



Highlights

In 2018, the *Réseau de suivi du milieu aquatique* (RSMA) continued its sampling program of shoreline waters, streams and inland waters as well as of the stormwater sewer systems of the Montréal agglomeration territory. For the sake of comparability, most of the sampling was again accomplished during the summer. However, the summer of 2018 was marked by frequent occurrences of heavy rainfalls, a factor contributing to a deterioration of water quality.

This deterioration is mainly due to the occasional discharge of waste waters from sewer systems during rainy weather. This is why Montréal is making significant efforts to improve the performance of its networks and to integrate innovative sustainable stormwater management concepts into its urban land use planning to reduce the occurrence of overflows during rainy weather. In fact, several interventions identified as part of the drainage master plan are being developed, are under way or have been completed. For example, five major retention structures are currently being designed or are under construction with a total storage capacity of nearly 150,000 m³ (Rockfield, Lavigne, Leduc, Williams and St. Thomas overflows). The addition of these infrastructures represents an important step in the implementation of the combined sewer improvement program intended to reduce waste water overflow occurrences during heavy rains.

QUALO: A Year Below Average

With barely 50% of stations obtaining their QUALO certification, meaning that they were conducive to direct contact water uses, the year 2018 ranked significantly below the average of 60% obtained since the beginning of the program in 1999. In Lac Saint-Louis, for instance, the year 2018 was one of the worst since the program's inception, with only 11 of the 25 stations, or 44%, having obtained their QUALO certification.

RUISSO: Declining Quality Indices

In 2018, a significant deterioration in the quality of streams and inland waters was observed relative to that of the previous year. On the basis of the calculation of the RUISSO index (RI), although the water quality improved in 5 of the 24 streams and inland waters sampled and remained stable in 8 others, nevertheless, a deterioration was observed in the remaining 11.

PLUVIO: Half of Ic Soon Corrected

Of the almost 600 stormwater systems present on the territory, 194 were examined in detail, given the level of contamination at their outlet. Of these 194 systems, the majority were found to be free of any illicit connections (Ic), either because the contamination was of a diffuse or animal origin (86), or because the Ic had already been corrected (17). As for the remaining 91 systems, our screening and correction efforts will continue in the coming years. To date, 48% of confirmed Ic have been corrected. In 2018, the RSMA continued its validation of Ic corrections in the agglomeration's stormwater systems.

Lakes above seasonal averages

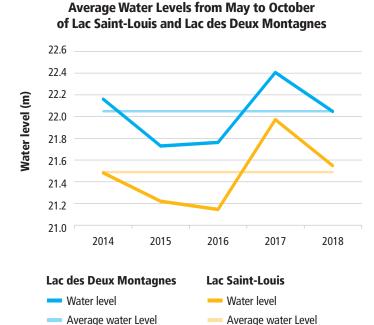
After slightly above average spring floods, the water level of Lac Saint-Louis began receding in the last week of May up until the last week of July. Thereafter, the level of the lake remained some 10 cm above its historical median (i.e. the median for the past 40 years).

As far as the flow rate of the Rivière des Outaouais is concerned, it stabilized at a level just above 1000 m³/s starting in mid-July, then increased, thus raising the water level of Lac des Deux Montagnes near its historical weekly maximums in September and October.

In short, the water levels of Lac des Deux Montagnes and Lac Saint-Louis, although significantly below the exceptional levels recorded in 2017, were above their summer averages. Consequently, the same situation prevailed for the water flows of rivers.

In October, the RSMA observed temporary reductions, over a day or two, of the flow rates of the Fleuve Saint-Laurent which resulted, to the great surprise of shoreline residents, in a significant lowering of the level of Lac Saint-Louis (about 40 cm). These temporary reductions in the flow rate of the Fleuve Saint-Laurent are done to maintain safe navigation conditions in the upstream portion of the River, also called Lac Saint-Laurent, between the mouth of Lac Ontario in Kingston and the Moses-Saunders Dam in Cornwall.

outh of Lac Ontario in average of 417 mm over the past 10 years. Dam in Cornwall.



