



2021 ANNUAL DRINKING WATER SYSTEM SUMMARY REPORT Dereham Centre Water System

1. GENERAL INFORMATION

Oxford County (the County) prepares a report summarizing system operation and water quality for every municipal drinking water system annually. The reports detail the latest water quality testing results, water quantity statistics and any adverse conditions that may have occurred for the previous year. They are available for review by the end of February on the County website at www.oxfordcounty.ca/drinkingwater or by contacting the Public Works Department.

All efforts have been made to ensure the information presented in this report is accurate. If you have any questions or comments concerning the report, please contact the County at the address and phone number listed below or by email at publicworks@oxfordcounty.ca

Drinking Water System:	Dereham Centre Water System
Drinking Water System Number:	220001510
Drinking Water System Owner & Contact Information:	Oxford County Public Works Department Water Services P.O. Box 1614 21 Reeve Street Woodstock, ON N4S 7Y3 Telephone: 519-539-9800 Toll Free: 866-537-7778 Email: publicworks@oxfordcounty.ca
Reporting Period:	January 1, 2021 – December 31, 2021

1.1. System Description

The Dereham Centre Water System is a Small Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03 and serves a population of approximately 48. The system consists of one groundwater well and a treatment facility. The water is treated with sodium hypochlorite for disinfection and sodium silicate to sequester iron. In spring 2021, an arsenic removal filtration system had been approved at the facility, treating a portion of the supplied water. Effective May 28, 2021, a dual filter arsenic removal system was placed online, fully treating all the supplied water.

In 2021, approximately 130 L of sodium hypochlorite and 61 L of sodium silicate was used in the water treatment process. The chemicals are certified to meet standards set by the Standards Council of Canada or American National Standards Institute. Upgrades to the water treatment facility have suspended the use of sodium silicate for iron sequestration. Iron is now removed through the filtration process.

The treatment facility houses pumps, MD-80 filters, treatment and monitoring equipment and a 37 m³ underground reservoir. A standby generator is available to run the facility in the event of a power failure. The system is maintained by licensed water system operators, who operate treatment and monitoring equipment and collect samples as specified by the Regulation. Alarms automatically notify operators in the event of failure of critical operational requirements.

1.2. Major Expenses

The Dereham Centre Water System is one of 14 water systems that have revenues and expenses pooled for the economy of scale purposes. The systems are combined into the Township Water financial system and in 2021 had operating and maintenance expenditures of approximately \$3,000,000.

Operations and maintenance expenditures included:

- \$175,000 for the replacement of general operating equipment and well rehabilitations

In addition to regular operational and maintenance expenditures, Capital Improvement Projects for the Townships systems totaled \$1,500,000 for improvements to water treatment systems and replacement of distribution mains in the Township System.

Township Capital Improvement Projects included:

- \$150,000 for Dereham Centre filter upgrades
- \$65,000 groundwater modeling
- \$350,000 for facilities improvements

Capital Improvement projects for all systems included:

- \$720,000 to develop Countywide SCADA Master Plan for all water systems
- \$14,000 for updated water systems modelling

2. MICROBIOLOGICAL TESTING

2.1. *E. coli* and Total Coliform

Bacteriological tests for *E. coli* and total coliforms are taken weekly from the raw water at the facility and from the distribution system. Samples of treated water are not required for Small Municipal systems but may be taken periodically. Extra samples are taken after major repairs or maintenance work. Any *E. coli* or total coliform results above 0 in treated water must be reported to the Ministry of Environment, Conservation and Parks (MECP) and Medical Officer of Health (MOH). Resamples and any other required actions are taken as quickly as possible. The results from the 2021 sampling program are shown in the table below. There was one adverse result from 105 treated water samples in this reporting period the corrective actions for this are discussed in section 6.2.

	<i>Number of Samples</i>	<i>Range of E. coli Results Min - Max MAC = 0</i>	<i>Range of Total Coliform Results Min - Max MAC = 0</i>
Raw	52	0	0
Distribution	62	0	0-8
Treated	43	0	0

2.2. Heterotrophic Plate Count (HPC)

HPC analyses are completed weekly from the distribution water for small systems. HPC should be less than 500 colonies per 1 mL. Results over 500 colonies per 1 mL may indicate a change in water quality but it is not considered an indicator of unsafe water. 2021 results are shown in the table below.

