THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

INFRASTRUCTURE COMMITTEE MEETING
OF THE VILLAGE OF LIONS BAY
HELD ON MONDAY, MARCH 26, 2018 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY

AGENDA

1. Call to Order

2. Appointment of Recorder

3. Approval of the Agenda

4. Public Questions & Comments

5. Approval of Minutes
- A. Infrastructure Committee Meeting – February 26, 2018 (Page 3)
- B. Action Items from the Minutes

6. Business Arising from the Minutes

7. Unfinished Business
- A. CWWF Projects
  - i. Water Storage Facility Replacement, et al
  - ii. Bayview Road Project (Future CWWF 2 Project)
- B. Magnesia and Harvey Condition
  - i. Intake Access Road – Report from Thurber Engineering Ltd. (Page 7)
  - ii. Magnesia Intake Flushing Report (Page 13)

8. New Business
- A. Memorial Project

9. Public Questions & Comments

10. Next Meeting – April 23, 2018

11. Adjournment

LIONS BAY INFRASTRUCTURE COMMITTEE MEETING
MONDAY 26 FEBRUARY 2018 AT 7:00 PM
COUNCIL CHAMBERS, 400 CENTER ROAD, LIONS BAY

MINUTES OF THE MEETING

In Attendance:

Fred Bain – Councilor and Committee Chair
Naizam Jaffer – Public Works Manager
Jim Mutrie – Resident
Tony Greville – Resident
Karl Buhr – Mayor
Norm Barmeir - Councilor
Brian Ulrich – Resident

Regrets:

Peter Dejong - CAO

1. **Call to Order**
   Meeting was called to order at 7:03 pm.

2. **Appointment of Recorder**
   Regular recorder: Brian Ulrich

3. **Approval of the Agenda**
   The Agenda was approved as is.

4. **Public Questions & Comments**
   None

5. **Approval of the Minutes**
   A. The 22 January 2017 IC meeting minutes were approved after the following changes:
      - In Section 7, Unfinished Business, last bullet under part ‘a’ should read: “Staff are working with AECOM to review reserves with the absence of Harvey Tank.”

      - In Section 7, Unfinished Business, third item under second bullet of part ‘c’, Magnesia, which reads: “Staff are considering IC’s suggestion of using the municipality’s semi portable water tanks as a source of water for hydraulic flushing the gallery” is to be deleted.

      - In Section 7, Unfinished Business, second sub bullet under second bullet of part ‘c’ should read: “looking into the availability of one of our fire pumps to do the job”

- In Section 8, New Business, part ‘b Leakdown test’, second bullet should read: “Suggestion was made that we wait until we have flow meters”.

- In Section 8, New Business, part ‘c’ should be titled “Need for a generator for the municipal offices”

B. Review of Action items from 22 January 2018 minutes.

There were no action items from these minutes.

6. Business Arising from the Minutes

A. Boydel.
Tony was asked again by Boydel what the stumbling block is. We did not take them up on a grant that was available for the project and the grant went to a project they’re doing in Esquimalt for DND. Now there is a second grant available, and they (Boydel) have improved their system. They indicated that we may be able to take advantage of the second grant.
IC decision: We’ll pass on pursuing their technology at this time.

B. FlowWorks
Three new flow meters will be on line in the SCADA system soon but KWL cannot guarantee flow data from the tanks. AECOM, however is committing that we will have flow data once the new tank project is done.

C. Generator
We can, according to code, use the generator we have to power the second building. Nai indicated that we need to get an electrical engineer in to map out the power demand from the two buildings and provide a report.

7. Unfinished Business

A. CWWF Projects

i. Water Storage Facility Replacement – Update

The tender closes on March 21. The site visit was last Thursday (Feb 15th) and Graham Construction was one of the attendees. The intent is to call a Council meeting on March 29th to award the contract so work can start the beginning of May or earlier.

The water conservation memo is in draft form and Staff are reviewing it. This plan is a prerequisite for grant funding.

The memo defining the triggers for imposing each water conservation level is also in draft and under review by Staff.

The SCADA communications memo is also in draft and under review.

Once Staff has completed review of the above three memos they will be brought to the Infrastructure Committee.