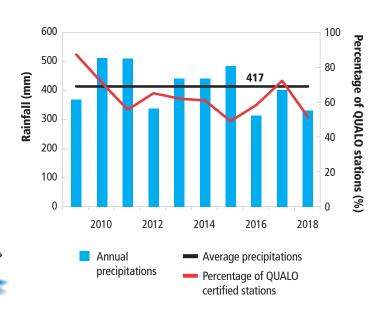
Lower Average Precipitations

In 2018, barely 334 mm of precipitations were measured during the sampling period, from May to October, compared to an average of 417 mm over the past 10 years.

COURDO: Better Knowledge of the Influence Area of the Wastewater Treatment Plant Discharge

As mentioned in the 2017 Portrait of the Quality of Montréal's Water Bodies, the influence area of the Jean-R. Marcotte wastewater treatment plant (WWTP) discharge was the subject of various studies in recent years in order to further our knowledge regarding the water quality of the Fleuve Saint-Laurent prior to the decontamination of the WWTP's effluent. For anyone intent on learning more about this subject, a summary document is available on the RSMA's Web site at www.rsma.gc.ca (in French only).

Total Precipitations During the Sampling Period (mm)



QUALO: a Year Below Average

The sampling program of the bacterial quality of the Island of Montréal's shoreline waters was performed for a 20th season, always relying on the same methodology. The program was completed from May 22nd to October 4th over a period of 20 weeks. To best reflect the quality of the waters surrounding the territory, 104 monitoring stations were chosen on the basis of interesting wildlife sites, shoreline recreational uses, storm sewers and streams.

Influence of Weather

The results of past years have demonstrated that the bacterial quality of water generally depended on precipitation levels. When heavy rainfalls occur in the hours preceding a sampling activity, a deterioration in the quality of surface waters is observed, particularly in stations impacted by spillages of overflow structures. On average, there may occur about 10 episodes of spillages of untreated wastewaters in waterways during the summer. And in dry spells, the opposite holds true, as often more than 90% of stations are found to be conducive to direct contact water uses (<200 COLI).

Recreational Activities Under Surveillance

Whether for drinking water or recreational activities, bacterial contamination is the key factor to be considered. Although reliance on the Escherichia coli bacteria count is gaining in popularity, the Ministère de l'Environnement et de la Lutte contre les Changements climatiques (MELCC) continues to recommend the use of fecal coliforms (COLI) as the criteria to assess the quality of surface waters. Their count is expressed in colony forming units or CFU per 100 mL. Regarding the protection of recreational activities, the criteria of 200 COLI applies for direct contact water uses, such as swimming or windsurfing, whereas the criteria of 1,000 COLI applies to indirect contact water uses, such as sports fishing and canoeing. These values are used by the MELCC as an indicator of the general quality of water. For further information on the classification of the bacterial quality of beaches, the reader should refer to the Environnement-Plage program at www.mddep.gouv.qc.ca/ programmes/env-plage (in French only).



Wharf on Île Bizard

On the other hand, in territories served by separate sewer systems as is the case in the western portion of the island, the streams' contribution, already important in dry spells, is even more significant during rainy periods. Fed by stormwater systems that collect runoff waters, streams' volume of water and level of contaminants increase during periods of rainfalls.

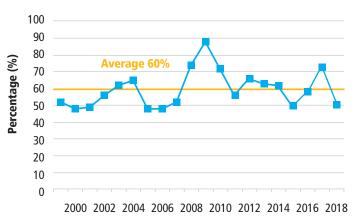
With just 334 mm of precipitations, the 2018 sampling season was one of the "driest" of the past 10 years, whose average was 417 mm. However, although total precipitations were below average, the precipitations often occurred in the guise of concentrated episodes, a factor that may result in a deterioration in the quality of surface waters.

Consequently, compared to last year, sampling was more often performed under the influence of rainfalls in the preceding 24 hours (25% of samples in 2018 versus 18% in 2017). Heavy rainfalls, which result in a deterioration of water quality, were also more frequent. Indeed, there were six occurrences of rainfalls exceeding 15 mm in 2018 compared to only three such occurrences in 2017.

