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Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

File: 2013

July 28, 2020

Beauchesne/Huang Marijuana Facility
Concession 8, Lot 25
998266 Mulmur-Tosorontio Townline, Mulmur
Ontario, L9V ON4

Attention: Denis Beauchesne

Re: Hydrogeology Report: SPA1-2020

Dear Mr. Beauchesne;

1.0 Introduction and Summary of Findings

We are pleased to provide a hydrogeology report summarizing our findings regarding potential interference with neighbouring private wells. Based on our pumping test and review of nearby water well records, we have concluded that any interference with a neighbour's water well will be minimal and the facility can withdraw up to 50,000 litres per day.

2.0. Scope of Work

In order to address the comments from the Township of Mulmur, we completed a pumping test in the site well and reviewed water well records for wells within 500 metres of the site well.

3.0. Analysis of Well Yield

On Wednesday July 15, 2020, Harden Environmental conducted a four-hour pumping test in the drilled well located at 998266 Mulmer-Tosorontio Townline. The well was completed on July 14, 2020 by Allan Wright Well Drilling. The well is 32 metres deep and has a static water level of 5.61 metres below casing top. The aquifer is a thick layer of brown sand found between 6 and 32 metres depth.

The well was pumped at several pumping rates in order to develop an understanding as to how the water level in the well will respond under varying conditions. The pumping rates were 5.8, 8.8, 11.5, 13.7 and 15.2 U.S. gallons per minute (22, 33, 44, 52, 58 L/min).

Figure 1 shows the response in the site well to the various pumping rates. After four hours of pumping, the water level in the site well had decreased by 8.41 metres and a total of 11,250 litres had been removed. The well recovered 97% within 40 minutes of cessation of pumping.

The maximum allowable water taking without a Permit to Take Water is 50,000 litres per day. A pump can be operated continuously at 9.1 US gpm (35 L/min) and remain within the allowable daily taking. Based on the pumping test results, the long-term drawdown in the well is estimated to be between 6 and 7 metres at a rate of 9.1 US gpm. It is estimated that the well can produce up to 25 US GPM (95 L/min) for short periods of time.

Figure 2 is a graph of the time-recovery in the well. Using the straight-line Jacob method, the transmissivity of the aquifer can be estimated using the following equation;

$T = 0.183\ Q / \Delta s$

Where;

T =transmissivity (m^2/day)
Q =pumping rate (m^3/day)
Δs = recovery over one log cycle (m)

The recovery over one log cycle is 1.5 metres, the average pumping rate was 66 m^3/day. Therefore, the estimated transmissivity is 42 m^2/day.

4.0. Analysis of Interference with Neighbours Wells

An irrigation well identified as 7187620 on Figure 3 is located approximately 600 metres from the site well. This well is 79.3 metres deep and obtains water from a deeper sand and gravel aquifer than the site well. There is a layer of clay between the aquifers. The irrigation well is rated at 530 US GPM.

The water level in the existing on-site dug well was monitored during the test and there was no influence observed between the site test well and the dug well.

Water well 1703617 (998290 Mulmur-Tosorontio Townline) is located approximately 200 metres from the site well. This well is 20 metres deep and has a static water level of 6 metres. Therefore, this well has approximately 14 metres of available drawdown. According to the water well record, the drawdown in well 1703617 during pumping was 7.3 metres at a rate of 11 US gpm.

There is no water well on record for 998381 Mulmur-Tosorontio Townline located a similar distance (approximately 200 m) from the site well. It is likely that this well is a dug well without a record.

The drawdown (s) at any distance (r) from the pumping well can be estimated using

$s = 0.183Q*\log(2.25\ T\ t/r^2S)/T$
where;

S = aquifer storativity (estimated to be 0.005 for a semi-confined aquifer)
t = time of pumping (days)
$Q = 50\ m^3/day$

Figure 4 is a graph of the estimated drawdown from the site well after 20 years (7300 days) of pumping. After 20 years of continuous pumping, the estimated drawdown at the nearest private well (1703617) is 0.75 metres.

5.0. Conclusions

It is our conclusion that the pumping of the site well at a rate of less than 50,000 litres per day will result in less than one metre of drawdown in the nearest private well located at a distance of 200 metres from the site well. This well is completed in the same semi-confined aquifer. It is highly unlikely that the site well will be operated continuously, and as seen during the testing period, there is a rapid recovery of the water level.

It is our conclusion that this will not interfere with the neighbour's ability to extract water from their well.