Modelling work on fire flows while the Harvey Tank is offline for replacement work is in progress. The configuration being analyzed includes flow from the 25K gallon Oceanview tank without any contributing flow from Magnesia.

ii. Bayview Road Project (future CWWF 2 project)
AECOM has done the remaining survey work required. Once we get that file it will be sent to ISL to get the project 'shovel ready' for Phase II.

We have applied for an extension given the rate of progress so far. If we don't get the extension we only get 2 new tanks (Highway buried tank & new Harvey Tank) and a new PRV on Bayview, but not the other 3 options in the original application (Harvey Crossing, Upgraded Bayview and PRV.

According to Nai, we are on track to the revised schedule to meet March 31st deadline (however there is no design done for the 3 options – the water bridge being the longest in design time of the 3).

B. Magnesia and Harvey Intake upgrades – Update

Magnesia is still plugged. Next step is to flush with pumped water. (all flushing to date has been with air per the design intent, which has been ineffective). If flushing with pressurized water does not clear the gallery, the next step will be to go back to CREUS for resolution.

Harvey intake now has 2 slides on the access road. The second slide is 20 meters past the original slide site that is to be fixed using the grant. Vehicle access is not possible now but personnel can walk to the intake provided the weather conditions meet safety policy requirements. (which they have not for some time). We have drone footage coming within a week that will show what is happening at the intake.

C. UBC Water Hydrology Project Update

No change since last month. The ball is in UBC's court and we need to urge them to complete their PR tasks and proceed to next steps.

8. New Business

None.

9. Public Questions and Comments

There were no questions or comments from the gallery.

10. Adjournment

Meeting was adjourned at 8:19 pm.

11. Next Meeting

The next meeting is scheduled for Monday 26 March 2018 at 7:00 pm.

THURBER ENGINEERING LTD.

November 30, 2016 File: 15210

The Municipality of Lions Bay
PO Box 141, 400 Centre Road
Lions Bay, BC
V0N 2E0

Attention: Nai Jaffer, Public Works Manager

GEOTECHNICAL REVIEW OF ACCESS ROADS
HARVEY AND MAGNESIA CREEK INTAKES
LIONS BAY, BC

Dear Nai:

Further to your request, Thurber Engineering Ltd. completed a site visit to observe the geotechnical conditions along the access roads to the Harvey and Magnesia Creeks drinking water intakes in the Village of Lions Bay (Village). The site visit was completed on the morning of September 15, 2016 in the company of two representatives from the Village. This letter presents a brief summary of our observations and provides our comments on the conditions. Further, you have asked us to provide our comments on the possible construction of a rockfall shed (cantilevered or otherwise) to protect the Harvey Creek access road.

It is a condition of this letter that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. BACKGROUND

A landslide can be defined as "the movement of a mass of rock, debris, or earth down a slope" (Cruden, 1991).

We understand that the access roads to the water intakes at Harvey and Magnesia Creeks have been impacted by several landslide events in the last few years. Further, we understand that the frequency and volume of the landslides is typically higher at Harvey Creek compared to Magnesia Creek. Such landslide events have impeded access to the intake structures. Further, the landslide hazard results in a risk to Village maintenance workers who need to clean and maintain the water intakes, particularly during wet weather when debris is moving in the creeks.

We understand that numerous and detailed studies of these access roads have been completed by others. Thurber was provided with the following background information prior to our site visit.

- April 15, 2016 letter by GeoPacific entitled "Post Remediation Field Review Comments, Harvey Creek Intake Access Road Rock Fall Review, Lions Bay BC"
- June 4, 2016 letter by CREUS Engineering Ltd. (CREUS) entitled "Harvey Road Slide – Completion Report"

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- June 10, 2013 drawings by CREUS entitled “Roadworks, North Access Plan and Profile, R-1 and R-2”

Thurber was retained by the Village to complete a brief site visit to observe the general geotechnical conditions along the access roads to the creeks and to provide or comments on the possibility of implementing potential landslide stabilization or protection measures. Our review and comments are conceptual in nature. Thurber has not completed any detailed mapping or slope stability analysis or modelling for the site or analyzed the frequency and magnitude of landslide events.

2. HARVEY CREEK WATER INTAKE ACCESS ROAD

2.1 Observations

The portion of the Harvey Creek intake access road that is subject to relatively frequent landslides is about 400 m long. Slopes above and below the approximately 4 m wide intake road are very steep and are sparsely tree covered. The slopes are generally bedrock but there are some locations where soil is exposed. Based on topography in the CREUS drawings, the near vertical portion of the slope could extend 60 m or more above the access road with steep, mountain slopes extending above that. Very steep soil slopes were noted above where the early 2016 landslide event occurred. This soil slope appeared to be actively eroding.

