AECOM

Gökırmak Copper Project

Hydrogeological Impact Assessment
Final Report

Acacia Maden İşletmeleri A.Ş.

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1. Introduction

The Gökırmak Copper Project ("GCP", "The Project") is a proposed copper mine, being developed by Acacia Maden İşletmeleri A.Ş. (Acacia, AMI). Proposed mine is located in the Hanönü District of Kastamonu Province in Northern Turkey. Surface and subsurface investigations on characterization of the ore grade and shape of the ore body have been carried out by Acacia since 2011.

Various environmental studies have been completed on site since 2011 to understand the potential impacts of the proposed mining activities. As part of these studies, AECOM Turkey was contracted by Acacia to complete the hydrogeological impact assessment of the proposed Gökırmak Copper Mine and its associated facilities on the groundwater resources in the vicinity of the mine area. This report presents the hydrogeological characterization studies conducted to date.

1.1 Overview

The mine site lies within the boundaries of Hanönü District which is located at an air distance of 50 km east of the Kastamonu Province. The mine will be operated as an open pit, where the ore will be excavated, crushed and milled, then will be concentrated with flotation process to produce copper concentrate.

The Project has an estimated operation phase of 12 years and 4 months (including top soil stripping and mine production). The resource is reported as 24.45 Mt at an average 1.64% Cu. At a cut-off grade of 0.3% Cu, of the 24.45 Mt, measured resource is 3.33 Mt at 2.04% Cu or 68,000 tons of Cu, indicated resource is 20.34 Mt at 1.58% Cu or 321,000 tons of Cu and inferred resources is 0.78 Mt at 1.7% Cu or 13,000 tons of Cu.

The 122,447 kBCM waste rock (with the swell factor in consideration) generated during the lifetime of the Project as a result of stripping operations is planned to be stored at the Çorakoğlu WRD, which has a total capcity of 124,5 kBCM. The WRD is planned towards North of the pit, in close proximity since the main criteria for site selection of the waste rock dump areas is minimization of impacts caused by haulage distance such as extent of topography alteration and air emissions, as well as economic factors associated with fuel consumption and time. Çorakoğlu WRD will cover approximately 199 ha area and the haulage distance from the pit to this area will be approximately 2 km in average (Figure 1.1).

In addition, a second WRD area located southwest of the open pit, namely the Gelberi WRD, is also included in the impact assessment within the scope of the ESIA studies. The Gelberi WRD has a footprint of approximately 85 ha and the haulage distance from the pit to this area is approximately 3 km. Utilization of Gelberi WRD is not expected since Çorakoğlu WRD's capacity is sufficient (i.e. Çorakoğlu WRD's capacity is approximately 2 kBCM more than the waste rock to be generated by the Project). However, AMI requested the inclusion of this WRD in the scope of the ESIA studies as GIIP to cover all potential WRD impacts. The decision was made in consideration of the potential of an increase in the total resource amount during the operation phase and a subsequent need that may arise for an additional WRD area to facilitate any such increase in the production capacity (Figure 1.1).

The tailings from the Process Plant will be deposited within two Tailing Storage Facilities (TSFs), which are located on the north side of the Gökırmak River. The Kepezkaya TSF will be located approximately 1 km northeast of the Hanönü town center while the Bağdere TSF is located about 2 km southeast of the town center. The Kepezkaya TSF has a capacity of 5 million m^3 which will operate during the first 5 years of the Project whereas the Bağdere TSF has a capacity of 8 million m^3 and will operate in the remainder of the Project's life. Both TSFs will be lined with clay and a geomembrane, and equipped with decant and leachate collection systems. The Project includes the following project units (Figure 1.1).

- Open Pit;
- Çorakoğlu Waste Rock Dump (North);
- Gelberi Waste Rock Dump (Southwest);
- Process Plant;
- Kepezkaya Tailings Storage Facility;
- Bağdere Tailings Storage Facility;
- Gökırmak River Diversion System; and

- Other auxiliary facilities (administrative buildings, explosive magazine, etc.).

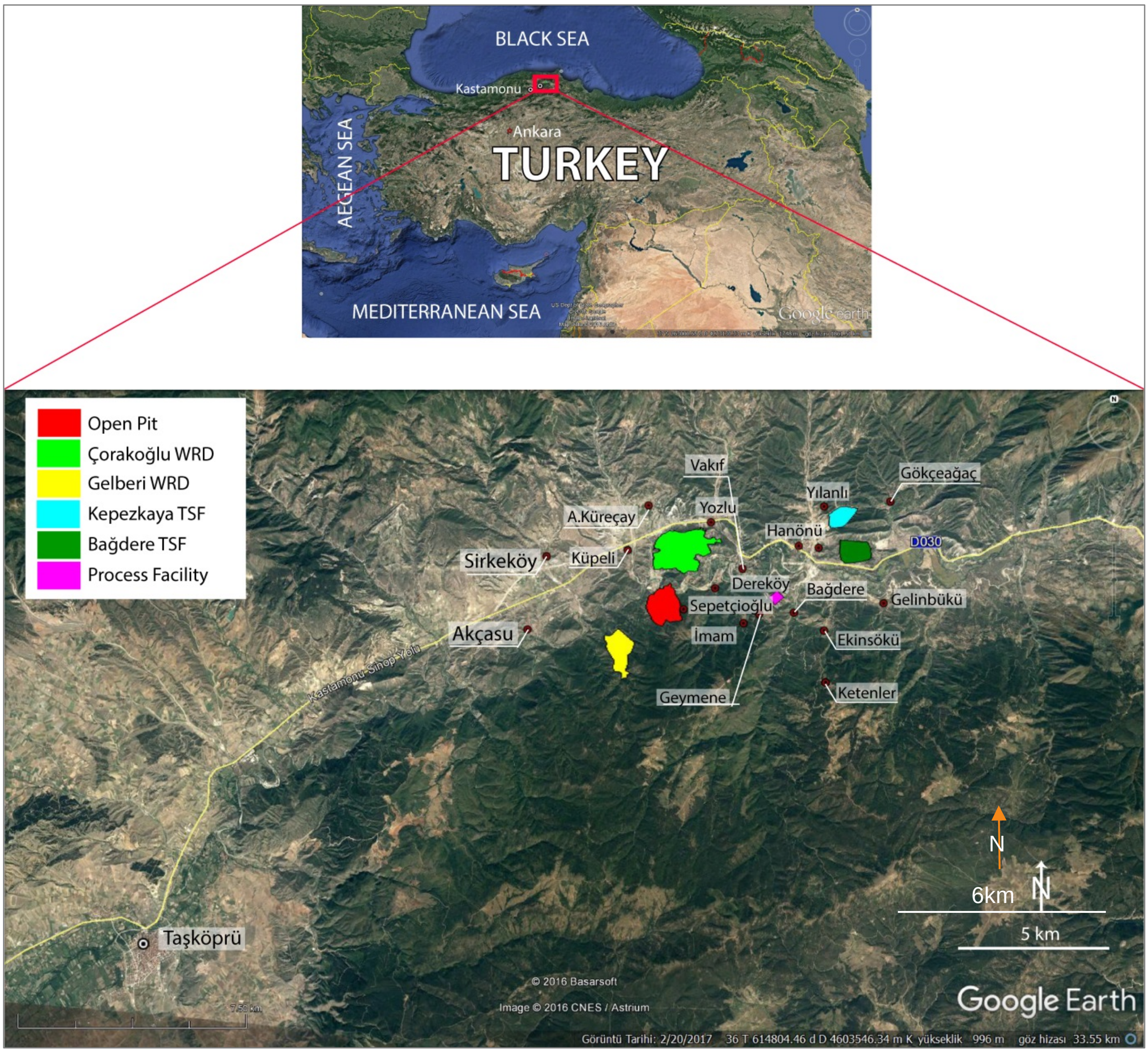


Figure 1.1 Layout of Project Units

1.2 Purpose and Scope

As noted above, various environmental studies have been completed for the GCP. Unfortunately the hydrogeological studies that have been completed to date (1) were not fully covering the potential impact area of the proposed mine, (2) were not in line with the international best practices and (3) do not comprise a regional numerical modelling study to estimate the potential cumulative impacts of the proposed mining activities.

AECOM was commissioned to carry out the following tasks;

a) Closing the Baseline Data Gaps

a. Open Pit Area Pump Test, completion of two pump tests to estimate the aquifer parameters in this area within different hydrogeological units.

b. Çorakoğlu WRD, extension of the previously completed hydrogeological studies in this area to fully characterize and assess the potential impacts that may originate from the WRD. This includes drilling of four additional wells in this area and completion of aquifer tests to determine the aquifer parameters.

c. Gelberi WRD was not previously investigated in any detail. The scope for this area includes drilling of two wells and completion of aquifer tests to determine the aquifer parameters.

d. Bağdere TSF was not previously investigated in any detail. The scope for this area includes drilling of five wells and completion of aquifer tests to determine the aquifer parameters.

e. Process plant area was not previously investigated in any detail as well. The scope for this unit includes the drilling of two wells and completion of aquifer tests to determine the aquifer parameters in this area.

b) Mine Site Hydrogeological Characterization;

Compilation of;

a. all data that have been produced / published until today (after a QA check) and

b. the data that will be collected as part of this study;

The compiled data will systematically be analyzed to further provide the essential input to establish a conceptual site model that also includes the Project's water budget.

c) Hydrogeological Modelling and Impact Assessment

Development of a Three Dimensional Numerical Flow and Transport Model, to simulate the groundwater flow and advective transport processes within the Project Area. This task will enable to estimate;

a. Extend and the geometry of the cone of depression (originated from the open pit dewatering), throughout the life of mine and the closure phase.

b. Potential impacts of dewatering on nearby groundwater and surface water resources.

c. Potential impacts of water supply and evaluations for the mine closure scenarios.

In addition to simulations given above, seepage modeling studies for the TSFs and WRDs will be completed. Impacts that may originate from the potential seepages that occur from the tailings dam and the waste rock dump(s) will therefore be identified and assessed.

d) Mine Water Balance Study

Establishing a time variant mine water balance (from the very early stage of mining phase to post-closure) will be prepared for the wet and dry seasons.

2. Description of the Project Area

2.1 Study Area

Although the hydrogeological investigation and characterization of the Gökırmak Copper Project Area is focused mainly on the project units, a study area is determined in order to limit the external boundary of the studies conducted in the area, such as geology and groundwater model.

The northern and southern boundaries of the study area follow the watershed boundary. On the other hand, the western and eastern boundaries are located about 4 and 9 km away from the closest project units, respectively (Figure 2.1).

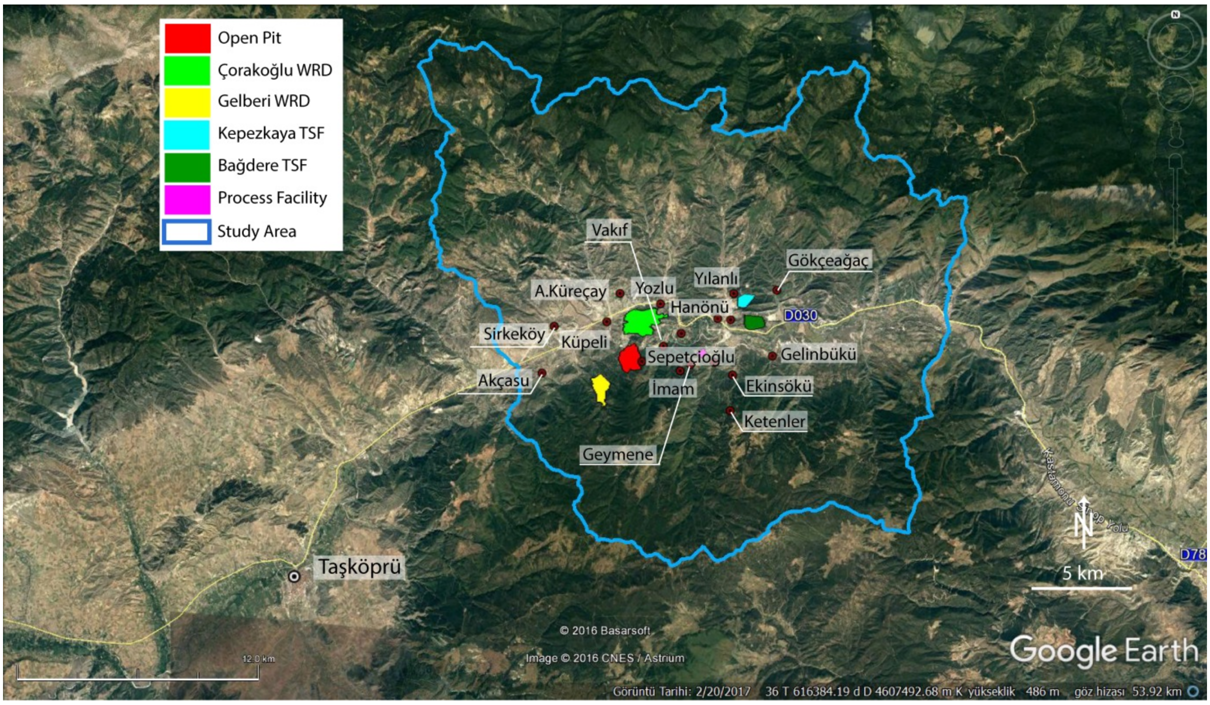


Figure 2.1: Location Map for the Study Area

2.2 Topography

The study area is located on a steep and undulating topography with an altitude ranging from 350 m at the eastern part around the Gökırmak River to 1799 m at the northern part of the study area. The altitude of the project units range from 880 m to 430 m in the Open Pit, 620 m to 436 m in the Çorakoğlu WRD, 903 m to 480 m in the Gelberi WRD, 602 m to 452 m in the Kepezkaya TSF, 530 m to 411 m in the Bağdere TSF, and 660 m to 528 m in the Process Plant area.

2.3 Population Characteristics

An extensive social impact assessment (SIA) study has been carried out by SRM to identify the current social status of the region. Based on the assessment report (SRM, 2016), the population growth rate of the province is greater than the Turkish average. Yet, the net migration rate of 11.6 per mille indicates that there is a tendency of migration from the province. The population density is around 1/3 of the national average.

As of 2014, Kastamonu province's population was 368,907. With its population of 3,976, Hanönü comprises approximately 1% of the province, while Taşköprü comprises around 11% with a population of 38,775.

According to TUIK's Address-Based Population Registration System data, the total population of 5 affected residential areas in 2014 was 2,232. The area with the largest population size among these areas was the central neighborhood of Hanönü with a population of 1,717. The total population of 7 residential areas neighboring these areas was 656, whereas the population of the remaining 11 residential areas in Hanönü district was 1,101.

All 4 neighborhoods (Vakıf, Geymene, Hanönü central, Gelinbükü) in the district center have water supply network. Bağdere village is connected to the water supply network as well. Gökçeağaç village, on the other hand, has a 50-tonne water reservoir. The village is connected to water supply network. Küreçayı also has a 50-tonne water reservoir. The mukhtar pointed out that they chlorinate the reservoirs themselves. The village is connected to water supply network.

2.4 Climate and Meteorology

The Project Area being located in the eastern part of the Kastamonu province is influenced by continental climate of Central Anatolia and mild and rainy climate of Black Sea region. The area is characterized by rainy seasons throughout the year, with cold and snowy winters and mild summers.

Long term meteorological data is required in order to determine meteorological characteristics in the Project Area. A series of meteorological stations collecting long term data have been established by the State Meteorological Organization (DMI) at Kastamonu, Devrekani, Taşköprü and Hanönü/Gökçeağaç. The closest meteorological station to the Project Area in operation is the Devrekani Meteorological Station, which is located approximately 50 km west of the area. In 2014, an automated meteorological station was established in Taşköprü region (station id: 18522) by DMI, but as representing the data of a relatively short operation period. Thereby, the measurements recorded at this station were not considered within the scope of this study. A site specific weather observation station was established in the Project Area on December 16, 2015. The station started data collection on December 18, 2015 and has so far been measuring meteorological data at 15-minute intervals.

Figure 2.2 shows the locations of the meteorological stations around the Project Area while Table 2 provides the basic information for the stations.

Figure 2.2: Location of the Meteorological Stations

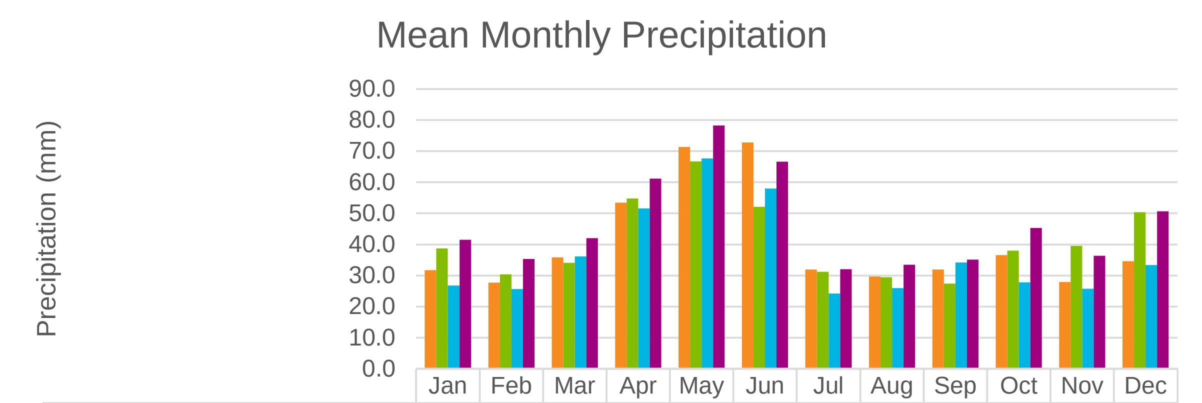
Table 2.1 Information about Meteorological Stations

Station ID	Station Name	Organization	Elevation (m)	Operating Period	Coordinates (UTM)	
					Easting	Northing
17074	Kastamonu	DMİ	800	1950 - present	564862.27	4580233.08
672	Gökçeağaç (Hanönü)	DMİ	475	1968 - 1984	622162.24	4610105.84
729	Taşköprü	DMİ	520	1955 – 1980 2012 - present	602043.30	4594341.64
17618	Devrekani	DMİ	1050	1965 - present	569543.16	4605658.08
001	Acacia Station	Acacia Maden	540	2015-present	617687.46	4608195.34

2.4.1 Precipitation

In order to assess the precipitation characteristics around the Project Area, meteorological stations having long-term data, namely, Kastamonu, Gökçeağaç, Taşköprü and Devrekani stations, were used. The precipitation measurements at these stations were conducted for the period of 1950-2015 for Kastamonu, 1968-1994 for Hanönü, 1956-1980 for Taşköprü and 1965-2011 for Devrekani station.

The calculated mean annual precipitation values for Kastamonu, Gökçeağaç, Taşköprü and Devrekani stations are 484.95 mm, 448.4 mm, 450.44 mm and 539.30 mm, respectively. Mean monthly precipitation values measured in these stations are given in Figure 2.3. According to Figure 2.3, measured precipitation values show seasonal variations, where maximum mean precipitation occurs in April to June, and minimum mean precipitation occurs in summer.

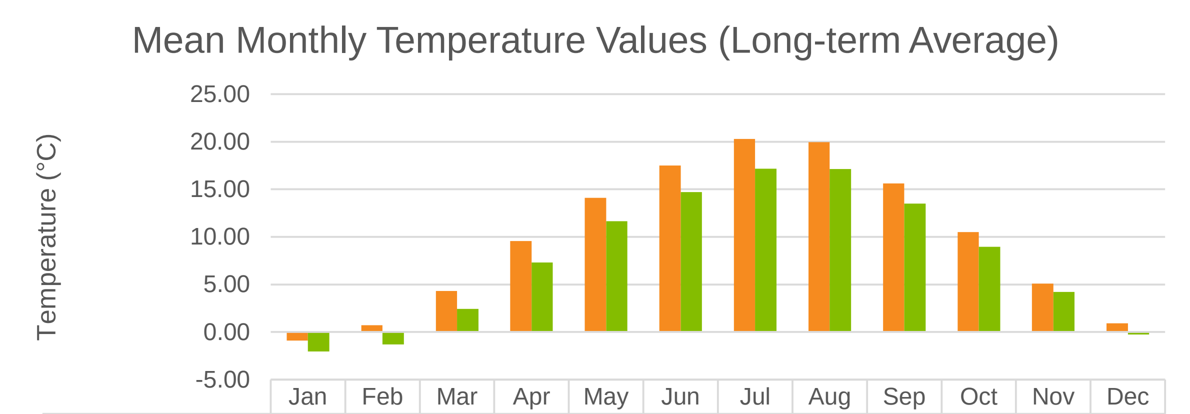


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17074-Kastamonu Station	31.7	27.7	35.8	53.5	71.4	72.8	32.0	29.6	31.9	36.6	27.9	34.6
672-Hanönü/Gökçeağaç Station	38.7	30.3	34.1	54.8	66.8	52.1	31.2	29.4	27.4	38.0	39.6	50.4
729-Taşköprü Station	26.7	25.6	36.2	51.6	67.7	58.0	24.2	26.0	34.2	27.8	25.7	33.4
18522-Devrekani Station	41.5	35.3	42.0	61.2	78.2	66.6	32.1	33.5	35.1	45.3	36.3	50.7

Figure 2.3: Mean Monthly Precipitation Values Measured In the Meteorological Stations

2.4.2 Temperature

The long-term temperature values were recorded at the Kastamonu and Devrekani meteorological stations. The distribution of the mean monthly temperature values measured at these stations are given in Figure 2.4. As seen from this figure, temperatures show seasonal variations. The minimum monthly temperatures are below 0°C and observed in winter, while maximum monthly temperatures are approximately 15 - 20°C and observed in summer.

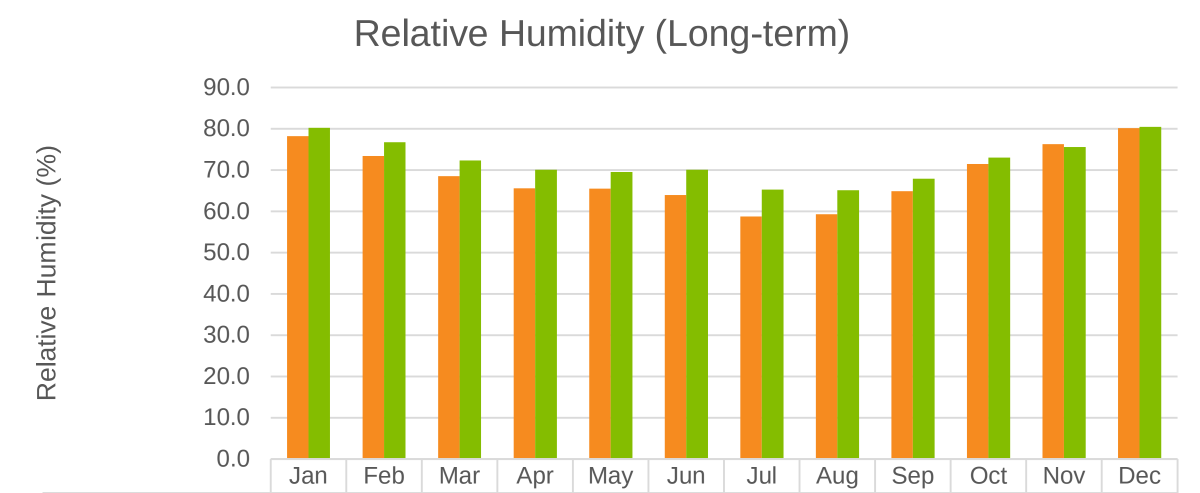


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17074-Kastamonu	-0.88	0.71	4.33	9.58	14.09	17.51	20.29	19.96	15.63	10.50	5.10	0.93
17618-Devrekani	-2.02	-1.31	2.42	7.33	11.66	14.72	17.15	17.13	13.50	8.97	4.22	-0.27

Figure 2.4 Distribution of Long Term Mean Monthly Temperature Values

2.4.3 Relative Humidity

The monthly average values of relative humidity were measured at the Kastamonu and Devrekani meteorological stations (Figure 2.5). The average relative humidity values vary between % 60 - 65 in July and August, and % 80 in January and December.

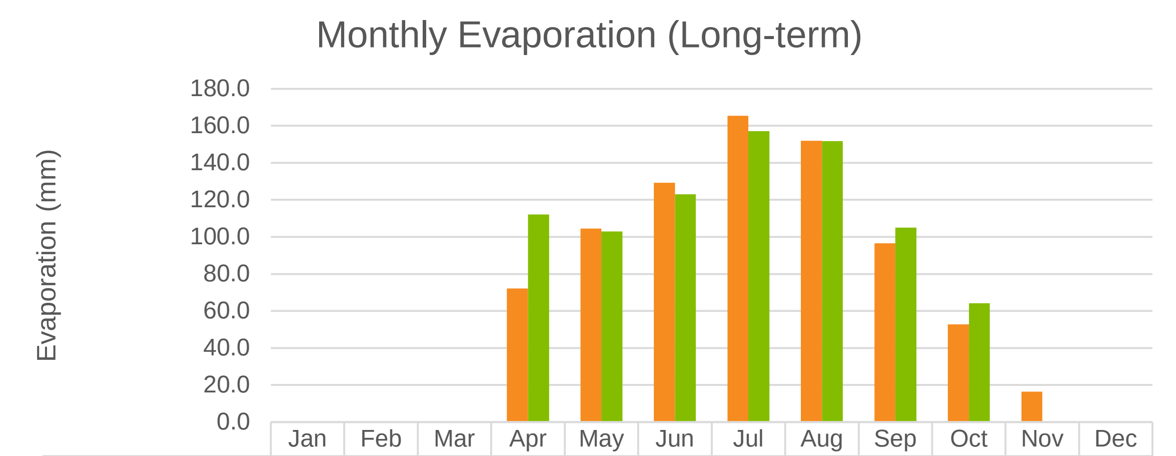


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17074-Kastamonu	78.2	73.4	68.5	65.6	65.5	63.9	58.8	59.3	64.8	71.5	76.3	80.1
17618-Devrekani	80.2	76.7	72.3	70.0	69.5	70.1	65.3	65.1	67.9	73.0	75.6	80.4

Figure 2.5: Distribution of Mean Monthly Relative Humidity Values

2.4.4 Evaporation

The evaporation values were measured at the Kastamonu and Devrekani meteorological stations (Figure 2.5) for the period of 1950 – 2016 (where 1955-1957 and 1966 is missing) and 1981 – 2011, respectively. These stations record evaporation data for the period between April and October. Hence evaporation data is generally missing for November – March period. The monthly average evaporation values measured at these stations are shown in Figure 2.6. As seen from this figure, evaporation values vary seasonally; maximum and minimum monthly evaporation values are observed in July and October, respectively.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17074-Kastamonu	0.0	0.0	0.0	72.2	104.5	129.3	165.5	151.9	96.6	52.7	16.4	0.00
17618-Devrekani	0.0	0.0	0.0	112.2	102.9	122.9	157.1	151.7	105.1	64.2	0.0	0.0

Figure 2.6: Distribution of Long-Term Average Monthly Evaporation Values

2.5 Calculated Hydro - Meteorological Parameters for the Study Area

2.5.1 Precipitation

The long term mean monthly precipitation data that describes the characteristics of the study area were estimated using the Kastamonu (elevation=800 m) and Devrekani (elevation=1050 m) meteorological stations, since they have longer precipitation records and their altitudes are closer to the median elevation of study area (median elevation=966.2 m) than other meteorological stations.

The monthly precipitation values measured at the Kastamonu and Devrekani meteorological stations have been compared using graphical (scatter plots) and statistical analysis. For the statistical comparisons, correlation coefficient (R2), % error (% Bias) and % absolute error (% |Bias|) values have been calculated.

The scatter plots in Figure 2.7 compares monthly precipitation values between the Kastamonu and Devrekani stations, for the period of 1970 - 2015. The diagonal red line (1:1 line) on these graphs indicate the equal precipitation amounts for vertical and horizontal axes, whereas blue dashed line is the linear trend line used to calculate the correlation coefficient (R2). The statistical analysis also includes computation of % Bias and % |Bias| value, where;

$$\% \, BIAS = \frac{y-x}{x} \times 100 \qquad (2.1)$$

$$\% \, |BIAS| = \frac{|y-x|}{|x|} \times 100 \qquad (2.2)$$

In these equations, “y” and “x” refers to the monthly precipitation values recorded in the Devrekani and Kastamonu stations, respectively. The best statistics is represented by a correlation coefficient value of 1, % Bias value of zero and % |Bias| value of zero. The calculated statistics are summarized in Table 2.1. According to the Table 2.1, calculated correlation coefficient values range between 0.83 (in September) and 0.30 (in May). On the other hand, % BIAS values are greater than zero except for June – September period, which indicates that Devrekani station receives more precipitation compared to Kastamonu station.

Table 2.1 Statistical values calculated using monthly precipitation data recorded at the Devrekani and Kastamonu stations for the period 1970-2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R2	0.55	0.58	0.52	0.72	0.30	0.51	0.70	0.41	0.83	0.66	0.78	0.52
% BIAS	25.57	20.85	9.91	4.01	3.76	-12.90	-4.74	-0.59	-4.68	17.48	11.51	30.09
% |BIAS|	36.46	33.05	28.78	19.68	35.03	38.48	35.28	45.96	93.54	31.44	23.81	36.34

The mean monthly precipitation values for the study area are obtained by corrected precipitation values measured in the Kastamonu meteorological station according to the calculated % BIAS values. The corrected precipitation values for the median elevation of the study area are given in Table 2.2. According to this table, the mean annual precipitation value for the study area is estimated as 515.22 mm/year.

Table 2.2 Estimated mean monthly precipitation of the study area after the correction procedure

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kastamonu (mm/month)	31.7	27.7	35.8	53.5	71.4	72.8	32.0	29.6	31.9	36.6	27.9	34.6
% BIAS	25.57	20.85	9.91	4.01	3.76	-12.90	-4.74	-0.59	-4.68	17.48	11.51	30.09
Study area (mm/month)	39.85	33.44	39.36	55.62	74.09	63.38	30.44	29.46	30.44	42.96	31.12	45.05

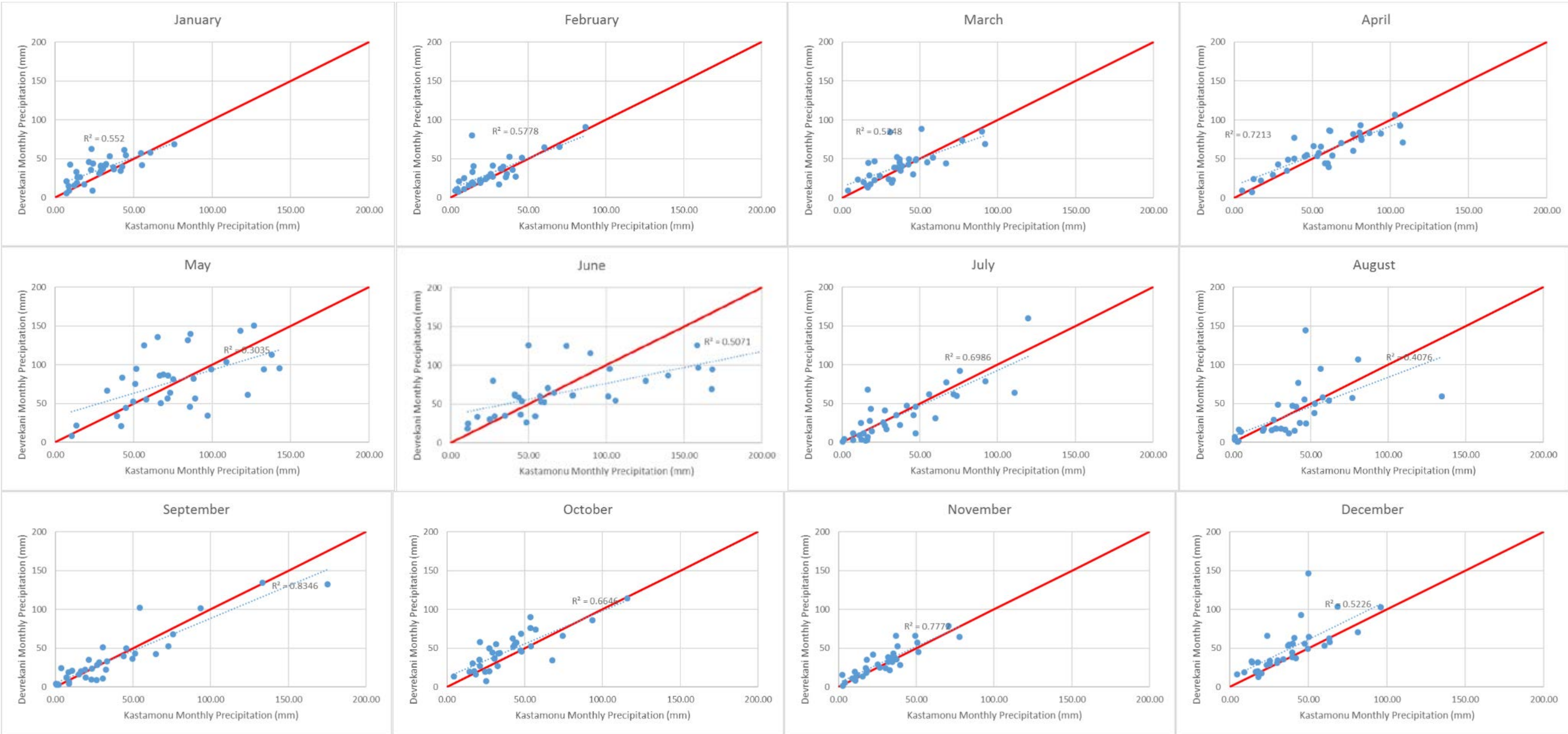


Figure 2.7 Scatter plots of monthly precipitation values measured at Kastamonu and Devrekani meteorological stations between 1970 and 2015

The estimated mean annual precipitation value for the study area is also checked by using the precipitation – elevation relationship. Figure 2.8 shows the relationship between elevation and average annual precipitation measured in meteorological stations located in the close vicinity of the study area. Based on the linear fit equation given in Figure 2.8, the average annual total precipitation corresponding to the median elevation of the study area is calculated as 518.50 mm. This precipitation value is very close to the estimated average annual total precipitation value (515.22 mm) obtained after the correction procedure.

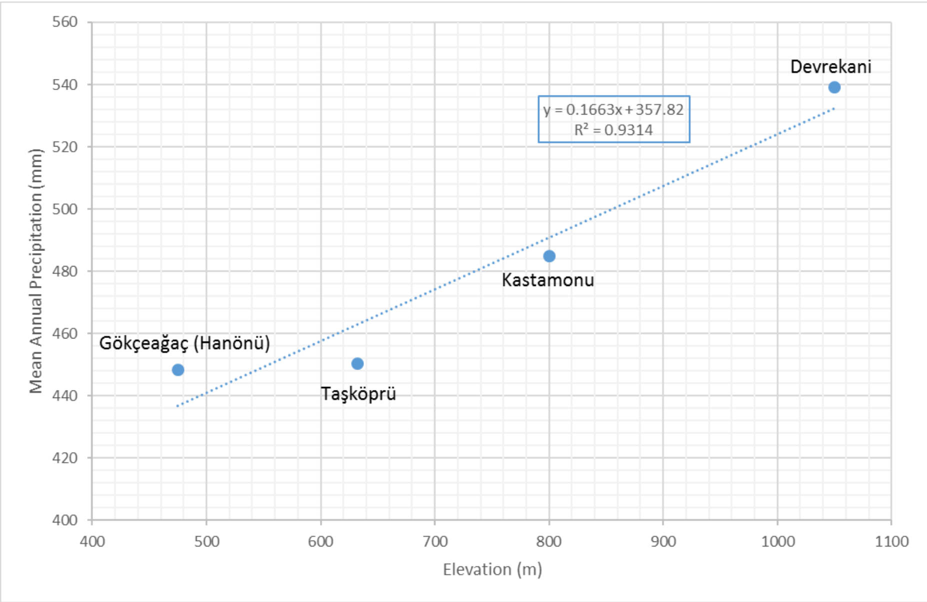
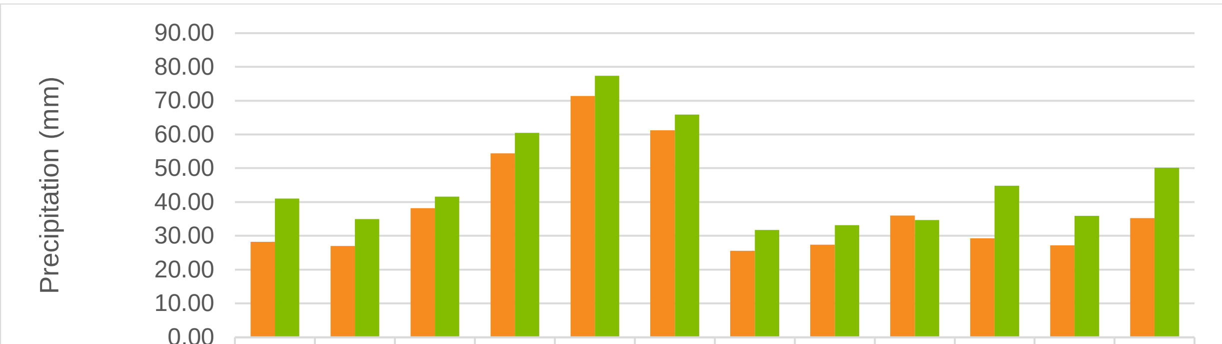


Figure 2.8 Mean annual precipitation vs elevation relationship of the meteorological stations in the vicinity of the study area

Since the study area is located in a steep and undulating topography, where the altitude ranges between 350 m and 1800 m, the distribution of precipitation also expected to vary within the study area. In this regard, the precipitation data recorded at the meteorological stations were corrected based on the elevation that corresponds to 25th and 75th percentile of the area, which are 621.7 m and 1166.2 m, respectively. In order to represent the precipitation regime of the lower elevations, precipitation values recorded at Taşköprü station was used. Based on the long-term mean monthly precipitation data, the ratio of annual precipitation for each month was determined. The mean annual precipitation for the representative elevation (25th percentile) was calculated as 461.2 mm/year according to the linear fit equation given in Figure 2.8. Using the calculated ratios, representative monthly precipitation series for the lower elevations is estimated (Figure 2.9). For the higher elevations, the representative precipitation regime was determined according to the precipitation values recorded at Devrekani station. The mean annual precipitation for the 75th percentile of the area was determined as 551.76 mm/year based on the linear fit equation given in Figure 2.8. The ratio of long-term annual precipitation to each month was then used to estimate a representative mean monthly precipitation data for the higher elevations (Figure 2.9).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25th percentile	28.22	27.03	38.19	54.44	71.42	61.21	25.58	27.40	36.05	29.31	27.15	35.23
75th percentile	41.01	34.95	41.57	60.50	77.37	65.85	31.73	33.16	34.70	44.80	35.93	50.16

Figure 2.9 Estimated monthly precipitation for the 25th and 75th percentile of the study area

2.5.2 Temperature

The mean monthly temperature distribution for the study area was estimated using the long-term data recorded at Kastamonu (elevation=800 m) and Devrekani (elevation=1050 m) meteorological stations for 1965 – 2014 that corresponds mutual operating period.

The monthly temperature values measured at the Kastamonu and Devrekani meteorological stations have been compared using both graphical (scatter plots) and statistical analysis, which are described in detail in Section 2.5.1. The scatter plots in Figure 2.10 compares monthly temperature values recorded at the Kastamonu and Devrekani stations, for the period of 1965 - 2014. As can be seen from the Figure 2.10, the temperature values generally around the 1:1 line and have high correlation coefficient values, except for the summer season. The calculated statistics are summarized in Table 2.14.

The mean monthly temperature values for the study area were obtained by correcting the temperature values measured in the Kastamonu meteorological station according to the calculated % BIAS values. The corrected temperature values for the median elevation of the study area are given in Table 2.4.

Table 2.3 Statistical values calculated using monthly temperature data recorded at the Devrekani and Kastamonu stations for the period 1965-2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R2	0.89	0.92	0.95	0.91	0.75	0.40	0.75	0.78	0.71	0.93	0.78	0.87
% BIAS	236.3	-312.1	-50.2	-23.7	-17.6	-15.9	-16.0	-14.3	-14.3	-14.7	-15.4	-123.6
% |BIAS|	244.1	316.5	50.2	23.8	17.7	16.4	16.1	14.3	14.5	14.7	21.3	129.0

Table 2.4 Estimated mean monthly temperature of the study area after the correction procedure

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kastamonu (°C)	-0.9	0.7	4.3	9.6	14.1	17.5	20.3	20.0	15.6	10.5	5.1	0.9
% BIAS	236.3	-312.1	-50.2	-23.7	-17.6	-15.9	-16.0	-14.3	-14.3	-14.6	-15.4	-123.6
Corrected (°C)	-3.0	-1.5	2.2	7.3	11.6	14.7	17.0	17.1	13.4	9.0	4.3	-0.2

The estimated mean monthly temperature values for the study area was also checked by using the temperature – elevation relationship. Since the temperature values decrease 1°C at every 100 m increase in elevation, the mean monthly temperature values for the study area (median elevation=966.2 m) are expected to be about 1.6°C lower than the Kastamonu station (elevation=800 m). The monthly temperature values obtained by correction and elevation-temperature relation are compared in Figure 2.11. According to Figure 2.11, the estimated temperature values were found to be close to each other.

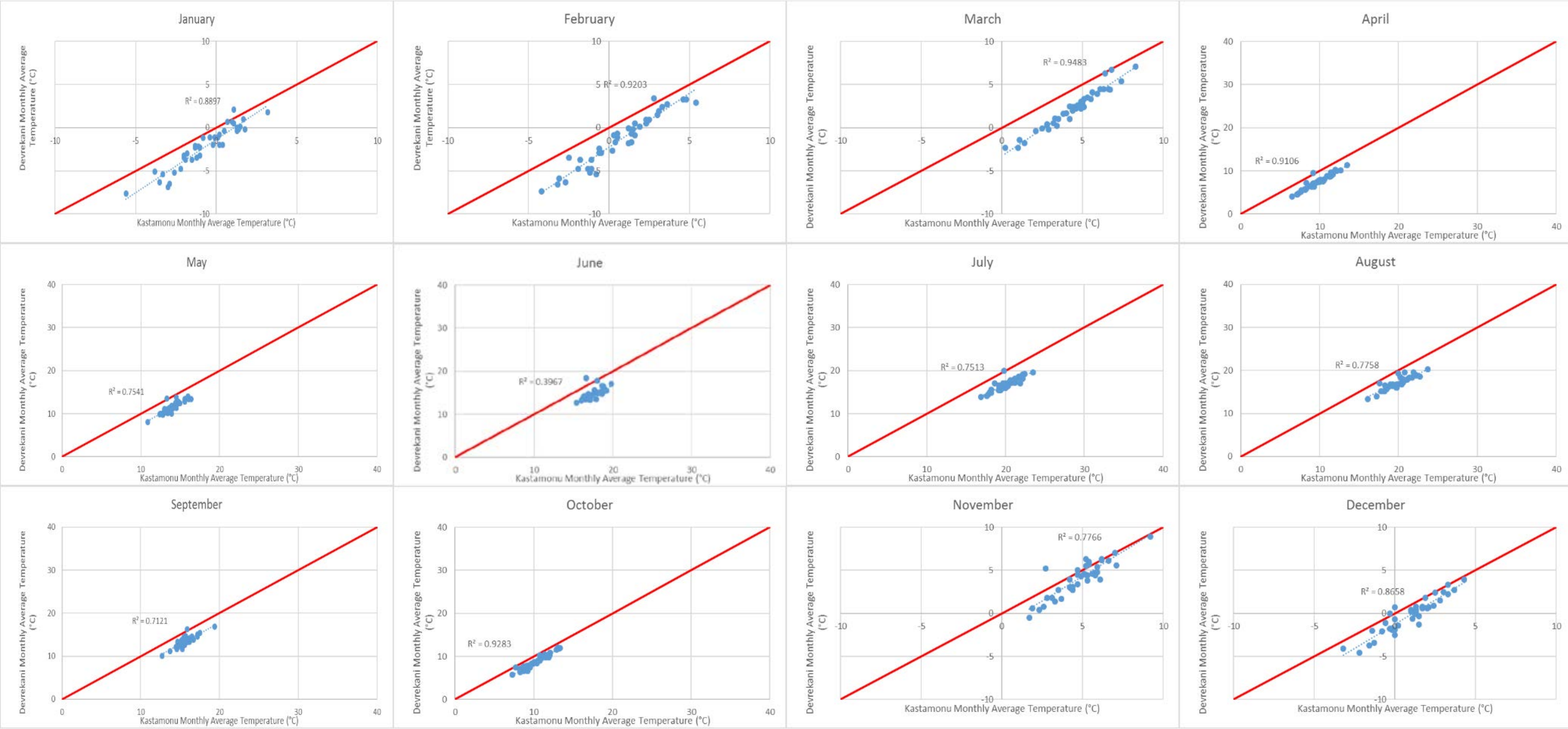


Figure 2.10 Scatter plots of monthly temperature values measured at Kastamonu and Devrekani meteorological stations between 1965 and 2014

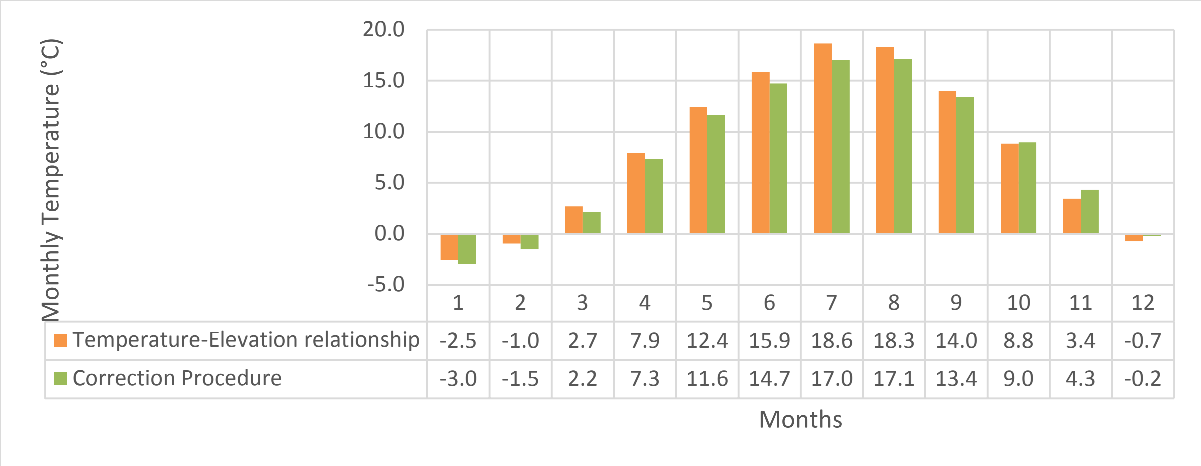


Figure 2.11 Estimated monthly temperature values for the study area by using temperature-elevation relation and correction procedure

The distribution of temperature also varies within the study area, where at lower elevations higher temperature and at higher elevations lower temperature values are expected. Therefore, the temperature data for the elevations corresponding 25th and 75th percentile of the area were estimated using the values recorded at the meteorological stations.

The temperature distribution for the lower elevations (621.7 m) was estimated using the values recorded at the Kastamonu and Taşköprü stations, for the mutual operating period of 2014 – 2016. Although the temperature values recorded at Taşköprü station is about 1 °C higher than Kastamonu station, in November – December and January, the temperature values became very close to each other. Therefore, instead of monthly periods, the scatter plots are obtained for 3-month periods (Figure 2.12). The representative temperature values for the lower elevations were obtained by using the linear fit equation shown in Figure 2.12 and the results are summarized in Table 2.5.

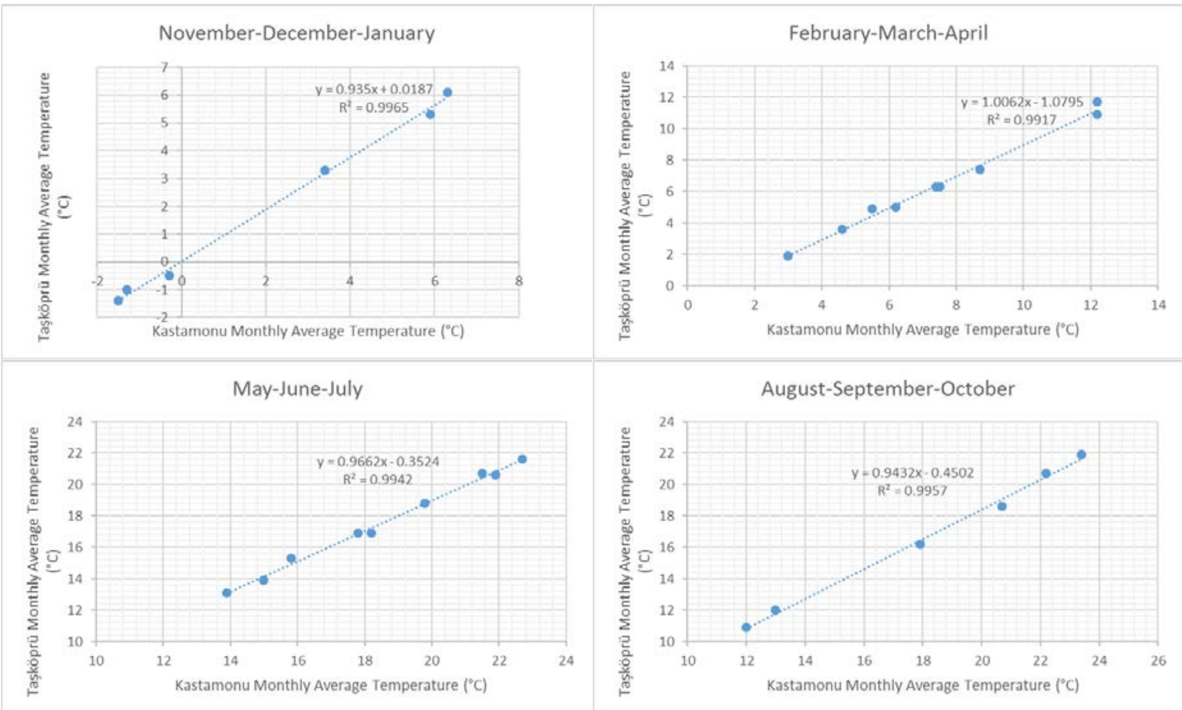


Figure 2.12 Scatter plots of temperature values measured at Kastamonu and Taşköprü meteorological stations between 2014 and 2016

Table 2.5 Estimated mean monthly temperature for the 25th percentile area after the correction procedure

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kastamonu (°C)	-0.9	0.7	4.3	9.6	14.1	17.5	20.3	20.0	15.6	10.5	5.1	0.9
Corrected (°C) (25th percentile)	-0.8	-0.4	3.3	8.6	13.3	16.6	19.2	18.4	14.3	9.5	4.8	0.9

The temperature distribution for the higher elevations (1166.2 m) was estimated using the temperature-elevation relationship. The long-term mean monthly temperature values recorded at the Devrekani station was used, since Devrekani station is located at the highest altitude (1050 m) in the vicinity of the study area, which is still lower than the representative elevation (1166.2 m). The estimated temperature values corresponding to the 75th percentile of the area is given in Table 2.6.

Table 2.6 Estimated mean monthly temperature for the 75th percentile area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Devrekani (°C)	-2.0	-1.3	2.4	7.3	11.7	14.7	17.2	17.1	13.5	9.0	4.2	-0.3
Corrected (°C)	-3.1	-2.4	1.3	6.2	10.5	13.6	16.0	16.0	12.4	7.8	3.1	-1.4

2.5.3 Evaporation

The evaporation values for the study area is determined by using the corrected temperature values for the median elevation of the study area and linear fit equation that is obtained from temperature-evaporation relationship of the Kastamonu station data. The temperature-evaporation relationship obtained from the Kastamonu station is shown in Figure 2.13. By using the linear fit equation given in Figure 2.13, the estimated evaporation and temperature data for the study area was determined.

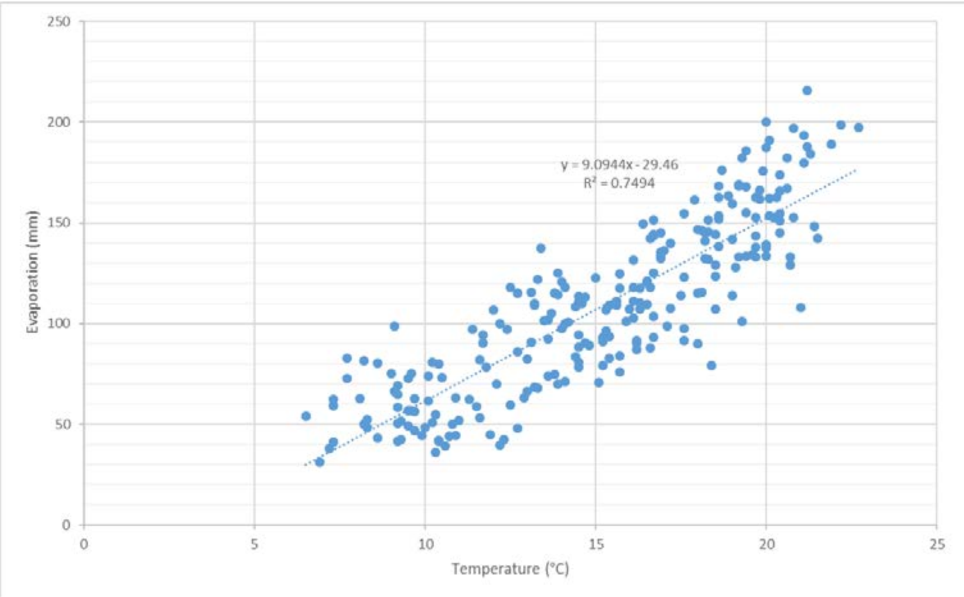


Figure 2.13: Temperature-Evaporation relationship obtained from Kastamonu station

2.6 Geology

The geology of the study area was obtained from 1:25000 scaled geological map prepared by General Directorate of Mineral Research and Exploration (MTA), and discussions on the regional and local geology was derived from geological reports prepared by Acacia (AMI, 2013) as well as geological booklet prepared by MTA (MTA, 2007).

2.6.1 Regional Geology

The study area consists of igneous, metamorphic and sedimentary rock units whose ages range between Mesozoic-Quaternary. Among these, pre-Upper Jurassic igneous and metamorphic lithologies form the basement rocks of the study area, whereas the post-Upper Jurassic sedimentary and volcanic rocks constitute the cover units overlying the basement rocks. The geological map of the study area is given in Figure 2.14, whereas the generalized columnar section is shown in Figure 2.15.

2.6.1.1 Stratigraphy

Elekdağ Metaophiolite

The Elekdağ Metaophiolite is mainly characterized by eclogite, serpentinized ultramafics, gabbro, diabase, basalt and pelagic sedimentary rocks. The Elekdağ Ophiolite consists of, at the bottom, ultramafic tectonites characterized by peridotites composed predominantly of olivine and pyroxene. Towards upper levels, the degree of serpentinization increases, which lead to the occurrence of serpentinites.

Bekirli Formation

The Bekirli Formation is mainly characterized by phyllite, pelitic schist, paragneiss and calc-schist, marble, metaserpentine, metadiabase, metagabbro and metachert blocks embedded in the metaclastics. The formation includes at the bottom quartz- and mica-rich phyllite, metasiltstone and metasandtone. The Bekirli Formation tectonically overlies the Elekdağ Metaophiolite. It is conformably overlain by the Akgöl Formation.

Akgöl Formation

The Akgöl Formation consists mainly of slate, phyllite, shale and sandstone. The formation includes at the bottom black shales which passes upwards an alternation of shale-siltsone-sandstone. These lithologies pass to clayey limestone and micritic limestone at the upper levels of the formation. The shales are blackish and very fine-grained. The clayey limestone and micritic limestone, on the otherhand, form rigid lithologies and they occur as blackish, thin-bedded lithologies. The age of Akgöl Formation can be regarded as Triassic-Liassic based on the fossil content of the formation and cross-cutting relationship with the Kastamonu Granitoid.

Kastamonu Granitoid

The granitoid is characterized by igneous rocks of variable composition including granite, granodiorite and tonalite. These rocks generally form a rough topography, although they exhibit a gentle morphology where the weathering is intense. These igneous rocks occur as whitish, pinkish-colored, generally fine- to medium-grained bodies and display equigranular and porphyritic textures. The age of granitoid can be regarded as Middle Jurassic on the basis of cross-cutting relationship, stratigraphic position and radiometric age dating.

Bürnük Formation

The Bürnük Formation is mainly characterized by alternation of conglomerate, sandstone and mudstone. The formation displays a reddish appearance in general. The clasts appear to have been derived from metamorphics, ophiolite, spilitic basalt, quartzite and shale. The conglomerates are poorly sorted and well-rounded. Bedding is not apparent. The age of Bürnük Formation can be regarded as Upper Jurassic based on the fossil content and stratigraphic position.

İnaltı Formation

The İnaltı Formation is chiefly composed of neritic limestone. The formation includes, at the bottom, whitish to grey, mostly thick-bedded recrystallized limestones with abundant calcite veins. These lithologies pass upwards to grey- to dark-grey colored, generally medium-bedded limestones with shale intercalations. The age of the İnaltı Formation can be regarded as Upper Jurassic-Lower Cretaceous based on the fossil content of the unit.

Ulus Formation

The Ulus Formation is mainly characterized by shale, siltstone, sandstone and subordinate conglomerate. The sandstones occur as brownish to grey, medium- to thick-bedded lithologies, whereas the shales and siltstones form grey-colored, thin-bedded layers. The lower levels of the formation comprise gravel-sized clasts derived from the İnaltı Formation. The age of the Ulus Formation is Lower Cretaceous based on the fossil content and stratigraphic position.

Kapanboğazı Formation

The Kapanboğazı Formation is mainly composed of thin- to medium-bedded clayey limestone, micritic limestone, cherty limestone and chert. The Kapanboğazı Formation conformably overlies the Ulus Formation. The age of the formation can be regarded as Upper Cretaceous based on the fossil content.

Cankurtaran Formation

The Cankurtaran Formation is characterized by alternation of claystone, siltstone, sandstone, sandy limestone and conglomerate with limestone blocks and volcanic intercalations. The volcanics, which are mainly observed at the lower parts of the formation, are differentiated as "the volcanic member". The Cankurtaran Formation is chiefly composed of brownish to greenish, thin- to medium bedded claystone, sandstone and clayey limestone. The age of Cankurtaran Formation can be regarded as the Campanian-Maastrichtian based on the fossil content.

Akveren Formation

The Akveren Formation consists mainly of limestone, clayey limestone, marl, claystone, siltstone and sandstone with volcanic intercalations. The limestone beds occurring at the upper levels of the formation contain cherts. The Akveren Formation conformably overlies the Cankurtaran Formation and passes gradually to the Atbaşı Formation at the top. The age of Akveren Formation can be regarded as Maastrichtian-Lower Paleocene based on the fossil content.

Atbaşı Formation

The Atbaşı Formation is mainly composed of marl and shale with limestone intercalations. The formation starts with alternation of burgundy-colored, thin-bedded marl and beige-colored, thin- to medium-bedded sandstone, which is followed by thick-bedded reddish brown marl. The upper levels of the formation consist of alternation of medium- to thick-bedded marl and brownish, thin-bedded sandstone. The Atbaşı formation rests conformably over the Akveren Formation and passes gradually to the Kusuri Formation at the top. The age of Atbaşı Formation can be regarded as upper Paleocene-lower Eocene based on the fossil content of the formation.

Kusuri Formation

The Kusuri Formation is characterized by alternation of marl, sandstone and limestone. The formation is mainly composed of brownish to greenish, thin- to medium-bedded shale-marl-sandstone alternation. The lower levels of the formation contain wedges and lenses of conglomerate-sandstone alternation. The Kusuri Formation conformably overlies the Atbaşı Formation. It is unconformably overlain by the Sinop Formation. The age of Kusuri Formation can be regarded as middle Eocene based on the fossil content of the formation.

Sakızdağı Formation

The Sakızdağı Formation is chiefly composed of alternation of mudstone, sandstone and conglomerate. The formation includes at the bottom, alternation of reddish mudstone and yellowish brown conglomerate, conglomeratic sandstone, sandstone and claystone. These lithologies pass to whitish to greenish marl, claystone and siltstone upwards in the sequence. These parts contain thin gypsum and coal layers. The Sakızdağı Formation unconformably overlies the Atbaşı, Cankurtaran and Kapanboğazı Formations. The age of the formation can be regarded as upper Oligocene-Miocene based on the stratigraphic position.

Alluvium

The unit consists of deposits of meandering and braided river and flood plain and mainly deposited along the river channel.

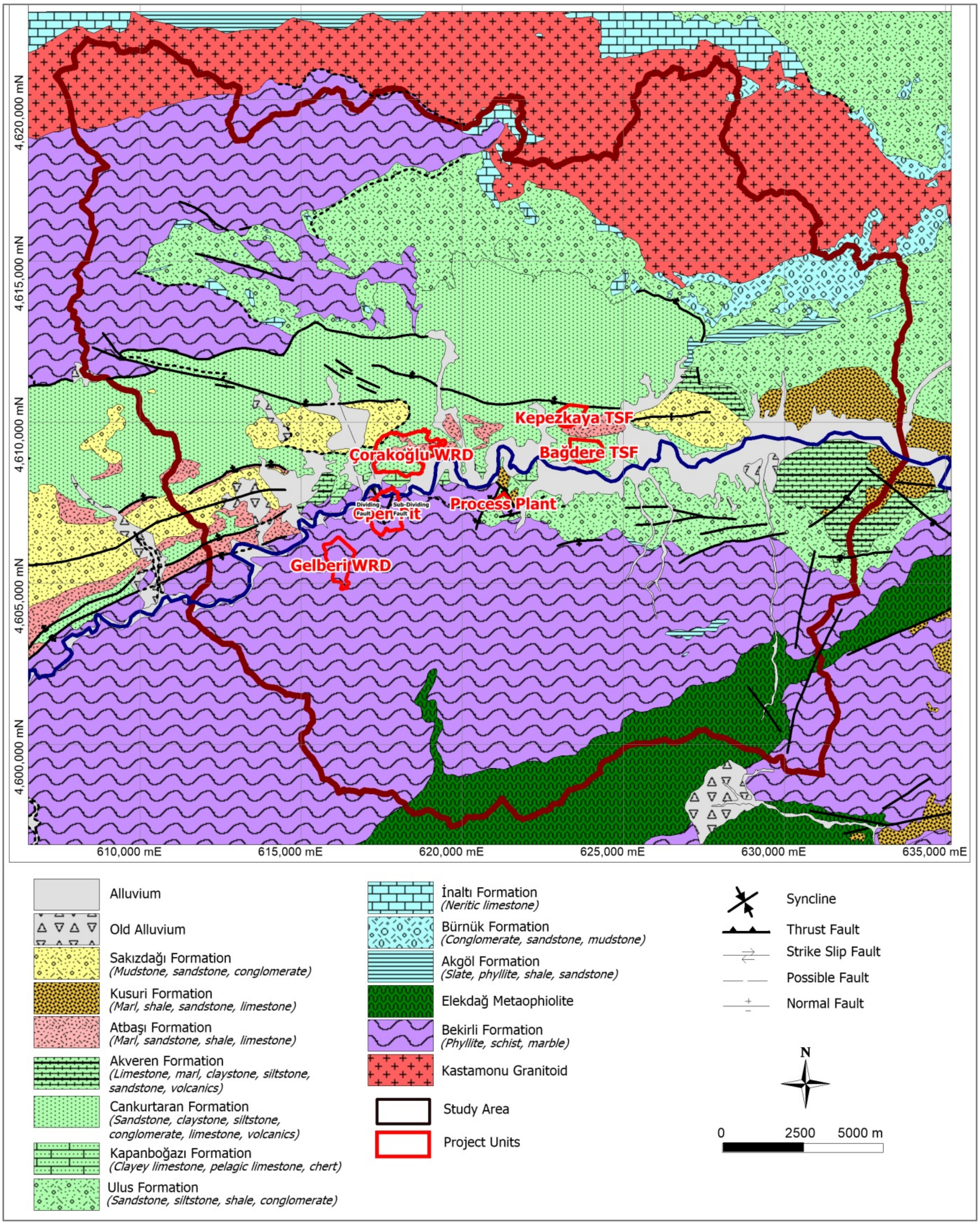


Figure 2.14 Geological Map of the Study Area (revised from MTA)

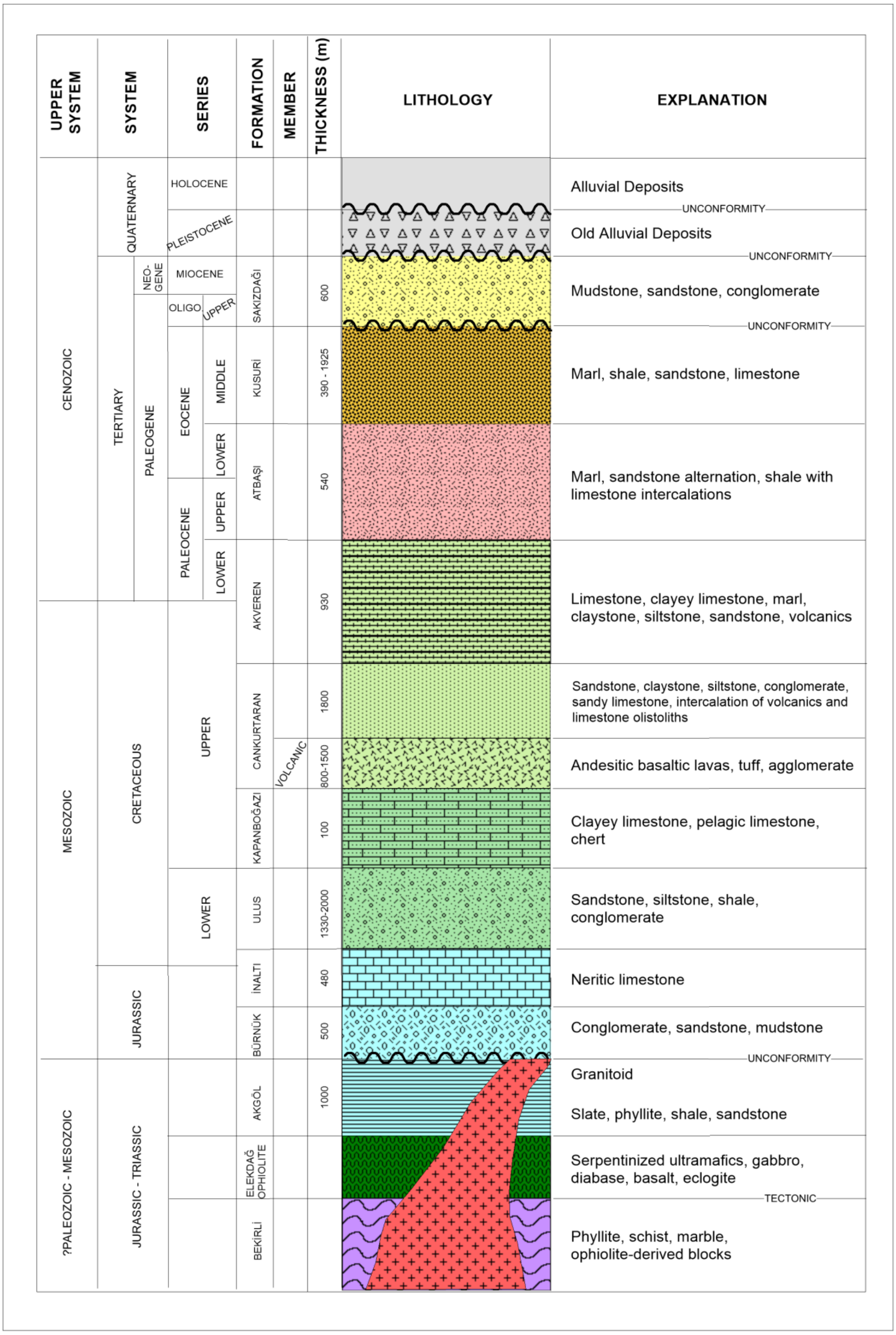


Figure 2.15 Generalized columnar section of the study area (modified from Uğuz and Sevin, 2007)

2.6.1.2 Regional Structural Features

According to Okay et al., (2006), the location of the license area is within the Çangaldağ-Complex. The intrusion by the Jurassic granites put a constraint to its age. Okay et al., (2006) describes the unit as a northward dipping tectonic slice with a true thickness of approximately 5 km. It is bounded to the south by a 50°–60° northward dipping shear zone (the Acısu Fault) as shown in Figure 2.16. The Acısu Fault is interpreted to be a normal fault which was reactivated during the Cretaceous Period as a thrust fault. North of the Gökırmak valley, the Çangaldağ-Complex is bordered by Maastrichtian to Eocene sediments which form the Gökırmak fold and thrust belt.

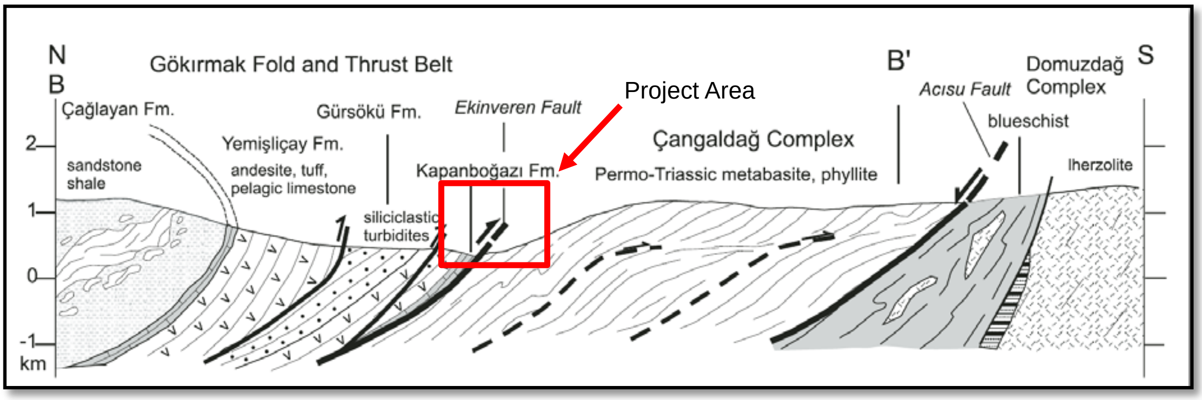


Figure 2.16: Cross-Section through the Gökirmak Fold and Thrust Belt (Okay et al., 2006)

The study area includes east-west trending structures owing to the north-south directed compressional regime. Syncline-anticline axes and bedding strikes are east-west directed. The Ekinveren Fault appears as the most prominent fault of the study area, bordering the northern boundary of the Kastamonu-Taşköprü-Boyabat basin. The Ekinveren Fault is known as a high-angle, normal or reverse fault. The formations outcropping beneath the project units are composed of Bekirli, Cankurtaran, Atbaşı, Sakızdağı and Kusuri formations and alluvium deposits.

Based on the previous studies carried out so far (RPS, 2015), bedrock in the open pit area is known to be heavily fractured and faulted. Core samples retrieved from the previous boreholes completed in the open pit indicates a major fault, known as the Dividing Fault. Investigations on the core samples show that the Dividing Fault has a north-south orientation that enhance the hydraulic conductivities along the fault plane. Details about the Dividing Fault are provided in the section given below.

2.6.2 Mine Site Geology

Open Pit

The open pit area is mainly composed of schists, phyllites and metavolcanic rocks that belong to Bekirli formation. Fracturing and faulting is observed throughout the bedrock in the open pit area. In the northern part of the open pit, alluvial deposits are observed along the Gökırmak riverbed.

Waste Rock Dumps (WRDs)

The Çorakoğlu WRD is underlain by Cankurtaran, Atbaşı and Sakızdağı formations. Cankurtaran formation is mainly composed of andesites, basalts, tuff as well as claystone, siltstone, sandstone alternation. Also, marl, shale and limestone alternation belonging to Atbaşı formation is observed at the small portion of Çorakoğlu WRD. The Sakızdağı formation, which is composed of alternation of mudstone, sandstone and conglomerate, is outcropped at the northwestern part.

Gelberi WRD, is located at the southwest part of the open pit. The schists, phyllites and metavolcanic rocks that belong to Bekirli formation is mainly outcrops in the Gelberi WRD.

Tailings Storage Facilities (TSFs)

The Kepezkaya TSF is composed of Cankurtaran and Atbaşı formations and alluvium deposits. The claystone, siltstone, sandstone alternation comprising Cankurtaran formation is mainly observed in the Kepezkaya TSF. In addition, marl, shale and limestone alternation of Atbaşı formation and alluvial deposits cropped out in the Kepazkaya TSF.

The Bağdere TSF, on the other hand, is composed of Cankurtaran formation. Andesites, basalts, tuff as well as claystone, siltstone, sandstone alternations are observed in the Bağdere TSF.

Process Plant

The marl, sandstone and limestone alternation of Kusuri formation and shale, siltstone, sandstone and conglomerate that belongs to Ulus formation are mainly observed in the process plant area.

2.6.3 Structural Features in the Open Pit Area

2.6.3.1 Dividing and Sub-Dividing Faults

The previous studies carried out for the Open Pit (RPS, 2015, Asya Maden, 2015) and recent pit characterization studies by Acacia indicate that two fault planes exist within the proposed pit area.

First fault, known as the Dividing Fault was reported to orient in northwest – southeast direction (Asya Maden, 2015) while the second one has an orientation in northeast – southwest direction. Since there is no specific name attributed to this second fault in previous reports, it is called as "Sub-Dividing Fault" through the following sections of this report.

The presence and location of these geological structures is largely inferred from drilling data. Dividing Fault and Sub-Dividing Fault were reported to intersect each other around the southern sections of the Open Pit creating a subsidence zone between each other (Asya Maden, 2015). Based on the drill log data and 3D wireframes obtained from Acacia, both faults are believed to show normal character with strike slip component and having fault surfaces dipping about 60° to Northeast (for the Dividing Fault) and Northwest (for the Sub-dividing Fault).

The Dividing Fault is observed to intersect the Gökırmak River to the north of the Open Pit (passing right under the spillway channel and upstream coffer dam) and west of the Çorakoğlu WRD. Geomorphology of the pit area and the area that extends to the North gives rise to a thought of likely continuation of the Dividing Fault to the North-Northwest direction along the Küreçay Stream (Figure 2.17 and Figure 2.18).

The Sub-Dividing Fault on the other hand, extends through the alluvium until the northern boundary of the Open Pit. However the geomorphology of this section suggests that the Sub-Dividing Fault is likely to continue until it reaches the eastern flank of the Çorakoğlu WRD. The extent of both fault zones to the South is not fully understood as the drill log data is limited within the open pit mineralization zone. Furthermore, the extent of these faults to the South cannot be clearly tracked from the geomorphology of the study area. Figure 2.17 and Figure 2.18 shows the locations of the two fault zones within the Open Pit and their potential extent to the North.

Both fault zones can be up to approximately 10 m wide, and are comprised of fault breccia. The brecciated material in this zone is described as; "unconsolidated and loose fragments, with grain sizes ranging from several cm to <0.01 mm. Sometimes large fragments with sharp edges appear to be "floating" in a finer grained matrix. Seamless transitions between more brittle rock on the one hand and fault gouge on the other are common. Some of the fault breccia has kept their internal cohesion, some are consolidated again by quartz and calcite, but most of them are unconsolidated without any cohesion. These are often areas of high core loss (Asya Maden, 2015). Hydrogeologically this data can be interpreted as potentially high permeable zones. Aquifer test analyses and estimated hydraulic parameters (see Section 3.2.4) indicate that the hydraulic conductivity values show differences for the schist itself and its particular portion along the potential extent of the fault zone.

It has been reported in the previous studies that there will be localized, more-significant inflows as the mine intersects permeable fracture/fault or contact zones (RPS, 2015). A fracture zone inflow assessment has been completed and suggests that the initial interception of fully saturated discrete fractured zones could result in discrete groundwater inflows. However, these initial localized inflows might reduce in magnitude rapidly assuming that there is not a constant supply of water to these fracture zones. It is possible that large rainfall events or extended wet periods might re-saturate these fracture zones and that fracture flows could temporarily increase.

2.6.3.2 Fracture Zones

Detailed structural measurements of foliation and fractures within the GCP have been obtained through the interpretation of downhole geophysical logs. Generally, the results confirm the measurements of Okay et al., (2006) where the dip and dip-direction of the foliation is reported to be 40°/335° with an indistinct sub-horizontal mineral lineation trending ENE.

The mixed schists exhibits foliation parallel shearing and these shear zones may be present at all scales. Other faults are also present at GCP where two deposit-scale faults were interpreted by AMI. The shape of these structures is unlikely to be planar. They are likely to exhibit changes in dip and dip direction from the small- to large-scale (Asya Maden, 2015). Based on the available structural data, a systematic fracture orientation could not be defined.

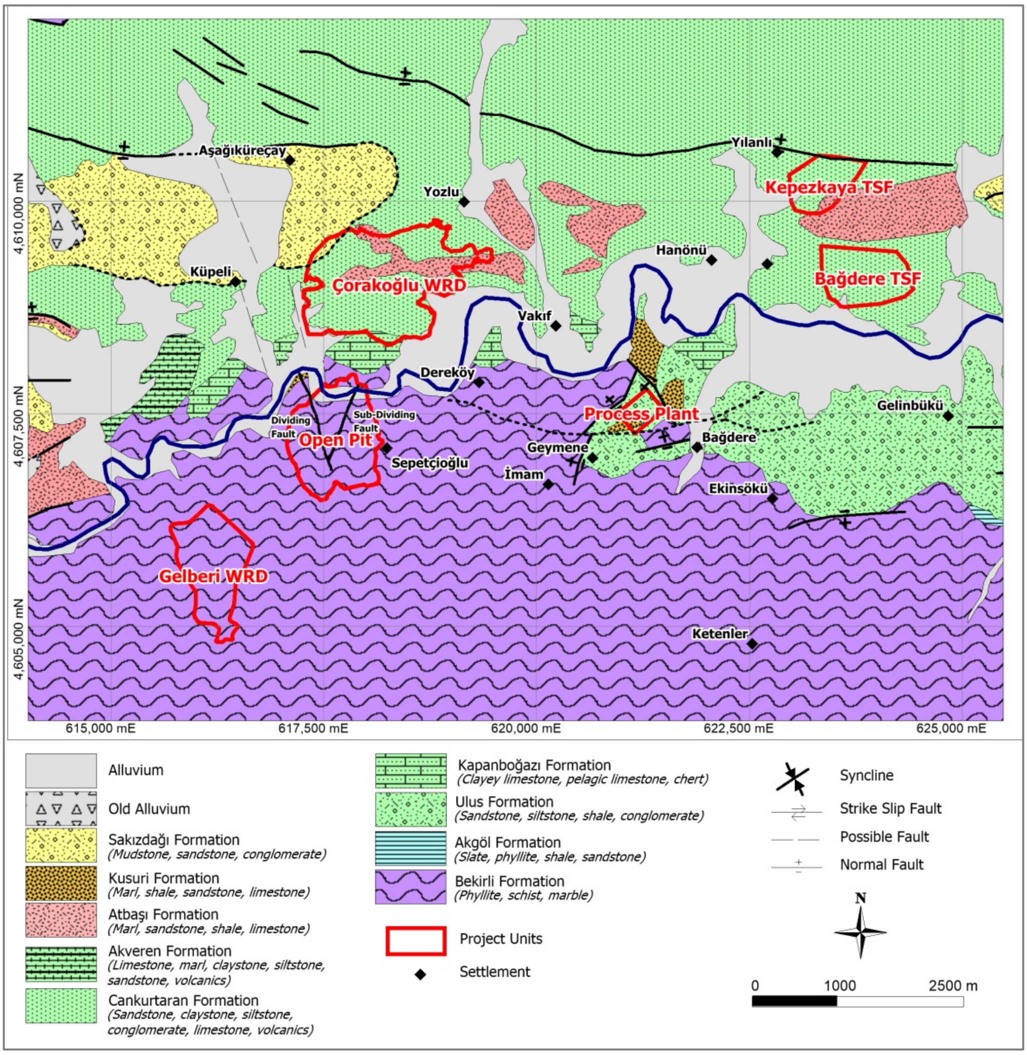


Figure 2.17: Geological map showing the potential extents of the Dividing and Sub-Dividing faults

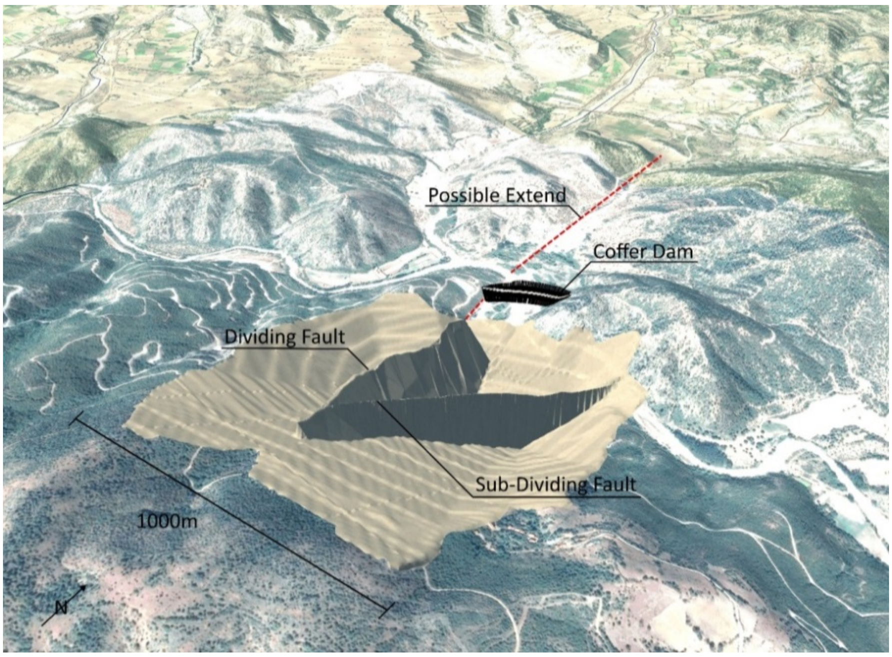


Figure 2.18: 3D view of the Dividing and Sub-Dividing faults within the Open Pit

2.7 Hydrology

2.7.1 Drainage Pattern

The Project Area is located in the Kızılırmak River catchment, which covers an area of approximately 82,000 km^2. The Gökırmak River, which is one of the biggest tributary of Kızılırmak River, flows between the project units. The Gökırmak River - originates from northern flanks of Ilgaz Mountain (Kastamonu) - flows in the eastern direction in the Project Area. The Gökırmak River passes Taşköprü and Hanönü villages and reaches Kızılırmak near Boyabat village, approximately 20 km away from the southeastern part of the study area (Figure 2.19).

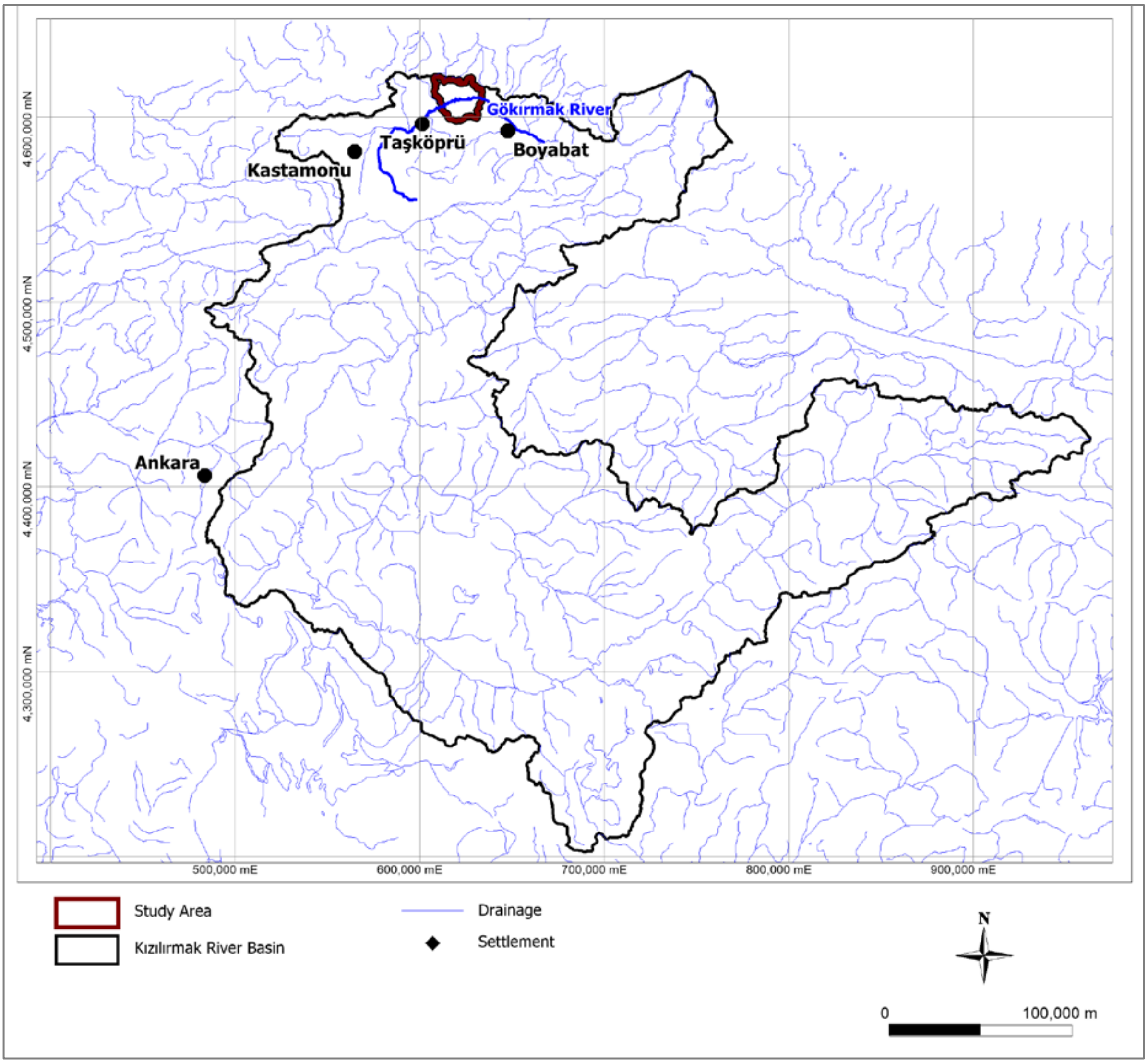


Figure 2.19 Drainage pattern of the Kızılırmak River

The drainage pattern at the Project Area and its immediate vicinity is presented in Figure 2.20. With the initiation of the Project, 11 flow monitoring points (SW-2, SW-4, SW-5, SW-7, SW-8, SW-9, SW-11, SW-12, SW-15, SW-17 and YS-2) were established on the ephemeral creeks draining the Project Area and its vicinity, and monthly flow rates have been monitored since May 2016.

