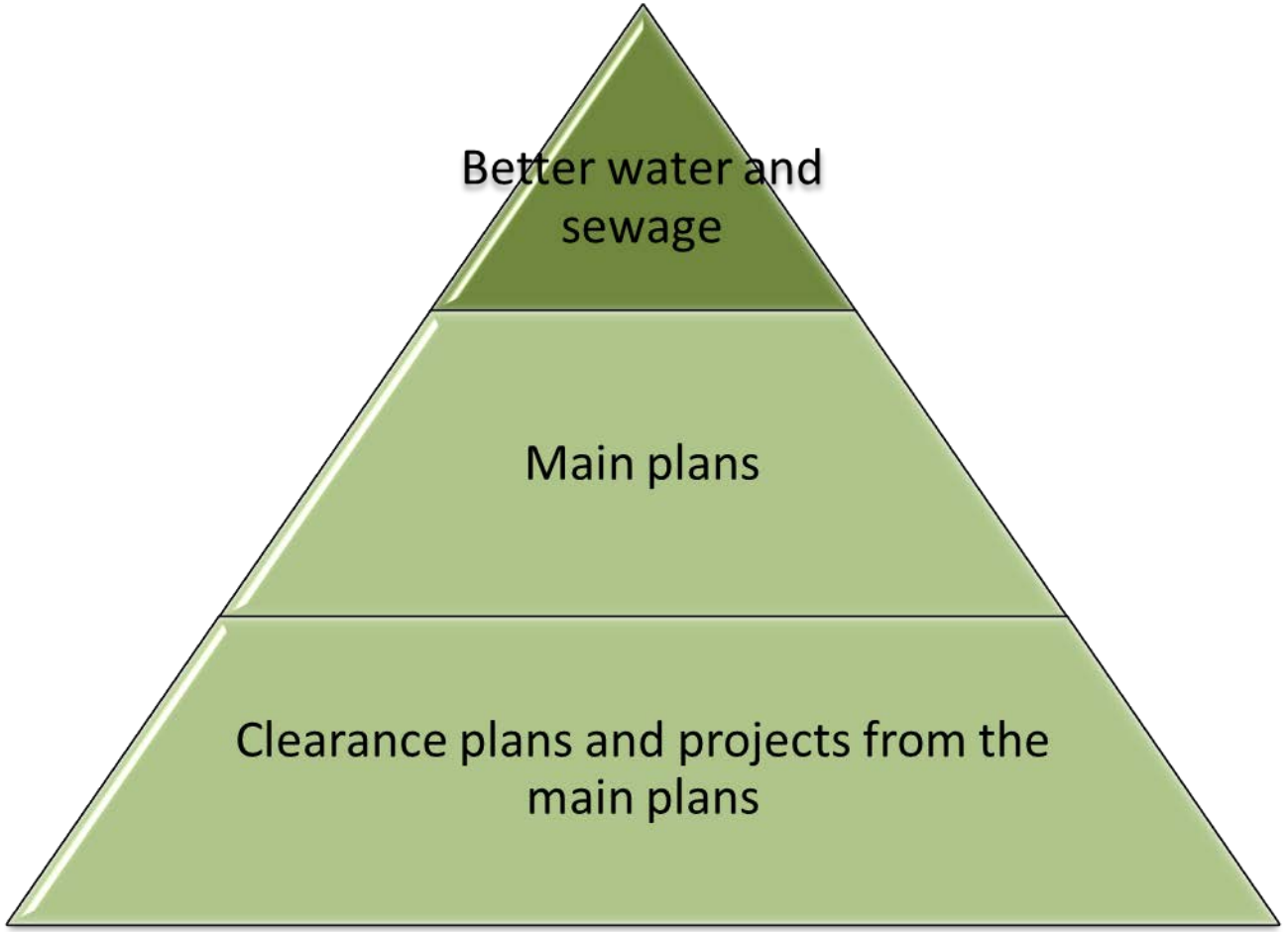
Powerplant

- Pelton turbine
- Installed capacity 1,4MW
- Prod. capacity 10GWh (approx 500 households)

Waterwork

- Year of startup 1985
- Capacity 210 l/s
- Yearly water consumption 4 mill m3
- Connected waterpipes approx 105 km
- One of the most modern waterworks in Norway