Significant portions of the bedrock exposed in the slope at road level was poor quality and highly fractured. The rock mass has many persistent discontinuities (i.e. faults, joints, etc.) that are very closely spaced in some areas. Where the 2016 landslide occurred, the rock mass was friable and could be crumbled into pieces by scraping the face by hand. This structural fabric causes the rock mass to be very susceptible to weathering and erosion. Many potentially unstable rock blocks and areas of the slope where observed during the visit. Several small rock blocks that had fallen from the slope were scattered on the road surface.

The Village representatives reported that several landslides comprising logs and unsorted debris have occurred within the various gullies above the road. These landslides have resulted the deposition of a significant amount of material on and beyond the access road. These landslides may have originated on the slope high above the road.

2.2 Comments and Further Work

The landslide hazard along the access road is high. The access road slopes are high and gullied and are generally comprised of poor quality, highly fractured bedrock with intermittent soil overlying bedrock. Both the bedrock and the soil are very susceptible to ongoing weathering during freeze/thaw cycles and erosion during periods of heavy rainfall.

Common slope stabilization techniques would be very difficult to employ and would only result in a very minimal reduction in the probability of landslides occurring. Stabilization would be very

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difficult due to the height of slope that would require treatment, the poor quality of the rock and the multiple slope instability mechanisms. Common rock slope stabilization techniques often involve installing anchors into the bedrock. In this case, very long anchors would likely be required due to the poor quality rock and setting up safe working conditions on the slope would be very difficult.

An alternative to stabilization would be the construction of some sort of landslide protection measure. Space constraints along the road would have to be considered for any protection measure. Protection measures for rockfall include barriers, fences and embankments. However, barriers and fences may be of little value for some of the landslide mechanisms that occur along the access road and embankments require a significant amount of space.

Another protection measure that could be considered is some sort of rock shed or gallery. This is a possible solution that was raised by the Village. Rock sheds or galleries are a highly reliable protection measure that are primarily used to protect major transportation corridors and tunnel portals from falling rock, a particular type of landslide.

Rock sheds are used in Japan and Europe but are less common in North America where traffic volumes are lower and the high cost of construction limits their use (Wyllie, 2015). Rock sheds are typically constructed of pre-cast concrete beams and slabs and require high capacity foundations to support the very high loads from both the structure and the rocks it must shed or retain. These foundations can be very difficult to construct on steep slopes and often require rock socketed pile foundations to transfer the load to stable rock. Construction of this type of structure could be on the order of $5 to $10 million or more for this location. Further work would need to be done to assess applicability of the structure to all the observed types of landslides that have occurred along the access road.

Based on the slope conditions observed during our site visit, we suggest that the Village strongly consider the possibility of relocating the intake structure on Harvey Creek to a location that has reliable and safe access for maintenance. Locations below the current intake will require pumping of water up to existing reservoirs. However, it is our opinion that money would be better spent the costs of this infrastructure than on attempts to permanently stabilize the slope above the access road or construct a protection shed.

We understand that the Village has implemented a procedure for maintenance worker travel along the intake access road and work at the intake. Review or provision of input into this procedure is outside of our scope of work.

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3. MAGNESIA CREEK WATER INTAKE ACCESS ROAD

The slopes above the final portion of the Magnesia Creek intake road generally comprise fractured bedrock with moderately spaced discontinuities. At one location, the road is narrow and takes an approximately 90 degree bend around the edge of a bedrock ridge above the creek. At this location, the bedrock is blocky with some potential for instability due to both toppling and sliding. We understand that some rock scaling has been done at this location in the past and a portion of the slope is covered by rockfall mesh. The surface blocks appeared to be loose and potentially unstable at some locations.

Closer to the intake, the rock blocks exposed on the surface slope are generally larger. There was no evidence of active slope stabilization (i.e. rock bolts, shotcrete) having been completed in this area. The access road closer to the intake is wider than at the sharp bend.