	<i>Number of Samples</i>	<i>Range of HPC Min - Max</i>
Distribution	52	0 - 45

3. CHEMICAL TESTING

The Safe Drinking Water Act requires periodic testing of the water for approximately 60 different chemical parameters. The latest results for all parameters are provided in Appendix A. The sampling frequency varies for different types and sizes of water systems and chemical parameters. If the concentration of a parameter is above half of the Maximum Allowable Concentration (MAC) under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by the Regulation. Where concerns regarding a parameter exist, the MECP can also require additional sampling be undertaken.

Information on the health effects and allowable limits of components in drinking water may be found on the MECP web page through the link provided in Appendix A. Additional information on common chemical parameters specific to the Dereham Centre system is provided below.

3.1. Hardness and Iron

These are aesthetic parameters that may affect the appearance of the water but are not related to health. Well water commonly has high levels of hardness and other minerals from being in contact with underground rock formations. Many households have water softeners to help reduce white calcium deposits and improve the efficiency of soaps. This information is included here to help set the water softener at the level recommended by the manufacturer. Levels of iron less than 0.30 mg/L (ppm) are not considered to cause problems such as discoloured water. In Dereham Centre sodium silicate was added to keep iron in suspension for the first half of 2021. New filter upgrades that came into service June 2021 mean that iron will be removed from the drinking water through the filtration process.

- Samples for hardness are collected at a minimum every 3 years from raw or treated water. The average hardness for the Dereham Centre Drinking Water System is 258 mg/L (15 grains/gallon) based on samples collected from 2006 to 2019.
- The average iron concentration in the treated drinking water for 2021 is 0.35 mg/L

3.2. Additional Testing Required by MECP

In January of 2018, the Maximum Allowable Concentration (MAC) for arsenic was reduced from 25 ug/L to 10 ug/L. In Dereham Centre, the average arsenic concentrations in the raw well water are naturally above 10 ug/L. In 2021 arsenic concentrations in the treated water ranged from 0.6 to 55.3 ug/L and averaged 4.5 ug/L over the whole year. Filter treatment is now required to manage arsenic levels in the treated drinking water. Treated water samples for arsenic were collected weekly during the commissioning and following the installation of the permanent filtration system. The weekly samples were used to monitor the efficacy of the filtration system and the effect of various operations such as before and after backwash cycles. The MECP approved quarterly sampling for arsenic after reviewing these results and successful removal had been demonstrated. Arsenic in treated drinking water following the implementation of the new filter ranges from 0.06 – 3.4 ug/L. The average arsenic concentration in the treated drinking water is now 2.1ug/L.

4. OPERATIONAL MONITORING

4.1. Chlorine Residual

Free chlorine levels of the treated water are monitored continuously at the discharge point of the Water Treatment Facility. In the distribution system, free chlorine is checked twice weekly at various locations. As a target, free chlorine residual within the distribution system should be above 0.20 mg/L. A free chlorine level lower than 0.05 mg/L must be reported and corrective actions taken. There were no reportable incidents in 2021. A summary of the chlorine residual readings is provided in the table below.

4.2. Turbidity

Turbidity of treated water is continuously monitored at the treatment facility, as a change in turbidity can indicate an operational problem. The turbidity of untreated water from the well is checked weekly. Turbidity is measured in nephelometric turbidity units (NTU). Under O. Reg. 170/03 turbidity in groundwater is not reportable however turbidity should be < 1 NTU at the treatment plant and < 5 NTU in the distribution system. A summary of the monitoring results for 2021 is provided in the table below.

<i>Parameter</i>	<i>Number of Tests or Monitoring Frequency</i>	<i>Range of Results (Min – Max) and Average</i>
Chlorine residual in distribution (mg/L)	104	(1.03 – 2.10) 1.47
Chlorine residual after treatment (mg/L)	Continuous	(0.60– 3.81) 1.49
Turbidity after treatment (NTU)	Continuous	(0.10 – 4.07) 0.13

5. WATER QUANTITY

Continuous monitoring of flowrates from the well into the treatment system and from the facility into the distribution system is required by O.Reg. 170/03. The Municipal Drinking Water License and Permit to Take Water issued by the MECP regulate the amount of water that can be utilized over a given time period. A summary of the 2021 flows are provided in the Table below and presented graphically in Appendix B.

