The Pilot Project of The Horikawa River Clarification

Summary of the result report by Nagoya City

> Sep. 22<sup>nd</sup>. 2012 Nagoya City Greenification & Public Works Bureau River Dep. River Planning Div.

# Outline of this Pilot PJ

Period March.27<sup>th</sup>.2007~March.22<sup>nd</sup>.2012

TRWKR (3years) April.27th.2007 ~ March.22nd.2010

survey after TRWKR(2years) March.23rd.2010~March.22nd.2012

### Purpose

To confirm the TRWKR clarification effect by transmitting pure water stably for long period.

Volume of transmission of raw water 0.4m<sup>3</sup>/s(upper limit)



Inuyama

# Outline of this survey

### <u>Spots</u>

10 Spots Koshio Bridge, Naya Bridge, etc.

#### **Points**

Transparency (general index) DO (direct effect on living things) BOD (organic pollution) SS (Suspended Solids) T-N, T-P (eutrophication index)



# Koshio Bridge

### BOD



DO

# Oto Bridge



# Summary of the survey result

### During TRWKR period

The water quality had been better in the area above midstream of Horikawa (around Naya Bridge).

After the stop of TRWKR

While the water quality has become a little worse in the area above midstream of Horikawa (around Naya Bridge), it still keeps better condition than when it was before TRKWR.

This result can be considered to be influenced by the new measures of sewage, such as advanced water treatment in Meijo Water Treatment Center( $2010.5\sim$ ), Horikawa Ugan Rain-water Reservior for pollution control ( $2010.9\sim$ ), and the good water quality of Shonai River in 2011.

# Survey of fish and benthos

Number of kinds identified from Sanage Bridge to the mouth of the river



### **During TRWKR period**

fish and benthos: Number of kinds and habitat area were expanded. After the stop of TRWKR

- fish: Compared with during TRWKR, number of kinds didn't fluctuate remarkably.
- benthos: Number of kinds decreased and became almost as many as before TRWKR.

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# Water quality simulation model

We made the water quality simulation model with the data of 3years (2007~2009) TRWKR

Effect of clarification measures was calcurated by the simulation modeling.

# Simulation results of clarification measures

# Improvement of BOD by TRWKR



# Simulation of clarification measure

# Improvement of BOD by sewage measure



sewage measures: advanced water treatment in Meijo Water Treatment Center and Horikawa Ugan Rain-water Reservoir for pollution control

# The effects of clarification measure by the water quality simulation model

# Improvement of BOD by improvement of the water quality of Shonai River



# Evaluation of our water quality simulation model

Comparison between analyzed value by our water quality simulation model and actual measured value by regular research in 2010,2011 to evaluate our simulation model



It is confirmed that our simulation model has high reproducibility,

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# Measures to make Horikawa River limpid

# Implementation by Nagoya city

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# Reserve additional water resource

## ◆Use of groundwater

Use of shallow ground water in the upstream section of Horikawa River



# Reserve additional water resource

Use of reclaimed wastewater Conducting reclaimed wastewater that was membrane filtered in Moriyama Water Treatment Center into Horikawa River up to 4000m<sup>3</sup>/day



Reclaimed wastewater was conducted during irrigation season(Apr-Oct)



# Improvement of water quality

Wood pile

Wood pile

diversionary stream

Obstacle stone

Obstacle stone

Image figure

## making rapid and pool

Wood pile

Improvement of self-clarification function of river by changing monotone straight flow to diversionary flow with wood piles and stones and by increasing vegetation.

> Scheduled to be installed near Kurokawa No. 2 Bridge

Straight stream

# Improvement of water quality

## Removal of sludge



## From FY 1994 to 2011 Removed 144,000m<sup>3</sup>

# Removal and inflow reduction of pollutants Garbage Catcher (near Johoku Bridge)



FY 2011 Collected 2.3t

## Removal and inflow reduction of pollutants

Horikawa Ugan Rain-water Reservoir ,which volume is 13000m<sup>3</sup>, for pollution control



#### Completed in 2010

Rain-water reservoirs for pollution control are constructed for storing rainwater temporarily and decreasing pollution load.

\*Stored rainwater is treated in water treatment center after stopping raining.

\*Horikawa Sagan Rain-water Reservoir, volume is 14000m<sup>\*</sup>, is under construction.

## Removal and inflow reduction of pollutants

## Advanced water treatment in Meijo Water Treatment Center



Filtering equipment ,Disc Filters, additionally removes fine pollution contained in treated sewage.



# Monitoring water quality by gate operation of Shonai Irrigation Headworks

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# Shonai Irrigation Headworks





6 winch gates on the left bank



4 tilting gates on the right bank 23

# Outline of monitoring water quality

Lignin, peculiarly contained in wastewater of the papermaking process, is focused on to monitor the water quality change caused by the gate operation of Shonai Irrigation Headworks.

The following items are monitored except for the concentration of Lignin.

- air temperature
- water temperature
- •pH
- transparency

# Monitoring point



# Gage number



(left bank) 6 winch gates



(right bank) 4 tilting gates











The relation between the concentration of Lignin and transparency



The relation between the concentration of Lignin and water temperature



Conclusions of the survey

In winter, the concentration of Lignin decreased on many days when we opened the winch gate near the left bank.

In summer, the difference of the concentration of Lignin by the way of the gate opening was not observed.

The change of the concentration of Lignin had relation with transparency and water temperature.