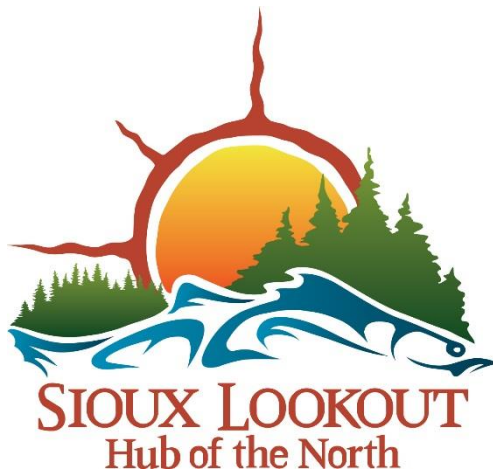


# 2019 Annual Report

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## Sioux Lookout Water Pollution Control Plant



**Prepared for:** The Ministry of the Environment, Conservation and Parks

**Prepared by:** Northern Waterworks Inc. on behalf of the Municipality of Sioux Lookout

**Date:** March 26, 2020

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# 1 Introduction

## 1.1 Annual Reporting Requirements

The Sioux Lookout Water Pollution Control Plant (WPCP) is regulated by the terms and conditions provided within Certificate of Approval No. 3-0250-92-006 (the Certificate), issued to the Town of Sioux Lookout on June 17, 1992. This Report summarizes the facility's performance over the previous calendar year (January 1 to December 31, 2019) and is intended (1) to provide a performance record for future references, (2) to ensure that the Ministry is made aware of problems as they arise and (3) to provide a compliance record for the terms and conditions outlined in the Certificate. The Sioux Lookout WPCP is owned by the Corporation of the Municipality of Sioux Lookout and was operated by Northern Waterworks Inc. for the entire reporting period.

This Annual Report has been prepared in accordance with Condition 17 of the Certificate and must contain, but shall not be limited to, the following information:

- (a) A summary of all monitoring and compliance reports submitted in the reporting period, including an overview of the success and adequacy of the sewage treatment program (refer to section 7);
- (b) A comprehensive interpretation of all monitoring data and analytical data collected relative to the works during the reporting period and a comparison to the effluent quality and quantity criteria (refer to sections 2.2 & 3);
- (c) A summary of any effluent quality assurance or control measures undertaken during the reporting period (refer to section 2.1);
- (d) A summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works (refer to section 5.1);
- (e) A description of any operating problems encountered and corrective actions taken during the reporting period (refer to section 6);
- (f) A summary of any proposed alteration, extension or replacement in the process or operation of the Works to be completed over the next reporting period which may require approval under the *Ontario Water Resources Act* (refer to section 5.3);

- (g) A tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated over the next reporting period (refer to section 4);
- (h) An outline of the sludge handling methods and disposal areas to be utilized over the next reporting period (refer to section 4);
- (i) An evaluation of the calibration and maintenance procedures conducted on all monitoring equipment (refer to section 5.2); and,
- (j) An evaluation for the need for modifications to the Works to improve performance and reliability and to minimize upsets and bypasses (refer to section 5.4).

## **1.2 System Description**

The Sioux Lookout sewage works consist of sanitary sewers, sewage pumping stations, associated force-mains and an extended aeration water pollution control plant. Sanitary sewers collect wastewater and direct it to multiple pumping stations located throughout the community, which in turn deliver the wastewater to the Robert Street Sewage Pumping Station. This pumping station includes an underground wet well and two variable speed submersible pumps for transferring wastewater via force-main to the Sioux Lookout WPCP for treatment. As an extended aeration facility, the Sioux Lookout WPCP relies upon a biological treatment method that utilizes microorganisms to process influent wastewater. The facility also uses gas chlorine for effluent disinfection prior to discharge to the natural environment. The overall goal of the treatment process is to reduce or remove contaminants from influent wastewater (raw sewage) to a level that will not adversely impact or impair receiving waters, including preventing the introduction of pathogens that could affect downstream users.

Designed for the treatment and disposal of sewage, the Sioux Lookout WPCP has a hydraulic rated capacity of 2,840 m<sup>3</sup>/day (average daily flow) with a peak flow rated capacity of 9,230 m<sup>3</sup>/day. The facility includes a mechanical and stationary bar screen for debris removal, a grit removal system, two circular treatment units each containing an aeration tank, clarifier, and aerobic digester, a chlorine contact chamber and an outfall sewer discharging final effluent to Pelican Lake. The facility also includes a sludge dewatering system and a control building housing a laboratory, a gas chlorination system, an emergency diesel generator set, air supply equipment, control and metering systems, and piping, heating and ventilation systems.

## 2 Water Quality

### 2.1 Monitoring Programs

Samples are collected by licenced operators and submitted to an accredited laboratory for analysis on a biweekly basis (once every two weeks) for influent (raw sewage) and effluent (treated) parameters. The minimum requirements for the sampling and testing of influent and effluent parameters are provided in Condition 15 (Monitoring and Recording) of the Certificate. Sampling is also conducted in accordance with the Ministry's Procedure F-10-1 (*Procedures for sampling and analysis requirements for municipal and private sewage treatment works – liquid waste streams only*) and with the federal *Wastewater Systems Effluent Regulations* (WSER). All individual effluent monitoring results are provided in **Appendix A**. The Certificate of Analysis pertaining to annual sludge monitoring conducted in 2019 is provided in **Appendix B**.

Licensed operators also conduct in-house testing to determine the operational performance of the various stages of the treatment process and for quality assurance purposes as it concerns final effluent parameters. **Table 1** summarizes those parameters that were routinely tested for operational control or quality assurance purposes during the reporting period. This table is intended to provide a summary of effluent quality assurance measures undertaken in the reporting period as required by Condition 17(c) of the Certificate. Typical control measures that may be implemented in response to test results include adjusting the rate of return activated sludge flow, altering the volume of solids removed from the treatment process (i.e. waste activated sludge), modifying chlorine dosages to optimize disinfection, modifying the operation of air supply equipment and conducting plant cleaning and maintenance.