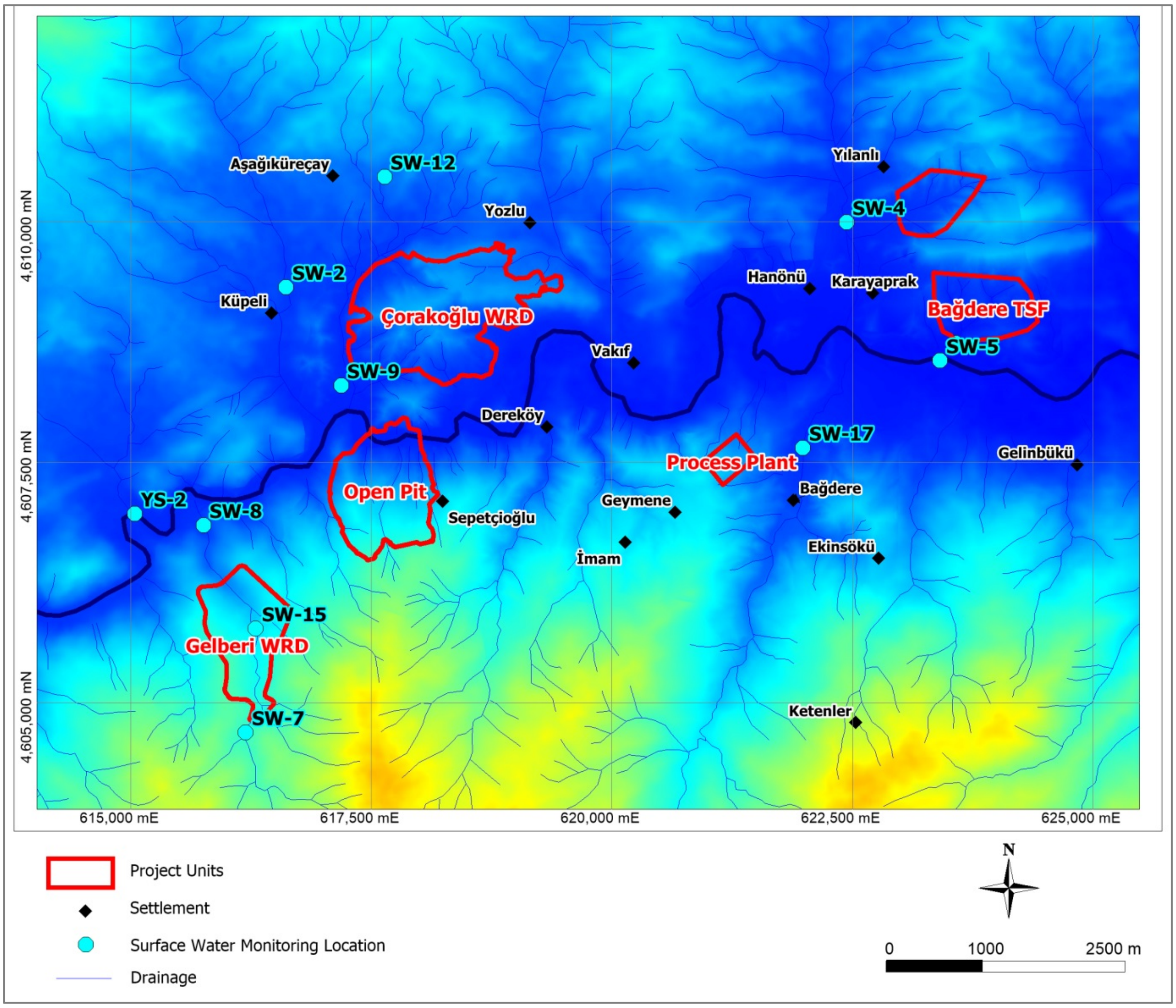


Figure 2.20 Location of surface water monitoring points

2.7.2 Gökirmak River Flow Rates

Several stream flow gauging stations were established along the Gökırmak River and its tributaries by DSI and Electrical Power Resources Survey and Development Administration (EIEI). The closest flow monitoring stations to the Project Area are Gökırmak – Kuyluş (E15A024) and Gökırmak –Purtulu (E15A045) stations (Hidro Dizayn, 2015). The locations of these stations are shown in Figure 2.21.

The Gökırmak-Kuyluş station was operated between the years 1954 – 1998. The Gökırmak-Purtulu station, which is in operation since 1999, replaced Kuyluş station. The long-term average monthly discharge rates measured at these stations are given in Figure 2.22.

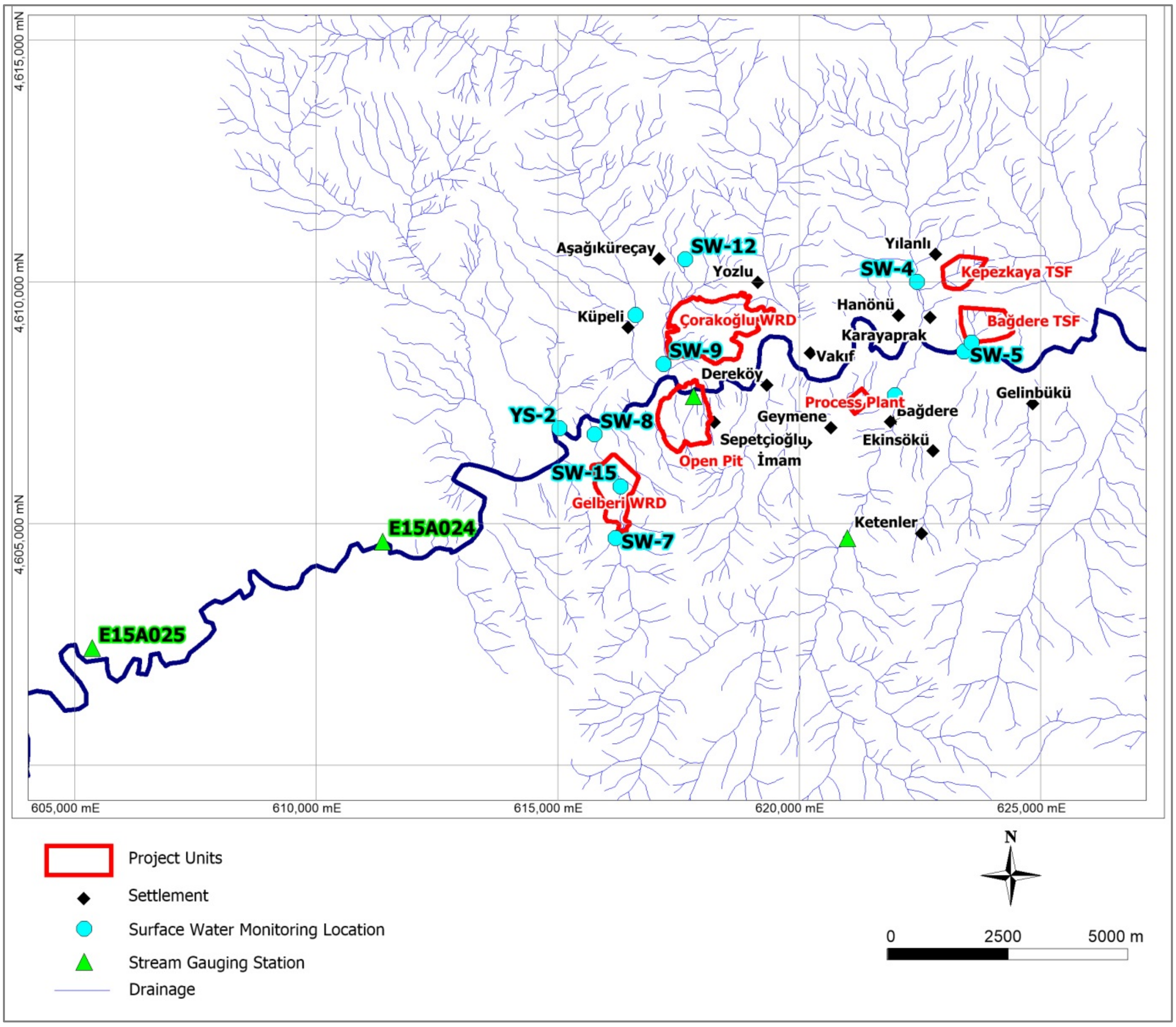
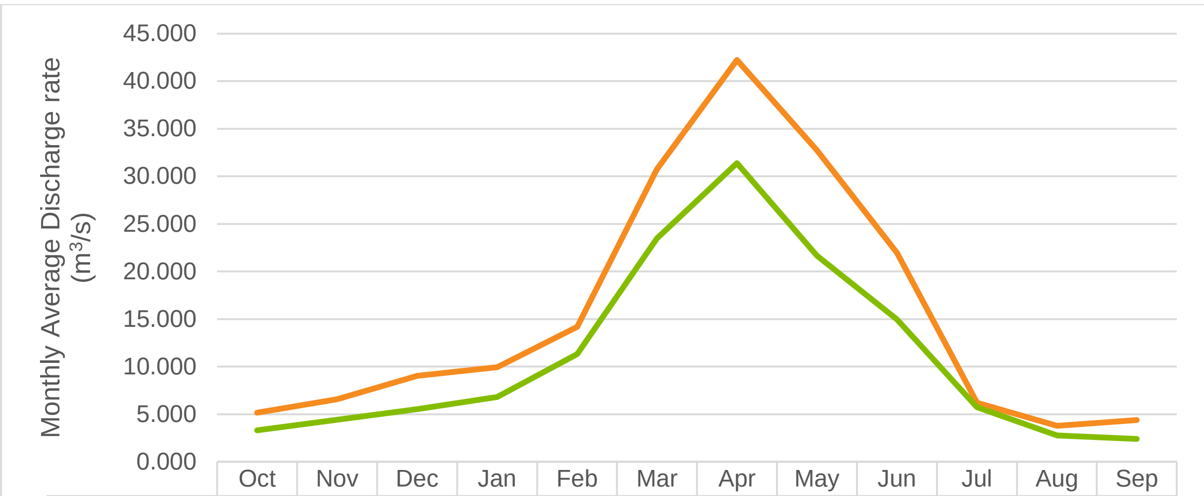


Figure 2.21 Location of stream flow monitoring stations



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
E15A024	5.162	6.561	9.040	9.954	14.175	30.751	42.239	32.733	21.975	6.192	3.764	4.396
E15A045	3.312	4.417	5.543	6.793	11.333	23.471	31.386	21.654	14.960	5.725	2.780	2.411

Figure 2.22 Long-term Average Monthly Discharge Rates Measured in Purtulu and Kuyluş Stations

2.7.3 Other Surface Water Resources and Structures

2.7.3.1 Lakes and Ponds

Several ponds are present within the Kastamonu Province. Table 2.7 shows notable ponds with their storage capacities, irrigation areas and their distances to Hanönü Town. The nearest ponds to the Project Area were identified as the Asar Pond, having a distance of 30 km, and Kabalar Pond, having a distance of 31.1 km to Hanönü. Both ponds are primarily used for irrigation purposes with storage volumes of 4.56 hm^3 and 0.56 hm^3, respectively. There is also a natural lake, known as the Dipsiz Lake, located in Tosya region of the Kastamonu Province, however, no study has so far been carried out regarding its use as a water resource.

Table 2.7: Notable Ponds in the Kastamonu Province

Pond Name	Nearest Settlement Area	Corresponding Stream	Completion of Construction	Storage Volume (hm3)	Irrigation Area (ha)	Distance to Project Area
Kösençayırı	Tosya	Kavuncu	1986	2.04	2000	72.5
Kabalar	Taşköprü	Değirmen	1975	0.56	53.4	31.1
Tasçılar	Daday	Iğdır	1983	1.02	126	90
Yumurtacılarf	Daday	Bakırca	1981	0.93	124	86.5
Çiğdem	Devrekani	Çatak Boğazı	1981	1.005	111	49.2
Tuzaklı	Araç	Gavur	2002	1.1	229	96
Asar	Taşköprü	Hasanlı	2008	4.56	1010	30
Bezirgan	Daday	Koldan	Under Construction	17.5	2505	91.5

2.7.3.2 Existing Surface Water Structures

Dams

Seven dams are currently being operated within the Kastamonu Province. The dams were identified to be used for different purposes such as drinking and industrial water supply, irrigation, and power production. The nearest dam was identified to be the Karadere Dam having a distance of 31.1 km to the Project Area. Table 2.8 provides general information on surface areas, volumes and their distances to the Project Area.

Table 2.8: Information on dams located within the Kastamonu Province

Name of Dam	Surface Area (ha)	Volume (hm3)	Distance (km)	Direction	Intended Purpose
Karaçomak	154	23	68	South-West	Drinking water+ Irrigation
Germeçtepe	54	7.3	72	South-West	Irrigation
Beyler	240	25	54.6	North-West	Irrigation
Karadere	101	26	31.3	South-West	Irrigation
Küre-Çatak	1	0.51	68	North-West	Industrial Water Supply
Kulaksızlar	200	18.72	43.5	West	Irrigation
Altınkaya	11800	5.763.00	58.3	South-East	Energy Supply

Demirci Regulator and Hydroelectric Power Plant

Privately-owned Demirci Regulator and Hydroelectric Power Plant (Demirci HEPP) is constructed on the Gökırmak River, next to the Dereköy Village in Hanönü. The facility consists of 18.500 m-long supply canal, forebay pool, 200 m-long penstock pipe, turbine and a power house. Thalweg and crest elevations of the Demirci HEPP are 420 m and 425m while maximum water elevation is 428 m, respectively. Installed capacity of the facility is 13.05 MW and it is planned to generate 59.1 GWh power per year. The nearest project units to the

Demirci HEPP are the Open Pit and the Çorakoğlu WRD which are situated in 1 km (Open Pit) and 600 m (Çorakoğlu WRD) distances. Figure 2.23 shows the location of the Demirci HEPP within the Project Area.

2.7.3.3 Planned Surface Water Structures

Taşköprü Dam and Power Plant

Taşköprü Dam is planned to be constructed on the Gökırmak River with a thalweg elevation of 437 m. The dam embankment will be constructed approximately 1.5 km southwest of the upstream cofferdam of the Gökırmak River diversion. The dam is planned to provide water for both irrigation purposes and power generation. Following its construction, the Taşköprü Dam is expected to irrigate 6062 ha gross agricultural land area (5456 ha net area) with an annual energy production of 52.20 GWh. Dam site, reservoir and 1st unit of irrigation area (Hanönü Irrigation) are located within Kastamonu (Hanönü province) while the 2nd unit of Irrigation (Urluca Irrigation) site is located within Sinop, (Boyabat and Durağan provinces).

It should be noted that Taşköprü Dam Project has granted its EIA approval from the Ministry of Environment and Urbanization and is included in the “Planned Dam List” by the State Hydraulic Works. Gelberi Waste Rock Dump is planned to be developed after the 4th year of the mining operation, in the Gelberi Valley, just on the south of the dam embankment. Furthermore, the proposed boundary of the Gelberi Waste Rock Dump is lying within the extend of the Taşköprü Dam Lake. As known, Gelberi Waste Rock Dump is still in the planning phase and needs to be permitted before any development. During the permitting stage there might be some conflicting issues with the State Hydraulic Works, due to potential community health and safety related risks.

Gökçeağaç Pond

Gökçeağaç Pond is planned to be constructed approximately 7.5 km from the Open Pit area, to supply drinking water. The nearest project units to the planned Gökçeağaç Pond are the Kepezkaya and Bağdere TSFs that are located within 2 km and 2.6 km distances. Figure 2.23 shows the location of the planned Gökçeağaç Pond with respect to Kepezkaya and Bağdere TSF areas.

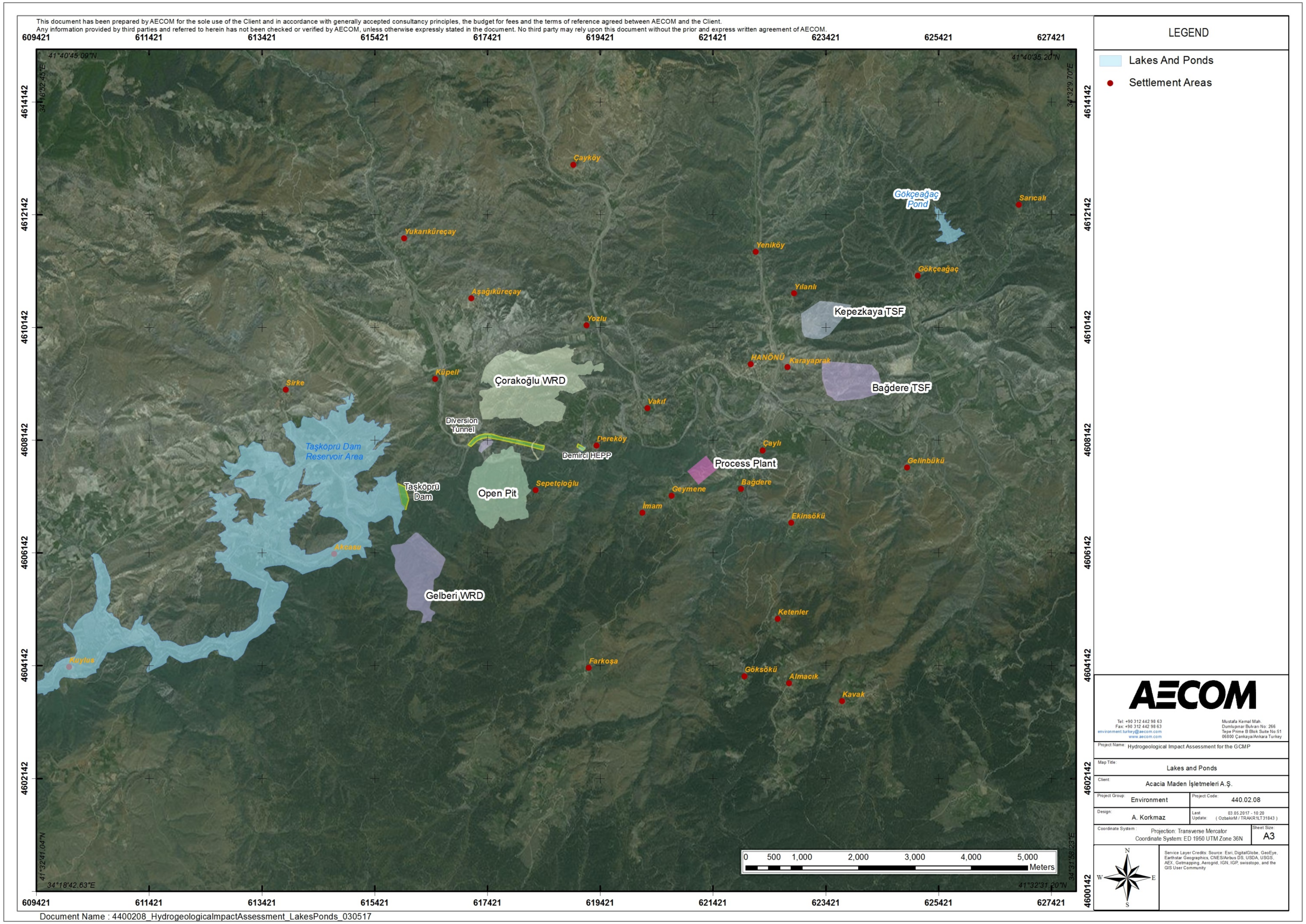


Figure 2.23: Locations of the planned Taşköprü Dam, Demirci HEPP and Gökçeağaç Pond

2.8 Hydrogeology

2.8.1 Water Bearing Units

Water bearing units in the Project Area can be classified into two main categories (1) highly permeable and (2) semipermeable to impermeable units.

2.8.1.1 Highly Permeable Units

Unconsolidated alluvial deposits associated with the Gökırmak River and its tributaries are classified as highly permeable units. These deposits can exhibit a significant primary permeability where clean sand, gravel or pebble units are present. In the vicinity of the pit, the width of the alluvium is generally up to 200 meters and thicknesses of up to 40m have been recorded. Furthermore, where the tributaries meet with the Gökırmak River, alluvium fans can be noted. The width of these fans can reach up to 500m meters and thicknesses of up to 60m.

These coarse grained alluvial deposits have the potential to act as significant aquifers for the Project. A key feature is the storage properties of these aquifers and the degree of hydraulic continuity/connectivity of the deposits. Furthermore a study completed by AECOM in September 2015, indicated that these alluvial units are being recharged by the surface water. Especially on the upstream sections of the tributaries of Gökırmak River, up to 50 l/s of surface water flow was noted where the river bed was formed by the outcropping bedrock units. On the other hand, as soon as the flow reaches to a location where this alluvium unit overlies the bedrock; the water flow on the surface was fading away and continued at the subsurface.

Various studies have been completed to estimate the aquifer parameters of the alluvial deposits by different parties (DSI 1994, 1996, Nbaproje 2013, 2014, RPS 2015, AECOM 2015 and AECOM 2016). Test results indicate that the alluvial deposits in the Project Area shows permeable features having hydraulic conductivities on the order of 10^{-3} and 10^{-6} m/s (majority of the test results are on the order of 10^{-3} m/s).

2.8.1.2 Semipermeable to Impermeable Units

The schists, phyllites, metabasic rocks as well as the sedimentary and volcanoclastic rocks are classified as semipermeable to impermeable units. These units cover almost all of the Project Area except for the areas that the alluvial units are present (underlies the alluvial deposits as well). The thickness of these units can reach more than 1000 meters.

Fresh and un-fractured sections of these units show almost impermeable behavior. On the other hand, the contact zones and significant fracturing and/or alteration zone of the rock mass shows a semipermeable behavior.

Third parties have completed a series of aquifer tests on these units. However the majority of the tests were not completed in accordance with the international standards. The results of the tests provided by the third parties are given here just to give a rough estimate about the permeability of these units. The tests completed on the un-fractured sections of these units indicate hydraulic conductivities on the order of 10^{-7} to 10^{-9} m/s. On the other hand, the tests that have been completed on the fractured sections indicate hydraulic conductivities reaching up to 10^{-5} m/s.

2.8.2 Springs and Depots

A water quality sampling and monitoring program was initialized in September 2015 by AECOM, primarily to identify the quality of drinking waters. AECOM has collected samples from the water depots and springs at selected locations in the Project Area to understand the baseline conditions in more detail and more in line with the current mine layout. Within the scope of this program, 3 village fountains, 2 springs and 6 village water depots were visited. Collected samples were analyzed in ALS Prague Laboratories for anions and nutrients, inorganic parameters such as total dissolved solids, alkalinity, nitrogen and dissolved/total metals. Project Area and its vicinity were also investigated to identify the major transmission lines that provide water for the nearby settlement areas. As of May 2016 AECOM has started an extensive sampling and monitoring program on drinking water quality that covers village water depots, fountains and springs located in the Project Area. Sampling and monitoring studies and water quality assessments are provided in detail in Section 3.2.5.

2.8.2.1 Drinking water resources for the nearby villages:

- Sepetcioğlu Village: the closest village to the Open Pit area. Habitants of this village consume water directly from a nearby spring (K-1 in). A depot does not exist in the village. K-1 coded water sample was collected and analyzed.
- Dereköy Village: located in the southern bank of the Gökırmak River. This village uses a nearby spring located in the upstream portion of Kızılince stream. The K-4 coded water sample was collected from this spring and D-4 coded sample was collected from the water depot of the Dereköy village.
- Vakıf Village: located at the northwest of the Process Plant near the Gökırmak River. Domestic water for this village is supplied from a well located in the village. Water is pumped to the depot of Vakıf village constructed in the northeast of the village and then distributed to the households.
- Küpeli Village: located in the west of the Çorakoğlu WRD. Domestic water need of this village is met from a well, constructed within the bank alluvium of the Gökırmak River. Water is pumped to the village water depot via a buried pipeline system.
- Hanönü Town: located in the west of the Kepezkaya and Bağdere TSFs. The spring used for drinking water supply is located north of te Yeniköy Village on the upstream of Yılanlı Stream. Hanönü has two water depots in the Karayaprak Village. The municipality of Hanonü utilizes a caisson well located at the intersection point of Gökırmak and Yılanlı streams to meet the additional water needs in the dry season.
- Yılanlı Village: located near the planned Kepezkaya TSF. This village uses the same water supply system which is utilized for the Hanönü Town.
- Imam Village: located toward the southwest of the planned Process Plant. The village has a relatively small water depot fed by a nearby spring located 50 m away from the depot.
- Geymene Village: located at the south of Hanönü between Bağdere and İmam villages. Domestic water source location is not exactly known. However, based on the information verbally obtained from the locals, the source is close to the Farkoşa Village in the south. Water is stored in the depot of the village itself.
- Yeniköy Village: located in the north of the Hanönü Town (upstream section of the Yılanlı Stream). Water is provided by the same source as the Hanönü Town.
- Bağdere Village: located in the south of Hanönü Town. A domestic water source is located in close proximity to a waterfall on the Sarıkaya stream. There are two water depots belonging to Bağdere in the South, one of them is known to be the old one while the other is the new. These depots belong to both Bağdere and Çaylı Villages.
- Çaylı Village: located between Bağdere and Hanönü. Tap water is transferred from the Bağdere Village water depot.

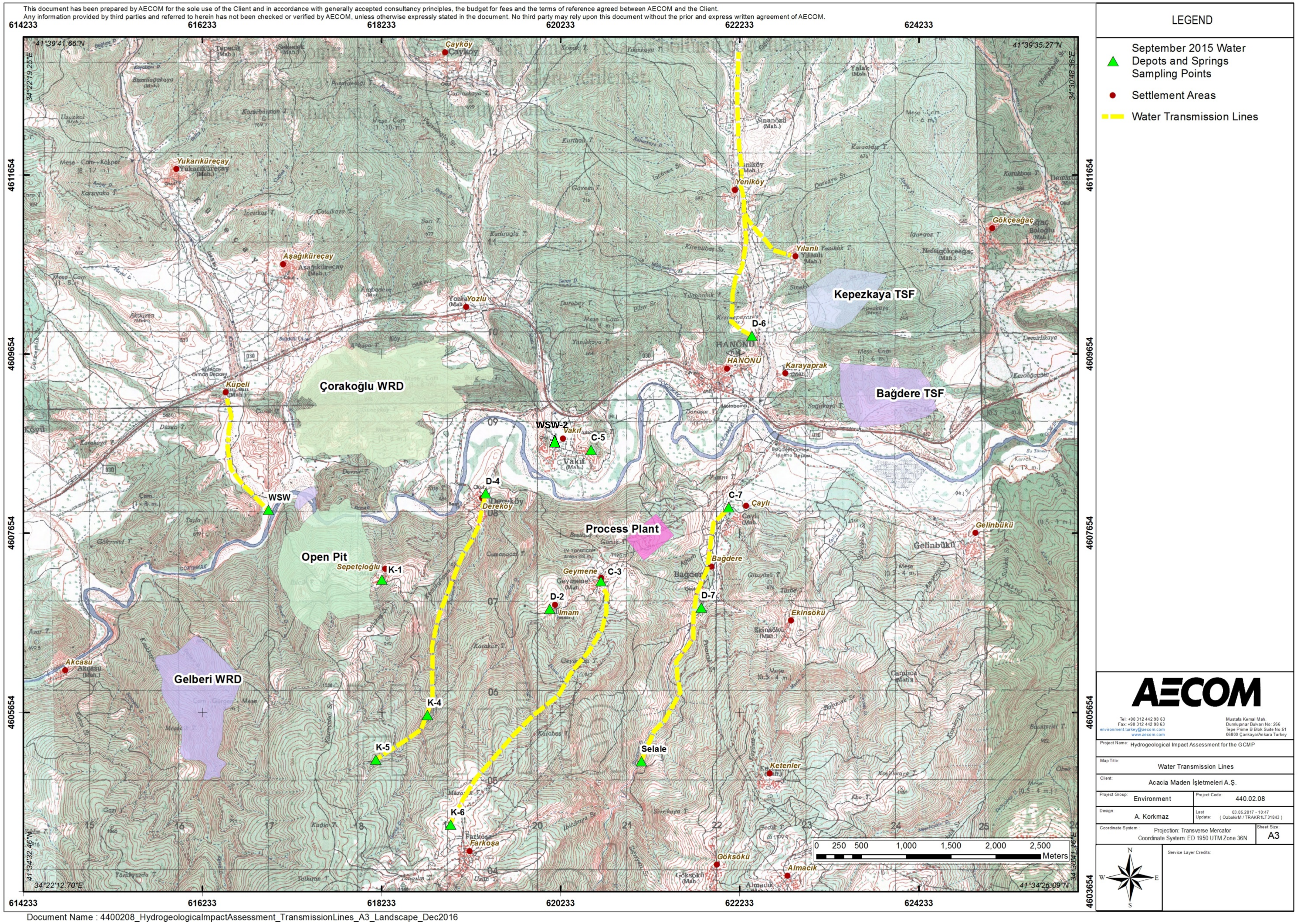


Figure 2.24: Water Depots and Springs Sampling/Monitoring Locations and Water Transmission Lines

2.8.3 Estimation of Groundwater Recharge

Precipitation in an area is transformed into runoff, infiltration and/or evapotranspiration components. Water budget calculations estimate the ratio of these components to precipitation.

During the estimation of the water budget for the study area, Thornthwaite method was used to calculate potential evapotranspiration while the estimated curve number was used for surface runoff determinations. The remaining portion of the precipitation was assumed to be equal to infiltration into groundwater. This method requires a set of inputs to estimate ratio of the water budgets components as described below.

- The mean monthly precipitation values that represent the study area (for median elevation) are obtained by correlating the measured data of Kastamonu and Devrekani meteorological stations, and corrected precipitation values measured in the Kastamonu meteorological station according to the calculated % BIAS values, which is explained in detail in Section 2.5.1.
- The mean monthly temperature values measured in Kastamonu meteorological station were corrected according to the calculated % BIAS values (see Section 2.5.2).
- Latitude of the study area
- Run off Curve Number (see below for further description)

According to the Thornthwaite Method, uncorrected monthly potential evaporation (UPET; mm/month) is calculated by:

$$UPET_m = 16 \times \left(\frac{10t_m}{I}\right)^a \quad (3.1)$$

$$a = (675 \times 10^{-9})I^3 - (771 \times 10^{-7})I^2 + (179 \times 10^{-4})I + 0.492 \quad (3.2)$$

$$I = \sum_{i=1}^{12}\left(\frac{t_i}{5}\right)^{1.514} \quad (3.3)$$

where,

m: month index,

t: mean monthly temperature (°C),

I: annual heat index (equals to the sum of monthly heat indices, i),

a: coefficient that depend on heat index

In the Curve Number (CN) method, which was developed by U.S. Soil Conservation Service (SCS, 1964), the surface runoff values are calculated on the basis of: (a) direct runoff (or excess rainfall), Pe, is less than or equal to total precipitation (P); (b) soil moisture retention occurring after runoff begins (Fa) is less than or equal to the potential soil moisture retention (S). Until precipitation reaches a certain value (Ia, initial abstraction) runoff is not observed, thus, potential runoff is equal to P - Ia. In the CN method, the ratio of two real and two potential values mentioned above, are equal, and by applying the continuity principle, direct runoff (or excess rainfall, Pe) can be computed as:

$$P_e = \frac{(P - I_a)^2}{P - I_a + S}$$

For small watersheds, it is generally assumed that Ia=0.2xS, hence the generalized form of the CN method is obtained as:

$$P_e = \frac{(P - 0.2S)^2}{P + 0.8S}$$

The Curve number is derived from curves drawn based on the relationship between P and Pe from data corresponding to many basins. CN is related to potential soil moisture retention by CN=1000/(S+10). Thus, runoff curve numbers (CNs) indicate the runoff potential from a hydrologic soil-cover complex during periods when the soil is not frozen. A higher CN indicates a higher runoff potential.

Runoff curve numbers (CNs) depend on land use, landcover, and hydrologic soil groups. Hydrologic soil groups are divided into four types:

- Group A: Well drained soils that have low runoff potential and high infiltration rates even when they are thoroughly wetted (such as sand, conglomerate, silt).
- Group B: Soils that have moderate runoff potential and infiltration rates (such as sandy loam).
- Group C: Soils that have high runoff potential and low infiltration rates (such as clay loam).
- Group D: Soils that have very high runoff potential and very low infiltration rates (such as plastic clay).

The study area is mainly composed of forests, and the soil can be classified as hydrologic soil group B, having moderate runoff and infiltration potential. Therefore, for the study area, the curve number is estimated as 79.

The components of long-term hydrologic water budget were determined conceptually for each month using the calculated CN for the study area, long-term mean monthly precipitation and potential evapotranspiration data obtained from the Thornthwaite method.

The monthly potential evapotranspiration (PET) values were obtained by correcting the UPET value, using the coefficient “r”, which is based on the latitude of the area (41°). The surface runoff (R/O) was calculated using monthly precipitation values and curve number (CN=79). The difference between monthly precipitation and runoff is equal to infiltration (SZ). The soil moisture (ST) capacity is assumed to be 100 mm, and for each month, change in soil moisture (delta SZ) was computed. Based on these calculations, actual evapotranspiration (AET), surface runoff and groundwater recharge values were determined (Table 2.9).

According to the water budget calculations, average annual groundwater recharge from direct precipitation in the study area is calculated as 31.70 mm, which comprises 6 % of the annual precipitation (Table 2.10).

Since the study area is located in a steep and undulating topography, the distribution of groundwater recharge also varies within the study area. In this regard, the conceptual water budget calculations are repeated by using the corrected precipitation and temperature series provided in Section 2.5.5 for higher and lower elevations, which corresponds to 75th and 25th percentile of the area, respectively. The curve number was estimated as 79 for the higher elevations, whereas due to change in slope and vegetation, it was taken as 75 for the lower elevations. The monthly conceptual water budget model for the higher and lower elevations is given in Table 2.11 and Table 2.12, respectively. According to the water budget calculations, average annual groundwater recharge from direct precipitation at the higher elevations was calculated as 50.39 mm, which comprises 9 % of the annual precipitation (

Table 2.13). On the other hand, at the lower elevations, average annual groundwater recharge from direct precipitation was determined as 14.03 mm, which comprises 3 % of the annual precipitation (Table 2.14).

Table 2.9: Monthly conceptual water budget model for the study area

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	% of Precipitation
Mean Monthly Temperature (oC)	-2.96	-1.51	2.16	7.31	11.61	14.73	17.04	17.1	13.38	8.96	4.31	-0.22		
i	0	0	0.28	1.78	3.58	5.13	6.4	6.43	4.44	2.42	0.8	0	31.26	
a;	1	1	1	1	1	1	1	1	1	1	1	1	11.96	
UPET	0	0	11.06	37.32	59.16	75	86.74	87.04	68.19	45.73	22.06	0	492.29	
PET	0	0	11.39	41.43	73.94	94.5	110.16	103.57	70.92	43.9	18.09	0	567.9	
r : monthly correction factor	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.8		
Mean Monthly Precipitation (mm)	39.85	33.44	39.36	55.62	74.09	63.38	30.44	29.46	30.44	42.96	31.12	45.05	515.22	
CR/O	1	1	1	1	1	1	1	1	1	1	1	1		
R/O	7.39	4.54	7.16	16.18	28.65	21.19	3.4	3.05	3.4	8.95	3.65	10.05		
SZ (mm)	32.45	28.9	32.2	39.44	45.44	42.19	27.04	26.41	27.04	34.01	27.48	35.01		
SZ-PET	32.45	28.9	20.81	-1.99	-28.51	-52.31	-83.11	-77.16	-43.88	-9.88	9.39	35.01		
TOTAL (P-PET)	0	0	0	-1.99	-30.5	-82.81	-165.92	-243.08	-286.96	-296.84	0	0		
ST	100	100	100	98.03	73.72	43.69	19.03	8.8	5.67	5.14	14.53	49.54		
delta ST	32.45	18.01	0	-1.97	-24.32	-30.03	-24.66	-10.23	-3.12	-0.53	9.39	35.01		
AET	0	0	11.39	41.41	69.75	72.22	51.7	36.64	30.17	34.55	18.09	0	365.92	71%
Excess Rainfall (SZ-AET)	7.39	15.43	27.97	16.18	28.65	21.19	3.4	3.05	3.4	8.95	3.65	10.05	149.3	
Surface Runoff	7.39	4.54	7.16	16.18	28.65	21.19	3.4	3.05	3.4	8.95	3.65	10.05	117.61	23%
Recharge	0	10.88	20.81	0	0	0	0	0	0	0	0	0	31.7	6%
												TOTAL	515.22	100%

Table 2.10 Annual conceptual hydrologic budget results of the study area

Hydrologic Component	Amount (mm/yr)	Ratio to Annual Precipitation (%)
Precipitation	515.22	100
Evaporation	365.92	71
Surface Runoff	117.61	23
Recharge	31.70	6

Table 2.11 Monthly conceptual water budget model for the higher elevations

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	% of Precipitation
Mean Monthly Temperature (oC)	-3.15	-2.43	1.30	6.20	10.54	13.60	16.03	16.01	12.38	7.85	3.09	-1.39		
i	0.00	0.00	0.13	1.39	3.09	4.55	5.83	5.82	3.94	1.98	0.48	0.00	27.22	
a;	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	11.23	
UPET	0.00	0.00	8.01	34.58	56.80	72.08	84.07	83.96	66.00	43.09	18.03	0.00	466.63	
PET	0.00	0.00	8.25	38.39	71.01	90.83	106.76	99.91	68.64	41.37	14.79	0.00	539.94	
r : monthly correction factor	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.80		
Mean Monthly Precipitation (mm)	41.01	34.95	41.57	60.50	77.37	65.85	31.73	33.16	34.70	44.80	35.93	50.16	551.72	
CR/O	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
R/O	7.96	5.17	8.24	19.29	31.04	22.86	3.87	4.43	5.07	9.91	5.59	12.90		
SZ (mm)	33.05	29.78	33.33	41.21	46.32	42.99	27.85	28.73	29.64	34.89	30.34	37.26		
SZ-PET	33.05	29.78	25.08	2.83	-24.68	-47.84	-78.91	-71.18	-39.00	-6.48	15.55	37.26		
TOTAL (P-PET)	0.00	0.00	0.00	0.00	-24.68	-72.52	-151.43	-222.61	-261.61	-268.09	0.00	0.00		
ST	100.00	100.00	100.00	100.00	78.13	48.42	22.00	10.80	7.31	6.85	22.40	59.66		
delta ST	33.05	7.29	0.00	0.00	-21.87	-29.70	-26.43	-11.20	-3.49	-0.46	15.55	37.26		
AET	0.00	0.00	8.25	38.39	68.20	72.69	54.28	39.93	33.12	35.35	14.79	0.00	365.00	66%
Excess Rainfall (SZ-AET)	7.96	27.66	33.32	22.11	31.04	22.86	3.87	4.43	5.07	9.91	5.59	12.90	186.73	
Surface Runoff	7.96	5.17	8.24	19.29	31.04	22.86	3.87	4.43	5.07	9.91	5.59	12.90	136.33	25%
Recharge	0.00	22.49	25.08	2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.39	9%
												TOTAL	551.72	100%

Table 2.12 Annual conceptual hydrologic budget results of the higher elevations

Hydrologic Component	Amount (mm/yr)	Ratio to Annual Precipitation (%)
Precipitation	551.72	100
Evaporation	365.00	66
Surface Runoff	136.33	25
Recharge	50.39	9

Table 2.13 Monthly conceptual water budget model for the lower elevations

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	% of Precipitation
Mean Monthly Temperature (oC)	-0.80	-0.36	3.28	8.56	13.26	16.57	19.25	18.37	14.29	9.45	4.79	0.88		
i	0.00	0.00	0.53	2.26	4.38	6.13	7.70	7.17	4.90	2.62	0.94	0.07	36.70	
a;	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	12.94	
UPET	0.00	0.00	14.17	39.87	63.93	81.30	95.57	90.89	69.30	44.40	21.30	3.45	524.17	
PET	0.00	0.00	14.59	44.25	79.92	102.43	121.38	108.15	72.07	42.62	17.47	2.76	605.65	
r : monthly correction factor	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.80		
Mean Monthly Precipitation (mm)	28.22	27.03	38.19	54.44	71.42	61.21	25.58	27.40	36.05	29.31	27.15	35.23	461.23	
CR/O	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
R/O	1.33	1.07	4.27	11.52	21.33	15.20	0.80	1.15	3.52	1.58	1.10	3.25		
SZ (mm)	26.89	25.95	33.93	42.93	50.08	46.01	24.78	26.25	32.53	27.73	26.05	31.98		
SZ-PET	26.89	25.95	19.34	-1.33	-29.83	-56.43	-96.60	-81.91	-39.55	-14.89	8.58	29.22		
TOTAL (P-PET)	0.00	0.00	0.00	-1.33	-31.16	-87.59	-184.18	-266.09	-305.64	-320.52	0.00	0.00		
ST	100.00	100.00	100.00	98.68	73.23	41.65	15.85	6.99	4.71	4.05	12.64	41.86		
delta ST	26.89	25.95	5.30	-1.32	-25.46	-31.58	-25.80	-8.86	-2.28	-0.65	8.58	29.22		
AET	0.00	0.00	14.59	44.24	75.54	77.58	50.58	35.11	34.81	28.39	17.47	2.76	381.07	83%
Excess Rainfall (SZ-AET)	1.33	1.07	18.30	11.52	21.33	15.20	0.80	1.15	3.52	1.58	1.10	3.25	80.16	
Surface Runoff	1.33	1.07	4.27	11.52	21.33	15.20	0.80	1.15	3.52	1.58	1.10	3.25	66.13	14%
Recharge	0.00	0.00	14.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.03	3%
												TOTAL	461.23	100%

Table 2.14 Annual conceptual hydrologic budget results of the lower elevations

Hydrologic Component	Amount (mm/yr)	Ratio to Annual Precipitation (%)
Precipitation	461.23	100
Evaporation	381.07	83
Surface Runoff	66.13	14
Recharge	14.03	3

3. Hydrogeological Site Assessment

3.1 Previously Completed Works

A series of hydrogeological field investigations were carried out both within the scope of the earlier EIA studies and during the subsequent investigations prior to AECOM's involvement to the GCP. A chronology and brief descriptions for the previous hydrogeological works carried out by third parties are provided below:

- General Directorate of State Hydraulic Works (DSI) has completed a site investigation between 1994 and 1996 on boreholes called SK-3, SK-4 SK-5 SK-12 and SK-14 related with the construction of a hydroelectric dam on Gökırmak River (ERGIN 1998).
- As part of the open pit hydrogeological and geotechnical site investigations, 5 monitoring wells (OW-1, OW-2, OW-3, OW-4 and OW-5) were drilled in the schists in the pit area in November 2012. Aquifer testing of these wells was performed by AMI in 2013 (AMI, 2013).
- Four monitoring wells (DH-1, DH-2, DH-3 and DH-4) were completed in alluvium in 2013 by Nbaproje. Aquifer testing of these monitoring wells was performed by AMI in 2013 (AMI, 2013).
- A total of 14 monitoring wells (DSK1 – 10) were completed, dominantly in the alluvium, in 2014. The drilling work is reported to be associated with geological and geotechnical investigations regarding the coffer dam and tunnel construction (Nbaproje 2014a and 2014b).
- Kepezkaya TSF area was investigated with a total of 25 monitoring wells (KSK1 – KSK25) completed in 2014 and 2015 by AMI. AMI has completed aquifer tests on 14 of the monitoring wells in 2014.
- Three caisson wells near the Gökırmak River were completed in 2014. Aquifer testing in these wells was performed by AECOM in 2015.
- Field studies and installation of new boreholes were extended to cover Çorakoğlu WRD (WD series) along with additional monitoring wells that were installed in the Open Pit area (GT series) as of August 2015. Two of the Open Pit monitoring wells (GT-007 and GT-013) has been completed to characterize the hydraulic properties of a major fault, known as the Dividing Fault.
- RPS has performed aquifer tests on GT-2, GT-3, GT-7, GT-9, GT-11, GT-13 and GT-15 in the Open Pit area. As for the Çorakoğlu WRD area, RPS has carried out aquifer tests in WD-001 and WD-002.
- An investigation on the hydraulic properties of the discrete fault zones, and the potential interconnection between alluvium and the bedrock schists was discussed in previous reports (RPS, 2015). However, previous studies do not provide detailed assessment of the fault zones, especially for the Open Pit area.

3.2 Hydrogeological Assessments Completed by AECOM

A total of 20 groundwater wells have been drilled by AECOM including 15 monitoring wells within the proposed project units and 5 water supply wells in the alluvium. Water supply wells were also tested to obtain aquifer parameters, being monitored in terms of static water level variations and quality parameters. Table 3.1 shows technical information on AECOM wells while the well construction details are given in Appendix A Locations of each well with respect to the project units is provided in Figure 3.1.

A total drilling length of 1760 m were completed either using air percussion and/or mud rotary drilling methods depending on the lithological properties of the drilling locations. 11.5" drill bits were used for the GK wells with 175 mm PVC casings and screens and 5 -7 mm silica gravel placed in the annulus. Water supply wells (ST Wells) were drilled using 15" drill bits. Well developments were performed by injection of compressed air as well as over pumping with submersible pumps. Each well has been sealed with bentonite layer above gravel pack as well as a cement layer on the top.

3.2.1 Water Supply Study

AECOM completed a water supply study in October 2016 which aimed to estimate the sustainable adequate amount of water for the mining activities. As a result of evaluating several water supply options, extracting groundwater from the alluvium aquifer was considered to be the most efficient and sustainable approach for the Project's water supply.

In order to reach to this goal, five water supply wells have been drilled and installed in the alluvial deposits. Four of these boreholes (ST-1A, ST-2, ST-4 and ST-5) have been drilled on the alluvial fan of the Sarıkaya Creek (mobilization area) while one well (ST-3) was drilled on the alluvial deposits of the Kuruçay Creek.

A set of short and long term aquifer tests have been completed on these wells and it has been understood that the wells drilled on the alluvial fan of Sarıkaya Creek (mobilization area) are capable of sustaining the water demand on the long term (80 L/s). One well (ST-1) in the mobilization area has already been completed by Acacia prior to AECOM's involvement in the Project. AECOM has been informed by Acacia that ST-1 has been drilled with a total depth of 141 m and a casing/screen diameter of 200 mm. Following the completion of AECOM water supply wells, ST-1 has been started to be used as an observation well during the aquifer tests and included in the water level monitoring program.

3.2.2 Drilling and Completion of the Groundwater Monitoring Wells

Within the scope of the hydrogeological studies, a total of 15 groundwater monitoring wells have been installed so far at the Project Area. Information on monitoring well drilling works is presented in Table 3.1 while the construction details are given in Appendix A . Summary of the drilling program is provided below:

Each project unit was evaluated by hydrogeological means before proceeding with the drilling locations. The number of the monitoring wells was determined by evaluating the number and location of the previously installed monitoring wells in each project unit. To this respect,

- 5 monitoring wells for the Bağdere TSF,
- 1 monitoring well for the Kepezkaya TSF,
- 4 monitoring wells for the Çorakoğlu WRD,
- 2 monitoring wells for the Gelberi WRD,
- 1 monitoring well for the Open Pit,
- 2 monitoring wells for the Process Plant and for supplementary purposes,

have been completed.

Drilling works were performed either using air percussion and/or mud rotary drilling methods based on the lithological properties of the drilling locations. 11.5" drill bits were used for each well. Each monitoring well was constructed using 175 mm PVC casings and screens, having 5 -7 mm silica gravel placed in the annulus.

Each well was developed by injection of compressed air as well as overpumping with submersible pumps.

Each well has been sealed with bentonite layer above gravel pack as well as a cement layer on the top.

Table 3.1: Information on Monitoring Wells

Well ID	Project Unit	Coordinates (ED50 UTM Zone 36N)		Total Depth (m)	Borehole Diameter (mm)	Casing/Screen Diameter (mm)	Start Date	Finish Date	Drilling Method	Drilling Fluid	Development Method	Depth to Water Level (m) (Dec. 2016)*
		Easting	Northing									
GK-1	Bağdere TSF	623981	4609146	76	292	175	14.10.2016	16.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	8.17
GK-2	Bağdere TSF	623666	4608939	68	292	175	24.10.2016	25.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	12.5
GK-3	Bağdere TSF	623597	4609148	72	292	175	21.10.2016	22.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	17.58
GK-4	Bağdere TSF	623516	4608838	56	292	175	26.10.2016	27.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	14.5
GK-5*	Bağdere TSF	623875	4609096	68	292	175	17.10.2016	19.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	13.23
GK-6	Çorakoğlu WRD	618863	4608836	53	292	175	13.10.2016	19.10.2016	Mud Rotary	Mud	Air Compressor + Overpumping	19.07
GK-7	Çorakoğlu WRD	618992	4609550	69	292	175	27.09.2016	29.09.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	36.47
GK-8*	Çorakoğlu WRD	618323	4609330	132	292	175	21.10.2016	28.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	71.51
GK-9	Çorakoğlu WRD	617625	4609531	69	292	175	15.08.2016	21.08.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	28.2
GK-10	Gelberi WRD	616318	4605880	64	292	175	01.10.2016	02.10.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	23.72
GK-11	Gelberi WRD	615811	4606749	59	292	175	24.08.2016	09.09.2016	Air Percussion + Mud Rotary	Water + Mud	Air Compressor + Overpumping	6.11
GK-12	Open Pit	617484	4607598	281	292	175	23.09.2016	28.10.2016	Air Percussion + Mud Rotary	Water + Foam + Mud	Air Compressor + Overpumping	54.86
GK-13	Kepezkaya TSF	622869	4610091	70	292	175	05.08.2016	12.08.2016	Air Percussion + Mud Rotary	Water + Foam + Mud	Air Compressor + Overpumping	28.89
GK-A	Process Plant	620689	4607231	135	292	175	01.11.2016	10.11.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	29.91
GK-B	Process Plant	620177	4606970	120	292	175	01.11.2016	14.11.2016	Air Percussion	Water + Foam	Air Compressor + Overpumping	55.73
ST-1A	Mobilization Area	622498	4608489	80	381	280	10.07.2016	15.07.2016	Mud Rotary	Mud	Air Compressor	15.58
ST-2	Mobilization Area	622586	4608626	75	381	225	20.02.2016	25.02.2016	Mud Rotary	Mud	Air Compressor	9.29
ST-3	Küpeli Village	616690	4609130	64	381	225	19.05.2016	24.05.2016	Mud Rotary	Mud	Air Compressor	14.35
ST-4	Mobilization Area	622713	4608599	80	381	280	19.06.2016	25.06.2016	Mud Rotary	Mud	Air Compressor	7.81
ST-5	Mobilization Area	622632	4608423	70	381	280	26.07.2016	31.07.2016	Mud Rotary	Mud	Air Compressor	13.62

Notes:
*: GK-5 and GK-8 were observed to be still in recovery period by the time of the latest groundwater level measurements in December 2016.

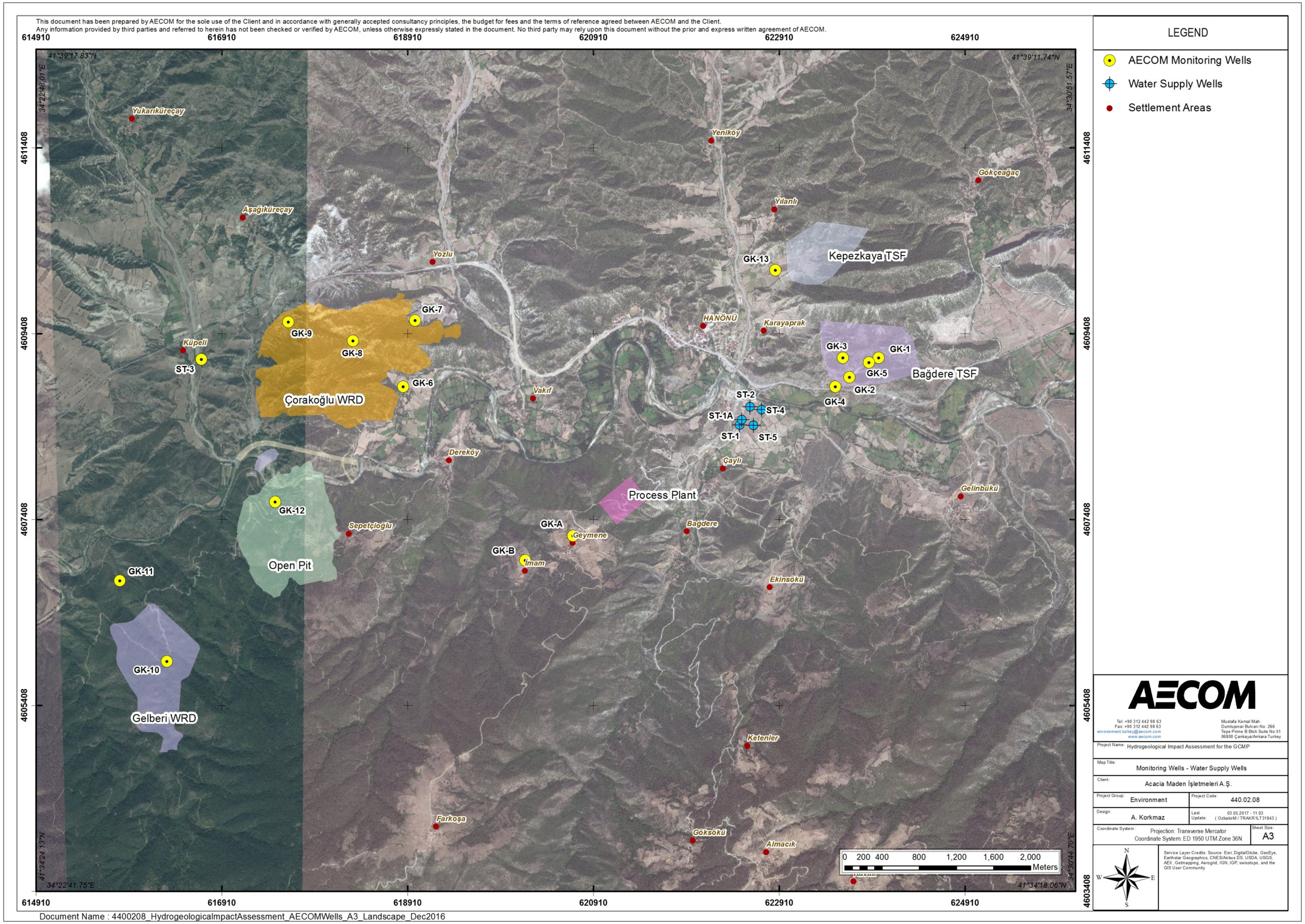


Figure 3.1: Locations of the Groundwater Wells Completed by AECOM

3.2.3 Groundwater Levels

Following sections provide information on groundwater level measurements for each project unit and for the study area. Groundwater contour maps were created using the combined data obtained from the previous studies and the additional fieldwork carried out by AECOM since September 2015. Groundwater levels were evaluated both in temporal and spatial scale. Groundwater contours were generated by taking the account of average values calculated from the groundwater level measurements, location of springs and topography data for the study area. Groundwater table is assumed to be located 3 m below stream level along valleys.

3.2.3.1 Spatial Variation in Groundwater Levels

As a part of the hydrogeological characterization study;

- Historical groundwater level measurements were collected for the previously drilled wells,
- A bi-weekly groundwater level measurement program was initiated,
- All surface water features in the project area were identified with desktop and site studies
- Topography and the topographical measurements of the water features (wells, springs, streams) were analyzed, and
- Structural features (faults) were identified and their potential impacts on the groundwater levels were analyzed.

All this data was distilled to produce a groundwater elevation map of the study area (Figure 3.2). According to the findings of this study, groundwater levels generally follow the topography with a general flow pattern from northern and southern borders toward the Gökırmak River which forms the major drainage zone within the study area. Groundwater levels decrease from a value of about 1600 - 1400 m in the northern and southern borders (respectively) to a value of about 350 - 400 m in the eastern part along the Gökırmak River. The hydraulic gradients are measured between 0.2 and 0.4 especially on the rough terrain and decrease to 0.01 in the lower elevations especially around the Gökırmak River bed.

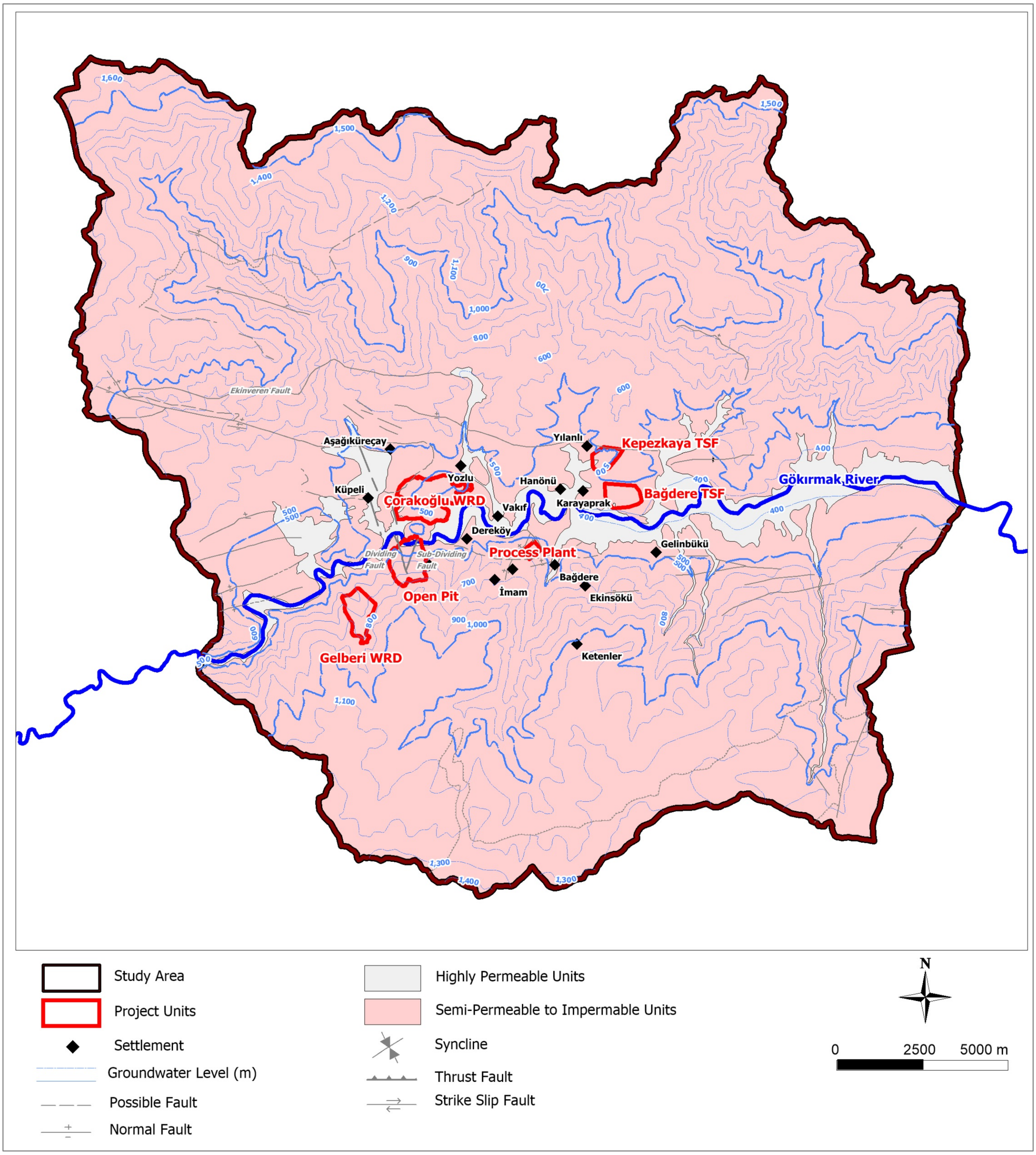


Figure 3.2: Regional groundwater level map of the study area

3.2.3.2 Temporal Variation in Groundwater Levels

The groundwater level measurement studies were started (by AMI) in 2013 and continued intermittently from the wells located in the alluvium, open pit and Kepezkaya TSF area. Groundwater levels have been measured manually from exploration boreholes, geotechnical investigation bores and hydrogeological investigation/observation wells.

Dataloggers were also installed at OW wells (OW-1 – OW-5) within the open pit, where continuous groundwater level measurements were taken between 29.03.2013 and 25.05.2015 for all OW wells and between 24.10.2016 and 21.11.2016 period for all OW wells except OW-1. Since the depths of the probes in these wells were not provided to AECOM, the groundwater level data could not be converted to groundwater elevation data. However, from the height of water column above the probes, it can be interpreted that seasonal groundwater fluctuations are occurring as 2.5m, 1.6m, 2.5m, 0.8m and 0.1m at OW-1, OW-2, OW-3, OW-4 and OW-5 wells, respectively.

The measured groundwater levels from various boreholes/wells in the project area are given in Appendix B . For each project unit, available groundwater level measurements were analyzed below. In order to determine the relationship of measured groundwater levels with precipitation, daily precipitation values that were recorded at Kastamonu meteorological station were corrected and have been added to the hydrographs.

Open Pit

Within the footprint of open pit, 31 existing wells and 1 recently drilled monitoring well (GK-12) are located (Figure 3.3). Among these, four wells (DH-1 – DH-4) were targeted in alluvium, and remaining wells were drilled to screen schist. Also, to the northeast of the open pit, in 6 existing wells (AOBH, ATBH, BOBH, BTBH, SK-9 and SK-10) groundwater levels are measured. AOBH, ATBH, BOBH, BTBH wells were drilled as a cluster where AOBH and ATBH wells were drilled to screen alluvium and BOBH and BTBH were drilled to screen underlying schists. The groundwater level measurements from these cluster wells indicate that the head in the alluvium and schist are identical at this location.

A detailed groundwater elevation map was produced with the collected data from the average groundwater levels measured at the all available monitoring points. The groundwater levels changes from 800 m at the southern part to 425-450 m near the Gökırmak River (Figure 3.4). Depth to groundwater levels measured in this area is varying between 5 and 50 meters. Groundwater table generally follows the topography and the groundwater flow direction is from south to north with hydraulic gradient range within 0.25 and 0.4. Groundwater level seasonally fluctuates up to 10 meters in schist and up to 3 meters in alluvium according to the hydrographs provided in Figure 3.4. The effect of dividing and subdividing faults can be clearly seen on the groundwater levels, indicating a relatively high conductivity zone in between the faults.

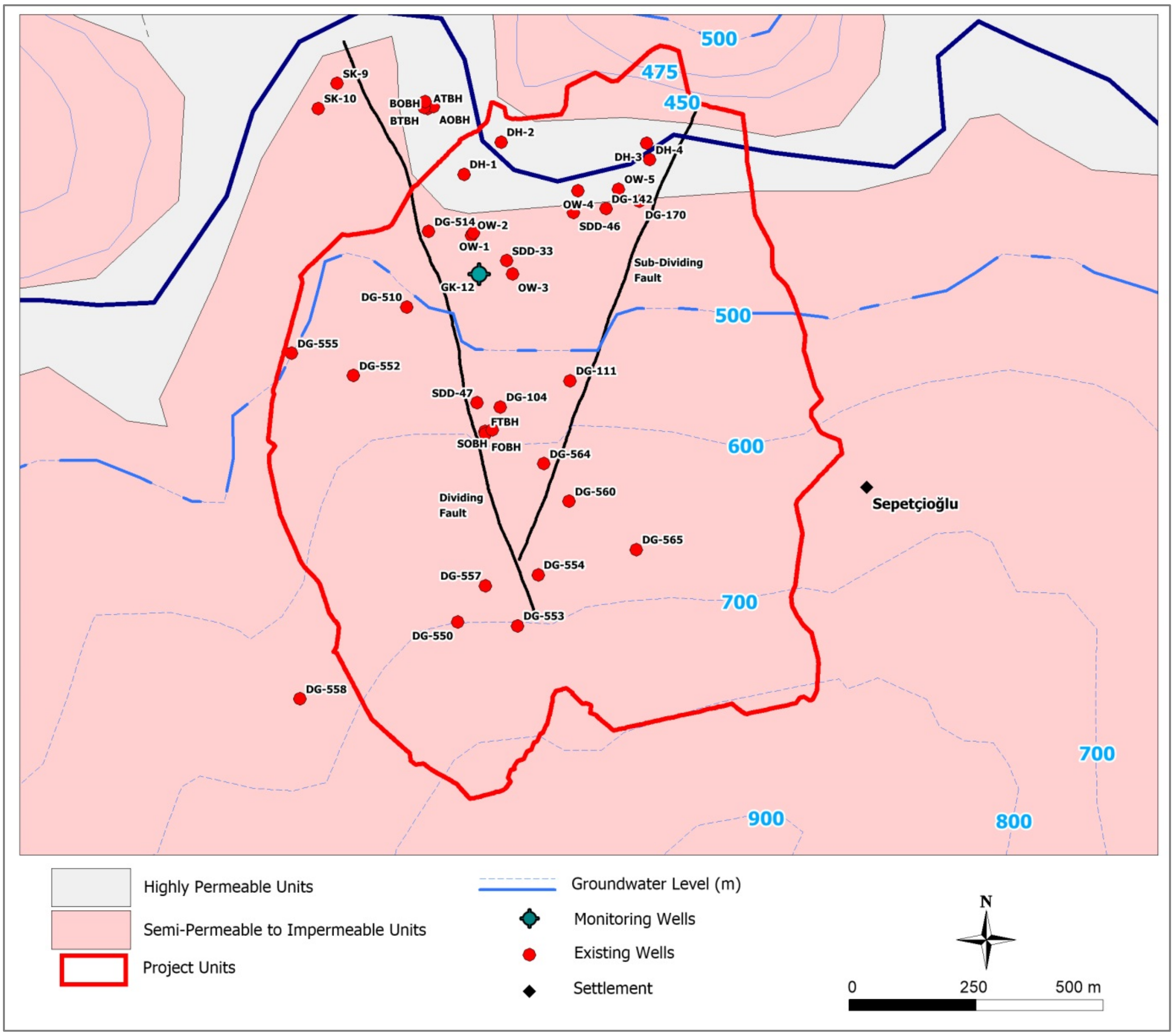


Figure 3.3 Groundwater level map of the open pit showing monitoring points

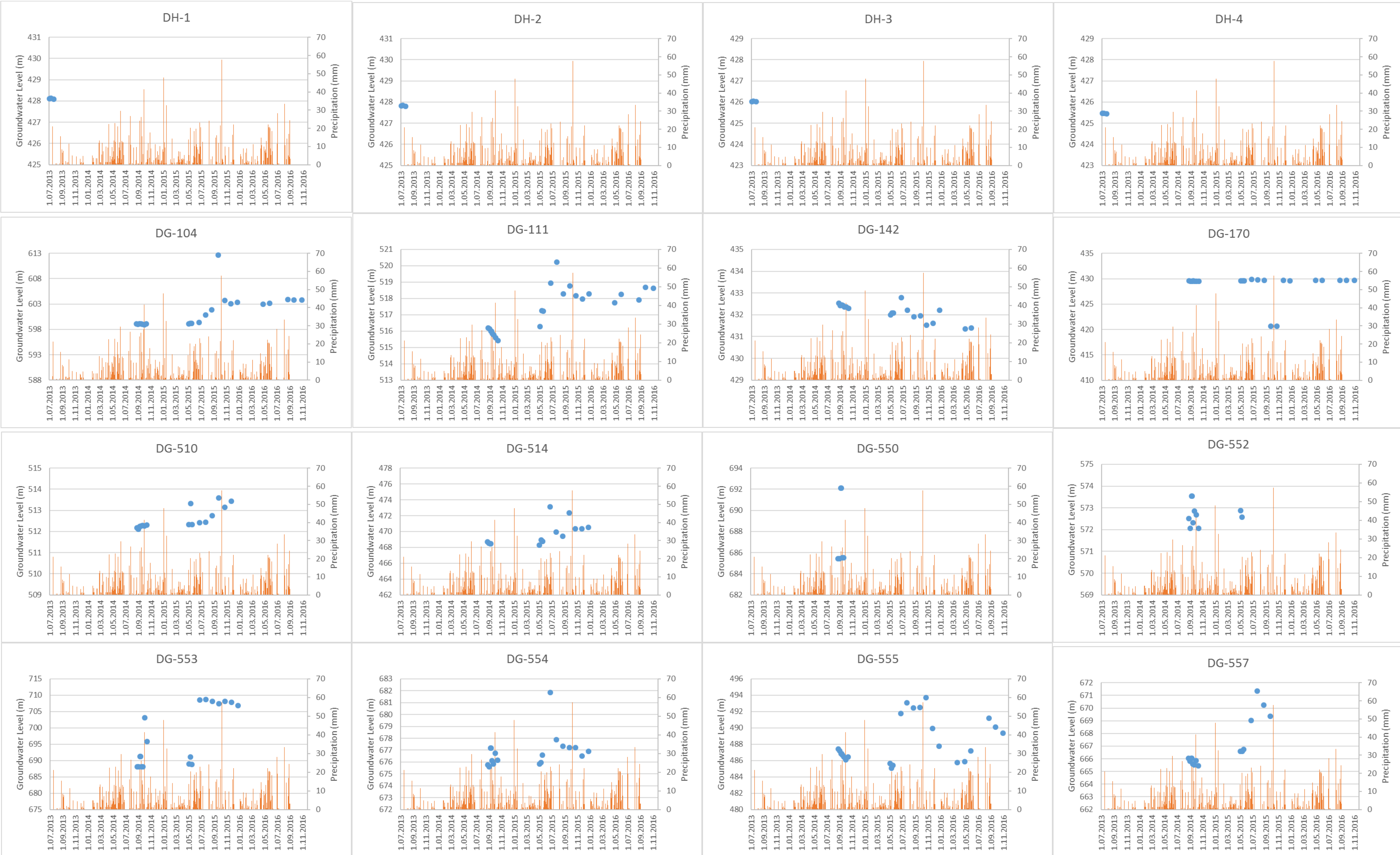


Figure 3.4: Monitored Groundwater Levels in and around the Open Pit

Figure 3.4: Monitored Groundwater Levels in and around the Open Pit (cont.)

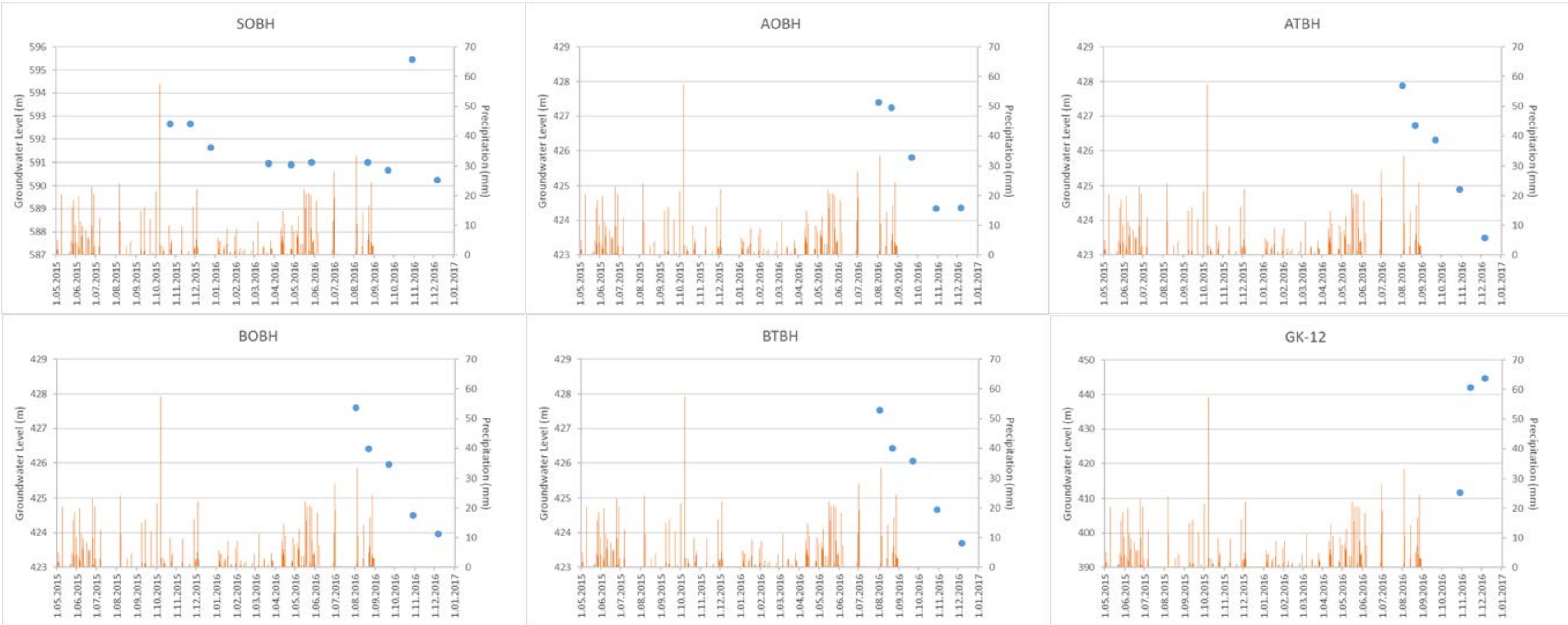


Figure 3.4: Monitored Groundwater Levels in and around the Open Pit (cont.)

Çorakoğlu WRD

In order to determine groundwater levels within the Çorakoğlu WRD, 4 monitoring wells (GK-6, GK-7, GK-8, GK-9) were drilled by AECOM (Figure 3.5). Bi-weekly groundwater level measurements are conducted in these wells, following the well completion. The hydrographs of these wells are given in Figure 3.6.

Depth to groundwater levels were observed to vary between 19 and 36 meters. Groundwater table is forming an irregular mound around the Çorakoğlu Hill, in line with topography. The groundwater flow occurs radially from this zone of groundwater high. However, the predominant flow network from this mound is from center to the south east and again from center to west and then south. The average hydraulic gradient is about 0.4 in the Çorakoğlu WRD. Collected groundwater level data was not long enough to estimate the seasonal fluctuation of groundwater table. Furthermore the observed water levels were affected by drilling and development artifacts due to the low permeability of the medium. Hence the static water levels were not reached yet. The monitoring will continue until April 2017 to reach the static water levels.

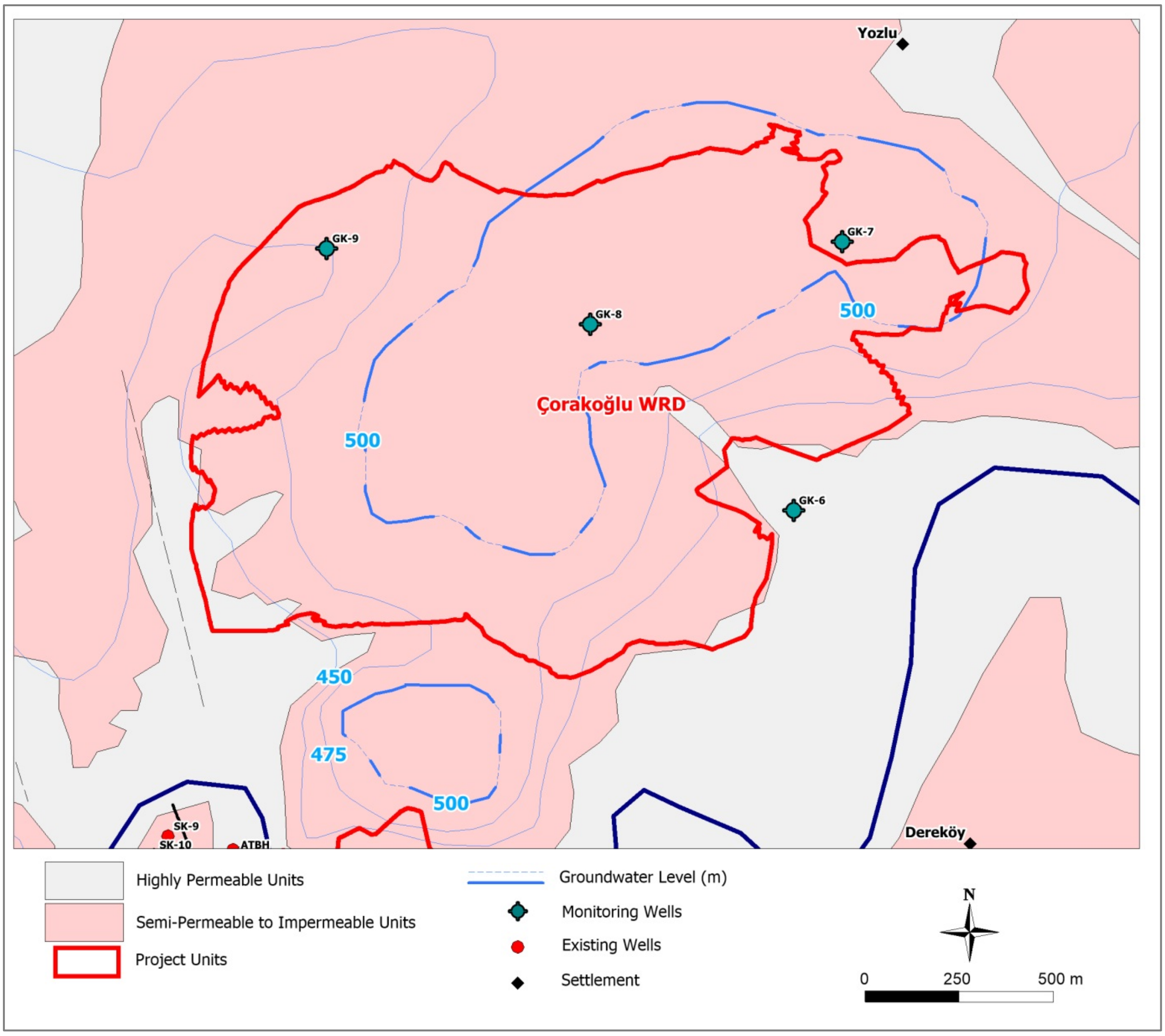


Figure 3.5 Groundwater level map of the Çorakoğlu WRD showing monitoring points

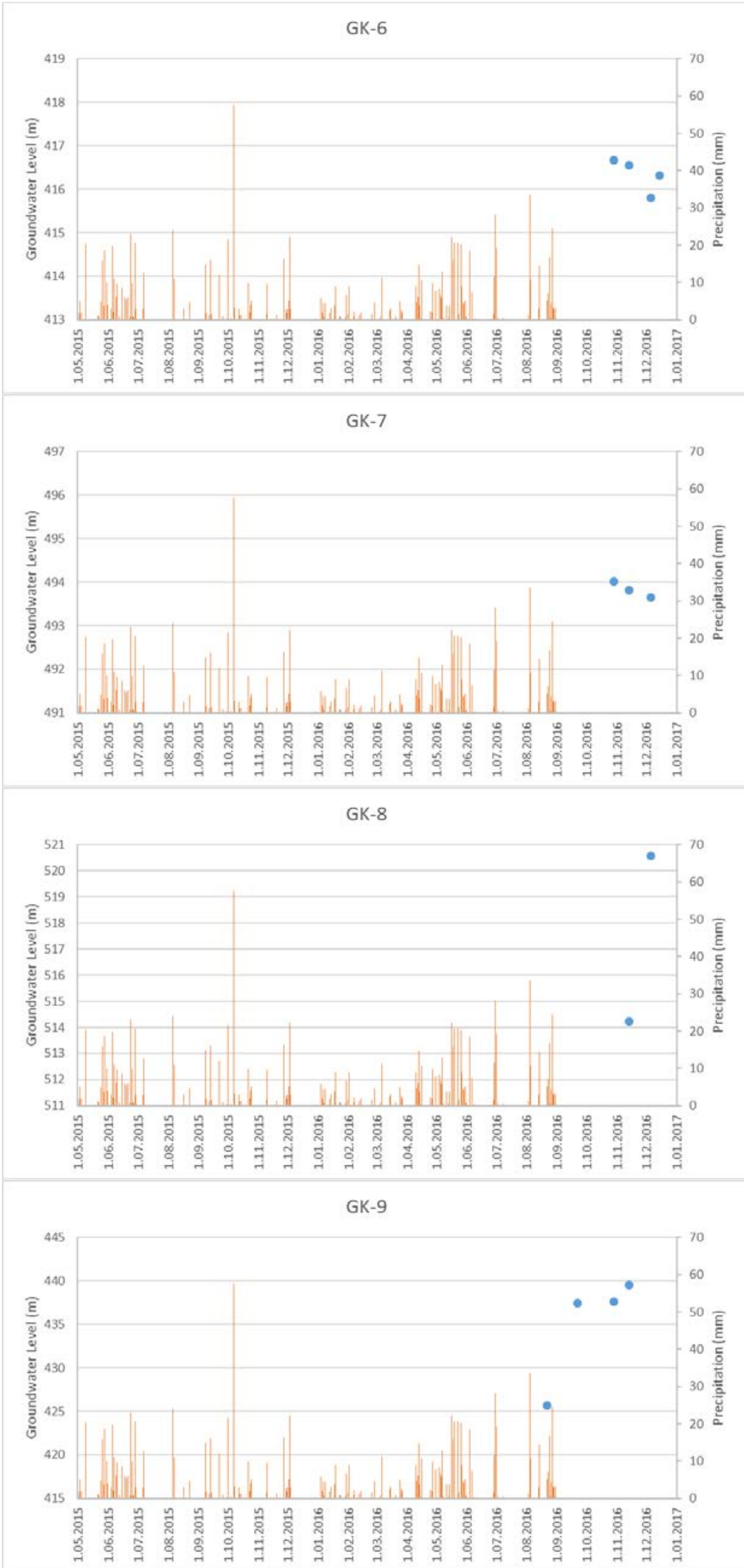


Figure 3.6 Monitored groundwater level in and around the Corakoglu WRD

Gelberi WRD

Two monitoring wells (GK-10 and GK-11) were drilled in the Gelberi WRD to understand the hydraulic properties and measure groundwater levels (Figure 3.7). The groundwater level measurements at these wells were started on October 29, 2016. The hydrographs of these wells are given in Figure 3.8.

In the Gelberi WRD, groundwater levels range from 800 m in the south to 500 m in the northern part. Depth to groundwater levels were observed to vary between 5 and 24 meters. Groundwater table generally follows the topography with a flow direction from SE to NW, having an average hydraulic gradient of 0.4. Collected groundwater level data was not long enough to estimate the seasonal fluctuation of groundwater table. Furthermore the observed water levels were affected by drilling and development artifacts due to the low permeability of the medium. Hence the static water levels were not reached yet. The monitoring will continue until April 2017 to reach the static water levels.

