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A19.2

Summary of Analytical Results – Groundwater Pumping Test Areas (2019/2020)

Appendix A19.2

Summary of Key Analytical Results - Groundwater Pumping Test Areas (2019/2020)

Note: Please read alongside tabulated summary of analytical results (included herein)

Abbreviations:

- *EPA – Environmental Protection Agency*
- *GTV – Groundwater Threshold Value*
- *IGV – Interim Guideline Value*
- *LOD – Limit of Detection*

Area AZ-1 Northern Section:

Groundwater sampling was undertaken at eight newly drilled boreholes along the R132, north in February/ March 2020 as part of the initial pumping test works. The main pumping wells were also tested during the second test completed in September 2020. At the R132, south groundwater quality testing included at the pumping borehole and observation wells in February/ March 2020 (initial pumping test) and at the pumped borehole in September 2020 (second pumping test period).

In general, exceedances of the GTV (0.00075mg/l) for the metal mercury were observed during the initial pumping tests only, in both shallow and deep boreholes along the R132, with a range of 0.00095mg/l to 0.0032mg/l reported. A single detection of the metal zinc above the GTV (0.075mg/l) was recorded at NBH401 (Gravels) during the second pumping test. A single exceedance of the GTV (0.175mg/l) for ammonia was reported for samples from NBH404 (Bedrock) only. A single detection above the laboratory detection limit (0.01mg/l) for Total Petroleum Hydrocarbons (TPH, >C6-C40) was reported at the R132 south borehole location NBH406 (Bedrock) i.e. 0.34mg/l which also exceeds the GTV (0.0075mg/l). A single [rare] detection of fats, oils and grease was recorded at NBH406 (Bedrock, 81mg/l) and is possibly a laboratory anomaly.

Area AZ-2 Airport Section:

Groundwater was sampled at South Portal (Portal 2, Pumping Test Area 1) the only testing area within geographical area AZ-2. Analysis was completed on groundwater from pumped boreholes NBH06 (Bedrock) and NBH06A (Gravels) during June 2019 (initial test) and September 2020 (second pumping test period).

In general, the majority of the test results were reported at less than detection with rare exceedances of analytes reported above available GTVs. Ammonia was reported as exceeding the GTV (0.175 mg/l) at bedrock borehole NBH06 (i.e. 0.29mg/l - 0.35mg/l) in June 2019.

Area AZ-3 Dardistown to Northwood Section:

There was no hydraulic testing completed within this area and consequently no groundwater sampling.

Area AZ-4 Northwood to Charlemont Section:

Groundwater sampling was undertaken at newly drilled pumping wells located within geographical area AZ-4 and included analysis of groundwater at deep excavations for proposed stations namely at Glasnevin (July 2019), O'Connell Street (July/ August 2019), Tara Street (September 2019) and Charlemont (April/ May 2019) as part of the initial pumping test works. The main pumping wells at these locations were also tested during the second test i.e. Glasnevin (June 2020), O'Connell Street (March 2020), Tara Street (March 2020) and Charlemont (February 2020). An additional summary of the key observations is provided as follows:

- General: Slight exceedances of the EPA IGV for Chloride (30mg/l) are observed at all stations.

- General: The parameters related to TPH and BTEX were mainly recorded as below the respective LOD.

- Glasnevin Station (Pumping Test Area 2) -
  - No exceedances of available guideline values for metals.
  - A single exceedance of the GTV (0.0075mg/l) for Total TPH (>C_6-C_{40}) in July 2019 i.e. 0.68mg/l reported -there were no further detections above LOD at this well. No detections of other organics noted.
  - Elevated sulphate at NBH19A (160mg/l) in July 2019 when compared with the GTV (187.5mg/l).
  - Exceedance of ammonia GTV (0.175 mg/l) observed in borehole NBH19A (Gravels) with 0.23-0.24mg/l reported in July 2019 i.e. no change during the testing period.