### 2.2 Monitoring Results

In accordance with Condition 17(b) of the Certificate, this report must provide a comprehensive interpretation of all monitoring and analytical data collected relative to the facility during the reporting period, complete with a comparison to the effluent quality criteria. The sewage works must be designed, constructed, operated and maintained such that effluent compliance limits are not exceeded. Effluent limits are summarized in Condition 12 (Non-Compliance) of the Certificate, and any exceedance constitutes non-compliance. Limits are expressed as maximum monthly average concentrations and maximum monthly average loadings for the parameters biochemical oxygen demand and total suspended solids, as a maximum monthly average concentration for the parameter total residual chlorine and as a maximum monthly geometric mean density for the parameter E. coli.

**Table 1:** Testing program summary<sup>1</sup>

Parameter	Sample Type	Minimum Frequency
<b>Influent Monitoring</b>		
Dissolved Oxygen	Grab	2x Weekly
Temperature	Grab	2x Weekly
pH	Grab	Weekly
Alkalinity	Grab	Weekly
<b>Effluent Monitoring</b>		
Dissolved Oxygen	Grab	2x Weekly
Temperature	Grab	2x Weekly
pH	Grab	Weekly
Alkalinity	Grab	Weekly
Total Suspended Solids (per CTU) <sup>2</sup>	Grab	Weekly
Total Residual Chlorine	Grab	Daily
<b>Process Monitoring<sup>2</sup></b>		
Aeration Dissolved Oxygen	Grab	2x Weekly
Aeration Sludge Settling Test	Grab	2x Weekly
Aeration pH	Grab	2x Weekly
Aeration Total Suspended Solids	Grab	Weekly
Return Activated Sludge TSS	Grab	Weekly
Clarifier Sludge Depth	Grab	2x Weekly
Clarifier Dissolved Oxygen	Grab	2x Weekly
Clarifier Temperature	Grab	2x Weekly
<p>1. Refers to all in-house tests conducted for operational control and quality assurance.</p> <p>2. All process monitoring tests are conducted on each of the aeration tanks and secondary clarifiers associated with the two combined treatment units.</p>		

Effluent objectives are summarized in Condition 11 (Effluent Objectives) of the Certificate, and the facility must also be designed, constructed and operated to achieve the objectives. Objectives are set at more stringent values than compliance limits and they are expressed as maximum monthly average concentrations and maximum monthly average loadings for the parameters biochemical oxygen demand and total suspended solids, as a maximum monthly average concentration for the parameter total residual chlorine and as a maximum monthly geometric mean density for the parameter E. coli.

**Table 2** summarizes effluent monitoring results and compares them to the relevant objectives and compliance limits for regulated and certain unregulated parameters. Compliance limits for all effluent parameters were achieved for the entire reporting period. Results were also below the objectives for the entire reporting period except for the effluent parameters total suspended solids and total residual chlorine. The monthly average concentration for effluent total suspended solids exceeded the objective of 10 mg/L in the month of January. The monthly average concentration for effluent total residual chlorine exceeded the effluent objective of 0.50 mg/L in the months of January, April and June. Refer to section 6.1 for more information concerning effluent objective exceedances.

**Table 2:** Effluent monitoring results summary and comparison with performance criteria<sup>1</sup>

Month	BOD		TSS		TRC <sup>2</sup>	E. coli	TAN <sup>3</sup>	Total P <sup>3</sup>	CBOD <sup>3</sup>
	MAC (mg/L)	MAL (kg/d)	MAC (mg/L)	MAL (kg/d)	MAC (mg/L)	MGMD (MPN/100 mL)	MAC (mg/L)	MAC (mg/L)	MAC (mg/L)
Objective	10	28.4	10	28.4	0.50	150	n/a		
Limit	25	71.0	25	71.0	1.20	200	n/a		
Jan	4.1	6.5	12.6	20.1	0.79	10	7.52	0.34	2.4
Feb	4.5	6.8	6.3	9.6	0.41	137	13.5	0.21	3.5
Mar	3.6	6.5	4.4	7.9	0.31	14	14.5	0.20	3.0
Apr	4.3	9.6	3.5	7.7	0.53	52	14.0	0.24	4.1
May	3.4	6.9	4.5	9.1	0.46	78	14.7	0.21	2.5
Jun	6.4	12.0	2.3	4.2	0.53	55	6.94	0.16	2.9
Jul	2.1	4.5	2.7	5.6	0.36	55	0.09	0.24	2.1
Aug	2.0	4.1	4.5	9.3	0.38	10	0.13	0.27	2.0
Sep	2.0	4.9	9.0	22.0	0.37	10	0.09	0.39	2.0
Oct	2.9	7.7	4.1	11.1	0.43	10	0.27	0.35	2.0
Nov	2.3	5.3	9.4	21.4	0.47	14	0.44	0.23	2.0
Dec	4.4	8.9	5.2	10.6	0.38	24	0.10	0.42	3.2

1. BOD = five-day total biochemical oxygen demand; TSS = total suspended solids; TRC = total residual chlorine; TAN = total ammonia nitrogen; Total P = total phosphorus; CBOD = five-day carbonaceous BOD; MAC = monthly average concentration; MAL = monthly average loading; MGMD = monthly geometric mean density.
2. Regulatory testing for effluent total residual chlorine is achieved through the in-house testing program. TRC is tested on a daily basis.
3. Although no compliance limits or objectives exist with respect to total ammonia nitrogen, total phosphorus or CBOD in the Certificate, other contemporary approvals typically have maximum limits of between 5 to 10 mg/L for total ammonia nitrogen, between 0.5 to 1 mg/L for total phosphorus and 25 mg/L for CBOD.



### 3 Flow Monitoring

Condition 13(a) of the Certificate states that the sewage works are approved to treat sewage at an average flow of 2,840 m<sup>3</sup>/day, with a peak flow rate of 9,230 m<sup>3</sup>/day. Condition 13(b) states that the introduction of sewage flows in excess of the peak flow rate is not approved under the Certificate. Condition 13(c) states that the introduction of sewage flows in excess of the average daily flow for any consecutive period of time greater than one year is not approved.