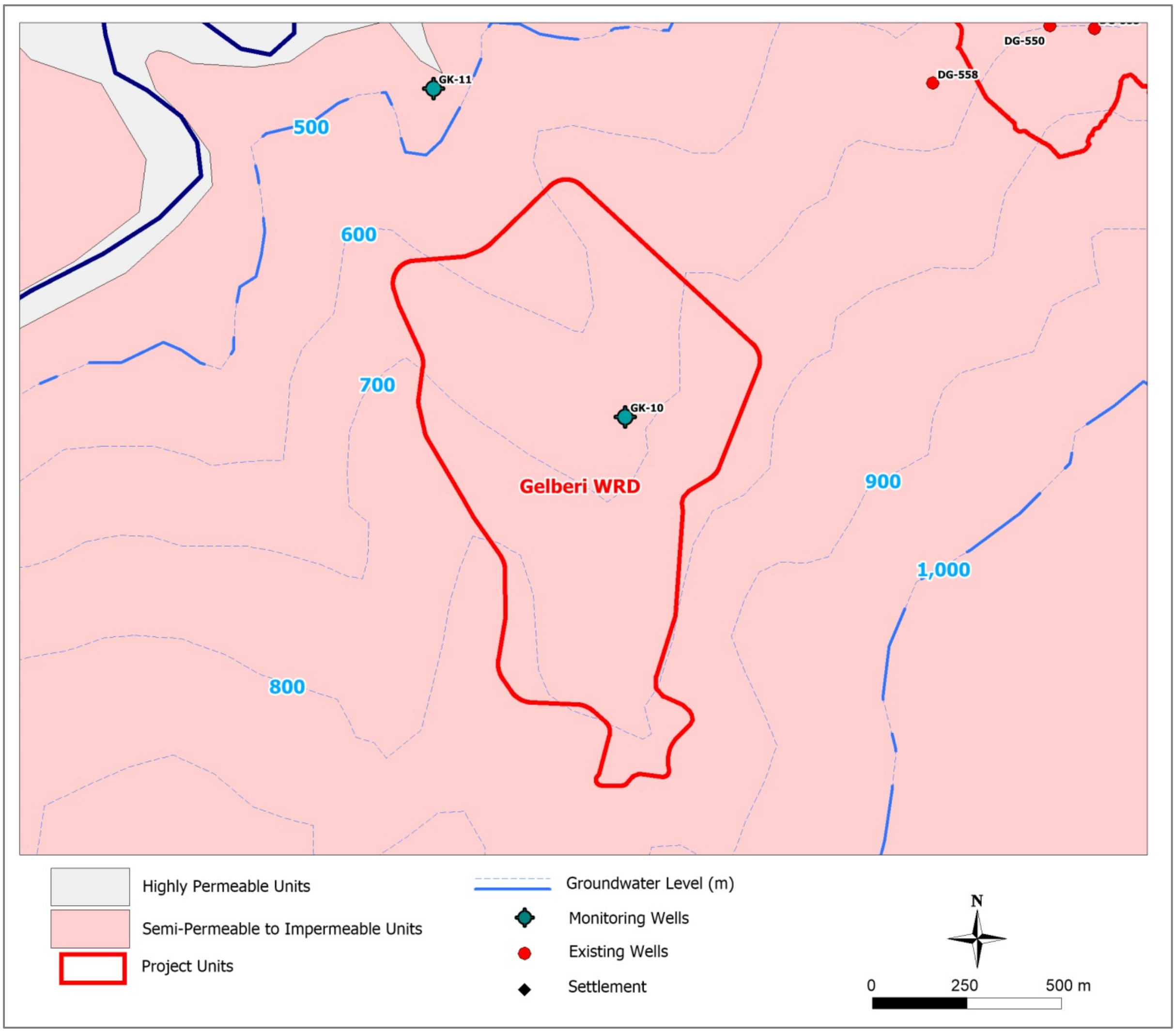


Figure 3.7 Groundwater level map of the Gelberi WRD showing monitoring points

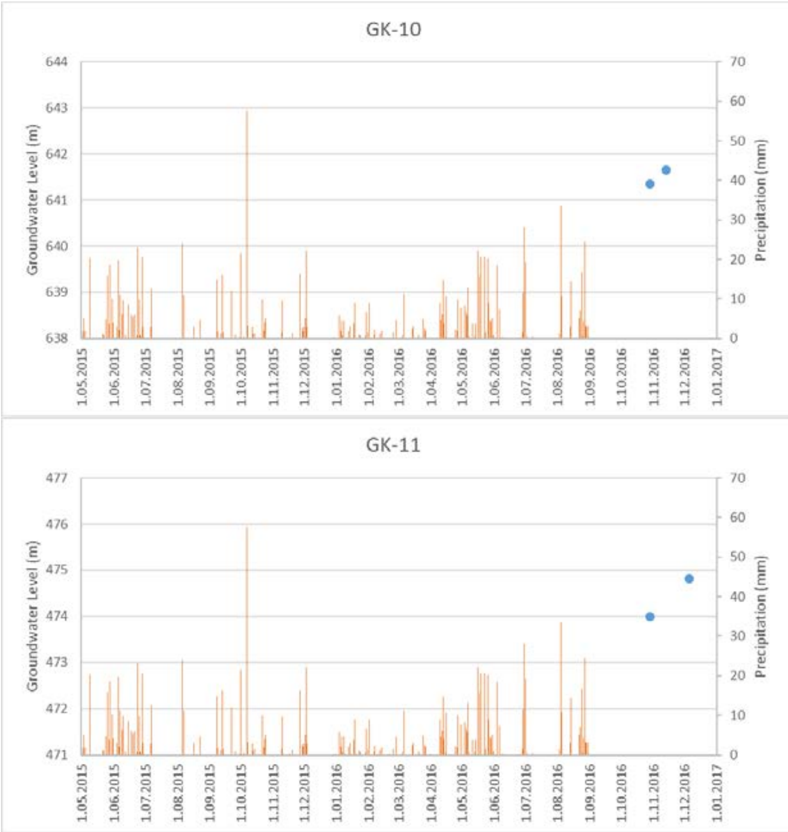


Figure 3.8 Monitored groundwater level in the Gelberi WRD

Kepezkaya TSF

In and around the Kepezkaya TSF, 15 existing wells (KSK wells and IK wells) and 1 new monitoring well (GK-13) are located (Figure 3.9). The groundwater level measurements were started on June 2015 and ended on June 2016 at the KSK wells. For the IK wells, groundwater levels have been measured since June 29, 2016. The hydrographs of these wells are given in Figure 3.10.

The groundwater levels of the Kepezkaya TSF are drawn based on the average groundwater levels measured at the all available monitoring points. The groundwater levels range between 500 – 520 m in the northeastern part and 450 m in the southwestern part. Depth to groundwater level in this area was noted between 2 and 30 m. Groundwater flow direction was identified as from NE to SW, following the topography, with hydraulic gradient varying between 0.05 and 0.2. Seasonal fluctuation of the groundwater level in this area was noted up to 10 meters.

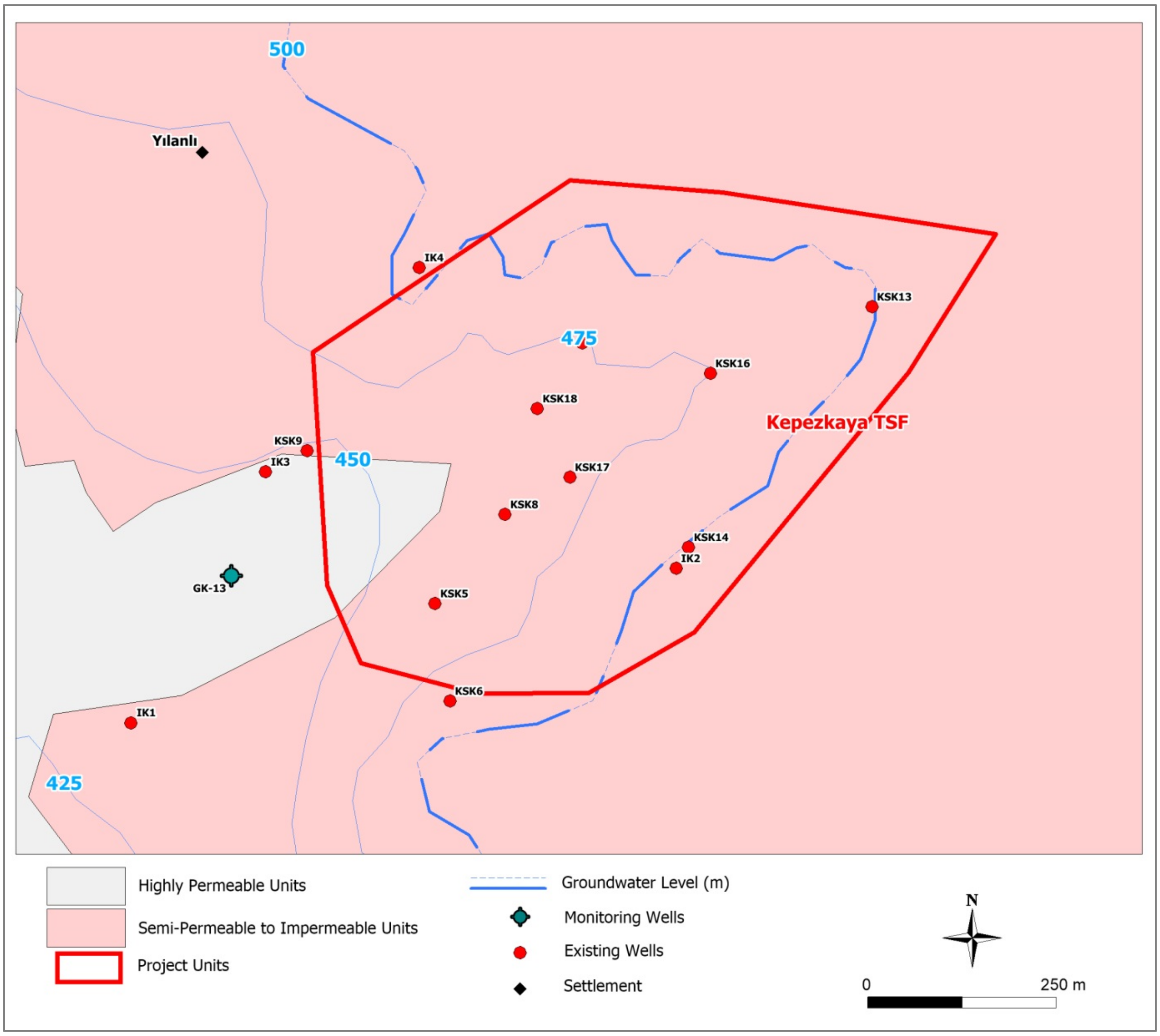


Figure 3.9 Groundwater level map of the Kepezkaya TSF showing monitoring points

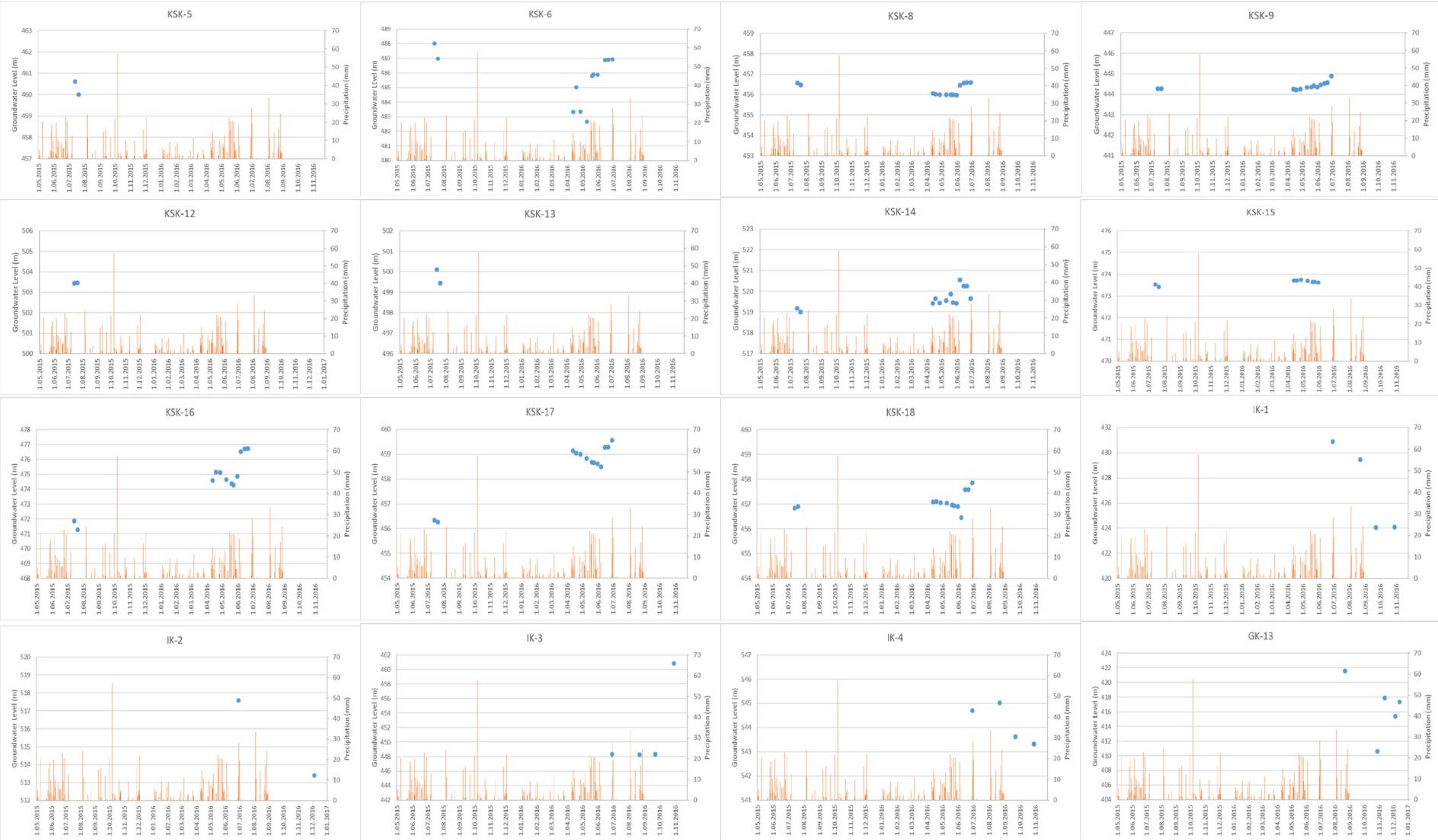


Figure 3.10 Monitored groundwater level in and around the Kepazkaya TSF

Bağdere TSF

5 monitoring wells (GK-1 – GK-5) were drilled in the Bağdere TSF by AECOM, in order to determine hydraulic properties and measure groundwater levels (Figure 3.11). The groundwater level measurements were started following the well completion. The hydrographs of these wells are provided in Figure 3.12. Depth to groundwater levels vary between 6 m and 15 m in the Bağdere TSF area.

The groundwater levels within the Bağdere TSF range from 475 m in the northern part to 400 m in the south. The groundwater flows from north to the Gökırmak River in the Bağdere TSF area with an average hydraulic gradient of 0.1. Collected groundwater level data was not long enough to estimate the seasonal fluctuation of groundwater table. Furthermore the observed water levels were affected by drilling and development artifacts due to the low permeability of the medium. Hence the static water levels were not reached yet. The monitoring will continue until April 2017 to reach the static water levels.

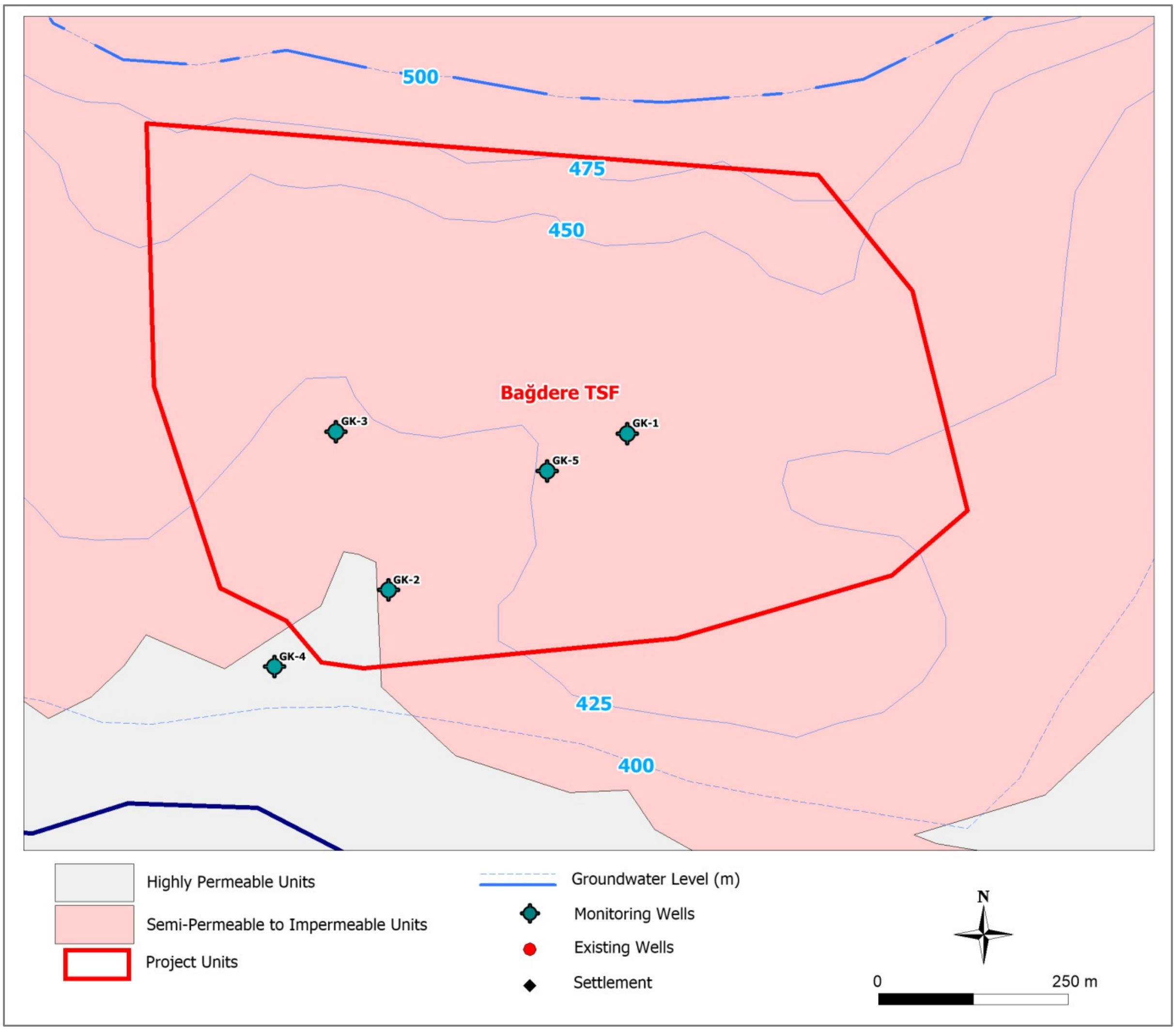


Figure 3.11 Groundwater level map of the Bağdere TSF showing monitoring points

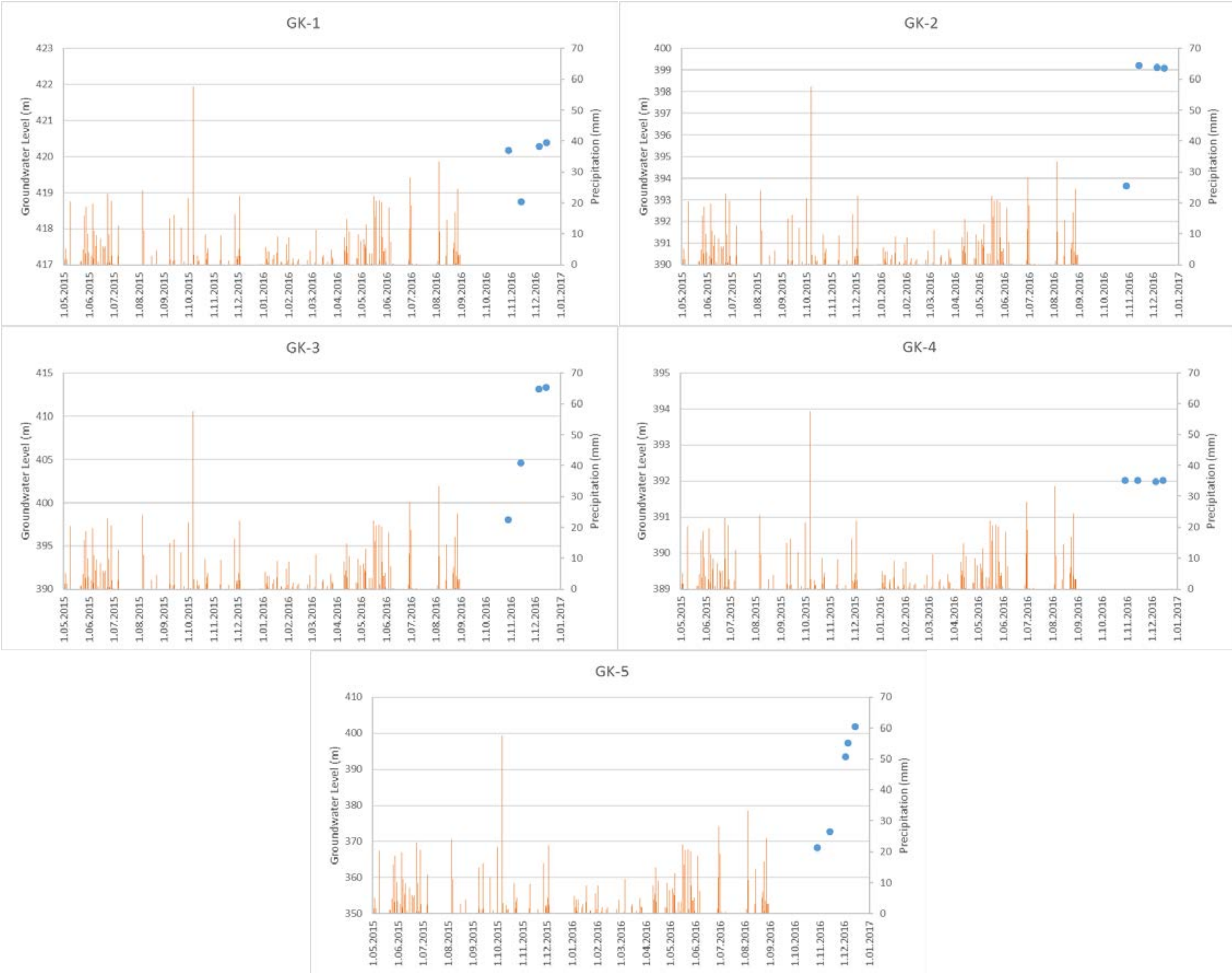


Figure 3.12 Monitored groundwater level in and around the Bağdere TSF

Other Groundwater Wells in the Study Area

In the five wells drilled for water supply purposes (ST-1A – ST-5), groundwater level measurements are also conducted (Figure 3.13). The groundwater level measurements were started on August 2016. The hydrographs of these wells are given in Figure 3.14.

Furthermore, two additional wells were drilled by AECOM on the south of process plant, namely GK-A and GK-B (Figure 3.13). The groundwater level measurements at these wells were started at December, 2016 and up to date only two measurements can be conducted. Collected groundwater level data was not long enough to estimate the seasonal fluctuation of groundwater table. Furthermore the observed water levels were affected by drilling and development artifacts due to the low permeability of the medium. Hence the static water levels were not reached yet. The monitoring will continue until April 2017 to reach the static water levels. The hydrographs of GK-A and GK-B are provided in Figure 3.15.

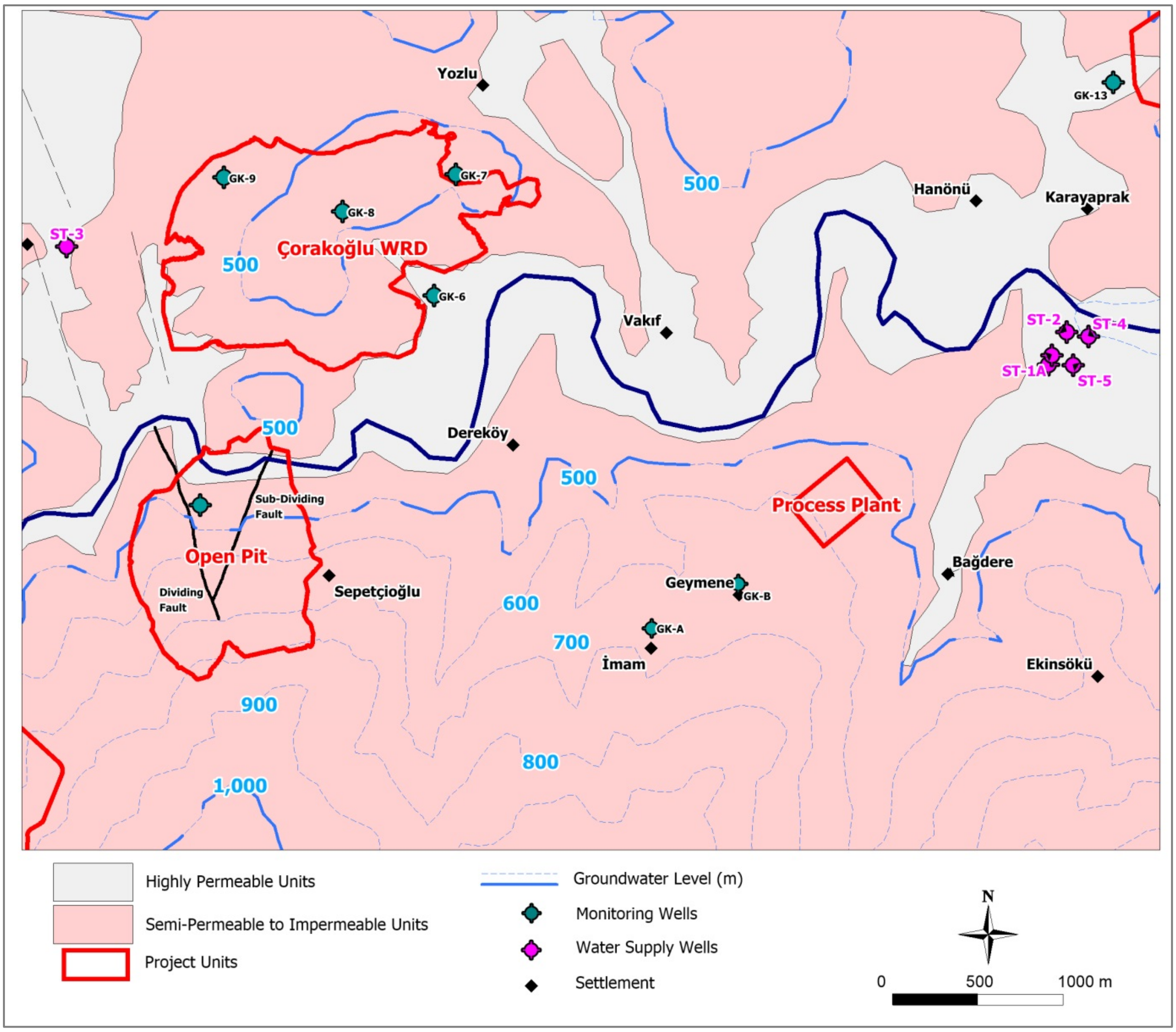


Figure 3.13 Groundwater level map showing water supply wells

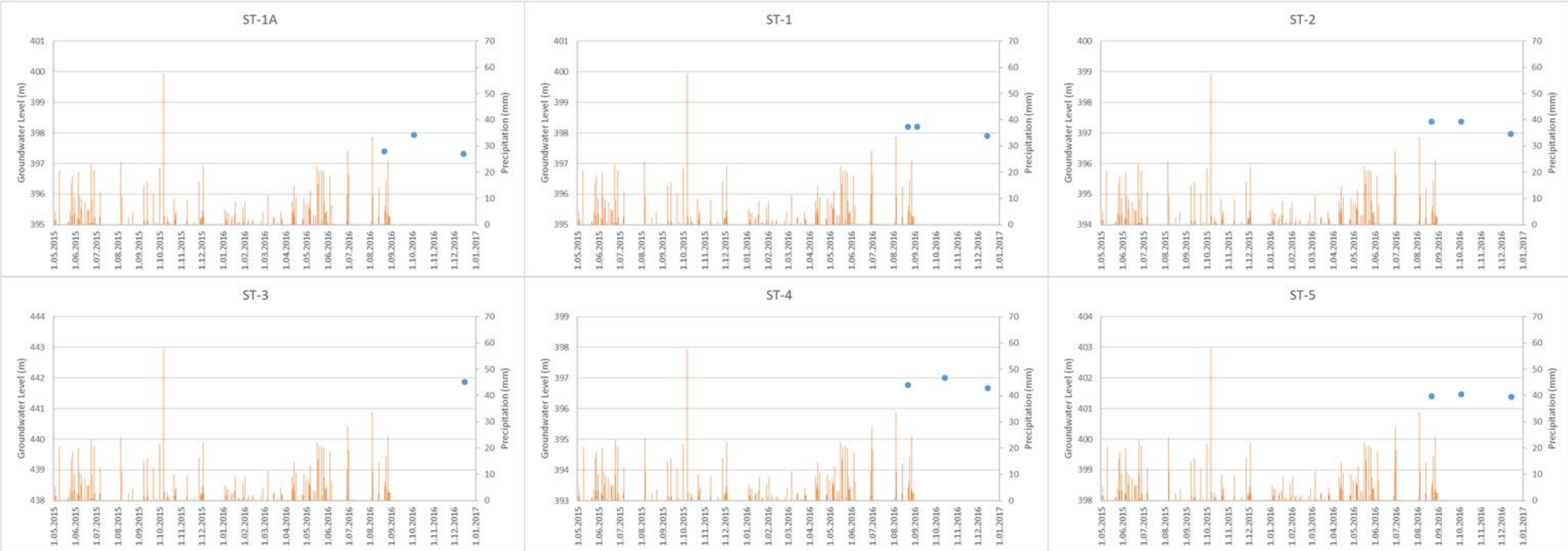


Figure 3.14: Monitored groundwater level in the water supply wells

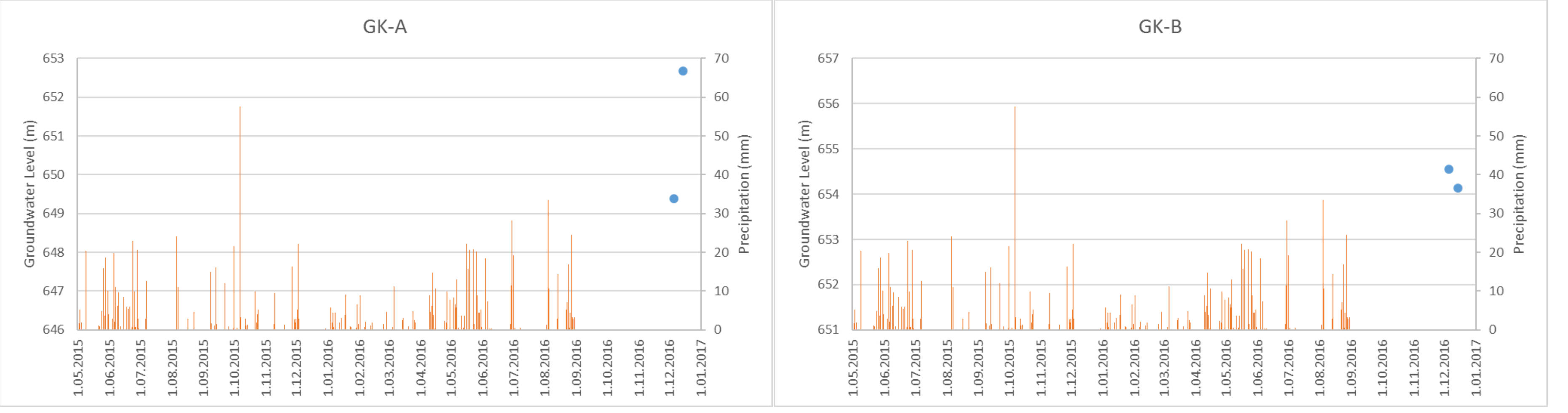


Figure 3.15 Monitored groundwater level at GK-A and GK-B

3.2.4 Aquifer Tests

A series of aquifer tests have so far been performed both by the third parties prior to AECOM's involvement to the GCP and by AECOM within the scope of the Hydrogeological Impact Assessment Study. In this context, pumping and slug tests were carried out on selected wells among those were previously-drilled by other parties and the wells completed by AECOM. The results obtained from the aquifer tests were used for the estimation of hydraulic properties such as transmissivity and hydraulic conductivity.

Pumping test equipment typically consists of components such as a submersible pump, riser pipe, flow -meter, valve and, water level probes. Submersible pump is used to pump the water from wells through riser pipe which is used to discharge water to a nearest hydraulic boundary, preferably a stream or a valley located in downstream. On the other hand, valve and flow-meter are used to adjust and measure the flow rate during the pumping period. Water level probes (pressure transducers) are used to collect drawdown and recovery data.

Slug test is a relatively simple method compared to a pumping test and do not require a pump, riser pipe and other mechanic equipment. A slug with a proper diameter is lowered down the well, below the static water level, to induce an instantaneous rise in the water level. Drawdown data is collected during the time period as the water level drops back to its original position which is also known as the falling head test. After the water level in the well gets back to its original position, the slug is removed this time to create an instantaneous drop in the head. The recovery data is then collected during the time period as the water level rebounds back to its original position. This second phase is known as the rising head test. Due to relatively slow response of low permeability formations, slug tests can be a convenient way of producing drawdown and recovery data to estimate the hydraulic parameters.

Aqtesolv (Aquifer Test Solver) Pro 4.5 has been utilized in evaluation of the data obtained from the pumping and slug tests and in subsequent estimation of the aquifer parameters. Collected data were analyzed with relevant different solution methods to estimate aquifer parameters representative for each well.

3.2.4.1 Previously-Completed Tests

Several tests have been carried out in OW, GT, KSK and WD wells by Acacia under the supervision of third party consultants prior to AECOM's involvement to the GCP. The data collected from testing results were re-evaluated by AECOM and summarized in below sections while the Aqtesolv solution plots are provided in Appendix C.

Prior to AECOM's involvement to the GCP, RPS has performed airlift tests by injecting high pressure air into the boreholes to a depth of up to 100 meters below ground level. The water discharging at surface was controlled by means of a custom build borehole head works, which funneled the water through a discrete outlet, allowing the water discharge rate to be measured using a graduated bucket and stopwatch (RPS, 2015).

AECOM has re-evaluated the data that was provided in RPS, 2015 by following the same approach that was taken into account by RPS. Where the water discharge from the borehole was estimated to be less than 10 liters per minute the airlift testing ceased within five minutes and the recovery of the water level was monitored. In this instance, recovery of the water level was analyzed as a rising head test using the Bouwer-Rice method. Where the water discharge from the borehole was sustainable and greater than 10 liters per minute the airlift testing was continued for generally up to one hour. In this instance, recovery of the water level was analyzed using the Theis recovery method (RPS, 2015). Re-evaluated results are provided below.

OW Wells

According to the data collected from airlift recovery tests performed in OW wells (OW-1, OW-2, OW-3, OW-4 and OW-5), transmissivity and hydraulic conductivity values were analyzed by Theis Recovery solution. Well information and estimated aquifer parameters for OW wells are given in Table 3.2.

Table 3.2: Estimated aquifer parameters from OW-series wells

Well ID	Coordinates		Location	Depth (m)	Lithology	Hydraulic Conductivity (m/s)	Method/Source
	X(m)	Y(m)					
OW-1	617503.68	4607774.43	Open Pit	222	Schist	8.68E-07	Theis Recovery
OW-2	617499.56	4607769.96	Open Pit	50	Schist	5.84E-09	Bouwer-Rice
OW-3	617579.74	4607693.61	Open Pit	210	Schist	1.30E-08	Theis Recovery
OW-4	617708.42	4607856.70	Open Pit	90	Schist (partly Alluvium)	3.18E-07	Theis Recovery
OW-5	617788.30	4607860.34	Open Pit	120	Alluvium/Schist	1.22E-05	Theis Recovery

GT Wells

A total of 16 boreholes were drilled with GT code with exploration purposes. Seven (7) of them were tested (namely, GT-002, GT-003, GT-007, GT-009, GT-011 and GT-013). All GT boreholes were completed in the Open Pit area with varying depths between 105 to 250 meters. Collected airlift recovery test data were analyzed by Theis Recovery or Bouwer-Rice solutions taking into the account of discharge rate during airlifting. Well information and estimated aquifer parameters for GT wells are given in Table 3.3.

Table 3.3: Estimated aquifer parameters from GT-series wells

Well ID	Coordinates		Location	Depth(m)	Lithology	Hydraulic Conductivity (m/s)	Method/Source
	X(m)	Y(m)					
GT-002	617976.34	4607860.73	Open Pit	150	Schist	5.30E-06	Theis Recovery
GT-003	617867.56	4607684.38	Open Pit	200	Schist	3.53E-07	Theis Recovery
GT-007	617556.46	4607371.99	Open Pit	200	Fault	2.42E-05	Theis Recovery
GT-009	617473.44	4607217.69	Open Pit	250	Schist	7.30E-09	Theis Recovery
GT-011	617249.94	4607404.76	Open Pit	215	Schist	1.31E-07	Bouwer-Rice
GT-013	617500.39	4607698.74	Open Pit	180	Schist/Fault	7.54E-07	Theis Recovery
GT-015	617684.76	4607992.66	Open Pit	105	Schist	2.12E-07	Bouwer-Rice

KSK and WD Wells

Aquifer testing in three of the previously-drilled KSK wells (KSK-15, KSK-17 and KSK-25) and two of the WD wells (WD-01 and WD-02) were also performed (RPS, 2015). Due to the lack of sufficient data, hydraulic parameters could not be calculated for these wells. The hydraulic parameters estimated by RPS (2015) are provided in Table 3.4 below.

Table 3.4: Estimated aquifer parameters from KSK and WD series wells

Well ID	Coordinates		Location	Depth (m)	Lithology	Hydraulic Conductivity (m/s)	Method/Source
	X(m)	Y(m)					
KSK-15	623362.97	4610496.12	Kepezkaya TSF	30	Sedimentary	2.00E-05	RPS, 2015
KSK-17	623347.55	4610318.49	Kepezkaya TSF	30	Sedimentary	1.80E-06	RPS, 2015
KSK-25	623048.39	4610227.19	Kepezkaya TSF	30	Sedimentary	1.50E-07	RPS, 2015
WD-01	617744.91	4608526.98	Çorakoğlu WRD	28	Schist	5.00E-08	RPS, 2015
WD-02	617172.97	4608867.98	Çorakoğlu WRD	54	Schist	2.00E-06	RPS, 2015

3.2.4.2 Tests Completed by AECOM

As of October 2016, AECOM has completed individual pumping tests in the water supply wells (ST-1, ST-1A, ST-2, ST-3, ST-4 and ST-5) that were drilled within the scope of the water supply study. A simultaneous long term pumping test in three wells (ST-1A, ST-4 and ST-5) was also carried out for a total of 14 days in order to understand the long term response of the alluvium aquifer.

Within the scope of the Hydrogeological Impact Assessment Study, AECOM has performed pumping tests in the wells located in the project units including the Open Pit area, Çorakoğlu WRD area, Gelberi WRD area, Kepezkaya TSF area and Bağdere TSF area (GK series wells). Additional pumping tests in the alluvium and schist monitoring wells (AOBH, ATBH, BOBH and BTBH) in the near vicinity of the Open Pit area and fault observation wells (FOBH, FTBH and SOBH) within the Open Pit area has also been carried out. In addition to the pumping tests, slug tests have been performed in selected AECOM wells (GK series) as well as in selected wells (OW-2, OW-3, OW-4, OW-5 and SOBH) among those which were previously-drilled. Details on the aquifer tests completed by AECOM are provided in below sections while estimated hydraulic parameters for the Project Area are summarized in Table 3.5.

Water Supply Wells Aquifer Tests

There are 6 wells which were completed and tested for water supply purposes in the Project Area. The first water supply well (ST-1) has been drilled by Acacia in the mobilization site. Following the subsequent field and desktop studies, a total of 4 water supply wells (ST-1A, ST-2, ST-4 and ST-5) were drilled by AECOM in the mobilization site while one additional well (ST-3) were drilled in Küpeli Village to have an understanding on alluvium's potential for water supply. Among these wells, ST-2 was completed by February 2016 which was followed by the installation of ST-3 in May 2016. Based on the initial pumping test results obtained from these two wells, ST-2 was found to produce relatively high well yield compared to ST-3. For this reason, subsequent water supply wells (ST-1A, ST-4 and ST-5) were completed within the alluvium in the mobilization site. Following the completion of drilling and well development, pumping tests in these wells were performed in October 2016.

ST-1 Pumping Test

ST-1 was drilled to a total depth of 141 m in the alluvium and underlying bedrock volcanics. The well targeted to provide water to be further used in the ore enrichment process. During the pumping test, 6" submersible pump and a pressure transducer were placed at 75 m and 73 m, respectively. The pumping was started with an initial discharge rate of 16 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 24-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 24 hours after pumping. The total drawdown at the end of the pumping period was observed to be 2.48 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-1 vary between 2.10E-02 m^2/s and 5.40E-02 m^2/s while the estimates of the hydraulic conductivity values range between 3.92E-04 m/s and 1.01E-03 m/s.

ST-1A Pumping Test

ST-1A was drilled to a total depth of 80 m in the alluvium and underlying bedrock volcanics. The well targeted to provide water to be further used in the process. During the pumping test, 8" submersible pump and a pressure transducer were placed at 72 m and 45 m, respectively. The pumping was started with an initial discharge rate of 60 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 12-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 12 hours after pumping. The total drawdown at the end of the pumping period was observed to be 4.56 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-1A vary between 2.10E-02 m^2/s and 4.80E-02 m^2/s while the estimates of the hydraulic conductivity values range between 3.90E-04 m/s and 9.03E-04 m/s.

ST-2 Pumping Test

ST-2 was drilled to a total depth of 75 m in the alluvium and underlying bedrock volcanics. The well targeted to provide water to be further used in the process. During the pumping test, 7" submersible pump and a pressure transducer were placed at 70 m and 45 m, respectively. The pumping was started with an initial discharge rate of 33 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 12-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 12 hours after pumping. The total drawdown at the end of the pumping period was observed to be 1.90 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-2 vary between 4.20E-02 m^2/s and 8.80E-02 m^2/s while the estimates of the hydraulic conductivity values range between 8.52E-04 m/s and 1.77E-03 m/s.

ST-3 Pumping Test

ST-3 was drilled to a total depth of 64 m in the alluvium and underlying bedrock schists. The well targeted to provide water to be used in the process but later converted to a monitoring well due to relatively low well yield compared to the other ST-series wells. During the pumping test, 6" submersible pump and a pressure transducer were placed at 52 m and 50 m, respectively. The pumping was started with an initial discharge rate of 6.5 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 24-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 12 hours after pumping. The total drawdown at the end of the pumping period was observed to be 6.37 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis, Moench, Neuman and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-3 vary between 4.24E-04 m^2/s and 7.60E-04 m^2/s while the estimates of the hydraulic conductivity values range between 7.56E-06 m/s and 1.36E-05 m/s

ST-4 Pumping Test

ST-4 was drilled to a total depth of 72 m in the alluvium and underlying bedrock volcanics. The well targeted to provide water to be used in the process. During the pumping test, 8" submersible pump and a pressure transducer were placed at 72 m and 45 m, respectively. The pumping was started with an initial discharge rate of 66.6 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 12-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 12 hours after pumping. The total drawdown at the end of the pumping period was observed to be 6.00 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-4 vary between 1.40E-02 m^2/s and 4.40E-01 m^2/s while the estimates of the hydraulic conductivity values range between 2.74E-04 m/s and 8.16E-03 m/s.

ST-5 Pumping Test

ST-5 was drilled to a total depth of 70 m in the alluvium and underlying bedrock volcanics. The well targeted to provide water to be used in the process. During the pumping test, 8" submersible pump and a pressure transducer were placed at 72 m and 26 m, respectively. The pumping was started with an initial discharge rate of 66.6 L/s and sustained with the same rate constantly until the end of the pumping period. The pump has been stopped after a total of 12-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 12 hours after pumping. The total drawdown at the end of the pumping period was observed to be 5.16 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for ST-5 vary between 3.80E-02 m^2/s and 8.20E-02 m^2/s while the estimates of the hydraulic conductivity values range between 9.58E-04 m/s and 2.05E-03 m/s.

Open Pit Aquifer Tests

A total of four pumping test and 5 slug tests have been performed within the Open Pit area to characterize the hydrogeological behavior of the bedrock schists, alluvium and the major fault zone known as the Dividing Fault. The testing wells include;

- GK-12 to characterize the pit lithologies from the surface to the pit bottom,
- AOBH to characterize the full thickness of the alluvium,
- BOBH to characterize the underlying schists,
- FOBH to characterize the behavior of the fault zone (Dividing Fault) located in the Open Pit.

Details on each pumping test are provided below while the Aqtesolv solution plots are given in Appendix C.

GK-12 Pumping Test

GK-12 was drilled to a total depth of 281 m in the schists with quartz veins including fine to medium-sized crystals of chalcopyrite and pyrite. The well targeted to identify the hydrogeological characteristics of the schists from the surface of the proposed Open Pit until the pit bottom. During the pumping test, a 4" submersible pump and a pressure transducer were placed at 250 m and 248 m, respectively. The pumping was started with an initial discharge rate of 1 L/s and sustained with an average discharge rate of 0.69 L/s throughout the course of the pumping period. At the end of the 9th hour of pumping, groundwater level in the well has dropped below the depth of the submersible pump. The pump has then been stopped after a total of 9-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent four days after pumping. The total drawdown at the end of the pumping period was observed to be 198 m.

Based on the collected hydrogeological data, the aquifer type was identified to show unconfined behavior with two distinguished permeability zones for the fractures sections and the rock mass. The drawdown and the recovery data indicates three fracture zones along the saturated thickness of the schist that the well has been drilled. Hydraulic conductivity values for each fracture zone were calculated taking into account that each zone responded distinctly resulting in three major concurrent drawdown and recovery trend. It is important to note that the depths that the changes were observed to occur during the pumping period, coincides with the depths that were observed to change during the recovery period. The concurrent changes in certain depth intervals for drawdown and recovery periods provided an opportunity to estimate the thicknesses of these distinct fracture zones. Core recovery logs of the two nearby exploration wells (DG-143 and DG-159), having nearly the same depth (around 300 m) with GK-12 were also examined to have a better understanding of the vertical profile of the schist. GK-12 was observed to show similar heterogeneity with the two exploration wells, which indicate three relatively high permeability zones successively followed by three relatively intact zones. Core samples from the two exploration wells indicate the existence of three fracture zones below 100m, with thicknesses of 20 m, 10 m and 10 m with a direction from the bottom to the surface of the two wells.

Collected time-drawdown data for GK-12 was analyzed with Cooper-Jacob solution method for the pumping period while the recovery data was analyzed by Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for the fracture zones vary between 1.18E-06 m^2/s and 2.94E-06 m^2/s. Above-estimated thickness values were then used in calculation of three hydraulic conductivities for three fracture zones within the saturated thickness of the schist along the well. The estimated results indicate that the hydraulic conductivity values for the fracture zones have a range between 5.92E-08 m/s and 2.94E-07 m/s.

The same approach were followed to estimate the hydraulic conductivity values for the rock mass that is interrupted by the above-mentioned fracture zones along the well. This time the thickness of the three rock mass zones have been taken into consideration. Accordingly, the transmissivity values for the rock mass zones were estimated to vary between 2.35E-07 m^2/s and 6.28E-07 m^2/s while the rock mass hydraulic conductivities were identified to range between 4.69E-09 m/s and 2.09E-08 m/s. The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.16.

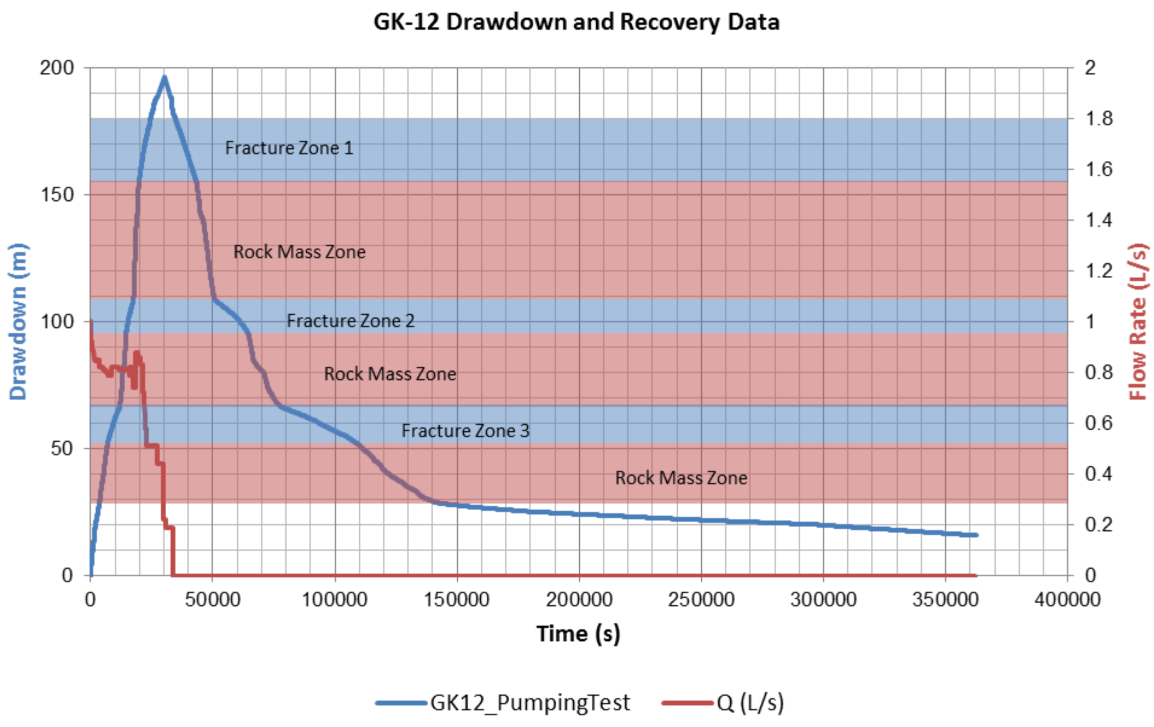


Figure 3.16: Time – Drawdown Plot for the GK-12 Pumping Test

AOBH and BOBH Pumping Tests

AOBH was previously-drilled prior to AECOM's involvement to the GCP, with a total depth of 40 m in the full thickness of the Gökırmak alluvium in the northern part of the Open Pit. The well targeted to identify the hydrogeological characteristics of the alluvium and its interconnection with the underlying schists. During the pumping test, a 6" submersible pump and a pressure transducer were placed at 30 m and 29 m, respectively. The pumping was started with an initial discharge rate of 31.5 L/s and sustained with the same rate constantly until the end of the pumping period. Nearby monitoring wells, ATBH (in 12 m distance), BOBH (in 18m distance) and BTBH (in 19 m distance), were used as observation wells to monitor drawdown data in the alluvium (ATBH) and in the schist (BOBH and BTBH) with pressure transducers placed in all three wells. The pump in AOBH has stopped during the 16th hour of pumping due to a power failure occurred in greater Hanönü town. Recovery test was then applied during the subsequent 24 hours after pumping. Total drawdown in the pumping well (AOBH) was recorded as 1.73 m while the total drawdown values for the observation wells were recorded as 0.36 m for ATBH, 0.57 m for BOBH and 0.59 m for BTBH at the end of the pumping period.

Similar to AOBH, BOBH was previously-drilled prior to AECOM's involvement to the GCP, with a total depth of 78 m in the schist underlying the Gökırmak alluvium in the northern part of the Open Pit. The well targets to identify the hydrogeological characteristics of the schist and its interconnection with the overlying alluvium. Hence, the alluvium thickness was passed with a blank casing and the annular space was cemented. A 4" submersible pump and a pressure transducer were placed at 75 m and 72 m, respectively. The pumping was started with an initial discharge rate of 0.5 L/s and sustained with the same rate constantly until the end of the pumping period. Nearby monitoring wells, AOBH (in 18 m distance), ATBH (in 14 m distance) and BTBH (in 10 m distance), were used as observation wells to monitor drawdown data in the alluvium (ATBH and AOBH) and in the schist (BTBH) with pressure transducers placed in all three wells. At the end of the 15th-hour pumping, groundwater level in the pumping well has dropped down to the depth of the submersible pump. The pump has then been stopped after a total of 15-hour continuous pumping which marks the start of the recovery period. Recovery test was applied during the subsequent 33 hours after pumping. The total drawdown at the end of the pumping period was observed to be 63 m in the pumping well (BOBH) while the total drawdown values for the observation wells were recorded as 14.8 m for BTBH, 0.10 m for AOBH and 0.02 m for ATBH at the end of the pumping period.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined for the alluvium wells (AOBH and ATBH) whereas the schist wells (BOBH and BTBH) were evaluated as confined aquifers. Time – drawdown data from the alluvium wells (AOBH and ATBH) was analyzed with Cooper-Jacob, Theis, Neuman, Moench and Tartakovsky-Neuman solution methods for the pumping period while the recovery period was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for the alluvium vary between 2.11E-02 m^2/s and 2.50E-01 m^2/s while the estimates of the hydraulic conductivity values range between 6.39E-04 m/s and 7.58E-03 m/s. In addition to transmissivity and hydraulic conductivity values, specific yield values for the unconfined alluvium aquifer vary between 0.02 and 0.54. Multiple well pumping tests were evaluated to assess the specific yield values since single well pumping tests are not applicable for the assessment. On the other hand, Cooper-Jacob and Theis solution methods were applied for the schist wells (BOBH and BTBH) for the pumping period while Theis Recovery solution method was applied for the recovery period. Transmissivity values for the schist were estimated to vary between 1.30E-06 m^2/s and 7.68E-06 m^2/s while the hydraulic conductivities for the schist were identified to range between 3.25E-08 m/s and 1.92E-07 m/s. Storativity values for confined schist aquifer vary between 0.00039 to 0.00048 as expected from low permeable confined aquifer. The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.17 for the pumping test in AOBH and Figure 3.18 for BOBH. Estimated aquifer parameters for different solution methods are given in Figure 3.17 and Figure 3.18, respectively.

Test results show the existence of interconnectivity between alluvium and schist units. During the pumping in the alluvium well (AOBH), water level in the underlying schist (BOBH and BTBH) was observed to drop as a result of the drawdown in the alluvium aquifer, which verifies a head difference between hydraulically-connected aquifers. On the other hand, during the pumping in the schist well (BOBH), no change in water level was observed within the alluvium, indicating a drastic conductivity difference between the alluvium and the schist.

Figure 3.17: Time – Drawdown Plot for the AOBH Pumping Test

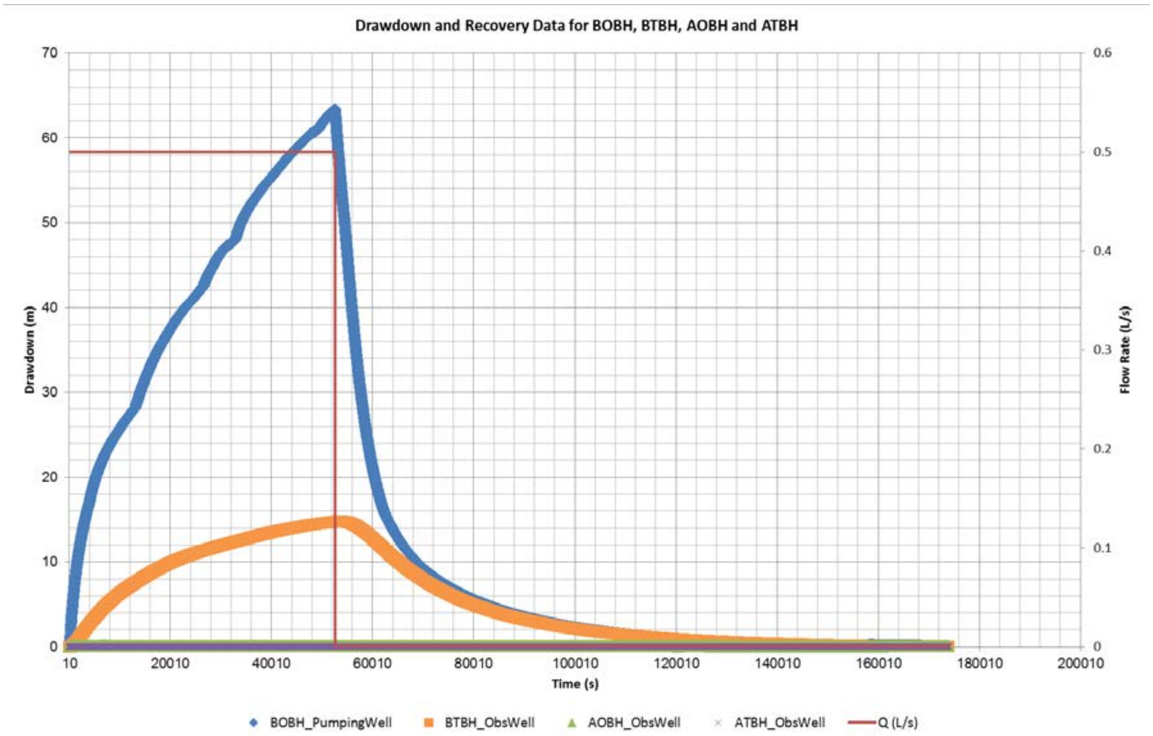


Figure 3.18: Time – Drawdown Plot for the BOBH Pumping Test

FOBH Pumping Test

FOBH was previously-drilled prior to AECOM's involvement to the GCP, with a total depth of 90 m in the schist intersecting the major fault zone known as the Dividing Fault. The well was located to identify the hydrogeological characteristics of the schist within the Open Pit to provide a better understanding of the water inflow from the Dividing Fault to Open Pit area. During the pumping test a 4" submersible pump and a pressure transducer were placed at 75 m and 73 m, respectively. The pumping was started with an initial discharge rate of 1.15 L/s and sustained with the same rate constantly until the end of the pumping period. Nearby monitoring wells, FTBH (drilled in the fault zone within 5 m distance to FOBH) and SOBH (drilled outside of the potential fault zone, within 15 m distance to FOBH) were used as observation wells to monitor drawdown data with pressure transducers placed in both wells. A total of 48 hours of pumping was performed in FOBH pumping well along with 48 hours of subsequent recovery period. The total drawdown at the end of the pumping period was observed to be 1.41 m in the FOBH pumping well and FTBH observation well (which has the same total depth with FOBH (90 m)) while the total drawdown for the SOBH observation well was recorded as 0.076 m at the end of the pumping period.

Based on the aquifer evaluations, the aquifer type was identified as unconfined behavior. Collected data was analyzed with Cooper-Jacob, Theis, Neuman and Tartakovsky-Neuman solution methods while the recovery period was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for the fault zone vary between 7.44E-05 m^2/s and 1.00E-03 m^2/s while the estimates of the hydraulic conductivity values range between 1.43E-06 m/s and 1.92E-05 m/s. Additionally, specific yield values for fractured/unconfined aquifer vary between 0.40 to 0.66. Pumping test in the fault zone has revealed that fracture zone located in the Open Pit bears very limited amount of water. Recovery of the fracture zone is so weak that it is thought to be directly related with schist-fracture zone interaction. Data analysis for SOBH observation well has not been included in the assessments as the drawdown data was not found to be sufficient throughout the pumping period. Aquifer parameters for SOBH were estimated through slug tests.

The time – drawdown plot for the pumping and recovery periods is provided in for the pumping test in FOBH while estimated aquifer parameters for different solution methods are given in Figure 3.19

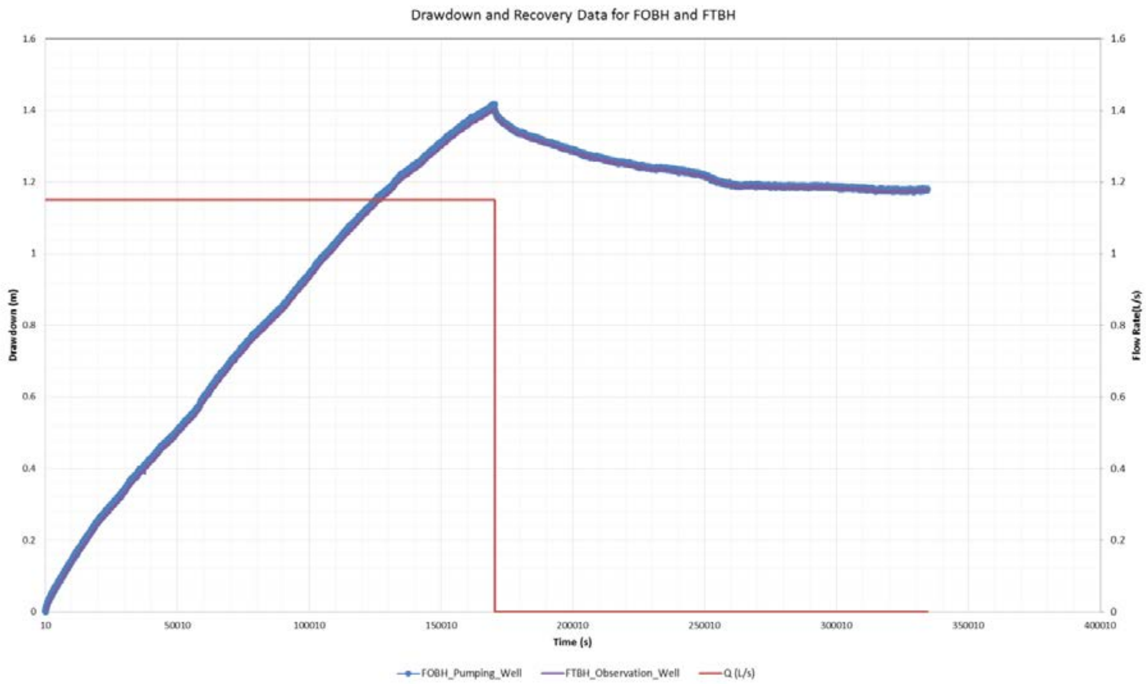


Figure 3.19: Time – Drawdown Plot for the FOBH Pumping Test

OW-3 Slug Test

Slug test was completed on OW-3 with a solid cylinder having 1 m length and 90 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.39 m. Time vs water level data was collected for falling and rising periods. According to time-drawdown data of the falling head test conducted on OW-3, hydraulic conductivity value was calculated as 5.96E-08 m/s and 6.94E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively. For the rising head test, hydraulic conductivity values were calculated as 8.91E-08 m/s and 1.08E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively.

OW-4 Slug Test

Slug test was completed on OW-4 with a solid cylinder having 1 m length and 90 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.33 m. Time vs water level change data was collected for falling and rising periods. According to time-drawdown data of the falling head test, hydraulic conductivity values were calculated as 1.11E-06 m/s and 1.48E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for rising head test on OW-4, hydraulic conductivity values were calculated as 1.76E-06 m/s and 2.08E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively.

OW-5 Slug Test

Slug test was completed on OW-5 with a solid cylinder having 1 m length and 90 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.55 m. Time vs water level change data was collected for falling and rising periods. According to time-drawdown data for the falling head test conducted on OW-5, hydraulic conductivity values were calculated as 3.70E-06 m/s and 5.22E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test hydraulic conductivity values were calculated as 4.03E-06 m/s and 5.32E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively.

SOBH Slug Test

Slug test was completed on SOBH with a solid cylinder having 1 m length and 90 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.04 m. Time vs water level change data was collected for falling and rising periods. According to time-drawdown data for the falling head test conducted on SOBH, hydraulic conductivity values were calculated as 4.98E-06 m/s and 5.20E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test hydraulic conductivity values were calculated as 8.36E-06 m/s and 5.53E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively.

Çorakoğlu WRD Aquifer Tests

One pumping test and 3 slug tests have been performed to complete the hydrogeological characterization of the proposed Çorakoğlu WRD area. Slug test results for one well (GK-8) has not produced reliable data due to the ongoing recovery following the well development. Hence, slug test data for this well has not been included in the analyses. Details on the pumping and slug tests for the Çorakoğlu WRD area are provided below while the Aqtesolv solution plots are given in Appendix C.

GK-6 Pumping Test

GK-6 was drilled with a total depth of 53 m within lithologies composed of schists, limestone, claystone and volcano-sedimentary units. The well targeted to identify the hydrogeological characteristics of these units representative for the Çorakoğlu WRD. During the pumping test, a 4" submersible pump and a pressure transducer were placed at 50 m and 48 m, respectively. The pumping was started with an initial discharge rate of 1 L/s and sustained with an average discharge rate of 1.11 L/s throughout the course of the pumping period. A total of 24 hours of pumping was performed in GK-6 along with 24 hours of subsequent recovery period. The total drawdown at the end of the pumping period was observed as 9.47 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis, Moench, Neuman and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for GK-6 vary between 8.26E-05 m^2/s and 2.62E-04 m^2/s while the estimates of the hydraulic conductivity values range between 2.43E-06 m/s and 7.71E-06 m/s.

The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.20 while the estimated aquifer parameters for different solution methods are given in Figure 3.20.

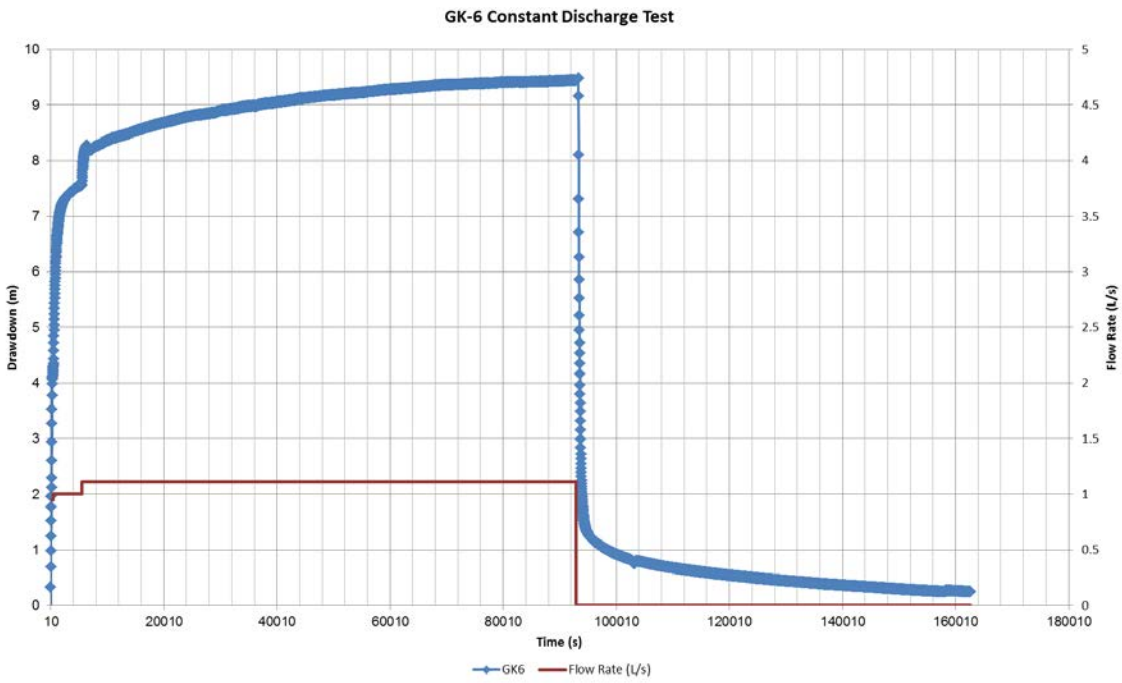


Figure 3.20:Time – Drawdown Plot for the GK-6 Pumping Test

GK-7 Slug Test

Slug test was completed on GK-7 with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.21. Time vs water level change data was collected for falling and rising periods. According to time-drawdown data of the falling head test, hydraulic conductivity values were calculated as 2.22E-08 m/s and 2.28E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test, hydraulic conductivity values were calculated as 3.11E-08 m/s and 3.10E-08 m/s for Bouwer-Rice and Hvorslev methods.

GK-9 Slug Test

Slug test was completed on GK-9 with a solid cylinder having 0.5 m length and 150 mm diameter. Time-drawdown data for this well was only collected for the rising head period as the falling head data were found to be non-reliable after several testing attempts. Therefore, slug test on GK-9 was assessed by the rising head data. After the removal of slug from the well, the initial drop in water level was noted as 0.17 m. Based on the rising head analysis of the well the hydraulic conductivity values were calculated as 6.20E-06 m/s and 6.15E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively.

Gelberi WRD Aquifer Tests

One pumping test and 1 slug test have been performed to characterize the hydrogeological behavior of the lithologies underlie the proposed Gelberi WRD area. Details on the pumping and slug tests are provided below while the Aqtesolv solution plots are given in Appendix C

GK-10 Pumping Test

GK-10 was drilled to a total depth of 64 m within the schists with quartz veins including fine to medium-sized crystals of chalcopyrite and pyrite. The well targeted to identify the hydrogeological characteristics of these units representative for the Gelberi WRD. During the pumping test a 4" submersible pump and a pressure transducer were placed at 60 m and 58 m, respectively. The pumping was started with an initial discharge rate of 0.25 L/s and sustained with the same rate constantly until the end of the pumping period. A total of 24 hours of pumping was performed in GK-10 along with 24 hours of subsequent recovery period. The total drawdown at the end of the pumping period was observed as 2.99 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected time-drawdown data was analyzed with Cooper-Jacob, Theis, Moench, Neuman and Tartakovsky-Neuman solution methods for the pumping period while recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for GK-10 vary between 1.08E-05 m^2/s and 3.14E-05 m^2/s while the estimates of the hydraulic conductivity values range between 2.70E-07 m/s and 7.84E-07 m/s.

The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.21 while the estimated aquifer parameters for different solution methods are given in Appendix C.

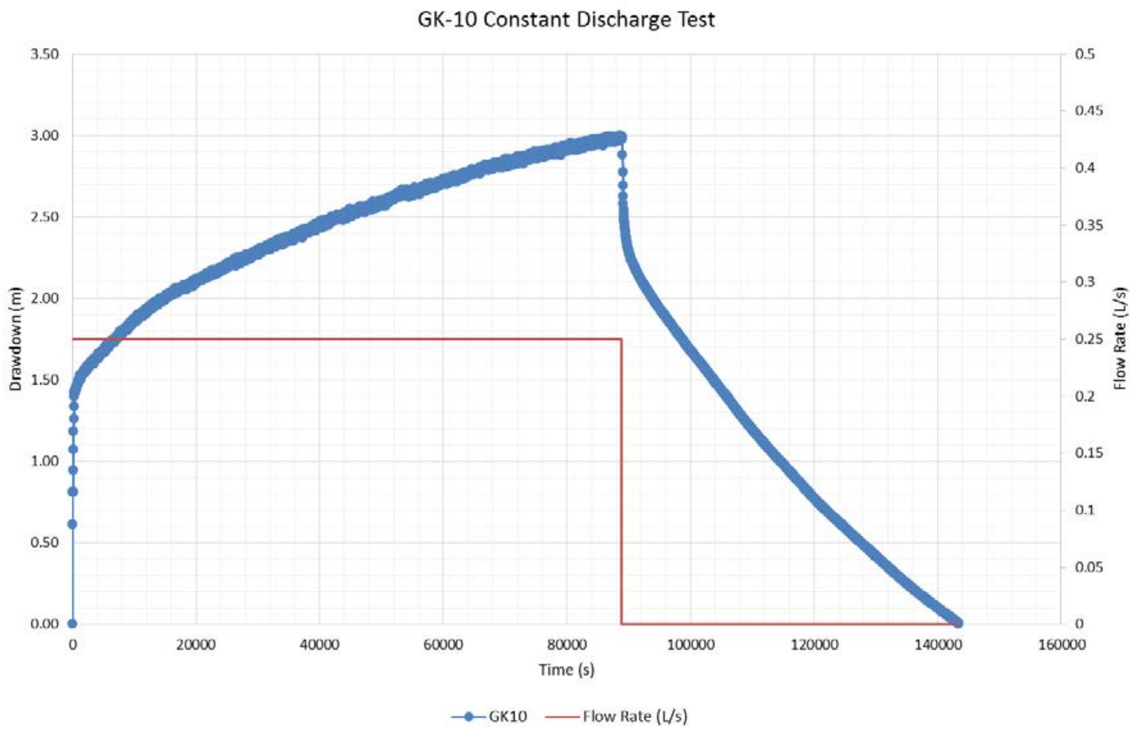


Figure 3.21: Time – Drawdown Plot for the GK-10 Pumping Test

GK-11 Slug Test

Slug test was completed on GK-11 with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.42 m. Time-water level change data was collected for falling and rising periods. According to time-drawdown data of the falling head test, hydraulic conductivity values were calculated as 1.34E-08 m/s and 1.74E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test, hydraulic conductivity values were calculated as 5.02E-08 m/s and 7.78E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively.

Kepezkaya TSF Aquifer Tests

One pumping test have been performed to characterize the hydrogeological behavior of the lithologies underlying the proposed Kepezkaya TSF area. Details on the pumping test are provided below while the Aqtesolv solution plots are given in Appendix C.

GK-13 Pumping Test

GK-13 was drilled to a total depth of 70 m within units which are composed of turbidites and sandstone-claystone alternation. The well targeted to identify the hydrogeological characteristics of these units representative for the Kepezkaya TSF. During the pumping test, a 4" submersible pump and a pressure transducer were placed at 65 m and 63 m, respectively. The pumping was started with an initial discharge rate of 1.85 L/s. The well has discharged completely within 20 minutes after pumping starts. The recovery period for GK-13 has taken 5.5 days. The total drawdown at the end of the pumping period was observed as 27 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Due to low permeability, the pumping period lasted too short followed by a relatively long recovery period. For this reason, the pumping data was not included in the estimations. Recovery data on the other hand, was evaluated as a rising head test. Therefore, Bouwer-Rice, Hvorslev and KGS Model solution methods were applied to the data for the recovery period. Estimated results for the recovery data show that the transmissivity values for GK-13 vary between 1.11E-07 m^2/s and 2.07E-07 m^2/s while the estimates of the hydraulic conductivity values range between 3.26E-09 m/s and 6.09E-09 m/s. During the drilling and development of this well the yield was much higher. However, the ongoing construction works within the Kepezkaya TSF area installed a pillar wall upstream of GK-13; thereby reducing the permeability of the rock mass drastically. Previous studies indicate that the hydraulic conductivity of this area is in the magnitude of 2.00E-06m/s.

The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.22 while the estimated aquifer parameters for different solution methods are given in Appendix C.

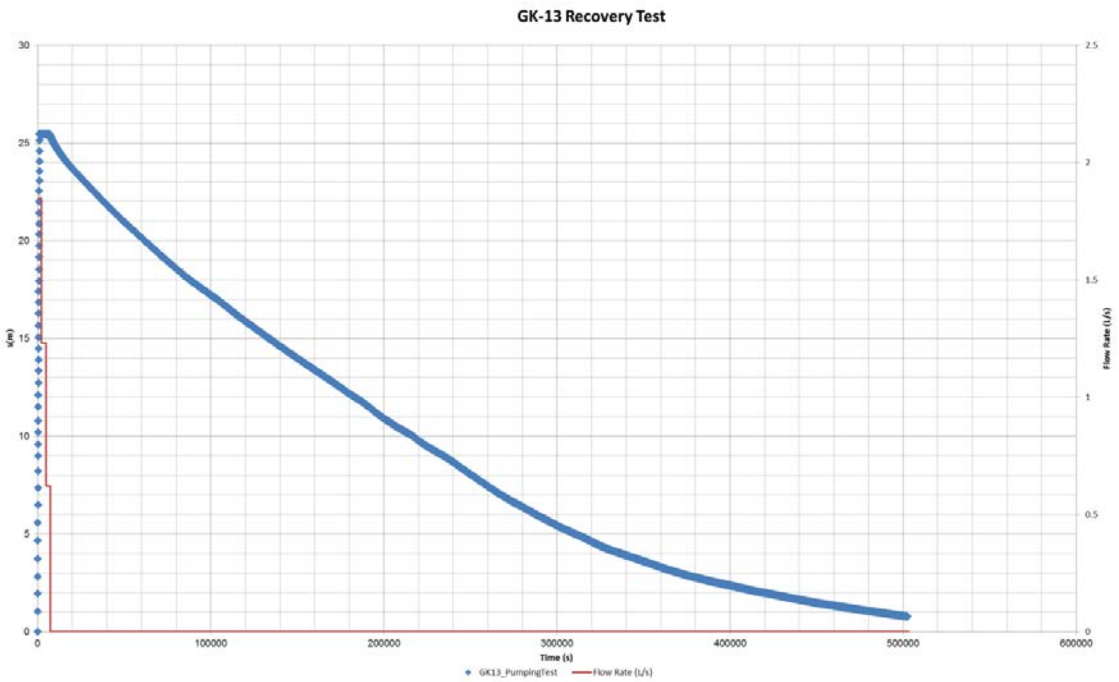


Figure 3.22: Time – Drawdown Plot for the GK-13 Pumping Test

Bağdere TSF Aquifer Tests

One pumping test and 3 slug tests have been performed to characterize the hydrogeological behavior of the lithologies underlying the proposed Bağdere TSF area. Details on the pumping and slug tests are provided below while the Aqtesolv solution plots are given in Appendix C.

GK-4 Pumping Test

GK-4 was drilled to a total depth of 56 m in units which are composed of claystone-marl alteration with sandstone intercalations. The well targeted to identify the hydrogeological characteristics of these units representative for the Bağdere TSF. During the pumping test, a 4” submersible pump and a pressure transducer were placed at 50 m and 48 m, respectively. The pumping was started with an initial discharge rate of 1.85 L/s and sustained with the same rate constantly until the end of the pumping period. A total of 20 hours of pumping was performed in GK-4 along with 24 hours of subsequent recovery period. The total drawdown at the end of the pumping period was observed as 0.57 m.

Based on the collected hydrogeological data, the aquifer type was identified as unconfined. Collected data was analyzed with Cooper-Jacob, Theis, Moench, Neuman and Tartakovsky-Neuman solution methods for the pumping period while the recovery data was analyzed with Theis Recovery solution. Estimated results for the pumping and recovery data show that the transmissivity values for GK-4 vary between 1.30E-03 m^2/s and 1.45E-03 m^2/s while the estimates of the hydraulic conductivity values range between 3.16E-05 m/s and 3.53E-05 m/s.

The time – drawdown plot for the pumping and recovery periods is provided in Figure 3.23 while the estimated aquifer parameters for different solution methods are given in Appendix C.

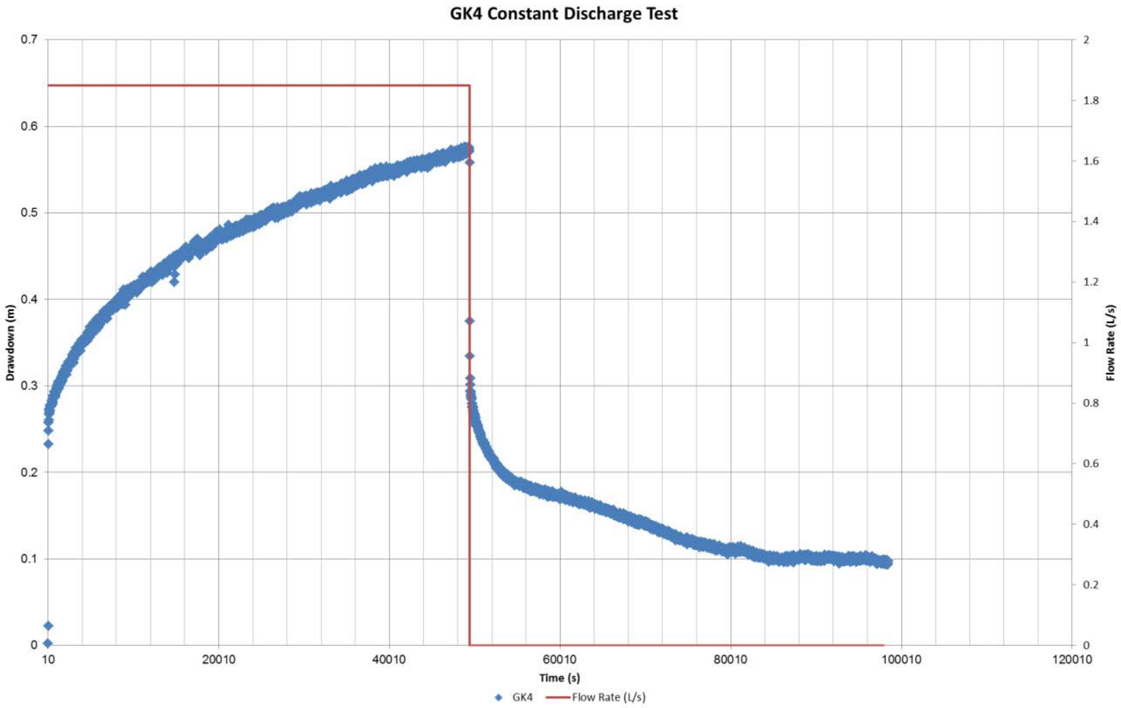


Figure 3.23: Time – Drawdown Plot for the GK-4 Pumping Test

GK-1 Slug Test

Slug test was completed on GK-11 with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.32 m. Time-water level change data was collected for falling and rising periods. According to data set of the falling head test conducted on GK-1, hydraulic conductivity value was calculated as 2.01E-07 m/s and 2.49E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test, hydraulic conductivity values were calculated as 1.37E-07 m/s and 1.83E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively.

GK-2 Slug Test

Slug test was completed on GK-2 with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.14 m. Time-water level change data was collected for falling and rising periods. According to time-drawdown data of the falling head test, hydraulic conductivity values were calculated as 1.24E-06 m/s and 1.29E-06 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for rising head test, hydraulic conductivity value was calculated as 3.99E-07 m/s and 4.01E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively.

GK-3 Slug Test

Slug test was completed on GK-3 with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.36 m. Time-water level change data was collected for falling and rising periods. According to time-drawdown data set of the falling head test, hydraulic conductivity values were calculated as 2.52E-07 m/s and 2.21E-07 m/s for Bouwer-Rice and Hvorslev methods respectively. Similarly, for rising head test hydraulic conductivity values were calculated as 1.41E-07 m/s for both Bouwer-Rice and Hvorslev methods, respectively.

Process Plant Aquifer Tests

Two slug tests have been conducted to characterize the hydrogeological behavior of the lithologies representing the Process Plant and its near vicinity. Details on the slug tests are provided below while the Aqtesolv solution plots are given in Appendix C.

GK-A Slug Test

Slug test was completed on GK-A with a solid cylinder having 0.5 m length and 150 mm diameter. After the initial submergence of the slug, the initial displacement was noted as 0.21 m. Time-water level change data was collected for falling and rising periods. According to time-drawdown dataset of the falling head test, hydraulic conductivity values were calculated as 8.23E-08 m/s and 7.40E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test, hydraulic conductivity values were calculated as 4.33E-08 m/s and 3.61E-08 m/s for Bouwer-Rice and Hvorslev methods, respectively.

GK-B Slug Test

Slug test was completed on GK-B with a solid cylinder having 0.5 m length and 150 m diameter. After the initial submergence of the slug, the initial displacement was noted as 0.42. Time-water level change data was collected for falling and rising periods. According to time-drawdown data of the falling head test, hydraulic conductivity values were calculated as 2.11E-07 m/s and 1.79E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively. Similarly, for the rising head test, hydraulic conductivity values were calculated as 2.91E-07 m/s and 2.61E-07 m/s for Bouwer-Rice and Hvorslev methods, respectively.

