



Est. 1873

REPORT TO MAYOR AND COUNCIL

PRESENTED:	NOVEMBER 18, 2019 - REGULAR AFTERNOON MEETING	REPORT:	19-175
FROM:	ENGINEERING DIVISION	FILE:	5600-05-004
SUBJECT:	MURRAYVILLE WATER QUALITY		

RECOMMENDATIONS:

That Council direct staff to implement a conversion of the municipal water supply in the Murrayville and Brookwood areas to Metro Vancouver sources as soon as practical, as a short-term measure to address aesthetic issues, while maintaining the existing ground water supply facilities as reserve for emergencies and potential peak demand periods, until such time as other potential measures, such as centralized or localized treatment options and related cost implications have been fully explored; with costs related to the purchase of additional water from Metro Vancouver and connecting the Brawn pump station included in the 2020 budget.

EXECUTIVE SUMMARY:

Iron and manganese are naturally occurring minerals in groundwater. Contact with chlorine, which is an additive necessary for public health purposes, in the Murrayville water distribution system has recently resulted in these minerals precipitating out, causing numerous complaints of discoloured or dirty water. Other factors affecting water aesthetics include temperature and time of residency, that being the period of time for water to be consumed after chlorination, which is in itself dependent upon pipe size, water pressure in the system, and rate of demand.

In early September 2019, the chlorine levels increased in the Murrayville water system resulting in the water discolouration reported by the residents. Some of the measures undertaken by the Township to mitigate the issue included operational adjustments, such as system flushing and completing low-flow water exchanges in affected areas of the Murrayville water system, and adjusting chlorine levels to suit; daily monitoring and testing for Iron and Manganese at the affected reservoirs and lowering or eliminating the intake from selected wells, as needed. Flushing is planned to continue until the end of the current year.

More permanent treatment processes are available, that would remove the iron and manganese from groundwater at source, prior to the water entering the distribution system. Until such time as options for such treatment facilities are explored complete with cost implications, and appropriate systems installed based on Council's approval of the necessary funding, regional (Metro Vancouver) water supplies can be used to provide the residents in the affected areas with their domestic requirements.

Staff recommend that Council approve the purchase of additional water from Metro Vancouver and direct staff to incorporate associated costs in the 2020 budget for Council's consideration, while treatment options, including cost implications, are being explored and analyzed for future consideration by Council.

PURPOSE:

This report is in response to Council direction and outlines the municipal and residential costs, as well as timelines, associated with addressing water discolouration issues in Murrayville.

BACKGROUND/HISTORY:

At its Regular Evening Meeting on October 21, 2019, Council adopted the following resolution:

Whereas Murrayville residents continually and repeatedly suffer from discoloured and staining water as a result of Township's policy of blending GVWD and local aquifer water; and

Whereas the cost of this blended water is high for Murrayville residents due to their ongoing costs of adding and maintaining home water filtration systems plus rapid turnover replacement costs for home appliances, such as water heaters;

Therefore be it resolved that Council ask staff to bring forward a report and recommendation on switching Murrayville residents off of blended water as soon as possible; and further

Be it resolved that this staff report outline the municipal and residential costs as well as timelines of achieving a switchover to either 100% GVWD water or 100% aquifer water; and finally

Be it resolved that the cost of the switchover of the water supply in Murrayville be included in the 2020 Township of Langley budget.

DISCUSSION/ANALYSIS:

The municipally supplied water in the Murrayville (and Brookwood) system is a mixture of groundwater, sourced from local wells, and regional water supplied by Metro Vancouver. Please refer to the water systems map in Attachment A for the locations of wells, reservoirs, and supply locations.

The groundwater in the Murrayville area has trace amounts of iron and manganese, which are normally soluble and not observable. The Township, as a matter of best practice, adds chlorine to the ground water supply to satisfy public health requirements and address potential micro-organisms for water to be potable (i.e. safe to drink). In the past, Fraser Health had allowed the Township to forego chlorination, provided bacteriological results did not degrade. Chlorination equipment was installed in 2002 and used sporadically as needed. In December 2012, chlorine disinfection was mandated by Fraser Health as part of the Township's Water System Operating Permit, and has been used continuously since then.