**Table 3** summarizes influent flow monitoring results. Throughout the reporting period, 832,288 m<sup>3</sup> of influent was introduced to the facility. On an average day in 2019 2,280 m<sup>3</sup> of influent was introduced, representing 80% of the average daily rated capacity. The maximum amount of influent introduced to the facility on a given day in 2019 was 3,863 m<sup>3</sup>, which represents 42% of the peak flow rate of the facility.

**Table 3:** Influent wastewater flows and solids management summary

Month	Influent Flows					Solids Management
	Total Volume (m <sup>3</sup> )	Daily Flows (m <sup>3</sup> /day)		Capacity Assessments <sup>1</sup>		Dewatered Sludge Volume Generated (m <sup>3</sup> )
		Average	Maximum	Average	Maximum	
Jan	54,600	1,761	2,000	62%	22%	134
Feb	49,700	1,775	2,000	63%	22%	101
Mar	59,500	1,919	2,500	68%	27%	96
Apr	70,400	2,347	2,900	83%	31%	101
May	66,700	2,152	2,500	76%	27%	55
Jun	62,900	2,097	2,300	74%	25%	66
Jul	84,808	2,736	3,690	96%	40%	80
Aug	76,537	2,469	2,942	87%	32%	118
Sep	81,623	2,721	3,293	96%	36%	74
Oct	87,715	2,830	3,863	100%	42%	52
Nov	72,767	2,426	2,769	85%	30%	30
Dec	65,038	2,098	2,347	74%	25%	80
Total	832,288	---	---	---	---	987
Average	69,357	2,280	---	80%	---	82

1. Capacity assessments compare average and maximum daily influent wastewater flows to the hydraulic rated capacity (2,840 m<sup>3</sup>/day ) and peak flow rated capacity (9,230 m<sup>3</sup>/day) of the treatment facility, respectively.

Recent historical influent wastewater flows for the Sioux Lookout Water Pollution Control Plant are summarized in **Table 4**. The facility has operated at between 69% to 87% of its rated capacity over the previous nine (9) reporting periods. In 2019 average daily flows approached 80% of the rated capacity, and this threshold is generally considered to be a design objective for a wastewater treatment facility. An assessment of the issues and recommendations for corrective actions may be indicated if average daily flows continue to exceed 80% of the rated capacity.

**Table 4:** Recent historical influent flow monitoring results

Year	Total Volume (m <sup>3</sup> )	Average Daily Flow (m <sup>3</sup> )	Capacity Assessment – Average Daily Flow (%)	Maximum Daily Flow (m <sup>3</sup> )	Capacity Assessment – Peak Flow (%)	Annual % Change
2011	778,100	2,132	75%	4,340	47%	-13.1%
2012	908,700	2,483	87%	4,200	46%	+16.8%
2013	815,300	2,234	79%	4,200	46%	-10.3%
2014	745,600	2,043	72%	3,600	39%	-8.5%
2015	784,000	2,148	76%	4,600	50%	+5.2%
2016	755,800	2,065	73%	2,900	31%	-3.6%
2017	764,700	2,095	74%	3,200	35%	+1.2%
2018	719,500	1,971	69%	2,700	29%	-5.9%
2019	832,288	2,280	80%	3,863	42%	+15.7%

## 4 Solids Management

In accordance with Condition 17(h) of the Certificate, this report must provide an outline of the sludge handling methods and disposal areas that will be utilized over the next reporting period. The volume of solids in the treatment process is controlled by directing activated sludge (i.e. waste activated sludge) to the respective aerobic digesters at the Sioux Lookout WPCP. Sludge is then transferred to a dewatering system for further processing, such that the solids are concentrated and much of the water present is removed and returned to the influent works. Dewatered sludge is then hauled by trailer to the Sioux Lookout Sludge Lagoon located at the Hidden Lake Landfill site, where it is mixed with sand and used as site cover.

During the reporting period dewatered sludge was hauled exclusively to the Sioux Lookout Sludge Lagoon (approval no. 9378-7P5KHR). Dewatered sludge is classified as dewatered processed organic waste and is hauled by Northern Waterworks Inc. under amended Environmental Compliance Approval no. 5924-5NPKL7. Sludge management methods and disposal areas to be utilized over the next reporting period are not expected to change.

In accordance with Condition 17(g) of the Certificate, this report must provide a tabulation of the volume of sludge generated in the reporting period, in addition to providing an outline of anticipated volumes to be generated over the next reporting period. A tabulation of the amount of sludge generated in the reporting period is provided in **Table 3** and recent historical solids management data are summarized in **Table 5**. Approximately 987 m<sup>3</sup> of dewatered solids were removed from the facility in 2019, which was the result of dewatering 5,942 m<sup>3</sup> of waste activated sludge. The amount of dewatered sludge generated and removed from the facility in 2020 is anticipated to be between 800 m<sup>3</sup> and 1,600 m<sup>3</sup>.

**Table 5:** Recent historical solids management summary

Year	Waste Activated Sludge Processed			Dewatered Sludge Removed	
	Total Volume – CTU 1 (m <sup>3</sup> )	Total Volume – CTU 2 (m <sup>3</sup> )	Total Volume – Combined (m <sup>3</sup> )	Total Mass (kg)	Total Volume (m <sup>3</sup> )
2016	3,281	3,983	7,264	1,068,573	1,182
2017	3,714	3,928	7,642	969,824	1,039
2018	2,679	4,161	6,840	1,161,490	1,261
2019	2,708	3,234	5,942	870,300	987

## **5 Maintenance and Modifications**

### **5.1 Planned Maintenance & Modifications**

In accordance with Condition 17(d) of the ECA, this report must include a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works. A planned maintenance program is employed that ensures that the sewage works and related equipment that are installed or used to achieve compliance are properly operated and maintained. Licenced Operators perform routine maintenance on all equipment including pumps, air supply equipment, chemical feed systems, monitoring equipment, alarm systems, safety equipment and other treatment components. Both routine and non-routine (emergency) maintenance activities are conducted in accordance with manufacturers' instructions.

Additional significant planned inspection, maintenance, rehabilitation and renewal activities that occurred during the reporting period are summarized below.