50% of Stations QUALO Certified

For a monitoring station to obtain the QUALO certification, it must fulfill the following two conditions: the geometric mean of all its results must not exceed 200 COLI and no more than 10% of its samples can exceed 400 COLI.

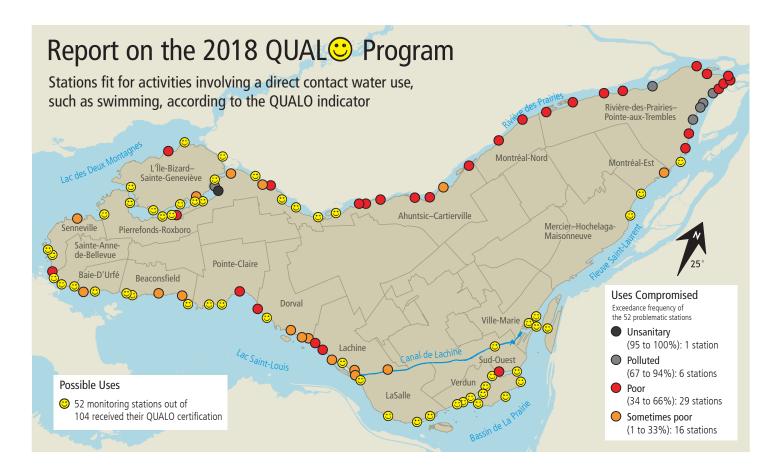
Evolution of the Total Percentage of QUALO Stations since the Inception of the Program in 1999



In 2018, 50% of the monitoring stations obtained their QUALO certification compared to 73% in 2017. This percentage is similar to that obtained in 2015. Whereas greater total precipitations (488 mm) marked the 2015 sampling season, 2018 was characterized by significant rainfalls in the 24-hour period preceding the sampling activity. With just 50% of QUALO certified stations, 2018 is significantly below the 60% average obtained since the inception of the program in 1999. The map below presents the results of the 2018 water quality monitoring campaign in Montréal: 1 station was deemed unsanitary whereas 6 were characterized as polluted, 29 as of poor quality and 16 as sometimes poor. The impact of rainfall occurrences is likely responsible for these results.

Of the 2078 bacterial analyses performed in 2018:

- 74% of samples respected the criteria of 200 COLI allowing for direct contact compared to 83% in 2017;
- almost 8% of the samples exceeded the criteria of 1000 COLI compromising indirect contact uses, compared to 4% in 2017.



Evolution of the Quality of Water Bodies

Rivière des Prairies: 54 to 35% Decline in QUALO

The lower percentage of QUALO certified stations in 2018 is mainly due to the strong impact of heavy rainfalls in the 24-hour period preceding the sampling. This impact was particularly felt during the August 28th sampling tour, all of the river's stations, except for the station located in Parc Antoine-Faucon in Pierrefonds-Roxboro, having exceeded the 200 COLI criteria and 17 of the 37 stations having exceeded the 1000 criteria. Thus, none of the Rivière des Prairies stations located downstream of Ruisseau Bertrand, in the vicinity of Autoroute 13, obtained their QUALO certification in 2018. Such a situation, although uncommon, had already occurred, for instance in 2015 and 2011.

Île Bizard: 88 to 75% Decline in QUALO

As in the past, the quality of this sector's shoreline waters was rather good. Exceedances of the 1000 COLI criteria were only observed at two of the stations. The one located near the extremity of Terrasse Martin, on Lac des Deux Montagnes, was the only station downgraded in 2017; it had also been downgraded from 2011 to 2013. The second downgraded station is the one located just downstream of the Île Bizard Bridge. Both were downgraded owing to measures greater than 400 COLI during the same three sampling tours.