Table 3.5: Summary table for the estimated aquifer parameters

	Well ID	Supervision	Lithology	Project Unit	Aquifer Testing Type	Saturated Thickness (m)	Theis (1935) T(m2/s)	Theis (1935) K(m/s)	Cooper-Jacob (1946) T(m2/s)	Cooper-Jacob (1946) K(m/s)	Neuman (1974) T(m2/s)	Neuman (1974) K(m/s)	Moench (1997) T(m2/s)	Moench (1997) K(m/s)	Tartakovsky-Neuman (2007) T(m2/s)	Tartakovsky-Neuman (2007) K(m/s)	Theis Recovery (1935) T(m2/s)	Theis Recovery (1935) K(m/s)	Bouwer-Rice (1976) Falling Head (K-m/s)	Bouwer-Rice (1976) Rising Head (K-m/s)	Hvorslev(1951) Falling Head Test (K-m/s)	Hvorslev(1951) Rising Head Test (K-m/s)	Geometric Mean of Hydraulic Conductivity (K-m/s)
PREVIOUSLY COMPLETED WELLS	OW-3	Drilled by AMI, 2013 Tested by AECOM, 2016	Schist	Open Pit	Unconfined	162.50	-	-	-	-	-	-	-	-	-	-	-	-	5.96E-08	8.91E-08	6.94E-08	1.08E-07	7.94E-08
	OW-4		Schist (partly Alluvium)	Open Pit	Unconfined	85.00	-	-	-	-	-	-	-	-	-	-	-	-	1.11E-06	1.76E-06	1.48E-06	2.08E-06	1.56E-06
	OW-5		Alluvium/Schist	Open Pit	Unconfined	108.00	-	-	-	-	-	-	-	-	-	-	-	-	3.70E-06	4.03E-06	5.22E-06	5.32E-06	4.51E-06
	AOBH		Alluvium	Northwest of Open Pit	Unconfined	33.00	2.94E-02	8.92E-04	3.96E-02	1.20E-03	-	-	2.11E-02	6.39E-04	2.11E-02	6.39E-04	2.50E-01	7.58E-03	-	-	-	-	1.27E-03
	ATBH[1]		Alluvium	Northwest of Open Pit	Unconfined	33.00	3.04E-02	9.22E-04	2.57E-02	7.79E-04	-	-	2.94E-02	8.91E-04	2.81E-02	8.51E-04	9.69E-02	2.94E-03	-	-	-	-	1.10E-03
	BOBH		Schist	Northwest of Open Pit	Confined	40.00	1.30E-06	3.25E-08	1.31E-06	3.27E-08	-	-	-	-	-	-	3.09E-06	7.72E-08	-	-	-	-	4.64E-08
	BTBH[2]		Schist	Northwest of Open Pit	Confined	40.00	6.77E-06	1.69E-07	7.68E-06	1.92E-07	-	-	-	-	-	-	4.53E-06	1.13E-07	-	-	-	-	1.54E-07
	SOBH		Schist (fault)	Open Pit	Unconfined	13.50	-	-	-	-	-	-	-	-	-	-	-	-	4.99E-06	8.36E-06	5.21E-06	8.53E-06	6.56E-06
	FOBH		Schist/Fault	Open Pit	Unconfined	52.00	8.36E-05	1.61E-06	1.07E-04	2.07E-06	8.21E-05	1.58E-06	-	-	7.87E-05	1.51E-06	1.00E-03	1.92E-05	-	-	-	-	2.73E-06
	FTBH[3]		Schist/Fault	Open Pit	Unconfined	52.00	9.61E-05	1.85E-06	1.01E-04	1.94E-06	8.10E-05	1.56E-06	-	-	7.44E-05	1.43E-06	9.50E-04	1.83E-05	-	-	-	-	2.71E-06
	KK-1		Alluvium	Alluvium	Unconfined	5.00	5.35E-03	1.07E-03															1.07E-03
	KK-2		Alluvium	Alluvium	Unconfined	5.00	2.17E-02	4.34E-03															4.34E-03
	KK-3		Alluvium	Alluvium	Unconfined	5.00	1.92E-02	3.84E-03															3.84E-03
AECOM WELLS	GK-1	AECOM, 2016	Sedimentary	Bağdere TSF	Unconfined	69.00	-	-	-	-	-	-	-	-	-	-	-	-	2.01E-07	1.37E-07	2.49E-07	1.83E-07	1.88E-07
	GK-2		Sedimentary	Bağdere TSF	Unconfined	50.00	-	-	-	-	-	-	-	-	-	-	-	-	1.24E-06	3.99E-07	1.29E-06	4.00E-07	7.11E-07
	GK-3		Sedimentary	Bağdere TSF	Unconfined	48.00	-	-	-	-	-	-	-	-	-	-	-	-	2.52E-07	1.41E-07	2.21E-07	1.41E-07	1.82E-07
	GK-4		Sedimentary	Bağdere TSF	Unconfined	41.00	1.32E-03	3.22E-05	1.36E-03	3.32E-05	1.30E-03	3.16E-05	1.34E-03	3.27E-05	1.39E-03	3.38E-05	1.45E-03	3.53E-05	-	-	-	-	3.31E-05
	GK-6		Sedimentary/Schist	Çorakoğlu WRD	Unconfined	34.00	2.62E-04	7.71E-06	2.30E-04	6.75E-06	8.26E-05	2.43E-06	8.61E-05	2.53E-06	1.48E-04	4.36E-06	1.60E-04	4.71E-06	-	-	-	-	4.42E-06
	GK-7		Sedimentary/Schist	Çorakoğlu WRD	Unconfined	33.00	-	-	-	-	-	-	-	-	-	-	-	-	2.22E-08	3.11E-08	2.28E-08	3.10E-08	2.64E-08
	GK-9		Sedimentary	Çorakoğlu WRD	Unconfined	39.00	-	-	-	-	-	-	-	-	-	-	-	-	-	6.20E-06	-	6.15E-06	6.18E-06
	GK-10		Schist	Gelberi WRD	Unconfined	40.00	3.14E-05	7.84E-07	3.08E-05	7.71E-07	2.88E-05	7.19E-07	2.73E-05	6.83E-07	2.90E-05	7.25E-07	1.08E-05	2.70E-07	-	-	-	-	6.22E-07
	GK-11		Schist	Gelberi WRD	Unconfined	53.00	-	-	-	-	-	-	-	-	-	-	-	-	1.34E-08	5.02E-08	1.74E-08	7.78E-08	3.09E-08
	GK-12 (Fracture Zone)		Schist	Open Pit	Unconfined	226.00	-	-	2.38E-06	1.89E-07	-	-	-	-	-	-	1.58E-06	1.25E-07	-	-	-	-	1.57E-07
	GK-12 (Rock Mass-Schist)				Unconfined		-	-	5.07E-07	1.31E-08	-	-	-	-	-	-	3.09E-07	9.95E-09	-	-	-	-	1.15E-08
	GK-13		Sedimentary	Kepezkaya TSF	Unconfined	34.00	-	-	-	-	-	-	-	-	-	-	-	-	4.98E-09		6.09E-09		5.51E-09
	GK-A		Schist	South of Process Plant	Unconfined	103.00	-	-	-	-	-	-	-	-	-	-	-	-	8.23E-08	4.33E-08	7.40E-08	3.61E-08	5.55E-08
	GK-B		Schist	South of Process Plant	Unconfined	65.00	-	-	-	-	-	-	-	-	-	-	-	-	2.11E-07	2.91E-07	1.79E-07	2.61E-07	2.31E-07
	ST-1		Alluvium/Sedimentary	Alluvium	Unconfined	54.00	5.47E-02	1.01E-03	3.81E-02	7.06E-04	-	-	-	-	4.88E-02	9.03E-04	2.12E-02	3.92E-04	-	-	-	-	7.09E-04
	ST-1A		Alluvium/Volcanics	Alluvium	Unconfined	54.00	4.88E-02	9.03E-04	4.87E-02	9.02E-04	-	-	-	-	2.11E-02	2.11E-02	2.90E-02	5.36E-04	-	-	-	-	1.74E-03
	ST-2		Alluvium/Volcanics	Alluvium	Unconfined	50.00	8.86E-02	1.77E-03	8.68E-02	1.74E-03	-	-	-	-	6.35E-02	1.27E-03	4.26E-02	8.52E-04	-	-	-	-	1.35E-03
	ST-3		Alluvium/Sedimentary	Alluvium	Unconfined	56.00	7.60E-04	1.36E-05	7.60E-04	1.36E-05	4.24E-04	7.57E-06	4.24E-04	7.57E-06	7.60E-04	1.36E-05	3.97E-03	7.09E-05	-	-	-	-	1.47E-05
	ST-4		Alluvium/Volcanics	Alluvium	Unconfined	54.00	4.40E-01	8.16E-03	4.56E-02	8.44E-04	-	-	-	-	1.48E-02	2.74E-04	3.78E-02	7.00E-04	-	-	-	-	1.07E-03
	ST-5		Alluvium/Volcanics	Alluvium	Unconfined	40.00	8.14E-02	2.03E-03	8.22E-02	2.05E-03	-	-	-	-	7.53E-02	1.88E-03	3.83E-02	9.58E-04	-	-	-	-	1.66E-03

Notes:
[1]: Specific yield (S) values of ATBH: 0.54 (Cooper&Jacop), 0.02 (Theis), 0.096 (Tartakovsky-Neuman) and 0.096 (Moench)
[2]: Specific yield (S) values of BTBH: 0,00039 (Cooper&Jacop), 0.00048 (Theis)
[3]: Specific yield (S) values of FTBH: 0.40 (Cooper&Jacop), 0.51 (Theis), 0.66 (Tartakovsky-Neuman) and 0.66 (Neuman)

3.2.5 Water Quality

Several water quality sampling/monitoring surveys have so far been carried out within the scope of the GCP. Initial studies on water quality comprise field works performed as part of the local EIA studies conducted by ENVY, 2014. An additional water quality sampling and monitoring survey was performed in September 2015 by AECOM, primarily to assess the quality of drinking waters and identify the gaps in baseline water quality of the Project Area and its vicinity. Within the scope of the September 2015 survey, the number of sampling and monitoring locations was increased to characterize the upstream and downstream sections of the individual project units. Project Area and its vicinity were also investigated to identify the major transmission lines that provide water for the nearby settlement areas.

As of May 2016, a more comprehensive sampling and monitoring program has been established within the scope of the Hydrogeological Impact Assessment Study for the GCP. Baseline studies on water quality has been extended to involve groundwater, village water depots, fountains, springs and surface water locations as to represent each project unit such as WRDs, TSFs, Process Plant and the Open Pit. Field parameter measurements (including pH, electrical conductivity, dissolved oxygen and temperature) have been started to be performed on a monthly basis while water sampling surveys have been started to be carried out on a quarterly basis to improve the understanding on the quality of the water resources.

Following sections provide the details on general methodology of the water quality program, field parameter measurements, chemical characteristics of the water resources and quality assessments with respect to relevant international and local regulatory criteria. Each sampling/monitoring survey has been evaluated separately and chronologically to reflect the progressive development on the overall status on Project's water quality.

3.2.5.1 Sampling and Monitoring Methodology

Methodology of the water quality studies includes two major tasks that have been completed for groundwater and surface waters. These are;

- Measurement of Field Parameters (incl. pH, temperature, electrical conductivity (EC) and dissolved oxygen (DO)) to evaluate temporal and spatial trends for water resources.
- Sampling and chemical analysis of the water samples representative of each project unit, to identify hydrogeochemical characteristics and quality classes for each water type.

Groundwater samples include samples collected from monitoring wells, village water depots, fountains and springs whereas surface water samples represent intermittent and permanent streams located in the vicinity of the Project Area. Collected samples were sent to ALS Prague Laboratories to be analyzed for dissolved and total metals, physical parameters (pH and EC), hardness, total organic carbon, major ions and inorganic parameters. Each sample was collected in HDPE and amber glass sampling bottles using relevant chemical preservatives. Although the assessments for previous sampling/monitoring studies are also provided in this report, AECOM has extended the number of the analysis parameters to bridge the gaps in baseline water quality of the Project Area. The list of the parameters analyzed within the scope of the Hydrogeological Impact Assessment Study is given in Table 3.6 while the laboratory analysis results are provided in Appendix F.

Analysis results were compared to relevant water quality standards specified within international and local regulations. Comparisons were made with respect to the following standards which are briefly described below.

- Water Pollution and Control Regulation (WPCR), Inland Water Quality Criteria – Turkish Ministry of Environment and Urbanization, 2004;
- Regulation on the Protection of Groundwater Due to Pollution and Degradation (RPGDPD) – Turkish Ministry of Forestry and Water Works, 2015;
- Surface Water Quality Regulation (SWQR), Inland Surface Waters Quality Criteria – Turkish Ministry of Forestry and Water Works, 2012;
- Regulation on Waters Intended for Human Consumption (RWIHC), Chemical Parameters and Indicator Parameters – Turkish Ministry of Health, 2005;
- TS-266 Drinking Water Quality Standards – Turkish Standards Institution,
- European Union Quality Criteria for Waters Intended for Human Consumption – Council Directive 98/83/EC of 3 November 1998,
- Guidelines for Drinking Water Quality – World Health Organization (WHO), 2011.

Table 3.6: Parameters analyzed within the scope of the Hydrogeological Impact Assessment Study

Aggregate Parameters	Nonmetallic Inorganic Parameters
Calcium Hardness	Acid neutralizing capacity (alkalinity) as $CaCO_3$pH 4.5
Hardness	Ammonia (free)
Hardness as $CaCO_3$	Ammonia (free) as N
Magnesium Hardness	Ammonia and ammonium ions as N
Total Organic Carbon	Ammonia and ammonium ions as NH_4
	Bicarbonate Alkalinity as $CaCO_3$
Dissolved and Total Metals / Major Cations	Bromide
Aluminum	Carbonate Alkalinity as $CaCO_3$
Antimony	Chemical Oxygen Demand (COD-Cr)
Arsenic	Chloride
Barium	Dissolved Oxygen
Beryllium	Dissolved solids dried at 105 °C
Boron	Easily released cyanides
Cadmium	Fluoride
Calcium	Free Cyanide
Chromium	Hydroxide Alkalinity as $CaCO_3$
Cobalt	Inorganic Nitrogen as N
Copper	Nitrate as N
Hexavalent Chromium - Soluble	Nitrates
Iron	Nitrite + Nitrate as N
Lead	Nitrite as N
Lithium	Nitrites
Magnesium	Organic Nitrogen as N
Manganese	Oxygen Saturation
Mercury*	Phosphorus (as P_2O_5)
Molybdenum	Sulphate as SO_4^{2-}
Nickel	Suspended solids dried at 105 °C
Phosphorus	Total Cyanide
Potassium	Total Kjeldahl Nitrogen as N
Selenium	Total Nitrogen as N
Silver	Total Phosphorus as P
Sodium	Total Phosphorus as PO_4^{3-}
Thallium	
Vanadium	Physical Parameters
Zinc	Electrical Conductivity @ 25°C
	pH Value

Water Pollution and Control Regulation (WPCR) – Inland Water Quality Criteria

The analytical results were compared with the quality limits referred in current Turkish Water Pollution Control Regulation (WPCR) published in Official Gazette No. 25687, dated December 31, 2004, and amended on February 13, 2008, March 30, 2010, April 24, 2011 and November 2012. The aim of the WPCR is to determine the necessary legal and technical principles in order to protect surface and groundwater resources and prevent water pollution in harmony with sustainable development objectives.

The WPCR covers water quality classes and utilization principles, planning principles and prohibitions concerning water quality, wastewater discharge principles and discharge permits, applications in wastewater infrastructure facilities and monitoring and auditing principles in order to prevent water pollution. Industries are categorized according to their sectors in the WPCR. The WPCR presents “sector-specific” discharge limits for numerous types of wastewater discharges. It also sets the discharge limits for domestic wastewaters and protection zones for drinking water dam reservoirs.

The WPCR for groundwater (spring and groundwater well sources), include three quality classes, as defined below.

- Class I: High quality groundwater: Groundwater that attains the quality parameters of Class I surface water shall be regarded as Class I groundwater, provided that the required oxygen can be supplied by aeration alone.
    - ✓ Drinking water and food industry
- Class II: Medium quality groundwater: Groundwater that attains the quality parameters of Class II surface water (excluding ammonia, iron, manganese, and dissolved oxygen) shall be regarded as Class II groundwater.
    - ✓ Drinking water supply after treatment
    - ✓ Agricultural and livestock water
    - ✓ Cooling water
- Class III: Low quality groundwater.

Regulation on the Protection of Groundwater Due to Pollution and Degradation and Surface Water Quality Regulation

Analytical results were reviewed in accordance with the parameter limits defined in 7, 8, 11, 12, 13 and 22 clauses of WPCR limits issued by the Ministry of Environment and Urbanization in 2004 and amended finally in 2012. However, these clauses were cancelled with the issuance of the following regulations:

- Regulation on the Protection of Groundwater Due to Pollution and Degradation (RPGDPD), dated April 7, 2012 and numbered 28257 in the official gazette; and,
- Surface Water Quality Regulation (SWQR) dated November 30, 2012 and numbered 28483.

Those cancelled clauses define groundwater and surface water classification, classes and enacts prohibitions of groundwater pollution and related regulations. The objectives of the new regulations are protection of good conditions of available groundwater and surface water, prevention of pollution and degradation of groundwater and surface water, and improvement of these waters.

The 9th clause of the RPGDPD defines that the monitoring of a groundwater body and chemical condition are realized in accordance with the Annex 5 of the regulation, after the groundwater characterization is completed. According to the Annex 5 of the regulation, the parameters of ammonium, nitrate, conductivity, pH values, and oxygen content will be monitored for general monitoring purposes. According to the 9th Clause of this regulation, groundwater characterization tables will be completed in five years after the regulation is published.

The newly published SWQR includes classification limits for inland water resources (ambient water). The surface water resources are classified into four classes by these defined limits. Guidelines of the surface water classes according to SWQR are as follows:

- Class I, High quality water: These waters are regarded as a potential water supply for drinking after disinfection, recreational use (including body contact), trout propagation, animal production, and farming needs.
- Class II, Slightly contaminated water: These waters are also considered a potential water supply for drinking after proper treatment, recreational use, propagation of fish other than trout, irrigation water, provided they meet the irrigation water quality criteria.

- Class III, Contaminated water: These waters could be used as industrial water needs after appropriate treatment, except for those industries that require high quality water, such as the food and textile industries.
- Class IV, Highly Contaminated Water.

Drinking Water Criteria

In addition to WPCR and SWQR, analytical results are compared with the chemical and indicative parameter limits defined in Regulation on Water Intended for Human Consumption (RWIHC – by Turkish Ministry of Health (MoH)), which was published in Official Gazette No: 25730 in 2005 and amended in 2009. The RWIHC separates the water resources for consumption into two different groups which are natural springs and bottled drinking water resources, and provides different limits for each. However, this differentiation is only valid for "Microbiological Parameters", and therefore, there is only one set of limits for the remaining parameters. The RWIHC provides limits for the below mentioned parameter groups:

In addition to classification of water sources according to WPCR and RWIHC, there exists a similar standard on "Water Intended for Human Consumption, TS266" published by the Turkish Standard Institution (TSE), which provides limits for the below mentioned groups of different water sources:

a. Class 1: Natural Springs,
b. Class 2: Water sources other than springs in which two types are differentiated;
    - Type 1: Processed spring water
    - Type 2: Drinking and usage water

Drinking water resources which were sampled within the scope of the Hydrogeological Impact Assessment Study were also compared with the drinking water quality criteria specified in the European Union Council Directive (98/93/EC of November 1998). According to the council directive, water intended for human consumption is defined as

a. all water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied from a distribution network, from a tanker, or in bottles or containers,
b. all water used in any food-production undertaking for the manufacture, processing, preservation or marketing of products or substances intended for human consumption unless the competent national authorities are satisfied that the quality of the water cannot affect the wholesomeness of the foodstuff in its finished form.

Drinking water resources which were sampled within the scope of the Hydrogeological Impact Assessment Study were lastly compared with the drinking water guideline values specified by the World Health Organization (WHO). The Guidelines provide the recommendations of the WHO for managing the risk from hazards that may compromise the safety of drinking-water. The recommendations should be considered in the context of managing the risk from other sources of exposure to these hazards, such as waste, air, food and consumer products (WHO, 2011).

3.2.5.2 Groundwater

Groundwater Sampling and Monitoring Locations

May / August 2012 Field Survey

Groundwater quality sampling and monitoring surveys were started in Spring and Summer 2012 by ENVY to identify initial baseline conditions for the Project Area groundwater resources. In order to represent wet and dry periods of the year, consecutive field surveys were conducted in May and August 2012. Four groundwater points were visited for sampling and in-situ field parameter measurements. The locations of the monitoring wells were selected to identify the groundwater quality for both upstream and downstream portions of the Project Area with respect to the Gökırmak River. One monitoring well (DG-101) located in the proposed open pit area was also sampled to obtain quality information of groundwater pertaining to the pit area. Coordinates and descriptions for the groundwater sampling and monitoring points are provided in Table 3.7 while their locations are shown in Figure 3.24.

September 2013 Field Survey

An additional water quality sampling survey was conducted in September 2013 among the monitoring wells located in the open pit area. A total of 9 groundwater samples were collected from DH and OW series monitoring wells to identify groundwater quality in the open pit. Field parameters including pH, electrical conductivity (EC) and temperature were measured in each sampling location. Collected groundwater samples were analyzed in terms of major ions and metals. Three of the open pit monitoring wells (OW-1, OW-3 and OW-5) were also sampled in July 2015 and analyzed for metals and dissolved ions. Field parameters including pH, EC and temperature were also measured during the July 2015 field survey. Coordinates and descriptions for the groundwater sampling and monitoring points are provided in Table 3.7 while their locations are shown in Figure 3.24.

September 2015 Field Survey

A water quality sampling and monitoring program was performed in September 2015 by AECOM, primarily to identify the quality of drinking waters. AECOM has also collected samples from the surface waters and groundwater from the selected locations in the project area to understand the baseline conditions in more detail and more in line with the up-to-date mine layout. Within the scope of this new program, the number of the sampling locations was increased to characterize the upstream and downstream portions of the individual project units. 16 groundwater locations were visited including 3 village fountains, 2 springs, 6 village water depots and 5 groundwater wells. Field parameters including pH, electrical conductivity (EC), temperature (T) and dissolved oxygen (DO) were monitored for each selected water point. Project site and its vicinity were also investigated to identify the major transmission lines that provide water for the nearby settlement areas. Coordinates and descriptions for the September 2015 groundwater sampling and monitoring points are provided in Table 3.7 while their locations are shown in Figure 3.24.

Field surveys within the scope of the Hydrogeological Impact Assessment Study (May 2016 – present)

An extended baseline water quality program has been initiated in May 2016 to collect groundwater samples and to measure physical site parameters. Within the scope of this program, a total of 29 monitoring wells, 10 water depots, 1 fountain and 1 spring have been visited. Fifteen of the 29 monitoring wells were visited for quarterly sampling while field parameter measurements were carried out in all 29 monitoring wells. Those locations comprising water depots, fountains and springs were visited both for quarterly sampling and monthly field parameter monitoring. Field parameters including pH, electrical conductivity (EC), temperature (T) and dissolved oxygen (DO) were monitored for each selected water point. Sampling and monitoring points were selected to represent downstream and upstream locations of the project units. Monitoring wells (GK series) completed by AECOM within the scope of the Hydrogeological Impact Assessment Study were included in the water quality sampling and monitoring program upon their completion and well development by early December 2016.

Coordinates, descriptions and sampling periods for the all groundwater sampling and monitoring points visited since 2012 are provided in Table 3.7. Groundwater sampling and monitoring locations visited until 2016 are shown in Figure 3.24 while the locations visited within the scope of the Hydrogeological Impact Assessment Study are given in Figure 3.25.

Table 3.7: Coordinates and Descriptions for Groundwater Samples

Monitoring Wells

Station ID	Coordinates (WGS84 UTM Zone 36N) X	Coordinates (WGS84 UTM Zone 36N) Y	Type[1]	Description	Sampling Period(s)[2]	Monitoring Period(s)[3]	Project Unit(s)
KS-1	605408	4602649	MW	Upstream Gökırmak River, Southwest of the Project Area.	May / Aug. 2012	May / Aug. 2012	Project Area Upstream
KS-2	613010	4607397	MW	Upstream of Akcasuköy, West of the Project Area.	May / Aug. 2012	May / Aug. 2012	Project Area Upstream
KS-3	627390	4608585	MW	Downstream Gökırmak River, East of the Project Area.	May / Aug. 2012	May / Aug. 2012	Project Area Downstream
DG-101	617504	4607762	MW	South bank of the Gökırmak River, within the Open Pit boundaries.	May / Aug. 2012	Aug. 2012	Open Pit
DH-1	617449	4607711	MW	Open pit area monitoring well.	Sep. 2013	Sep. 2013	Open Pit
DH-2	617522	4607775	MW	Open pit area monitoring well.	Sep. 2013	Sep. 2013	Open Pit
DH-3	617808	4607772	MW	Open pit area monitoring well.	Sep. 2013	Sep. 2013	Open Pit
DH-4	617814	4607740	MW	Open pit area monitoring well.	Sep. 2013	Sep. 2013	Open Pit
OW-1	617468	4607596	MW	Open pit area monitoring well.	Sep. 2013 / July 2015	Sep. 2013	Open Pit
OW-2	617464	4607592	MW	Open pit area monitoring well.	Sep. 2013	Monthly (from July 2016 to present)	Open Pit
OW-3	617544	4607515	MW	Open pit area monitoring well.	Sep. 2013 / Jul. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Open Pit
OW-4	617673	4607678	MW	Open pit area monitoring well.	Sep. 2013	Monthly (from July 2016 to present)	Open Pit
OW-5	617753	4607682	MW	Open pit area monitoring well.	Sep. 2013 / Jul. 2015	Monthly (from July 2016 to present)	Open Pit
IK-1	622730	4609815	MW	Southwest of the Kepezkaya TSF and northeast of Hanönü	May-Aug.16	Monthly (from May 2016 to present)	Kepezkaya TSF
IK-2	623452	4610019	MW	Monitoring well within the Kepezkaya TSF, northeast of Hanönü.	May-Aug.-Nov.16	Monthly (from May 2016 to present)	Kepezkaya TSF
IK-3	622909	4610147	MW	Monitoring well within the Kepezkaya TSF, northeast of Hanönü.	May-Aug.-Nov.16	Monthly (from May 2016 to present)	Kepezkaya TSF
IK-4	623112	4610417	MW	Monitoring well within the Kepezkaya TSF, northeast of Hanönü.	May-Aug.-Nov.16	Monthly (from May 2016 to present)	Kepezkaya TSF
ATBH	617378	4607841	MW	Open pit area monitoring well.	-	Monthly (from Sept. 2016 to present)	Open Pit
FTBH	617490	4607206	MW	Open pit area monitoring well.	May-Aug.-Nov.16	Monthly (from July 2016 to present)	Open Pit
WD-001	617742	4608536	MW	Monitoring well, southwest of Çorakoğlu WRD.	May-Aug.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
WD-002	617186	4608870	MW	Monitoring well, southwest of Çorakoğlu WRD.	May-Aug.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
WD-003	618060	4608775	MW	Monitoring well, south of Çorakoğlu WRD.	May-Aug.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
ST-1	622501	4608400	MW	Water supply well, mobilization area.	Aug.16-Nov.16	Monthly (from December 2016 to present)	Mobilization Area
ST-1A	622480	4608345	MW	Water supply well, mobilization area.	-	Monthly (from December 2016 to present)	Mobilization Area
ST-2	622588	4608538	MW	Water supply well, mobilization area.	-	Monthly (from December 2016 to present)	Mobilization Area
ST-3	616685	4609049	MW	Water supply well, mobilization area.	-	Monthly (from December 2016 to present)	Mobilization Area
ST-4	622716	4608510	MW	Water supply well, mobilization area.	-	Monthly (from December 2016 to present)	Mobilization Area
ST-5	622627	4608342	MW	Water supply well, mobilization area.	-	Monthly (from December 2016 to present)	Mobilization Area
GK-1	623975	4609065	MW	Bağdere TSF area monitoring well.	-	Monthly (from December 2016 to present)	Bağdere TSF
GK-2	623660	4608858	MW	Bağdere TSF area monitoring well.	-	Monthly (from December 2016 to present)	Bağdere TSF
GK-3	623591	4609067	MW	Bağdere TSF area monitoring well.	-	Monthly (from December 2016 to present)	Bağdere TSF
GK-4	623510	4608757	MW	Bağdere TSF area monitoring well.	Dec.16	Monthly (from December 2016 to present)	Bağdere TSF
GK-5	623870	4609015	MW	Bağdere TSF area monitoring well.	-	Monthly (from December 2016 to present)	Bağdere TSF
GK-6	618858	4608755	MW	Çorakoğlu WRD area monitoring well.	Dec.16	Monthly (from December 2016 to present)	Çorakoğlu WRD
GK-7	618986	4609469	MW	Çorakoğlu WRD area monitoring well.	-	Monthly (from December 2016 to present)	Çorakoğlu WRD
GK-8	618318	4609249	MW	Çorakoğlu WRD area monitoring well.	-	Monthly (from December 2016 to present)	Çorakoğlu WRD
GK-9	617620	4609450	MW	Çorakoğlu WRD area monitoring well.	-	Monthly (from December 2016 to present)	Çorakoğlu WRD
GK-10	616313	4605799	MW	Gelberi WRD area monitoring well.	Dec.16	Monthly (from December 2016 to present)	Gelberi WRD
GK-11	615806	4606668	MW	Gelberi WRD area monitoring well.	-	Monthly (from December 2016 to present)	Gelberi WRD
GK-12	617478	4607517	MW	Open Pit area monitoring well.	Dec.16	Monthly (from December 2016 to present)	Open Pit

	GK-13	622863	4610010	MW	Kepezkaya TSF area monitoring well.	Dec.16	Monthly (from December 2016 to present)	Kepezkaya TSF
	GK-A	620654	4607053	MW	Process Plant area monitoring well.	-	Monthly (from December 2016 to present)	Process Plant
	GK-B	620141	4606792	MW	Process Plant area monitoring well.	-	Monthly (from December 2016 to present)	Process Plant
Groundwater Wells	KK-1	622440	4609048	GW	Hanönü groundwater well, southwest of TSFs.	Sep. 2015	Sep. 2015	Bağdere & Kepezkaya TSFs
	KK-2	622430	4609058	GW	Hanönü groundwater well, southwest of TSFs.	Sep. 2015	Sep. 2015	Bağdere & Kepezkaya TSFs
	KK-3	622590	4608851	GW	Hanönü groundwater well, southwest of TSFs.	Sep. 2015	Sep. 2015	Bağdere & Kepezkaya TSFs
	BK-1	622426	4609225	GW	Hanönü groundwater well, southwest of TSFs.	Sep. 2015	Sep. 2015	Bağdere & Kepezkaya TSFs
Springs	K-1	618246	4607061	SP	Sepetçi Village natural spring.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Open Pit
	K-4	618732	4605535	SP	Dereköy Village natural spring, water provider for D-4.	Sep. 2015	Sep. 2015	Open Pit
Village Water Depots	D-2	620114	4606808	DE	Imam Village water depot, southwest of the Processing Facility.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Process Plant
	D-3	620769	4607000	DE	Geymene Village water depot, southwest of the Processing Facility.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Process Plant
	D-4	619392	4608026	DE	Dereköy Village water depot, east of the Open Pit.	Sep. 2015	Sep. 2015	Çorakoğlu WRD
	D-5	620595	4608905	DE	Vakıf Village water depot, east of the Open Pit and North WRD.	Sep. 2015	Sep. 2015	Çorakoğlu WRD
	D-6	622371	4609856	DE	Hanönü Village water depot, southwest of TSFs.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Kepezkaya TSF
	D-7	621805	4606823	DE	Bağdere Village water depot, downstream of the Processing Facility.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Process Plant
	D-8	616394	4609372	DE	Küpeli Village water depot, west of Çorakoğlu WRD.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
	D-9	619244	4609981	DE	Yozlu Village water depot, northeast of Çorakoğlu WRD.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
	D-10	616985	4610714	DE	Aşağıküreçay Village water depot, northwest of Çorakoğlu WRD.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
	D-11	622718	4610872	DE	Yılanlı Village water depot, northwest of Kepezkaya TSF.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Kepezkaya TSF
	D-12	620161	4608882	DE	Vakıf Village water depot, east of the Open Pit and North WRD.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Çorakoğlu WRD
	D-13	619469	4607924	DE	Dereköy Village water depot, east of the Open Pit.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Open Pit
Village Fountains	C-3	620686	4607117	FO	Geymene Village fountain, southwest of the Processing Facility.	Sep. 2015	Sep. 2015	Process Plant
	C-5	620555	4608521	FO	Vakıf Village fountain, east of the Open Pit and North WRD.	Sep. 2015	Sep. 2015	Çorakoğlu WRD
	C-7	622106	4607865	FO	Çaylı Village water depot, downstream of the Processing Facility.	Sep. 2015 / May-Aug.-Nov.16	Monthly (from May 2016 to present)	Process Plant

Notes:
[1]: MW: Monitoring Well, GW: Groundwater Well, SP: Spring, DE: Village Water Depot, FO: Village Fountain
[2]: indicates water quality sampling periods,
[3]: indicates field parameters measurement periods.

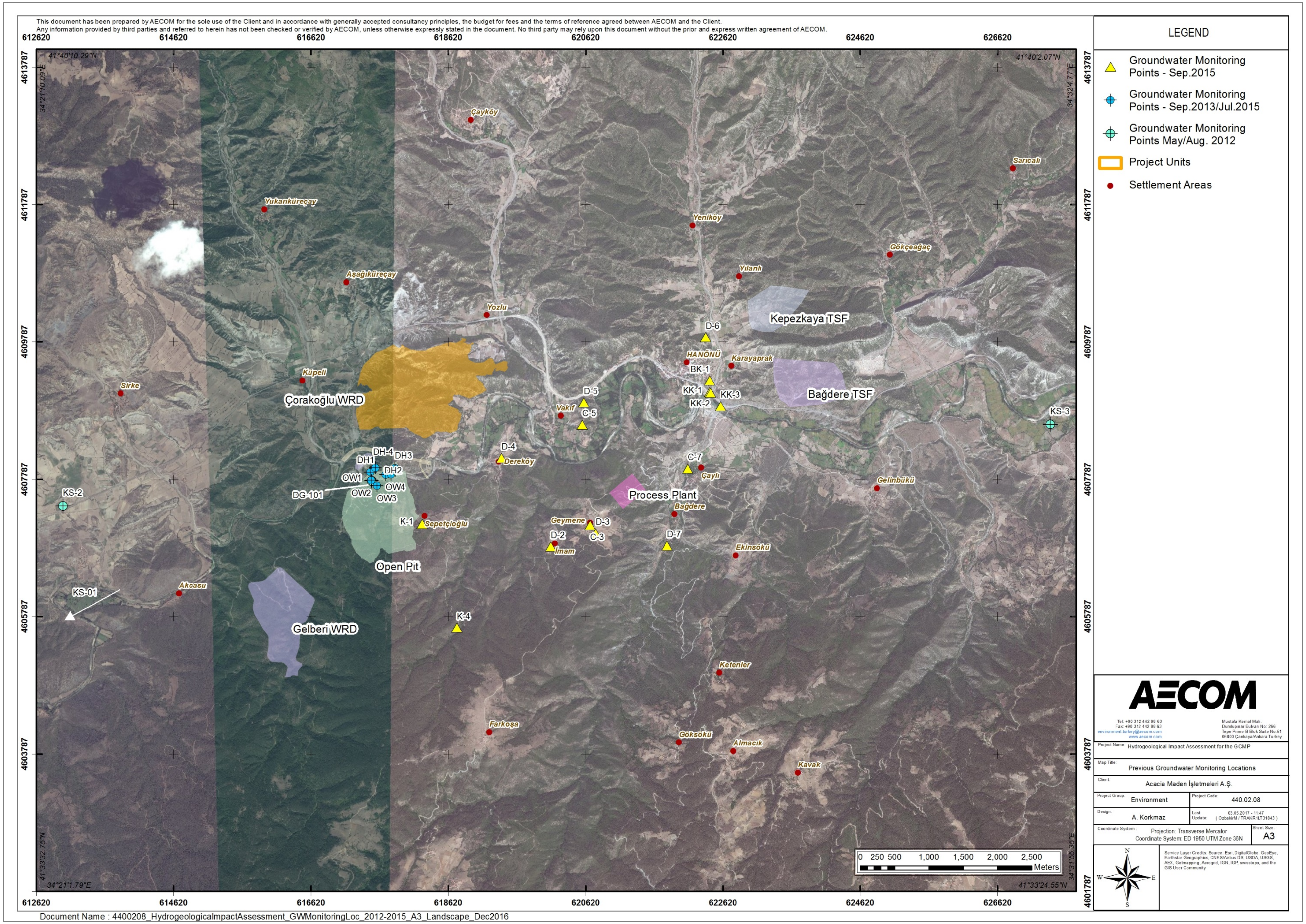


Figure 3.24: Groundwater Sampling and Monitoring Locations (2012 – 2015)

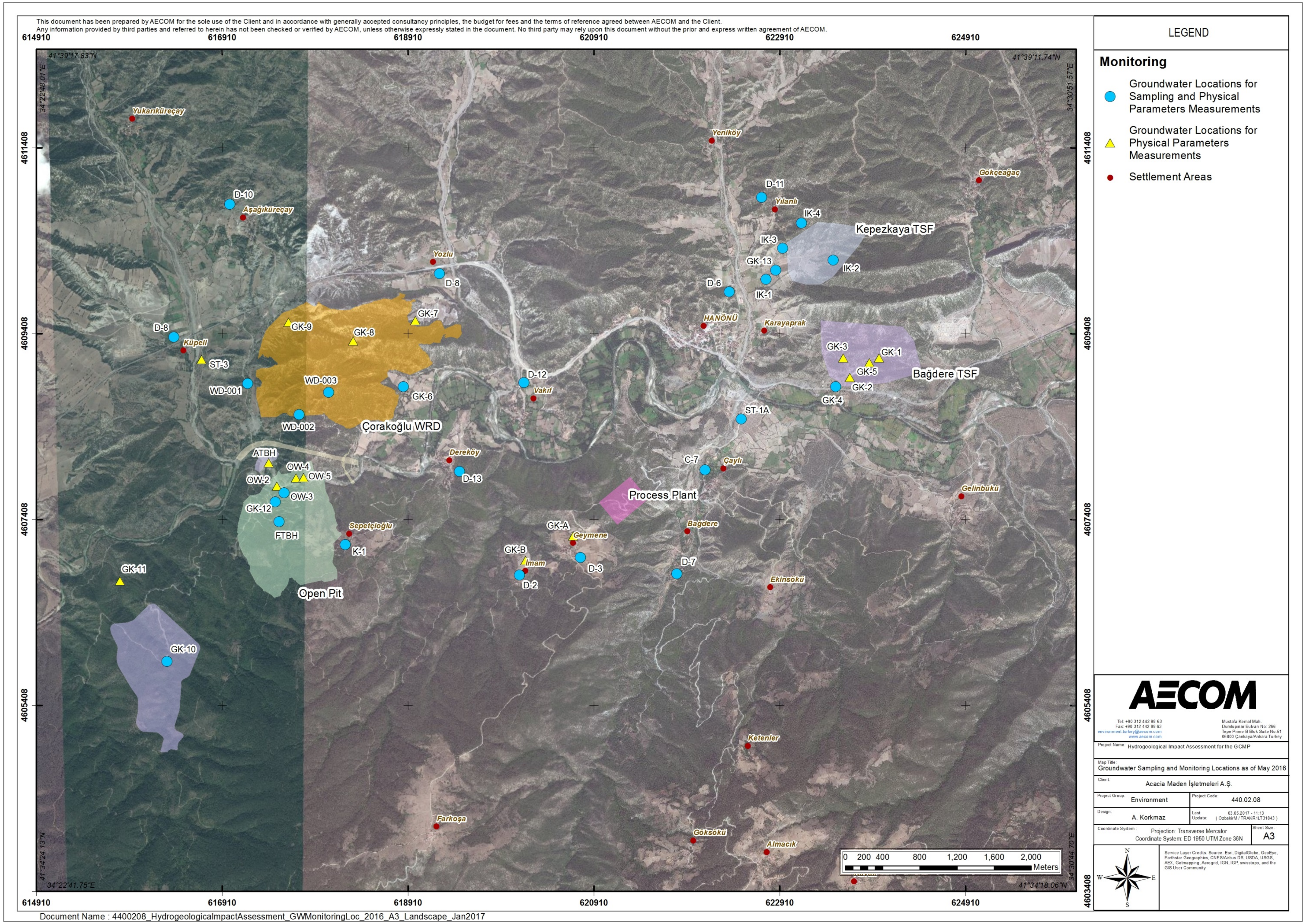


Figure 3.25: Groundwater Sampling and Monitoring Locations (May 2016 – present)

Groundwater Field Parameters

Field parameter measurements for the groundwater sampling and monitoring locations are provided in Appendix D while the summary of the results are provided below.

May / August 2012 Field Parameter Measurements

Field parameter measurements conducted in 2012 field surveys show that the electrical conductivity (EC) values are relatively high in KS-2 and DG-101 monitoring wells as were measured to be over 1000 µS/cm. Remaining groundwater wells (KS-1 and KS-3) which were also monitored in May and August 2012 show EC values between 600 and 1000 µS/cm. pH values were generally observed to vary between 6.5 to 8 reflecting a near neutral to slightly alkaline character. pH value for the open pit monitoring well, DG-101, was measured as 6.15 in the showing near neutral to slightly acidic conditions.

September 2013 and July 2015 Field Parameter Measurements

Groundwater quality in the open pit area was monitored in September 2013 by collecting samples from 9 monitoring wells (DH1 – DH4 and OW1 – OW5). The majority of the EC values for these wells were identified to be below 1000 µS/cm except OW-2 which reflects an EC value of 4670 µS/cm. pH values were observed to vary between 6.5 to 8 reflecting a near neutral to slightly alkaline character. Additional sampling was carried out in three of these monitoring wells (OW-1, OW-3 and OW-5) in July 2015. EC value in OW-1 was observed to increase in July 2015 sample compared to September 2013 while EC values in OW-3 and OW-5 were measured to be between 700 and 1000 µS/cm. pH values between 7 and 7.5 for July 2015 period shows that the groundwater samples collected from OW-1, OW-2 and OW-3 are near neutral in character.

September 2015 Field Parameter Measurements

Aiming to identify the existing status of groundwater in the near vicinity of the project units, village fountains and water depots of the nearby settlement areas and their corresponding upstream springs were monitored in September 2015. In situ measurements were carried out in water depots/springs of the settlements located in downstream of the open pit (D-4 and K-1), process plant (C-7) and tailings storage facilities (D-6). Fountains, water depots and springs located in the villages of Vakıf and Geymene (C-5, D-5, K-4, D-2, C-3 and D-3) were also included in field parameters measurements because of their proximity to the open pit, Çorakoğlu WRD and processing facility areas. Caisson wells located in downstream of Hanönü (KK-1, KK-2, KK- and BK-1) were visited for field monitoring.

Monitoring points display near neutral to slightly alkaline conditions with an average pH value of 7.8. The minimum pH was recorded as 6.9 in KK-1 groundwater well while the maximum as 9.4 in BK-1. Relatively high pH value observed in BK-1 suggests a potential influence of domestic activities that are likely to originate in the town of Hanönü. The remaining water samples were found to have pH values between 7 and 8, having neutral to slightly alkaline character.

Groundwater field parameter measurements within the scope of the Hydrogeological Impact Assessment Study (May 2016 – present)

Based on the monthly field parameter measurements performed since May 2016, temperature values were observed to have coinciding trend with the atmospheric conditions, varying between 20.10-13.83 ºC and 16.10-8.20 ºC for summer and winter seasons, respectively. Dissolved Oxygen measurements present two different increasing trends for the months of July and October. This trend gives a peak in the same months for the wells OW-3, OW-5 and FTBH which are located in the Open Pit. Mean value for all dissolved oxygen measurements was determined as 4.72 mg/L. IK-1, IK-2 and IK-3 which are located in Kepezkaya TSF gave relatively high electrical conductivity readings with a mean value of 4093 µS/cm while the rest of the measurements have a mean of 1643 µS/cm. Slightly alkaline conditions were observed in this period of monitoring as well with an average pH value of 7.63. pH measurements through May 2016 to present gave relatively stable values.

Temperature values obtained from water depots, fountains and springs were observed to reflect a similar trend with the atmospheric conditions varying between 31.10-10.0 ºC and 6.30-2.10 ºC for summer and winter seasons, respectively. Mean of dissolved Oxygen measured for the water depots, fountains and springs were found to be 9.04 mg/L. Electrical conductivity values show a relatively stable trend throughout the course of the monitoring period, with an overall mean of 543 µS/cm. Slightly alkaline conditions were obtained for the pH values having an overall mean of 7.78.

Groundwater Hydrogeochemistry

Ionic characteristics of the groundwater samples and their hydrogeochemical facies types were evaluated using relevant water quality diagrams. In this regard, Piper and Schoeller diagrams were generated based on the major ion concentrations. In order to assess the groundwater samples regarding their potential use for irrigation purposes, analysis results were evaluated through Wilcox Diagram. Analysis results for May / August 2012 and July 2015 groundwater samples were not included in water quality diagrams since some of the major ion concentrations were not available for those two periods.

As of May 2016, a more comprehensive baseline water quality sampling/monitoring program has been initiated within the scope of Hydrogeological Impact Assessment Study for the GCP. In this respect, the number and spatial distribution of groundwater sampling/monitoring points have been improved to represent each project unit. Based on this improved program, analysis results for three successive periods of water quality sampling have been assessed to identify ionic characteristics and hydrogeochemical facies types for Project's groundwater resources. The results have been evaluated under two groups as monitoring wells and village water depots-fountains-springs. As of August 2016, upon the completion of Water Supply Study for the GCP, one water supply well (ST-1A) was added to the monitoring program to chemically characterize the groundwater in alluvium. Following the completion of monitoring wells drilled within the scope of the Hydrogeological Impact Assessment Study, selected 5 monitoring wells were also added to the sampling/monitoring program by December 2016.

Some of the previously drilled monitoring wells have been observed to be affected due to the ongoing construction activities in the Kepezkaya TSF and Çorakoğlu WRD areas. These wells have been found either to be plugged, stay under construction debris or affected from the blasting activities that alter the physical structure of the well leading mud accumulation in the borehole. Monitoring wells which were exposed to such conditions were excluded from the sampling/monitoring program in August and November 2016 to avoid any misleading evaluations.

Hydrogeochemical Assessment for the September 2013 Groundwater Samples

Based on the Piper Diagram for the September 2013 groundwater samples (Figure 3.26), monitoring wells located in the proposed open pit area were identified to be enriched in Ca^{2+} except the groundwater sample collected from OW-2. OW-2 was found to have relatively high concentrations of Mg^{2+} compared to the other major cations. The majority of the groundwater samples collected from the proposed open pit area was observed to display a mixture of HCO_3^- and SO_4^{2-} with respect to major anion concentrations. DH-1, OW-1, OW-2 and OW-5 were found to have relatively high SO_4^{2-} concentrations compared to HCO_3^- and Cl^-. SO_4^{2-} enrichment in DH-1, OW-1 OW-2 and OW-5 suggests a probable indication of the open pit mineralization on groundwater. As can be seen in Piper Diagram, OW-2 is distinguished from the remaining groundwater locations by its SO_4^{2-} concentration.

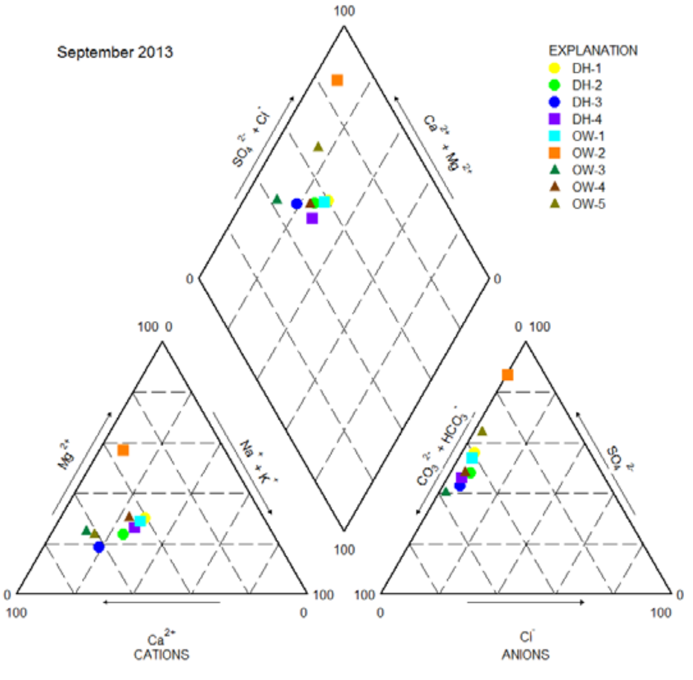


Figure 3.26: Piper Diagram for the September 2013 Groundwater Samples

Relatively high SO_4^{2-} concentration in OW-2 is accompanied by higher conductivity values compared to the remaining monitoring wells in the proposed open pit. Major ion distribution indicates that the open pit monitoring wells in September 2013 are mostly characterized by Ca–HCO_3–SO_4 facies type. Relatively increased SO_4^{2-}

concentrations in DH-1 and OW-5 show that these monitoring wells reflect a facies type of Ca – SO_4. OW-2 on the other hand is characterized by relatively high Mg and SO_4^{2-} concentrations resulting in Mg-SO_4 type of groundwater.

According to the Schoeller Diagram (Figure 3.27), most of the groundwater samples collected from the open pit monitoring wells display enriched Ca^{2+} concentrations. OW-2, however is distinguished from the remaining samples with its relatively high Mg^{2+} concentrations. Relative SO_4^{2-} increase in DH-1, OW-1, OW-2 and OW-5 is also distinctive in the Schoeller Diagram.

According to the Wilcox Diagram (Figure 3.28), all groundwater samples were observed to have low sodium hazard potential (S1). With regard to their conductivity values most of the groundwater samples collected from the proposed open pit area was observed to have moderate risk for salinity hazard (C2). Among the open pit monitoring wells (sampled in September 2013), OW-3 and OW-5 were identified to have high salinity hazard (C3) while OW-2 shows very high salinity hazard (C4).

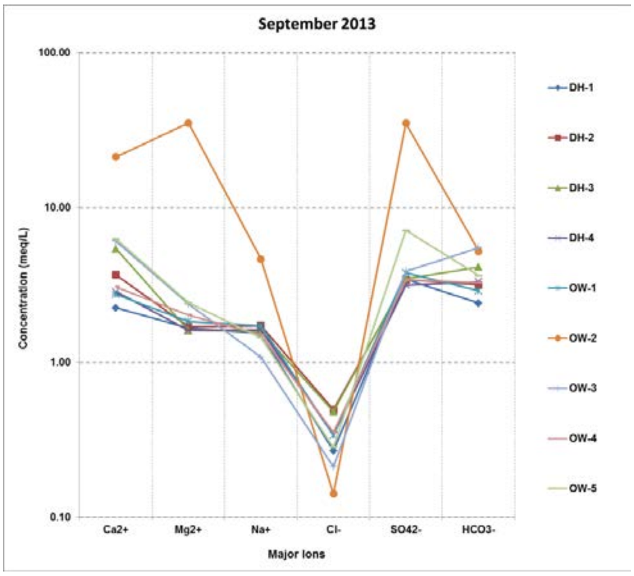


Figure 3.27: Schoeller Diagram for the September 2013 Groundwater Samples

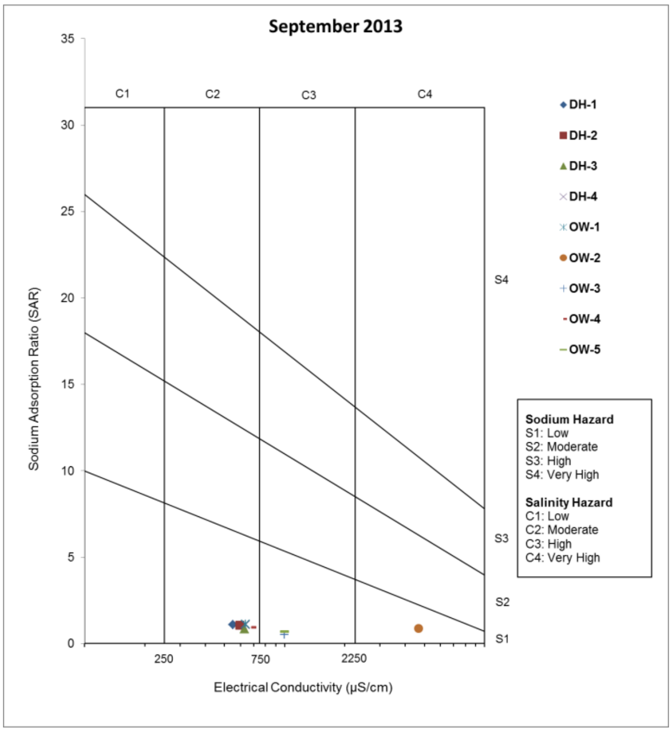


Figure 3.28: Wilcox Diagram for the September 2013 Groundwater Samples

Hydrogeochemical Assessment for the September 2015 Groundwater Samples

Groundwater samples collected from springs, village water depots and caisson wells located outside the proposed Open Pit area show considerable differences with the Open Pit monitoring wells. Based on the Piper Diagram (Figure 3.29), the majority of the September 2015 groundwater samples were identified to be enriched in Ca^{2+} ion among the major cations. Village fountain of Çaylı (C-7) and water depot of Bağdere (D-7) were found to display a mixture of Ca^{2+} and Mg^{2+} due to their relatively high Mg concentrations. Groundwater samples were identified to be enriched in HCO_3^- with respect to their anion concentrations. Water depots and fountains located in the villages of Çaylı and Geymene were observed to have higher concentrations of HCO_3^- compared to the rest of the samples. Groundwater wells located in downstream of the town of Hanönü (except KK-3) and the water depots/fountains located in north of the Gökırmak River (C-5, D-5 and D-6) were found to have relatively low HCO_3^- values compared to the points those are located in the villages of Çaylı and Geymene. This difference however, does not have a major influence on waters to be dominated by SO_4^{2-} and/or Cl^-. Piper diagram indicates that the groundwater samples have Ca-HCO_3 and Ca-Mg-HCO_3 facies types, suggesting that the samples are representative of shallow groundwater that was freshly recharged.

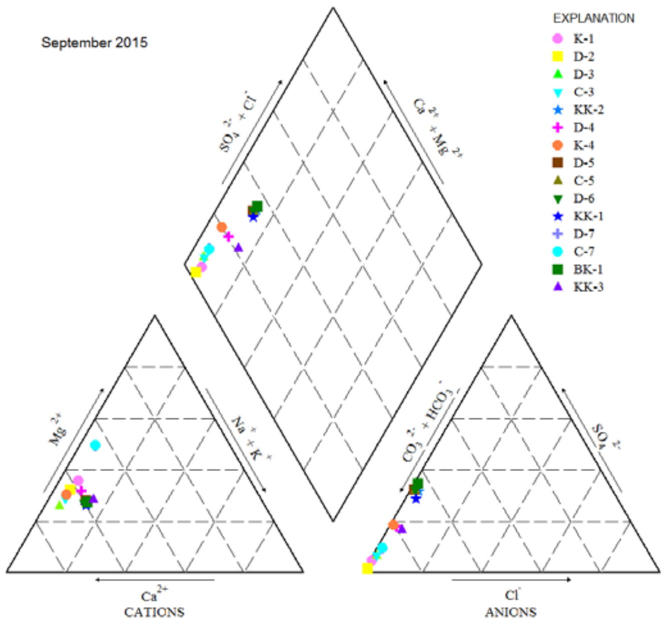


Figure 3.29: Piper Diagram for the September 2015 Groundwater Samples

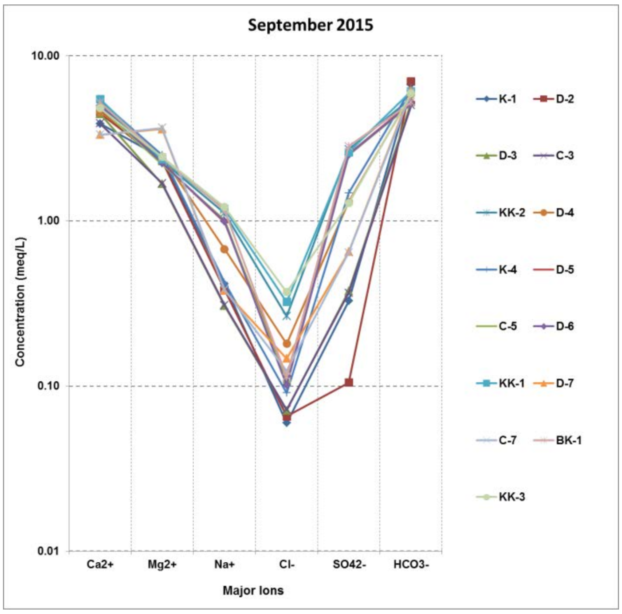


Figure 3.30: Schoeller Diagram for the September 2015 Groundwater Samples

Schoeller diagram also indicates that the September 2015 groundwater samples are dominated by Ca^{2+} and HCO_3^- (Figure 3.30). It is evident from Figure 3.30 that the village fountain of Çaylı (C-7) and the water depot of

Bağdere (D-7) show relatively high Mg concentrations. With respect to the major anions, Na^+ and Cl^- concentrations were found to have relatively low values compared to the rest of the major ions.

According to the Wilcox Diagram (Figure 3.31), all groundwater samples collected in September 2015 were observed to have low sodium hazard potential (S1). All groundwater samples collected in September 2015 were classified to have moderate risk for salinity hazard (C2).

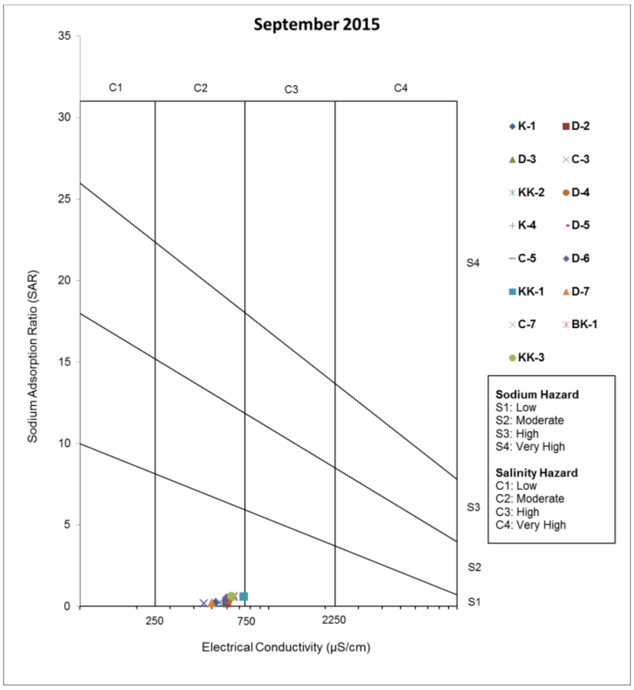


Figure 3.31: Wilcox Diagram for the September 2015 Groundwater Samples

Hydrogeochemical Assessment within the scope of the Hydrogeological Impact Assessment Study

A. Monitoring Wells

Major ion distribution of the samples collected from monitoring wells indicates that the dominant cation and anion types differ among the Project Area groundwater resources. Three monitoring wells (IK-1, IK-2, IK-4) located in the Kepezkaya TSF area were found to be enriched in Na^+ while IK-3 was found to show a mixed type of cations for all sampling periods. Groundwater sample collected from the Çorakoğlu WRD area shows similar characteristics in terms of major cations as it was observed to be enriched in Na^+. Two Open Pit groundwater samples (OW-3 and FTBH) were identified to be enriched in Ca^{2+}; however, FTBH was found to a have considerable amount of Mg^{2+} in addition to its Ca^{2+} content. Major anion distribution for the monitoring wells indicates 3 dominant anion groups as CO_3^{2-}-HCO_3^-, SO_4^{2-} and Cl enrichments. Open Pit monitoring well, FTBH, was identified to have a dominant anion type of CO_3^{2-}-HCO_3^- along with OW-3 and IK-4. The latter (OW-3 and IK-4) were identified to reflect slightly higher SO_4^{2-} concentrations compared to FTBH. Two of the samples (IK-1 and IK-3) collected from the Kepezkaya TSF area, were observed to be enriched in SO_4^{2-} along with WD-1 representing the Çorakoğlu WRD area. IK-2 on the other hand, was found to have a dominant anion type of Cl^-. In addition to the above-mentioned monitoring wells, one of the water supply wells (ST-1A) was also sampled to chemically characterize groundwater in the alluvium. This sample was found to be enriched in Ca^{2+} as the dominant cation and CO_3^{2-}-HCO_3^- as the dominant anion. Hydrogeochemical facies types for the groundwater monitoring wells were identified as:

- IK-1 (Kepezkaya TSF): Na-SO_4
- IK-2 (Kepezkaya TSF): Na-Cl
- IK-3 (Kepezkaya TSF): mixed-SO_4
- IK-4 (Kepezkaya TSF): Na-HCO_3
- ST-1A (Mobilization Area) – Ca-HCO_3
- WD-1 (Çorakoğlu WRD): Na-SO_4
- OW-3 and FTBH (Open Pit): Ca-HCO_3

As the installation and well development of the GK-series wells were completed by late November 2016, 5 of them were included in the sampling program. Therefore, chemical characteristics of groundwater within each project unit were also evaluated from the results of the 5 wells (GK-4, GK-6, GK-10, GK-12 and GK-13) representing each project unit. The results show that the groundwater samples representative for the Kepezkaya TSF downstream (GK-13) and the Çorakoğlu WRD area (GK-6) are enriched in Na^{+} in terms of major cations. Sample collected from the Gelberi WRD area (GK-10) indicates that the groundwater in this area is enriched in Ca^{2+} as the dominant cation. Similarly, groundwater samples representing the Open Pit (GK-12) and the Bağdere TSF area (GK-4) were found to be enriched in Ca^{2+}. However they were also found to show relatively high concentrations of Mg^{2+} compared to GK-10.

Major anion distribution of the GK-series on the other hand, shows anion types varying from CO_3^{2-}-HCO_3^{-} and SO_4^{2-}. Groundwater sample representing the Gelberi WRD (GK-10) was observed to have a dominant anion type of CO_3^{2-}-HCO_3^{-} while the samples representative for Kepezkaya TSF (GK-13) and Çorakoğlu WRD (GK-6) areas were found to be enriched in SO_4^{2-} as the dominant anion. Open Pit (GK-12) and Bağdere TSF (GK-4) groundwater samples were identified to be characterized by CO_3^{2-}-HCO_3^{-} showing slight increases in their Mg^{2+} concentrations. Hydrogeochemical facies types for the GK series groundwater monitoring wells were identified as:

- GK-4 (Bağdere TSF): Ca-HCO_3
- GK-6 (Çorakoğlu WRD): Na-SO_4
- GK-10 (Gelberi WRD): Ca-HCO_3
- GK-12 (Open Pit): Ca-HCO_3
- GK-13 (Kepezkaya TSF): Na-SO_4

Piper and Schoeller diagrams for the monitoring wells are shown through Figure 3.32 and Figure 3.39.

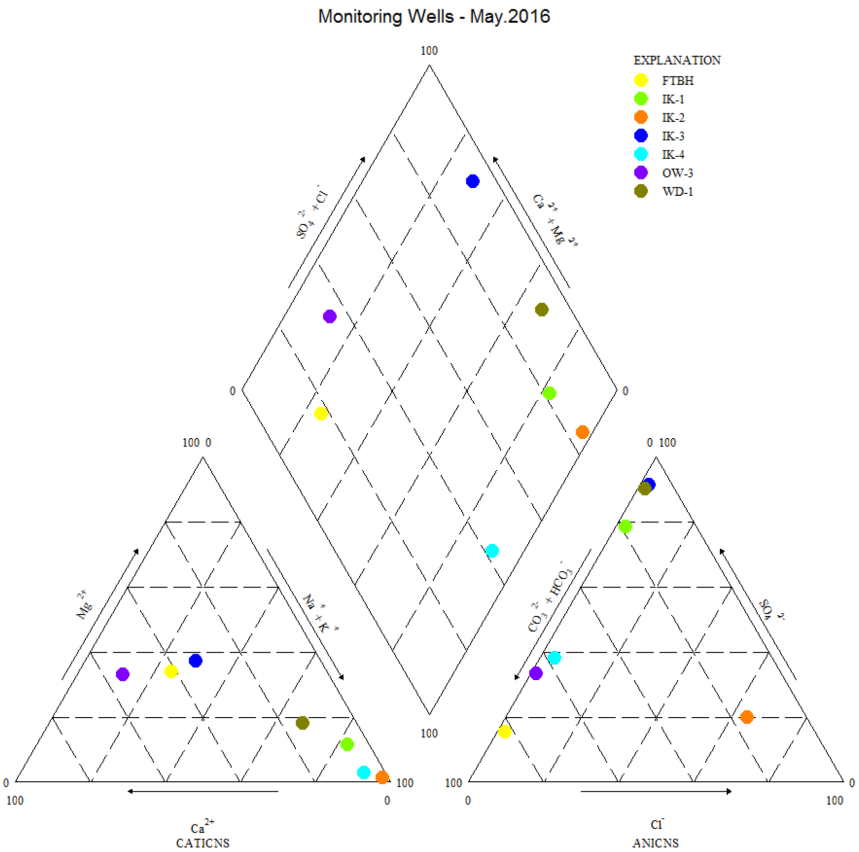


Figure 3.32: Piper Diagram for the May 2016 Monitoring Wells

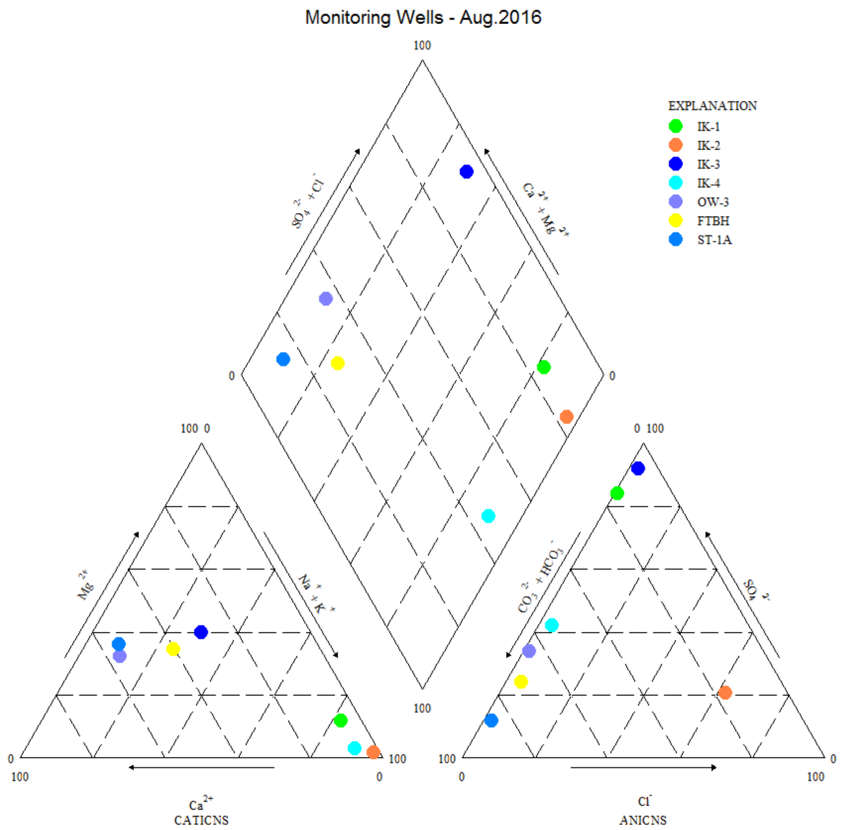


Figure 3.33: Piper Diagram for the August 2016 Monitoring Wells

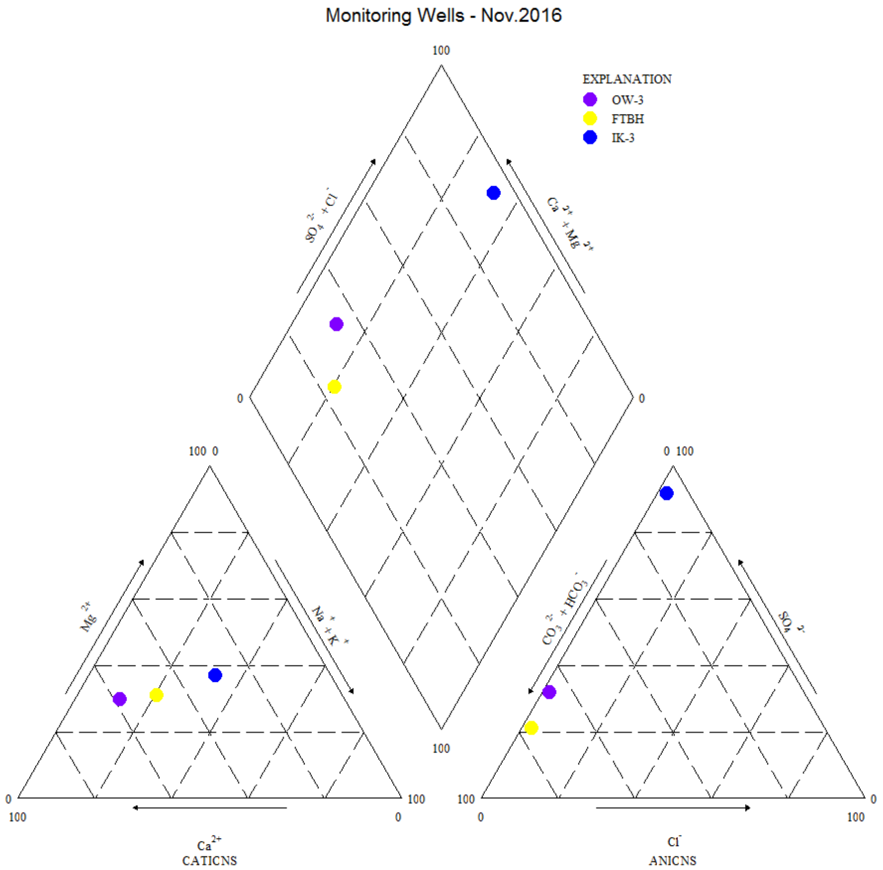


Figure 3.34: Piper Diagram for the November 2016 Monitoring Wells

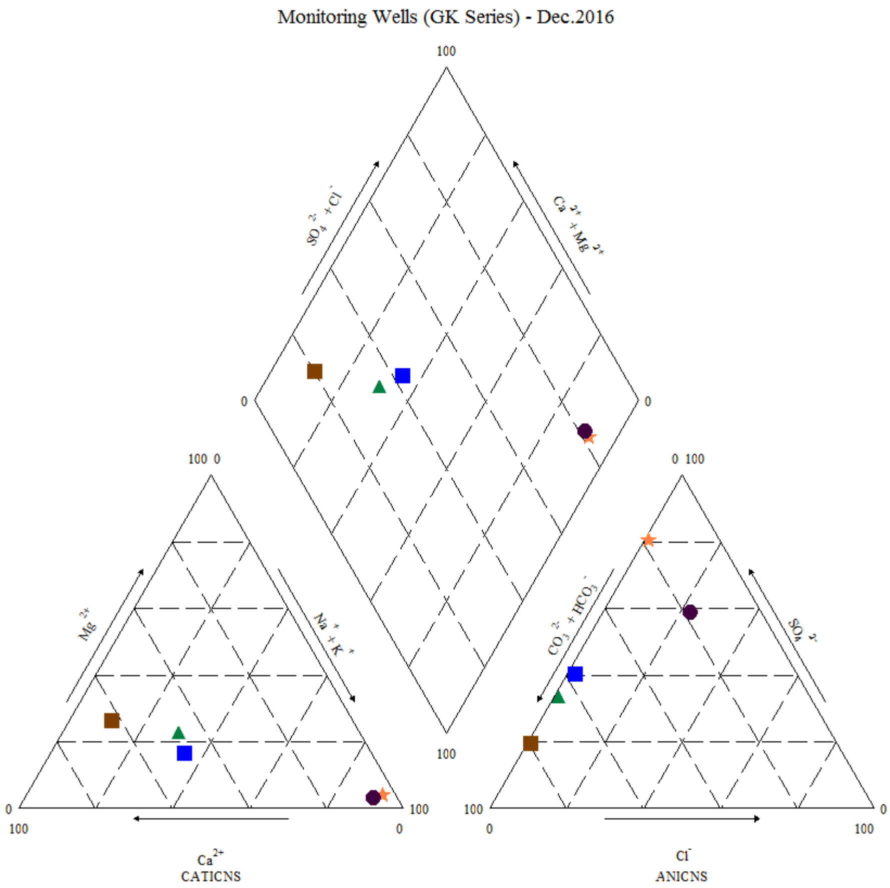


Figure 3.35: Piper Diagram for the GK-Series Wells (December 2016)

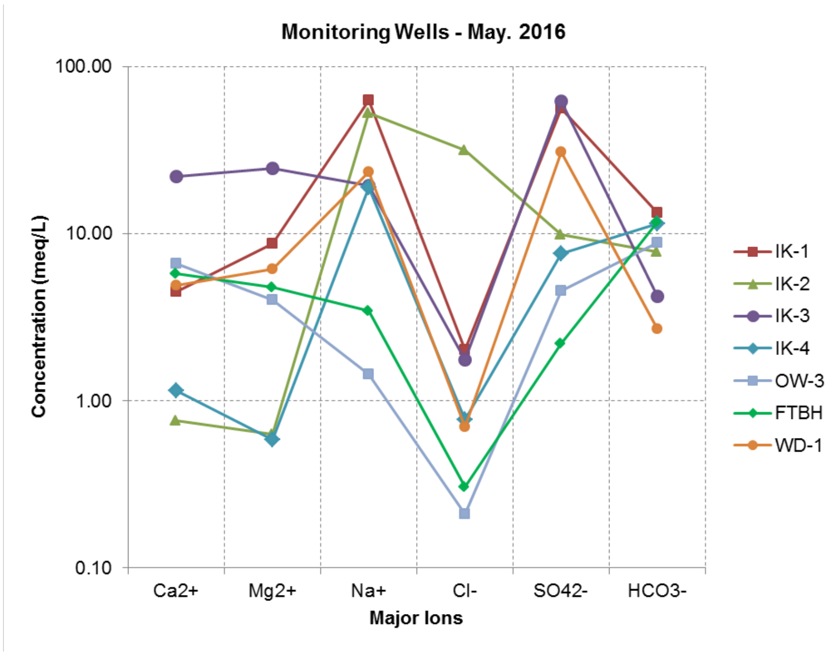


Figure 3.36: Schoeller Diagram for the May 2016 Monitoring Wells

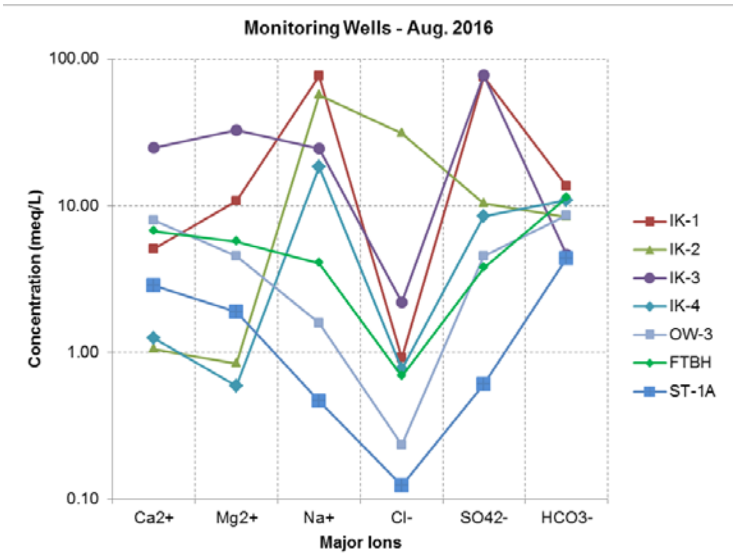


Figure 3.37: Schoeller Diagram for the August 2016 Monitoring Wells

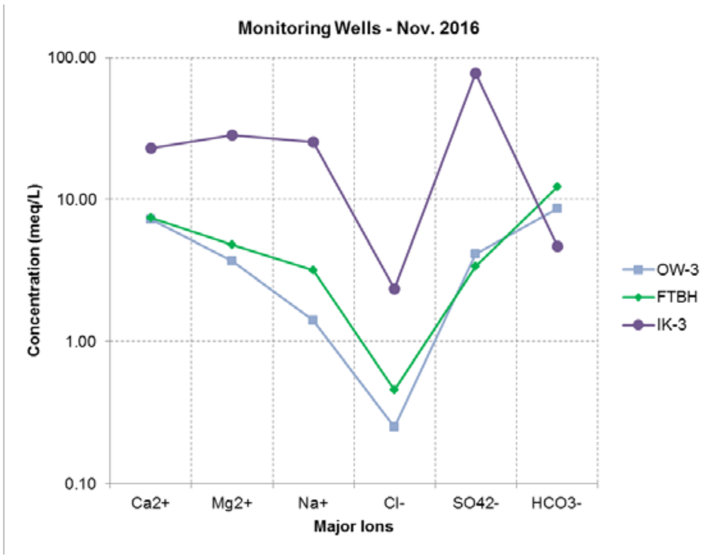


Figure 3.38: Schoeller Diagram for the November 2016 Monitoring Wells

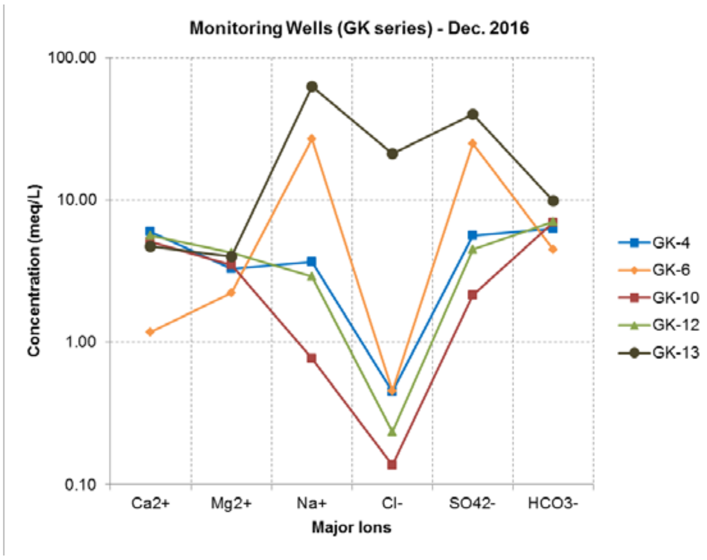


Figure 3.39: Schoeller Diagram for the GK-Series Wells (December 2016)

According to the Wilcox Diagram, three of the groundwater samples collected from the Kepezkaya TSF monitoring wells (IK-1, IK-2 and IK-4), were found to have relatively high sodium adsorption ratios (SAR) compared to the remaining groundwater samples. IK-1 and IK-2 are classified within very high salinity hazard and very high sodium hazard (C4/S4) while IK-4 is classified within high salinity hazard and very high sodium hazard (C3/S4). The other sample from the Kepezkaya TSF area (IK-3) and the sample collected from the Çorakoğlu WRD area (WD-1) were found to have very high salinity hazard. Among these two monitoring wells, WD-1 shows high sodium hazard (C4/S3) while IK-3 shows medium salinity hazard (C4/S2). Groundwater samples collected from the Open Pit area (OW-3 and FTBH) were found to have high salinity hazard with low sodium hazard (C3/S1). As for the GK-series, monitoring wells located in the Open Pit area (GK-12), Bağdere TSF area (GK-4) and Gelberi WRD area (GK-10) were identified to show high salinity hazard with low sodium hazard (C3/S1). Wilcox diagrams for the monitoring wells are provided in Figure 3.40.

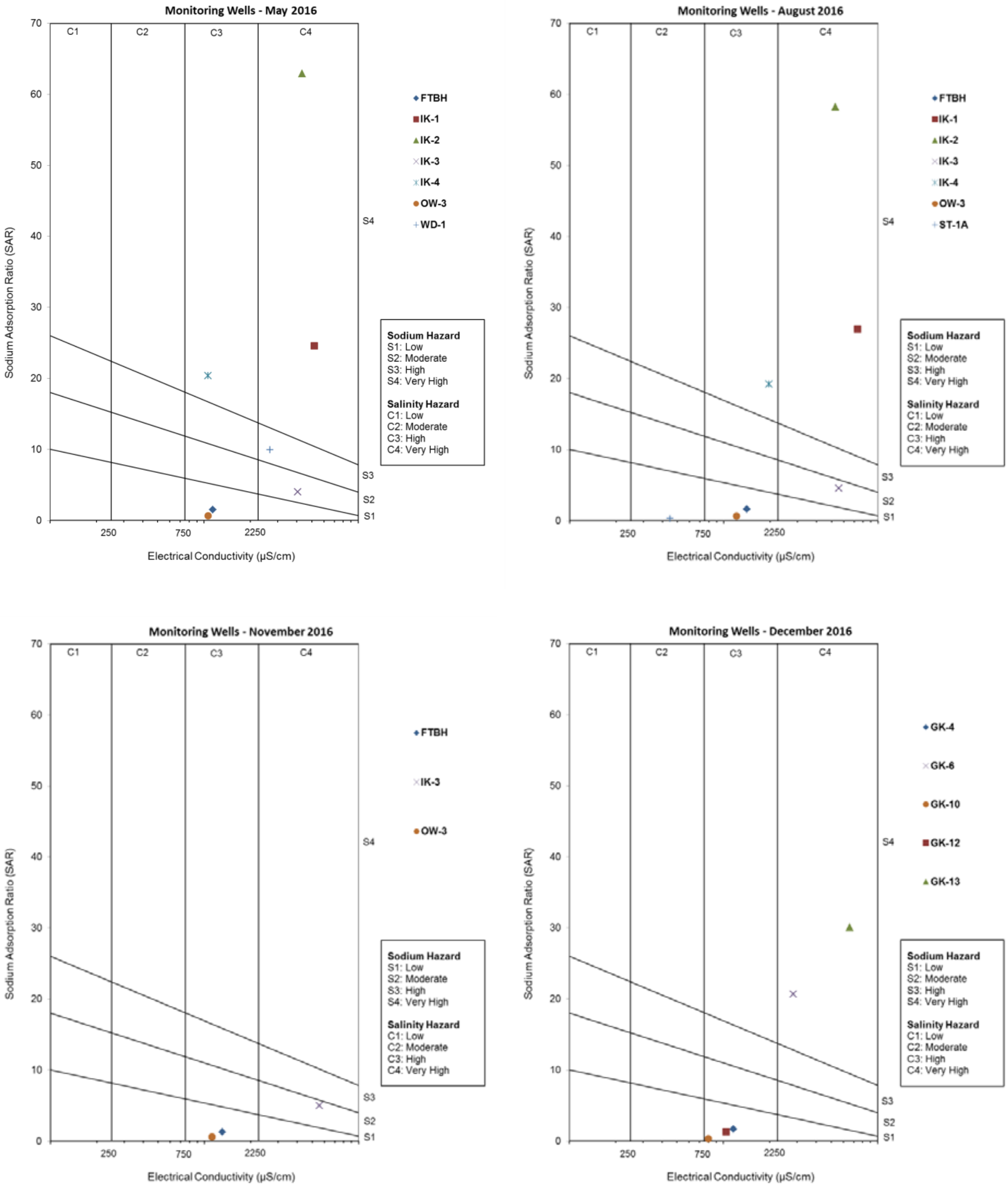


Figure 3.40: Wilcox Diagrams for the Groundwater Monitoring Wells

B. Village water depots, fountains and springs

Based on the major ion distribution of the samples collected from the village water depots, fountains and springs, the majority of the samples were found to be enriched in Ca^{2+} and HCO_3^- for all sampling periods. Two village water depots located at downstream of the Çorakoğlu WRD (Yozlu: D-9 and Küpeli: D-8) were identified to have relatively high concentrations of Na^+ compared to the rest of the water depots, fountains and springs. Hanönü water depot (D-6) was observed to have relatively high $SO4^{2-}$ and Cl^- concentrations for the August 2016 sampling period. Piper and Schoeller diagrams for the village water depots, fountains and springs are provided through Figure 3.41 and Figure 3.46.