- Between April 24 and April 29, the gas chlorinator units no. 1 and 2 were rebuilt, including the replacement of both chlorine gas regulators and feed lines.
- On August 27, the emergency generators were inspected, tested and serviced by representatives with GAL Power.
- On June 18, the scum skimmer on treatment unit. 1 was replaced.
- On July 4, the level sensor used for influent flow measurement was relocated to ensure accurate flow measurement in accordance with the unit's operating specifications.
- On July 23, the control wiring for blower no. 2 was reconfigured to allow for blower operation to be controlled by the programmable logic controller.
- On July 25, the chlorine gas detector was replaced and integrated with automation systems.

- On September 12, calibration verification for the one (1) influent and one (1) effluent flow measuring devices was conducted by a representative from Syngery Controls Corporation. Both flow measuring devices passed calibration verification. A copy of the report is included in **Appendix C**.
- On October 18, a new diesel fuel tank (associated with the emergency generator) was installed at the WPCP.
- Between October 29 and October 30, the lift stations in the community were cleaned and inspected.
- On December 3, a thermographic imaging study of electrical systems was conducted by an ABB representative. A deficiency was identified with the control wiring for blower no. 1., which was subsequently corrected by an electrician.
- On November 18, all backflow prevention devices were tested and inspected by a representative from Venshore Mechanical Ltd. One (1) backflow prevention device was replaced.

## **5.2 Monitoring Equipment Calibration and Maintenance**

Condition 13(d) of the Certificate requires the installation, maintenance and operation of a sufficient number of flow measurement devices. These devices must be calibrated at regular intervals not exceeding one year to ensure their accuracy within  $\pm 5\%$  of the full scale reading. Flow meters are required to measure a) the quantity of sewage being conveyed to and through the sewage treatment plant and b) the quantity of untreated sewage being bypassed to the disinfection facility.

Flow monitoring equipment indicated in the Certificate includes one (1) 229 mm throat dimension Parshall flume at the influent works and one (1) V-notch weir for measuring plant effluent flow. Additional monitoring equipment includes a handheld colorimeter for measuring chlorine residuals and a portable meter used for determining pH, temperature and dissolved oxygen concentrations. A summary of planned calibration and maintenance activities conducted on monitoring equipment is provided in **Table 6**.

**Table 6:** Monitoring equipment calibration and maintenance activities

Equipment	Calibration & Maintenance Activities
Flow Measuring Devices (Influent & Effluent)	Daily inspection; annual calibration verification; calibration as required.
Handheld Colorimeter (Total Chlorine Residual)	Daily (weekdays) inspection; monthly quality assurance; calibration as required.
Portable Multi-Parameter Meter (Dissolved Oxygen, pH, Temperature)	Weekly (minimum) inspection; calibration and maintenance as required.

In accordance with Condition 17(i) of the Certificate, this report must include an evaluation of the calibration and maintenance procedures conducted on all monitoring equipment. Current planned calibration and maintenance procedures are considered to be adequate for all monitoring equipment.

### **5.3 Summary of Proposed Alterations, Extensions, or Replacements**

In accordance with Condition 17(f) of the Certificate, this report must provide a summary of any proposed alteration, extension, or replacement in the process or operation of the works to be completed over the next reporting period which may require approval under the *Ontario Water Resources Act*.

It is anticipated that the Sioux Lookout Water Pollution Control Plant will undergo significant modifications over the next reporting period that will require approval under the *Ontario Water Resources Act* and the issuance of a contemporary Environmental Compliance Approval. These modifications are being prompted by the prospective federal effluent total residual chlorine standard that comes into force on January 1, 2021. Modifications include, but may not be limited to, 1) the installation of an ultraviolet disinfection system in the existing and repurposed chlorine contact chamber, 2) the removal of gas chlorination system components and the installation of a sodium hydroxide chemical feed system for pH and alkalinity control (to be located in the existing gas chlorination room) and 3) various electrical and automation upgrades.

#### **5.4 Modifications to Improve Performance and Reliability**

In accordance with Condition 17(j) of the Certificate, this report must provide an evaluation for the need for modifications to the sewage works to improve performance and reliability and to minimize upsets and bypasses. For the purposes of this report, modifications intended to improve performance may include major and minor capital and operational projects planned for future reporting periods.

Modifications to improve the performance and reliability of the sewage treatment program include those modifications discussed in section 5.3 that are intended to ensure compliance with prospective federal and provincial effluent water quality standards.

## **6 Operating Problems**

In accordance with Condition 17(e) of the Certificate, this report must provide a description of any operating problems encountered and corrective actions taken during the reporting period. For the purposes of this report, operating problems may be indicated by 1) effluent limit and objective exceedances, 2) significant equipment, infrastructure and process failures and 3) bypasses, overflows, spills, and abnormal discharge events.

### **6.1 Effluent Limit and Objective Exceedances**

#### **6.1.1 Total Suspended Solids**

The monthly average concentration for effluent total suspended solids in the month of January was 12.6 mg/L, which exceeded the objective of 10 mg/L. No significant process adjustments were indicated and there were no objective exceedances for effluent total suspended solids for the remainder of the reporting period.

#### **6.1.2 Total Residual Chlorine**

The monthly average concentration for effluent total residual chlorine exceeded the effluent objective of 0.50 mg/L in the months of January, April and June. TRC results are compared with E. Coli results to confirm that harmful organisms have been destroyed or inactivated. Additionally, TRC results are used to ensure that excessive amounts of chlorine compounds are not discharged to receiving waters.

Consistently achieving the effluent TRC objective while also achieving the E. coli objective and compliance limit continues to be a challenge for the facility. Throughout the reporting period, applied chlorine dosages were adjusted in a timely manner to minimize effluent TRC while also attempting not to compromise disinfection. Operational modifications have been successful in minimizing the variation in TRC concentrations, and in 2019 TRC average monthly concentrations varied from 0.31 mg/L to 0.79 mg/L.