Lac Saint-Louis: 92 to 44% Decline in QUALO

The year 2018 was one of the worst for this water body since the inception of the program, with only 11 of its 25 stations, or 44%, having been QUALO certified. Of the 500 samples or so, 100 were taken after rainfalls exceeding 8 mm were observed in the 24-hour period preceding the sampling (compared to 25 in 2017). To better illustrate this phenomenon, whereas generally no more than 5 or 6 values exceed the 1000 COLI criteria, no less than 15 exceedances were recorded during the 2018 season. The deterioration in water quality was especially noteworthy east of Baie de Valois in Pointe-Claire, and this, up to the entrance of Canal de Lachine. In addition to the diffuse pollution contributed by the storm sewers, the poor water quality of many streams and the presence of many birds along its shoreline, it is believed that the strong rainfalls in the hours preceding the sampling are greatly responsible for these poor results.



Wharf of the Club de canotage de Cartierville

Bassin de La Prairie: 94 to 89% Decline in QUALO

Similar to 2017, the percentage of QUALO stations remained greater than this sector's average of 79% since the inception of the program. With a geometric mean of 45 COLI, the results obtained at the future Verdun beach were generally lower than the 200 COLI criteria, except on three occasions when very slight exceedances were recorded. In addition to the station located just downstream of the Saint-Pierre collector sewer, only the station located downstream of the Rockfield overflow, in Canal de Lachine, was downgraded.

Fleuve Saint-Laurent: 56 to 38% Decline in QUALO

The percentage of QUALO certified stations fell below the average of 46% calculated for this sector since the inception of the program. Whereas just 13 exceedances of the 1000 COLI criteria had been recorded in 2017, 22 were recorded in 2018. The river's water quality particularly deteriorated in its eastern portion. Indeed, three slight exceedances of the 400 COLI value occurred, resulting in a downgrading of three stations that were QUALO certified in 2017. This was the case at two of the stations located at the end of the island, downstream of 94th Avenue. According to the observations of the *Direction de l'épuration des eaux usées* of the *Service de l'eau*, no less than seven rainfall episodes with spillages of wastewaters occurred in this sector of the eastern portion of the island in 2018.

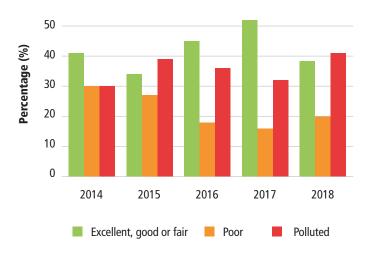
RUISSO: Lower Quality Indices

Streams and inland waters are irreplaceable environments necessary for biodiversity in urban areas. In 2018, the monitoring program focused on 24 streams and inland waters, and relied on 51 monitoring stations, sampled on seven occasions between May 9th and November 7th.

More than 8,100 measurements and physicochemical and bacterial analyses, obtained from the 355 water samples collected during the season, were used in the calculation of the RUISSO index (RI). On the basis of this index, compared to 2017, one may conclude that the water quality improved in 5 of the 24 streams and inland water bodies, that it remained stable in 8 of these and that it deteriorated in 11 others.

On the other hand, the results of the past two years show, for the most recent year, a decline in the number of stations having a quality deemed "excellent, good or fair", i.e. from 29 to 21, combined with an increase from 8 to 11 and from 14 to 19 in the number of stations having respectively a quality deemed "poor" and "polluted". This deterioration in the water quality of streams and inland waters, compared to last year, is mainly due to

Evolution of the Water Quality at 44 Monitoring Stations of Streams and Inland Water Bodies over 5 Years



more frequent rainfalls in the days preceding the sampling. This situation, however, is not exceptional, as it is comparable in terms of results to certain past years, for instance 2015, characterized by precipitations greater than on average.



Evolution of the Water Quality of Streams and Inland Water Bodies

The results obtained for the water bodies in 2018 are compared to those of the previous year, and graded as to whether an improvement (+), a stability (=) or a deterioration (-) of at least five units of the RUISSO Index (RI) has been recorded.