When chlorine is added to the water, the manganese and iron react with the chlorine and precipitate out of solution. This takes some time to occur, and depends on the amount of chlorine added and water temperature. Normally, water is consumed before any appreciable amount of iron and manganese precipitates out. However, occasionally the water spends a longer period of time in the distribution system or the amount of chlorine concentration increases, resulting in the iron and manganese becoming visible (precipitating out). When temperatures increase, bacterial growth also increases, requiring heavier concentrations of chlorination. This creates a challenge in balancing the appropriate amount of disinfection (using chlorine) to reduce bacteriological growth, while ensuring it does not reach a level that would result in oxidization of the dissolved minerals in the water.

At concentrations above 0.3 mg/L, iron can stain laundry and plumbing fixtures and produce an undesirable taste. The precipitation of excessive iron imparts an objectionable reddish-brown colour to water. Low levels of manganese may accumulate in the distribution system and periodically lead to high levels of manganese at the tap. This shows as a brownish-black discolouration. The Township has a management plan utilizing best practices for watermain and reservoir cleaning, which minimizes physical/hydraulic disturbances.

In May 2019, Health Canada established a health-based Maximum Acceptable Concentration (MAC) value for manganese in drinking water of 0.12 mg/L and an Aesthetic Objective (AO) of 0.02 mg/L. Based on the most recent source water testing, Brookwood Well #10 exceeds the new MAC, and all wells exceed the AO for manganese. Brookwood Well #9 and Murrayville Wells #1 and #2 approach the MAC for manganese.

Water sources for the South Langley Water System:

Source	Average Winter Day Demands (m3)	Average Summer Day Demands (m3)	Total Demands 2018 (m3)	Manganese Levels Summer 2019 (MAC <0.12) (AO < 0.02)	Iron Levels Summer 2019 (mg/L) (AO < 0.3)
Brookwood Well 7	1148	1194	415,558	0.0527	0.14
Brookwood Well 9	1035	999	357,000	0.0937	0.05
Brookwood Well 10	1118	983	395,509	0.1370	Non detect
Murrayville Well 1	321	785	119,538	0.1030	Non detect
Murrayville Well 2	1132	2354	602,615	0.0939	0.185
GVWD	1534	8945	1,413,908	n/a	n/a
Total	6288	15259	3,303,760	n/a	n/a

The mix of local groundwater and Metro Vancouver water is dynamic, which can affect both the percentage of ground water and the level of chlorine in the system. Over the September 6, 2019 weekend, the chlorine levels slowly increased which caused the water discolouration that residents observed. Crews were mobilized to complete low flow water exchanges in affected areas of the Murrayville water system, and have adjusted the chlorine level accordingly. Daily water testing for Iron and Manganese at the reservoirs in Murrayville and Brookwood has commenced. On October 25, 2019 Brookwood Well #10 was turned off as it exceeds the MAC.

When completing regular watermain flushing, intended to remove sediment buildup, adequate water velocity in the watermain is needed to ensure that sediment in the watermain is picked up and carried by the water and discharged out of the water system by the flushing. This scouring velocity can be difficult to achieve where there are insufficient water release points (hydrants) for the size of the watermain, or where the ground terrain is such that the large volume of discharge water cannot safely flow away without causing flooding concerns.

In reviewing the Murrayville water system flushing plan there are a few locations where the large size of the watermains cause some difficulties achieving scouring velocity. In addition to the number of discharge hydrants required and ensuring the discharged water can safely drain away, great care has to be taken to start and end the flushing cycle slowly enough to ensure the pressure fluctuation does not become large enough to affect the fire suppression systems in those buildings that have fire suppression systems.

This year operational adjustments were made to increase the velocity of the water in the largest watermains during flushing. The effect of achieving a higher scouring velocity in the first large watermain was instantly noticeable, as significant amounts of iron and manganese sediment and

other normal sediment were observed in the discharged flushing water. This suggests that the velocity achieved in previous years was not accomplishing a full scour in these large watermains and that iron and manganese and other normal sediment was being retained in these large watermains.

Flushing of the Murrayville system will continue until December 2019.