## **6.2 Equipment, Infrastructure and Process Failures**

Operating problems associated with significant equipment, infrastructure and process failures that occurred during the reporting period include the following:

- There were numerous failures associated with the sludge dewatering system throughout the reporting period. Failures included the failure of the front bearing on the press, the breakage of the scraper, control panel electrical failures, problems with the conveyor belt not tracking properly, a shredded conveyor belt and system blockages. In all cases repairs or replacements were promptly completed to ensure that there was no significant interruption to dewatering processes.
- On June 7, a leak in the pressurized air line extending to combined treatment unit no.1 was observed. Representatives with the Municipality repaired the line. Treatment processes were not significantly impacted.
- On July 3, the return activated sludge pump associated with combined treatment unit no. 1 failed and was replaced with a spare unit.
- In early September, it was observed that the motor for the grit classifier unit was tripping frequently. An electrician inspected the motor and completed repairs on September 16.

## **6.3 Bypasses, Overflows, Spills and Abnormal Discharge Events**

A bypass refers to the diversion of sewage around one or more unit processes within the treatment facility, whereby diverted sewage flows are returned to the treatment facility upstream of the effluent sampling location and are discharged to the environment through the plant outfall. Bypasses are prohibited except in certain situations and may be planned (i.e. for maintenance purposes) or unplanned (i.e. emergency situations or high flow conditions).

A plant overflow means a discharge to the environment from the sewage treatment facility at a location other than the plant outfall or into the plant outfall downstream of the final effluent sampling location. Overflows are prohibited except in certain situations, and special reporting, sampling, and recording requirements apply in the event of an overflow. Overflows are generally the result of heavy rainfall or snow melt events, such that the system becomes hydraulically overloaded.

Spills are releases of pollutants into the natural environment from or out of a structure, vehicle or other container that is abnormal in quality or quantity in light of all the circumstances of the discharge. Spills are generally the result of mechanical, electrical, automation or process failures. Abnormal discharge events include any other abnormal events not otherwise classified as a bypass, overflow or spill.

There were no bypasses, overflows or abnormal discharge events during the reporting. Two (2) spills occurred during the reporting, both associated with hauling dewatered sludge from the treatment facility to the sludge disposal site:

- On June 11, a spill of approximately 20 L (0.02 m<sup>3</sup>) of dewatered sludge (classified as processed organic waste) occurred at the intersection of Wellington Street and Fifth Avenue. The entire spill volume was cleaned and the event was reported to the Ministry's Spills Action Centre (SAC reference no. 2215-BD2SH5).
- On August 21, a spill of approximately 150 L (0.15 m<sup>3</sup>) of dewatered sludge (classified as processed organic waste) occurred at the intersection of Wellington Street and Fifth Avenue. The entire spill volume was cleaned and the event was reported to the Ministry's Spills Action Centre (SAC reference no. 7561-BF9SB8). Following this spill, the route used by operators to haul dewatered sludge to the sludge lagoon was changed in order to avoid this particular intersection.

## 7 Conclusion

In accordance with Condition 17(a) of the Certificate, this report must provide a summary of all monitoring and compliance reports submitted in the reporting period, including an overview of the success and adequacy of the sewage treatment program. All owners of mechanical sewage treatment plants are encouraged to submit Municipal Utility Monitoring Program forms to the Ministry. These forms summarize monitoring data and are completed for every calendar month. All such forms were completed and submitted to the Ministry for the entire reporting period.

Water quality and flow monitoring results suggest a successful and adequate sewage treatment program. The Sioux Lookout WPCP was capable of achieving all effluent compliance limits throughout the reporting period. Additionally, all flows from the sewage works were below the average daily and peak flow rated capacities. Facility performance with respect to the total number of effluent limit and objective exceedances across all parameters is summarized in **Table 7**. The goals of the sewage treatment program in 2020 are (1) to achieve all effluent compliance limits, (2) to achieve all effluent objectives for all parameters except for total residual chlorine, and (3) to maintain system performance with respect to effluent TRC objective exceedances until the UV disinfection system is installed and commissioned.

**Table 7:** Performance history – total number of limit and objective exceedances<sup>1</sup>

Year	No. of Limit Exceedances				No. of Objective Exceedances				Total
	BOD5	TSS	TRC	EC	BOD5	TSS	TRC	EC	
2013	0	0	0	0	0	4	12	0	16
2014	0	0	0	1	0	12	10	0	23
2015	0	0	0	1	0	4	3	0	8
2016	0	0	0	1	0	1	0	0	2
2017	0	0	0	1	0	5	0	0	6
2018	0	0	0	0	0	1	5	0	6
2019	0	0	0	0	0	1	3	0	4

1. BOD5 = total biochemical oxygen demand; TSS = total suspended solids; TRC = total residual chlorine; EC = Escherichia coli.