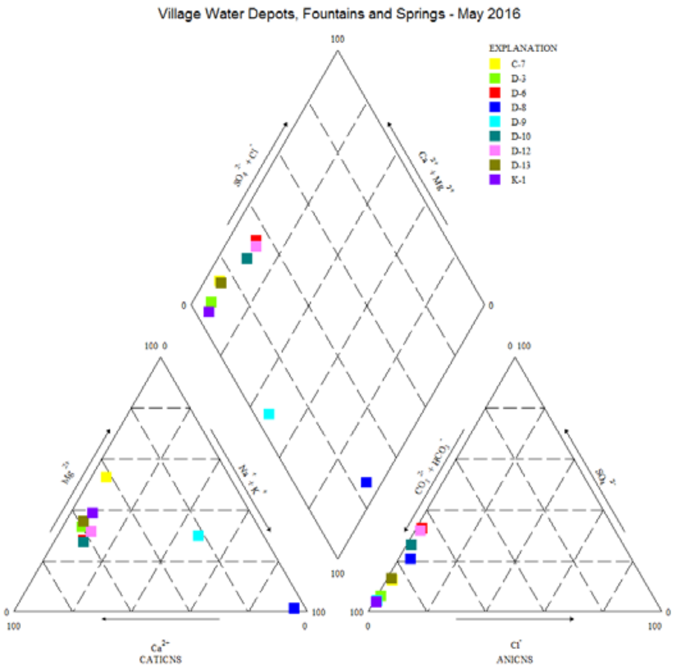


Figure 3.41: Piper Diagram for the May 2016 water depot, fountain and spring samples

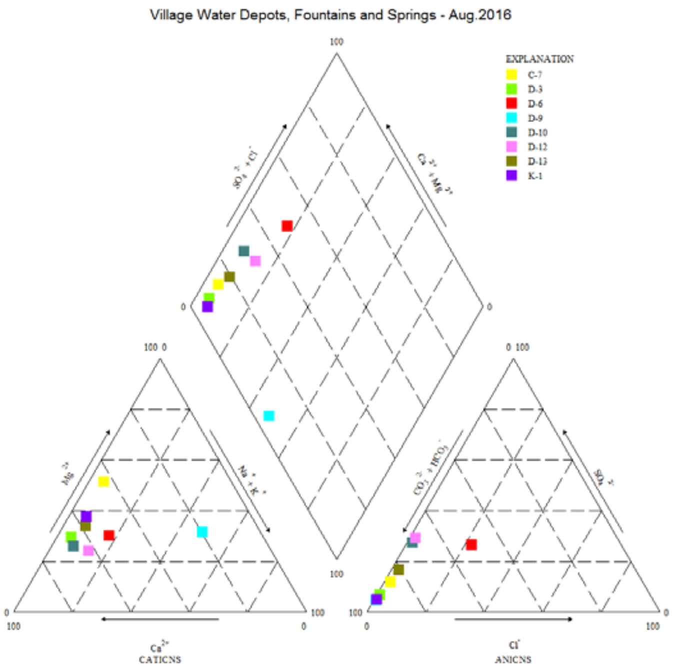


Figure 3.42: Piper Diagram for the August 2016 water depot, fountain and spring samples

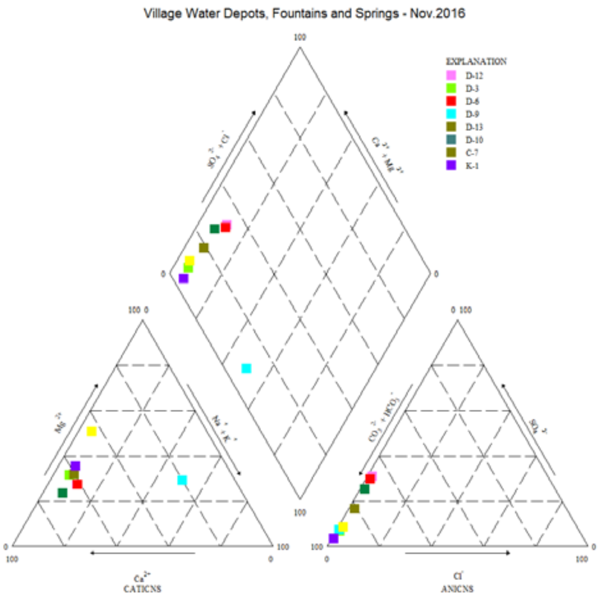


Figure 3.43: Piper Diagram for the November 2016 water depot, fountain and spring samples

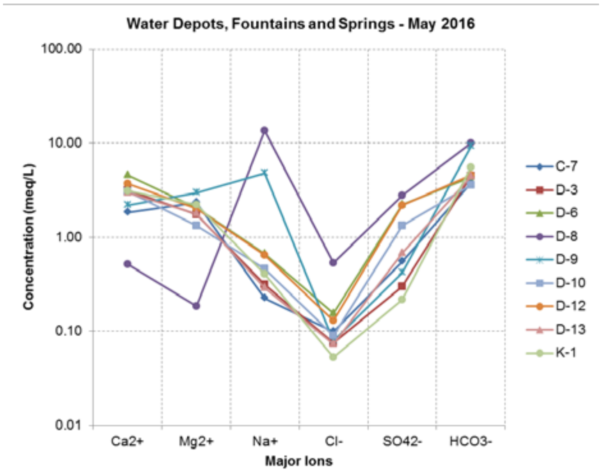


Figure 3.44: Schoeller Diagram for the May 2016 water depot, fountain and spring samples

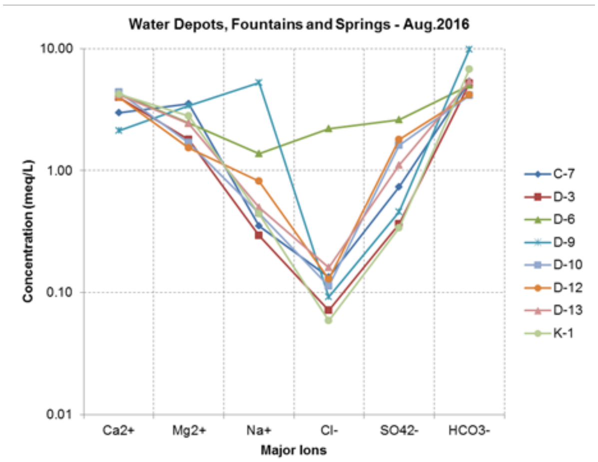


Figure 3.45: Schoeller Diagram for the August 2016 water depot, fountain and spring samples

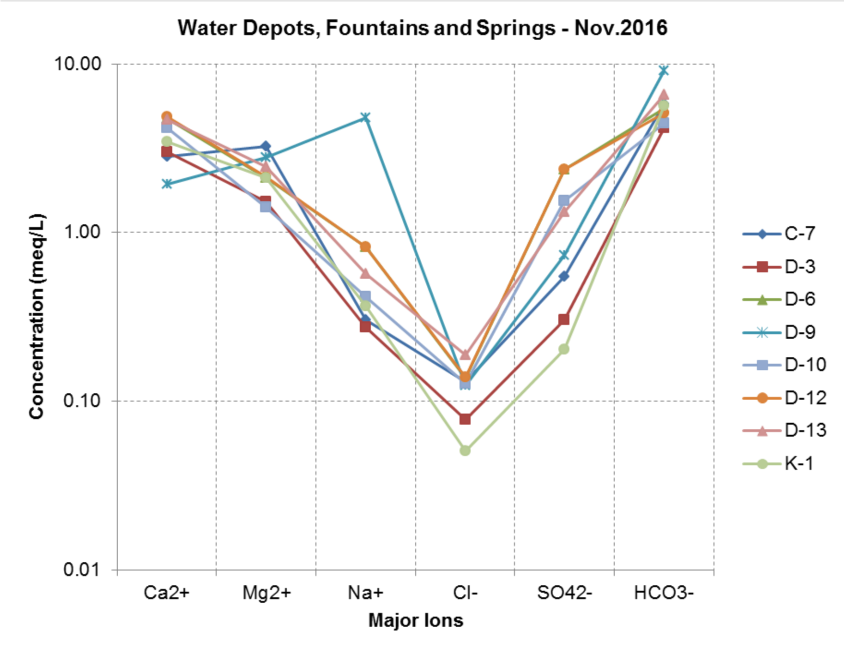
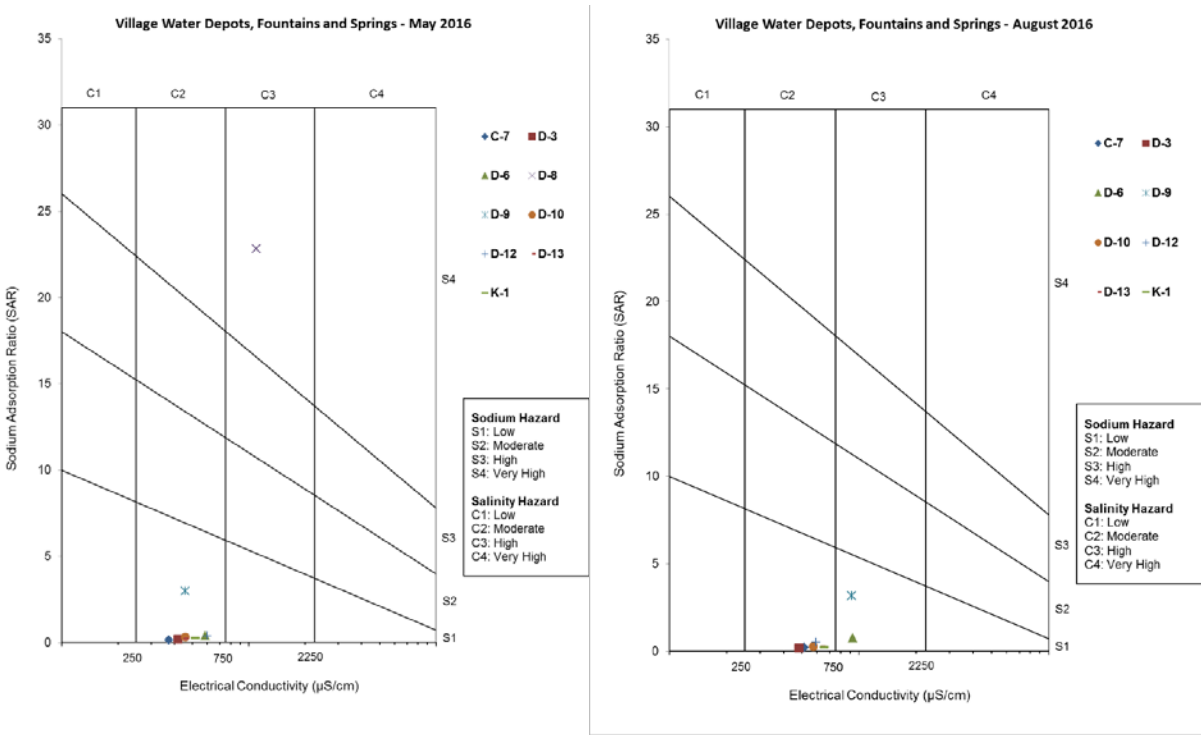


Figure 3.46: Schoeller Diagram for the November 2016 water depot, fountain and spring samples

According to the Wilcox Diagram, the majority of the village water depots, fountains and springs were found to have moderate salinity hazard - low sodium hazard (C2/S1). Küpeli Village water depot (D-8) were found to have high salinity hazard – very high sodium hazard (C3/S4) for the May 2016 sampling period. Water depots for the Hanönü and Yozlu villages (D-6 and D-9) were observed to show variances as they reflect moderate or high salinity hazards (C2 or C3) for different sampling periods (August and November 2016). Both of these samples were identified to show low sodium hazard (S1). Wilcox diagrams for the monitoring wells are provided in Figure 3.47.



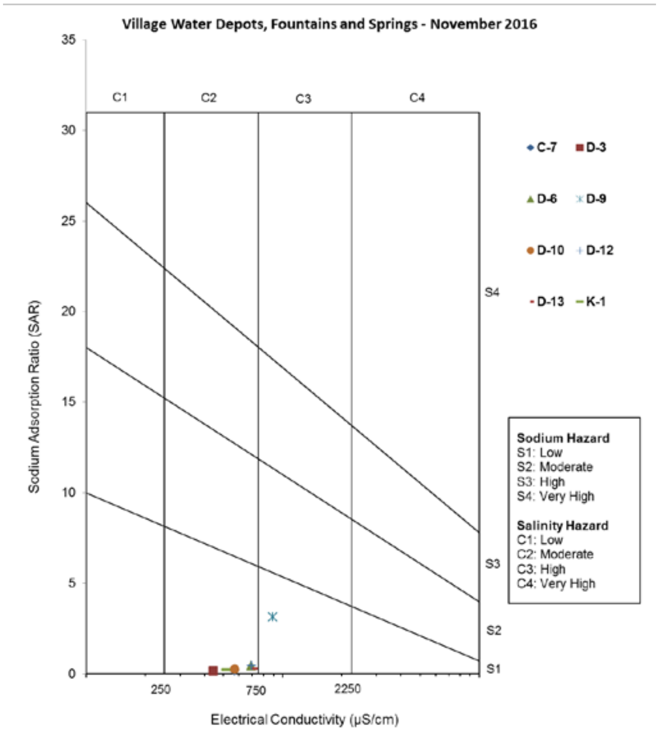


Figure 3.47: Wilcox Diagrams for the Village Water Depots, Fountains and Springs

Groundwater Quality Classifications

May / August 2012 Groundwater Quality Classifications

Analysis results for the groundwater samples have been compared with the Water Pollution Control Regulation (WPCR) which was published on Official Gazette (# 25687) dated 31st December, 2004. The comparison is based upon the Quality Criteria of the Inland Water Resources which is provided in Table 1 of the WPCR. Groundwater samples were also compared with the drinking water standards of those specified by the Ministry of Health and Turkish Standards Institution.

Laboratory detection limits for some parameters were found to be greater than the limit values specified in WPCR and drinking water standards. Concentrations for those parameters were assumed as the same values with the laboratory detection limits and are shown in bold in results below. Comparison table with respect to WPCR and drinking water standards are provided in Appendix E while summarized below.

- May and August 2012 analysis results show that the collected groundwater samples from the monitoring wells (KS-1, KS-2, KS-3, DG-1) are classified as Class III with respect to the WPCR. SO_4, Na, TKN, **Pb** and Zn concentrations were observed to be within Class III levels for KS-2 and DG-1. Parameters measured in DG-1 were observed to have elevated concentrations within Class III limits which suggest the effect of mineralization in the Open Pit area. Accordingly, pH value in DG-1 was measured below 6.5 which indicate slightly acidic conditions while TDS, Fe, Mn show relatively high values. KS-1 was observed to show Class III level SO_4 as a seasonal increase in May 2012 while KS-3 was found to show Class III levels of TKN in May 2012 and Class III levels of TOC and **Pb** in August 2012.
- Dissolved oxygen and oxygen saturation values for the May and August 2012 groundwater samples were found to be within Class II limits with the exceptions of KS-2 and DG-1 August 2012 samples, which indicate concentrations within Class III limits. Remaining parameters for the groundwater samples for May and August 2012 were found to have concentrations within Class I and Class II limits.
- Comparison with the drinking water criteria show that groundwater samples collected from monitoring wells are classified as Class II-Type II with respect to TS-266 drinking water standards, due to relatively elevated concentrations of **Pb**, Al, NH_4 and SO_4. Ni and Mn were found to be within Class II-Type II levels as seasonal increases in the monitoring wells.

September 2013 and July 2015 Groundwater Quality Classifications

A water quality comparison was also made for the analysis results available for the September 2013 and July 2015 sampling periods. Since the number of the analyzed parameters is less than those of May/August 2012 and September 2015, the comparisons for September 2013 and July 2015 are shown in separate tables (Appendix E).

- 6 of the 9 groundwater samples (DH-2, DH-3, OW-1, OW-2, OW-3 and OW-5) collected from the Open Pit monitoring wells in September 2013 are classified as Class III with respect to WPCR. The remaining 3 wells are classified as Class I. OW-2 was observed to be distinct from the other monitoring wells as it has relatively elevated concentrations of SO_4. Zn, Fe and Mn concentrations in this well were found to be within Class III limits while Cd was identified to be within Class II limit. SO_4 concentrations were also identified to be within Class III limit for OW-5
- Zn concentrations were observed to be within Class III limit in September 2013 groundwater samples collected from DH-3, OW-1, OW-2 and OW-3. Mn concentrations were found to be within Class III limits in OW-2 and OW-3 and within Class II limits in DH-3. Pb and Cd concentrations were found to be within Class III limits respectively for DH-2 and DH-3
- All three samples collected in July 2015 (OW-1, OW-3 and OW-5) are classified as Class III due to their dissolved oxygen values with respect to WPCR while SO_4 and Zn concentrations in OW-1 and OW-3 were observed to be within Class III limits. Cu and Mn concentrations in OW-3 and OW-5; Fe concentrations in OW-1 and OW-5 were found to be within Class II limits. Fe concentration for the OW-3 July 2015 sample was found to be within Class III.

September 2015 Groundwater Quality Classifications

i. Comparison with Water Pollution and Control Regulation

According to the comparison with WPCR, most of the September 2015 groundwater samples were identified to be classified as Class I while some of them are classified as Class II and Class III. Groundwater quality classes with respect to WPCR are provided in Appendix E and summarized below:

- The comparison shows that the majority of the fountains and water depots were found to be classified as Class I. Sepetçioğlu Village spring (K-1) and fountain of the Vakıf Village (C-5) were identified to be classified as Class II due to elevated concentrations of Pb. Water depot of the village of Bağdere (D-7) was found to be classified as Class II due to NO2 concentrations.
- Groundwater wells (KK-1 and KK-3) located in the downstream of Hanönü, are classified as Class III due to their Fe and Al concentrations. Dissolved oxygen and oxygen saturation values for these two wells were found to be within Class II levels. Total dissolved solids (TDS) and Mn concentrations were observed to be within Class II levels particularly for KK-1. Total Phosphorus concentration for KK-3 was detected to be within Class II levels.

ii. Comparison with drinking water standards

September 2015 sampling/monitoring study also includes samples collected from village water depots and fountains that were compared with the relevant drinking water criteria. According to the comparison with TS-266 Drinking Water Standards, groundwater samples were mostly classified within Class II Type II limits. Water depots for the villages of Imam and Geymene (D-2 and D-3) were found to be classified within Class I and Class II Type I limits.

Comparison results are provided in (Appendix E) while parameter-based details are summarized below:

- Pb concentrations for Sepetçi Village spring (K-1) and Vakıf Village fountain (C-5), were found to be within Class II Type II limits. SO_4 concentrations were found to be within Class II Type II limits for most of the samples. Sepetçi Village spring (K-1), water depots for the villages of Imam and Geymene (D-2 and C-3) and Geymene village fountain (C-3) were identified to have SO_4 concentrations within Class I and Class II Type I limits.
- Fe and Mn concentrations were observed to be within Class II Type II limits for Sepetçi Village spring (K-1), Geymene village fountain (C-3) and Vakıf Village fountain (C-5). Groundwater wells, KK-1 and KK-3 were also found to have Fe, Mn and Al concentrations within Class II Type II limits.

- KK-2 groundwater well was identified to have electrical conductivity, Fe and SO_4 concentrations within Class II Type II limits. Electrical conductivity values were observed to exceed Class I and Class II Type I limits for more than half of the groundwater samples.
- None of the samples were found to exceed the drinking water limits specified in the RWIHC.

Groundwater Quality Classifications within the scope of Hydrogeological Impact Assessment Study

A total of four water quality sampling surveys (May 2016, August 2016, November 2016 and December 2016) have so far been carried out within the scope of the Hydrogeological Impact Assessment Study. Analysis results for the all groundwater samples (incl. monitoring wells, village water depots, fountains and springs) were compared with the Water Pollution Control Regulation (WPCR) which was published on Official Gazette (# 25687) dated 31st December, 2004. The comparison is based upon the Quality Criteria of the Inland Water Resources which is provided in Table 1 of the WPCR.

Samples collected from village water depots, fountains and springs were also compared with the drinking water standards/guidelines specified by the Turkish Ministry of Health, Turkish Standards Institution, European Union (EU) Council Directive on Drinking Waters and World Health Organization (WHO).

Laboratory detection limits for some parameters were found to be greater than the limit values specified in WPCR and drinking water standards. Concentrations for those parameters were assumed as the same values with the laboratory detection limits and are shown in bold in results below. Comparison table with respect to WPCR and drinking water standards are provided in Appendix E while summarized below.

i. Comparison with Water Pollution and Control Regulation

- Majority of the groundwater samples were determined to be Class II while the remaining were seasonally found to be Class III, showing changes in different periods of sampling with respect to the WPCR.
- Majority of the samples collected from village water depots, fountains and springs were found to be classified as Class II and Class III according to their dissolved oxygen (DO) concentrations. DO values were seasonally observed to vary within Class II and Class III limits. Sample collected from Küpeli Village water depot (D-8) in May 2016 is classified as Class III due to its elevated concentrations of Na, Fe and Al. NO_2-N and P concentrations for August and November 2016 samples collected from Yozlu Village water depot (D-9) were found to be within Class II limits while TKN concentrations were observed to be within Class II limits for May and August 2016 samples of C-7 (Çaylı Village), May 2016 samples of D-3 (Geymene Village) and D-8 (Küpeli Village). Samples collected from the Sepetçioğlu Village water spring (K-1) is classified as Class II due to its DO concentrations for May and August 2016 sampling periods. **Se** concentrations were found to be within Class II limits for the village water depots, fountains and springs.
- Groundwater samples collected from the Kepezkaya TSF area (IK-1, IK-2, IK-3, IK-4 and GK-13) were found to be classified as Class III due to -but on a seasonal scale not limited to – DO, SO_4, Na, Zn, B and Al concentrations. Some of the parameters for the Kepezkaya TSF area (inc. NH4-N, TKN, Fe and Mn) were found to be within Class II and Class III limits indicating seasonal variations in groundwater quality. **Se** concentrations in Kepezkaya TSF wells were seasonally found to be within Class II and Class III limits.
- Groundwater samples collected from the Open Pit area (FTBH, OW-3 and GK-12) are classified as Class III due to their DO and Zn concentrations. Fe and Cu concentrations were seasonally observed to have concentrations within Class III limits for FTBH and OW-3, however, they were found to be within Class I limits in GK-12. Seasonal existence of Co within Class II limits were observed in the Open Pit area in FTBH and GK-12 while TKN concentrations were seasonally observed to have Class II limits in FTBH, OW-3 and GK-12. **Se** concentrations were found to be within Class II limits for the groundwater samples collected from the Open Pit area.
- Groundwater samples collected from the Çorakoğlu WRD area (WD-1 and GK-6) are classified as Class III due to relatively high SO_4 and Na concentrations. NO_2-N, TKN and Mn concentrations for WD-1 were found to be within Class II limits while Pb and Al concentrations are within Class III limits. On the other hand, GK-6 was found to have Class III limits of DO

values. **Se** concentrations were found to be within Class III limits for the groundwater samples collected from the Çorakoğlu WRD area.

- Groundwater samples collected from Bağdere TSF (GK-4) and Gelberi WRD (GK-10) were found to be classified as Class III due to relatively high concentrations of SO_4 in GK-4 and DO in GK-10. DO and NO_3- N concentrations were found to be within Class II limits for GK-4. **Se** concentrations were found to be within Class II limits for GK-4 while GK-13 were observed to have Class III levels of **Se**.

ii. Comparison with drinking water standards

- The majority of the village water depots, fountains and springs (except D-3: Geymene Village and K-1: Sepetçioğlu Village spring) were found to be classified as Class II-Type II with respect to TS-266 drinking water standards, mainly due to SO_4 concentrations.
- Al, Fe, SO_4, Na and EC values in D-8 (Küpeli Village water depot) were identified to be within Class II-Type II limits, unlike the majority of the drinking water resources. EC values in D-9, Cl concentrations in D-6 and Fe concentrations in D-12 were seasonally found to be within Class II-Type II levels with respect to TS-266 drinking water standards. All samples collected from village water depots, fountains and springs except D-8 were found to be in compliance with Turkish Ministry of Health drinking water criteria (RWIFHC). Al, Fe and Na concentrations in D-8 were observed to exceed the limit values specified in RWIFHC.
- All samples collected from village water depots, fountains and springs except D-8 were found to be in compliance with the drinking water criteria specified within the EU Council Directive (98/83/EC, 1998). D-8 was found to have exceeding concentrations of Na with respect to EU drinking water criteria.
- All samples collected from village water depots, fountains and springs were found to be in compliance with the drinking water guidelines specified by World Health Organization (WHO, 2011).

3.2.5.3 Surface Waters

Surface Water Sampling and Monitoring Locations

May / August 2012 field survey

Surface water quality monitoring was first started in 2012 to identify initial baseline conditions for the project area surface water resources. In order to represent wet and dry periods of the year, consecutive field surveys were conducted in May and August 2012. Three surface water stations were visited in each field survey for sampling and in-situ field parameter measurements. It is understood from the previous reports (ENVY, 2014 and ENVY, 2015) that surface water stations visited in 2012 were selected to be along the Gökırmak River which is the primary surface water body in the Project Area. Surface water stations were selected to cover both upstream and downstream sections of the Project Area. Coordinates and descriptions for May / August 2012 surface water monitoring points are provided in Table 3.8 while their locations on the map are shown in Figure 3.48.

September 2015 field survey

A water quality sampling and monitoring program was initialized in September 2015 by AECOM, primarily to identify the quality of drinking waters. AECOM has also collected samples from the surface waters and groundwater from the selected locations in the project area to understand the baseline conditions in more detail and more in line with the current mine layout. In addition to sampling, field parameters including pH, electrical conductivity (EC), temperature (T) and redox potential (ORP) were monitored for each selected water point. Three of the sampling locations were found to be dry at the time of the September 2015 field survey. Coordinates and descriptions for September 2015 surface water monitoring points are provided in Table 3.8 while their locations on the map are shown in Figure 3.48.

Field surveys within the scope of the Hydrogeological Impact Assessment Study

As of May 2016, an extended water quality sampling and monitoring program has been commenced by AECOM to improve the understanding on the quality of the surface waters located in the Project Area. A total of 11 surface water locations have been visited including the Gökırmak River upstream and downstream sections and its sidelong branches. Quarterly sampling has been performed among these locations simultaneously with monthly field parameter measurements. Field parameters including pH, electrical conductivity (EC), temperature (T) and dissolved oxygen (DO) were monitored for each surface water point. A significant number of the surface waters were found to be dry during the summer and autumn seasons. Gökırmak River were observed to have continuous flow throughout the year with decreasing and increasing flow rates during the summer and spring seasons, respectively.

Coordinates, descriptions and sampling periods for the surface water sampling and monitoring points are provided in Table 3.8. The surface water sampling and monitoring locations visited until 2016 are shown in Figure 3.48 while the locations visited within the scope of the Hydrogeological Impact Assessment Study are given in Figure 3.49.

Table 3.8: Coordinates and Descriptions for Surface Water Samples

Station ID	Coordinates (WGS84 UTM Zone 36N)		Description	Sampling Period(s)[1]	Monitoring Period(s)[2]	Corresponding Project Unit(s)
	X	Y				
SW-1	617084	4608138	Gökırmak River, upstream of the Open Pit.	Sep. 15	Sep. 15	Open Pit
SW-2	616650	4609497	Downstream and west of the Çorakoğlu WRD.	Sep.15 / May-Aug.-Nov.16	Monthly (from May 16 to present)	Çorakoğlu WRD
SW-3	622430	4609058	Gökırmak River, south of Hanönü settlement area.	Sep. 15	Sep. 15	Bağdere TSF
SW-4	622580	4609513	Downstream and west of the Kepezkaya TSF.	Sep.15 / May-Aug.-Nov.16	Monthly (from May 16 to present)	Kepezkaya TSF
SW-5	623584	4608525	Gökırmak River, downstream of the Project Area and the Bağdere TSF.	Sep.15 / May-Aug.-Nov.16	Monthly (from May 16 to present)	Bağdere TSF
SW-6	621928	4607121	Bağdere Stream, downstream of the Process Plant.	Sep. 15	Sep. 15	Process Plant
SW-7	616230	4604875	Upstream of the Gelberi WRD.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Gelberi WRD
SW-8	615788	4606921	Downstream of the Gelberi WRD.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Gelberi WRD
SW-9	617212	4608378	Downstream and southwest of the Çorakoğlu WRD.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Çorakoğlu WRD
SW-11	623604	4608918	Downstream of the Bağdere TSF.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Bağdere TSF
SW-12	617672	4610643	Upstream and north of the Çorakoğlu WRD.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Çorakoğlu WRD
SW-15	616333	4605951	Upstream of the Gelberi WRD.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Gelberi WRD
SW-17	622269	4608154	Downstream of the Process Plant area.	May-Aug.-Nov.16	Monthly (from May 16 to present)	Process Plant
YS-1	605097	4602674	Gökırmak River upstream, southwest of the Project Area.	May / Aug 2012	May / Aug 2012	Project Area Upstream
YS-2	615019	4606283	Gökırmak River, downstream of the Gelberi WRD.	May / Aug 2012 / May-Aug.-Nov.16	Monthly (from May 16 to present)	Project Area Upstream
YS-3	615075	4607146	Gökırmak River downstream, east of the Project Area.	May / Aug 2012	May / Aug 2012	Project Area Downstream

Notes:
[1]: indicates water quality sampling periods.
[2]: indicates field parameters measurement periods.

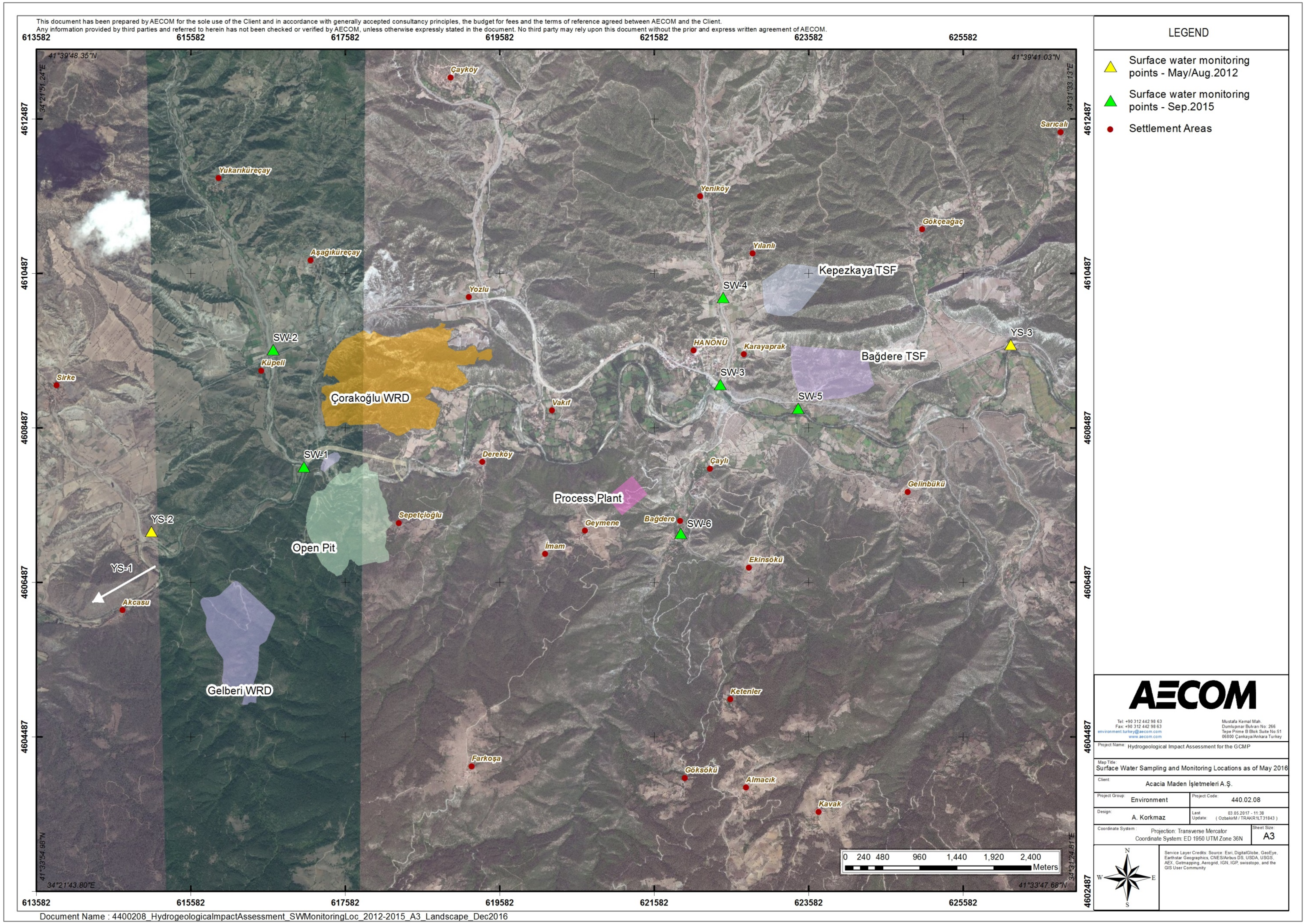


Figure 3.48: Surface Water Sampling and Monitoring Locations (2012 – 2015)

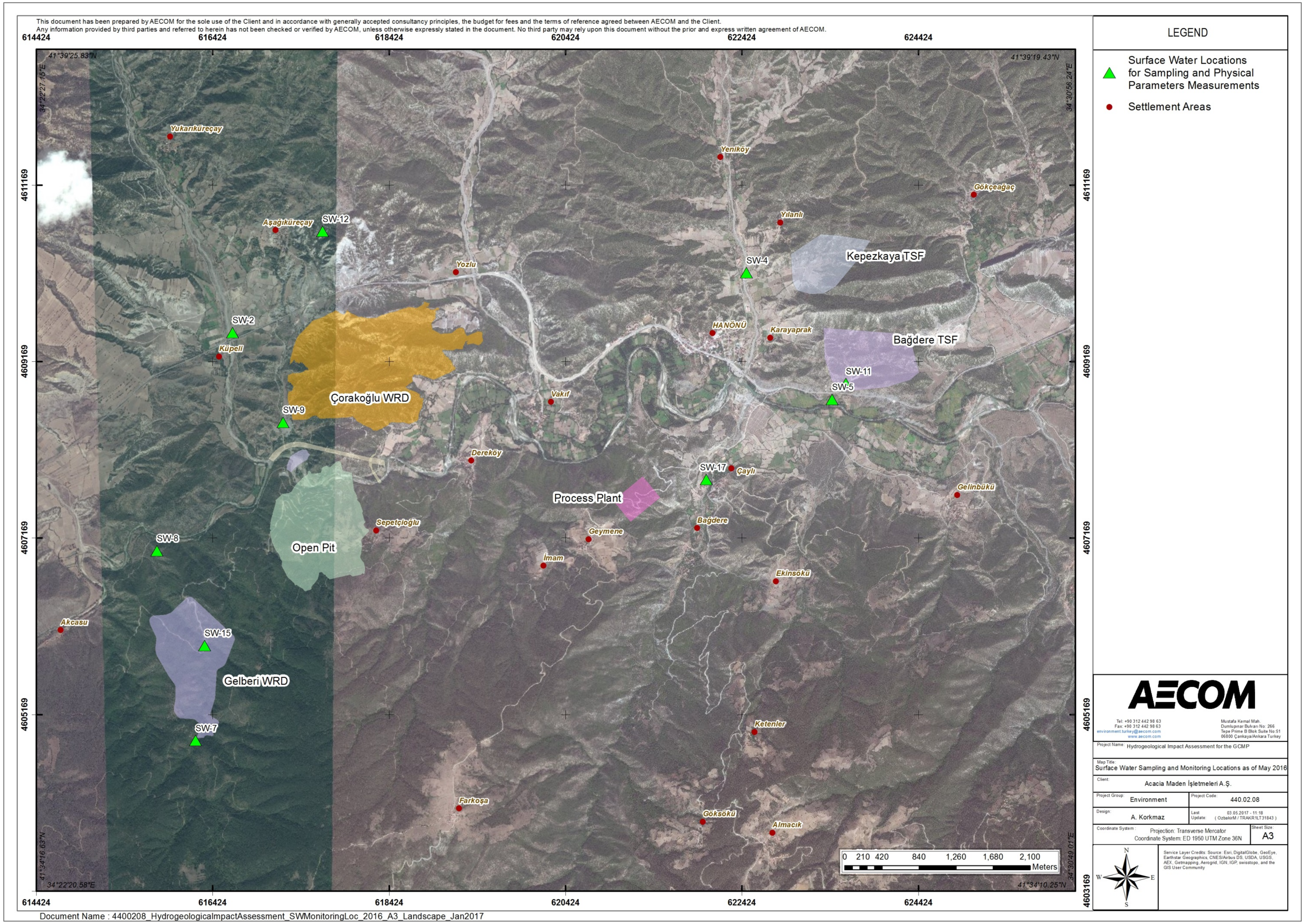


Figure 3.49: Surface Water Sampling and Monitoring Locations (May 2016 to present)

Surface Water Field Parameters

Field parameter measurements for the surface water sampling and monitoring locations are provided in Appendix D while the summary of the results are provided below.

May / August 2012 field parameter measurements

Based on the field measurements conducted in May and August 2012, surface water locations were found to reflect atmospheric temperatures. Monitored surface waters display near-neutral to slightly alkaline pH conditions having values around 7.5. Electrical conductivity values along the Gökırmak River were observed to vary between 530 and 700 µS/cm.

September 2015 field parameter measurements

September 2015 field survey shows that the visited surface waters were found to reflect atmospheric temperatures for the monitoring periods. Monitored surface waters display slightly alkaline pH conditions having values between 7.67 and 8.02. Electrical conductivity values among the monitored surface waters were observed to vary between 630 and 680 µS/cm.

Surface Waters field parameter measurements within the scope of Hydrogeological Impact Assessment Study (May 2016 – present)

Field parameter measurements which have been conducted since May 2016 show that surface water temperatures typically reflect atmospheric temperatures for all seasons. In terms of pH parameter, June 2016 monitoring period show with a mean of 8.73, although the rest of the months give an average of 8.06 having slightly alkaline character. Electrical conductivity values were observed to have a mean value of 569 µS/cm, yet SW-12 that is located in the east of Aşağıküreçay Village gives an average value of 1233 µS/cm for its ephemeral period of May/July 2016. YS-2 shows a decrease in electrical conductivity value from 700 µS/cm to 246 µS/cm for the months of August and September 2016, respectively. Increasing trend for the dissolved oxygen was observed through the period of May/October and relatively higher values (14-15 mg/L) were measured in project upstream and project downstream areas of the Gökırmak River. Mean of dissolved oxygen measurements for all other surface water points is 9 mg/L.

Surface Waters Hydrochemistry

As of May 2016, a more comprehensive baseline water quality sampling/monitoring program has been established for the GCP. In this respect, the number and spatial distribution of surface sampling/monitoring points have been improved to represent each project unit. Based on this improved program, analysis results for three successive periods of water quality sampling have been assessed to identify ionic characteristics and hydrochemical facies types for Project's surface water resources.

Some of the surface waters were found to be dry as they display intermittent stream characteristics during the large part of the year. Therefore, the number of surface water samples varies depending on the sampling/monitoring season.

Analysis results for May and August 2012 surface water samples were not included in hydrochemistry diagrams (Piper, Schoeller and Wilcox diagrams) since some of the major ion concentrations were not available in the analysis results for that period. Therefore, hydrochemistry evaluations for surface waters comprise the studies conducted since September 2015.

Hydrochemical Assessment for the September 2015 surface water samples

Based on the Piper and Schoeller diagrams, surface waters were observed to be enriched in HCO_3^- among the major anions while major cation concentrations indicate Ca^{2+} dominancy in surface water samples. It was identified that there is no significant difference in chemistry along the Gökırmak River as the surface water samples show consistent facies types. Hydrochemical facies type for surface water samples was found to be Ca-HCO_3. Piper and Schoeller diagrams for the surface water samples collected in September 2015 are presented in Figure 3.50 and Figure 3.51, respectively.

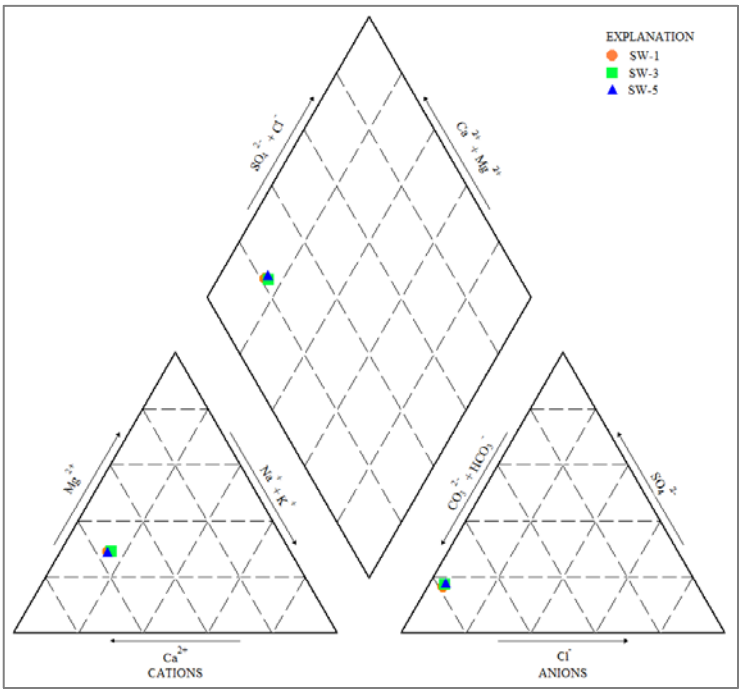


Figure 3.50: Piper Diagram for the Surface Water Samples (September 2015)

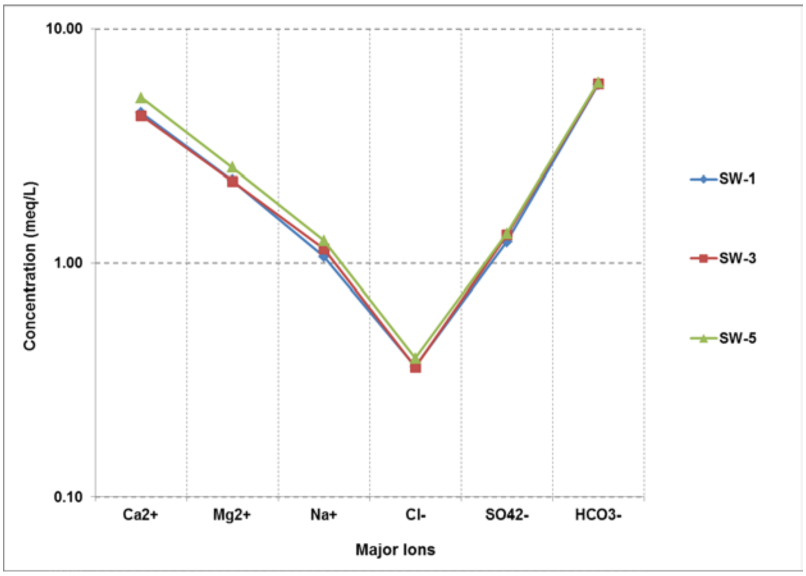


Figure 3.51: Schoeller Diagram for the Surface Water Samples (September 2015)

In order to assess the surface water samples regarding their potential use for irrigation purposes, analysis results were evaluated through Wilcox Diagram (Figure 3.52). Based on the Wilcox Diagram, all surface water samples were observed to have low sodium hazard potential (S1). With regard to their conductivity values all surface water samples were classified to have moderate risk for salinity hazard (C2).

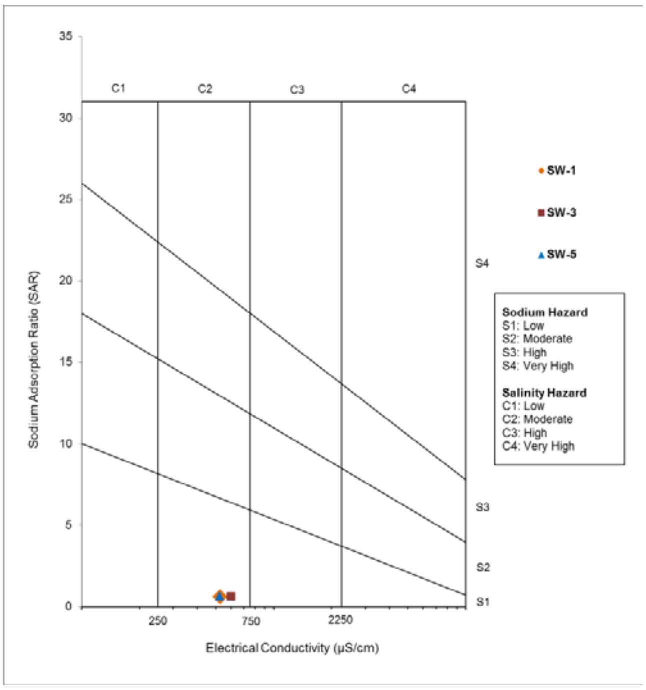


Figure 3.52: Wilcox Diagram for Surface Water Samples (September 2015)

Hydrochemical Assessment within the scope of Hydrogeological Impact Assessment Study

Based on the major ion concentrations, majority of the surface water samples were observed to be enriched in Ca^{2+} as the dominant cation, whereas HCO_3^- was identified to be the dominant anion. SW-12, located north of the Çorakoğlu WRD was found to have relatively enriched concentrations of Na^+ and $SO4^{2-}$ indicating a Na-SO_4 facies type for this water. Remaining surface water samples were characterized to have Ca-HCO_3^- facies type. Piper and Schoeller diagrams for the surface waters are provided through Figure 3.53 and Figure 3.58.

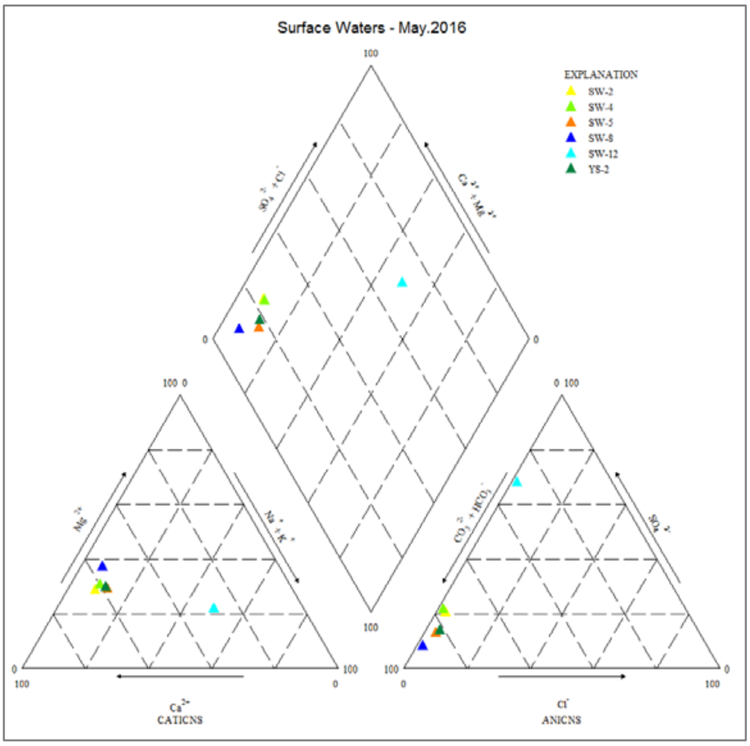


Figure 3.53: Piper Diagram for the May 2016 Surface Water Samples

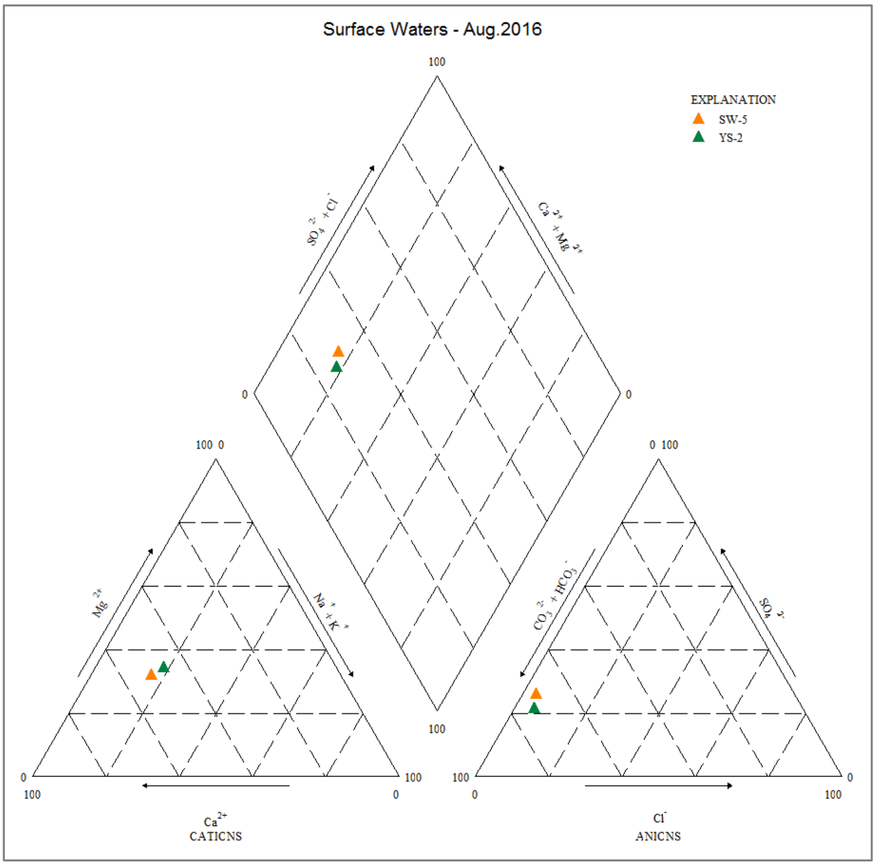


Figure 3.54: Piper Diagram for the August 2016 Surface Water Samples

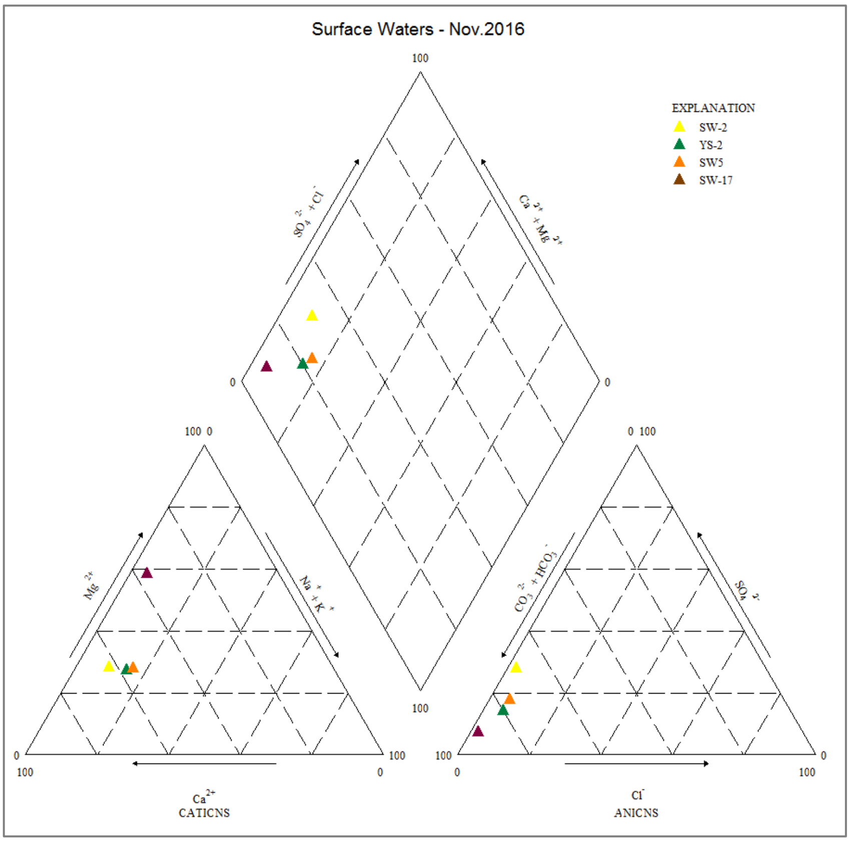


Figure 3.55: Piper Diagram for the November 2016 Surface Water Samples

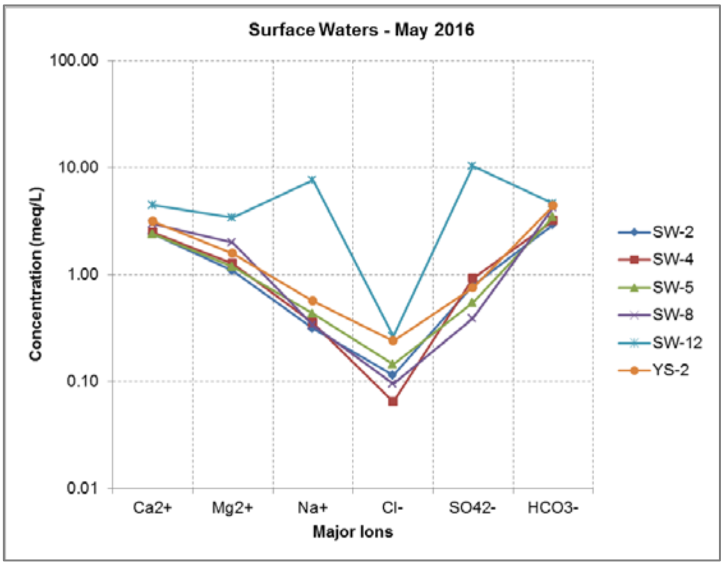


Figure 3.56: Schoeller Diagram for the May 2016 Surface Water Samples

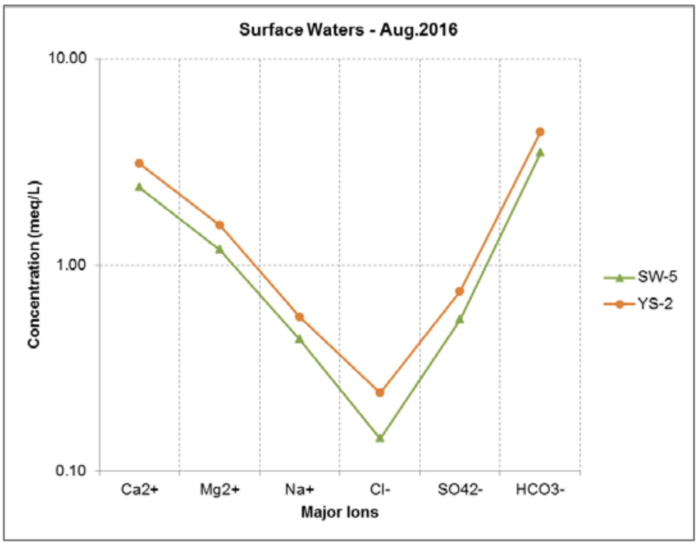


Figure 3.57: Schoeller Diagram for the August 2016 Surface Water Samples

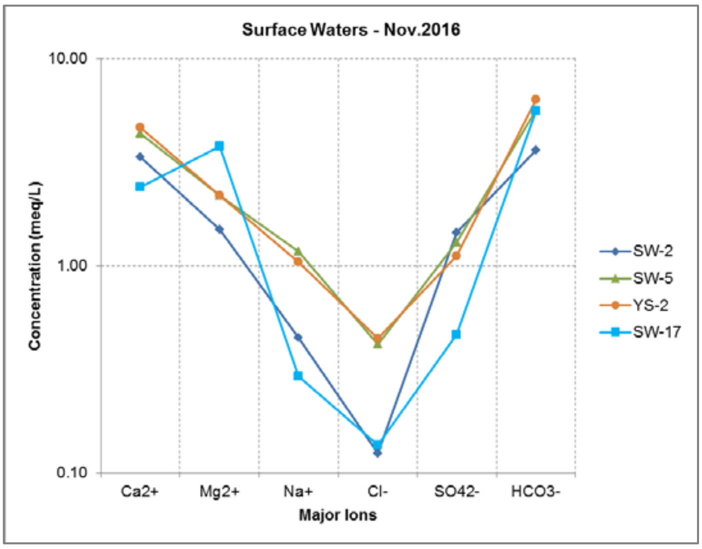


Figure 3.58: Schoeller Diagram for the November 2016 Surface Water Samples

According to the Wilcox Diagrams, surface water samples for all sampling periods were classified as having moderate salinity hazard – low sodium hazard (C2/S1). Wilcox diagrams for the surface waters are provided in Figure 3.59.

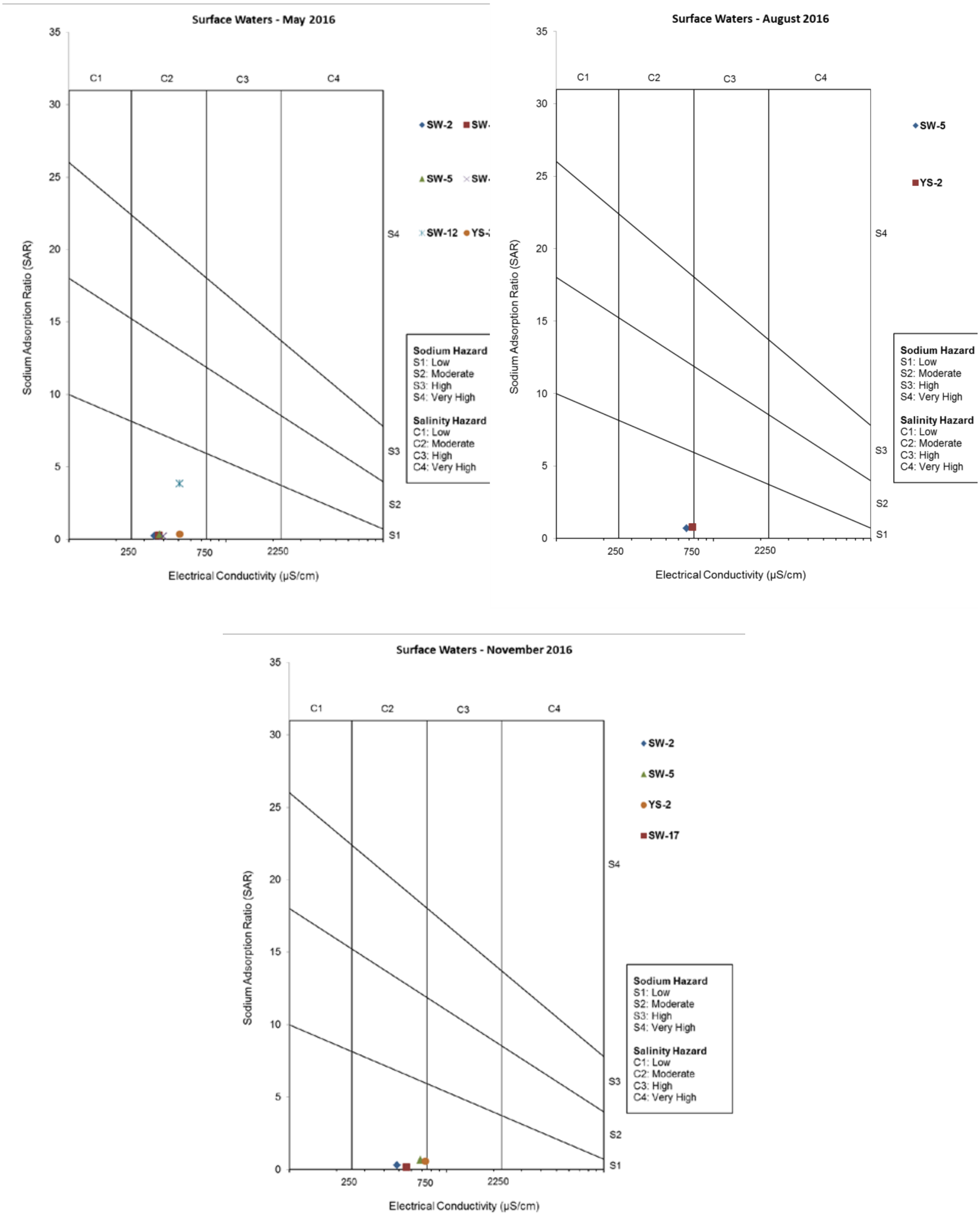


Figure 3.59: Wilcox Diagrams for the Surface Waters (2016)

Surface Water Quality Classifications

Analysis results for the surface water samples have been compared with the Surface Water Quality Regulation (SWQR) which was published on Official Gazette (# 28483) dated 30th November, 2012. The comparison is based on the Quality Criteria of the Inland Surface Water Resources which is provided in Table 5 of the SWQR.

Laboratory detection limits for some parameters were found to be greater than the limit values specified in SWQR. Concentrations for those parameters were assumed as the same values with the laboratory detection limits and are shown in bold in below results. Surface waters comparison table with respect to SWQR is provided in Appendix E while summarized below.

May/August 2012 Surface Water Quality Classifications

- Initial surface water samples (YS-01, YS-02 and YS-03) collected in May and August 2012 are classified as Class II due to TKN (Total Kjeldahl Nitrogen as N) concentrations. Total P and Mn concentrations for May 2012 samples for these three locations were found to be within Class II limits.
- Total P concentration was observed to be relatively high (within Class II limit) in YS-01 August 2012 sample compared to the remaining two samples (YS-02 and YS-03) collected in this period.

September 2015 Surface Water Quality Classifications

- September 2015 analysis results show that SW-3 and SW-5 surface water samples (collected from the east of the Project Area) are classified as Class III due to relatively high Total P concentrations while SW-1 is classified as Class II due to Total P and electrical conductivity.
- Parameters were mostly observed to be slightly increased along the Gökırmak River as SW-3 and SW-5 reflects relatively high concentrations of TKN-N, Total P, and Mn, compared to SW-1. Dissolved oxygen concentrations in SW-3 and SW-5 were observed to decrease to Class II limits compared to SW-1 which has dissolved oxygen value within Class I limit.

Surface water quality classifications within the scope of Hydrogeological Impact Assessment Study

- May 2016 samples collected from SW-2 (Çorakoğlu WRD), YS-2 (Project Area Upstream), SW-5 (Bağdere TSF) and SW4 are classified as Class IV due to **Se** concentrations. In terms of Total Phosphorus, Cr and Ni concentration, SW-5 were found to be in the same class for the same sampling period.
- As for the November 2016 sampling period, NO2-N concentrations were determined to be within Class IV limits for YS-2 and SW-5. Yet, August 2016 samplings for the YS-2 revealed that NO2-N concentration was observed to be within Class II limits.
- Dissolved Oxygen concentration for SW-8 (Gelberi WRD) and both Dissolved Oxygen concentration and EC value for SW-12 (Çorakoğlu WRD) showed that surface waters in these locations were regarded as Class III for May 2016 sampling period. Because of its pH value, SW-17 was determined to be a Class III quality type of surface water in November 16 sampling period.

3.3 Hydrogeological Characteristics of the Project Units

This section summarizes the findings of this study based on the project units.

3.3.1 Open Pit

Open Pit will be developed around Ibicik Tepe, next to the west of Sepetçioğlu Village, about 4.5 kilometers SW of Hanönü. The open pit will have a circular crest with about 1 kilometer in diameter and will have a maximum depth of 100 meters below ground level at Gökırmak's River stage. It will be developed within the low permeability schists showing an unconfined behavior within the pit area. Secondary porosity and permeability was developed in the schists due to fracturing and faulting zones. In addition to schists, a relatively thin (about 40 m) alluvium layer is present within the open pit boundaries. However, the alluvial material within the open pit boundaries has been hydraulically disconnected from the rest of the alluvial aquifer along the Gökırmak River with the slurry walls of the diversion dams.

One groundwater monitoring well (GK-12) was installed in the Open Pit area within the scope of this Project. However, several other monitoring and test wells were also drilled within the scope of previous studies. AECOM combined the data produced in the past and the data produced in GK-12 to characterize the hydrogeological properties of the Open Pit lithologies. Depth to groundwater levels measured in this area varies between 5 and 52 meter. Groundwater table generally follows the topography and the groundwater flow direction is from south to north. The groundwater levels change from 800 m at the southern part to 425-450 m near the Gökırmak River. The hydraulic gradient range within 0.25 and 0.4 in the open pit area (along the schist) and it decreases as the topography gets gentle to the north. The effect of two major faults, dividing and subdividing faults, can be clearly seen on the groundwater levels, indicating a relatively high conductivity zone in between the faults.

Hydraulic conductivity values vary between 1.75E-09 m/s (GK-12) and 1.54E-07m/s (BTBH) for the schist, 2.73E-06m/s (FOBH) and 6.56E-06m/s (SOBH) for the fractured / faulted sections of the schist. The difference between the conductivity values of the schist underlying the Gökırmak alluvium, and the schist that behaves as the host rock of the Open Pit is thought to be consequence of the weak fault zone that extends from the Open Pit through the spillway. On the other hand, hydraulic conductivity values for the alluvium were estimated as 1.27E-03m/s (AOBH) and 1.56E-06m/s (OW-4, partly in alluvium).

Surface water monitoring results show slightly alkaline properties with a mean pH value of 8.02 while EC values were observed to vary between 550-650 µS/cm. Surface waters located in the near vicinity of the Open pit reflect Ca-HCO_3 type of hydrochemical facies according to the analyses results. Groundwater pH was identified to range within 5.81-9.10 while EC values were observed between 282-2800 µS/cm with a mean of 927 µS/cm. Groundwater samples indicate a hydrogeochemical facies type of Ca-HCO_3 for the Open Pit groundwater.

3.3.2 Gelberi WRD

Gelberi WRD will be located along the Gelberi Creek Valley about 1.5 km SW of the Open Pit and 6 km SW of Hanönü. Waste rock material in this area will be deposited on low permeability schists that show an unconfined behavior. Secondary porosity was observed due to fracture and fault zones within the schists in this area.

Two groundwater monitoring wells (one for the upstream section, one for the downstream section) were installed to identify the hydraulic properties of the bedrock that underlies the Gelberi WRD. Depth to groundwater levels were observed to vary between 5 and 24 meters. Groundwater table generally follows the topography with a flow direction from SE to NW and having an average hydraulic gradient of 0.4.

Aquifer test analyses carried out among the monitoring wells show that the hydraulic conductivity values vary between 6.22E-07m/s (GK-10) and 3.09E-08m/s (GK-11) for the schists underlying the Gelberi WRD.

Surface water monitoring were identified to have a baseline pH range of 7.44 – 8.30 showing slightly alkaline conditions while EC values were observed to vary between 349 and 630 µS/cm. Hydrochemical facies types for Gelberi WRD surface waters were indicated as both Ca-HCO_3 and Ca-SO_4. For the groundwater monitoring, baseline pH mean was observed as 8.42. Variation of EC values were obtained as in between 653-921 µS/cm. Ca-HCO_3 type facies were acquired after the sampling and analyses of groundwater sample for the Gelberi WRD.

3.3.3 Çorakoğlu WRD

Çorakoğlu WRD will be situated 1 km North of the Open Pit, across the northern bank of the Gökırmak River. The area will be located 4 km West of Hanönü. Waste rock in the Çorakoğlu WRD will be deposited on lithological units composed of schists, limestone, claystone and volcano-sedimentary units that show unconfined behavior. Secondary porosity is observed among these lithologies related to fracture zones, more particularly for schists.

A total of four groundwater monitoring wells were installed to identify the hydraulic characteristics of the lithologies situated in the Çorakoğlu WRD. Depth to groundwater levels were observed to vary between 19 and 36 meters. Groundwater table is forming an irregular mound around the Çorakoğlu Hill, in line with topography. The groundwater flow occurs radially from this zone of groundwater high. However, the predominant flow network from this mound is from center to the south east and again from center to west and then south. The average hydraulic gradient is about 0.4 in the Çorakoğlu WRD. Average hydraulic gradient were observed to be 0.1 towards the North, 0.3 towards the South, 0.2 and 0.1 throughout the East and West, respectively.

Based on the aquifer test analyses carried out among the monitoring wells in the Çorakoğlu WRD area, the limestones were observed to have hydraulic conductivity values on the order of 6.18E-06 m/s (GK-9) while the hydraulic conductivities for the sandstone-claystone and schist alternations were found to be on the order of 2.64E-08 m/s (GK-7). Pumping test results show that the alternation of schists and sedimentary units shows hydraulic conductivity value on the order of 4.42E-06 m/s (GK-6).

Çorakoğlu WRD surface waters show pH values between 7.62-8.64 while EC values were found to be between 348-1873 µS/cm with a mean of 966 µS/cm. Based on the analysis results, Çorakoğlu WRD surface waters were identified to reflect two different hydrochemical facies types as Ca-HCO_3 and Na-SO_4. Groundwater monitoring results indicate a pH and EC range as 7.21 - 8.60 and 395-4076 µS/cm, respectively. Groundwater samples show a facies type of Na-SO_4 while drinking water depots show hydrogeochemical facies types of Ca-HCO_3 and Na-HCO_3.

3.3.4 Kepezkaya TSF

Kepezkaya TSF will be situated about 1.5 km NE of Hanönü, along the Kepezkaya Valley. The TSF will be constructed on low permeability units which are composed of turbidites and sandstone-claystone alternation.

Taking into the account of previously drilled monitoring wells in the Kepezkaya TSF, one monitoring well was installed in downstream section of the TSF to identify the hydraulic properties of the lithologies. Groundwater flow direction was identified as from NE to SW, following the topography, with hydraulic gradient varying between 0.05 and 0.2. Pumping tests performed indicate low hydraulic conductivities on the order of 2.00E-06 m/s for the Kepezkaya lithological units according to the previous studies.

Mean of pH value for surface waters for the Kepezkaya TSF area was observed to be 8.23 which indicates slightly alkaline conditions. EC mean was determined to be 373 µS/cm. Major ion distribution of the surface water samples reflects a hydrochemical facies type of Ca-HCO_3. Groundwater in this area on the other hand, shows a baseline pH mean of 7.82 with an EC mean of 2831 µS/cm within 489-6060 µS/cm range. Type of water was identified as Ca-HCO_3 from the examination of drinking water depots while groundwater samples generally show a facies type of Na-SO_4.

3.3.5 Bağdere TSF

Bağdere TSF will be constructed along the Valley on the Karayaprak Neighborhood about 1.5 km E of Hanönü. The TSF will be constructed on low permeability units which are composed of claystone-marl alternation with sandstone intercalations.

A total of five groundwater monitoring wells were installed in the Bağdere TSF to identify the hydraulic properties of the lithologies in this area. The groundwater flow generally follows the topography and its direction was determined as from North to South with an average hydraulic gradient of 0.1. Based on the aquifer tests performed in the 5 monitoring wells, hydraulic conductivity values for Bağdere TSF lithologies were found to have relatively low hydraulic conductivity values on the order of 3.00E-07 m/s except for GK-4 which probably lies in a zone of weakness (K=3.31E-05 m/s).

Baseline data for pH and EC parameters of surface water monitoring provided mean values of 8.39 and 512 µS/cm, respectively. Surface water analysis results show a hydrochemical facies type of Ca-HCO_3 for this project unit. Groundwater monitoring results show mean values for pH and EC to be 7.12 and 4204 µS/cm, respectively. Groundwater analysis results show that the hydrogeochemical facies type is Ca-HCO_3 for the Bağdere TSF area.

3.3.6 Process Plant

Process Plant will be constructed on Gücük Tepe about 2 km S of Hanönü. A total of two groundwater monitoring wells were installed in this area to identify the hydraulic characteristics of the Process Plant lithologies.

Based on the aquifer tests performed among the 2 monitoring wells, hydraulic conductivity values for the process plant lithologies were found to be relatively low, on the order of 10^{-7} to 10^{-8} m/s.

Surface water monitoring for this unit revealed a pH mean of 8.76 and an EC mean of 300 µS/cm. Mg-HCO_3 type of facies was determined for the surface waters located in the near vicinity of the Process Plant area. Groundwater monitoring results show a baseline pH mean of 7.98 and an EC mean of 393 µS/cm. Hydrogeochemical facies type was identified to be Ca-HCO_3 for the drinking water samples collected within the near vicinity of the Process Plant.

4. Numerical Groundwater Flow Model

In order to understand the hydrogeological impacts that might potentially originate throughout the operation and closure phases, a numerical groundwater flow model was constructed, which is capable of simulating the dynamic responses of the system to the imposed changes. Numerical models can handle not only the time-wise changes in input (seasonality of the recharge) and state (progression of excavation) variables of the system, but also the complexity of the excavation geometry, all of which would otherwise have had to be compromised with simplifying assumptions. The numerical modeling study has been carried out to assess the potential hydrogeological impacts of the open pit dewatering and subsequent pit lake formation processes on water resources. Hydrogeological assessment of potential impacts that might originate from TSFs and WRDs was also carried out to identify the long term behavior of the potential seepages through these units. Following sections provide the details on the numerical modeling study, from the model construction to impact assessment stage and monitoring. Geochemical and water quality impacts of the Project on the other hand, have been studied by Geochemico and provided in relevant sections of the ESIA Report (See ESIA Section 9). Risk assessment for the Kepezkaya TSF prepared by Golder Associates is provided in Volume-III of the ESIA Disclosure Package while related potential impacts and associated mitigation measures are summarized in Section 9 of this report.

4.1 Scope and Objective

A three dimensional (3D) numerical groundwater flow and transport model has been constructed for the Project Area to simulate groundwater flow and advective transport processes. AECOM has used VISUAL MODFLOW 2011.1 Premium software package which uses MODFLOW 2000 –three dimensional finite difference code. Objectives of the modeling study are listed below:

- Assessment of pit dewatering potential impacts on nearby groundwater and surface water resources (incl. community water resources),
- Assessment of potential impacts on groundwater as the potential seepages from TSFs and WRDs infiltrate through the unsaturated zone further to the saturated zone.
- Assessment of pit lake water levels and closure strategy as the operations cease and groundwater rebounds back to its original state.

The numerical model involves the simulation of the actual site conditions with simplifications applied under certain assumptions and approximations. While the numerical model set-up and model modifications are provided in Section 4.3, following steps have been evaluated during the assessment phase:

Open pit dewatering and pit lake formation

- Assignment of open pit shell to the model as a time variable boundary condition, to estimate the open pit dewatering pumping rates for different time intervals, throughout the life of mine.
- Determination of extent and the geometry of the cone of depression (originated from the dewatering of the open pit), throughout the life of mine and the closure period.
- Determination of the impacts of dewatering on nearby groundwater and surface water resources.
- Discussion of the closure strategy on two options;
    i. Leaving the diversion tunnels as is, and let the groundwater flow into the pit naturally. This will create a pit lake in long term.
    ii. Demolishment of the cofferdams and having a permanent surface water body that rapidly creates a pit lake.

Potential seepages from TSFs and WRDs

TSF and WRD Seepage Modeling Studies have also been completed in order to understand the transport time and transport path for the potential seepages that may result from the TSFs and WRDs separately. Following steps were followed for this study;

- TSF and WRD designs were examined prior to construction of the numerical model to determine the boundaries, footprint areas and potential pathways.
- Potential seepage rate from the TSFs and WRDs were estimated using the particle transport.

- Estimated seepage rates were evaluated for the case that the seepage reaches to receptor without having any dilution along the pathway.
- In order to evaluate the worst case scenario, the model was run to simulate advective transport (excluding dispersion and surface complexation reactions) along the pathway. Therefore, the transport time and preferential flow paths were evaluated under advective transport of particles. Particle transport is assumed to occur only in saturated zone, making the approach more conservative.

Water supply

With reference to the operational water budget estimations received from Acacia, the amount of water that is planned to be supplied from water supply wells is 326.5 m^3/day (3.8 L/s). AECOM has assessed the potential impacts that might originate as a result of groundwater pumping with the subject flow rate.

The impact of water supply was originally planned as a part of the modelling study but then Acacia revised its water supply plan to a lower rate where the impact could have been assessed with the real onsite measurements. Thus rather than assessing the impact with a modelling study, real on site measurements were used to assess the potential impacts.

Mine water balance:

A site specific mine water balance has also been developed for the Project. Results of the numerical flow model simulations have been used to assess the amount of water that will be derived from pit dewatering and has been introduced to the mine water balance as an input. Wet and average year net inflows are also evaluated for the tailings storage facilities.

4.2 Conceptual Model of the Study Area

A conceptual model for the study area has been developed prior to construction of the numerical model to distinguish and summarize the components that play role in overall hydrogeology. Conceptual model of the study area is presented in Figure 4.1 while explained below.

The study area consists of igneous, metamorphic and sedimentary rock units whose ages range between Mesozoic and Quaternary. Among these, pre-Upper Jurassic igneous and metamorphic lithologies form the basement rocks of the study area, whereas the post-Upper Jurassic sedimentary and volcanic rocks constitute the cover units overlying the basement rocks. Water bearing units can be classified into two main categories as “highly permeable” and “semi-permeable to impermeable” units. Unconsolidated alluvial deposits associated with the Gökırmak River and its tributaries represent highly permeable units whereas the schists in the open pit area, and sedimentary / volcanoclastic rocks distributed over the study area represent the semi-permeable to impermeable units.

The flow regime within the Project Area typically follows the topography as the groundwater flow occurs towards the Gökırmak River which is the main surface water body. The project units will be situated to the north and south of the Gökırmak River. Groundwater levels decrease from a value of about 1600 - 1400 m in the northern and southern borders (respectively) to a value of about 350 - 400 m in the eastern part along the Gökırmak River. The hydraulic gradients are measured between 0.2 and 0.4 especially on the rough terrain and decrease to 0.01 in the lower elevations especially around the Gökırmak River bed.

Due to relatively steep and undulating topography, the distribution of groundwater recharge varies within the study area. Based on the water budget calculations (See Section 4.3.4), average annual groundwater recharge from direct precipitation at the higher elevations (corresponding to northern and southern boundaries of the study area) was calculated to be 50.39 mm, which comprises 9% of the annual precipitation. As for the lower elevations on the other hand (corresponding to areas close to the Gökırmak River), groundwater recharge from direct precipitation was estimated to be 14.03 mm which comprises 3% of the annual precipitation.

Open Pit

Open pit will be developed within the low permeability schists showing an unconfined behavior within the pit area. Secondary porosity and permeability were developed in the schists due to fracturing and faulting zones. In addition to schists, a relatively thin (about 40 m) alluvium layer is present within the open pit boundaries. However, the alluvial material within the open pit boundaries has been hydraulically disconnected from the rest of the alluvial aquifer along the Gökırmak River with the slurry walls of the coffer dams. Furthermore, during the operation phase, the alluvium within the open pit area will be removed and will not be a component of the groundwater flow.

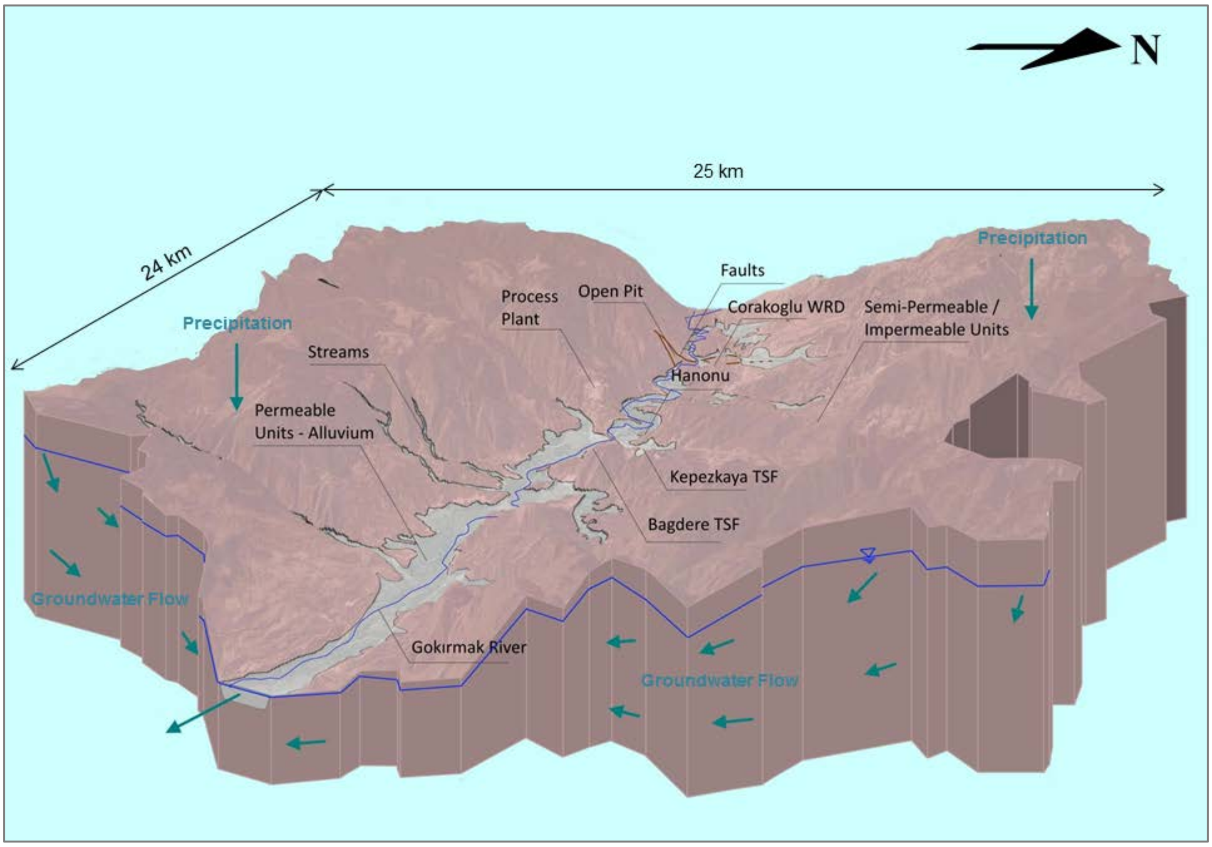


Figure 4.1: Conceptual Model of the Study Area

The groundwater levels changes from 800 m at the southern part to 425-450 m near the Gökırmak River. Depth to groundwater levels measured in this area is varying between 5 and 50 meters. Groundwater table generally follows the topography and the groundwater flow direction is from south to north with hydraulic gradient ranging between 0.25 and 0.4. The effect of dividing and subdividing faults can be clearly seen on the groundwater levels, indicating a relatively high conductivity zone in between the faults. The area lying in between the dividing and subdividing faults is also assumed to have a relatively high conductivity zone due to the activity of the both faults.

4.3 Numerical Model

A numerical groundwater flow model was constructed for the study area using the Visual MODFOW 2011.1 Premium software package developed by Schlumberger Water Services. Using this software, groundwater flow equations were solved by the MODFLOW-2000 code known as “3D Modular Finite-Difference Groundwater Flow Model” developed by the United States Geological Survey (USGS) (Harbaugh et al., 2000).

4.3.1 Model Domain and Finite Difference Grid

The model domain covers an area of 446 km^2 and is discretized into cells of variable size (Figure 4.2). The grid is coarsest (100 x 100 m) along the model boundaries; at the open pit area where higher accuracy is required, grid size was refined to 25 x 25 m. The topographical surface was introduced in the model with elevations ranging between 350 m and 1850 m. At the bottom, the model is confined with a no flow boundary at 0 m, corresponding to an elevation that is 270 m below the ultimate pit bottom. The thickness between these surfaces was divided into 5 layers in vertical direction to enable a better simulation of the dewatering process during the operational phase of the mine (Figure 4.3).

4.3.2 Boundary Conditions

Following the specification of the model domain, boundary conditions for the numerical model were defined. Boundary conditions were established as follows and shown in Figure 4.2.

- The southern and northern boundaries of the model domain were introduced to the numerical model as no flow boundaries as they represent basin divides.
- Eastern and western boundaries of the model domain were assigned as no flow boundary condition because regional water levels are almost perpendicular to these boundaries.
- Gökırmak River, which passes through the model domain, was simulated as a River Boundary Condition so that the groundwater is allowed to drain freely whenever groundwater level is above the River Stage elevation.
- Perennial and seasonal drainage were simulated using drain boundary conditions. All drain cells were assigned at elevations 2 m below the topographical surface so that the simulated groundwater levels were close to topographical surface along the drains.
- Drain boundary condition was used to simulate the time-wise progression of the open pit by assigning time-dependent head values to the drain cells.

Water springs that provide water for the settlement areas were introduced to the model as Drain Boundary.

4.3.3 Model Parameters

Groundwater Recharge

In estimation of the water budget for the study area, Thornthwaite method was used to calculate the potential evaporation while the estimated curve number method was used for surface runoff determinations. The remaining portion of the precipitation was assumed to be equal to infiltration into groundwater. Areal distribution of the recharge was assigned to the groundwater flow model and calibrated considering the hydrological and hydrogeological characteristics of the site. Three recharge zones were introduced to the numerical model representing the higher, intermediate, and lower elevations.

Hydraulic Conductivity

Hydraulic conductivity values obtained by the hydraulic tests were changed within the ranges obtained from the field tests to reflect the hydraulic characteristics of the lithologic units. Taking the account of relatively high fracture frequency near the surface, lateral hydraulic conductivity values were assigned to the model layers in a downwards decreasing manner. The vertical hydraulic conductivity values for the mining lithologies were estimated by calibration. The ratio of lateral to vertical hydraulic conductivity (K_x/K_z) was set to 10:1 for most of the units. Lithologies that were identified to have relatively high conductivities were assigned to have equal vertical and lateral hydraulic conductivity values. Based on the aquifer tests performed in the monitoring wells, the two major fault zones within the open pit is known to have higher hydraulic conductivity values than the surrounding rock mass especially for the northern section of the pit.

Specific Yield

A specific yield of 0.05 was assigned for the schists in the open pit and a specific yield of 0.1 was assigned for the alluvium overlying the schists.

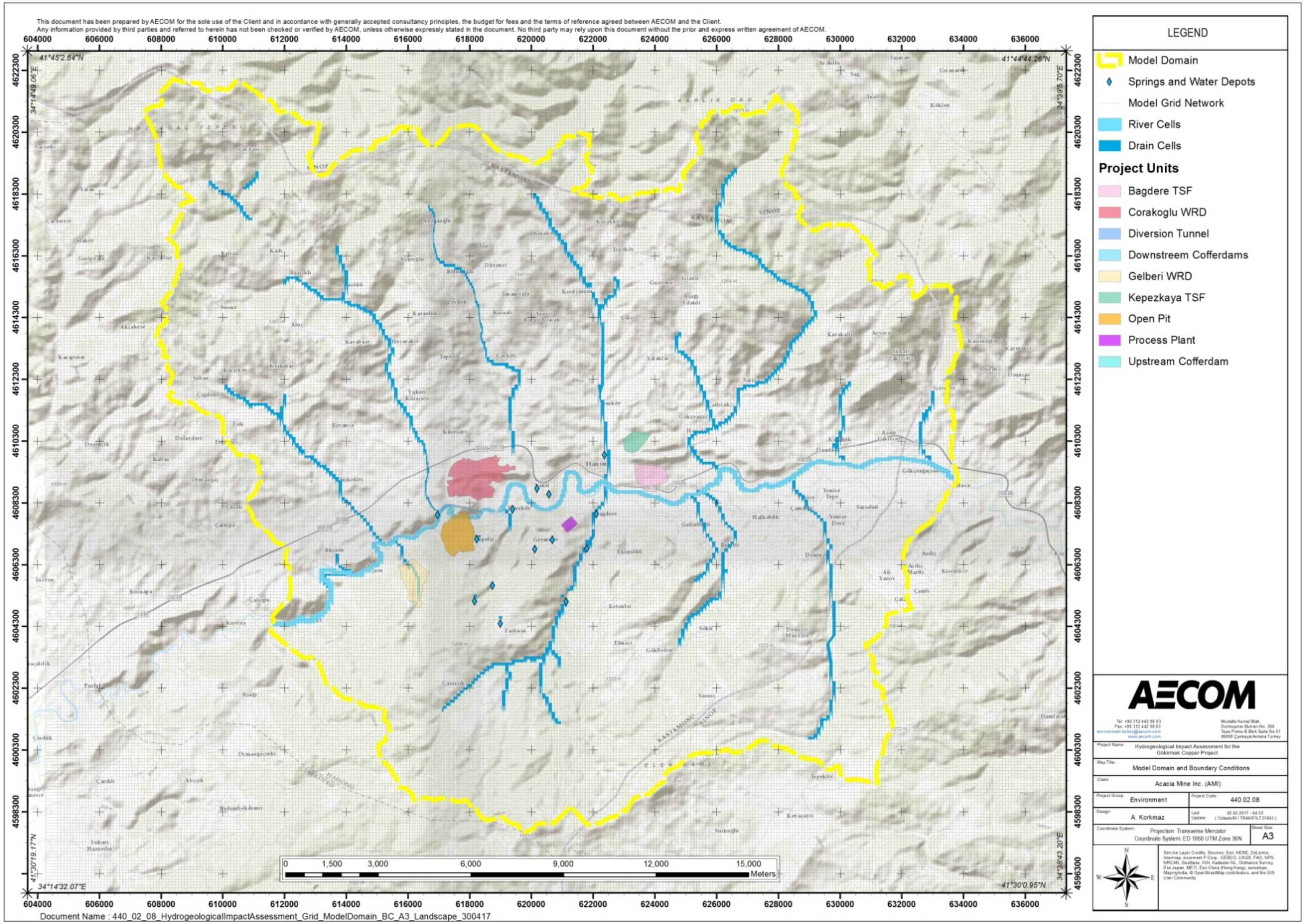


Figure 4.2: Model Domain and Boundary Conditions

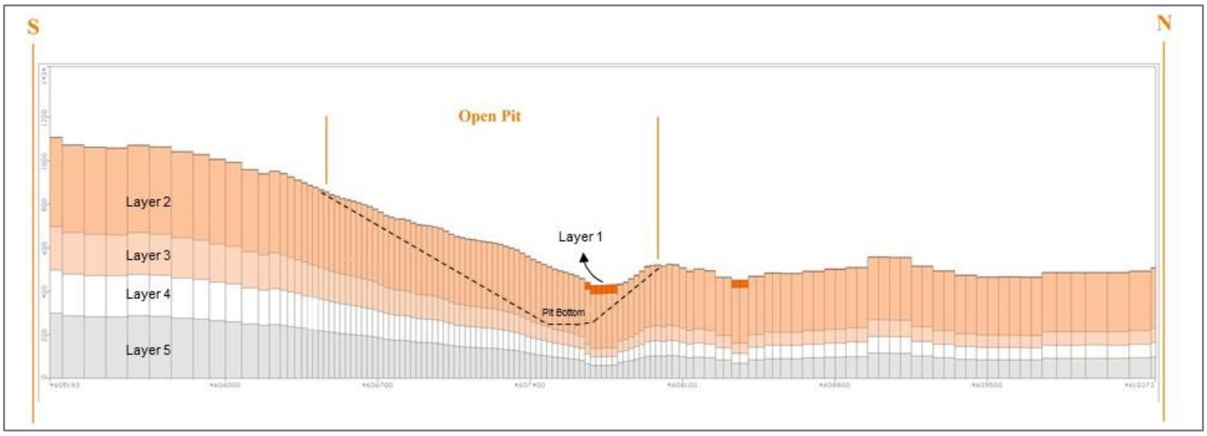


Figure 4.3: North-South Cross-Section through the Open Pit

4.3.4 Model Calibration

The numerical model was calibrated to the field conditions using the above-mentioned input parameters. The variables used as the input data into the numerical model were calibrated in consideration of the geological and hydrogeological characteristics of the units until a good match between the calculated and observed water levels were achieved. The calibration was performed through the data obtained from 21 monitoring wells distributed in the Project Area. The calibration was completed with a Root Mean Square (RMS) error of 11.47 m. The normalized RMS was estimated to be 4.76% with a correlation coefficient of 0.994. Therefore, it was concluded that this calibrated model was capable of simulating the possible responses of the hydrogeological system to the imposed stresses. The relation between observed and calculated heads obtained from the steady state calibration is shown in Figure 4.4.