From a technical standpoint, the system modifications to convert the water supply in Murrayville and Brookwood from a mixed source (groundwater and regional supply) to a completely regional (Metro Vancouver) supply can take effect immediately with no short-term constraints. This can be accomplished with Metro Vancouver water supply being provided at the 36 Avenue connection point. However, in the longer term, this arrangement may not be feasible based on restrictions in the volume of water that Metro Vancouver is obligated to supply to the Township of Langley pursuant to provisions of the historic agreement executed between the parties when the Township joined the Greater Vancouver Water District (GVWD).

With the construction of the East Langley Water Supply (ELWS) project, an allowance was made to provide some GVWD water to the Murrayville and Brookwood system from a connection point from the Brawn Pump Station in Murrayville. There currently is budget approval for design of this connection, and a further funding request for construction of the connection in the amount of \$1,500,000 has been included in the 2020 budget for Council's consideration for long-term security of supply. Until the connection from Brawn Pump Station is completed, groundwater wells would be kept on standby for potential augmentation of any shortages or supply issues.

In the long-term, however, the total GVWD supply, as stipulated in the agreement currently in place, will not be sufficient to meet the required peak water demands expected based on the population growth projected by the Brookwood-Fernridge Community Plan, adopted by Council in 2017. Having said that, continued water conservation measures, including public education, is expected to reduce the peak demands to more manageable levels.

Financial Implications:

Per the table below, if water to Murrayville, and by necessity Brookwood, areas are to be solely provided with water using the regional (Metro Vancouver) supply, an additional annual water purchase from GVWD in the amount of approximately \$1,425,000 is anticipated. This estimate is based on the 2018 water use and the 2019 water rates.

Source	Average Winter Day Demands (m3)	Average Summer Day Demands (m3)	Total Demands 2018 (m3)	Annual Metro Vancouver Cost (based on 2019 rates)
Brookwood Well 7	1148	1194	415,558	\$303,154
Brookwood Well 9	1035	999	357,000	\$257,676
Brookwood Well 10	1118	983	395,509	\$289,135
Murrayville Well 1	321	785	119,538	\$132,840
Murrayville Well 2	1132	2354	602,615	\$449,405
GVWD	1534	8945	1,413,908	n/a
Total	6288	15259	3,303,760	\$1,423,210

For a typical residential service, the 2019 water utility rate is \$516.49, which includes an increase of 4.69% over the 2018 rate. With the above increase in GVWD water purchase, the 2019 typical utility rate would have been \$549.80, an increase of \$33.31, or 11.44% above the 2018 rate.

Iron and manganese can be removed from water to levels below the Aesthetic Objective through various treatment processes. The Township is currently using filtration to do this in Aldergrove on a larger scale. Preliminary investigations have suggested that there is a reasonable short payback to construct localized treatment compared to the cost of Metro Vancouver water. Further analysis by qualified professionals is recommended to determine available treatment options complete with cost implications, which staff will undertake and present to Council at a future date for further consideration.

Optional Recommendations/Alternatives:

Continue with the current system configuration of the mixed water supply. In this scenario, should it be selected by Council, staff will maintain increased monitoring of chlorine and manganese levels in the Murrayville distribution system. Ongoing aesthetic issues in Murrayville may be due to residual manganese precipitate that had settled in the pipes due to the chlorine issues recently experienced, and occasionally getting stirred up when high flows are occurring in the pipes.

Additional flushing in Murrayville, which started at the beginning of November, should remove most of the manganese precipitate out of the system, and will continue as conditions necessitate.

Respectfully submitted,

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Kevin Larsen
MANAGER, WATER RESOURCES & ENVIRONMENT
for
ENGINEERING DIVISON