## **Appendix A**

### **Effluent Monitoring Results**

ALS		Sample ID	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT
		ALS ID	L2217884-3	L2223730-3	L2229107-3	L2234313-3	L2240333-3	L2246629-3	L2252757-3	L2259556-3	L2265479-3
Multiple Work Orders		Date Sampled	1/8/2019 12:30:00 PM	1/22/2019 9:15:00 AM	2/5/2019 2:02:00 PM	2/19/2019 12:00:00 PM	3/5/2019 2:20:00 PM	3/19/2019 1:20:00 PM	4/2/2019 11:20:00 AM	4/16/2019 11:20:00 AM	4/30/2019 11:05:00 AM
Analyte	Units	LOR	Water	Water	Water	Water	Water	Water	Water	Water	Water
Chlorine Residual, Client Supplied	mg/L	0.01	0.47	0.65	0.32	0.27	0.47	0.87	0.68	0.42	0.52
Temperature, Client Supplied	Degree C	0	9.5	7.1	6.9	6.7	6.4	6	6	6.4	7.2
pH	pH	0.1	6.4	7.01	7.19	7.34	7.19	7.4	7.35	7.32	7.57
Total Suspended Solids	mg/L	2	15.6	9.6	5.1	7.5	4	4.8	<2.0	6.4	<2.0
Alkalinity, Total (as CaCO3)	mg/L	1	-	52.4	78.3	84.4	90.4	78.6	91.1	103	119
Ammonia, Total (as N)	mg/L	0.02	3.14	11.9	13.3	13.6	15.9	13	13.5	15.4	13.2
Nitrate (as N)	mg/L	0.02	14.7	7.59	5.27	3.27	2.93	2.21	1.75	1.11	1.08
Nitrite (as N)	mg/L	0.01	<0.050	0.053	0.183	0.093	0.06	0.035	<0.050	0.048	0.032
Total Kjeldahl Nitrogen	mg/L	0.15	5.15	17	16.8	16.2	19.2	14.3	16.8	15.7	16.3
Phosphorus (P)-Total	mg/L	0.015	0.4	0.27	0.184	0.243	0.199	0.199	0.252	0.286	0.17
Escherichia Coli	MPN/100mL	10	10	10	110	170	20	10	20	70	100
Biochemical Oxygen Demand	mg/L	2	6.2	<2.0	5.5	3.4	4	3.2	4.7	4.3	3.9
BOD Carbonaceous	mg/L	2	2.1	2.7	3.6	3.3	3	2.9	4	4.6	3.8
ALS		Sample ID	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT
		ALS ID	L2269379-3	L2273557-3	L2281000-3	L2289671-3	L2298790-3	L2307123-3	L2315608-3	L2324272-3	L2332608-3
Multiple Work Orders		Date Sampled	5/7/2019 3:30:00 PM	5/14/2019 2:15:00 PM	5/28/2019 11:30:00 AM	6/11/2019 11:20:00 AM	6/25/2019 1:45:00 PM	7/9/2019 12:30:00 PM	7/23/2019 2:10:00 PM	8/7/2019 1:05:00 PM	8/20/2019 1:55:00 PM
Analyte	Units	LOR	Water	Water	Water	Water	Water	Water	Water	Water	Water
Chlorine Residual, Client Supplied	mg/L	0.01	0.7	0.33	0.46	0.4	0.55	0.33	0.31	0.36	0.4
Temperature, Client Supplied	Degree C	0	8	8.9	9.4	12.4	16	16.9	18	19.8	19
pH	pH	0.1	7.68	7.54	7.39	7.31	6.53	6.55	7.04	6.3	7.22
Total Suspended Solids	mg/L	2	6.5	2.7	4.4	<2.0	2.5	3.3	<2.0	2.9	6.1
Alkalinity, Total (as CaCO3)	mg/L	1	121	131	106	112	22.8	11.7	21.4	8	16.8
Ammonia, Total (as N)	mg/L	0.02	15.9	15.4	12.9	13.1	0.77	0.076	0.098	0.163	0.091
Nitrate (as N)	mg/L	0.02	0.96	0.524	3.67	0.954	17.7	17.5	18.7	18.9	17.1
Nitrite (as N)	mg/L	0.01	0.038	0.125	0.083	0.27	<0.010	<0.010	0.022	0.03	<0.010
Total Kjeldahl Nitrogen	mg/L	0.15	18	17.1	16.4	14	2.1	3.81	2.8	2.96	1.36
Phosphorus (P)-Total	mg/L	0.015	0.262	0.187	0.167	0.158	0.162	0.292	0.183	0.297	0.25
Escherichia Coli	MPN/100mL	10	30	230	70	300	<10	30	100	<10	<10
Biochemical Oxygen Demand	mg/L	2	2.9	3.4	4	7.4	5.3	2.2	<2.0	<2.0	<2.0
BOD Carbonaceous	mg/L	2	3.2	2.2	<2.0	3.5	2.3	2.1	<2.0	<2.0	<2.0

ALS		Sample ID	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT	FINAL EFFLUENT
		ALS ID	L2340513-3	L2349216-3	L2357786-3	L2365619-3	L2374019-3	L2381121-3	L2388299-3	L2394655-3	L2400050-3
Multiple Work Orders		Date Sampled	9/3/2019 11:00:00 AM	9/17/2019 12:55:00 PM	10/1/2019 11:35:00 AM	10/15/2019 8:55:00 AM	10/29/2019 3:10:00 PM	11/12/2019 11:10:00 AM	11/26/2019 1:00:00 PM	12/10/2019 11:47:00 AM	12/23/2019 1:58:00 PM
Analyte	Units	LOR	Water	Water	Water	Water	Water	Water	Water	Water	Water
Chlorine Residual, Client Supplied	mg/L	0.01	0.46	0.36	0.35	0.62	0.78	0.66	0.41	0.35	0.52
Temperature, Client Supplied	Degree C	0	17.6	17.4	15.6	15.3	14.1	10.4	11.1	9.3	7.7
pH	pH	0.1	7.04	7.13	7	7.14	7.19	6.95	6.47	6.3	6.26
Total Suspended Solids	mg/L	2	6	11.9	7.6	2.7	2.1	8.8	9.9	4.9	5.4
Alkalinity, Total (as CaCO3)	mg/L	1	37.4	36.1	43.1	67.1	49.5	48.2	28.4	14.7	20.5
Ammonia, Total (as N)	mg/L	0.02	0.061	0.11	0.073	0.168	0.574	0.612	0.264	0.05	0.148
Nitrate (as N)	mg/L	0.02	<0.020	16.5	14.6	11.6	12.9	9.93	13.8	14.6	11.3
Nitrite (as N)	mg/L	0.01	<0.010	0.019	<0.010	<0.050	0.072	0.059	<0.010	0.016	<0.050
Total Kjeldahl Nitrogen	mg/L	0.15	1.73	0.87	1.3	1.62	2.04	1.9	1.5	1.85	2.27
Phosphorus (P)-Total	mg/L	0.015	0.45	0.328	0.488	0.272	0.277	0.271	0.19	0.451	0.38
Escherichia Coli	MPN/100mL	10	<10	<10	10	<10	<10	<10	20	30	20
Biochemical Oxygen Demand	mg/L	2	<2.0	<2.0	3.5	3.1	<2.0	<2.0	2.6	3.5	5.2
BOD Carbonaceous	mg/L	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.2	3.2