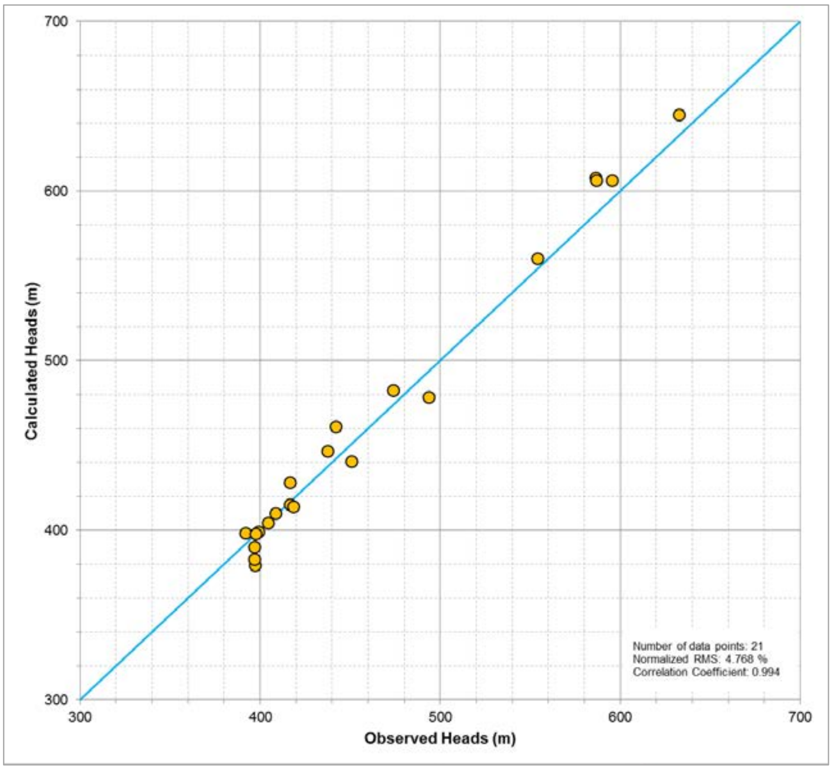


Figure 4.4: Calibration Plot for the Steady State Model Run

Groundwater recharge values calculated for the Study Area were also included in the calibration to better represent the overall hydrogeological system. The recharge was calibrated taking account of keeping the overall volumetric calculated and calibrated recharge values similar to each other. Table 4.1 shows the calculated and calibrated recharge values while the water budget for the calibrated numerical model is shown in Table 4.2.

Table 4.1: Calculated and Calibrated Groundwater Recharge Values

	Groundwater Recharge	
	Calculated Recharge (mm/year)	Calibrated Recharge (mm/year)
Zone 1 (Higher elevations)	50.39	46.12
Zone 2 (Mid-range elevations)	31.70	43.10
Zone 3 (Lower elevations)	14.03	22.26

Table 4.2: Water Budget for the Calibrated Numerical Model

In (m^3/d)		Out (m^3/d)	
Recharge		Drain[1]	
			42,652.69
		River	
	46,584.78		3,614.65
TOTAL IN		TOTAL OUT	
	46,584.78		46,267.33

[1]: indicates the water that drains out from streambeds and springs which ultimately reach to Gökırmak River in actual site conditions.

Previously-calculated recharge values were indicating daily 38,100 m^3/d of recharge, where the calibration of the model indicates a higher recharge from the precipitation at about 46,267 m^3/d (indicates about 17% difference from the calibrated recharge). The incorporation of site specific hydraulic parameters for various hydrogeological units during model calibration resulted in a more refined value for the recharge term.

4.4 Impact Assessment

Open pit mining, which requires deep excavations that reach below static groundwater level might impose potential environmental impacts on groundwater resources. In order to maintain safe and stable conditions for mining during the operational phase of the Project, the open pit area needs to be dewatered. The dewatering process can potentially modify the water balance which might further create potential impacts on nearby water sources.

Following the operational phase, as the pit dewatering ceases, the groundwater table tends to recover to its original position. Due to the hydraulic gradient towards the pit, an open pit lake will form until the hydrogeological regime in the pit reaches steady-state conditions.

In addition to the mining activities in the open pit, there will be two tailings storage facilities and two waste rock dumps that are planned to be operated in the Project Area. The Çorakoğlu WRD is planned towards North of the open pit, in close proximity as the primary waste rock storage area. In addition, a second WRD area located southwest of the open pit, namely the Gelberi WRD, is also included in the impact assessment within the scope of the ESIA studies.

In order to assess the hydrogeological impacts of the mining activities, following processes and/or project units were studied. Details for each topic are provided in the following sections.

- Open pit dewatering
- Pit lake formation
- Tailings storage facilities
- Waste rock dumps
- Groundwater extraction for water supply

4.4.1 Open Pit Dewatering

The elevation of the pit bottom of the Gökırmak Copper Mine will reach to its ultimate level at 270 m by the end of the operation phase of the Project. This implies that by the end of the operation phase, the groundwater levels will have to be lowered to this elevation via proper dewatering system. In order to design such a system, the groundwater inflow rate has to be quantified. At this stage, the calibrated numerical groundwater flow model was used to predict the amount of groundwater that will flow into the open pit as the pit deepens during the operation phase.

Although the duration of the open pit excavation will last 12 years and 4 months, numerical groundwater flow model was constructed to assume 13 full years to simulate a conservative pit dewatering scenario. The numerical groundwater flow model was utilized to simulate the time-dependent processes and was run in monthly stress periods to simulate the 13 years. In addition to boundary conditions, specific yield values had also to be defined before the model could be run under transient conditions. The model was run with a specific yield of 0.05. In order to evaluate the model's sensitivity to specific yield, an additional run with S_y=0.075 was also performed to obtain an upper bound for the pit inflow rates.

Following modifications were further implemented in the model to simulate the mining phase of the Project.

- River boundary condition was removed for the area lying between the cofferdams.
- Slurry walls of low permeability were assigned to alluvium along the cofferdams to eliminate/minimize the seepage to open pit from the cofferdams.
- Alluvium lying in between the cofferdams and in the open pit area was removed from the model (assigned as inactive) since it needs to be dewatered in a relatively short period of time.
- Drain boundary condition was used to simulate the time-wise progression of the pit by assigning time dependent elevation values to the drain cells. Drain elevation values were assigned in accordance with the mine layouts interpolated for the monthly periods.

The numerical groundwater flow model modified in this manner was run under transient conditions for 13 years with monthly stress periods.

Figure 4.5 demonstrates the time-wise progression of the pit bottom (solid black line) together with the corresponding groundwater inflow rates (bars) calculated by the numerical model for specific yield values of 0.05 and 0.075. Annual groundwater inflow rates to the pit, calculated by the numerical model for both specific yield values during the 13-year dewatering period are illustrated in Figure 4.5. The results show that the annual groundwater flow rates into the pit varies between 5.8 L/s and 26.9 L/s for S_y=0.05 and 6.2 L/s and 34.1 L/s for S_y=0.075.

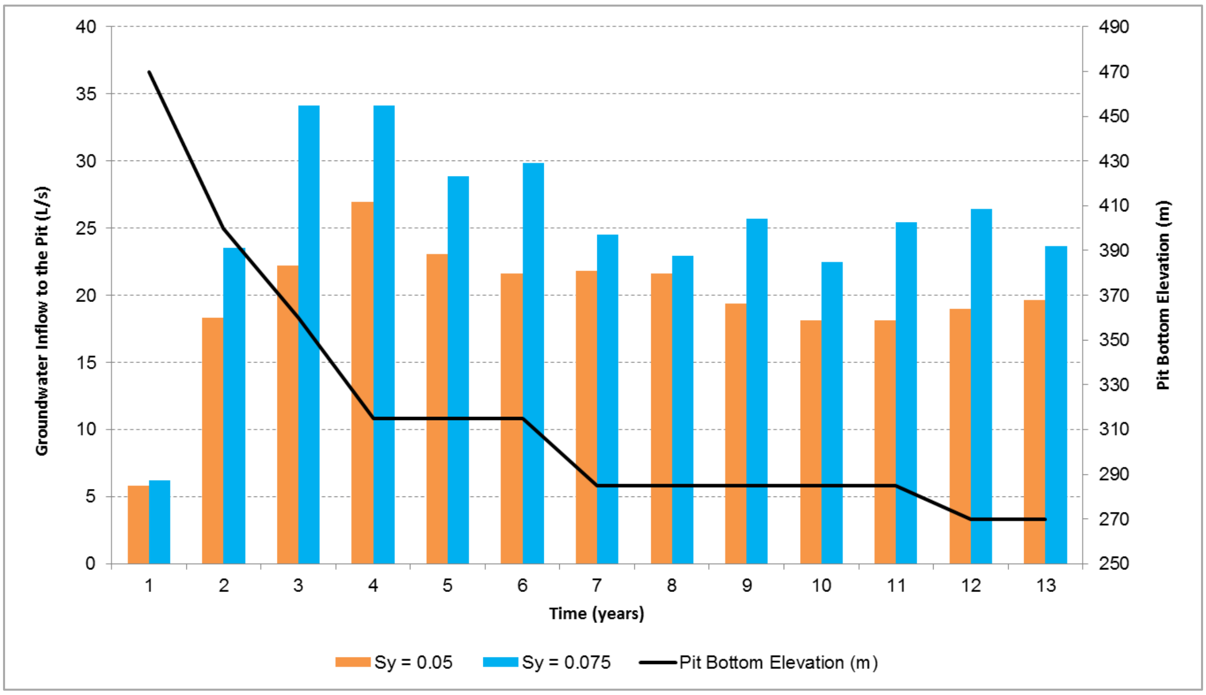


Figure 4.5: Groundwater Flow Rates into the Pit and Elevation of the Pit Bottom versus Time

The expansion of the cone of depression due to pit dewatering was also checked. Figure 4.7 shows the estimated lateral extents of final cone of depressions expressed by 20 m, 10 m, 5 m and 1 m drawdown cones at the end of 13 years of mining operation. Model outputs show that these depression cones will reach to the

Sepetçioğlu Village spring. In order to assess the radius of influence, model budgets were checked and changes in the interactions between the modeled units and nearby community water sources were quantified. Accordingly, it was concluded that there are two community water resources that will potentially be affected. These are the Sepetçioğlu Village spring (K-1) and Küpeli Village water supply well (WSW-1). Numerical modeling results indicate that the Sepetçioğlu Village spring is vulnerable to open pit dewatering process and expected to dry out by the end of simulation period. Based on the drawdown values obtained by the numerical groundwater flow model, the water level in the Sepetçioğlu Village spring was estimated to drop more than 5 m.

Küpeli Village water supply well on the other hand is located on the Gökırmak riverbank. The well is known to be screened both in alluvium and underlying schists. Numerical modeling results indicate more than 20 m drawdown for the underlying schists. On the other hand high conductivity alluvium could compensate the reduced drawdown in the schists. However, a water supply study for both resources is strongly recommended to compensate the expected reduction in groundwater sources for the subject settlement areas.

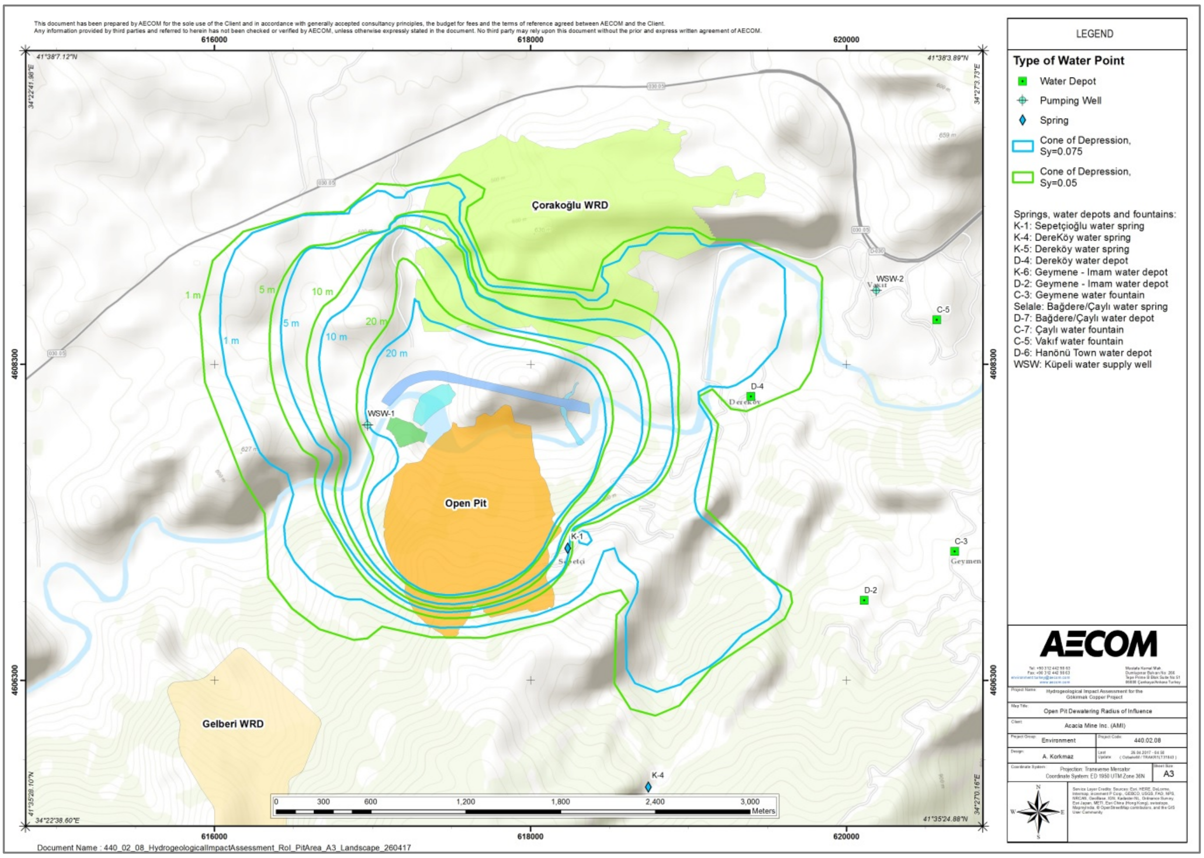


Figure 4.6: Open Pit Area Cone of Depressions for Specific Yields of 0.05 and 0.075

Dewatering impact on other community water resources including Dereköy and Geymene villages, Selale Spring and Hanönü Town were observed to be negligible as those settlement areas remain out of the cone of depression that will be formed by the end of 13 years. Figure 4.7 shows the pit dewatering radius of influence on a broad scale that involves the other project units and water users.

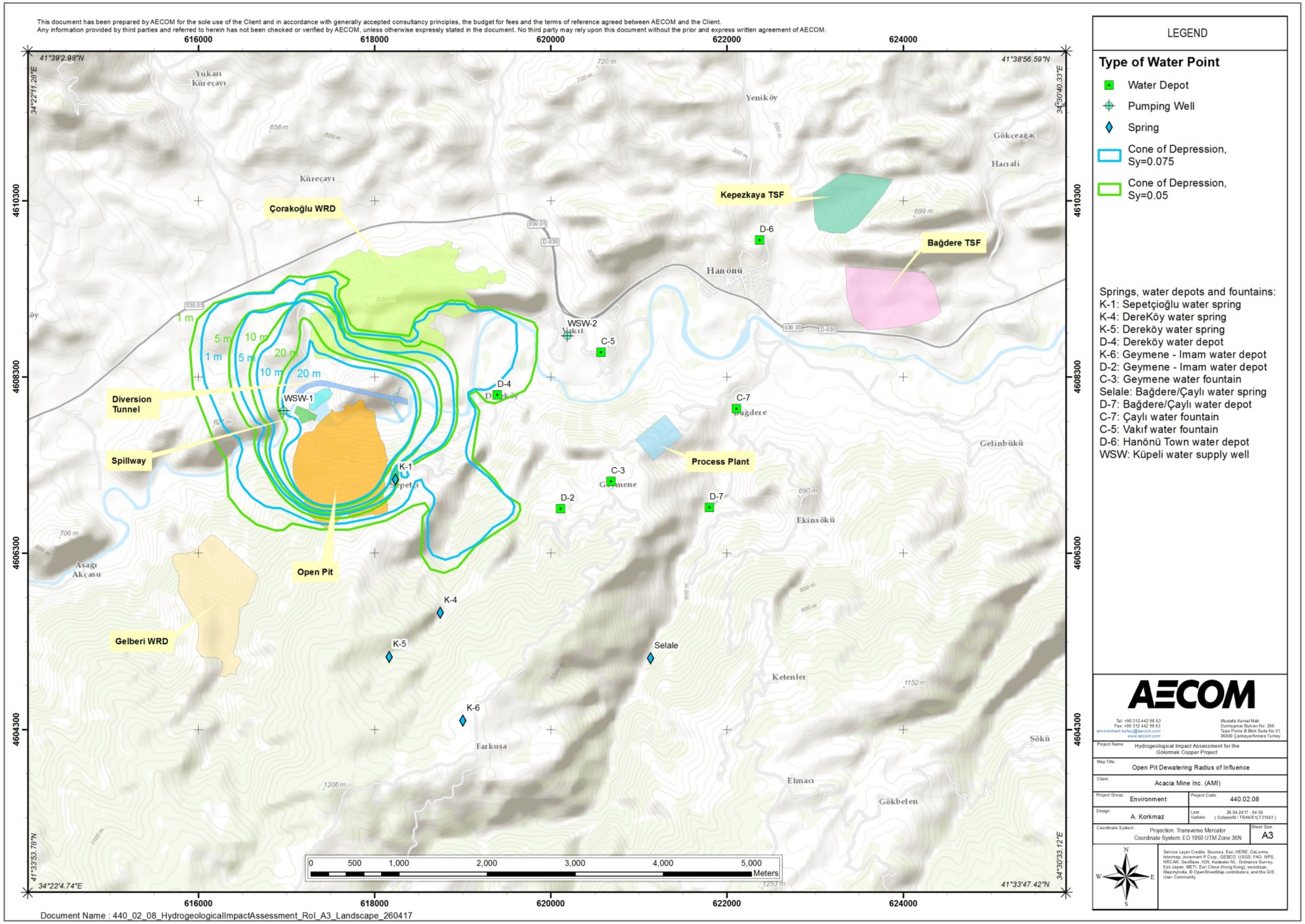


Figure 4.7: Cone of Depressions for Specific Yields of 0.05 and 0.075

4.4.2 Pit Lake Formation

As the operation of the open pit ceases and the dewatering pumps are shut down, groundwater levels will start to rise back to static water level. Two components of pit lake formation are included in the pit lake assessments. These are:

- The **inflow components** of the pit lake can be classified as (1) direct precipitation falling onto the lake surface; (2) runoff from the pit walls following a precipitation event and (3) groundwater inflow.
- The **outflow components** are (1) evaporation from the lake surface and (2) groundwater outflow.

Conceptual drawing for an open pit lake components are shown in Figure 4.8. The change in the volume of the water accumulated in the open pit has been estimated taking the account of progressive rise in pit lake water level over time. The open pit reaches its bottom elevation of 270 m asl (above sea level) by the end of the operations.

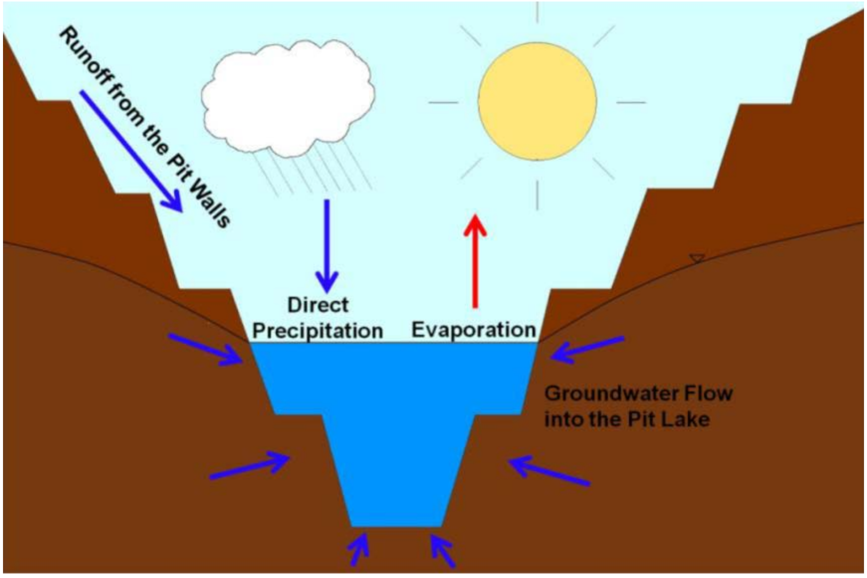


Figure 4.8: Conceptual Drawing of an Open Pit Lake (Ünsal, 2013)

The components that play role in pit lake formation are described below:

1. **Groundwater inflow:**
   As the dewatering in the open pit will be terminated, groundwater inflow will significantly contribute to the formation of the pit lake with a hydraulic gradient towards the pit shell. The amount of closure phase groundwater inflow into the pit has been estimated on a monthly basis by the numerical model explained in Section 4.3. The model results show that the initial groundwater inflow will take place with a maximum discharge of 14 L/s during the first year of the closure. The inflow rate will gradually decline as the hydraulic gradient decreases over the course of pit lake formation. The process of pit lake formation will continue to take place until equilibrium is attained in the pit as the pit lake water level reaches the discharge elevation.

2. **Direct precipitation:**
   The second input to the pit lake will originate from the direct precipitation that fall on the pit lake surface. The surface area of the pit lake will gradually enlarge as the volume of the water in the pit increases over time. Pit lake volume and lake area were estimated on a monthly basis to further include the direct precipitation contribution to the pit lake. Direct precipitation rates were included in the model on a monthly basis and converted into volumetric values by multiplication with the pit surface area. Precipitation data from both Kastamonu and Devrekani meteorological stations were used separately to simulate the pit lake formations.

3. **Pit wall runoff:**
   The third input to the pit lake will emerge as a result of pit wall runoff. Runoff was introduced into the model as the surface flow that occurs on the pit wall which correspond the difference between the

footprint area of the lake surface and pit's maximum extent. As the pit lake water level rises during the closure phase, footprint area of the pit wall surface will gradually decrease, which in turn dictates the amount of reduced surface runoff.

4. **Direct Evaporation:**
Pit lake water will also be affected by the direct evaporation from the surface of the lake. As the Project's closure phase starts and the volume of the pit lake increases, the surface area of the lake will also increase. Therefore, the amount of evaporation increases in direct proportion to the expanding surface area of the pit lake. Evaporation data from both Kastamonu and Devrekani meteorological stations were used separately to simulate the pit lake formations.

All relevant characteristics specific to the Study Area and to the ultimate pit design were considered in selecting the appropriate methodology to simulate the pit lake formation process. A volumetric balance approach was adopted to allow simulations for progressive pit lake levels until the water level of the pit lake stabilizes. The rate of groundwater inflow and/or groundwater outflow will be controlled by the lake level and groundwater level surrounding the pit. These two components were calculated numerically, by running the groundwater flow model under steady-state conditions for each 20 m increments in lake level from the bottom of the pit. Output of the numerical model was then incorporated into the pit lake budget to calculate the volumetric changes of all components on daily basis. Further, it was used to predict the time-wise change in lake levels, final pit lake and the time required to reach this level.

In evaluation of the sensitivity of the pit lake budget to climatic conditions, two additional runs were performed with ± 5% of the precipitation and ±10% of the evaporation data. Intervals for the sensitivity runs were specified based on the generalized projected changes in precipitation and temperature outlined by Turkey's National Climate Change Adaptation Strategy and Action Plan (Ministry of Environment and Urbanization, 2012). Based on this document, the precipitation is projected to decrease while the evaporation rates increase for the future climatic conditions of the zone that the Project Area is located. Accordingly, dry conditions are likely to occur in the future, however wet conditions were also simulated to evaluate opposite climatic conditions.

Within the scope of the numerical modeling study, following three scenarios of pit lake formation were evaluated. Sensitivity runs were evaluated for Scenario 1 and Scenario 2. Taking into account that pit lake formation in Scenario 3 takes relatively short period of time, sensitivity runs for this scenario were not conducted. AECOM recommends the optimal closure of the pit will be decided during the operational phase as the long term data from the on-site meteorological is collected.

Scenario 1

The first scenario is leaving the open pit as it is with the diversion tunnels and cofferdams in place and allowing formation of a pit lake. This process will eventually create a hydraulic gradient towards the open pit to form a pit lake over a period of time as a result of a combination of groundwater inflow to the pit, direct precipitation and pit wall runoff. In this case, the Gökırmak River will be kept diverted out of the pit preventing the river flowing into the open pit. Conceptual closure conditions for Scenario 1 are illustrated in Figure 4.9.

According to this scenario, the open pit area will be bounded by the upstream and downstream cofferdams, in the west and in the east. Assuming that the cofferdams will act as barriers, the crest elevation of the downstream cofferdam (431 m) was assigned to the model as the maximum elevation of the pit lake reservoir. Beyond this elevation, the pit lake overflows the cofferdam into the Gökırmak River.

Figure 4.10 shows the pit lake level change with different data sets for a period of 100 years as the dewatering pumps are shut down. According to this run, the maximum water level in the pit lake is assumed to be 431 m as explained above. Two initial runs were completed with the climate data of Kastamonu and Devrekani Meteorological Stations. The simulations indicated that the pit lake will reach to 431 m elevation;

- Within 46 years after the mining operations cease with the Devrekani Climate Data.
- Within 51 years after the mining operations cease with the Kastamonu Climate Data.

In addition to these runs, a second set of simulations were completed by modifying the climate data – for the wet and dry future conditions.

- *Scenario 1 – Simulation 1:* Evaporation data obtained from the Kastamonu meteorological station was decreased by 10% while precipitation data was increased by 5% to simulate relatively wet conditions. The simulation result indicated that the pit lake will reach to 431 masl within 42 years.

- *Scenario 1 – Simulation 2:* Evaporation data obtained from the Devrekani meteorological station was increased by 10% while precipitation data was decreased by 5% to simulate relatively dry conditions. The simulation result indicated that the pit lake will reach to 431 masl within 57 years.

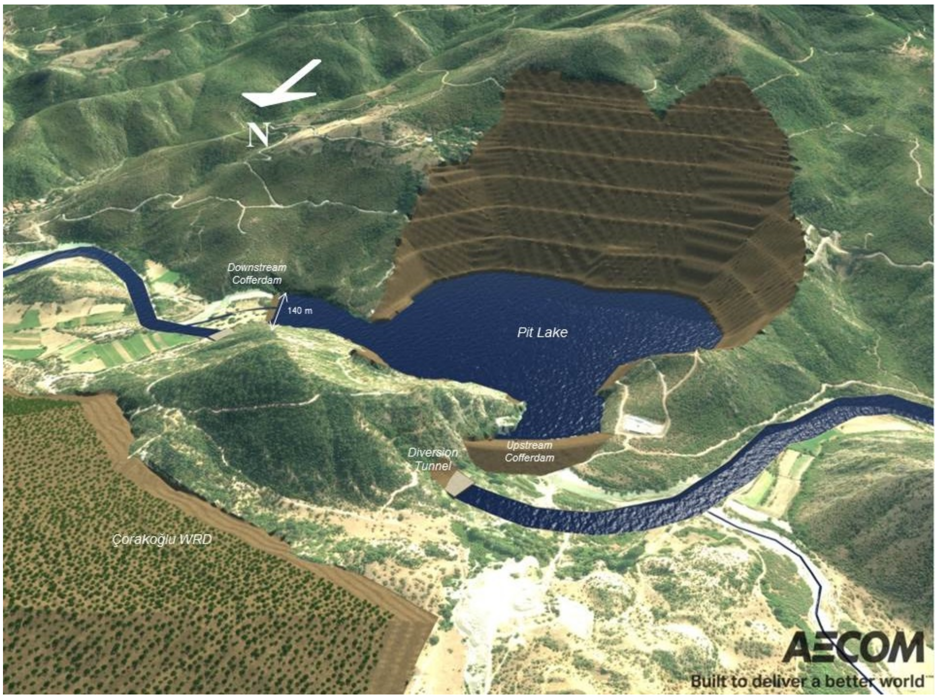


Figure 4.9: Conceptual Closure Conditions for Scenario 1

All runs indicate that a pit lake will be formed and will rise to 431 m level. After this level the pit lake will start to flow out of its enclosed area over the downstream cofferdam into the Gökırmak River Bed and will act as a source to the Gökırmak River. Table 4.3 shows the estimated monthly discharge rates from the pit lake as a result of each simulation. Taking the account that the information on pit lake water quality is currently limited, this scenario has to be reevaluated again during the operation phase of the Project.

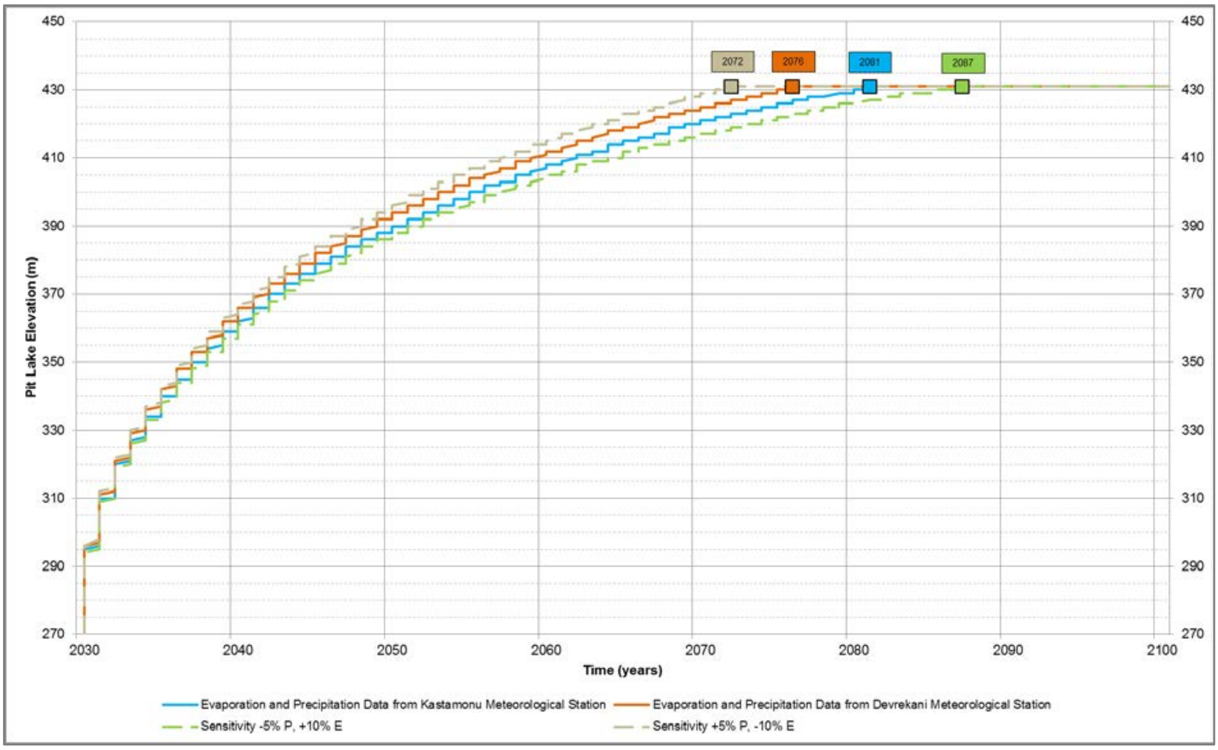


Figure 4.10: Pit Lake Level Change within Time for Scenario 1

Table 4.3: Estimated Monthly Discharge Rates from the Pit Lake According to Scenario 1

Months	Kastamonu Meteorological Station (L/s)	Devrekani Meteorological Station (L/s)	Scenario 1 Simulation 1 (L/s)	Scenario 1 Simulation 2 (L/s)
January	17.0	20.8	21.6	16.4
February	16.8	20.0	20.8	16.2
March	17.4	18.9	19.9	16.4
April	13.2	9.1	12.3	10.9
May	14.1	17.0	20.3	11.0
June	10.5	9.3	12.8	6.8
July	0.0	0.0	0.0	0.0
August	0.0	0.0	0.0	0.0
September	0.3	0.1	2.6	0.0
October	9.9	11.2	13.2	8.3
November	13.2	14.1	15.3	12.3
December	18.3	24.4	25.4	17.6

Scenario 2

Second scenario assumes that during the closure phase, the river will still be diverted out of the pit via the diversion tunnel but the cofferdams will be removed as the mine closure starts. Pit wall runoff will be diverted out of the pit to Gökırmak River downstream by in-pit interception channels. Hence, pit wall runoff is eliminated in this scenario which reduces the amount of water input to the pit lake, resulting in longer period for the pit lake to form. The final post-closure pit water elevation is estimated to be approximately 426 masl which corresponds to the Gökırmak river stage. The resulting lake reservoir will cover an area of 378,268 m^2 with a maximum depth of 156 m. Conceptual closure conditions for Scenario 2 is given in Figure 4.11.

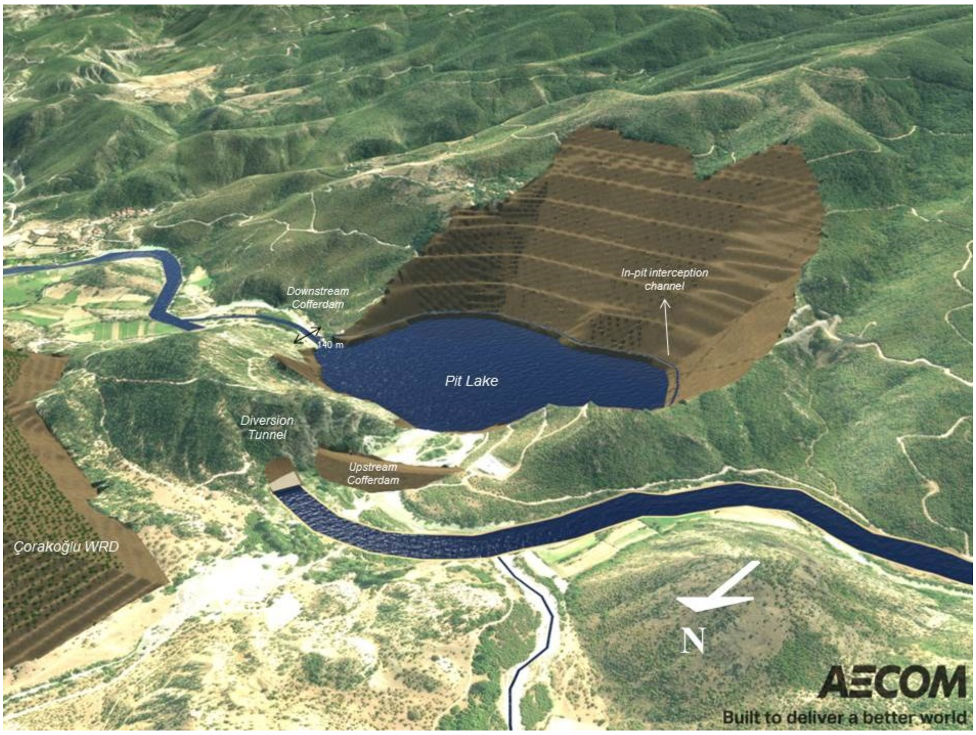


Figure 4.11: Conceptual Closure Conditions for Scenario 2

Figure 4.12 shows the pit lake level changes with different data sets for this scenario over a period of 100 years as the dewatering pumps are shut down. Initially two runs were completed with the climate data of Kastamonu and Devrekani Meteorological Stations. The simulations indicated that the pit lake will reach to 426 m elevation;

- Within 103 years after the mining operations cease with Devrekani Climate Data.

- Within 109 years after the mining operations cease with Kastamonu Climate Data.

In addition to these runs, a second set of simulations were completed by modifying the climate data – for the wet and dry future conditions.

- *Scenario 2 – Simulation 1:* Kastamonu Stations evaporation was decreased by 10% and precipitation was increased by 5% to simulate relatively wet conditions and the simulation result indicated that the pit lake will reach to 426 m level within 87 years.
- *Scenario 2 – Simulation 2:* Devrekani Stations evaporation was increased by 10% and precipitation was decreased by 5% to simulate relatively dry conditions and the simulation result indicated that the pit lake will reach to 426 m level within 140 years.

All runs indicate that a pit lake will be form and will rise to 426m level. After this level the pit lake will start to flow out of its reservoir area to the Gökırmak River Bed and will act as a source to the Gökırmak River. Table 4.4 shows the estimated monthly discharge rates from the pit lake as a result of each simulation.

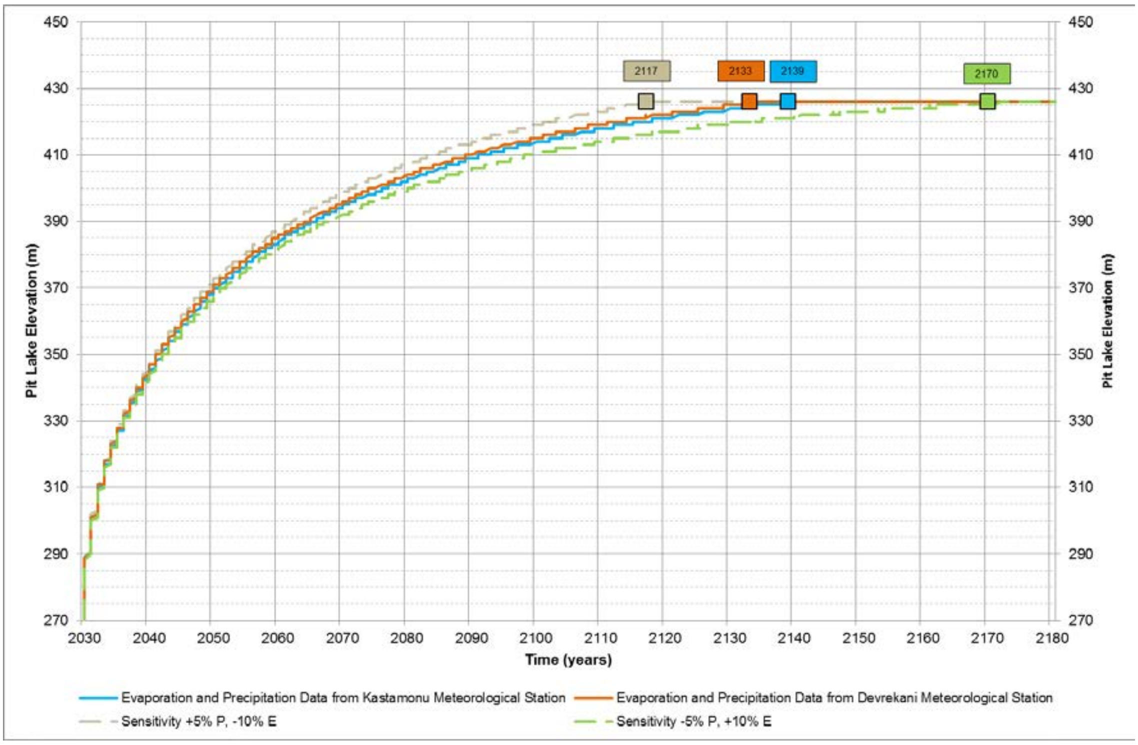


Figure 4.12: Pit Lake Level Change within Time for Scenario 2

Table 4.4: Estimated Monthly Discharge Rates from the Pit Lake According to Scenario 2

Months	Kastamonu Meteorological Station (L/s)	Devrekani Meteorological Station (L/s)	Scenario 2 Simulation 1 (L/s)	Scenario 2 Simulation 2 (L/s)
January	10.4	11.8	12.1	10.1
February	10.4	11.7	12	10.2
March	10.1	10.3	10.8	9.7
April	3.6	0.0	1	2.1
May	1.8	3.0	5	0
June	0.0	0.0	0.5	0
July	0.0	0.0	0.0	0.0
August	0.0	0.0	0.0	0.0
September	0.0	0.0	0.0	0.0
October	3.8	3.5	4.8	2.8
November	7.7	7.1	7.8	7.3
December	11.0	13.4	13.8	10.7

Scenario 3

The third scenario on the other hand, is allowing the open pit to be flooded by the Gökırmak River within a relatively short period of time compared to the first two scenarios. This scenario involves the demolishment of the cofferdams and considers the Gökırmak River being reset to its original course during the closure and allowing the river to flow directly into the open pit. In estimation of the river water income to the pit, long term average monthly discharge rates measured in the Gökırmak River were used.

AECOM recommends a controlled pit lake formation strategy that minimizes potential impacts on downstream water quantity and water users. Scenario 3 is based upon the rapid fill of the open pit with the excess water which is the remainder after the baseflow and Demirci HEPP's water requirements are satisfied. Following assumptions were applied to build up Scenario 3.

- In reference to long term average monthly discharge rates, baseflow in the Gökırmak River is assumed to be 5 m^3/s. As a conservative approach, baseflow is then multiplied by a factor of 1.5 making it 7.5 m^3/s.
- In order to evaluate the different amounts of water that Demirci HEPP would require, 3 different runs were conducted with varying amounts of 10 m^3/s, 15 m^3/s and 20 m^3/s. The time needed to fulfill the rapid fill scenario was separately estimated by taking the account of these three different rates.
- River water that flows into the pit is assumed to be the excess water that remains after the above-mentioned portions of water is transferred to downstream and/or water users.
- The climatic components of this scenario has significantly low impact for the filling period estimation, thus only Devrekani Meteorology Station's climate data was used for the completion of the simulations of the third scenario.

Conceptual closure condition for Scenario 3 is shown in Figure 4.9. Figure 4.14 shows the pit lake level changes demonstrating the rapid fill scenario as the Gökırmak River is diverted back to its original course. According to three runs and assuming different amounts of water need for the Demirci HEPP, the pit lake level will stabilize ~4 months (Demirci HEPP water use = 10 m^3/s), ~4 months (Demirci HEPP water use = 15 m^3/s) and ~2.5 years (Demirci HEPP water use = 20 m^3/s), respectively, after the closure of mine.

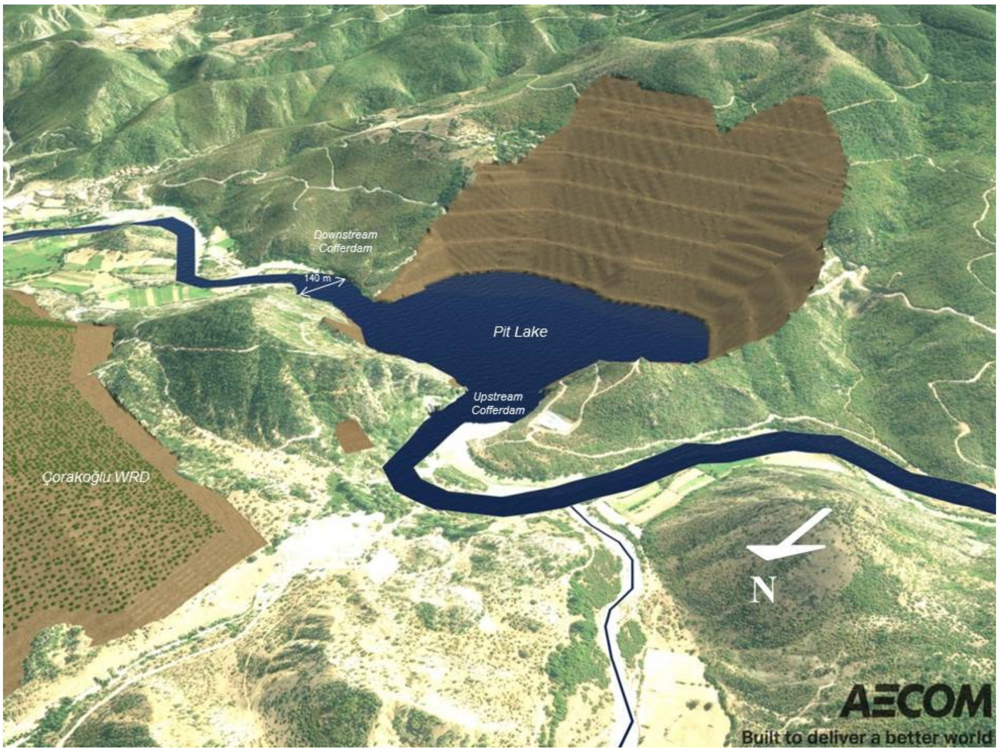


Figure 4.13: Conceptual Closure Conditions for Scenario 3

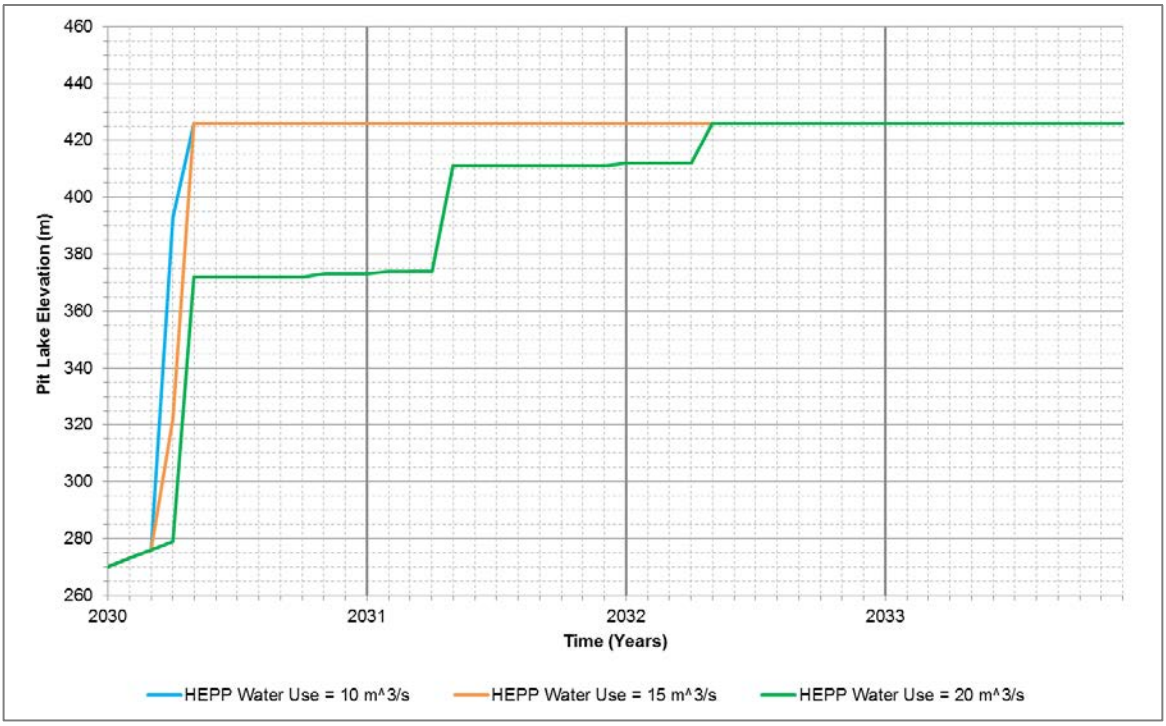


Figure 4.14: Pit Lake Level Change within Time for Scenario 3

4.4.3 Groundwater Extraction for Water Supply

In reference to the operational water budget estimations received from Acacia, the amount of water that is planned to be supplied from water supply wells is 326.5 m^3/day (3.8 L/s). Within the scope of the Water Supply Study, AECOM has conducted a long term constant discharge pumping test separately in each water supply well and showed that steady-state condition is attained by the end of 12 hours of pumping with discharge rates greater than 33 L/s. Simultaneously constant discharge pumping test was also performed in 3 water supply wells and with the rates of 59 L/s, 65 L/s and 65 L/s for 12 days of continuous pumping to understand the aquifer's response on long term groundwater pumping.

Figure 4.15 through Figure 4.18 shows the drawdowns observed in each test in water supply wells. During the tests, the drawdown values in pumping wells were observed to range between 1.8 m and 5.5 m. Given the total discharge rate of ~4 L/s of water as Acacia plans to supply it can be stated that the aquifer is sustainable to provide this rate.

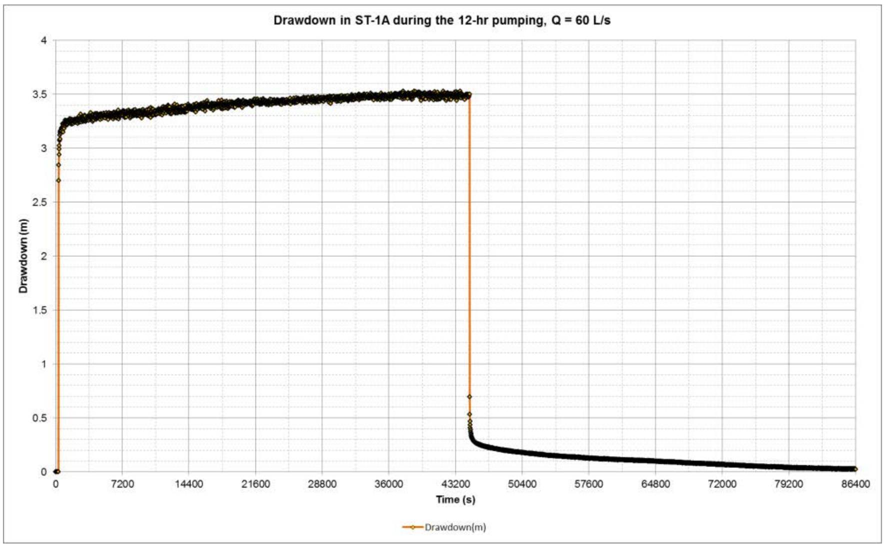


Figure 4.15: Time – Drawdown Plot for the Constant Discharge Test in ST-1A Water Supply Well

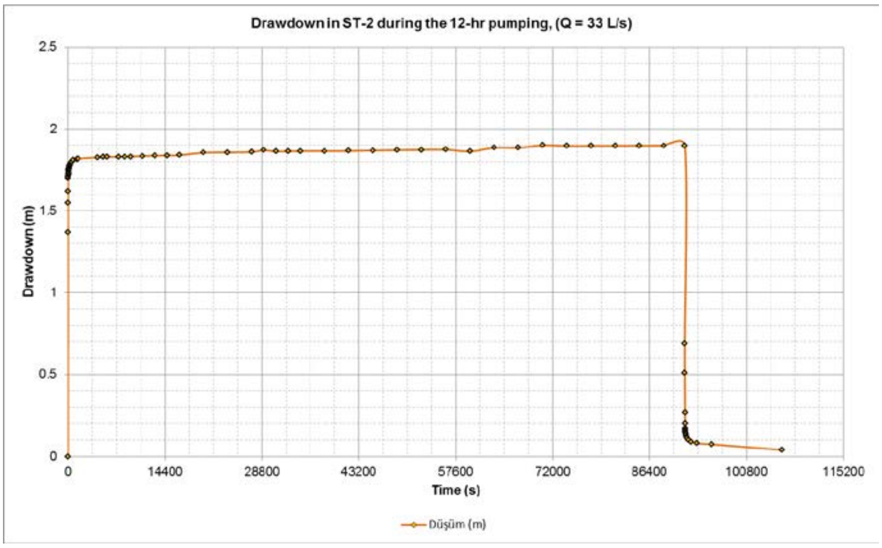


Figure 4.16: Time – Drawdown Plot for the Constant Discharge Test in ST-2 Water Supply Well

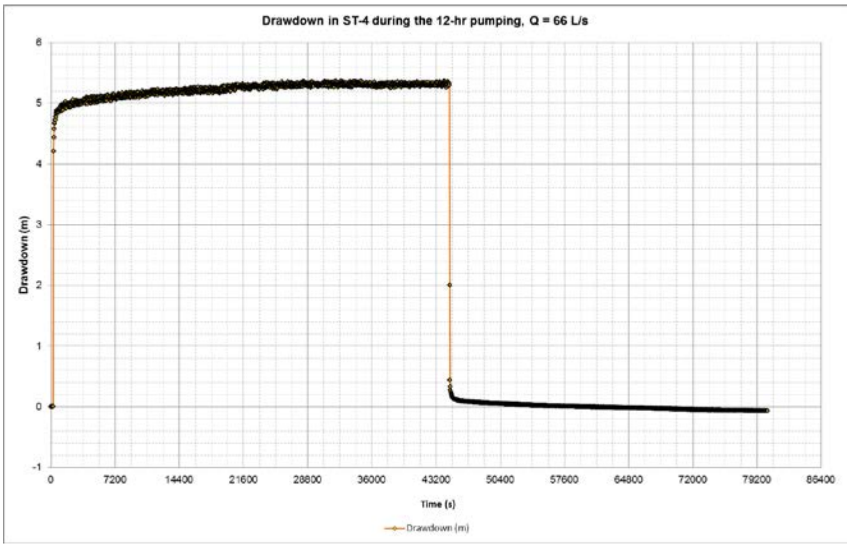


Figure 4.17: Time – Drawdown Plot for the Constant Discharge Test in ST-4 Water Supply Well

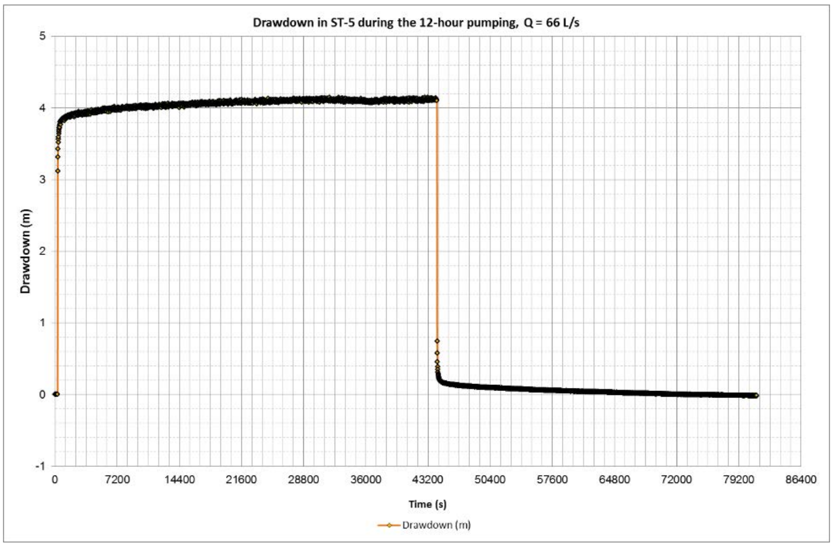


Figure 4.18: Time – Drawdown Plot for the Constant Discharge Test in ST-5 Water Supply Well

Assessment of the pumping test results from water supply wells indicated that the potential impacts on community water resources that might originate due to groundwater pumping will be negligible for supplying an amount of ~4 L/s. The tests have been performed during the driest period of the year which means the lowest groundwater recharge for the alluvium aquifer. Therefore, the tests results were evaluated as the worst case scenario.

4.4.4 Tailings Storage Facilities and Waste Rock Dumps

4.4.4.1 Initial Conditions

Numerical groundwater flow model was also run to simulate seepage transport from the bottom of the WRDs and TSFs. As the worst case scenario, advective transport of the particles was introduced to the model. The run was conducted to simulate 100 years from beginning of the closure phase, assuming that the planned Taşköprü Dam is already in place with a water elevation at 508 m. The model cells assigned for the Taşköprü Dam area were introduced to the model as constant head boundary at 508 m elevation.

As the operations cease, groundwater level starts to rise back to its original position. Also presented in Section 4.4.2, the pit lake is expected to reach its maximum elevation at 431 masl, approximately 45 years after the closure phase starts. Hence, the progressive pit lake elevations were introduced to the model as time-variable constant heads for the first 45 years of closure.

Each WRD and TSF was introduced to the model as a potential source of contamination that was simulated by particle tracking process starting from the outer boundaries of each project unit. Nearest receptors were taken into consideration in assessing the potential impacts of the contaminant transport on water resources. The nearest receptors were identified as:

- Gökırmak River for the Bağdere TSF,
- Yılanlı Stream for the Kepezkaya TSF,
- Gökırmak River for the Çorakoğlu WRD,
- Planned Taşköprü Dam for the Gelberi WRD.

Once the initial conditions are specified, a 100-year simulation was run under transient conditions to estimate the time for potential seepages for each project unit to reach the nearest receptors. MODPATH Particle Tracking module was used to simulate the transport processes assuming that the particles are transported via advection as a conservative approach. Particles were introduced as the potential contaminants directly to the saturated zone without any travel through the unsaturated zone. This makes the approach more conservative as the mobilization of the contaminants in the unsaturated zone will take some additional time as well.

4.4.4.2 Tailings Storage Facilities

Potential damages/defects on the impervious bottom liner can create seepages from the bottom of TSFs that may further reach to groundwater. Resultant waters can involve pollution and ARD/ML-related impacts which have been assessed within the scope of the Geochemical Impact Assessment by Geochemico. This section presents the prediction of potential leakage rate beneath the TSFs and the results for the numerical modeling of TSF seepages and material transport through the saturated zone. Similar conservative approach for WRD seepages was also followed for the TSF seepages that the particles were introduced to the model directly to the saturated zone.

Prediction of Potential Leakage Rate beneath the Tailings Storage Facilities (TSFs) During the Operational Period

Potential seepages from the TSFs are directly related with (1) the quality of the material that was used during the construction, (2) the construction quality and (3) operational maintenance of the TSFs.

Prediction of potential leakage rate beneath the TSFs during operational period is calculated with a series of calculations that was developed by Giroud and Bonaparte (1989) and an approach that is used by US - EPA.

The proposed design of TSFs include from bottom to top, 50 cm thick compacted clay layer overlain by 1 cm geosynthetic clay layer and 2 mm thick high density polyethylene (HDPE) liner. The liner will be covered by 50 cm thick gravel, where drainage pipes with a diameter of 11 cm will be inserted (Figure 4.19). Although the HDPE liner is practically impervious, manufacturing and application errors may cause leakage and subsequent contamination of groundwater.

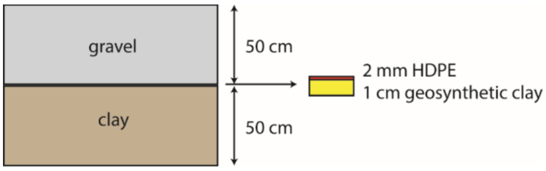


Figure 4.19 Proposed Design of the Composite Liner System beneath the TSFs

In order to predict potential leakage rate beneath the Kepezkaya and Bağdere TSFs, analytical model developed by Giroud and Bonaparte (1989) was used. According to this model, the leakage rate per unit area is calculated as:

$$\frac{Q}{A} = n \times 0.976 \times C_{q0} \times [1 + 0.1 \times (h/t_s)^{0.95}] \times d^{0.2} \times h^{0.9} \times k_s{}^{0.74}$$

Where:

Q : leakage rate (m^3/s)

A : area (m^2)

n : number of defects

C_{q0} : contact quality factor

h : head of liquid on top of geomembrane (m)

t_s : thickness of the low permeability soil component (m)

d : diameter of circular defect (m)

The good and poor contact conditions are described as follows:

- The good contact condition is achieved if the geomembrane is laid down without wrinkling on low permeability clay material which is compacted according to the standards and have a smooth upper surface (without any sharp edges, angular or coarse gravel). In this case, Cq_0=0.21.
- The poor contact condition, on the other hand, refers to the geomembrane layer that contains certain amount of wrinkles laid down on low permeability clay material which is not well-compacted and does not have a smooth upper surface. In this case, Cq_0=1.15, and calculated leakage rate will be 5 times higher compared to the good contact conditions.

According to the analytical model, the factors affecting the leakage rate are (i) the size of the hole, (ii) hydraulic conductivity of the lower clay layer, and (iii) the hydraulic head above the liner. The criteria defined by the U.S. Environmental Protection Agency (U.S. EPA) are used to calculate the leakage rate. U.S. EPA recommends to use 1 hole with a standard hole area of 10 mm^2 (hole diameter=3.57 mm) for a surface area of 4000 m^2 in such calculations.

The holes in the liner arise from manufacturing and application errors. The holes formed by manufacturing errors are generally as large as the thickness of the geomembrane in the form of a pinhole for a surface area of 4000 m^2. The holes formed during the application depend on the quality of the application, the condition of the ground, and quality assurance and quality control (QA/QC) procedures. In general, the number of holes where good practice is applied is one in 4000 m^2. On the other hand, the number of holes is increased to 20 in 4000 m^2 where bad practice is applied. In order to evaluate the performance of the liner system, both good contact and good application conditions and poor contact and poor application conditions were considered. The hydraulic head value above the liner is taken as 11 cm, which equals to the diameter of the drainage pipes within the gravel layer. The calculations were also repeated by considering the hydraulic head value of 50 cm, which is the thickness of the gravel layer above the liner. For different hydraulic conductivity values of the clay layer (i.e. 1E-7 m/s and 1E-8 m/s), the leakage rates were calculated using the above equation (Table 4.5, Table 4.6).

Table 4.5 Calculated leakage rates for hydraulic head above the liner equals to 0.11 m

Hydraulic Conductivity of the Clay Layer (m/s)	Leakage Rate ($m^3/s/m^2$)	
	Good contact and good application	Poor contact and poor application
1.00E-07	1.54E-11	1.69E-09
1.00E-08	2.80E-12	3.07E-10

Table 4.6 Calculated leakage rates for hydraulic head above the liner equals to 0.5 m

Hydraulic Conductivity of the Clay Layer (m/s)	Leakage Rate ($m^3/s/m^2$)	
	Good contact and good application	Poor contact and poor application
1.00E-07	6.47E-11	7.08E-09
1.00E-08	1.18E-11	1.29E-09

The total area that will be lined and tailings will be stored is calculated as 254,800 m^2 and 360,700 m^2 for Kepezkaya and Bağdere TSFs, respectively. Considering that an independent, specialized consultant is on site for the QA/QC of the construction, the facility is being built in accordance with the relevant legislation and codes, and also taking the account that the hydraulic conductivity of the clay layer to be used in the construction of the TSFs are lower than 1.00E-08 m/s, the potential discharge rate from the Kepezkaya and Bağdere TSFs are calculatedas 3.0E-03 L/s and 4.26E-03 L/s assuming that the hydraulic head above the liner is 0.5 m. Furthermore, this insignificant amount can be decreased about five fold with good operation of the drainage mechanism (i.e. 0.11 m hydraulic head above the liner).

Further model runs were also completed for a single particle that can pass through the liner and clay layer, travel through unsaturated zone and reach to groundwater. These runs were completed to estimate the tracking time of a single particle that is released to groundwater (from the TSF) and that can reach to nearest sensitive receptors. The details of these runs are given below.

Kepezkaya TSF

Located on a valley to the east of Hanönü, the closest receptor to Kepezkaya TSF is determined to be the Yılanlı Stream. An initial run was completed to simulate the particle transport from the perimeter of the TSF. The fastest flow path that reaches to the Yılanlı Stream was determined to be the western side of the TSF (embankment zone). Three particles were introduced to this area assuming that there is no travel time for the unsaturated zone. Simulations indicated that the fastest particle will not reach even halfway to the Yılanlı Stream within 100 years in the case of the scenario described above. The flow conditions for Kepezkaya area were re-evaluated and it was noted that the groundwater flow in this area stays steady during the 100-year transient run. Thus, a second steady state run was completed to estimate the travel time of a single particle that is released from Kepezkaya. It was noted that it will take more than 300 years for a particle released to groundwater from the TSF to reach to the Yılanlı Stream (Figure 4.20).

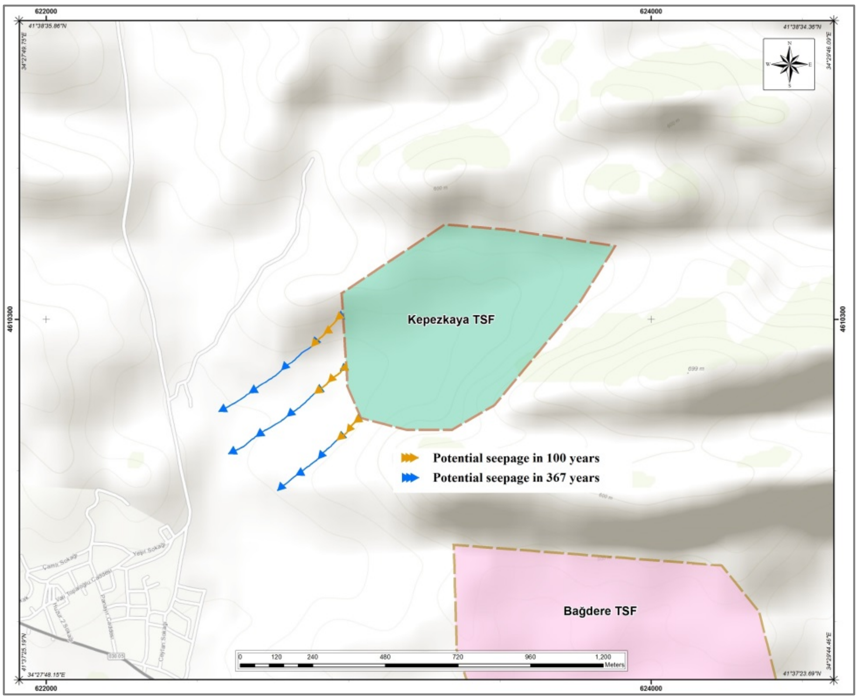


Figure 4.20: Potential Seepage Pathways for the Kepezkaya TSF

Bağdere TSF

Located on the southern side of the Kepezkaya TSF, the closest receptor to Bağdere TSF is determined to be the Gökırmak River. An initial run was completed to simulate the particle transport from the perimeter of the TSF. The fastest flow path that reaches to the Gökırmak River was determined to be the southern side of the TSF (embankment zone). Three particles were introduced to this area assuming that there is no travel time for the unsaturated zone. Simulations indicated that the fastest particle will reach to the Gökırmak River within 64 years in the case of the scenario described above (Figure 4.21).

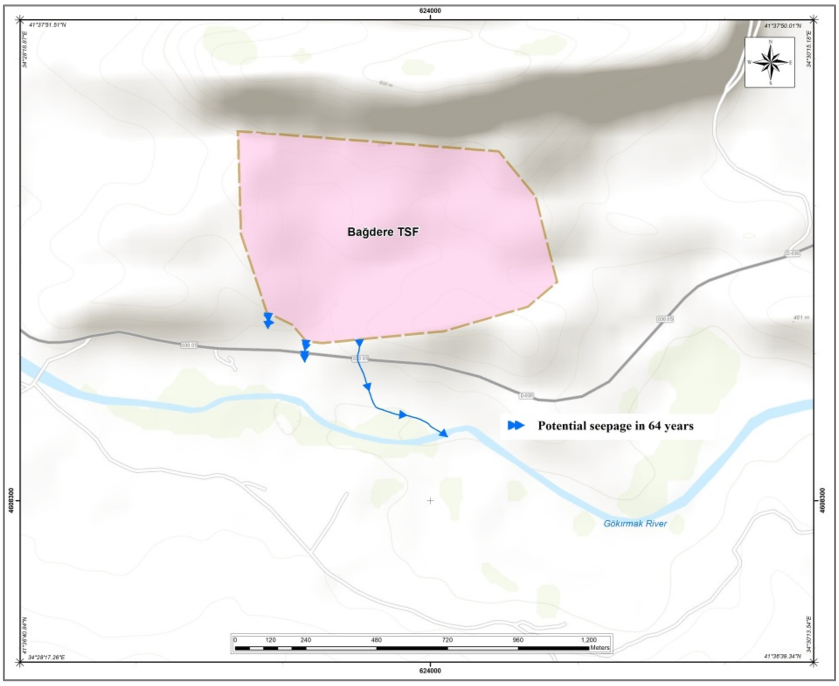


Figure 4.21: Potential Seepage Pathways for the Bağdere TSF

Information on nearest receptors to the TSFs, their distance to seepage source and particle transport time are summarized in Table 4.7. A groundwater monitoring will need to be implemented to monitor groundwater quality on the critical flow paths. Details on monitoring locations are given in Section 5.1.

Table 4.7: Information on Nearest Receptors, Their Distance and Estimated Travel Times for the Potential TSF Seepages

Project unit	Nearest receptor	Receptor's distance to Project Unit (m)	Particle transport time (years)
Kepezkaya TSF	Yılanlı Stream	450 m	> 300
Bağdere TSF	Gökırmak River	350 m	64

4.4.4.3 Waste Rock Dumps

Waste rock generated from the open pit will primarily be deposited in the Çorakoğlu WRD. Gelberi WRD is not planned to be used at this stage of the Project. However impact assessment for the waste rock dumps were carried out for both WRDs in the Project Area.

Çorakoğlu WRD

Located in the north of the open pit, the closest receptor to Çorakoğlu WRD is determined to be the Gökırmak River. An initial run was completed to simulate the particle transport from the perimeter of the WRD. The fastest flow path that reaches to the Gökırmak River was observed to be the southwestern corner of the dump. Three particles were introduced to this area assuming that there is no travel time for the unsaturated zone. Simulations indicated that the fastest particle will reach to Gökırmak River within 79.1 years in the case of the scenario described above (Figure 4.22). The ultimate point for the particles to reach is assumed to be the Gökırmak River for the closure period.

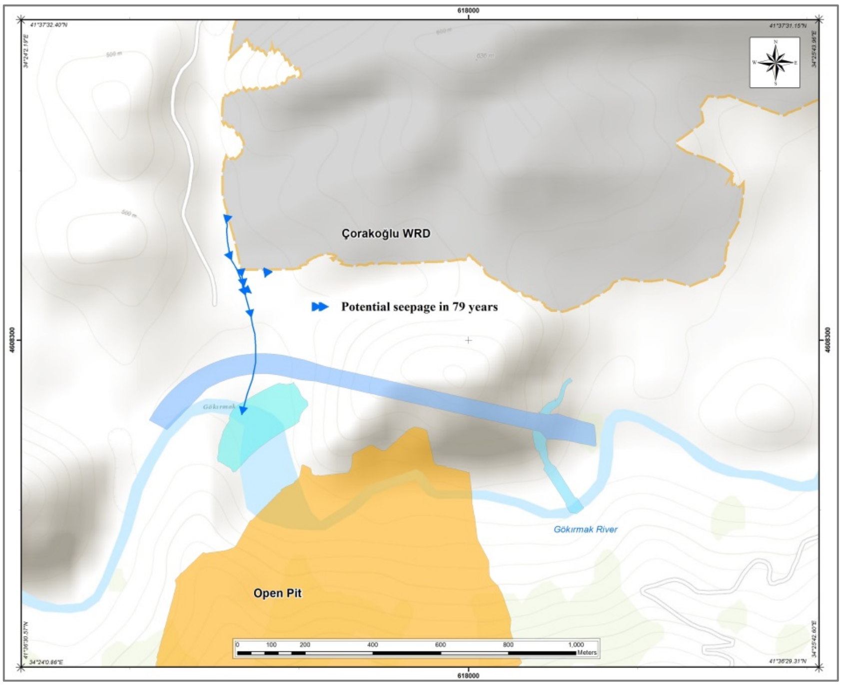


Figure 4.22: Potential Seepage Pathways for the Çorakoğlu WRD

Gelberi WRD

Although Gelberi WRD is not planned to be used at this stage of the Project, the potential travel time for any release from this area is also estimated. Gelberi WRD is planned to be located in the west of the open pit, within the catchment of the proposed Taşköprü Dam. The closest receptor to the Gelberi WRD was identified as the Taşköprü Dam reservoir. An initial run was completed to simulate the particle transport from the perimeter of the WRD. The fastest flow path that reaches to the Taşköprü Dam reservoir was observed to be the north of the dump. Four particles were introduced to this area assuming that there is no travel time for the unsaturated zone. Simulations indicated that the fastest particle will reach to Taşköprü Dam reservoir within 40.5 years in the case of the scenario described above (Figure 4.23).

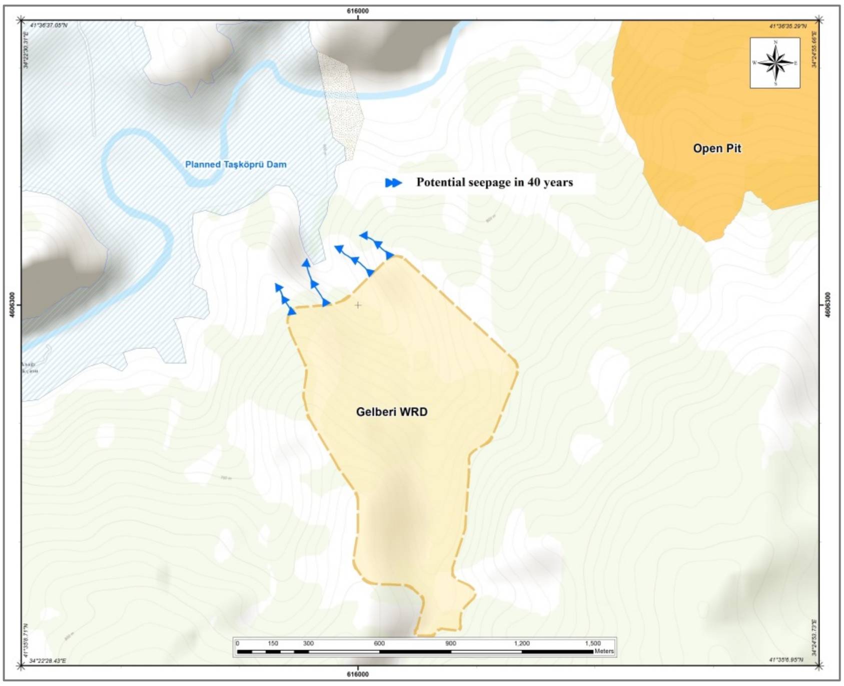


Figure 4.23: Potential Seepage Pathway for the Gelberi WRD

Information on nearest receptors to the WRDs, their distance to seepage source and particle transport time is summarized in Table 4.8. A groundwater monitoring will need to be implemented to monitor groundwater quality on the critical flow paths. Details on monitoring locations are provided in Section 5.1.

Table 4.8: Information on Nearest Receptors, Their Distance and Estimated Travel Times for the Potential WRD Seepages

Project unit	Nearest receptor	Receptor's distance to project unit (m)	Particle transport time (years)
Çorakoğlu WRD	Gökırmak River	280 m	79.1
Gelberi WRD	Planned Taşköprü Dam	270 m	40.5

As it is seen in Table 4.8, Gelberi WRD has the shortest particle transport time. Taking the account of the location of the planned Taşköprü Dam (Gelberi WRD downstream) and potential safety risks, construction of a waste rock dump in this location is not recommended by AECOM.

5. Monitoring Program

Monitoring program for the GCP was first developed in 2013 and revised in 2014 within the scope of the two EIA studies that were previously carried out (ENVY, 2013; ENVY 2014). It consists of the monitoring of flow rates, physical and chemical parameters at the existing surface water and groundwater locations as well as the additional proposed locations in the project area. The monitoring plan specified in the EIA reports is being carried out as legal commitments to be presented to the Turkish Ministry of Environment and Urbanization.

Based on the EIA monitoring plan, water resources are planned to be monitored monthly during the operational phase; quarterly during the closure phase and semi-annually during the post-closure phase. Details of the EIA monitoring plan are provided below:

- Drinking water resources are also incorporated in the EIA monitoring program as drinking water resources located in the downstream of the Project Area will be sampled/monitored quarterly.
- Any potential impact that might originate from the TSFs will be monitored via groundwater monitoring wells that are to be installed downstream (a minimum of two monitoring wells) and upstream (a minimum of one monitoring well) locations prior to construction phase of the Project. Sampling/monitoring will be carried out in these wells on a monthly basis.
- According to the EIA report (ENVY, 2013), a minimum of two monitoring wells will be installed in addition to the existing monitoring wells for groundwater monitoring in the open pit area.
- In order to monitor the potential ARD/ML impacts, seepage waters will be collected in sedimentation ponds to be sampled/monitored on a monthly basis. Discharge rate measurements will be carried out on a daily basis while physical parameters (pH, EC, T and TDS) will be measured weekly.
- EIA states that the hydrogeological characterization necessary for the operational and closure phases of the Project will be revised and associated mitigation measures will be evaluated based on the numerical modelling results. The results will be updated every 5 years to be presented to State Hydraulic Works (DSI).
- A total of 4 additional monitoring well will be installed in the north, west, southwest and east of the Çorakoğlu WRD to collect samples once every six months. Any potential impacts of the seepage waters will be monitored in these monitoring wells.

RPS Aquaterra also recommended a water monitoring strategy within the Mine Water Management report (RPS, 2015). It consists of recommendations for monitoring surface water flow, surface water quality and groundwater quality.

5.1 Mine Water Monitoring Plan

A monitoring program was developed for water resources in order to prevent/minimize potential risks that might arise during the construction, operation and closure phases of the Project. The monitoring plan will comprise both in situ measurements and field samplings that aim to monitor the quantity and quality of the surface waters and groundwater over the project phases. Water monitoring plan will be implemented in compliance with the relevant regulatory criteria for surface waters and groundwater. Monitoring will be continued 10 years after the closure phase starts unless any significant change in water quality during the closure is observed. Monitoring plan and monitoring frequencies are provided in Table 5.1 and Table 5.2 while the details are presented below. Locations for the monitoring locations are shown through Figure 5.1 and Figure 5.3.

5.1.1 Surface Waters

Gökırmak River and its sidelong branches

Surface water locations along the Gökırmak River and its sidelong branches will be monitored to ensure there is no adverse impact which might originate from the mining activities. Field parameters / flow rate measurements and water quality sampling will be carried out. Analysis results and field measurements will be compared with relevant EU criteria and the quality criteria specified in Annex 5 – Table 5 of the Turkish Surface Water Quality Regulation.

Open pit lake

In order to evaluate groundwater inflow to the open pit during the operational phase, flow rate measurements and field parameters will be carried out monthly. Pit lake water quality will be monitored by collecting samples from the pit lake quarterly in a year.

As the mining activities are terminated and the groundwater level starts to rebound back to its original position, monthly measurements of flow rate, pit lake water level and field parameters will be carried out. Samples from the open pit lake will be collected quarterly in the first two years of the post-closure phase, semi-annually between 2nd and 4th years of the post-closure and annually for the latter periods of the post-closure phase. Analysis results will be compared with relevant EU criteria and Inland Water Quality Criteria specified in Table 1 of the Turkish Water Pollution and Control Regulation.

Diversion tunnel outlet flow rates

Flow rate and field parameters will be measured at the outlet of the diversion tunnel to monitor the amount of water that will be diverted. This will further provide a long term dataset for the Gökırmak River within the Project Area.

Sedimentation ponds

In reference to Mine Water Management Report prepared by RPS Aqterra (RPS, 2015 – See Volume-III of the ESIA Disclosure Package), pit dewatering / pit wall runoff waters and WRD seepage waters will be captured in downstream sedimentation ponds. As for the selection of sedimentation ponds that will be used for monitoring purposes, locations and IDs specified in RPS Aquaterra's Mine Water Management Report was used. In order to determine the quantity and quality of seepage waters, collected water volumes will be measured monthly along with field parameters. Sampling surveys will be carried out quarterly. During the time of preparation of the Mine Water Management Report, footprint area and design for the Gelberi WRD is known to be different.

Analysis results will be compared with relevant EU criteria and Inland Water Quality Criteria and Effluent Discharge Criteria for Mining Industry Wastewaters (prior to discharge, if any) specified in Turkish Water Pollution and Control Regulation.

5.1.2 Groundwater

Open Pit Monitoring Wells

Groundwater wells located in the upstream and downstream locations of the open pit will be monitored for field parameters and groundwater levels. Water quality sampling surveys will be carried out in the monitoring wells. A total of 10 new monitoring wells will be installed in the pit area to monitor groundwater quantity and quality while one well, already drilled within the schists, will also be used for monitoring purposes. Three wells will be installed on the western, eastern and southern boundaries of the pit while seven wells will be installed in the areas where the cofferdams are located. These wells will be completed prior to commence production. Monitoring purpose for the open pit wells are provided below:

- Three monitoring wells (GK-15, GK-16, GK-17) to monitor water levels and water quality. Dewatering impacts will also be monitored from these wells during the operational phase. The wells are recommended to be completed with a casing and screen diameter of 175 mm. The well depths should extend 20 m lower than the ultimate pit bottom at each well location.

- Three monitoring wells next to upstream cofferdam to monitor water levels and water quality within the alluvium (GK-22 and GK-23) and schist (BOBH). Alluvium wells are recommended to be constructed with larger diameter (Ø >= 280 mm) for an additional purpose of emergency dewatering, if needed. Monitoring wells within the schist are recommended to be completed with a casing and screen diameter of 175 mm.
- 5 monitoring wells next to downstream cofferdam to monitor water levels and water quality within the alluvium (GK-18, GK-19, GK-20 and GK-30) and schists (GK-21). Alluvium wells are recommended to be constructed with larger diameter (Ø >= 280 mm) for an additional purpose of emergency dewatering, if needed. Monitoring wells within the schist are recommended to be completed with a casing and screen diameter of 175 mm.

In addition to the above-mentioned 10 monitoring wells, one pumping well (WSW-1), currently being used for water supply purposes for the Küpeli and Aşağıküreçay villages, will also be monitored in terms of water levels and water quality.

Waste Rock Dumps Monitoring Wells

Groundwater monitoring in the Çorakoğlu WRD will be carried out in 5 monitoring wells to detect any potential seepage in downstream. Since the groundwater table forms an irregular mound in the Çorakoğlu Hill and groundwater flow occurs radially from the zone of groundwater high, potential flow paths will be monitored in the wells. In addition to the previously-drilled GK-6 and GK-7 wells, three more wells will be drilled for monitoring purposes. One monitoring well will be installed in the downstream of the Gelberi WRD. Field parameters and water levels will be monitored and water quality samplings will be performed in the monitoring wells.

Tailings Storage Facilities Monitoring Wells

Groundwater monitoring in the Kepezkaya TSF will be carried out in 4 monitoring wells to detect any potential seepage in downstream. In addition to the previously-drilled GK-13 and IK-3 wells, one monitoring well will also be drilled in downstream to monitor southwest end of the TSF. One monitoring well (GK-14) will be installed in the upstream of the Kepezkaya TSF in order to collect data from un-impacted zone. Field parameters and water levels will be monitored and water quality samplings will be performed in the monitoring wells. As for the Bağdere TSF, in addition to previously-drilled wells, one monitoring well in the un impacted upstream zone (GK-31) will be installed. Furthermore, one more downstream monitoring well on critical flow path (GK-25) will be needed. Therefore monitoring in Bağdere TSF will be conducted in four monitoring wells. Analysis results will be compared with relevant EU criteria and Inland Water Quality Criteria specified in Table 1 of the Water Pollution and Control Regulation.

A total of 28 monitoring wells (8 existing wells, 20 additional wells) will be installed in the Project Area to monitor groundwater levels and groundwater quality representative for each project unit. AECOM recommends real time monitoring (groundwater levels, pH and EC) in the TSF monitoring wells in order for Acacia to detect any potential impact early enough to take action.

Springs, Fountains and Village Water Depots

In order to monitor any potential impact of the mining activities on drinking water, springs, fountains and village water depots located in the downstream of the project units will also be monitored. These locations will be monitored for field parameters and flow rate measurements. Water quality sampling surveys will also be carried out in accordance with the intervals specified in Table 5.1.

5.1.3 Process Waters and Operational Structures

Tailings samples will be collected and analyzed in accordance with relevant regulatory criteria. In order to monitor site water balance, daily flow rates of the process tailings that is to be transmitted to TSFs will be measured. Stability and durability of the operational structures such as TSF embankments, diversion channels, sedimentation ponds and culvert structures will be inspected regularly to ensure if they function properly throughout the project lifetime. This will ensure that the stability of the structures is maintained over long term.