Decision making basis



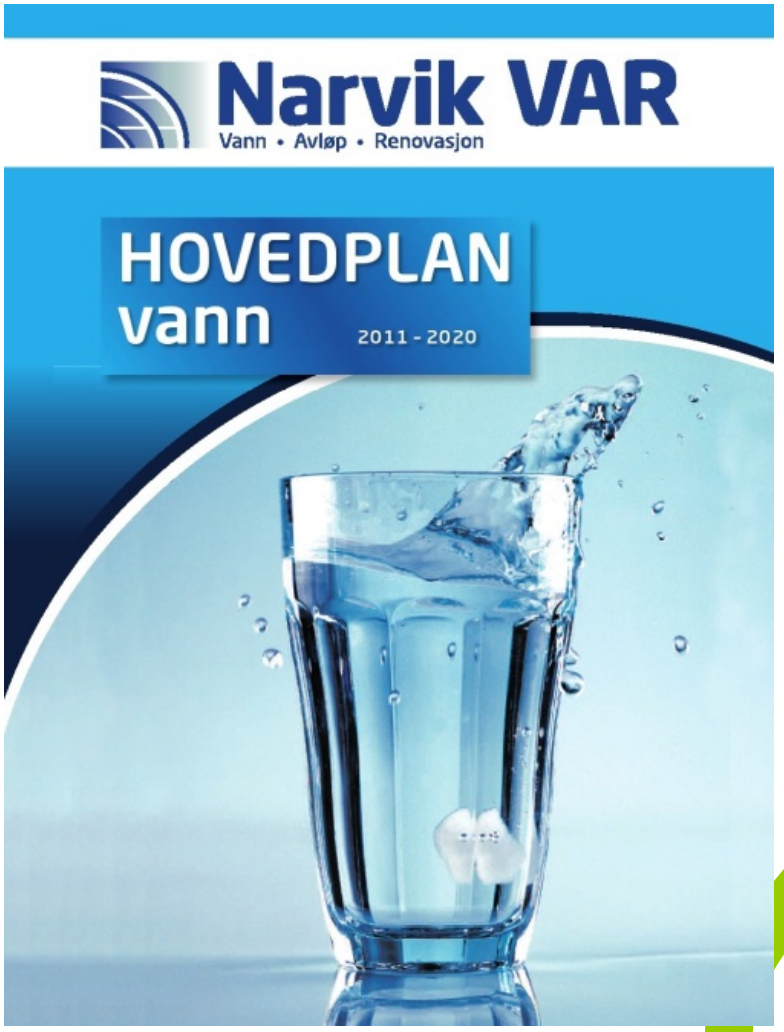
Better water (Bedre VA)

- Every year Norsk Vann publishes a report named better water
- Norsk Vann is a non-profit interest group for the water industry
- better WATER is a good tool to communicate the connection between the standard of the service, the investment need and the development of costs. Municipalities can use better WATER to measure their result development over time and compare themselves with other municipalities.

Mainplan water 2015-2020

Main plan

- Narvik Vann's tool for general management of the water sector
- The Drinking Water Regulations and the Water Regulations



Main objectives water

1. Enough water

- All subscribers shall have enough water with a minimum pressure of 2 bar from municipal pipelines
- Major leaks that give a measurable increase in water consumption or consequential damages, shall be located and improved as soon as possible
- Aim for sufficient fire water supply in accordance with the guidelines in the Planning and Building Act

2. Good water

- The waterworks shall supply water that fulfils the drinking water regulations.

3. Secure water supply

- The security and stand-by plan shall be updated
- All municipal waterworks shall aim to have 24 hours of reserve capacity for when there are interruptions in the main pipelines, or a breakdown in the main installations and ensure supply in the repair period.
- Pipeline breaks are to be repaired immediately if they affect institutions or businesses that depend on water for production. Other pipeline breaks are to be repaired as soon as possible. Subscribers shall have access to water during interruptions that are longer than four hours
- Cleaning main pipelines shall be prioritised and security of supplies shall be maintained at the current level
- All municipal waterworks shall have approved plans for handling crises/emergency water/reserve water

Main objectives water

4. Water for everyone

- All approved development areas shall have adequate water supply. The development of the water supply shall be coordinated with the municipal plan and other area plans
- After an application, municipal take-over of privately owned waterworks that are subject to approval will be considered