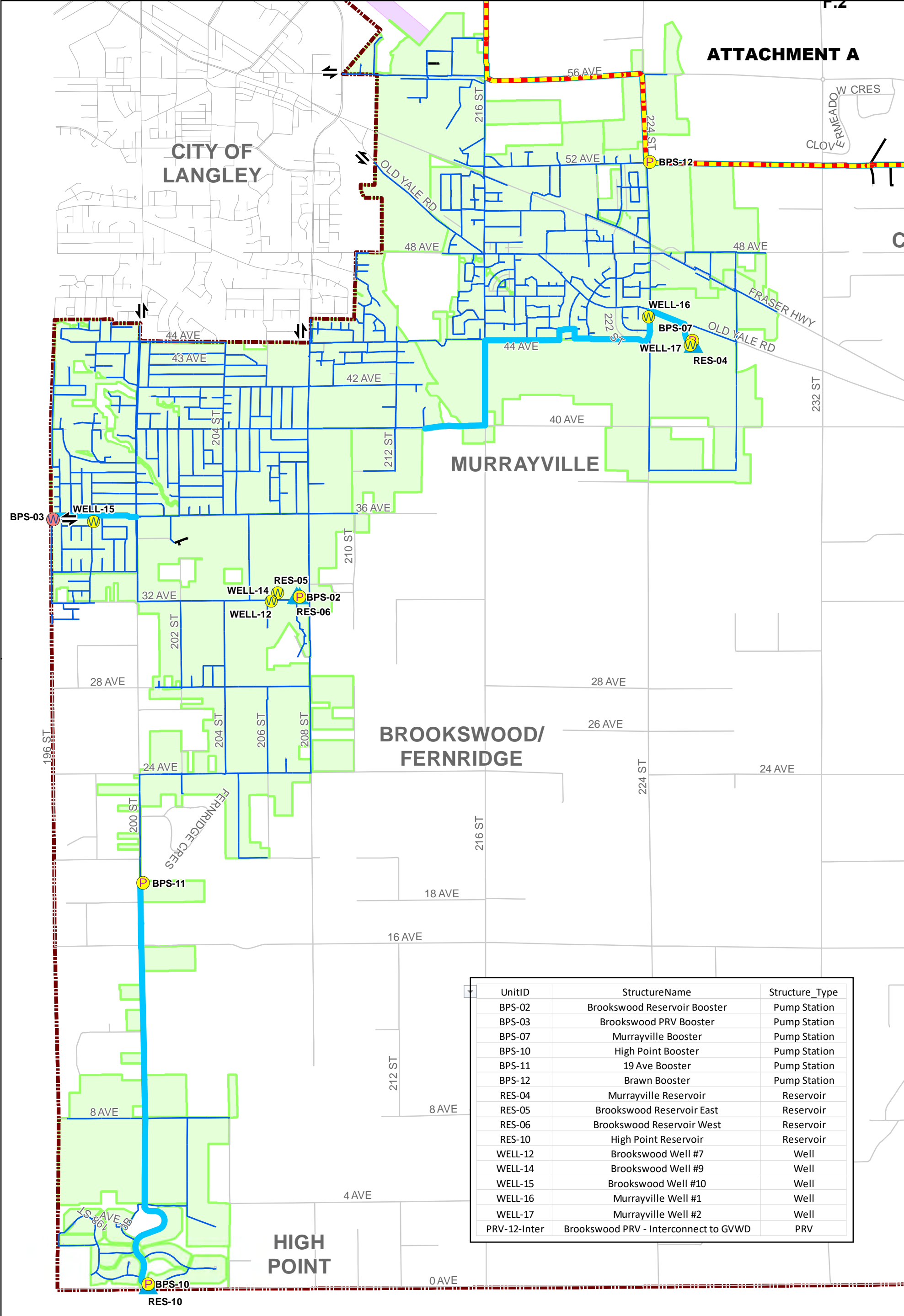
Roeland Zwaag
DIRECTOR, PUBLIC WORKS
for
ENGINEERING DIVISION

This report has been prepared in consultation with the following listed departments.

CONCURRENCES	
Division / Department	Name
FINANCE DIVISION	K. Sinclair

ATTACHMENT A Brookwood / Murrayville Water System Map

ATTACHMENT A



Path: N:\Maps\Standard Maps\Engineering\Water_System\Eng_TW_System_Brookwood_Murrayville.mxd



Brookwood / Murrayville Water System

Printed Date: 17 October 2019

- Active Municipal Well (WELL-)
- Pump Station (BPS-)
- Reservoir (RES-)
- GVWD Connection (PRV-xx-Inter)
- Inter-Municipal Connections

- Parcels on Municipal Water
- Parcel Supplied by City of Langley
- ELWS - East Langley Water System
- GVWD Metro Vancouver Water Main

- Water Mains
- Township of Langley
 - Private
 - TOL Dedicated Trunk Main

Disclaimer:
The data provided has been compiled from various sources and is not warranted as to its accuracy or sufficiency by the Township of Langley. The user of this information is responsible for confirming its accuracy or sufficiency.



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