<i>Flow Summary</i>	<i>Quantity</i>
Water Taking Limit	50 m ³ /d
Municipal Drinking Water License Limit	78 m ³ /d
2021 Average Daily Flow	8 m ³ /d
2021 Maximum Daily Flow	44 m ³ /d
2021 Average Monthly Flow	233 m ³
2021 Total Amount of Water Supplied	2,791 m ³

A review of the available supply capacity and the anticipated growth forecasted for the community indicates that the system has sufficient capacity over the 20 year planning horizon.

Firm Capacity of this system is rated at 50 m³/day. Firm Capacity is defined as the removal of the highest producing well in an emergency or operational / maintenance situation with the ability to transport water if necessary to maintain system integrity. This system comprises of one supply well that is limited to 50 m³/day. When this well is not in service 50 m³/day can be supplied via trucked water.

6. NON-COMPLIANCE FINDINGS AND ADVERSE RESULTS

This section documents any known incidents of non-compliance or adverse results and the associated correction actions taken to resolve the issue. Non-compliance issues are typically identified by either the Operating Authority or the MECP Drinking Water Inspectors. The issues and associated required actions are documented by the Inspectors in the system's Annual Inspection Report.

All non-compliance issues are investigated, corrective actions taken and documented using the County's Drinking Water Quality Management System (DWQMS) procedures.

6.1. Non-Compliance Findings

At the time of this report, an inspection into non-compliance findings of the Dereham Centre Drinking Water System had not been undertaken in 2021.

6.2. Adverse Results

Any adverse results from bacteriological, chemical samples or observations of operational conditions that indicate adverse water quality are reported as required and corrective actions taken. Below is a summary of the four adverse/reportable occurrences for 2021 along with the corresponding resolution.

<i>Incident / Date</i>	<i>Corrective Action</i>	<i>Resolution / Date</i>
Treated Water Sample with Chemistry Exceedance		
April 26, 2021 Arsenic of 10.9 ug/L taken at the Dereham Centre WTF	Reported on May 3, 2021 resamples collected May 3 & 4, 2021 for confirmation	May 3, 2021 resample result was reported adverse on May 7, 2021
May 3, 2021 Arsenic of 11.7 ug/L taken at the Dereham Centre WTF	Reported on May 7, 2021, moved Sodium silicate injection to post filter, trucked in water and resampled.	May 4, 2021 resample result was also reported adverse on May 11, 2021.
May 4, 2021 Arsenic of 11.8 ug/L taken at the Dereham Centre WTF	Reported on May 11, 2021 after trucked water and May 7, 2021 resample taken.	May 7, 2021 resample result was reported as adverse, trucked water had disturbed sediment in the reservoir causing the arsenic sample result to increase.
May 7, 2021 Arsenic of 55.3 ug/L taken at the Dereham Centre WTF	Reported on May 12, 2021, samples collected on May 12 & 13, 2021 for confirmation.	Samples taken on May 12 & 13, 2021 were acceptable
Treated or Distribution Water Sample with Positive Test for <i>E.Coli</i> or <i>Total Coliform Bacteria</i>		
July 21, 2021 8 TC cfu/100mL in a treated distribution sample result. The free chlorine at the time of the sample was 1.41 mg/L.	Reported and resamples were taken.	Resample results acceptable July 23, 2021.

APPENDIX A: SUMMARY OF CHEMICAL RESULTS

UNDERSTANDING CHEMICAL TEST RESULTS

The following tables summarize the laboratory results of the chemical testing the County is required to complete. Different types of parameters are required to be tested for at different frequencies as noted below. Explanations on the health impacts of these parameters can be found in the MECP document at https://cvc.ca/wp-content/uploads/2011/03/std01_079707.pdf PSIB 4449e01 titled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines".