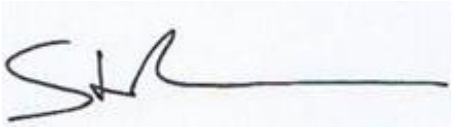
It is our conclusion that there will be no interference with the water taking for well 7187620 as this well obtains water from a deeper aquifer.

It is our conclusion that there will be no impact on the shallow dug well located adjacent to the site well and also no impact to any shallow dug well in the area.

6.0 Closure

Respectfully submitted:

Harden Environmental Services Ltd.



Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

Figure 1: Drilled Well Pumping Test

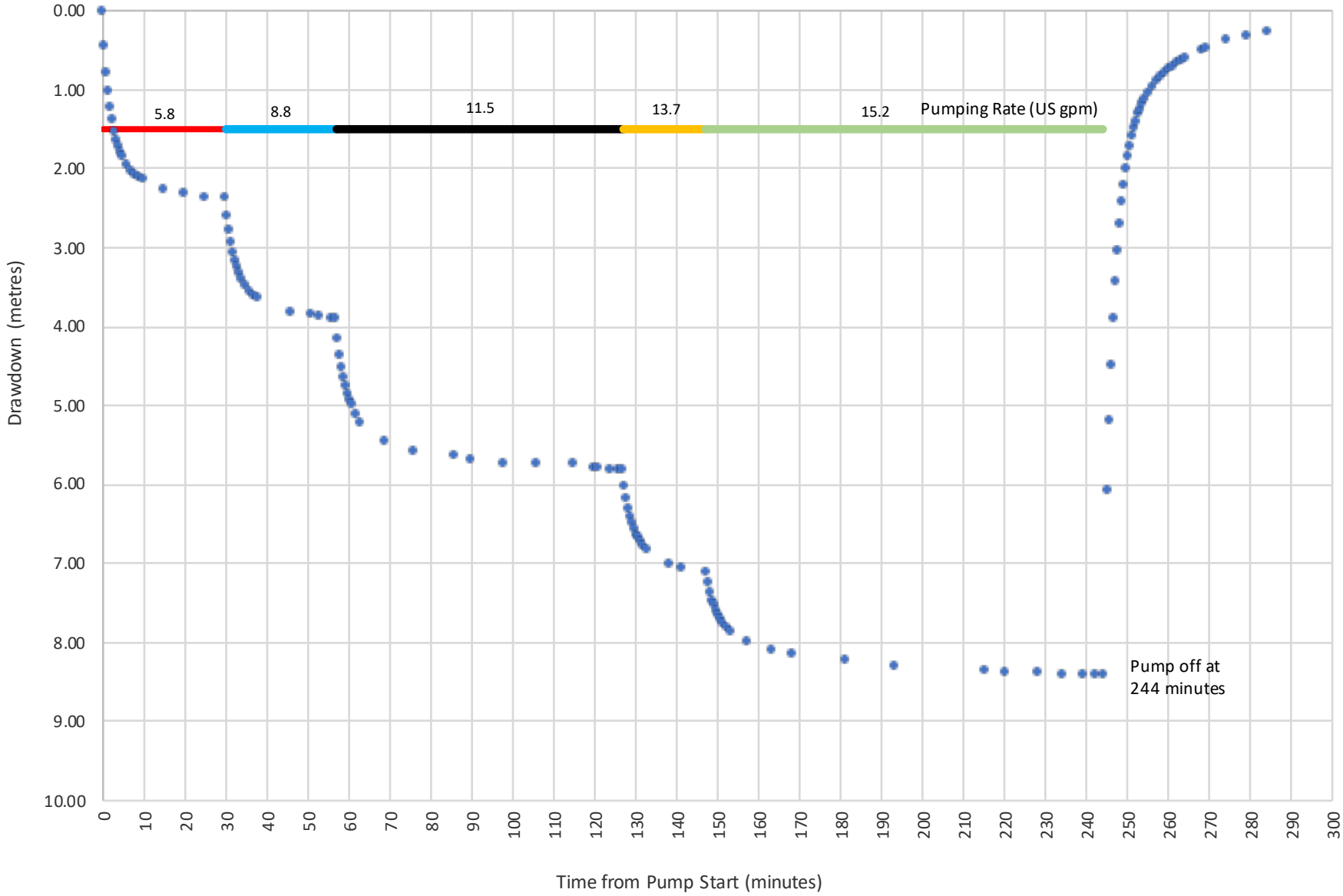
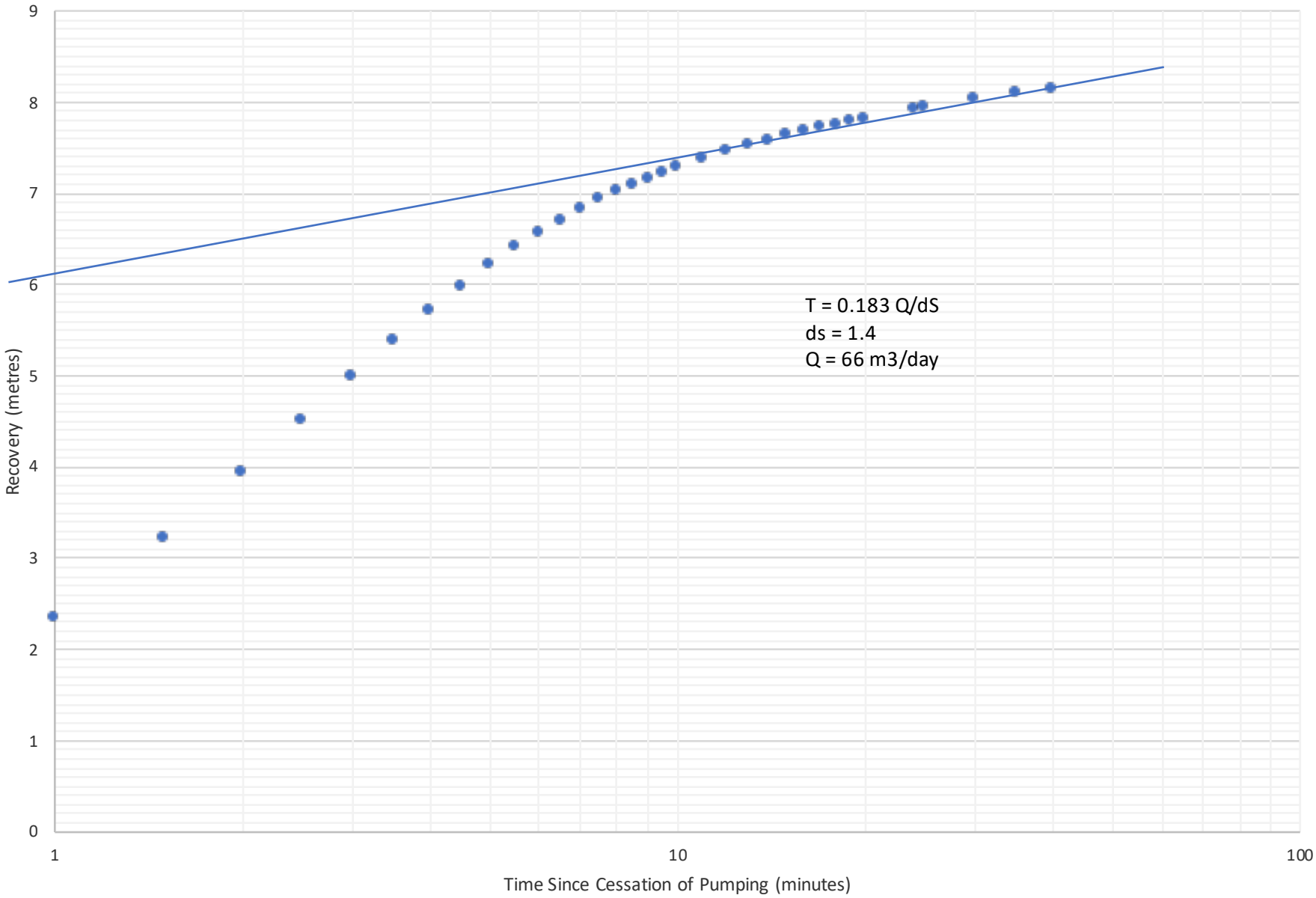


Figure 2: RECOVERY DATA



Harden Environmental Services Ltd.	**Project No:** 2012 **Date:** Jul 2020 **Drawn By:** AR	Hydrogeological Assessment 998266 Mulmur-Tosorontio TL, Mulmur, L9V 0N4 Township of Mulmur, County of Dufferin MULMUR CON 8 EAST OF HURONTARIO STREET, LOT 25	**Figure 3: Water Well Records within 1000 metres**

Figure 4: Estimated Drawdown with Distance