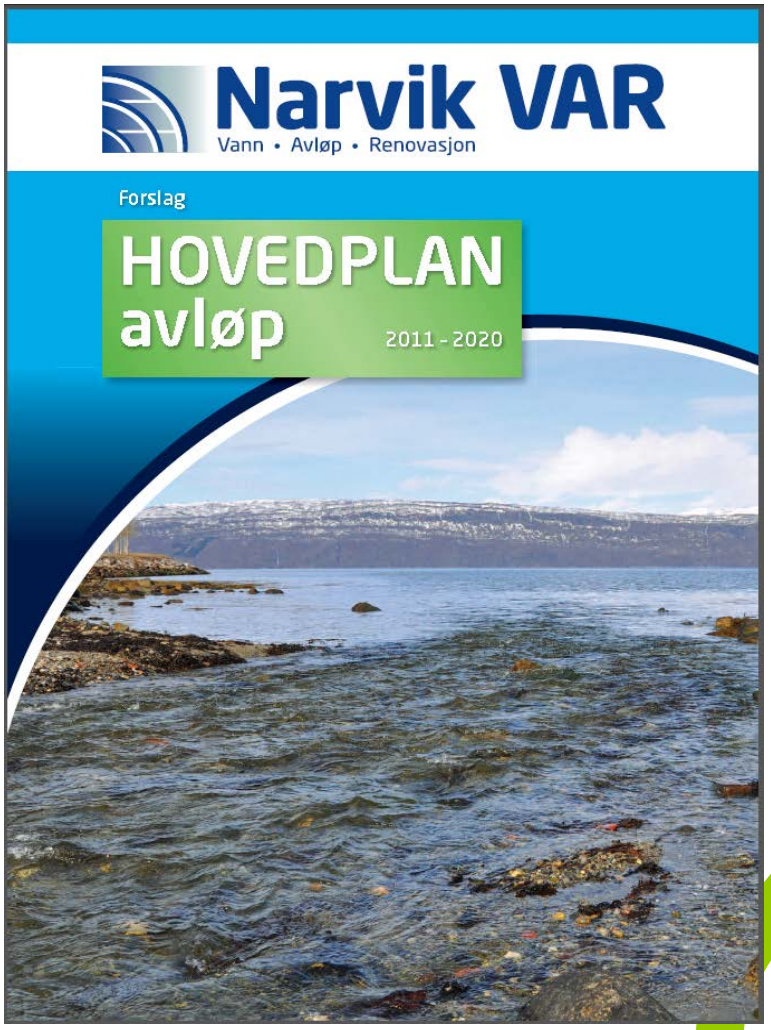
5. Efficient water supply

- The water supply shall be run in an efficient and rational way, so that the costs for subscribers are as low as possible at the same time that the other objectives are met
- Active and continual inspections of leaks shall be carried out
- Investments shall have a long term perspective and shall ensure that function and condition are maintained and that the lifetime of the installations will not deteriorate
- Continual operations and preventive maintenance shall be carried out in accordance with the operational plans and with the available support systems

Mainplan sewage 2015-2020

Main plan

- Narvik Vann's tool for general management of sewage activities
- The Water Directive and the Pollution Regulations



Main objective sewage

1. Good water environment

- All sewage water shall be treated so that user interests are taken care of both as regards water quality, the environment and asethetics around water sources.
- Requirements and conditions in the Pollution Regulations and in the emission permits shall be met, for both treatment facilities and the transport system.

2. Good service provision

- The transport system shall have the capacity and transporting ability to serve subscribers, also as regards the expected climate changes.
- Subscribers shall have predictable and good framework conditions for their enterprise.

3. Efficient sewage treatment

- Sewage shall be treated in an efficient and rational way so that the costs for subscribers are as low as possible at the same time that the other objectives are met.
- Operations and maintenance shall have a long term perspective and shall ensure that function and condition are maintained and that the lifetime of the installations will not deteriorate