Results are shown as concentrations with units of either milligrams per litre (mg/L) or micrograms per litre (ug/L). 1 mg/L is equal to 1000 ug/L. The Maximum Acceptable Concentration (MAC) is the highest amount of a parameter that is acceptable in Municipal drinking water and can be found in the MECP Drinking Water Standards. The Method Detection Limit (MDL) is the lowest amount to which the laboratory can confidently measure. A result of "ND" stands for "Not Detected" and means that the concentration of the chemical is lower than the laboratory's equipment is capable of measuring. In the event that some samples results are ND, and other results are above the MDL, the value of the MDL will be used where an average result must be calculated. Where all collected samples are ND the average sample result will be assumed to be ND.

Nitrate and nitrite samples are required every 3 months in normal operation.

<i>Parameter</i>	<i>Result Range Min – Max (mg/L)</i>	<i>Average Result (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Nitrite	ND – 0.013	0.006	1.0	0.003
Nitrate	0.009 – 0.013	0.011	10.0	0.006

Trihalomethane (THM) and total Haloacetic Acids (HAA) are by-products of the disinfection process. The samples are required every 3 months from the distribution system.

<i>Parameter</i>	<i>Annual Average</i>	<i>Result Value (ug/L)</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Trihalomethane (THM)	2021	9.3	100	0.37
Haloacetic Acids (HAA)	2021	ND	80	5.3

The following Table summarizes the most recent test results for Sodium and Fluoride. Testing and reporting any adverse results is required every 5 years.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Sodium	August 16, 2021	11.6	20.0*	0.01
Fluoride	August 16, 2021	0.59	1.5**	0.06

*Sodium levels between 20 – 200 mg/L must be reported every 5 years.

**Natural levels of fluoride between 1.5 – 2.4 mg/L must be reported every 5 years.

The following Table summarizes the most recent results for the Lead Testing Program. Lead samples are taken every 3 years. Levels of alkalinity and pH are monitored twice per year in the distribution system to ensure water quality is consistent and does not facilitate leaching of lead into the water.

<i>Parameter</i>	<i>Result Range (Min - Max)</i>	<i>Number of Samples</i>	<i>Acceptable Level</i>
Distribution Alkalinity	223 – 228	2	30 – 500mg/L
Distribution pH	7.78 – 8.21	2	7.7 – 8.0
Distribution Lead 2021	0.22 – 0.41	2	10 ug/L MAC

The following Table summarizes the most recent test results for Schedule 23. Testing is required every 5 years for secure groundwater wells.