Streams Located in Ecoterritories

The water quality of Rivière à l'Orme (–) deteriorated in 2018, the values of the RI having declined at six of the river's monitoring stations. This deterioration was particularly noticeable at the station located in the tributary fed by the drainage waters of that sector of the City of Kirkland north of Autoroute 40. The lower index is mainly due to a slight increase in phosphorus concentrations. As in previous years, a chronic water deficiency near the branch of the river originating in Sainte-Anne-de-Bellevue was observed.

Located in the heart of the Bois-de-Liesse Nature Park, Ruisseau Bertrand (–) is fed by the storm waters of the City of Dorval and the boroughs of Saint-Laurent and Pierrefonds-Roxboro, in addition to those of Autoroutes 40 and 13. The quality of the waters from Dorval has deteriorated in 2018. Indeed, they proved to be loaded with suspended matter (SM) and rich in phosphorus. The samples of the tributary fed by the waters of the Technoparc de Saint-Laurent also showed signs of poor water quality. Indeed, half of the sampling tours at this location had to be cancelled due to a deficiency in water. Further downstream, at the two stations located in the Bois-de-Liesse Nature Park, one in the vicinity of the Pitfield House and the other in the tributary fed by the stormwaters from the northern portion of the territory of Saint-Laurent, the RI is still "polluted" due mainly to high COLI counts (> 2000).

The global water quality of **Ruisseau De Montigny** (–) showed signs of a slight deterioration since last year; it is "polluted" at four stations, at the beginning of the stream, near Bombardier Boulevard, until its mouth in Rivière des Prairies. Indeed, the waters feeding the beginning of the stream are of poor quality and further deteriorate downstream of the stormwater collector discharging upstream of Henri-Bourassa Boulevard, which drains a major industrial sector of the borough

RUISSO Index, a Water Quality Assessment Tool for Streams and Inland Waters

A list of specific criteria taking into account their hydrology, whether it's a stream, a marsh, a swamp, a basin or a pond, and key criteria relative to the protection of aquatic life or to acute and chronic toxicity was developed to establish the scales of the RUISSO Index (RI). This index is in fact an adaptation of the MELCC's index of bacteriological and physicochemical quality (IBPQ).

The RI is an effective tool to assess the relative quality of streams and inland waters as well as to identify parameters leading to a downgrading of the water's quality. 24 such parameters were chosen: suspended matter (SM), dissolved oxygen (DO), ammoniacal nitrogen (NH₃), total phosphorus (TP), fecal coliforms (COLI) and the main heavy metals. An analysis of these parameters allows one to check whether these contaminants are in sufficient quantity to result in a deterioration of the health of aquatic ecosystems.

of Anjou. It's this sector, located east of Autoroute 25, that is home to one of the Island of Montréal's biggest snow disposal sites (SDS). As in past years, significant contamination episodes occurred due, in part, to heavy rainfalls during which very high concentrations of SM (> 300 mg/L) and metals (of which copper, lead and zinc) were measured. The problematic parameters are, by importance, phosphorus, SM and COLI.

The water quality of **Ruisseau Pinel** (=) remained stable in the "fair" category. In 2018, the stream was dry during only one of the seven sampling tours compared to three such occurrences in 2017. Phosphorus, SM and COLI remain the limiting parameters.

The water quality at the mouth of **Coulée Grou** (+) slightly improved, but remained "polluted", despite an increase of seven RI points. Disturbing signs of water deficiency were again observed. Indeed, four of the seven sampling tours had to be cancelled due to an insufficient flow of water. Phosphorus is once again the main limiting parameter.

Marshes and Swamps

Marshes and swamps are mainly fed by the drainage waters brought by stormwaters and snowmelts. Phosphorus and ammonia nitrogen concentrations (decomposition of organic matter) as well as COLI counts (droppings from warm-blooded animals) are sometimes high.

At the Lac des Battures (+) monitoring station, the value of the RI improved by some 10 points, but remained in the "fair" category. The pumping station for the waters of the Fleuve Saint-Laurent, commissioned by the borough of Verdun in Île-des-Sœurs District, seems to have had a beneficial impact on the water flow of the Ruisseau des Hérons, visibly better, than on the water quality of Lac des Battures.