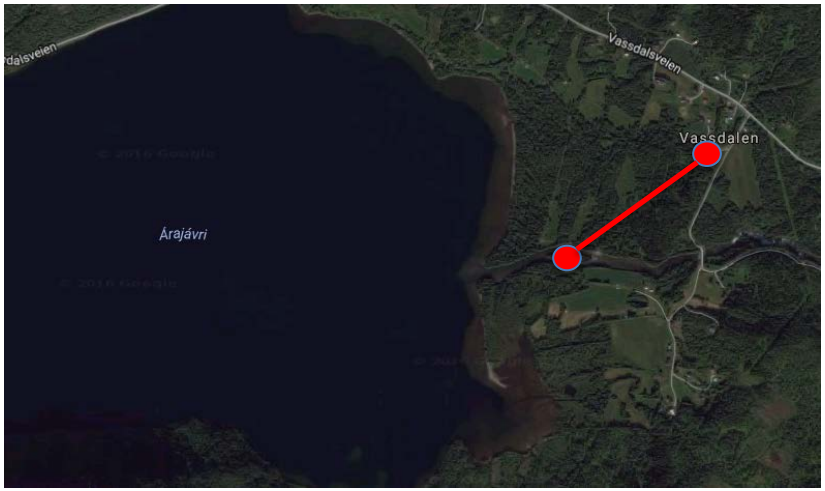
Narvik reserve water

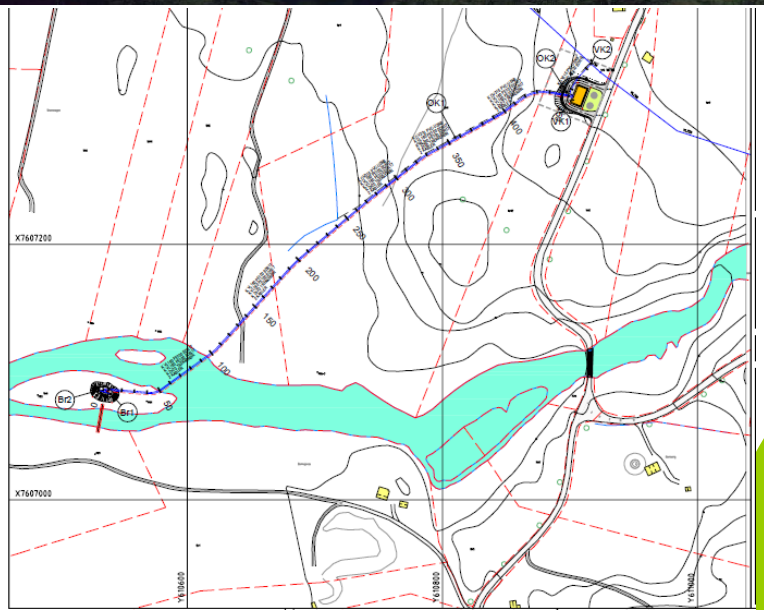
- 2050m total length
  - 1700m traditional blasted trench with buried pipeline
  - 350m drilled borehole
- Ø250 waterpipe
- From contour height 210 – 608 m above sea level
- 66 bar water pressure
- Design capacity 250l/s
- Construction period 2015-2017
- Investment approx 27 MNOK

Narvik Sewage treatment facility

- Building footprint 375 sqm
- 2,5 floors
- Dimensioned for 15.000 population equivalents
- Qmax 200l/s
- Qdim 115l/s
- Primary separation by rotating filter system with integrated thickening and dewatering of sludge
- Investment approx 75MNok

Bjerkvik – new water source





- Building footprint 115 sqm
- 2 floors
- Design capacity 25l/s
- 2 Groundwater wells
  - Capacity tested 13 months on 25l/s each well
- 2x430m waterpipe Ø250mm
- 28m steel bridge
- Connected to existing pipes – old watersource to become reserve water
- Construction period 2016-2017
- Investment approx 27 MNOK

Water for Øyjord

- Prestudy ongoing
- 2.500m sealine
- Seadepth 350m
- Water and sewage pipelines and elevation basins on land
- Construction period ? (2020-2015)

«Preventive thinking»

- Preventive maintenance on pumps and equipment
- Regular cleaning of all elevation basins
- Regular flushing/cleaning of waterpipes
- Replacing content in marblefilter
- Cleaning UV-lamps
- Actively checking waterpipes for leakage
- Replacing old water basins
- Sampling program for water quality
- Good priority of pipes to redevelop
- Procedures
- Job description with clear responsibility areas
- Training/education

Elected as Norways best water *(surface water source)* in 2005, 2008, 2016……

….. we like to think probably **worlds** best water…..

Thank you for your attention

Narvik Vann