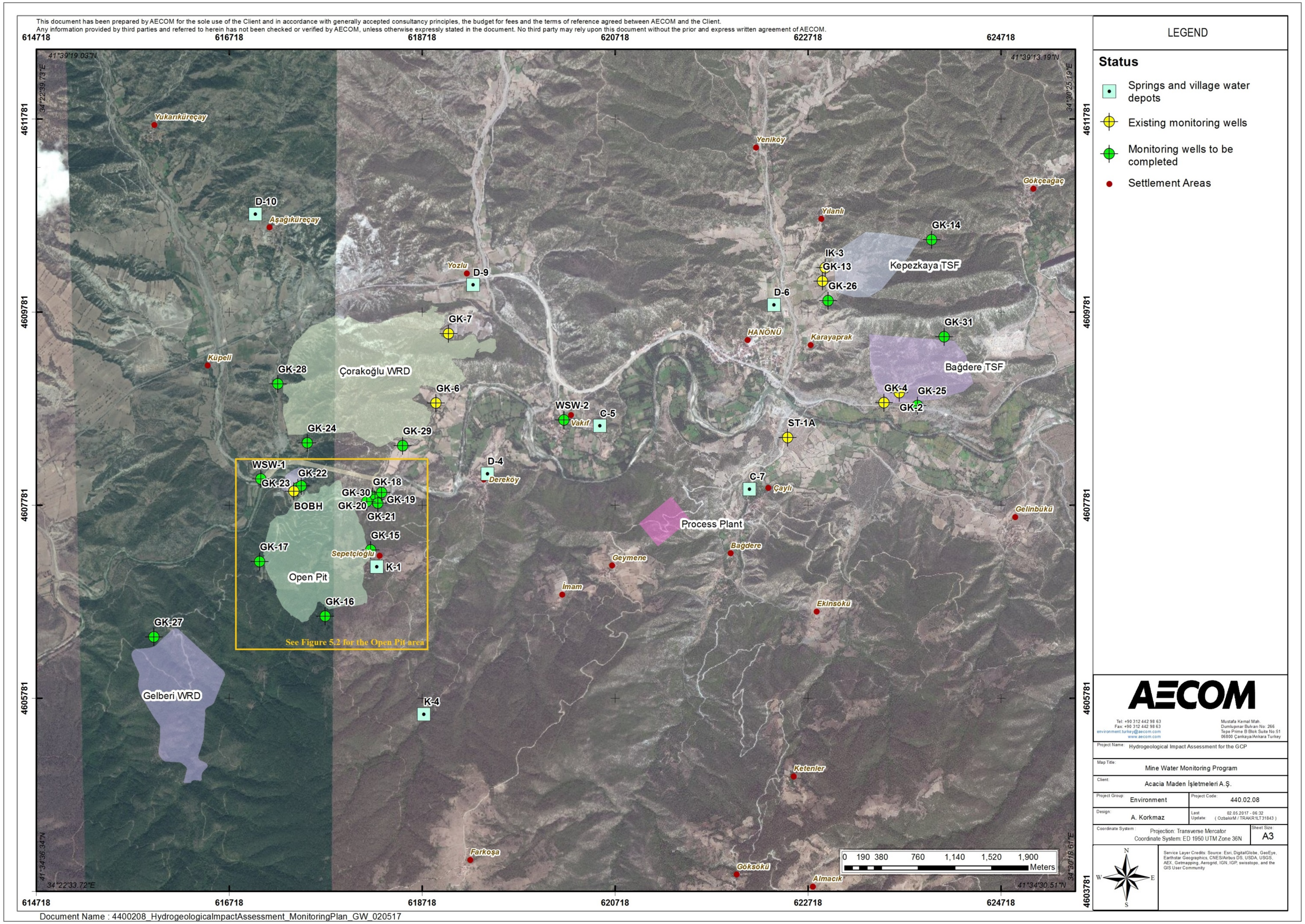


Figure 5.1: Groundwater (Monitoring Wells, Sprigs and Water Depots) Monitoring Locations for the Project Area

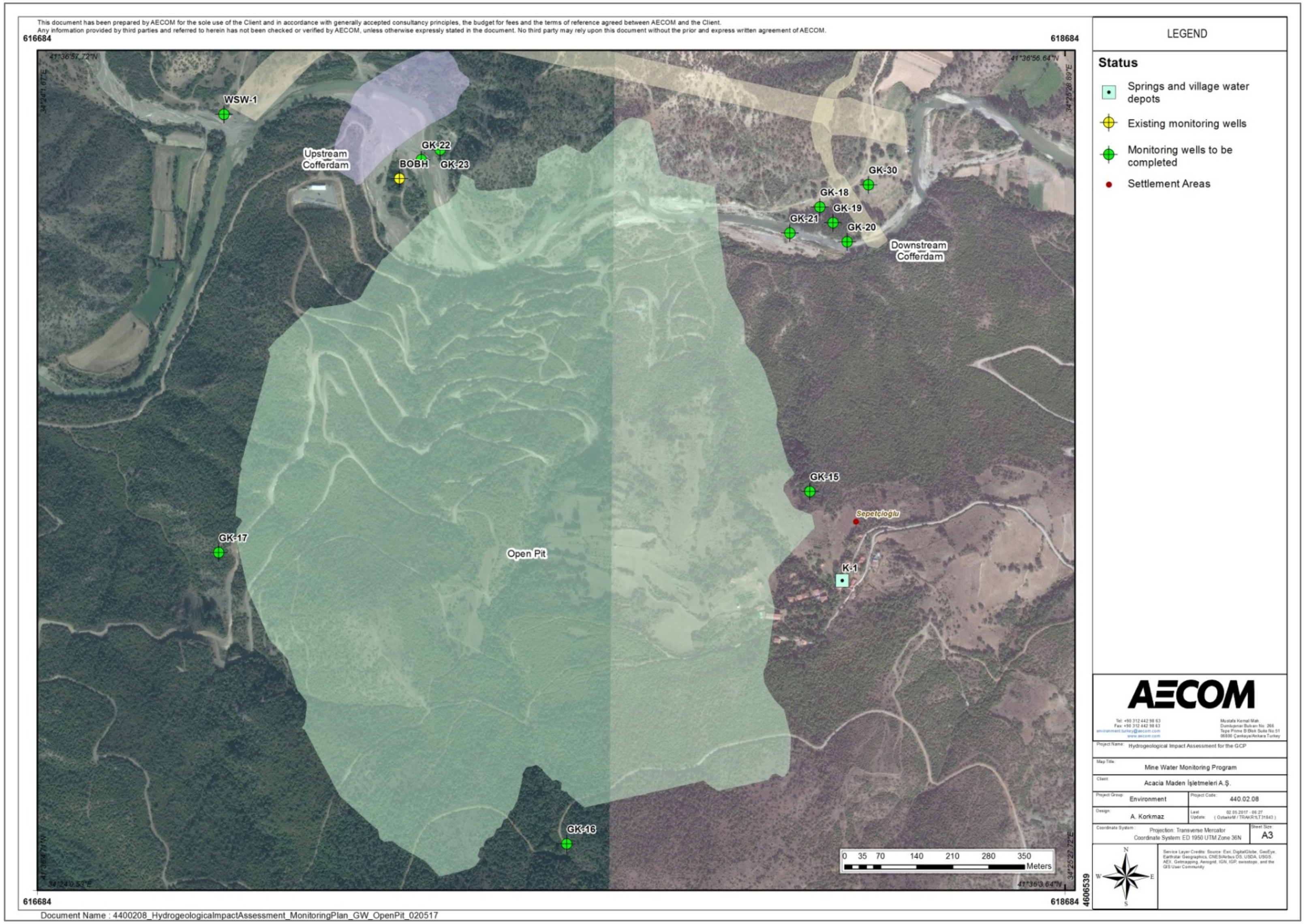


Figure 5.2: Groundwater (Monitoring Wells, Sprigs and Water Depots) Monitoring Locations for the Open Pit

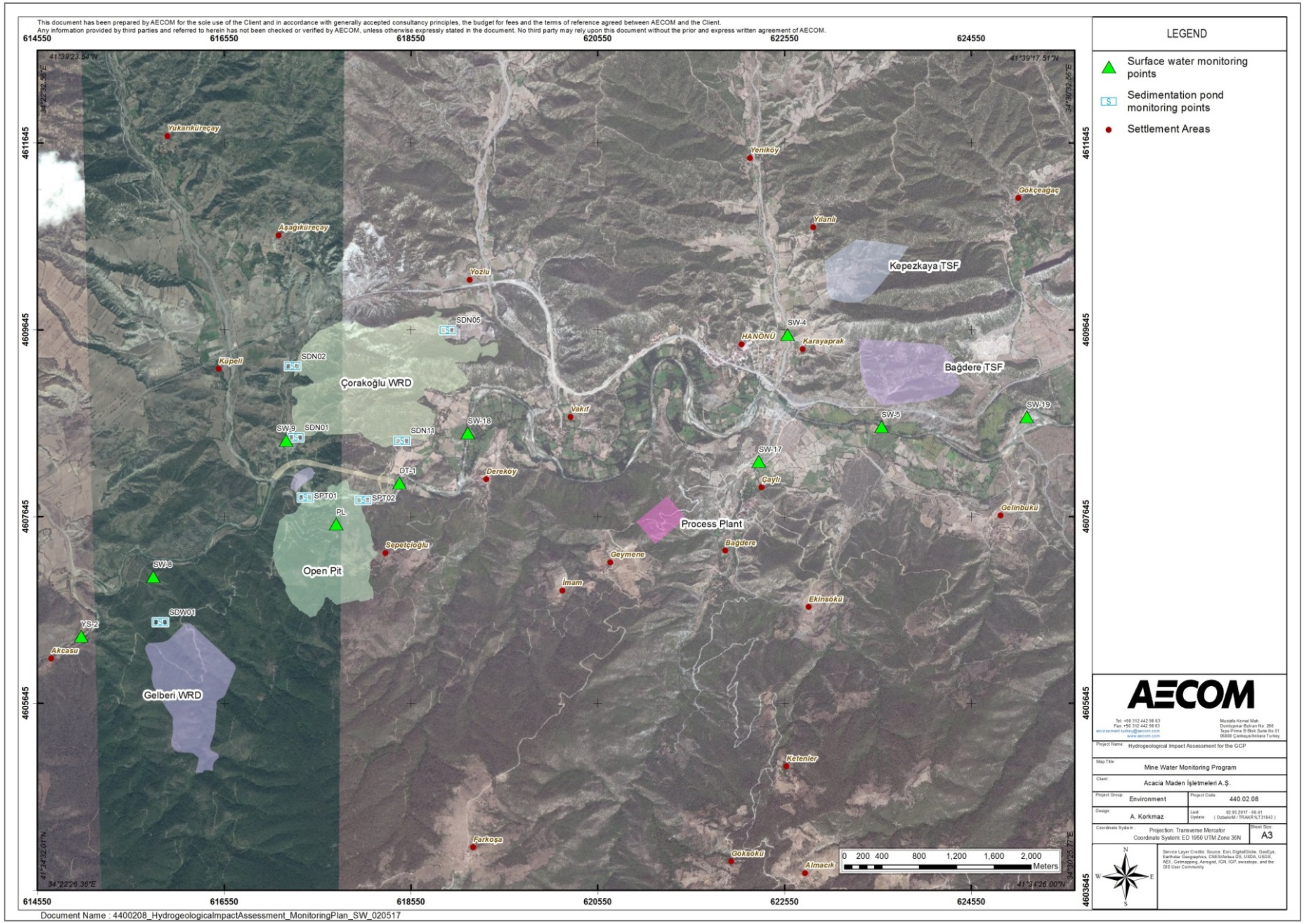


Figure 5.3: Surface Water Monitoring (Pit Lake, Streams and Sedimentation Ponds) Locations for the Project Area

Table 5.1: Water Monitoring Plan for the GCP

	Monitoring Location	Objective of Monitoring	Monitoring Frequency	Monitoring Parameters	Project Phase
Surface Waters	Gökırmak River (YS-2, SW-5, SW-18, SW-19, DT-1)	Gökırmak River flow rate and water quality monitoring (downstream sections of WRDs, TSF and the Open Pit)	**Construction and Operational Phases** Field parameter and flow measurements: Monthly Field sampling: Quarterly **Post-closure Phase** Field parameters, flow measurements and field sampling: Quarterly (first two years of closure), semi-annually (2 to 4 years of closure), and annually (4 years after closure).	EU Water Framework Directive Turkish Surface Water Quality Regulation, Annex 5 - Table 5: Quality Criteria for the Inland Surface Water Resources	Construction, Operational and Post-Closure Phases
Surface Waters	Gökırmak River sidelong branches (SW-4, SW-8, SW-9, SW-17)	Gökırmak River sidelong branches flow rate and water quality monitoring (downstream sections of WRDs, TSF and the Open Pit)	**Construction and Operational Phases** Field parameter and flow measurements: Monthly Field sampling: Quarterly **Post-closure Phase** Field parameters, flow measurements and field sampling: Quarterly (first two years of closure), semi-annually (2 to 4 years of closure), and annually (4 years after closure).	EU Water Framework Directive Turkish Surface Water Quality Regulation, Annex 5 - Table 5: Quality Criteria for the Inland Surface Water Resources	Construction, Operational and Post-Closure Phases
Surface Waters	Open pit lake (PL)	Pit lake water level and water quality monitoring	**Operational Phase** Field parameter and pit inflow measurements: Monthly Field sampling: Quarterly **Post-closure Phase** Field parameter and pit inflow measurements: Monthly Field sampling: Quarterly (first two years of closure), semi-annually (2 to 4 years of closure), and annually (4 years after closure).	EU Water Framework Directive Turkish Water Pollution and Control Regulation, Table 1: Quality Criteria for the Inland Water Resources	Operational and Post-Closure Phases
Surface Waters	Sedimentation Ponds (SPT01, SPT02, SDN01, SDN02, SDN05, SDN11)	Water quantity and quality monitoring for waters that are captured in sedimentation ponds	**Construction and Operational Phases** Field parameter and flow measurements: Monthly Field sampling: Quarterly	EU Water Framework Directive Turkish Water Pollution and Control Regulation, Table 1: Quality Criteria for the Inland Water Resources	Operational and Post-Closure Phases
Groundwater	**Monitoring Wells**				
Groundwater	Open pit (WSW-1, GK-15, GK-16, GK-17, GK-18, GK-19, GK-20, GK-21, GK-22, GK-23, GK-30, BOBH) Çorakoğlu WRD (GK-6, GK-7, GK-24, GK-28, GK-29, Gelberi WRD (GK-27) Kepezkaya TSF (GK-13, GK-14, IK-3, GK-26) Bağdere TSF (GK-2, GK-4, GK-25,GK-31)	Groundwater level and quality monitoring in existing and planned monitoring wells.	**Construction and Operational Phases** Field parameter and static water level measurements: Monthly Field sampling: Quarterly **Post-closure Phase** Field parameters, static water level, flow measurements and field sampling: Quarterly (first two years of closure), semi-annually (2 to 4 years of closure), and annually (4 years after closure).	EU Water Framework Directive Turkish Water Pollution and Control Regulation, Table 1: Quality Criteria for the Inland Water Resources	Construction, Operational and Post-Closure Phases
Groundwater	**Springs, fountains and village water depots** (K-1, K-4, C-5, C-7, D-4, D-6, D-9, D-10)	Groundwater flow rate and quality monitoring (springs located in the downstream of WRDs, TSFs and the open pit, if any). Drinking water quantity and quality monitoring (fountains and village water depots located within the Project Area)	**Construction and Operational Phases** Field parameter and flow measurements: Monthly Field sampling: Quarterly **Post-closure Phase** Field parameters, flow measurements and field sampling: Quarterly (first two years of closure), semi-annually (2 to 4 years of closure), and annually (4 years after closure).	EU Water Framework Directive Turkish Water Pollution and Control Regulation, Table 1: Quality Criteria for the Inland Water Resources	Construction, Operational and Post-Closure Phases
Discharge Waters	Discharge Waters	Discharge water quality monitoring, if any.	Prior to discharge, if any.	EU Water Framework Directive Turkish Water Pollution and Control Regulation, Table 7.1: Effluent Discharge Criteria for Mining Industry Wastewaters	Operational Phase

Table 5.2: Monitoring Plan for the Operational Water Structures

Monitoring Location	Objective	Monitoring Frequency	Monitoring Parameters	Project Phase
Process tailings discharge	Monitoring of site water balance	Daily measurements	Tailings discharge rate	Operation
Process tailings	Monitoring chemical composition of the tailings material	Annual analysis	Physical parameters and metals	Operation
TSF embankment	Monitoring physical stability of the TSF	Daily observations, monthly measurements	Consolidation and stress	Operation and Post-Closure
Diversion channels and Sedimentation ponds	Monitoring sustainability of the diversion channels	Weekly observations	Water level and stability	Operation and Post-Closure
Culvert structures and waterways	Monitoring sustainability of the culvert structures waterways	Weekly observations	River flow rate and culvert stability	Operation and Post-Closure

6. Mine Water Balance

This chapter presents the mine water balance developed for the Gökırmak Copper Mine project. The study combines groundwater and surface water components to evaluate the quantity of water entering and leaving various project facilities, namely open pit, TSFs, process plant and sedimentation ponds. The details of water inflows and outflows for each facility are explained below.

6.1 Open Pit

The main sources of water inflow to the open pit are groundwater inflows and rainfall runoff, whereas evaporation and pit dewatering comprise the outflow components. In order to assess the inflow and outflow components, the pit area has been divided into two sub-catchments based on 440 mRl elevation. For the inflows above that elevation gravity drainage is planned to be used to channel out the water. On the other hand, water inflows below 440 mRl is planned to be collected at the pit sump, and pumped out of the pit (RPS, 2015).

A three-dimensional groundwater flow model developed by AECOM (AECOM, 2017) is used to assess the amount of groundwater inflow during 13 years of operation period. According to the model results, the groundwater inflow rate, for the elevations below 440 mRl, ranges between 213 m^3/day (year 1) and 2163 m^3/day (year 4), with an average rate of 1457 m^3/day (Table 6.1).

Table 6.1: Yearly Groundwater Inflow Rates to the Open Pit

Years	Groundwater Inflow Rates (m^3/day)	
	Below 440 mRl	Above 440 mRl
1	213	291
2	1427	159
3	1754	166
4	2163	168
5	1689	302
6	1551	317
7	1597	286
8	1566	299
9	1400	273
10	1352	215
11	1375	190
12	1436	202
13	1425	273

In order to predict the average annual surface water inflow to the pit, mean annual precipitation data measured at Hanönü Meteorological Station (i.e. 492 mm) and runoff coefficient (RoC) values were used. Runoff coefficient is required to estimate the proportion of total rainfall that actually runs offs, and depends on rainfall intensity, topography and ground conditions. The inflow volume from rainfall runoff is calculated according to Equiation 1.

$$Inflow\ Volume\ (m^3) = RoC * Area(m^2) * Rainfall(m) \qquad (1)$$

The runoff coefficient values considering average annual rainfall is taken as 0.45 for pit and external catchment area (RPS, 2015). The corresponding areas for above and below 440 mRl elevation are determined from yearly pit progress drawings. In Table 6.2, the catchment areas for elevations below and above 440 mRl and corresponding rainfall runoff inflows during operation period are summarized. The average rainfall runoff values ranges from 0 to 99874 m^3/year and from 89756 to 169592 m^3/year for elevations below and above 440 mRl, respectively. The average rainfall runoff rates originating below 440 mRl is calculated as 199 m^3/day and considered as direct inflow to the open pit sump. On the other hand, for elevations above the 440 mRl, rainfall runoff inflows will be directed to the sedimentation ponds via diversion channels that will be constructed along the pit perimeter, and hence is not included in pit water balance.

Table 6.2: Pit Catchment Areas and Average Annual Rainfall Runoff Inflow Rates for Operation Period

Years	Pit Catchment (km2)		Average Annual Rainfall Runoff Inflow (m3/year)	
	Below 440 mRl	Above 440 mRl	Below 440 mRl	Above 440 mRl
1	0.00	0.41	0	89756
2	0.13	0.48	28583	105696
3	0.21	0.59	47202	130914
4	0.21	0.72	47269	160028
5	0.33	0.71	73748	157615
6	0.33	0.75	74036	166404
7	0.33	0.77	73726	169592
8	0.45	0.67	99763	147320
9	0.45	0.66	99874	147209
10	0.45	0.66	99874	147209
11	0.45	0.66	99874	147209
12	0.45	0.66	99874	147209
13	0.45	0.66	99874	147209

Evaporation from the open pit can be expected from the pit sump, which will have a negligible rate compared to other components, hence is not considered herein. The main outflow component from open pit is pit dewatering, which includes extraction of waters originating from both groundwater inflows and rainfall runoff. The amount of water from pit dewatering is calculated as 1656 m^3/day.

6.2 Sedimentation Ponds

According to RPS (2015) the mine water is planned to be managed by separating into 'clean water' and 'dirty water'. Clean water comes from non-impacted catchments, whereas; dirty water comes from catchments impacted by the Project developments. Clean water derived from rainfall runoff from the non-impacted catchments is not directed to the sedimentation ponds prior to discharge to the environment; hence it is not included in the water balance. On the other hand, dirty water derived from rainfall runoff from the impacted catchments (e.g. waste dumps) is planned to be directed to sedimentation ponds in order to be used in the mining activities (drilling, dust suppression, etc). The total capacity of WRD sedimentation ponds is approximately 1200 m^3 (RPS 2015).

The main water inflow to the sedimentation ponds is from pit dewatering, which is determined as 1656 m^3/day. The inflows from groundwater and surface water from the pit (corresponding the area above 440 mRl elevation) is another input for sedimentation ponds. The groundwater inflow rate from the pit to the sedimentation ponds is determined from the numerical model results, which ranges from 159 m^3/day (year 2) to 317 m^3/day (year 6), with an average value of 242 m^3/day (Table 1.1). The surface water inflow to the sedimentation pond is expected from the elevations above 440 mRl, which is the directed rainfall runoff inflow to the pit. The average surface water inflow from the pit to the sedimentation ponds is calculated as 392 m^3/day (Table 1.2).

The evaporation and seepage losses from the sedimentation ponds are negligible, hence are not included in the water balance calculations. The water retained in the ponds is either used for dust suppression or transported to the process water tank to be used in process plant. The projected daily water demand for dust suppression for operational phase is calculated by RPS (2015), where the average rate is determined as 307 m^3/day (Table 6.3). The amont of water that feeds the process water tank is calculated as 1982 m^3/day which seems to be excess water; however, some of the water could be discharged to environment if the discharge water quality standards are satisfied.

Table 6.3: Project Daily Water Demand for Dust Suppression During the Operational Period (RPS, 2015)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily water consumption (m^3)	160	160	240	320	320	400	480	480	400	320	240	160

6.3 Process Water Tank and Fresh Water Tank

The process water tank receives water from fresh water tank, sedimentation ponds, process plant and TSF return water. The amount of water inflow to the process water tank from sedimentation ponds is determined as 1982 m^3/day. Based on the water budget estimations received from Acacia, the amount of water inflow from fresh water tank, TSF return water amount and water inflow from process plant to process water tank are calculated as 326.5 m^3/day, 2702 m^3/day and 21545 m^3/day, respectively. Hence, the outflow of water from process water tank to the process plant is calculated as 24571 m^3/day.

The water supply wells drilled in the project area will be used to fill the fresh water tank. Total amount of water supplied from these wells is determined as 326.5 m^3/day. For firefighting purpose, 300 m^3 of water is needed to be reserved within the freshwater tank.

6.4 Process Plant

The only water inflow component to the process plant is from the process water tank, which is determined as 24571 m^3/day. On the other hand, process plant supplies water to the TSF (3120 m3/day) and process water tank (21545 m3/day) based on the water budget estimations received from Acacia.

6.5 Tailings Storage Facilities

There are two tailings storage facilities within the project area, namely Kepezkaya and Bağdere TSFs. Assuming that TSFs will be operated sequentially the inflows and outflows are calculated. The TSFs receive water from process plant (3120 m^3/day) and returns some of the water as input to the process water tank (2702 m^3/day). The entrained water amount in TSF is calculated as 418 m^3/day. Since TSFs are planned to be lined, the seepage losses are ignored.

The net inflow to the TSFs (from precipitation gain and evaporation loss) for average and wet years is also calculated based on the assumptions below:

- For average annual rainfall values, the long-term average monthly rainfall values for the Hanönü Meteorological Station is used. For the wet year analysis, the rainfall data from Kastamonu Meteorological Station has been examined and the wettest year in the period of record has been used.
- Kepezkaya and Bağdere TSFs are independently and sequentially filled without any overlapping period.
- The total internally draining area of the TDFs has been estimated as 254800 m^2 and 360700 m^2 for Kepezkaya and Bağdere, respectively.
- The tailings pond surface area has been assumed as 50 % of the total internally draining catchment area.
- Runoff coefficients (RoC) for average year are taken as 1 and 0.5 for pond area and remaining catchment, respectively.

Total rainfall runoff volumes have been calculated using the following formula:

$$Rainfall\ Runoff\ Volume\ (m^3) = RoC * Area(m^2) * Rainfall(m) \qquad (2)$$

- Mean open surface evaporation data from Devrekani Meteorological Station has been used for the monthly evaporation values.

- There is always a tailings water pond on the TSFs on which evaporation can act.
- Evaporation volumes have been calculated by the follow formula:

$$Evaporation\ Volume\ (m^3) = Pond\ Catchment\ Area(m^2) * Evaporation(m) \quad (3)$$

- Net inflow volumes have been calculated by subtracting rainfall runoff volume from the evaporation volume.

For the average year conditions, the calculated net inflow volumes for Kepezkaya and Bağdere TSFs are given in Table 6.4 and Table 6.5, respectively. As can be seen in these tables, the average year net inflow amounts to TSFs are 18.7 m^3/day and 26.5 m^3/day for Kepezkaya and Bağdere tailings storage facility, respectively. Hence, the average year net inflow for TSFs can be taken as 22.6 m^3/day.

Table 6.4: Calculated Net Inflow Rates for the Kepezkaya TSF for Average Annual Rainfall

	Month	Hanönü Avg. Rainfall Amount (mm)	Rainfall Inflow Volume (m3)	Evaporation Volume (m3)	Net Inflow Volume (m3)
Kepezkaya TSF	January	38.85	7424	0	7424
	February	29.42	5622	0	5622
	March	34.11	6518	0	6518
	April	54.77	10467	459	10008
	May	66.77	12760	12689	71
	June	52.1	9956	15161	-5204
	July	31.22	5966	19378	-13411
	August	29.44	5626	19327	-13701
	September	27.41	5238	13390	-8152
	October	37.99	7260	6638	622
	November	39.56	7560	153	7407
	December	50.41	9633	0	9633
	Annual/Total	492.05	94031	87193	6838

Table 6.5: Calculated Net Inflow Rates for the Bağdere TSF for Average Annual Rainfall

	Month	Hanönü Avg. Rainfall Amount (mm)	Rainfall Inflow Volume (m3)	Evaporation Volume (m3)	Net Inflow Volume (m3)
Bağdere TSF	January	38.85	10510	0	10510
	February	29.42	7959	0	7959
	March	34.11	9228	0	9228
	April	54.77	14817	649	14167
	May	66.77	18063	17963	100
	June	52.1	14094	21462	-7367
	July	31.22	8446	27431	-18985
	August	29.44	7964	27359	-19395
	September	27.41	7415	18955	-11540
	October	37.99	10277	9396	881
	November	39.56	10702	216	10486
	December	50.41	13637	0	13637

Annual/Total	492.05	133112	123432	9680

To estimate the net inflow rates for a wet year, the long-term rainfall data from Kastamonu Meteorological Station has been examined and the monthly data corresponding to the wettest year (2014) has been used to estimate the net inflow rates. The calculated net inflow rates for the wettest year rainfall amounts for each TSF are shown in Tables 1.6 and 1.7, for the Kepezkaya and Bağdere Tailings Storage Facilities, respectively. The wettest year net inflow amounts are 215 m^3/day and 305 m^3/day for Kepezkaya and Bağdere tailings storage facility, respectively. Hence, the wettest year net inflow for TSFs can be taken as 260 m^3/day.

Table 6.6: Calculated Net Inflow Rates for the Kepezkaya TSF for Wettest Annual Rainfall

	Month	Kastamonu 2014 Rainfall (mm)	Rainfall Inflow Volume (m3)	Evaporation (mm)	Evaporation Volume (m^3)	Net inflow Volume (m^3)
Kepezkaya TSF	January	14	2675	0	0	2675
	February	27.2	5198	0	0	5198
	March	47.8	9135	0	0	9135
	April	80.3	15345	3.6	459	14887
	May	133	25416	99.6	12689	12727
	June	139.6	26678	119	15161	-5204
	July	60	11466	152.1	19378	-13411
	August	24.8	4739	151.7	19327	-13701
	September	175.4	33519	105.1	13390	20129
	October	47.8	9135	52.1	6638	2497
	November	35.8	6841	1.2	153	6689
	December	81.4	15556	0	0	15556
	Annual	867.1	165703	684.4	87193	78510

Table 6.7: Calculated Net Inflow Rates for the Bağdere TSF for Wettest Annual Rainfall

	Month	Kastamonu 2014 Rainfall (mm)	Rainfall Inflow Volume (m3)	Evaporation (mm)	Evaporation Volume (m^3)	Net Inflow Volume (m^3)
Bağdere TSF	January	14	3787	0	0	3787
	February	27.2	7358	0	0	7358
	March	47.8	12931	0	0	12931
	April	80.3	21723	3.6	649	21074
	May	133	35980	99.6	17963	18017
	June	139.6	37765	119	21462	16304
	July	60	16232	152.1	27431	-11200
	August	24.8	6709	151.7	27359	-20650
	September	175.4	47450	105.1	18955	28495
	October	47.8	12931	52.1	9396	3535
	November	35.8	9685	1.2	216	9468
	December	81.4	22021	0	0	22021
	Annual	867.1	234572	684.4	123432	111141

All components of the mine water balance, and input output mechanisms are summarized in Table 1.8 and schematic mine water balance is given in Figure 6.1.

Table 6.8: Summary of Mine Water Balance for the Project Area

<table>
<tr><th></th><th colspan="4">Inputs</th><th colspan="5">Outputs</th></tr>
<tr><td rowspan="2">Pit</td><td colspan="2">Rainfall Runoff (Below 440 mRl)</td><td colspan="2">Groundwater Inflow (Below 440 mRl)</td><td colspan="2">Pit Dewatering</td><td colspan="3">Evaporation</td></tr>
<tr><td colspan="2">199 m^3/d</td><td colspan="2">1457 m^3/d</td><td colspan="2">1656 m^3/d</td><td colspan="3">Negligible</td></tr>
<tr><td rowspan="2">Sedimentation Pond</td><td colspan="2">Pit Dewatering</td><td colspan="2">Inflow of Groundwater and Surface water from Pit (Above 440 mRl)</td><td>Dust Suppression</td><td>Evaporation</td><td>Discharge to Environment</td><td>Water to Process Plant</td><td>Seepage</td></tr>
<tr><td colspan="2">1656 m^3/d</td><td colspan="2">633 m^3/d</td><td>307 m^3/d</td><td>Negligible</td><td>Depends on the discharge water quality standards</td><td>1982 m^3/d</td><td>Negligible</td></tr>
<tr><td rowspan="2">TSF</td><td colspan="2">Net Inflow</td><td colspan="2">Water from Process Plant</td><td colspan="2">TSF Return Water</td><td colspan="3">Entrained Water</td></tr>
<tr><td colspan="2">Average year: 22.6 m^3/d
Wet year: 260 m^3/d</td><td colspan="2">3120 m^3/d</td><td colspan="2">2702 m^3/d</td><td colspan="3">418 m^3/d</td></tr>
<tr><td rowspan="2">Process Plant</td><td>TSF Return Water</td><td>Water from Supply Wells</td><td>Water from Sedimentation Ponds</td><td>Water from Process Water Tank</td><td colspan="2">Water to TSF</td><td colspan="3">Water to Process Water Tank</td></tr>
<tr><td>2702 m^3/d</td><td>326.5 m^3/d</td><td>1982 m^3/d</td><td>24571 m^3/d</td><td colspan="2">3120 m^3/d</td><td colspan="3">21545 m^3/d</td></tr>
</table>

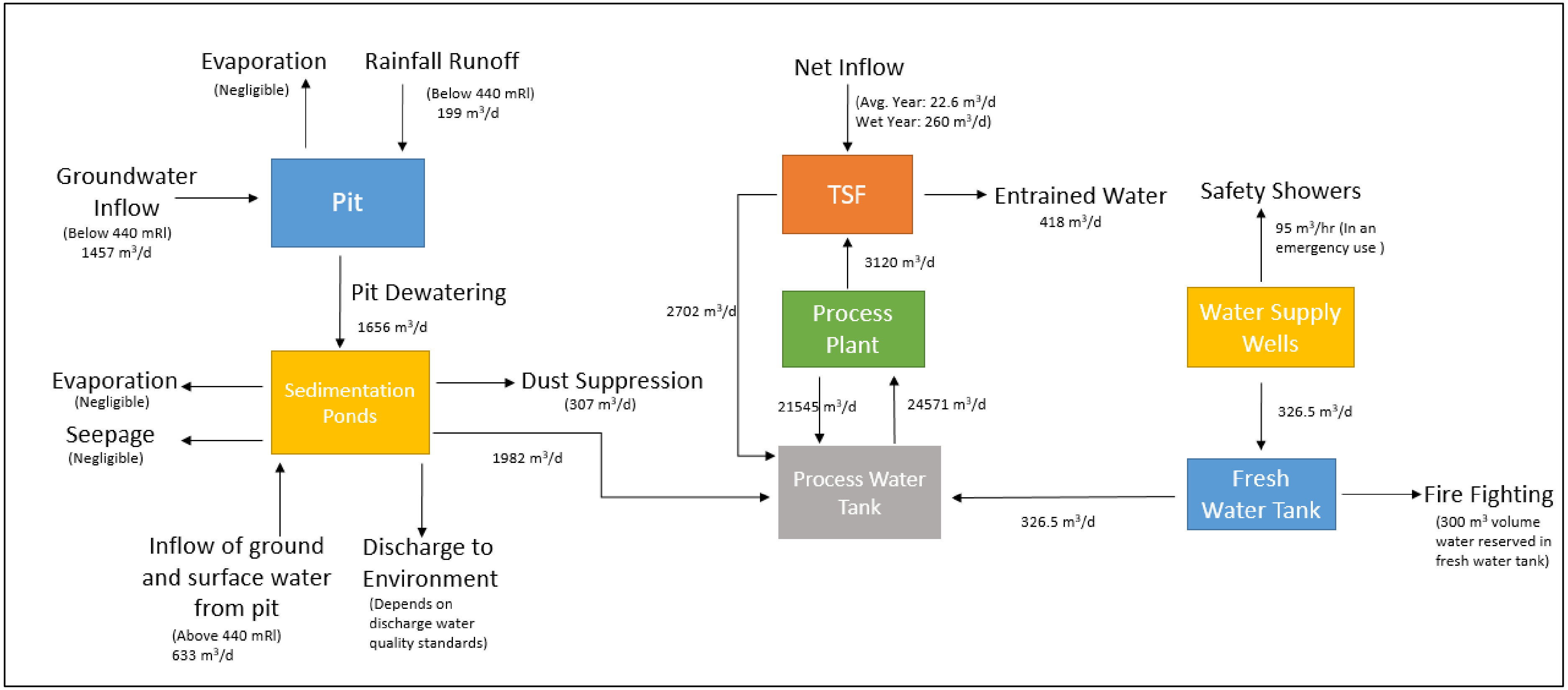


Figure 6.1: Schematic Mine Water Balance

Appendices

Appendix A Well Construction Details

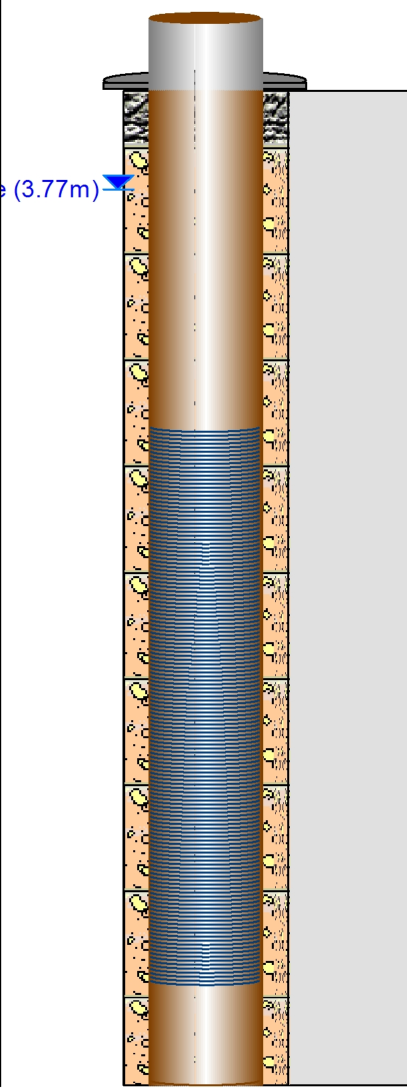
METU	Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site
	Project No:	2016-03-09-2-00-18
	Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.

Well No.

AOBH

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	38
Well Location:	Alluvium, North of Open Pit		**Well Diameter:**	0-38 m, 292 mm
Coordinates:	East (m):	617424.77	**Casing:**	PVC, 200 mm, 38 m
	North (m):	4608022.84	**Screen Interval:**	13-34 m,
Elevation (m):			**Gravel Pack:**	2-38 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	-
Start Date:	-		**Cement:**	0-2 m
Finish Date:	09.11.2015		**Formation / Aquifer:**	Alluvium
Drilling Method:	Rotary			
Drilling Fluid:	-		**Static Water Level:**	3.77 m

Depth (m)	Casing	Annular Fill	Well Construction	Formation/Lithology
0		Cement		
10				
20	PVC	Gravel		Alluvium (Clay, silt, gravel, pebbles)
30				

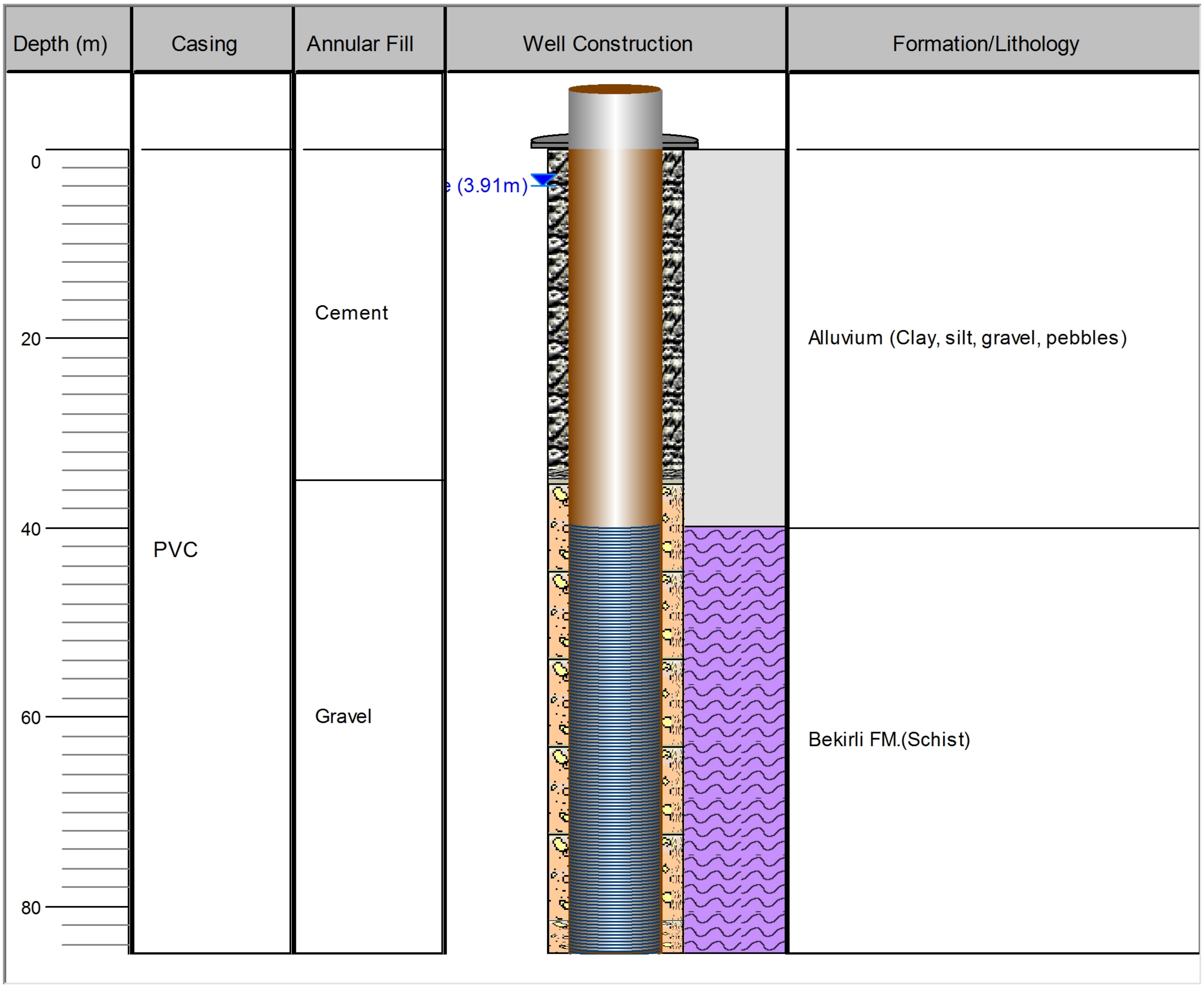


Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**AOBH**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	38
Well Location:	Alluvium, North of Open Pit		**Well Diameter:**	0-38 m, 292 mm
Coordinates:	East (m):	617424.77	**Casing:**	PVC, 200 mm, 38 m
	North (m):	4608022.84	**Screen Interval:**	13-34 m,
Elevation (m):			**Gravel Pack:**	2-38 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	-
Start Date:	-		**Cement:**	0-2 m
Finish Date:	09.11.2015		**Formation / Aquifer:**	Alluvium
Drilling Method:	Rotary			
Drilling Fluid:	-		**Static Water Level:**	3.77 m

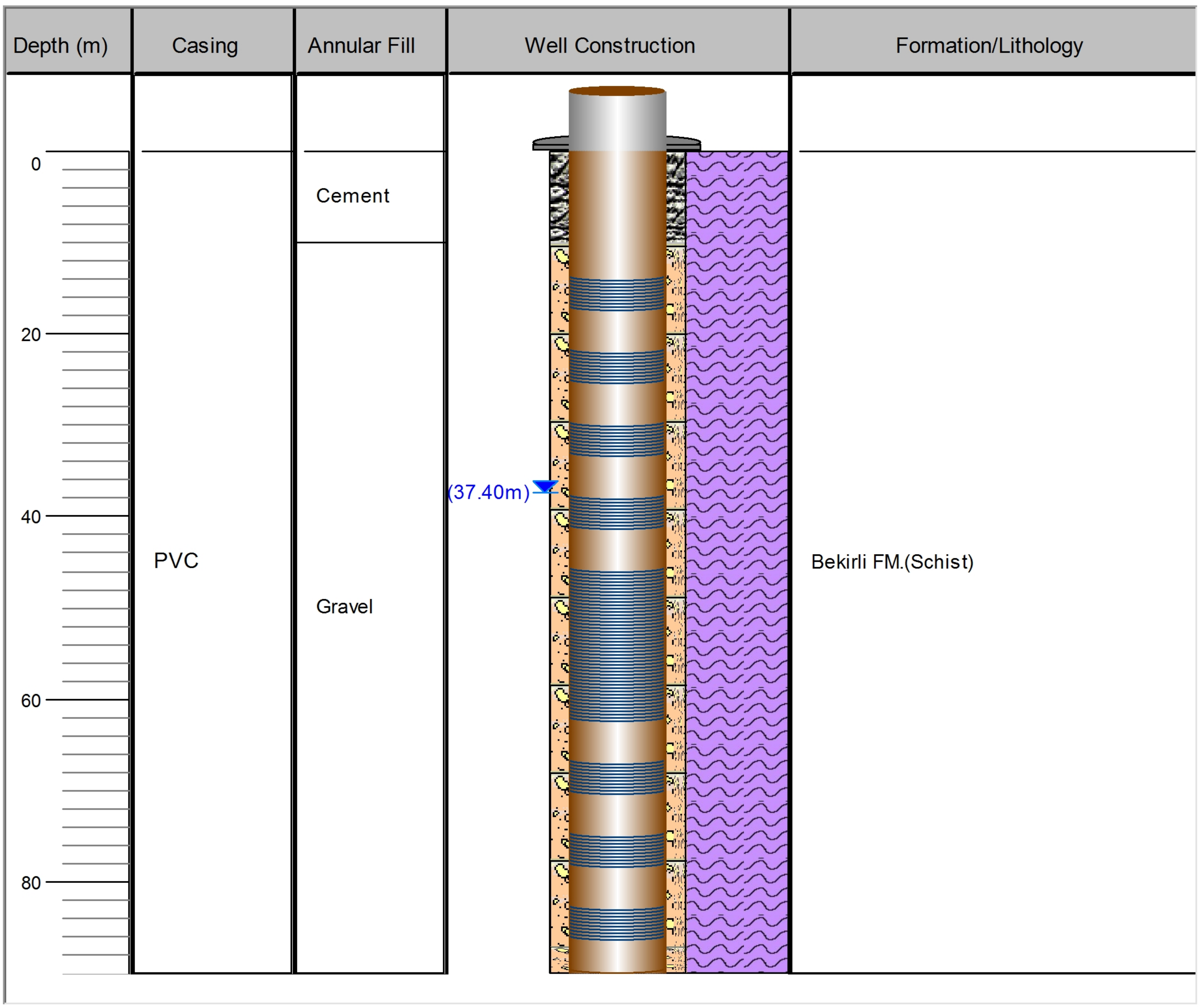
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**BOBH**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	85
Well Location:	Alluvium, North of Open Pit		**Well Diameter:**	0-85 m, 292 mm
Coordinates:	East (m):	617408.23	**Casing:**	PVC, 200 mm, 85 m
	North (m):	4608031.90	**Screen Interval:**	40-85 m
Elevation (m):	429.45		**Gravel Pack:**	35-85 m
Slope / Angle:	90		**Bentonite:**	-
Start Date:	-		**Cement:**	0-35 m
Finish Date:	28.12.2015		**Formation / Aquifer:**	Bekirli Fm.
Drilling Method:	Rotary			
Drilling Fluid:	-		**Static Water Level:**	3.91 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**FTBH**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	90
Well Location:	Open Pit		**Well Diameter:**	0-90 m, 178 mm
Coordinates:	East (m):	617525.63	**Casing:**	PVC, 125 mm, 90 m
	North (m):	4607384.647	**Screen Interval:**	14-86 m; 3 m filtered, 4 m closed
Elevation (m):	642.102		**Gravel Pack:**	10-90 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	-
Start Date:	-		**Cement:**	0-10 m
Finish Date:	15.10.2015		**Formation / Aquifer:**	Bekirli FM.
Drilling Method:	Rotary			
Drilling Fluid:	-		**Static Water Level:**	37.4 m



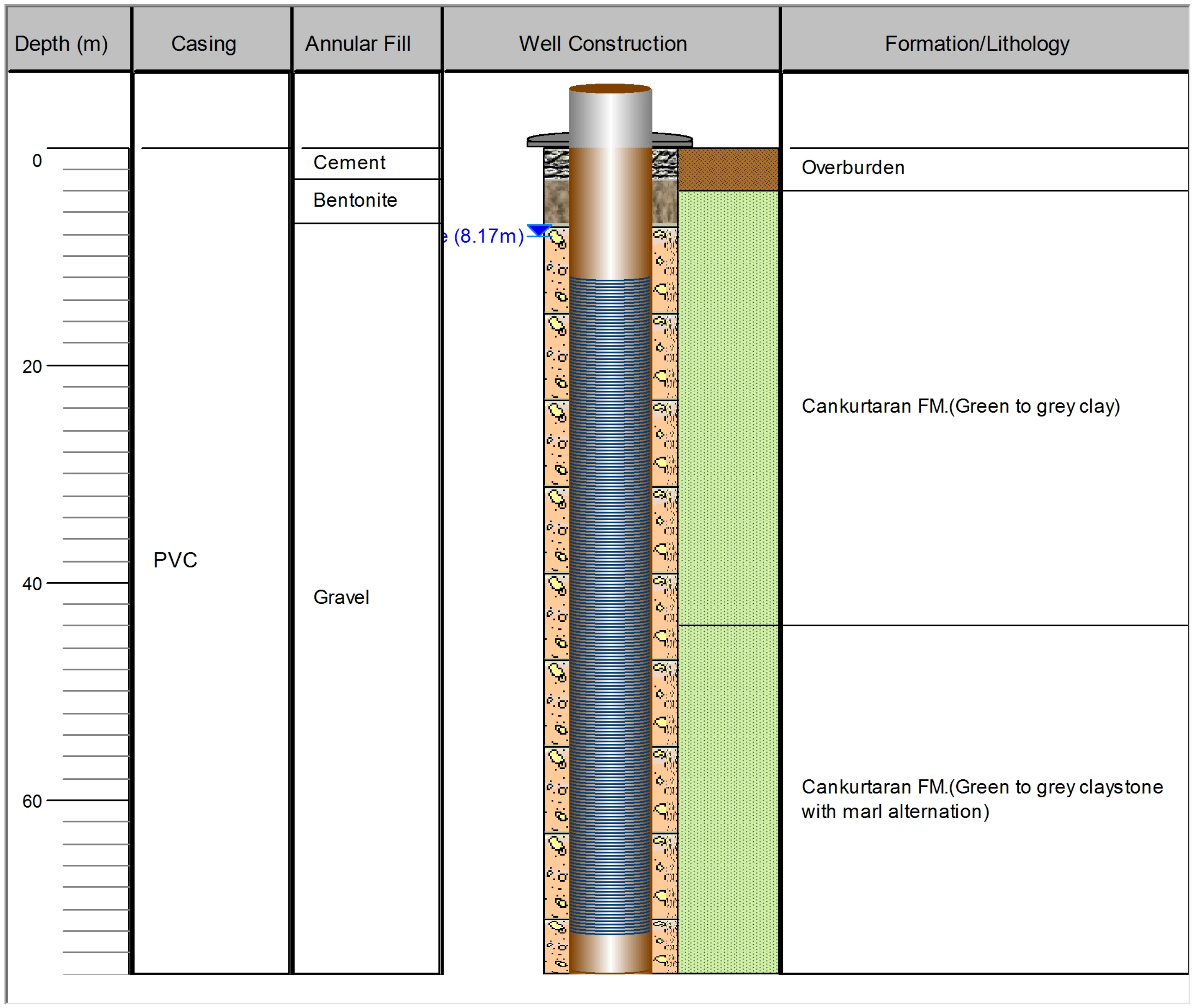
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site
Project No:	2016-03-09-2-00-18
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.

METU

Well No.

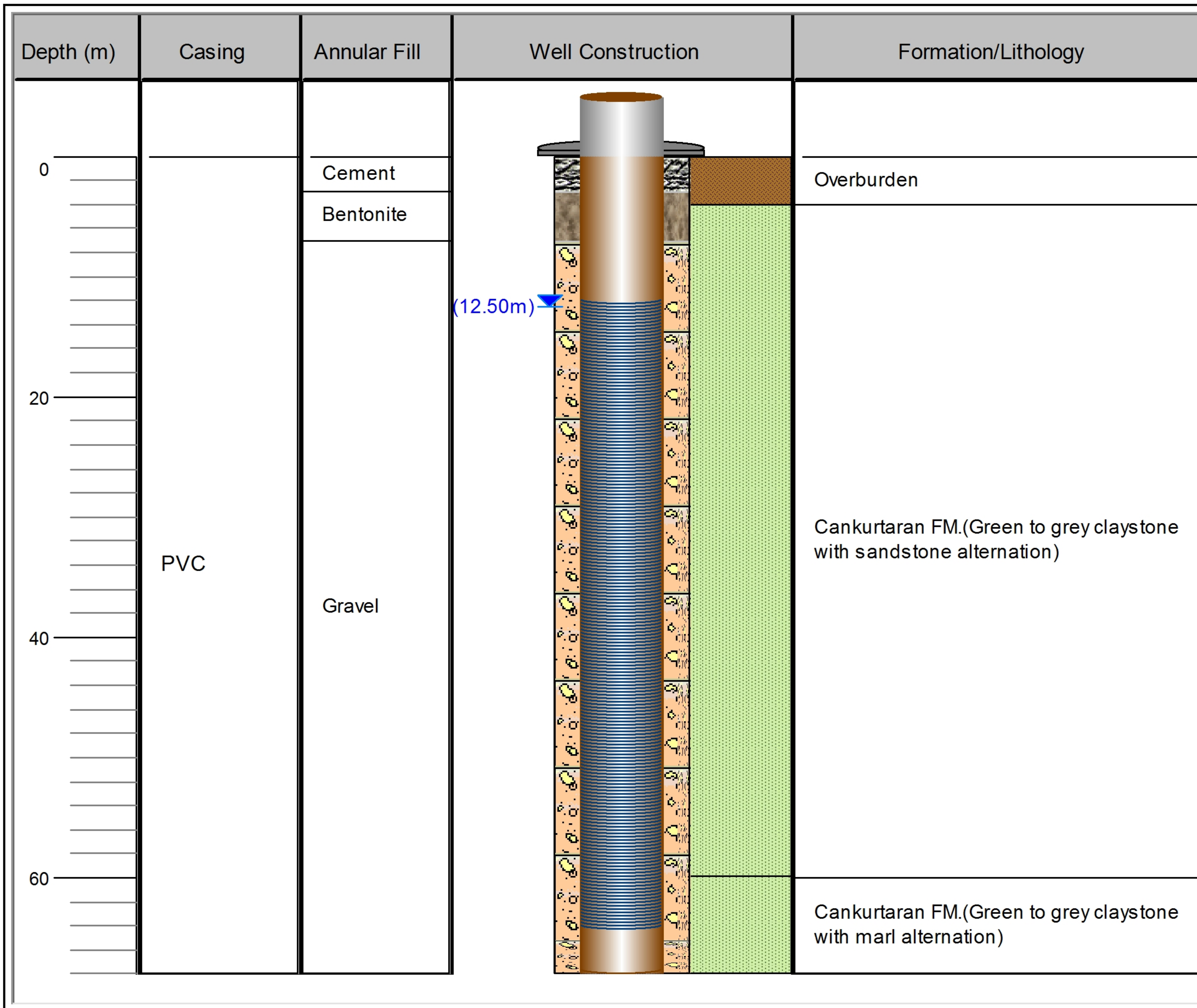
GK-1

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	76
Well Location:	Bagdere TSF		**Well Diameter:**	0-76 m, 292 mm
Coordinates:	East (m):	623981.00	**Casing:**	PVC, 175 mm, 76 m
	North (m):	4609146.00	**Screen Interval:**	12-72 m
Elevation (m):	426.92		**Gravel Pack:**	7-76 m 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	14.10.2016		**Cement:**	0-3 m
Finish Date:	16.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	8.17 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-2**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

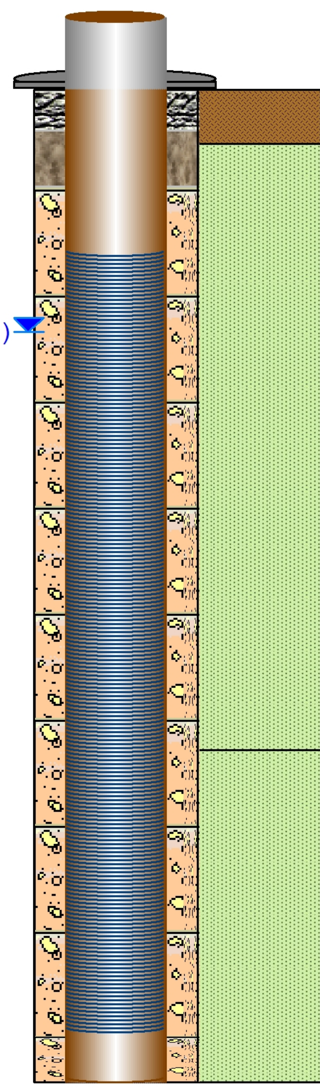
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	68
Well Location:	Bagdere TSF		**Well Diameter:**	0-68 m, 292 mm
Coordinates:	East (m):	623666.00	**Casing:**	PVC, 175 mm, 68 m
	North (m):	4608939.00	**Screen Interval:**	12-64 m
Elevation (m):	411.71		**Gravel Pack:**	7-68 m 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	24.10.2016		**Cement:**	0-3 m
Finish Date:	25.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	12.5 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site		Well No.
Project No:	2016-03-09-2-00-18		**GK-3**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.		

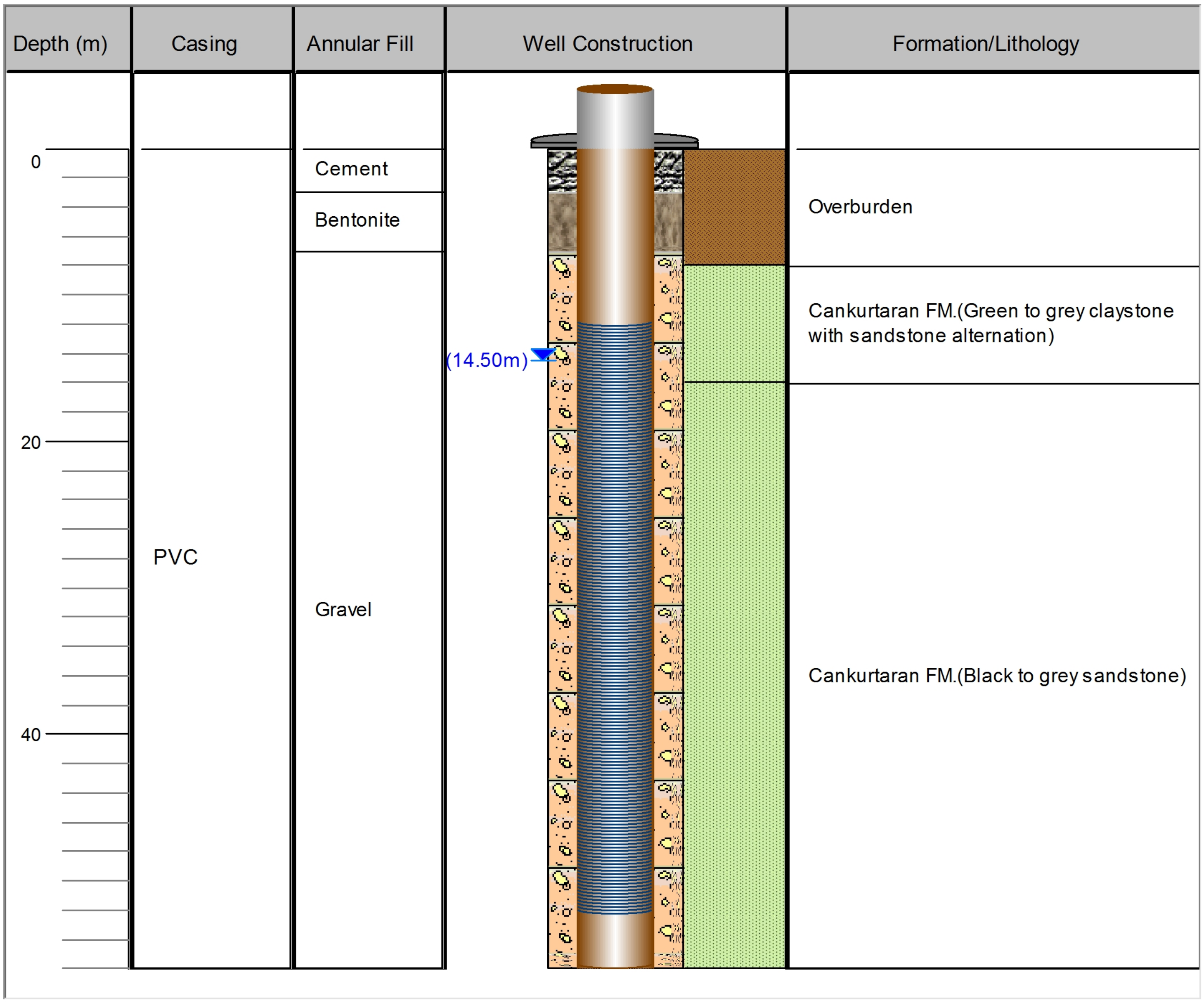
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	72
Well Location:	Bagdere TSF		**Well Diameter:**	0-72 m, 292 mm
Coordinates:	East (m):	623597.00	**Casing:**	PVC, 175 mm, 72 m
	North (m):	4609148.00	**Screen Interval:**	12-68 m
Elevation (m):	422.18		**Gravel Pack:**	7-72 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	21.10.2016		**Cement:**	0-3 m
Finish Date:	22.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	17.58 m

Depth (m)	Casing	Annular Fill	Well Construction	Formation/Lithology
0	PVC	Cement		Overburden
		Bentonite		
20		Gravel	(17.58m)	Cankurtaran FM.(Green to black claystone and white to yellow marl)
40				
60				Cankurtaran FM.(Green to black claystone-red to brown chert alternation)



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-4**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	56
Well Location:	Bagdere TSF		**Well Diameter:**	0-56 m, 292 mm
Coordinates:	East (m):	623516.00	**Casing:**	PVC, 175 mm, 56 m
	North (m):	4608838.00	**Screen Interval:**	12-52 m
Elevation (m):	406.52		**Gravel Pack:**	7-56 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	26.10.2016		**Cement:**	0-3 m
Finish Date:	27.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	14.5 m



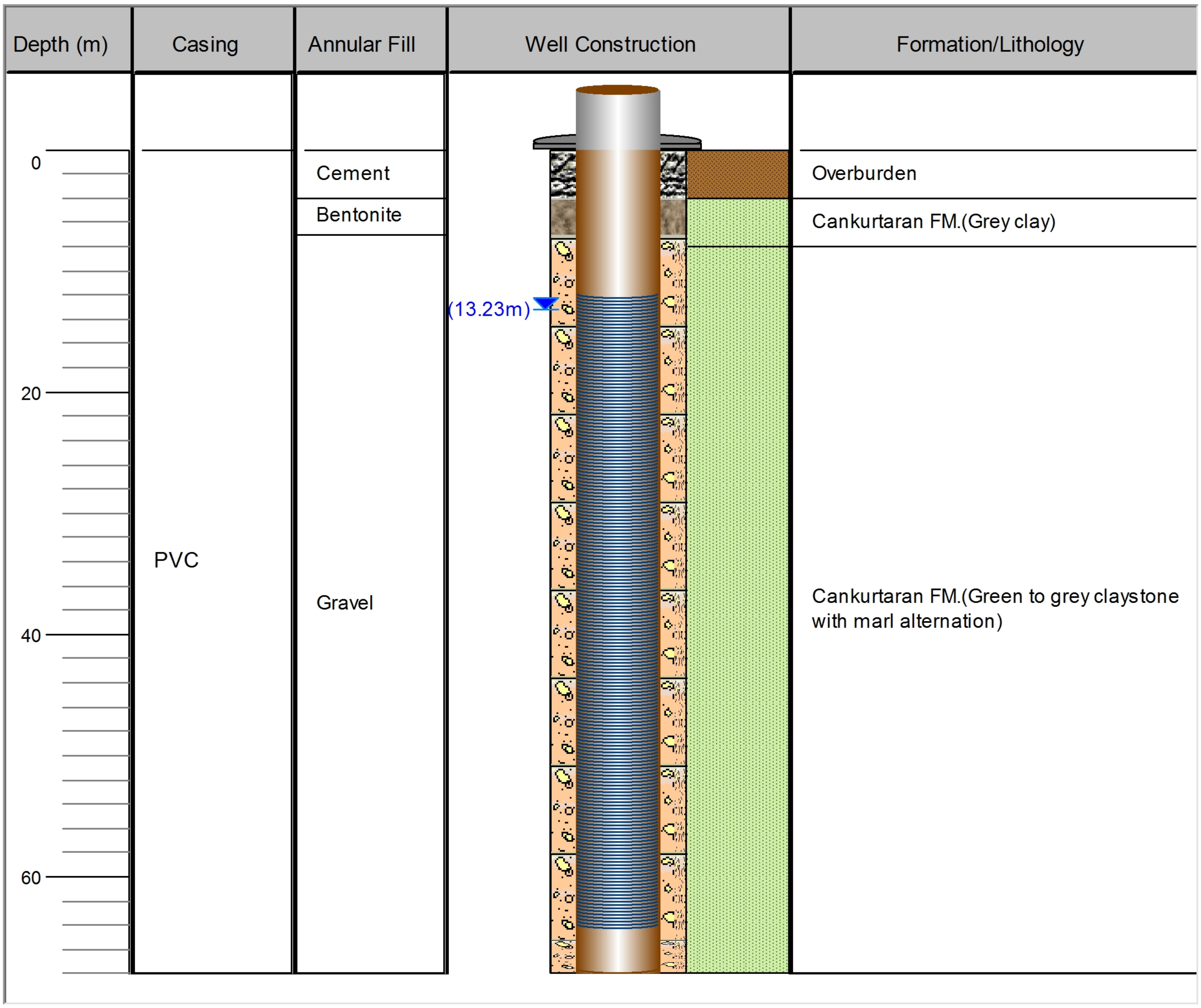
METU

Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site
Project No:	2016-03-09-2-00-18
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.

Well No.

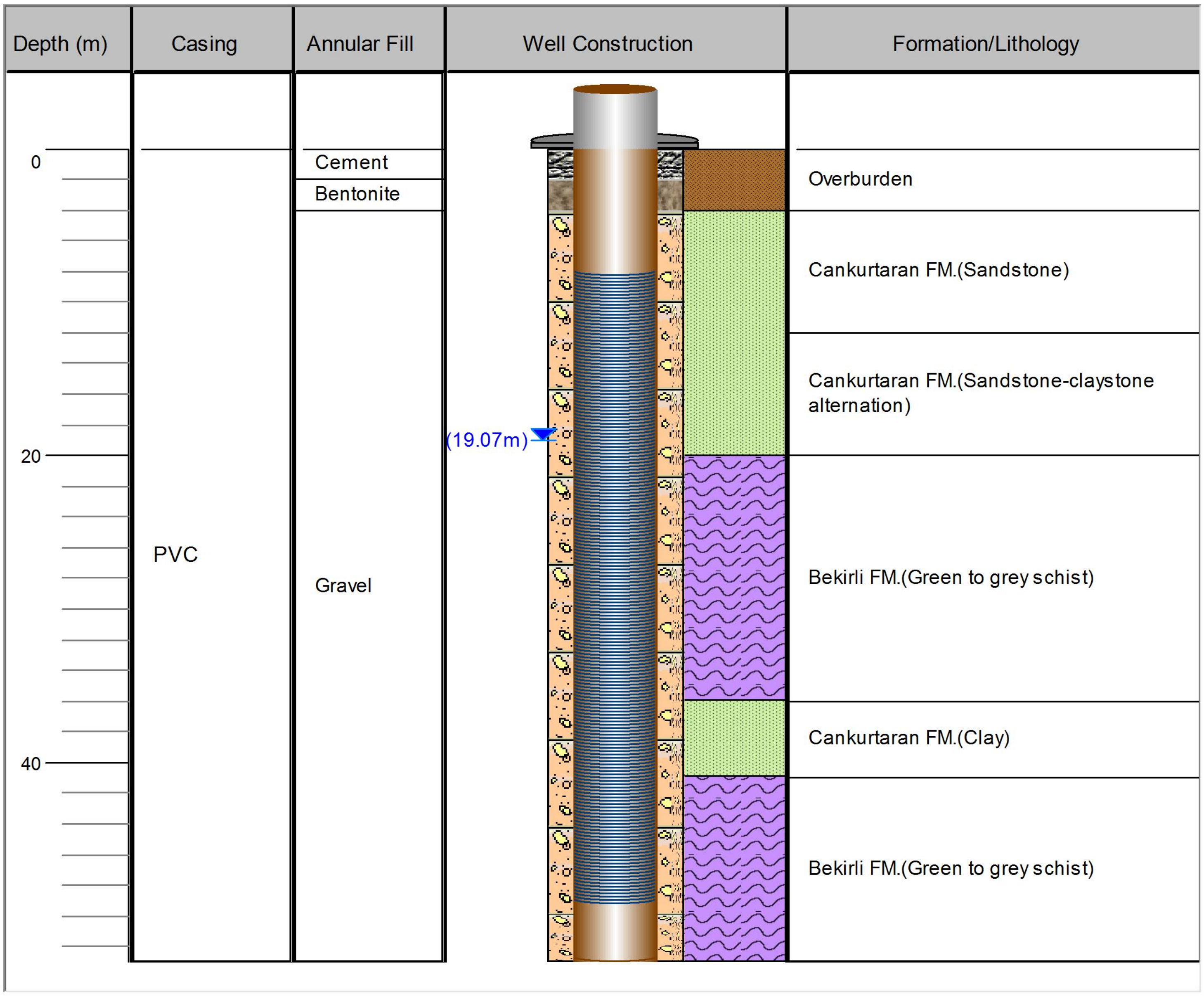
GK-5

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	68
Well Location:	Bagdere TSF		**Well Diameter:**	0-68 m, 292 mm
Coordinates:	East (m):	623875.00	**Casing:**	PVC, 175 mm, 68 m
	North (m):	4609096.00	**Screen Interval:**	12-64 m
Elevation (m):	421.87		**Gravel Pack:**	7-68 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	17.10.2016		**Cement:**	0-3 m
Finish Date:	19.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	13.23 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site		Well No.
Project No:	2016-03-09-2-00-18		**GK-6**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.		

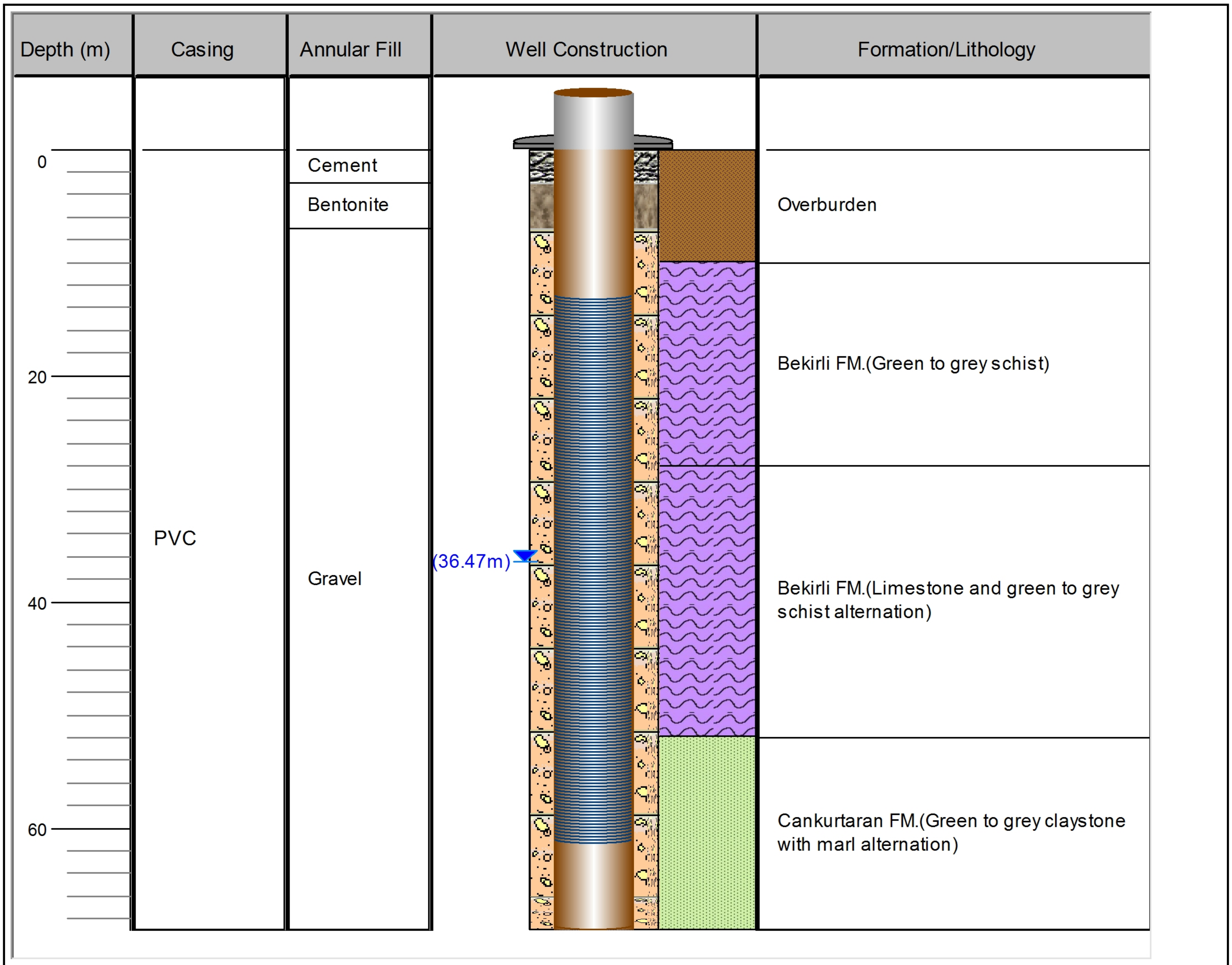
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	53
Well Location:	Corakoglu WRD		**Well Diameter:**	0-53 m, 292 mm
Coordinates:	East (m):	618863.00	**Casing:**	PVC, 175 mm, 53 m
	North (m):	4608836.00	**Screen Interval:**	8-49 m
Elevation (m):	435.62		**Gravel Pack:**	4-53 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	2-4 m
Start Date:	13.10.2016		**Cement:**	0-2 m
Finish Date:	19.10.2016		**Formation / Aquifer:**	Cankurtaran FM. Bekirli FM.
Drilling Method:	Mud Rotary			
Drilling Fluid:	Mud		**Static Water Level:**	19.07 m



METU

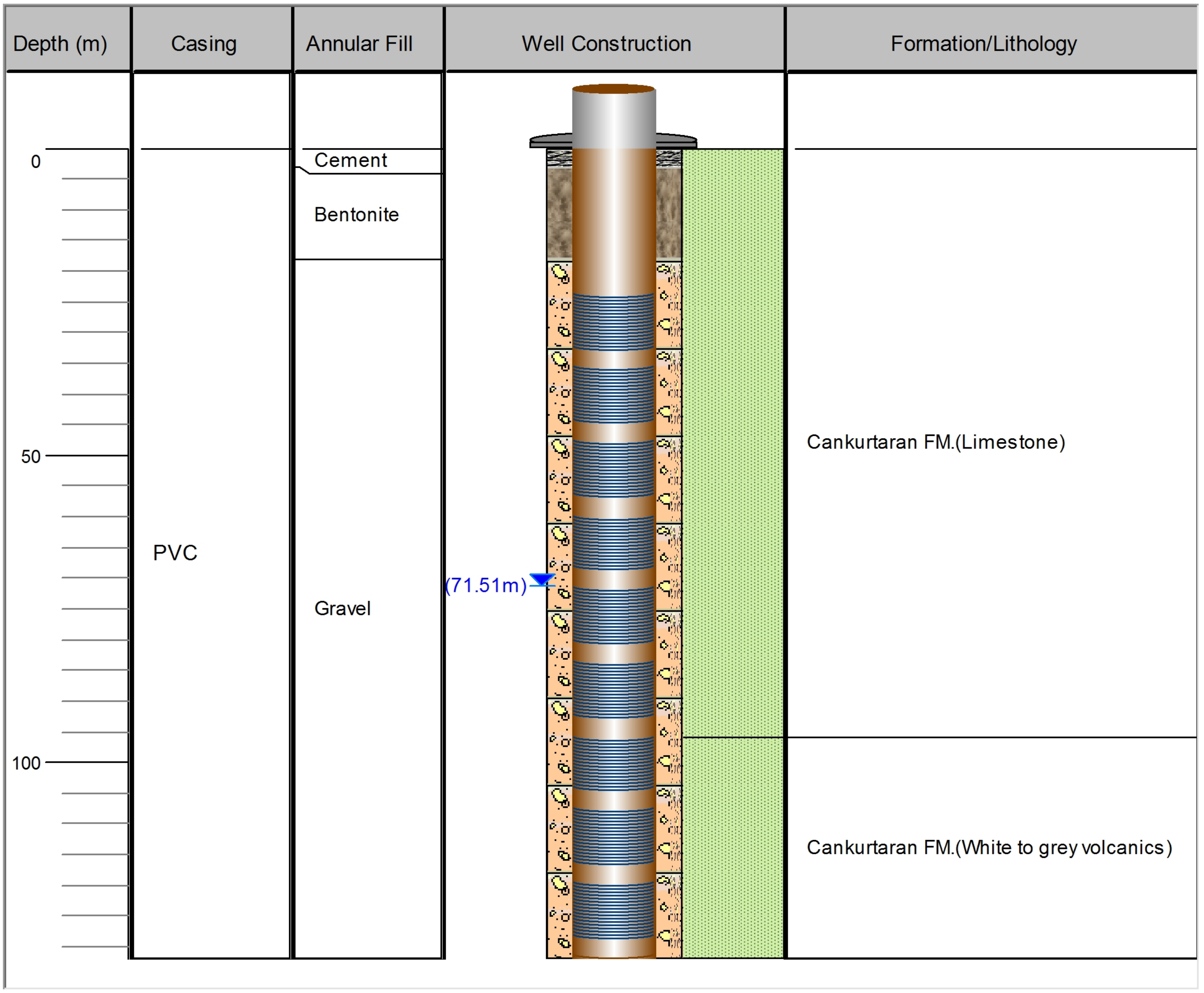
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-7**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	69
Well Location:	Corakoglu WRD		**Well Diameter:**	0-69 m, 292 mm
Coordinates:	East (m):	618992.00	**Casing:**	PVC, 175 mm,69 m
	North (m):	4609550.00	**Screen Interval:**	13-61 m
Elevation (m):	530.28		**Gravel Pack:**	7-69 m , 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	27.09.2016		**Cement:**	0-3 m
Finish Date:	29.09.2016		**Formation / Aquifer:**	Bekirli FM. Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	36.47 m



	Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
METU	Project No:	2016-03-09-2-00-18	**GK-8**
	Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

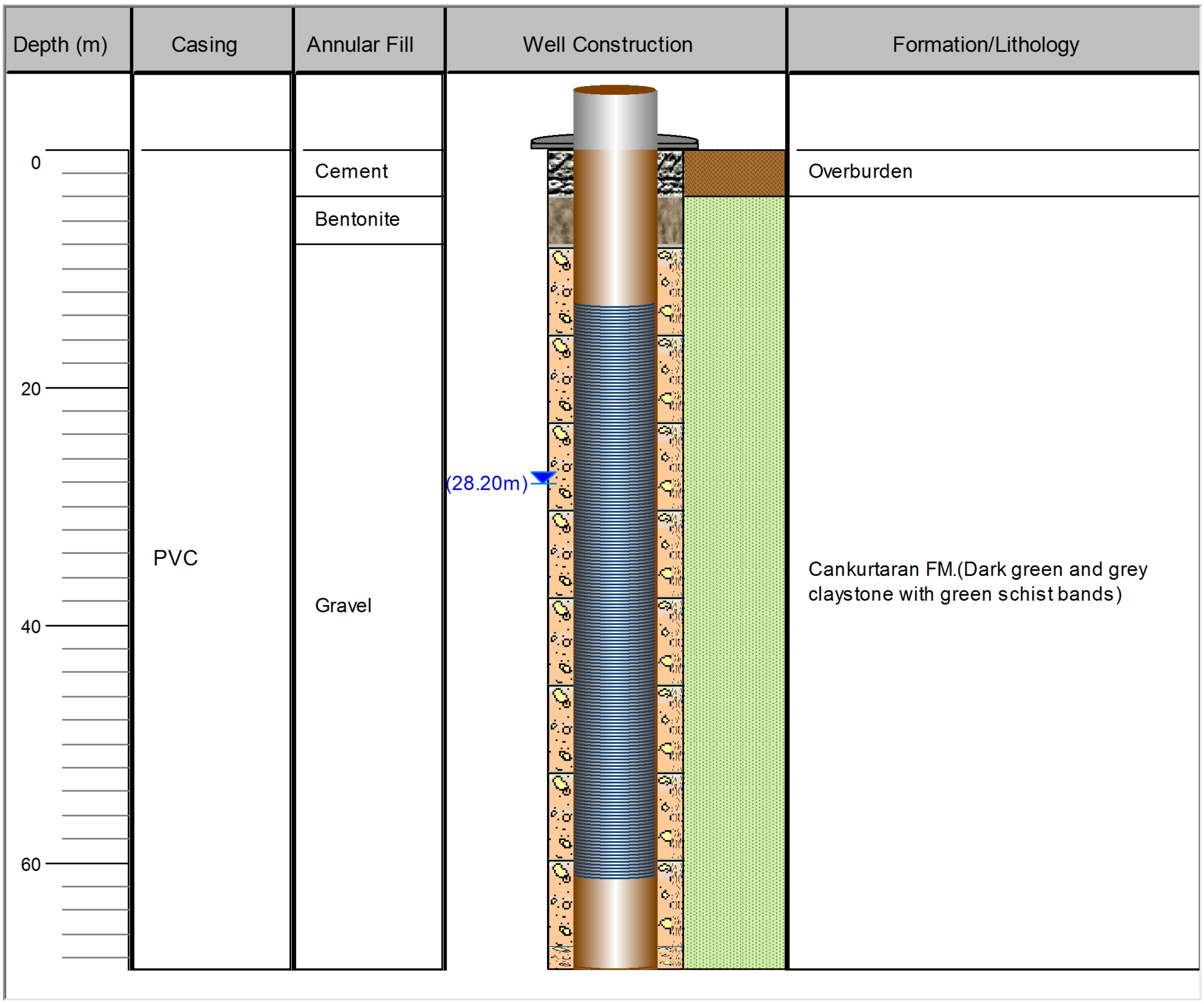
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	132
Well Location:	Corakoglu WRD		**Well Diameter:**	0-132 m, 292 mm
Coordinates:	East (m):	618323.00	**Casing:**	PVC, 175 mm, 132 m
	North (m):	4609330.00	**Screen Interval:**	24-128 m; 8 m filtered, 4 m closed
Elevation (m):	585.73		**Gravel Pack:**	18-132 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-18 m
Start Date:	21.10.2016		**Cement:**	0-3 m
Finish Date:	28.10.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	71.51 m



METU

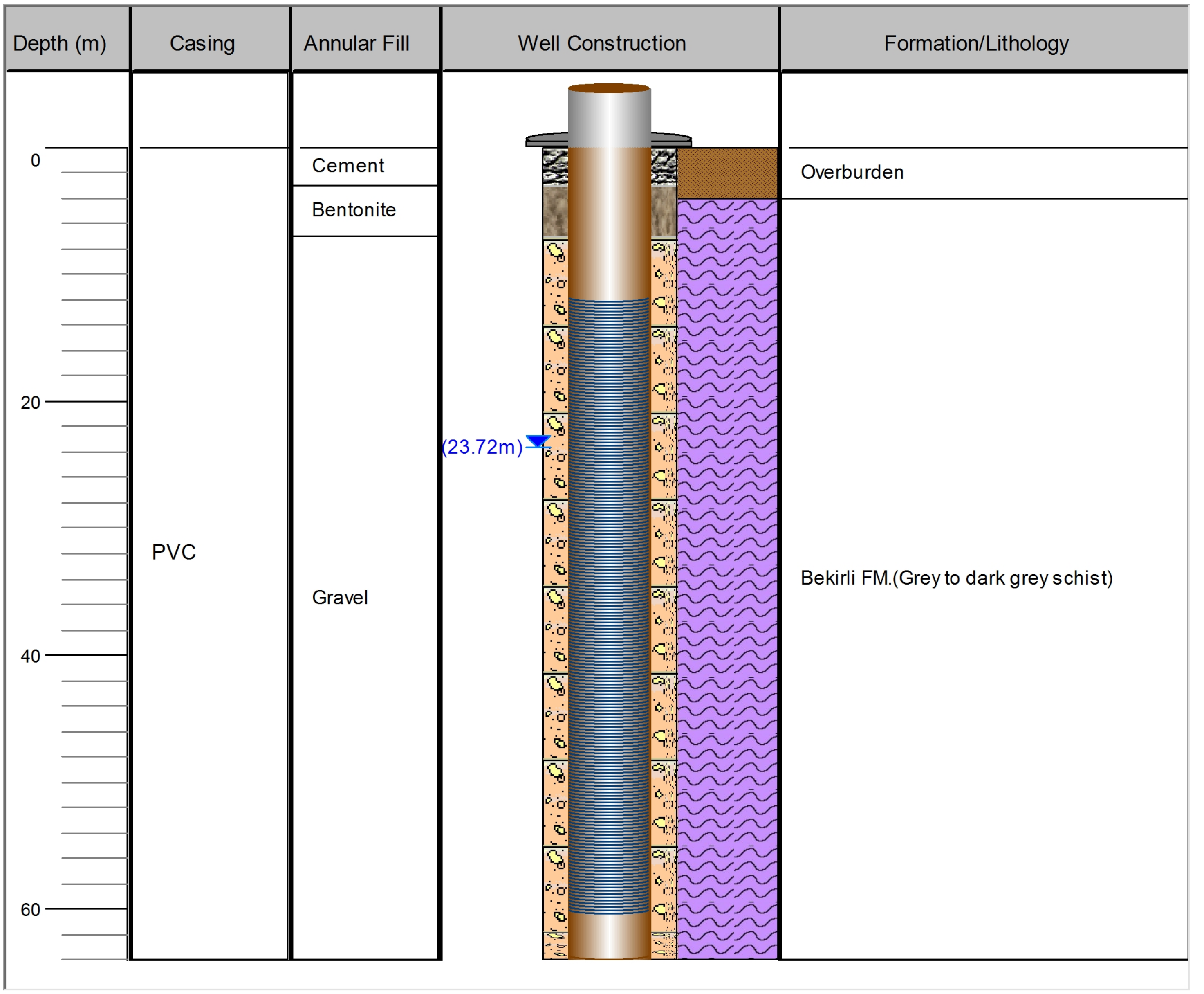
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-9**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	69
Well Location:	Corakoglu WRD		**Well Diameter:**	0-69 m, 292 mm
Coordinates:	East (m):	617625.00	**Casing:**	PVC, 175 mm, 69 m
	North (m):	4609531.00	**Screen Interval:**	13-61 m
Elevation (m):	465.75		**Gravel Pack:**	8-69 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-8 m
Start Date:	15.08.2016		**Cement:**	0-3 m
Finish Date:	21.08.2016		**Formation / Aquifer:**	Cankurtaran FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	28.2 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-10**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