## **Appendix B**

### **Annual Dewatered Sludge Monitoring Results**



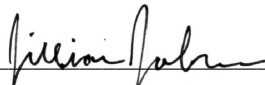
Northern Waterworks - Sioux Lookout  
ATTN: Dan Perron  
Public Works  
Box 158  
Sioux Lookout ON P8T 1A4

Date Received: 14-AUG-19  
Report Date: 27-AUG-19 08:46 (MT)  
Version: FINAL

Client Phone: 807-737-1664

## Certificate of Analysis

Lab Work Order #: L2328470  
Project P.O. #: SIOUX LOOKOUT  
Job Reference: PW-WPCP  
C of C Numbers:  
Legal Site Desc: ANNUAL SLUDGE

  
\_\_\_\_\_  
Jillian Johns  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 1081 Barton Street, Thunder Bay, ON P7B 5N3 Canada | Phone: +1 807 623 6463 | Fax: +1 807 623 7598  
ALS CANADA LTD Part of the ALS Group An ALS Limited Company



# ALS ENVIRONMENTAL ANALYTICAL REPORT

<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2328470-1 GRAB 13-AUG-19 13:30 ANNUAL SLUDGE					
<b>Grouping</b>	<b>Analyte</b>					
<b>MISC.</b>						
<b>Physical Tests</b>	% Moisture (%) Dry Weight (g) Total Sample Weight (g)	91.6 20.9 250				

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2328470-1			
		Description	GRAB			
		Sampled Date	13-AUG-19			
		Sampled Time	13:30			
		Client ID	ANNUAL SLUDGE			
Grouping	Analyte					
<b>SOIL</b>						
<b>Metals</b>	Aluminum (Al) (mg/kg)	32800				
	Antimony (Sb) (mg/kg)	0.72				
	Arsenic (As) (mg/kg)	1.58				
	Barium (Ba) (mg/kg)	63.1				
	Beryllium (Be) (mg/kg)	<0.10				
	Bismuth (Bi) (mg/kg)	12.9				
	Boron (B) (mg/kg)	<5.0				
	Cadmium (Cd) (mg/kg)	0.400				
	Calcium (Ca) (mg/kg)	2260				
	Chromium (Cr) (mg/kg)	6.59				
	Cobalt (Co) (mg/kg)	0.71				
	Copper (Cu) (mg/kg)	187				
	Iron (Fe) (mg/kg)	4770				
	Lead (Pb) (mg/kg)	5.63				
	Lithium (Li) (mg/kg)	<2.0				
	Magnesium (Mg) (mg/kg)	784				
	Manganese (Mn) (mg/kg)	54.6				
	Mercury (Hg) (mg/kg)	0.339				
	Molybdenum (Mo) (mg/kg)	1.62				
	Nickel (Ni) (mg/kg)	3.46				
	Phosphorus (P) (mg/kg)	14400				
	Potassium (K) (mg/kg)	1000				
	Selenium (Se) (mg/kg)	1.33				
	Silver (Ag) (mg/kg)	0.92				
	Sodium (Na) (mg/kg)	357				
	Strontium (Sr) (mg/kg)	9.91				
	Sulfur (S) (mg/kg)	2500				
	Thallium (Tl) (mg/kg)	<0.050				
	Tin (Sn) (mg/kg)	7.3				
	Titanium (Ti) (mg/kg)	46.7				
	Tungsten (W) (mg/kg)	<0.50				
	Uranium (U) (mg/kg)	1.19				
	Vanadium (V) (mg/kg)	3.32				
	Zinc (Zn) (mg/kg)	162				
	Zirconium (Zr) (mg/kg)	15.5				

## Reference Information

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>HG-200.2-CVAA-WP</b>	Soil	Mercury in Soil	EPA 200.2/1631E (mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
<b>MET-200.2-CCMS-WP</b>	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020B (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H <sub>2</sub> S) may be excluded if lost during sampling, storage, or digestion.			
<b>MOISTURE-WS-SK</b>	Misc.	Moisture, Dry & Wet weight -whole sample	CWS for PHC in Soil - Tier 1
The whole sample is weighed. A representative portion of sample is then dried at 105°C overnight. The dried soil is allowed to cooled to room temperature, weighed and the % moisture, dry sample weight and wet sample weight are determined.			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

## **Appendix C**

### **Flow Meter Calibration Verification Certificates**

# On-site Calibration Certificate

SYNERGY CONTROLS

**Synergy Controls** Corporation  
 1065 Lorne Street  
 Sudbury, Ontario  
 PC3-4S6

Certificate n° **SCC20191209-1**  
 Calibration date **September 12 2019**

### Customer information

Company name **Northern Water Works**  
 Address **Sioux Lookout**  
 Contact **Dan Perron**

### Place of calibration

Company name **Town Of Sioux Lookout**  
 Address **Waste Water Plant**  
 Remarks **FIT Raw Sewage**

### Instrument information (UUT)

UUT : Unit Under Test

Instrument (UUT) **Endress Hauser**  
 Description **FMU90-N21CA131AA1A Partial Flume**  
 Manufacturer **Endress Hauser Lisle Metrix**  
 Serial n° **06 08 35 17 13**  
 Tag n° **FIT Raw Sewage**

Measuring range **0.00** to **8.64** **ML/D**  
 Output **0.00** to **8.64** **ML/D**  
 Remarks  
 Calibrated range to  
 Max permissible error (MPE) **5.0** **% FS**

### Standards used

This calibration certificate documents the traceability to national standards, which states the units of measurement according to the International System of Units (SI)

Type	Description	Serial n°	ID	Certificat	Due date
	<b>Steel Rule</b>				<b>NR</b>
	<b>Lazer Level</b>				<b>NR</b>

### Calibration Method

Description **Compare UUT with a Clamp on Flowmeter**  
 Document(s) **Customers SOP's**

Typical Uncertainty \*  
 Confidence level **95.00** %  
 \* *E+H interpretation of GUM*