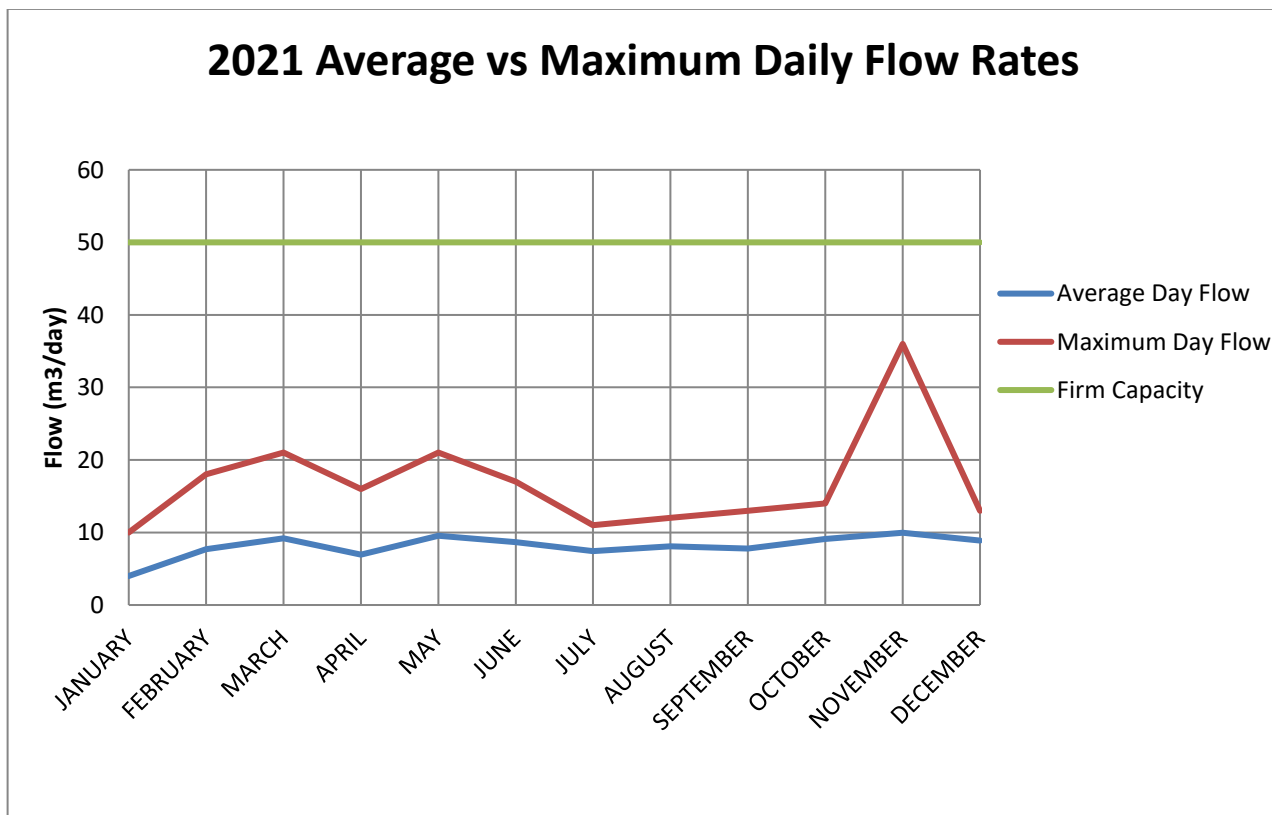
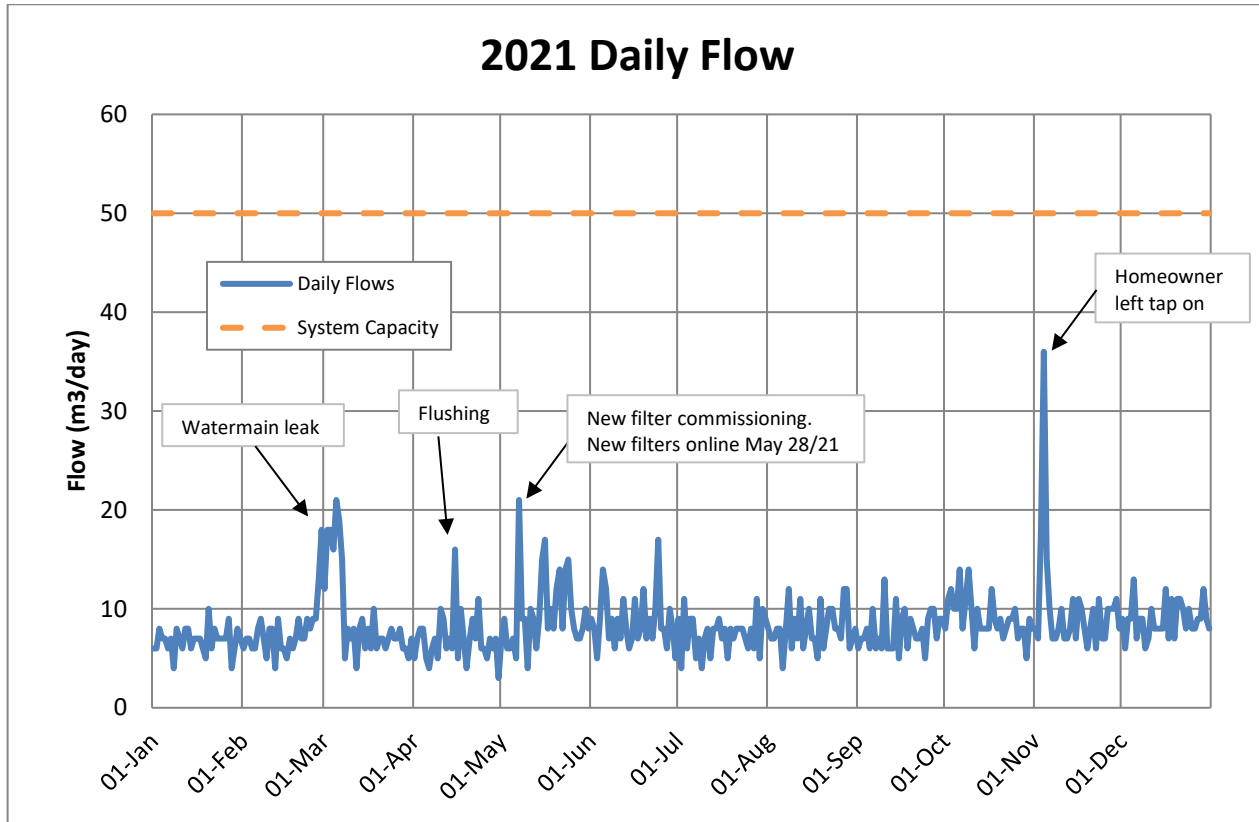
<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (ug/L)</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Antimony	Dec 2/19	ND	6	0.09
Arsenic	Annual Average	4.5	10	0.2
Barium	Dec 2/19	239	1000	0.01
Boron	"	29	5000	0.2
Cadmium	"	ND	5	0.003