Although the improvements brought to the Pointe-aux-Prairies Nature Park allowed for the re-establishment of better water drainage at the outlet of the marshes, the water quality of **Pointe-aux-Prairies Nature Park marsh** (=) remained in the "polluted" category, owing to the low oxygenation of the waters and very high phosphorus loads. Only a better water supply can improve this situation.

Given its difficult access and that the environment is stable and free of any human activities, sampling of the waters of the **Des Sources Nature Park** marsh was interrupted in 2018.



Snapping turtle observed near the Pointe-aux-Prairies
Nature Park marsh

Streams with a Stormwater Vocation

The quality of the waters of **Ruisseau Saint-James** (+) improved given an increase of a little more than five points in the RI. These waters continue to show signs of contamination by sanitary waters, mainly COLI. Deterioration is observed between the stream's two monitoring stations, one located downstream from Autoroute 20 and the other at the entrance to Lac Saint-Louis, where the geometric mean of counts increased from 451 to 2666 COLI.

The waters of **Ruisseau Meadowbrook** (=) always seem affected by discharges of sanitary wastewater (5 of 7 COLI results> 700 and 6 of 7 phosphorus results> 30 µg/L). Channelled over a major portion of its course, the stream is at ground-level from Brookside Park to Beaconsfield.

The quality of the waters of **Ruisseau Terra-Cotta** (=) remained "poor" mainly owing to strong concentrations of phosphorus (average of 60 µg/L). The waters of **Ruisseau O'Connell** (+) improved, upgrading to the "good" category, whereas those of **Ruisseau Château-Pierrefonds** (=) remained "polluted" due to the presence of sanitary wastewater from illicit connections in the neighbouring residential district.

Streams Draining the Airport Zone

The quality of the waters of **Fossé Smith** (=) remained at a "satisfactory" level. This ditch drains a significant portion of the storm waters originating from the Montréal-Trudeau Airport.

The water quality of **Ruisseau Denis** (–) deteriorated with a drop of almost 10 points in its RI owing to exceedances in phosphorus, COLI and SM. The water remained "polluted" at the three stations located in the upstream portion of the stream and "fair" at the station located at the mouth of the stream in Lac Saint-Louis. Particularly strong concentrations of MS from the Pointe-Claire and Montréal-Trudeau Airport snow deposits contributed to a deterioration of the stream's water quality.

The quality of the waters of **Ruisseau Bouchard** (–) showed a deterioration, with its global RI declining by almost 20 points. Also, it is worthwhile mentioning that this decline was observed at each of the stream's monitoring stations.

Inland Waters

Unsurprisingly, the quality of the waters of **Canal de Lachine** (–) maintained their standing in the "good" category. The most limiting parameter was phosphorus, although the concentrations measured were rather weak (average of 20 µg/L). A single value for COLI exceeded the 200 COLI criteria. The waters of **Lac aux Castors** (Beaver Lake) (–) were once again categorized as being "good", despite a slight decline in their RI. The same situation was observed for the waters of the **Parc Angrignon pond** (–) which remained in the "good" category despite a five-point decline in the RI. Phosphorus is the main cause of the index's decline, although concentrations remained weak. As for the waters of **Lac Lacoursière** (–), they deteriorated slightly, being downgraded to the "good" category whereas those of the **Parc Dr-Bernard-Paquet pond** (=) remained "excellent".

The quality of the waters of **Lac de la Brunante** (=) remained "fair", just under the limit of being categorized as "good". Those of the **Parc La Fontaine pond** (–) declined to "fair", their RI having recorded a drop of more than five points. Phosphorus was the most limiting parameter (average of 34 µg/L). The waters of the **Parc Centenaire William Cosgrove basin** (+) improved, having been upgraded to the "fair" category. Phosphorus and suspended matter remained, once again, the limiting parameter for this basin. Finally, the waters of **Ruisseau Provost** (–) were severely downgraded from the "good" category to "fair" owing to increased concentrations of phosphorus and SM.