- O'Connell Street Station (Pumping Test Area 3) -
  - A single detection of the metal mercury only slightly above the GTV (0.00075mg/l) was recorded at NBH23 (Bedrock) at 0.00081mg/l. No other exceedances of available guideline values for metals.
  - No exceedance of the available GTV for organics listed during either 2019 or 2020 sampling.
  - A single exceedance for sulphate at NBH23 (Bedrock, i.e. 200mg/l) in August 2019 and elevated value reported for March 2020 (170mg/l) when compared with the GTV (187.5mg/l).
  - Exceedances for chloride at NBH23 (Bedrock) i.e. 520mg/l for August 2019 and 390mg/l for March 2020 when compared with the GTV (187.5mg/l).
  - Elevated nitrate at NBH23A (Gravels) in March 2020 (12mg/l – 13mg/l) when compared with the reported value of 2.1mg/l for July 2019.
  - Elevated COD at NBH23A (Gravels) in March 2020 (11mg/l – 15mg/l) when compared with the reported value of <LOD for July 2019.
  - Elevated total dissolved solids (TDS) at NBH23 (Bedrock) well at 1,400mg/l (August 2019) and at 1,200mg/l (March 2020).

- Tara Street Station (Pumping Test Area 4) -
  - Exceedances of the metal arsenic above the GTV (0.0075mg/l) were recorded at NBH26A (Gravels) at 0.052mg/l in September 2019 and at 0.014mg/l in March 2020. The reported value for NBH26 (Bedrock) in March 2020 (0.01mg/l) also exceeded the GTV.
  - Exceedances of the metal chromium above the GTV (0.0375mg/l) were recorded at NBH26A (Gravels) at 0.097mg/l in September 2019 and at 0.042mg/l in March 2020.
  - Exceedances of the metal mercury above the GTV (0.00075mg/l) were recorded at NBH26A (Gravels) at 0.0039mg/l in September 2019 and at NBH26 (Bedrock) at 0.0034mg/l in March 2020.
  - Elevated zinc was reported for samples collected in March 2020 at NBH26A (Gravels) at 0.053mg/l and at NBH26 (Bedrock) at 0.051mg/l when compared with the GTV for zinc (0.075mg/l).
  - No exceedance of the available GTV for organics listed during either 2019 or 2020 sampling.
  - Exceedances of the GTV (187.5mg/l) for sulphate at NBH26A (Gravels) i.e. 1,300mg/l in September 2019 and 970mg/l in March 2020, with the reported value for NBH26 (Bedrock) at 650mg/l also exceeding the GTV.
  - Exceedances of the GTV (187.5mg/l) for chloride at NBH26A (Gravels) i.e. 9,200mg/l in September 2019 and 5,400mg/l in March 2020, with the reported value for NBH26 (Bedrock) at 4,300mg/l also exceeding the GTV. This may reflect local tidal influence in groundwater as observed in hydrographs for the wells.
  - Elevated COD at NBH26A (Gravels) i.e. 51mg/l in September 2019 and 55mg/l in March 2020, with the reported value for NBH26 (Bedrock) at 49mg/l indicating some consistency in reported concentrations for groundwater sampled in both the overburden and bedrock wells.
  - Exceedance of GTV (0.175 mg/l) for ammonia observed in borehole NBH26A (Gravels) with 0.35mg/l reported in September 2019.
  - Elevated total dissolved solids (TDS) at NBH26A (Gravels) well at 13,000mg/l (September 2019); (this parameter was not tested in March 2020).

- Charlemont Station (Pumping Test Area 5)
  - No exceedances of available guideline values for metals.
  - No exceedance of the available GTV for organics listed during either April/ May 2019 or March 2020 water quality sampling.
  - Reported sulphate concentrations at NBH30 (Bedrock) ranged between 94.0mg/l – 110mg/l, but values lie well within the GTV (187.5mg/l).
  - Exceedance of GTV (0.175 mg/l) for ammonia observed in borehole NBH30 (Bedrock) with 0.64mg/l reported in May 2019.
  - A single [rare] detection of fats, oils and grease was recorded at NBH30 (Bedrock, 17mg/l) and is possibly a laboratory anomaly.