### Environmental conditions

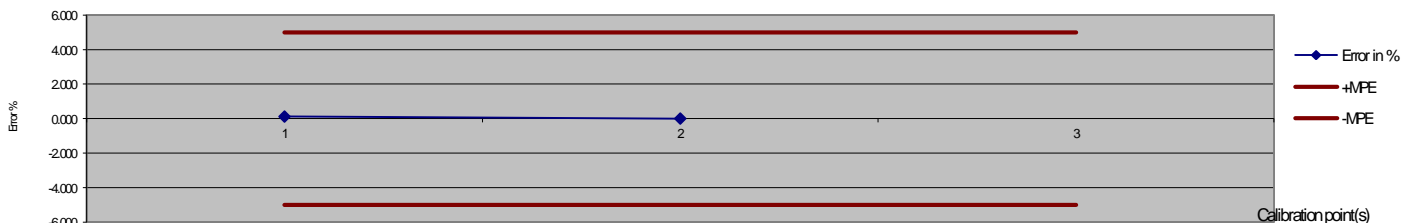
Ambient temperature **25.0** °C

Ambient humidity **55** %

Calibration value(s)  as found  as left

Number of test points **1**

Cal. point(s)	Measurand Reference value	Measured value display UUT	Display absolute error	Reference value output calculated	Measured value output UUT	Full scale relative error output UUT	MPE +/-	% of MPE
1	<b>2.696</b>	<b>2.71</b>	<b>0.01</b>	<b>2.70</b>	<b>2.71</b>	<b>0.116</b>	<b>5.00</b>	<b>2.31</b>
2	<b>0.000</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.000</b>	<b>5.00</b>	<b>0.00</b>
3							<b>5.00</b>	
Units*	<b>cm</b>	<b>cm</b>	<b>cm</b>	<b>ML/D</b>	<b>ML/D</b>	<b>% FS</b>	<b>% FS</b>	<b>%</b>



### Conformity

UUT conforms  UUT does not conform

### Remarks

**Zero tested, Grating to be modified to be clear of the Sensor holder. Sensor measured to bottom, flume is level and bottom at sensor is 0**

This calibration certificate meets the requirements of the ISO/CEI 17025 standard. It should not be published or reproduced other than in full

Service Technician **Synergy Controls / Dave Meredith**

Printing date **31/10/2019**

Signature *Dave Meredith*

# On-site Calibration Certificate

SYNERGY CONTROLS

**Synergy Controls** Corporation  
 1065 Lorne Street  
 Sudbury, Ontario  
 PC3-4S6

Certificate n° **SCC20191209-2**  
 Calibration date **September 12 2019**

**Customer information**

Company name **Northern Water Works**  
 Address **Sioux Lookout**  
 Contact **Dan Perron**

**Place of calibration**

Company name **Town Of Sioux Lookout**  
 Address **Waste Water Plant**  
 Remarks **FIT Raw Sewage Effluent**

**Instrument information (UUT)**

UUT : Unit Under Test

Instrument (UUT) **MultiRanger Plus**  
 Description **UltrasonicV Notch Wier**  
 Manufacturer **Miltronics,**  
 Serial n° **06 08 33 17 14**  
 Tag n° **FIT Raw Sewage Effluent**

Measuring range **0.00** to **9649.00 m<sup>3</sup>/day**  
 Output **0.00** to **9649.00 m<sup>3</sup>/day**  
 Remarks  
 Calibrated range to  
 Max permissible error (MPE) **5.0 % FS**

**Standards used**

This calibration certificate documents the traceability to national standards, which states the units of measurement according to the International System of Units (SI)

Type	Description	Serial n°	ID	Certificat	Due date
Steel Rule					NR
Laser Level					NR

**Calibration Method**

Description **Compare UUT with a Clamp on Flowmeter**  
 Document(s) **Customers SOP's**

Typical Uncertainty \*  
 Confidence level **95.00 %**  
 \* *E+H interpretation of GUM*

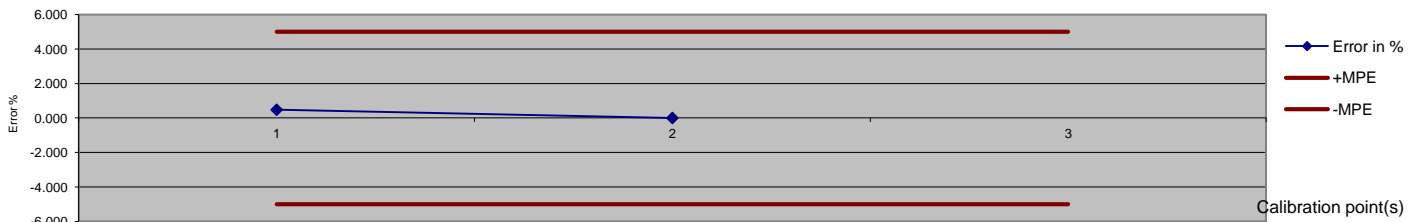
**Environmental conditions**

Ambient temperature **25.0 °C** Ambient humidity **55 %**

Calibration value(s) **as found as left**

Number of test points **1**

Cal. point(s)	Measurand Reference value	Measured value display UUT	Display absolute error	Reference value output calculated	Measured value output UUT	Full scale relative error output UUT	MPE +/-	% of MPE
1	2100.000	2146.00	0.00	2100.00	2146.00	0.477	5.00	9.53
2	0.000	0.00	0.00	0.00	0.00	0.000	5.00	0.00
3							5.00	
Units*	<input checked="" type="checkbox"/> cm	<input checked="" type="checkbox"/> cm	<input checked="" type="checkbox"/> cm	<input checked="" type="checkbox"/> m <sup>3</sup> /day	<input checked="" type="checkbox"/> m <sup>3</sup> /day	<input checked="" type="checkbox"/> % FS	<input checked="" type="checkbox"/> % FS	<input checked="" type="checkbox"/> %



**Conformity**

**UUT conforms** **UUT does not conform**

**Remarks**

**moved back 5 X H back from plate, (H=33.5 cm) need to investigate further. HD19.87 MV / , 20.04head uv, 2100mv/2146flow uv, Max head 36,58 cm**

This calibration certificate meets the requirements of the ISO/CEI 17025 standard. It should not be published or reproduced other than in full

Service Technician **Synergy Controls / Dave Meredith**

Printing date **31/10/2019**

Signature *Dave Meredith*