Environmental DNA (eDNA) Techniques for the Detection of Invasive Species in Montréal's Inland Waters

Within the framework of the activities provided in the Québec program to prevent the introduction and propagation of Asian carps and other invasive species, the RSMA collaborated with the Ministère des Forêts, de la Faune et des Parcs (MFFP) in activities intended to quickly identify invasive aquatic species in Québec's water bodies. It's in this context that in the summer of 2018, water samples were taken from some 10 Montréal inland water bodies to detect the presence of environmental DNA (eDNA). It should be noted that the DNA monitoring protocol used for this pilot project needs to be combined with observations or the capture of species targeted by these genetic analyses before being able to certify the presence of living fish. Indeed, it's important to adequately document the influence of external sources (for ex.: storm waters or human consumption) on the detection of eDNA. This exercise will be repeated in 2019, in order to complement the preliminary results already obtained.

For further information, the reader should consult the MFFP program at mffp.gouv.qc.ca/la-faune/especes/envahissantes/carpes-asiatiques (in French only).



Sampling at Lac des Battures

PLUVIO: Almost Half of Ic Corrected

The PLUVIO program was launched in 2007 to identify, locate and correct problems related to illicit connections (Ic)* on the Montréal agglomeration territory. Over the years, many problem sectors, namely street segments that may have been affected by Ic, were identified by the RSMA in some 100 stormwater sewer networks.

The territory of Montréal has almost 600 stormwater networks. Of the 194 problematic networks, more than half were exempt from Ic, either because the contamination was of a diffuse or animal origin (86) or because the Ic had been corrected (17). As for the 91 other networks, our screening and correction efforts will continue over the next few years.

Status of the 584 Stormwater Networks in 2018			
Non problematic networks	390		
Problematic networks	194		
Details re. the Problematic Networks			
No illicit connection (Ic)	86	103	
Corrected	17		
Awaiting corrections	58	- 91	
Awaiting screening or validation	33	- 91	
Total		194	

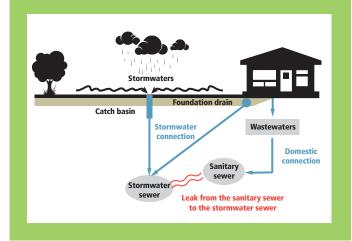
RSMA Studies in 2018

The RSMA validated sectors where no Ic had been confirmed and where corrections had been done by boroughs and related cities. This is how 71 problematic sectors were identified in 18 stormwater systems. These were located in the boroughs of L'Île-Bizard—Sainte-Geneviève, Montréal-Nord, Pierrefonds-Roxboro and Rivière-des-Prairies—Pointe-aux-Trembles as well as in the cities of Dollard-Des Ormeaux and Dorval.

Once the study was completed, 30 problematic sectors were redefined. Their location was communicated to the municipalities in order for the buildings located in these sectors to be subjected to a detailed screening. As for the remaining 41 problematic sectors, they revealed themselves to be exempt of any signs of sanitary contamination. This explains how the number of corrected stormwater systems increased to 17 from 14 in 2018.

Infiltration Sectors: Complex Illicit Connections (Ri) to be Corrected

Again this year, three new infiltration sectors were identified.
This is generally due to a leak from a domestic sewer system
into a stormwater sewer line which, according to the definition,
undoubtedly constitutes an Ic. In such a case, the buildings
are not necessarily responsible. It is rather the system that is
defective and that needs to be fixed.



Progress of the PLUVIO Program

Since the inception of the PLUVIO program, some 19,000 civic addresses have been screened and, of these, 93% had no Ic. To date, of the 1142 confirmed Ic, 544 were corrected, or 48%. In 2018, 54 new Ic were confirmed and 92 corrections were done.

Progression of the Correction of Confirmed Ic (at December 31, 2018)			
Cities	Boroughs	Total	
302	242	544	
16	582	598	
318	824	1142	
	Cities 302 16	Cities Boroughs 302 242 16 582	

An illicit connection (Ic) is a connection or defect that allows sanitary waste waters to seep elsewhere than in a domestic or combined sewer network, for instance in a storm sewer network, on the ground, in a ditch or in a water body, with the exception of septic tanks.



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