Based on the slope conditions observed, it is our opinion that the safety and reliability of this access road could be improved. Slope maintenance such as scaling and installation of some stabilization and/or protection measures such as rock anchors and additional slope mesh would decrease the probability of rockfall and increase protection for the road. It may also be possible to install other protection measures such as impact walls or ditches.

Thurber could complete a detailed assessment of the slope immediately above the access road and provide the Village with a brief report complete with plans detailing proposed stabilization measures. Our assessment would generally be completed from road level and limited to the slope within about 10 to 20 m above the road. The recommended work areas could be prioritized based on the experience of Village staff and our field observations. If the Village wants to proceed with this assessment, we suggest an engineering budget of $4,000 to complete 1 day of additional field work that will include mapping of bedrock outcrops and preparation of a report that presents our observations and provides our recommendations. Annotated photographs of the rock slope outlining the recommended stabilization work would be provided in our report.

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4. CLOSURE

We trust this is sufficient information for your current needs. Please feel free to contact the undersigned at your convenience with any questions.

Yours truly,
Thurber Engineering Ltd.
David Regehr, P.Eng.
Review Principal

Ben Singleton-Polster, P.Eng.
Project Engineer

Attachments: Statement of Limitations and Conditions

References:

Cruden, C.M. 1991. A simple definition of a landslide. Bulletin of the International Association of Engineering Geology, No. 43, pp. 27 – 29.

Wyllie, D.C. 2015. Rock Fall Engineering. CRC Pres Inc., Boca Raton, Florida, 243 pp.

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

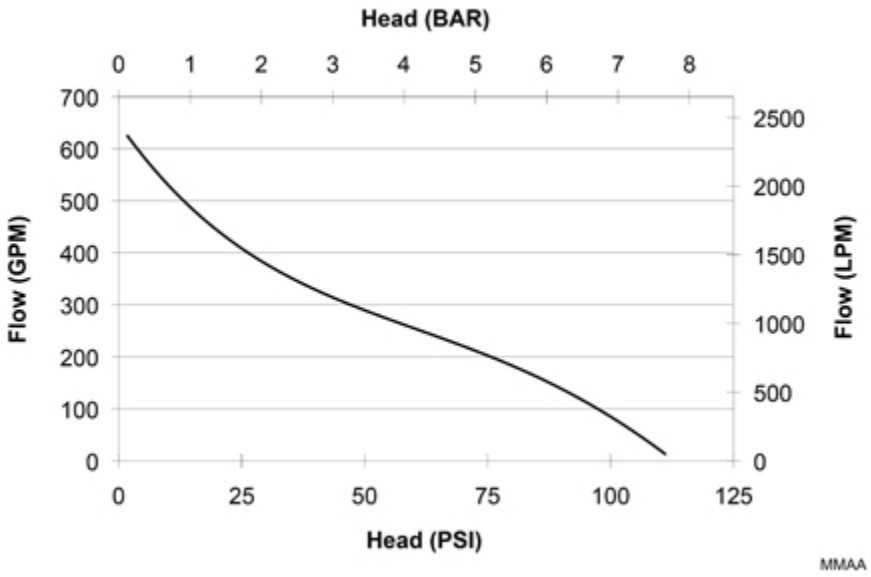
The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

Mag intake flushing March 16, 2018

Honda gx630/ CET water pump - PFP-20HPHND-2D

Garth, Neale and Kyle attended mag intake to try to clear the infiltration gallery after a full day of flushing.

We used the fire departments CET brand water pump. Specs shown below:



POWER : 15.5KW

MAX FLOW : 630 GPM

MAX PRESSURE : 105 PSI

410 GPM @ 25 PSI

300 GPM @ 50 PSI

100 GPM @ 100 PSI

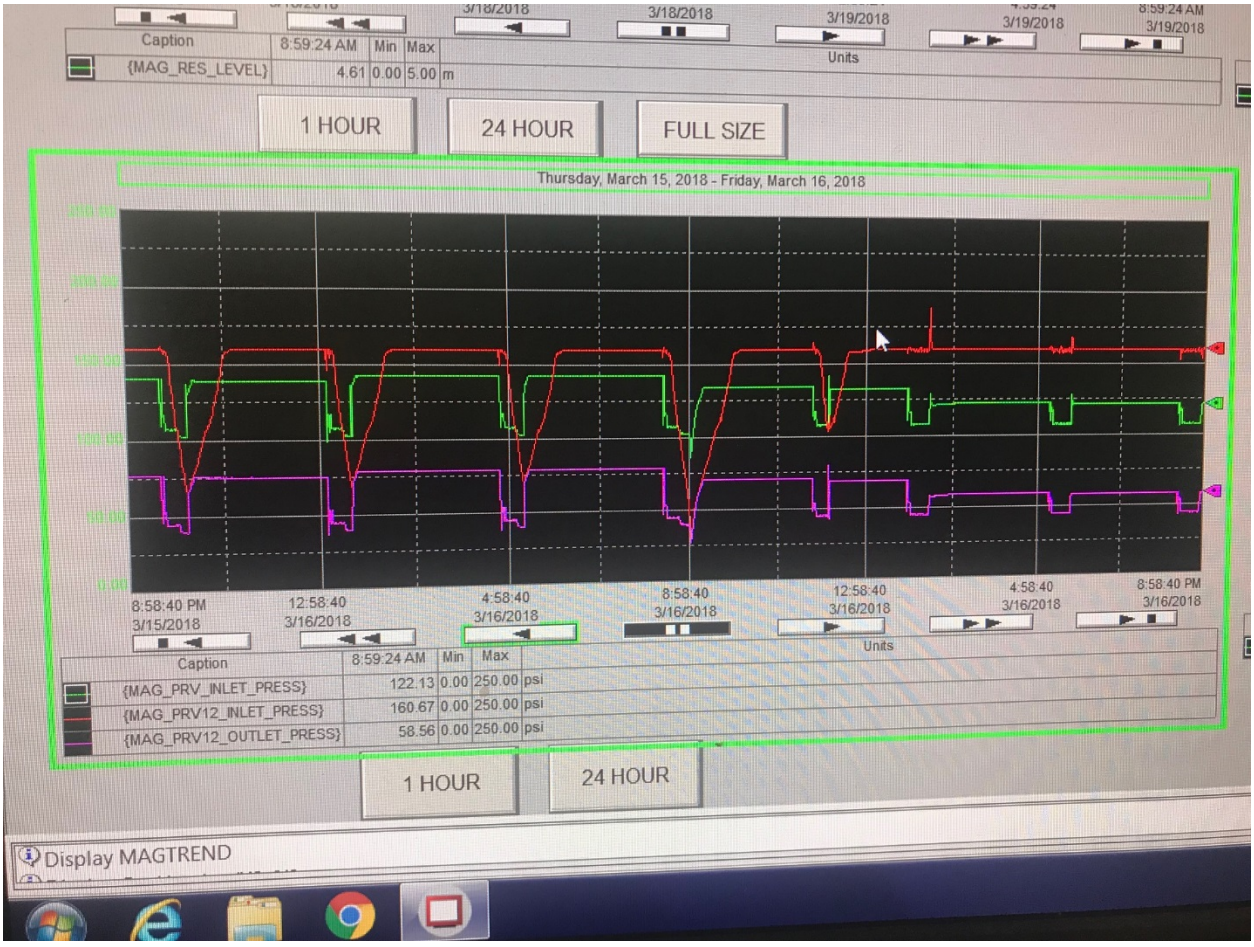
We supplied water through a 15ft length of 2 ½" fire hose, adapted to the piping in the bed of the infiltration gallery

After priming the pump and setting the engine to full throttle, discharge pressure was 62psi, indicating aprox 250gpm flow.

After 3 minutes a barely perceptible color appeared to the water, indicating very little agitation to the infiltration bed. The fire hose was switched back and forth to the piping around the infiltration pipe with little to no change in the plugged bed.

We then tried a make shift nozzle from pipe thread nipples. Using a 1 ½" nozzle we blasted the top of the grate. Large amounts of sand, mud, organics and sticks were washed away from the grate with this method. We alternated washing with the fire hose and draining the weir with the sluice gate to achieve an "as good as it gets" cleaned infiltration gallery

Red line below indicates upstream water pressure, showing inability to supply sufficient water as the tank fills at 210gpm on the 2" cla-valve , (plugged intake) then after the mouse cursor, showing ability to supply >210gpm while filling at 210gpm.(cleaned intake) Uncertain if it would be able to supply sufficient water when mag was filling on the 6" cla-valve, but certainly still operating well below its designed capacity: to be able to supply "twice the volume of what the pipe can carry" (creus)



Neale Mullen