Parameter	Sample Date	Result Value (ug/L)	MAC (ug/L)	MDL (ug/L)
Chromium	"	0.10	50	0.5
Mercury	"	0.01	1	0.02
Selenium	"	ND	5	1
Uranium	"	0.112	20	0.001

The following Table summarizes the most recent test results for Schedule 24. Testing is required every 5 years for secure groundwater wells.

Parameter	Sample Date	Result Value (ug/L)	MAC (ug/L)	MDL (ug/L)
Alachlor	Dec 2/19	ND	5	0.02
Atrazine + N-dealkylatedmetabolites	"	ND	5	0.01
Azinphos-methyl	"	ND	20	0.05
Benzene	"	ND	1	0.32
Benzo(a)pyrene	"	ND	0.01	0.004
Bromoxynil	"	ND	5	0.33
Carbaryl	"	ND	90	0.05
Carbofuran	"	ND	90	0.01
Carbon Tetrachloride	"	ND	2	0.17
Chlorpyrifos	"	ND	90	0.02
Diazinon	"	ND	20	0.02
Dicamba	"	ND	120	0.20
1,2-Dichlorobenzene	"	ND	200	0.41
1,4-Dichlorobenzene	"	ND	5	0.36
1,2-Dichloroethane	"	ND	5	0.35
1,1-Dichloroethylene(vinylidene chloride)	"	ND	14	0.33
Dichloromethane	"	ND	50	0.35
2-4 Dichlorophenol	"	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	"	ND	100	0.19
Diclofop-methyl	"	ND	9	0.40
Dimethoate	"	ND	20	0.06
Diquat	"	ND	70	1
Diuron	"	ND	150	0.03
Glyphosate	"	ND	280	1
Malathion	"	ND	190	0.02
Metolachlor	"	ND	50	0.01
2-methyl-4chlorophenoxyacetic acid (MCPA)	"	ND	100	0.12
Metribuzin	"	ND	80	0.02
Monochlorobenzene	"	ND	80	0.3
Paraquat	"	ND	10	1
Pentachlorophenol	"	ND	60	0.15
Phorate	"	ND	2	0.01
Picloram	"	ND	190	0.1
Polychlorinated Biphenyls(PCB)	"	ND	3	0.04
Prometryne	"	ND	1	0.03
Simazine	"	ND	10	0.01
Terbufos	"	ND	1	0.01
Tetrachloroethylene	"	ND	10	0.45
2,3,4,6-Tetrachlorophenol	"	ND	100	0.25
Triallate	"	ND	230	0.01
Trichloroethylene	"	ND	5	0.44
2,4,6-Trichlorophenol	"	ND	5	0.25
Trifluralin	"	ND	45	0.19
Vinyl Chloride	"	ND	1	0.17

APPENDIX B: WATER QUANTITY SUMMERY



Dereham Centre Firm Capacity 50 m³/day
 Dereham Centre Water Supply Capacity 50 m³ /day