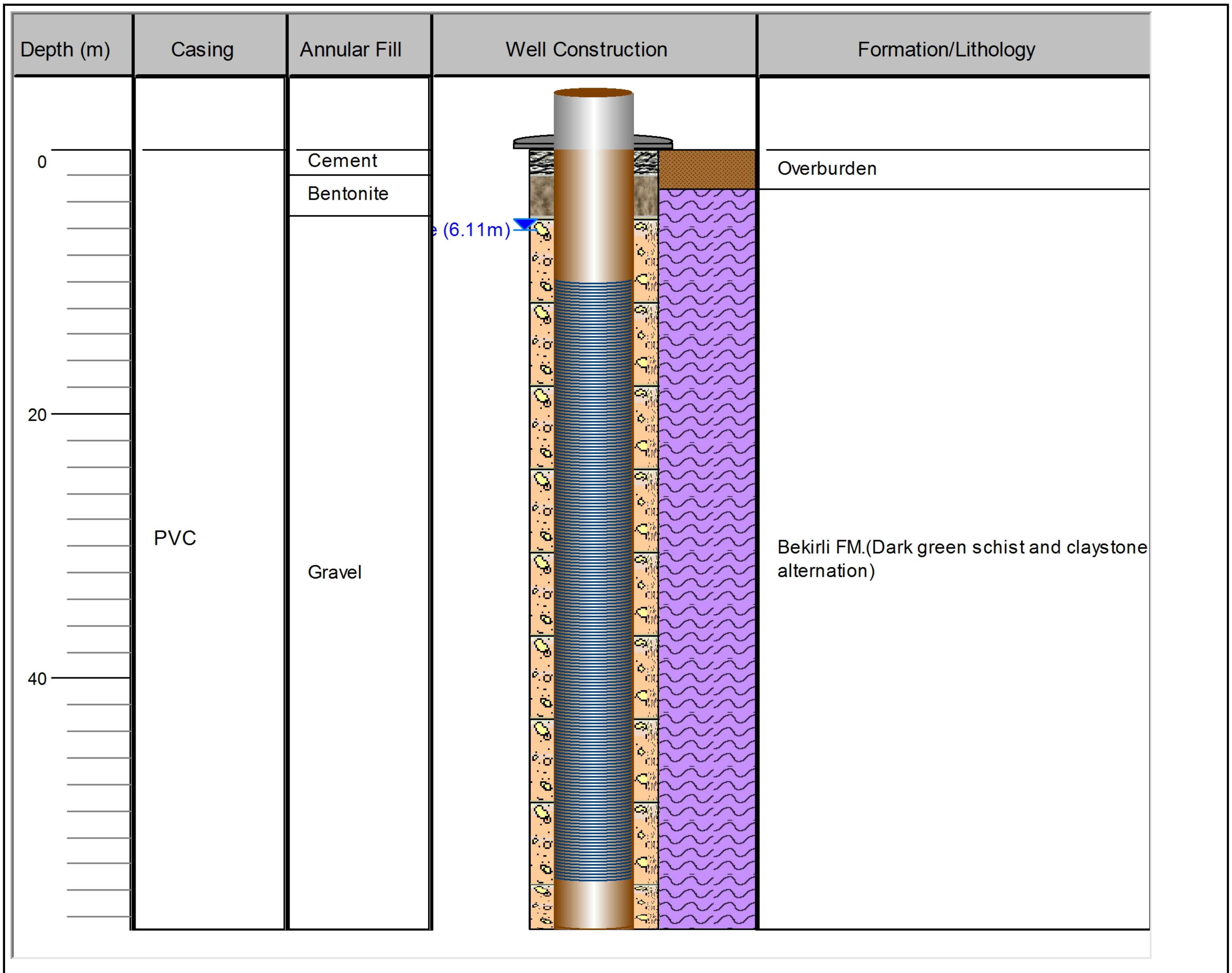
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	64
Well Location:	Gelberi WRD		**Well Diameter:**	0-64 m, 292 mm
Coordinates:	East (m):	616318.00	**Casing:**	PVC, 175 mm, 64 mm
	North (m):	4605880.00	**Screen Interval:**	12-60 m
Elevation (m):	656.37		**Gravel Pack:**	7-64 m 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-7 m
Start Date:	01.10.2016		**Cement:**	0-3 m
Finish Date:	02.10.2016		**Formation / Aquifer:**	Bekirli FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	23.72 m



METU

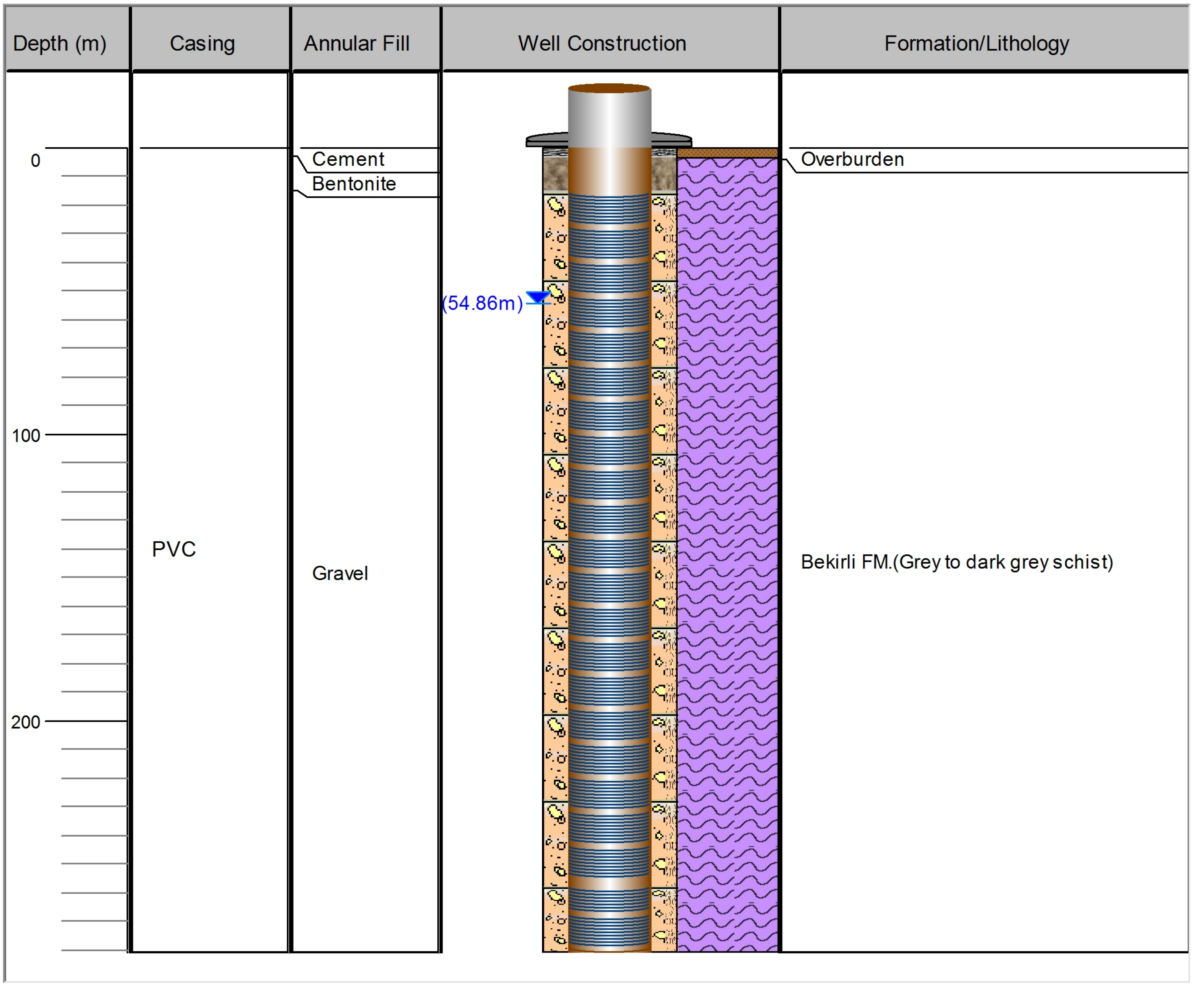
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-11**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü	**Well Depth (m):**	59
Well Location:	Gelberi WRD	**Well Diameter:**	0-59 m, 292 mm
Coordinates:	East (m): 615811.00	**Casing:**	PVC, 175 mm, 59 m
	North (m): 4606749.00	**Screen Interval:**	10-55 m
Elevation (m):	480.1	**Gravel Pack:**	7-59 m 5-7 mm gravel
Slope / Angle:	90	**Bentonite:**	3-7 m
Start Date:	24.08.2016	**Cement:**	0-3 m
Finish Date:	09.09.2016	**Formation / Aquifer:**	Bekirli FM.
Drilling Method:	Air Percussion + Mud Rotary		
Drilling Fluid:	Water + Mud	**Static Water Level:**	6.11 m



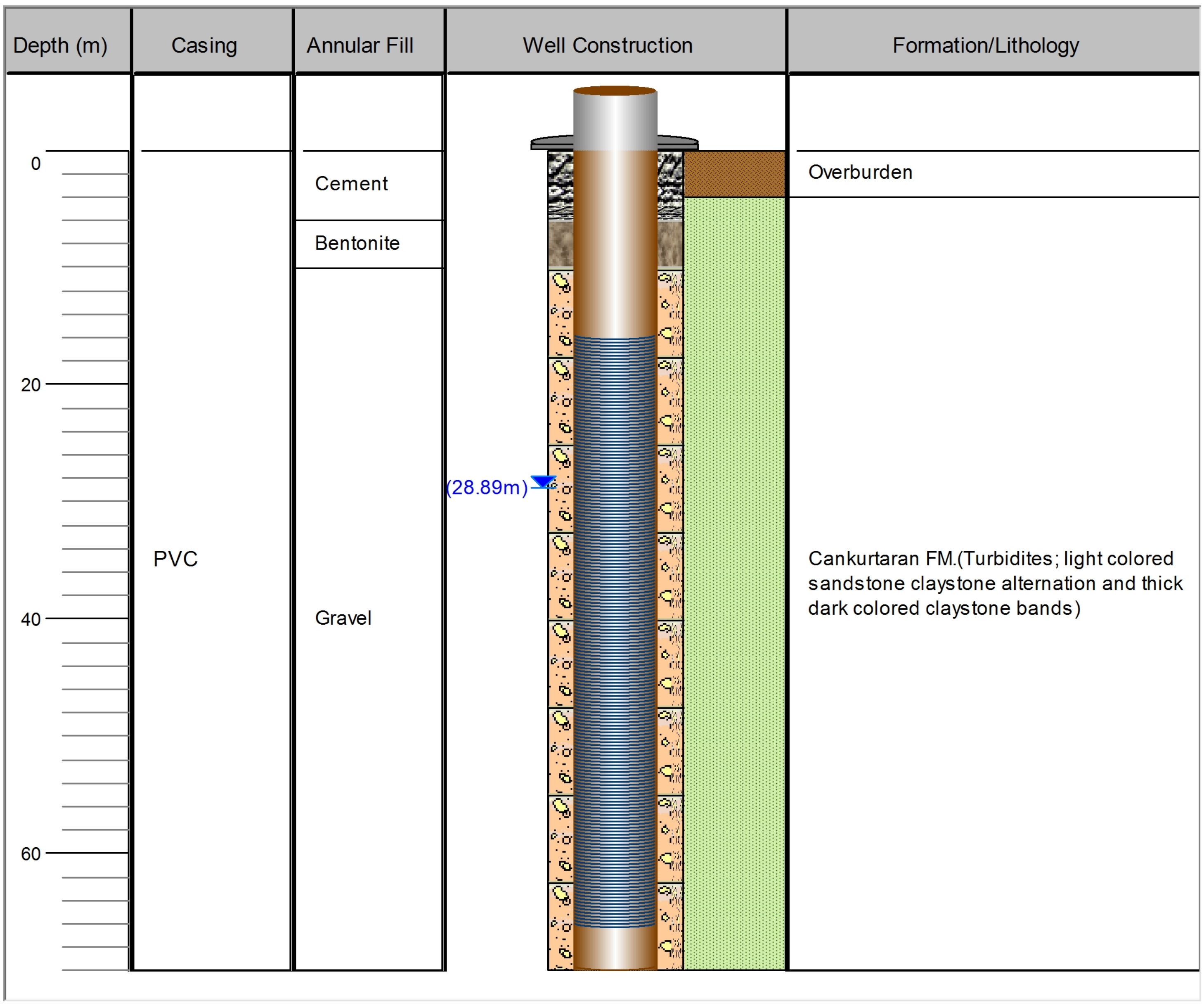
	Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
METU	Project No:	2016-03-09-2-00-18	**GK-12**
	Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	281
Well Location:	Open Pit		**Well Diameter:**	0-281 m, 292 mm
Coordinates:	East (m):	617484.00	**Casing:**	PVC, 175 mm, 175 mm
	North (m):	4607598.00	**Screen Interval:**	14-277 m; 8 m filtered, 4 m closed
Elevation (m):	496.89		**Gravel Pack:**	15-281 m 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-15 m
Start Date:	23.09.2016		**Cement:**	0-3 m
Finish Date:	28.10.2016		**Formation / Aquifer:**	Bekirli FM.
Drilling Method:	Air Percussion + Mud Rotary			
Drilling Fluid:	Water+ Foam+ Mud		**Static Water Level:**	54.86 m



		Well No.
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	**GK-13**
Project No:	2016-03-09-2-00-18	
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	70
Well Location:	Kepezkaya TSF		**Well Diameter:**	0-70 m, 292 mm
Coordinates:	East (m):	622869.00	**Casing:**	PVC, 175 mm, 70 m
	North (m):	4610091.00	**Screen Interval:**	16-66 m
Elevation (m):	446.78		**Gravel Pack:**	10-70 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	6-10 m
Start Date:	05.08.2016		**Cement:**	0-6 m
Finish Date:	12.08.2016		**Formation / Aquifer:**	Cankurtaran Fm.
Drilling Method:	Air Percussion +Mud			
Drilling Fluid:	Water + Foam +Mud		**Static Water Level:**	28.89 m



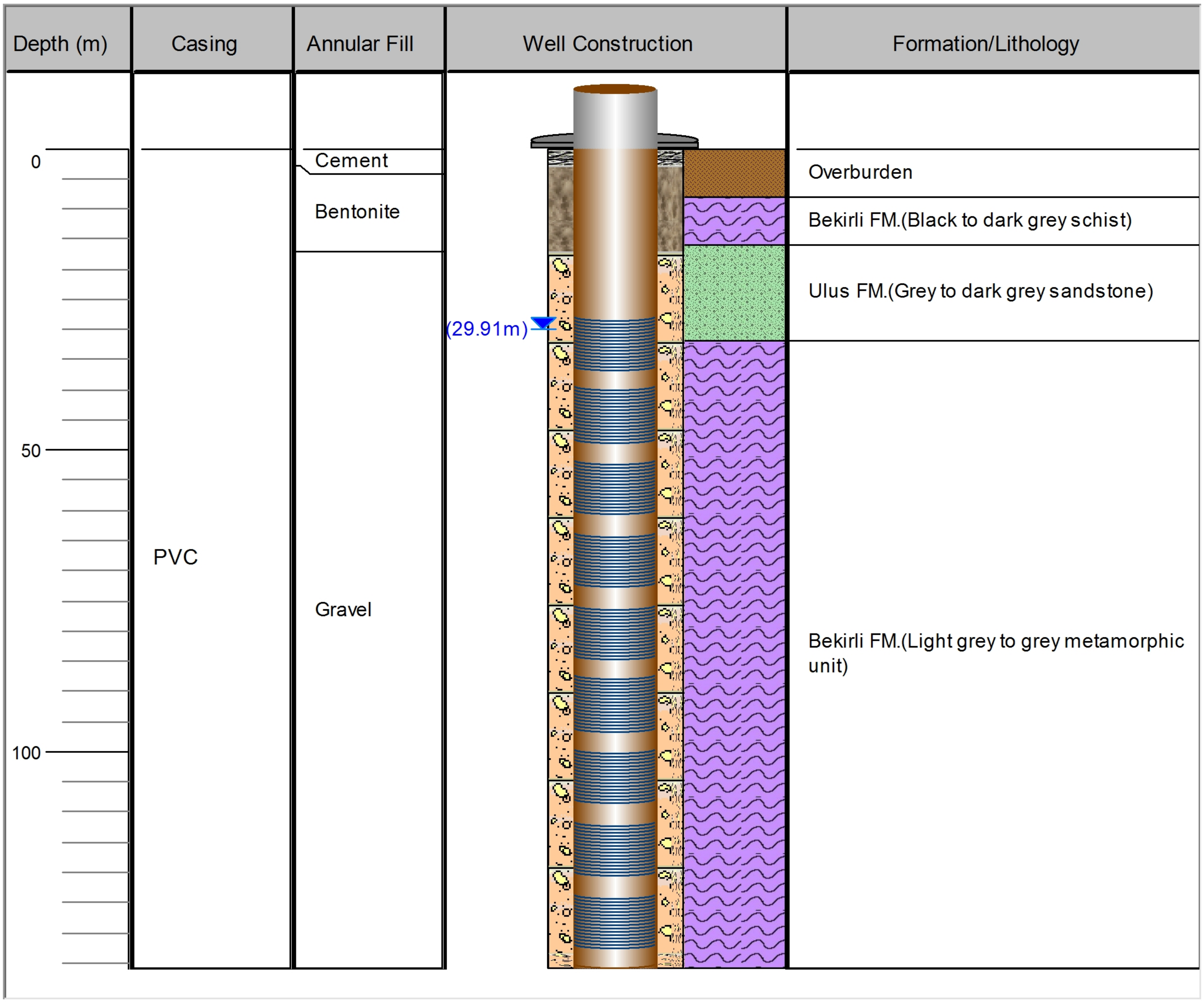
METU

Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site
Project No:	2016-03-09-2-00-18
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.

Well No.

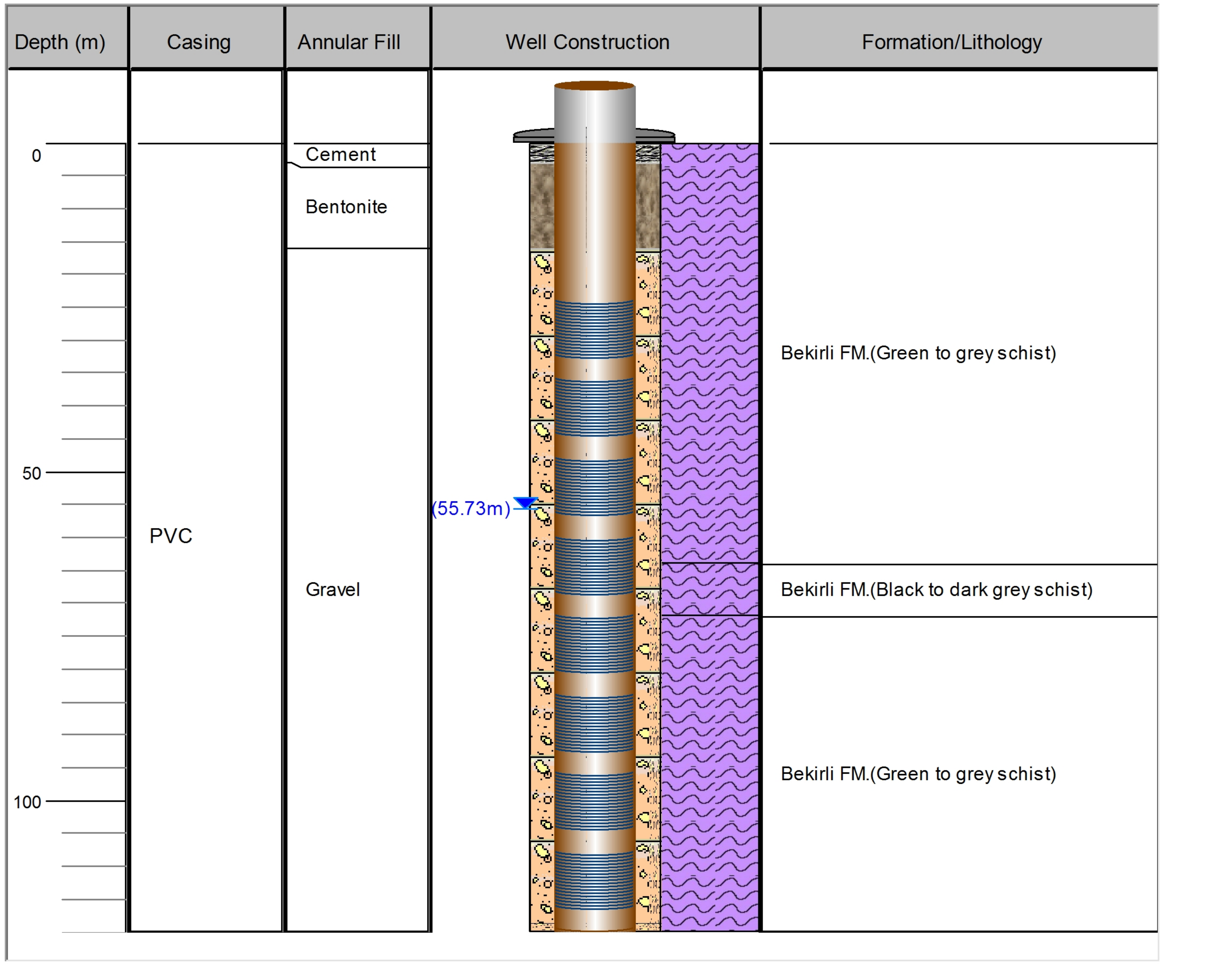
GK-A

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	136
Well Location:	Process Plant		**Well Diameter:**	0-136 m, 292 mm
Coordinates:	East (m):	620689.29	**Casing:**	0-136 m, 175 mm
	North (m):	4607231.45	**Screen Interval:**	28-132 m;8 m filtered, 4 m closed
Elevation (m):	682.59		**Gravel Pack:**	17-132 m, 5-7 mm gravel
Slope / Angle:	90		**Bentonite:**	3-17 m
Start Date:	1.11.2016		**Cement:**	0-3 m
Finish Date:	10.11.2016		**Formation / Aquifer:**	Ulus FM. Bekirli FM.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water+ Foam		**Static Water Level:**	29.91 m



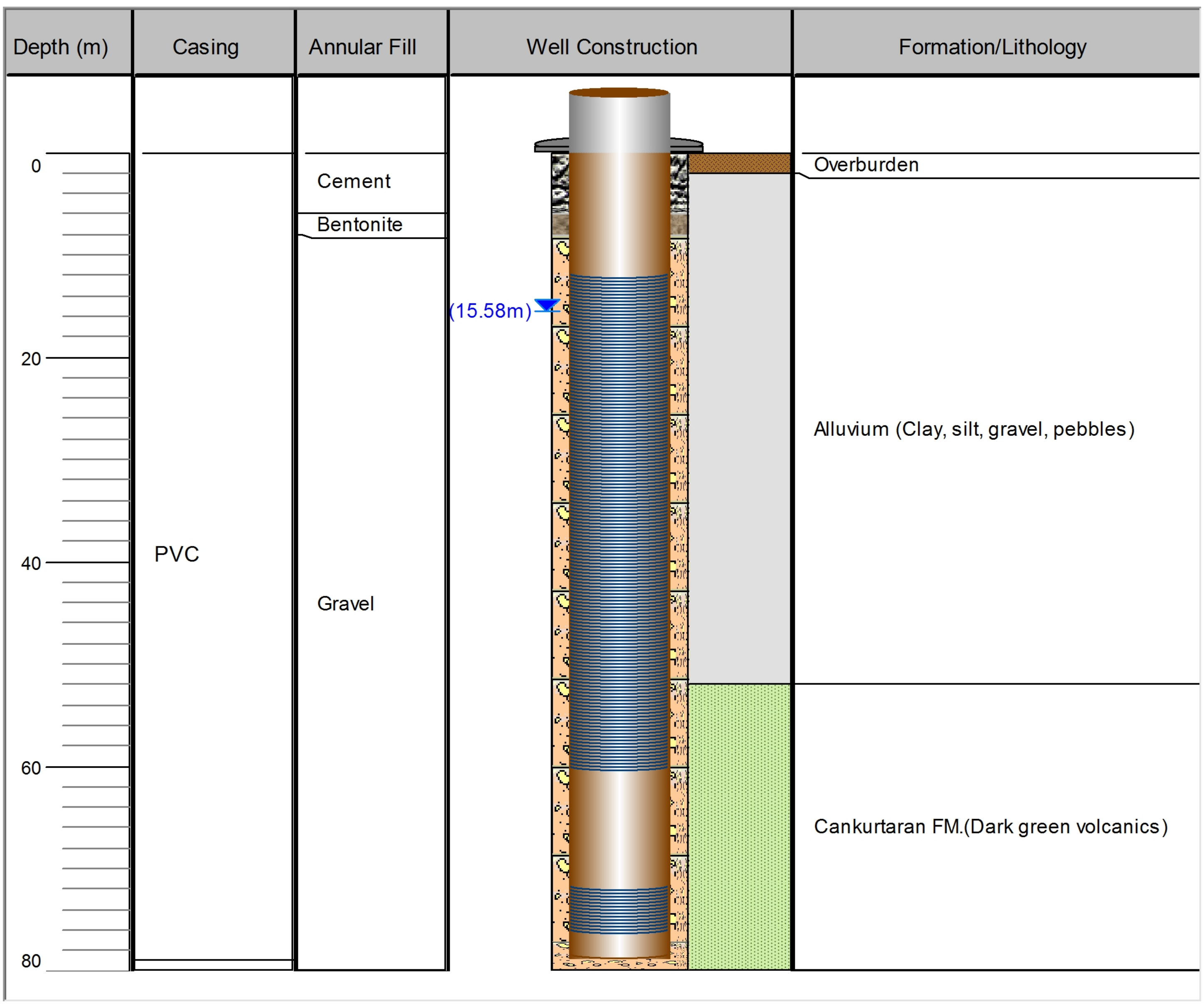
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**GK-B**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	120
Well Location:	Process Plant		**Well Diameter:**	0-120 m, 292 mm
Coordinates:	East (m):	620176.87	**Casing:**	PVC, 175 mm, 120 m
	North (m):	4606969.90	**Screen Interval:**	24-116 m; 8 m filtered, 4 m closed
Elevation (m):	709.87		**Gravel Pack:**	16-120 m
Slope / Angle:	90		**Bentonite:**	3-16 m
Start Date:	1.11.2016		**Cement:**	0-3 m
Finish Date:	17.11.2016		**Formation / Aquifer:**	Bekirli Fm.
Drilling Method:	Air Percussion			
Drilling Fluid:	Water + Foam		**Static Water Level:**	55.73 m



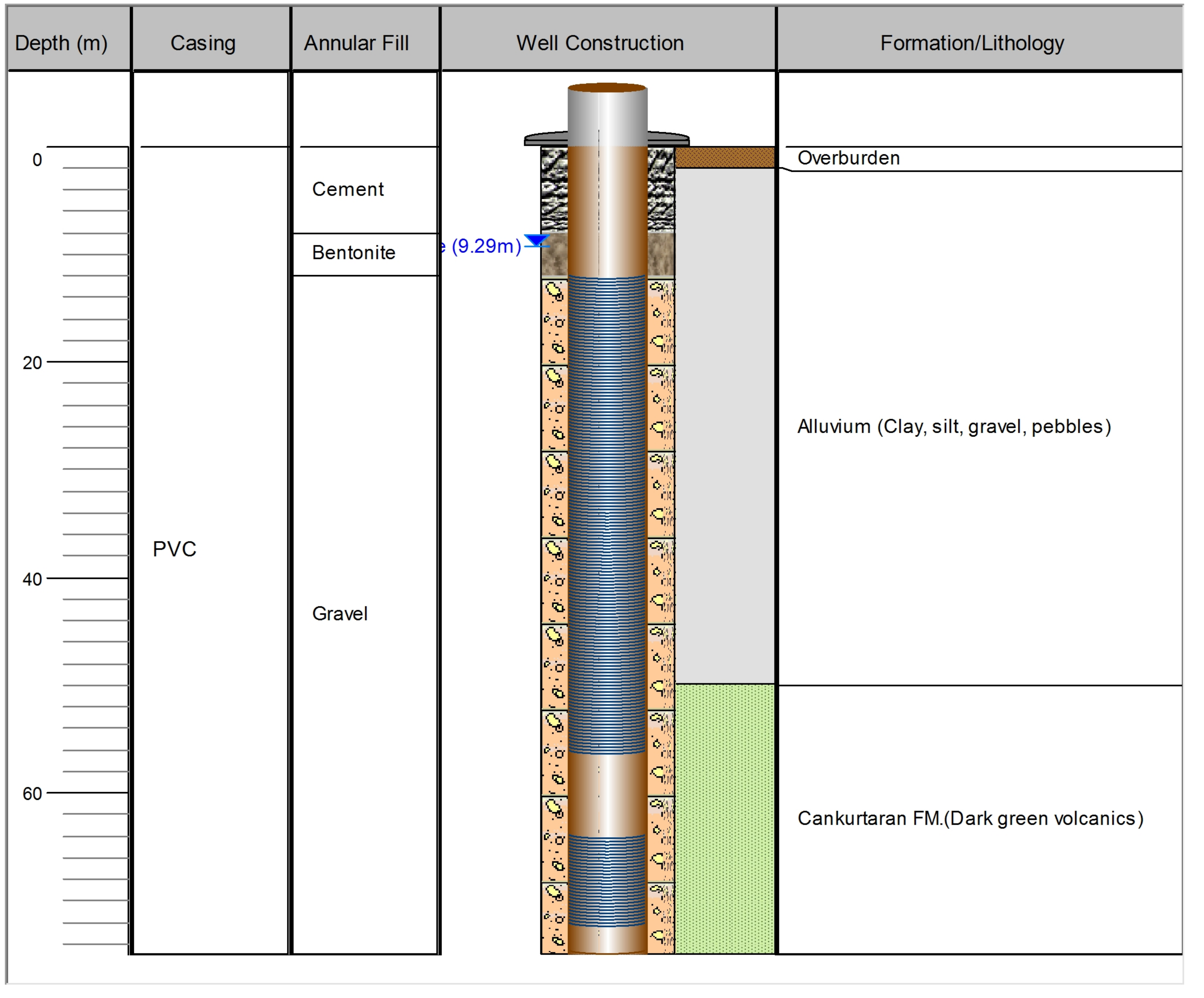
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**ST-1A**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	80
Well Location:	Mobilization Area		**Well Diameter:**	381 mm
Coordinates:	East (m):	622528.07	**Casing:**	PVC, 280 mm, 80 m
	North (m):	4608585.56	**Screen Interval:**	12-60 m / 72-76 m
Elevation (m):	412.89		**Gravel Pack:**	8-80 m, gravel
Slope / Angle:	90		**Bentonite:**	6-8 m
Start Date:	10.07.2016		**Cement:**	0-6 m
Finish Date:	15.07.2016		**Formation / Aquifer:**	Alluvium Cankurtaran FM.
Drilling Method:	Mud Rotary			
Drilling Fluid:	Mud		**Static Water Level:**	15.58 m



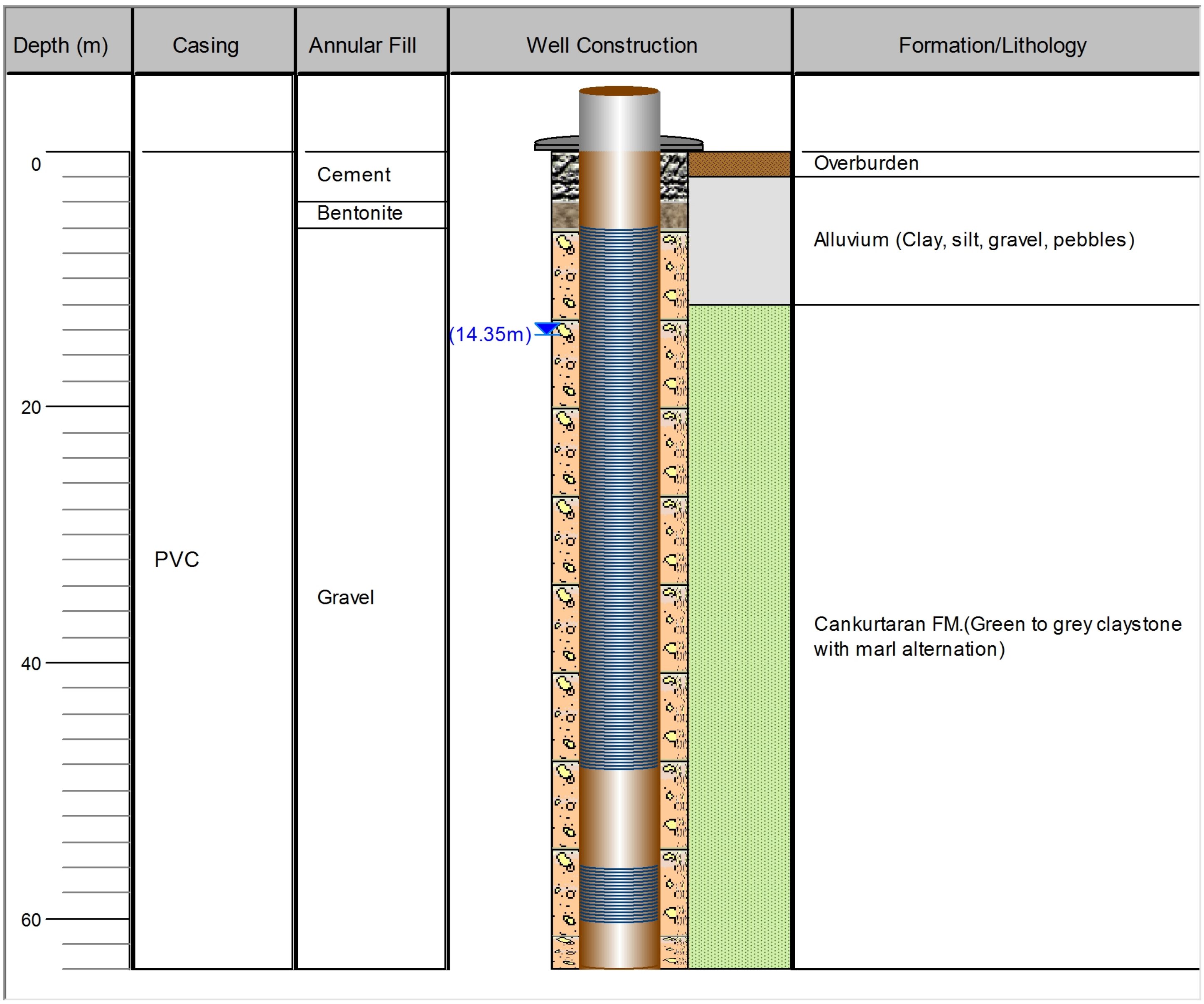
	Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
METU	Project No:	2016-03-09-2-00-18	**ST-2**
	Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	75
Well Location:	Mobilization Area		**Well Diameter:**	381 mm
Coordinates:	East (m):	622615.91	**Casing:**	PVC, 225 mm, 75 m
	North (m):	4608723.14	**Screen Interval:**	12-56 m / 64-72 m
Elevation (m):	406.26		**Gravel Pack:**	12-75 m gravel
Slope / Angle:	90		**Bentonite:**	8-12 m
Start Date:	20.02.2016		**Cement:**	0-8 m
Finish Date:	25.02.2016		**Formation / Aquifer:**	Alluvium Cankurtaran FM.
Drilling Method:	Mud Rotary			
Drilling Fluid:	Mud		**Static Water Level:**	9.29 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**ST-3**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

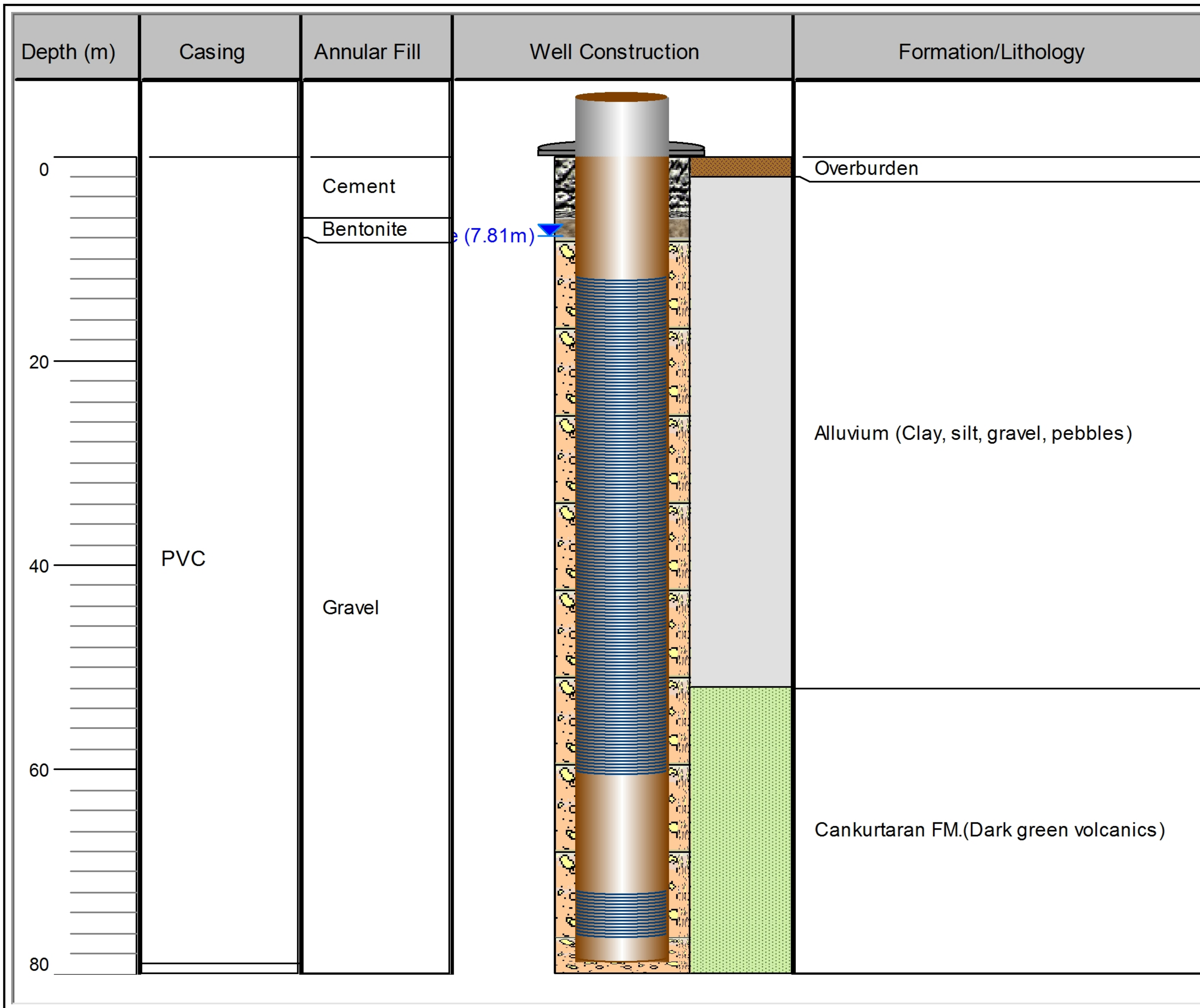
City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	64
Well Location:	Küpeli Village		**Well Diameter:**	381 mm
Coordinates:	East (m):	616719.90	**Casing:**	PVC, 225 mm, 64 m
	North (m):	4609227.14	**Screen Interval:**	6-48 m/ 56-60 m
Elevation (m):	465.23		**Gravel Pack:**	6-64 m gravel
Slope / Angle:	90		**Bentonite:**	4-6 m
Start Date:	19.05.2016		**Cement:**	0-4 m
Finish Date:	24.05.2016		**Formation / Aquifer:**	Alluvium Cankurtaran FM.
Drilling Method:	Mud Rotary			
Drilling Fluid:	Mud		**Static Water Level:**	14.35 m



METU

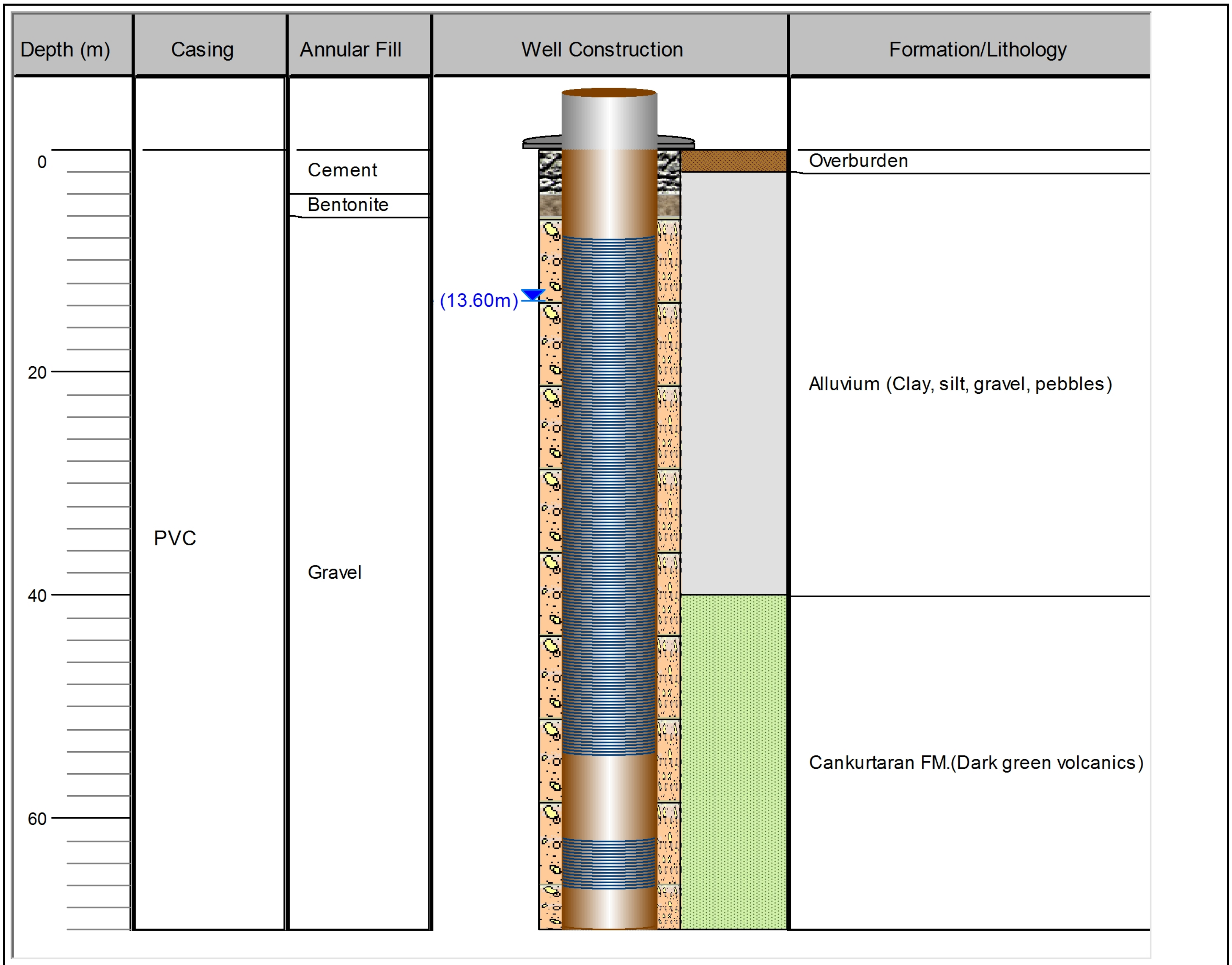
Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**ST-4**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü	**Well Depth (m):**	80
Well Location:	Mobilization Area	**Well Diameter:**	419 mm
Coordinates:	East (m): 622743.32	**Casing:**	PVC, 280 mm
	North (m): 4608695.80	**Screen Interval:**	12-60 m / 72-76 m
Elevation (m):	404.48	**Gravel Pack:**	8-80 m gravel
Slope / Angle:	90	**Bentonite:**	6-8 m
Start Date:	19.06.2016	**Cement:**	0-6 m
Finish Date:	25.06.2016	**Formation / Aquifer:**	Alluvium Cankurtaran FM.
Drilling Method:	Mud Rotary		
Drilling Fluid:	Mud	**Static Water Level:**	7.81 m



Project Name:	Hydrogeological Investigation and Characterization of AECOM-ACACIA Gökirmak Copper Project Site	Well No.
Project No:	2016-03-09-2-00-18	**ST-5**
Employer:	AECOM Turkey Consulting and Engineering Ltd. Co.	

City / Province:	Kastamonu/ Hanönü		**Well Depth (m):**	70
Well Location:	Mobilization Area		**Well Diameter:**	0-70 m 419 mm
Coordinates:	East (m):	622654.271	**Casing:**	PVC, 280 mm, 70 m
	North (m):	4608528.765	**Screen Interval:**	8-54 m / 62-66 m
Elevation (m):	411.15		**Gravel Pack:**	6-70 m gravel
Slope / Angle:	90		**Bentonite:**	4-6 m
Start Date:	26.07.2016		**Cement:**	0-4 m
Finish Date:	31.07.2016		**Formation / Aquifer:**	Alluvium Cankurtaran FM.
Drilling Method:	Mud Rotary			
Drilling Fluid:	Mud		**Static Water Level:**	13.6 m



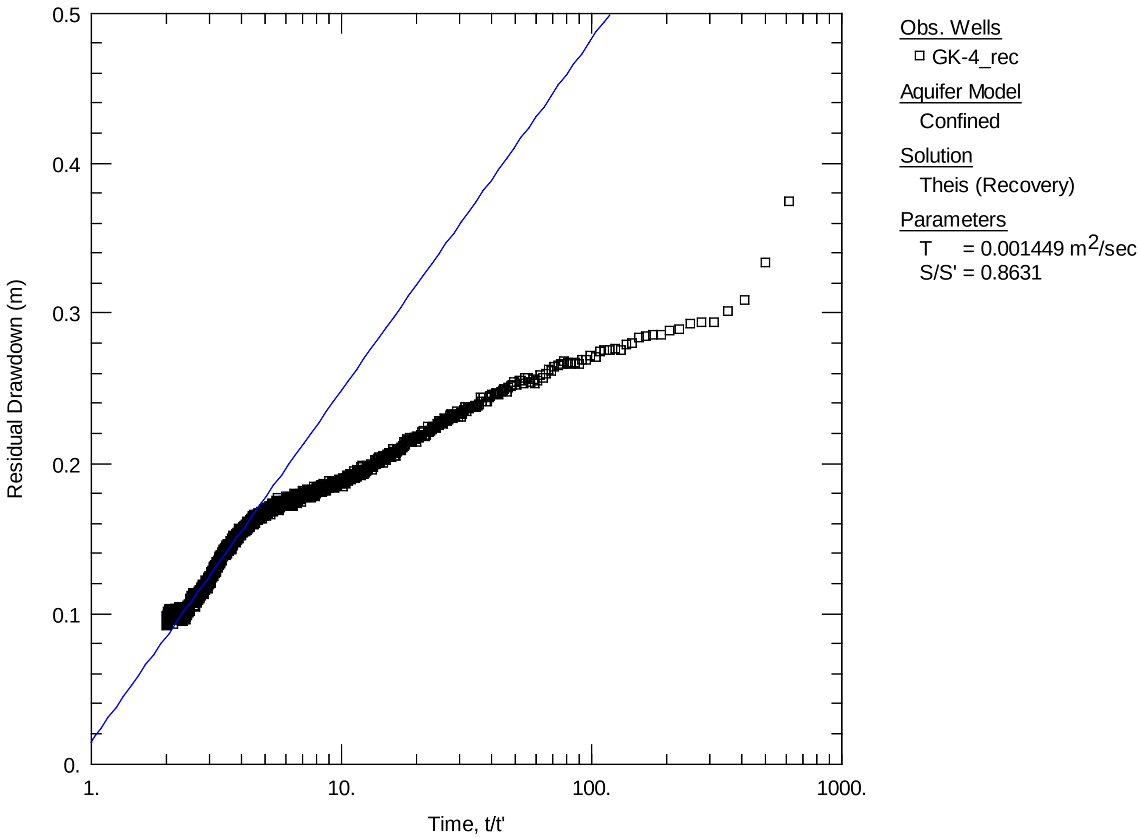
Appendix B Measured Groundwater Levels from Various Boreholes/Wells

Well ID	Coordinates WGS84-UTM Zone 36N		Z (m)	DATES																
	X (m)	Y (m)		02.07.2013	10.07.2013	22.07.2013	25.08.2014	01.09.2014	08.09.2014	10.09.2014	15.09.2014	22.09.2014	01.10.2014	11.10.2014	03.05.2015	10.05.2015	17.05.2015	23.06.2015	14.07.2015	21.07.2015
DH-1	617449	4607711	429.93	1.82	1.8	1.84														
DH-2	617522	4607775	431.94	4.11	4.09	4.13														
DH-3	617808	4607772	429.16	3.13	3.11	3.15														
DH-4	617814	4607740	429.51	4.05	4.05	4.07														
DG-104	617556	4607433	614.44				15.35	15.45	15.35	15.35	15.37	15.43	15.49	15.38	15.35	15.30	15.28	15.10		
DG-111	617693	4607484	595.14				78.95	79	79.16	79.16	79.29	79.39	79.54	79.72	78.86	77.90	77.92	76.20		
DG-142	617764	4607822	450.18				17.65	17.75	17.74	17.74	17.75	17.82	17.83	17.89	18.18	18.10	18.1	17.40		
DG-170	617829	4607837	441.76				12.2	12.24	12.25	12.25	12.21	12.28	12.26	12.23	12.20	12.18	12.2	11.90		
DG-510	617372	4607629	531.22				19.05	19.1	18.97	18.97	18.95	18.94	18.96	18.92	18.90	17.90	18.88	18.80		
DG-514	617415	4607777	482.46				13.75	13.95	14	14					14.20	13.50	13.7	9.35		
DG-550	617472	4607010	735.37				49.93	49.95	43.25	43.25	49.85	49.85								
DG-552	617267	4607494	593.67				21.16	21.62	20.14	20.14	21.35	20.81	20.98	21.62	20.80	21.10				
DG-553	617590	4607003	739.62				51.58	51.59	48.4	48.4	51.55	51.55	36.49	43.85	50.60	48.53	50.8	31.03		
DG-554	617630	4607103	694.80				19.05	19.2	17.64	17.64	18.7	18.97	18.07	18.63	18.95	18.85	18.2	12.95		
DG-555	617146	4607538	529.55				42.13	42.39	42.68	42.68	42.9	43.09	43.47	43.12	43.92	44.50	44.15	37.78		
DG-557	617527	4607082	709.78				43.74	43.96	43.74	43.74	44.17	44.24	43.94	44.32	43.20	43.20	43.05	40.75		
DG-558	617162	4606859	686.28				32.37	32.45	32.4	32.4	32.42	32.41	32.51	32.55	32.30	32.40	32.43	31.95		
DG-560	617691	4607247	657.75				13.6	13.91	13.91	13.91	13.92	13.92	13.87	13.87	19.20	19.22	18.68	14.60		
DG-564	617642	4607321	639.21				16.9	16.97	17.06	17.06	17.09	17.15	17.23	17.22	17.28	17.22	17.25	16.45		
DG-565	617824	4607153	692.70				31.13	31.13	31.13	31.13	31.13	31.11	31.15	31.16	31.18	31.20	31.23	30.90		
SDD-33	617568	4607720	494.81				30.31	30.35	30.36	30.36	30.38	30.4	30.42	30.46	27.50	27.50	27.48	25.67		
SDD-46	617700	4607814	456.30				18.65	18.75	18.71	18.71	18.7	18.66	18.51	18.72	18.10	18.10	18.05	17.40		
SDD-47	617511	4607441	607.30				58.79	58.01	58.7	58.7	57.93	58.09	58.34	58.04	60.50	59.70	60.15			
ST-1A	622480	4608345	412.89																	
ST-1	622501	4608400	415.41																	
ST-2	622588	4608538	406.26																	
ST-3	616685	4609049	456.23																	
ST-4	622716	4608510	404.48																	
ST-5	622627	4608342	411.15																	
OW-1	617468	4607596	469.20				37.38	37.57	37.74	37.74	37.82	37.88	37.93	37.94	35.05	35.22	35.12	31.53		
OW-2	617464	4607592	468.83				37	37.2	37.34	37.34	37.45	37.51	37.58	37.6	34.50	34.53	34.52	29.18		
OW-3	617544	4607515	510.07				49.76	49.78	49.83	49.83	49.83	49.86	49.86	49.9	45.80	45.75	45.82	45.10		
OW-4	617673	4607678	430.14				3.65	3.68	3.62	3.62	3.65	3.44	3.12	3.37	2.90	2.85	3.1	2.10		
OW-5	617753	4607682	436.78				10.81	10.85	10.79	10.79	10.82	10.6	10.23	10.48	9.93	9.88	10.1	9.12		
SK-9	617235	4608068	456.18				15.47	15.48	15.52	15.52	15.58	15.64	15.73	15.82	11.62	11.68	11.8	11.50		
SK-10	617198	4608019	461.50				23.69	23.67	23.69	23.69	23.7	23.72	23.78	23.78	22.68	22.67	22.67	22.50		
FTBH	617490	4607206	624.10																	
FOBH	617492	4607202	624.10																	
SOBH	617504	4607209	628.76																	
KSK5	623168	4610151	462.70																2.1	2.7
KSK6	623188	4610022	517.50																29.05	30.52
KSK8	623261	4610269	465.70																9.13	9.22
KSK9	622999	4610353	457.50																13.22	13.23
KSK12	623461	461062	521.50																18.06	18.05
KSK13	623747	4610544	500.50																0.4	1.05
KSK14	623504	4610225	525.50																6.32	6.5
KSK15	623363	4610496	485.50																11.97	12.08
KSK16	623533	4610456	481.80																9.95	10.53
KSK17	623347	4610318	470.40																14.05	14.15
KSK18	623304	4610409	469.50																12.66	12.6
IK1	622730	4609815	445.00																	
IK2	623452	4610019	529.00																	
IK3	622909	4610147	464.00																	
IK4	623112	4610417	571.00																	
ATBH	617378	4607841	429.58																	
AOBH	617389	4607844	429.60																	
BTBH	617370	4607843	429.58																	
BOBH	617373	4607854	429.45																	
GK-1	623975	4609065	426.92																	
GK-2	623660	4608858	411.71																	
GK-3	623591	4609067	422.18																	
GK-4	623510	4608757	406.52																	
GK-5	623870	4609015	421.87																	
GK-6	618858	4608755	432.65																	
GK-7	618986	4609469	530.28																	
GK-8	618318	4609249	585.73																	
GK-9	617620	4609450	467.75																	
GK-10	616313	4605799	665.37																	
GK-11	615806	4606668	480.10																	
GK-12	617478	4607517	496.89																	
GK-13	622863	4610010	446.78																	
GKA	620654	4607053	682.59																	
GKB	620141	4606792	709.87																	

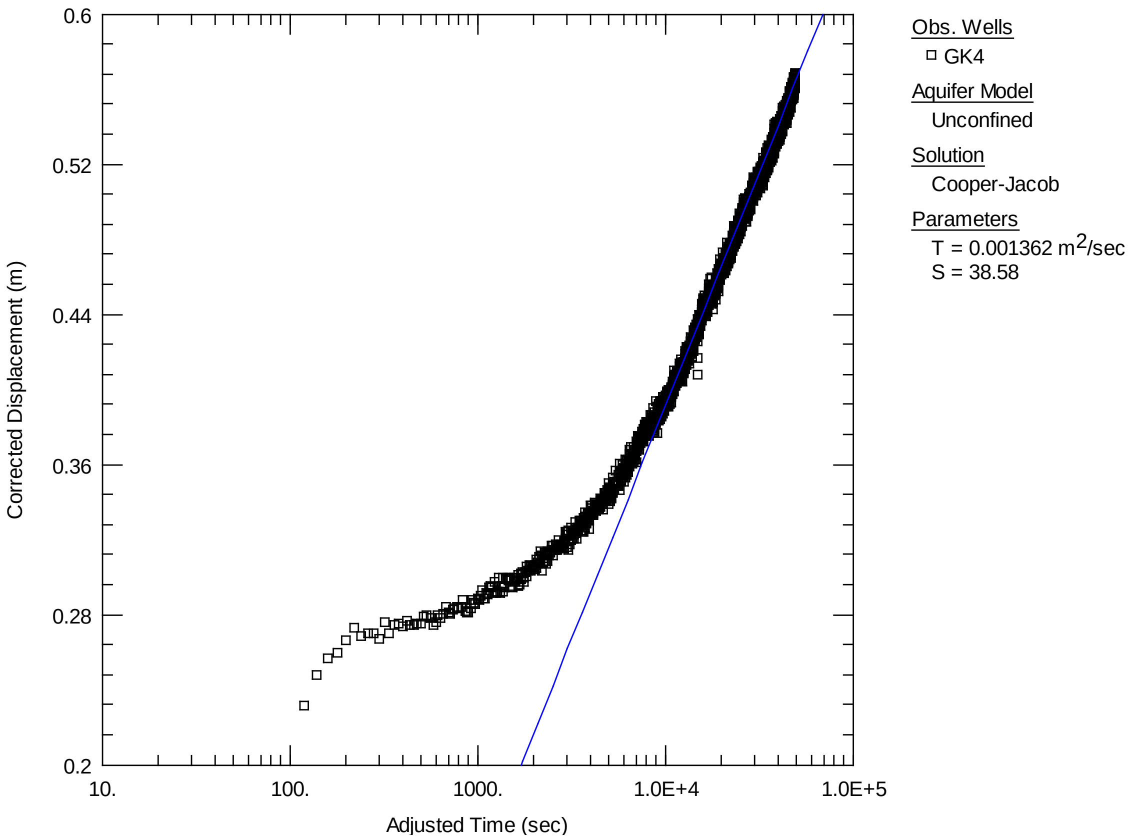
Well ID	Coordinates WGS84-UTM Zone 36N		Z (m)	DATES																
	X (m)	Y (m)		23.07.2015	23.08.2015	23.09.2015	23.10.2015	23.11.2015	24.12.2015	22.03.2016	26.04.2016	13.04.2016	19.04.2016	27.04.2016	10.05.2016	20.05.2016	24.05.2016	27.05.2016	31.05.2016	07.06.2016
DH-1	617449	4607711	429.93																	
DH-2	617522	4607775	431.94																	
DH-3	617808	4607772	429.16																	
DH-4	617814	4607740	429.51																	
DG-104	617556	4607433	614.44	13.56	12.57	1.80	10.75	11.43	11.15		11.48							11.34		
DG-111	617693	4607484	595.14	74.90	76.85	76.38	76.98	77.18	76.85	77.30	77.40							76.88		
DG-142	617764	4607822	450.18	17.97	18.28	18.22	18.65	18.57	17.98	18.69	18.82							18.78		
DG-170	617829	4607837	441.76	12.03	12.05	21.10	21.10	12.10	12.18	12.05	12.05							12.05		
DG-510	617372	4607629	531.22	18.78	18.48	17.62	18.07	17.78												
DG-514	617415	4607777	482.46	12.50	13.04	10.08	12.11	12.11	11.96											
DG-550	617472	4607010	735.37																	
DG-552	617267	4607494	593.67																	
DG-553	617590	4607003	739.62	30.98	31.50	32.27	31.43	31.83	32.72	32.91										
DG-554	617630	4607103	694.80	16.93	17.45	17.58	17.58	18.28	17.88											
DG-555	617146	4607538	529.55	36.45	37.10	37.05	35.83	39.60	41.78	43.78	43.70							42.35		
DG-557	617527	4607082	709.78	38.45	39.55	40.42														
DG-558	617162	4606859	686.28	30.75	31.85	31.68	30.90	30.57	30.22	30.45	30.45							29.40		
DG-560	617691	4607247	657.75	15.44	13.35	13.08	13.05	19.28	19.17	18.70	19.05									
DG-564	617642	4607321	639.21	16.30																
DG-565	617824	4607153	692.70	29.43	30.50	30.29	30.45	30.57	30.52	30.70	32.95							30.92		
SDD-33	617568	4607720	494.81	17.88	15.60	16.97	19.28	22.30	22.12	22.38	23.40							23.12		
SDD-46	617700	4607814	456.30	17.30	17.45	17.38	17.40		17.48	17.30	17.30							17.12		
SDD-47	617511	4607441	607.30																	
ST-1A	622480	4608345	412.89																	
ST-1	622501	4608400	415.41																	
ST-2	622588	4608538	406.26																	
ST-3	616685	4609049	456.23																	
ST-4	622716	4608510	404.48																	
ST-5	622627	4608342	411.15																	
OW-1	617468	4607596	469.20	30.63	32.38	32.98	32.92	35.52	35.22	34.35	34.25							34.21		
OW-2	617464	4607592	468.83	28.94	31.70	32.02	31.98	33.46	33.70	33.35	33.38							33.38		
OW-3	617544	4607515	510.07	44.65	44.43	44.46	44.45	44.88	45.05	45.20	45.22							45.20		
OW-4	617673	4607678	430.14	43.13	3.07	3.11	3.10	3.15	3.08	2.58	2.40							2.32		
OW-5	617753	4607682	436.78	10.12	10.10	10.17	10.17	10.20	10.17	9.65	9.50							9.43		
SK-9	617235	4608068	456.18	11.35																
SK-10	617198	4608019	461.50	20.85	19.95															
FTBH	617490	4607206	624.10				36.88	36.89	37.69	37.66	37.68							37.45		
FOBH	617492	4607202	624.10				36.75	37.05	37.46	37.41	37.45							37.28		
SOBH	617504	4607209	628.76				36.10	36.10	37.12	37.80	37.85							37.76		
KSK5	623168	4610151	462.70																	
KSK6	623188	4610022	517.50									34.16	32.50	34.15	34.83	31.70	31.59		31.63	31.58
KSK8	623261	4610269	465.70									9.65	9.68	9.70	9.71	9.71	9.71		9.73	9.25
KSK9	622999	4610353	457.50									13.25	13.29	13.25	13.17	13.15	13.09		13.14	13.05
KSK12	623461	461062	521.50																	
KSK13	623747	4610544	500.50																	
KSK14	623504	4610225	525.50									6.08	5.85	6.07	5.95	5.63	6.04		6.09	4.95
KSK15	623363	4610496	485.50									11.78	11.78	11.75	11.80	11.85	11.85		11.89	
KSK16	623533	4610456	481.80									7.20	6.65	6.68	7.15	7.44	7.51		6.94	5.28
KSK17	623347	4610318	470.40									11.25	11.35	11.40	11.58	11.72	11.74		11.79	11.90
KSK18	623304	4610409	469.50									12.41	12.40	12.45	12.47	12.54	12.56		12.60	13.05
IK1	622730	4609815	445.00																	
IK2	623452	4610019	529.00																	
IK3	622909	4610147	464.00																	
IK4	623112	4610417	571.00																	
ATBH	617378	4607841	429.58																	
AOBH	617389	4607844	429.60																	
BTBH	617370	4607843	429.58																	
BOBH	617373	4607854	429.45																	
GK-1	623975	4609065	426.92																	
GK-2	623660	4608858	411.71																	
GK-3	623591	4609067	422.18																	
GK-4	623510	4608757	406.52																	
GK-5	623870	4609015	421.87																	
GK-6	618858	4608755	432.65																	
GK-7	618986	4609469	530.28																	
GK-8	618318	4609249	585.73																	
GK-9	617620	4609450	467.75																	
GK-10	616313	4605799	665.37																	
GK-11	615806	4606668	480.10																	
GK-12	617478	4607517	496.89																	
GK-13	622863	4610010	446.78																	
GKA	620654	4607053	682.59																	
GKB	620141	4606792	709.87																	

Well ID	Coordinates WGS84-UTM Zone 36N		Z (m)											
	X (m)	Y (m)		15.06.2016	21.06.2016	29.06.2016	02.08.2016	22.08.2016	22.09.2016	04.10.2016	29.10.2016	14.11.2016	06.12.2016	15.12.2016
DH-1	617449	4607711	429.93											
DH-2	617522	4607775	431.94											
DH-3	617808	4607772	429.16											
DH-4	617814	4607740	429.51											
DG-104	617556	4607433	614.44					10.55	10.66		10.69			
DG-111	617693	4607484	595.14					77.23	76.47		76.53			
DG-142	617764	4607822	450.18											
DG-170	617829	4607837	441.76					12.05	12.08		12.05			
DG-510	617372	4607629	531.22											
DG-514	617415	4607777	482.46											
DG-550	617472	4607010	735.37											
DG-552	617267	4607494	593.67											
DG-553	617590	4607003	739.62											
DG-554	617630	4607103	694.80											
DG-555	617146	4607538	529.55					38.37	39.47		40.2			
DG-557	617527	4607082	709.78											
DG-558	617162	4606859	686.28					28.75	28.03		28			
DG-560	617691	4607247	657.75											
DG-564	617642	4607321	639.21											
DG-565	617824	4607153	692.70					30.88						
SDD-33	617568	4607720	494.81					19.08	20.58		23.4			
SDD-46	617700	4607814	456.30					17.43	17.6		17.9			
SDD-47	617511	4607441	607.30											
ST-1A	622480	4608345	412.89					15.49		14.95				15.58
ST-1	622501	4608400	415.41					17.21		17.21				17.51
ST-2	622588	4608538	406.26					8.89		8.89				9.29
ST-3	616685	4609049	456.23											
ST-4	622716	4608510	404.48					7.70		7.48				7.81
ST-5	622627	4608342	411.15					13.60		13.54				13.62
OW-1	617468	4607596	469.20											
OW-2	617464	4607592	468.83		31.45			33.18	33.5		34.22		35.42	
OW-3	617544	4607515	510.07		45.20			45.56	45.1		45.22		47.35	
OW-4	617673	4607678	430.14		2.50			2.80	3.18		4.25		5.14	
OW-5	617753	4607682	436.78		9.30			9.70	10.04		11.05		11.92	
SK-9	617235	4608068	456.18											
SK-10	617198	4608019	461.50											
FTBH	617490	4607206	624.10					37.30	37.4		37.4		37.62	
FOBH	617492	4607202	624.10					37.50	37.83		37.8		37.84	
SOBH	617504	4607209	628.76					37.75	38.08		33.3		38.5	
KSK5	623168	4610151	462.70											
KSK6	623188	4610022	517.50	30.61	30.60	30.56								
KSK8	623261	4610269	465.70	9.12	9.10	9.11								
KSK9	622999	4610353	457.50	12.96	12.92	12.60								
KSK12	623461	461062	521.50											
KSK13	623747	4610544	500.50											
KSK14	623504	4610225	525.50	5.25	5.25	5.85								
KSK15	623363	4610496	485.50											
KSK16	623533	4610456	481.80	5.10	5.06									
KSK17	623347	4610318	470.40	11.12	11.11	10.83								
KSK18	623304	4610409	469.50	11.92	11.92	11.65								
IK1	622730	4609815	445.00			14.10		15.53	20.95		20.92			
IK2	623452	4610019	529.00			11.42							15.6	
IK3	622909	4610147	464.00			15.65		15.70	15.65		3.15			
IK4	623112	4610417	571.00			26.30		25.98	27.38		27.68			
ATBH	617378	4607841	429.58				1.7	2.85	3.28		4.68		6.09	
AOBH	617389	4607844	429.60				2.2	2.35	3.8		5.25		5.24	
BTBH	617370	4607843	429.58				2.05	3.15	3.53		4.91		5.89	
BOBH	617373	4607854	429.45				2	3.19	3.65		5.1		5.63	
GK-1	623975	4609065	426.92								6.75	8.17	6.64	6.54
GK-2	623660	4608858	411.71								18.06	12.5	12.58	12.63
GK-3	623591	4609067	422.18								24.16	17.58	9.05	8.83
GK-4	623510	4608757	406.52								14.5	14.5	14.54	14.51
GK-5	623870	4609015	421.87								53.63	49.14	24.65	20.04
GK-6	618858	4608755	432.65								18.95	19.07	19.82	19.31
GK-7	618986	4609469	530.28								36.27	36.47	36.63	
GK-8	618318	4609249	585.73									71.51	65.16	
GK-9	617620	4609450	467.75					42.10	30.28		30.15	28.2		
GK-10	616313	4605799	665.37								24.02	23.72		
GK-11	615806	4606668	480.10								6.11		5.28	
GK-12	617478	4607517	496.89								85.17	54.86	52.2	
GK-13	622863	4610010	446.78					25.20			36.17	28.893	31.38	29.43
GKA	620654	4607053	682.59										33.2	29.91
GKB	620141	4606792	709.87										55.32	55.73

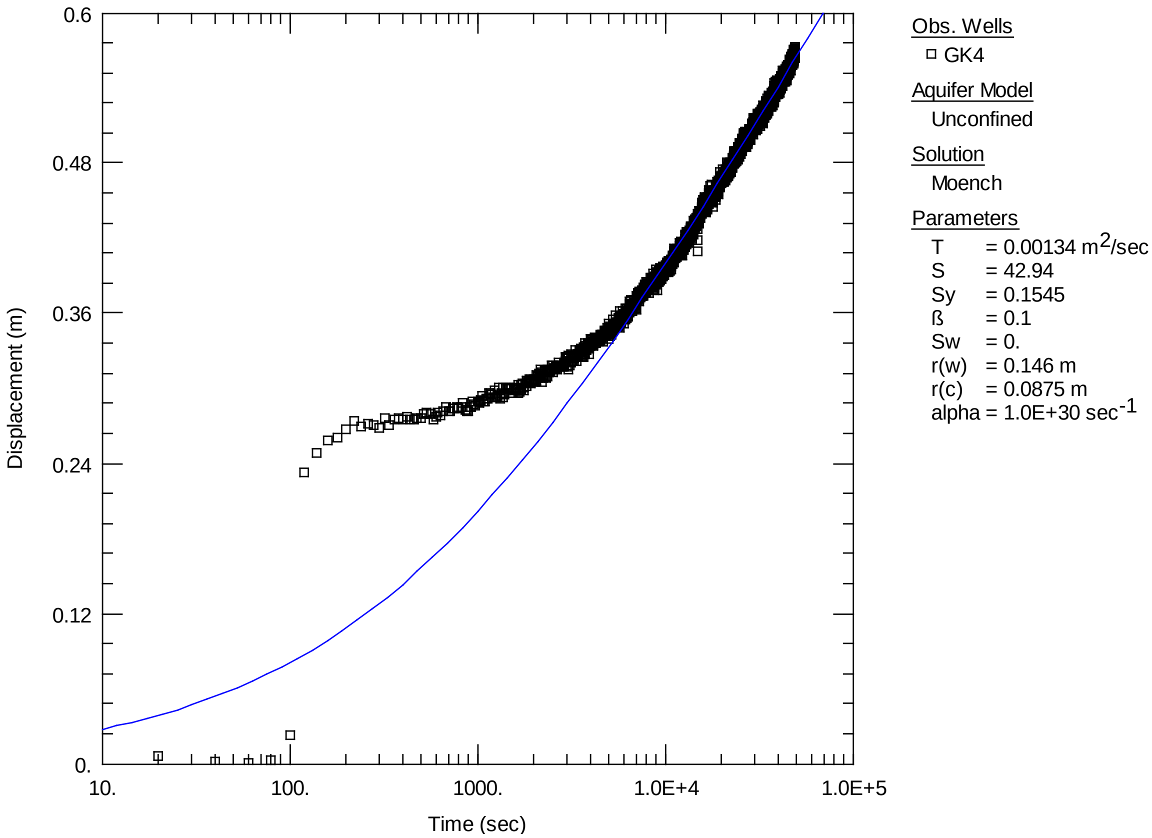
Appendix C Aqtesolv Outputs

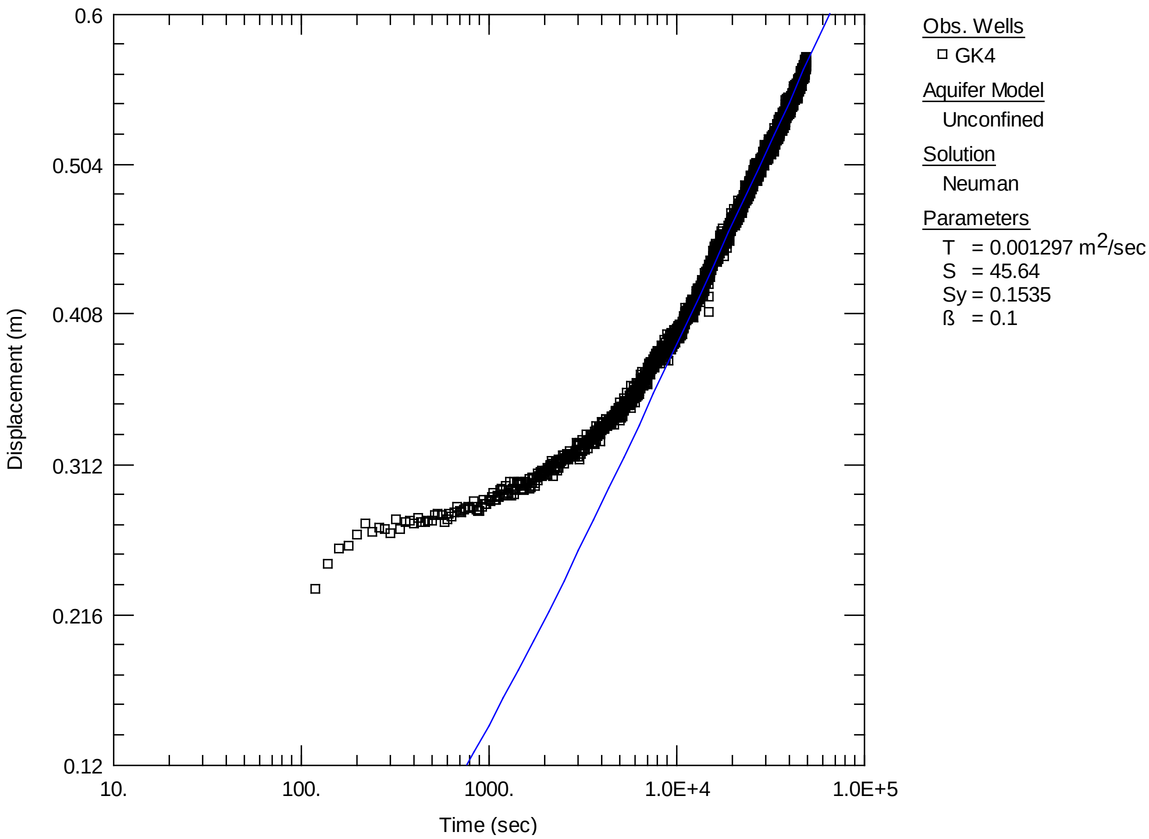


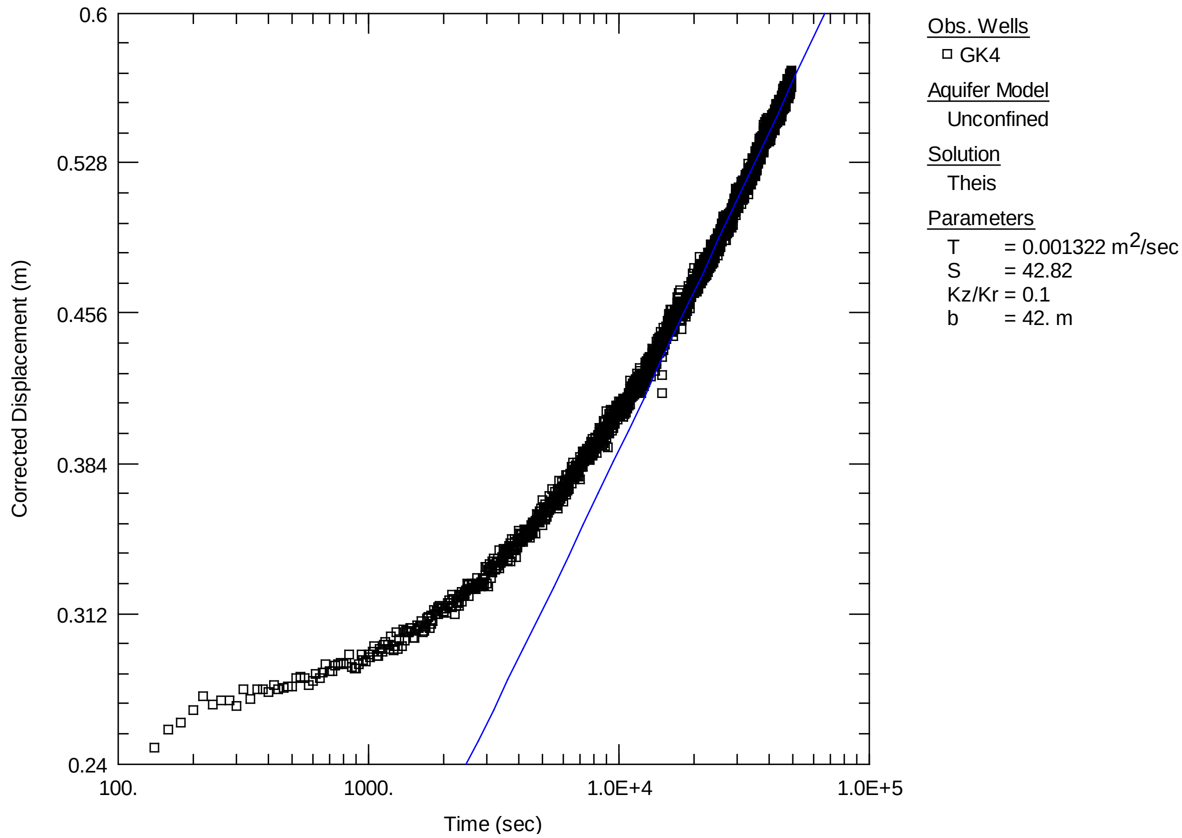
0.5
0.4
0.3
0.2
0.1
0.
Residual Drawdown (m)
1.
10.
100.
1000.
Time, t/t'
Obs. Wells
GK-4_rec
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.001449 m2/sec
S/S' = 0.8631



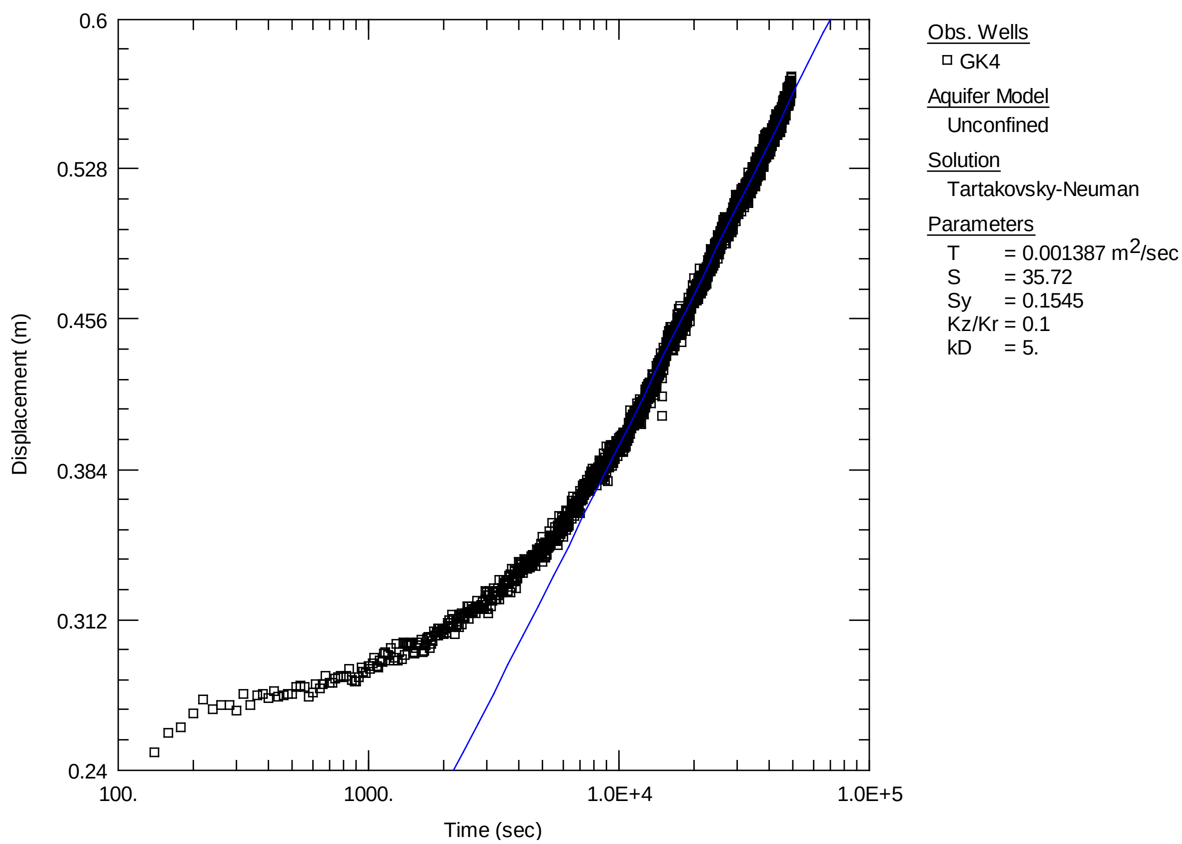
0.6
0.52
0.44
0.36
0.28
0.2
Corrected Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Obs. Wells
GK4
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.001362 m2/sec
S = 38.58


0.6
0.48
0.36
0.24
0.12
0.
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK4
Aquifer Model
Unconfined
Solution
Moench
Parameters
T = 0.00134 m2/sec
S = 42.94
Sy = 0.1545
ß = 0.1
Sw = 0.
r(w) = 0.146 m
r(c) = 0.0875 m
alpha = 1.0E+30 sec-1

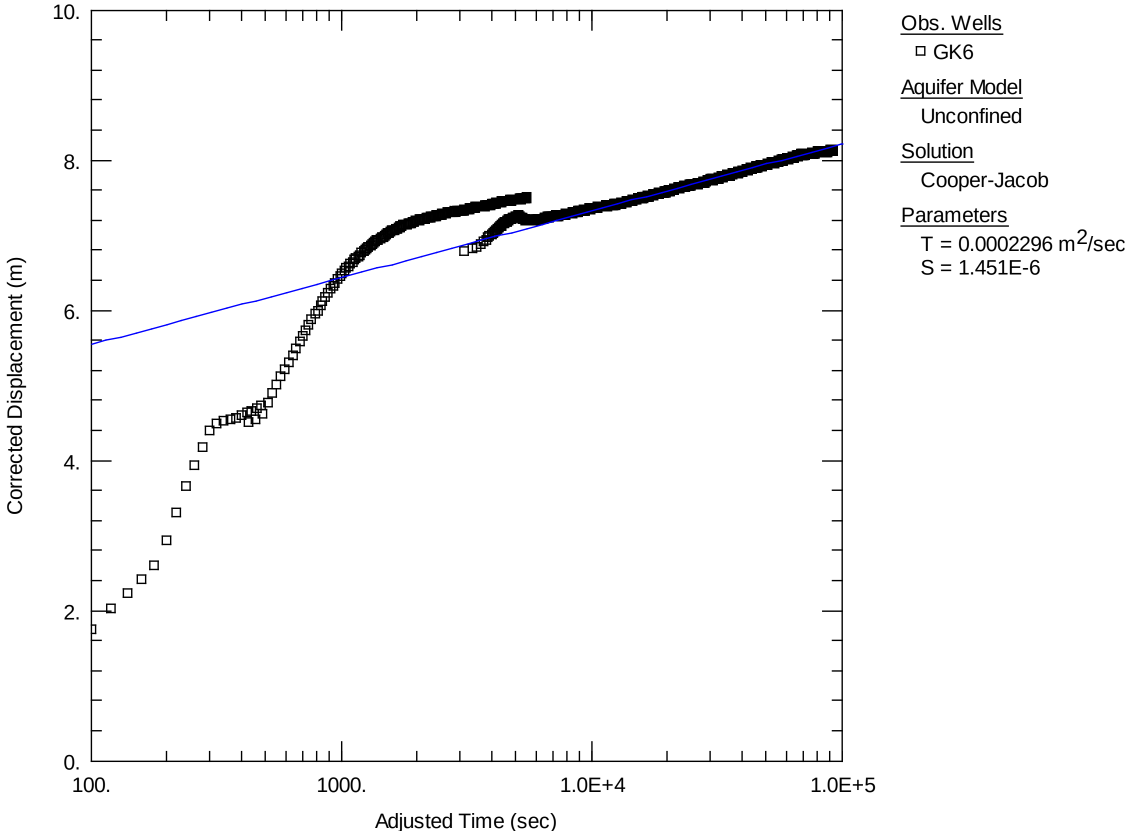

0.6
0.504
0.408
0.312
0.216
0.12
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK4
Aquifer Model
Unconfined
Solution
Neuman
Parameters
T = 0.001297 m2/sec
S = 45.64
Sy = 0.1535
ß = 0.1

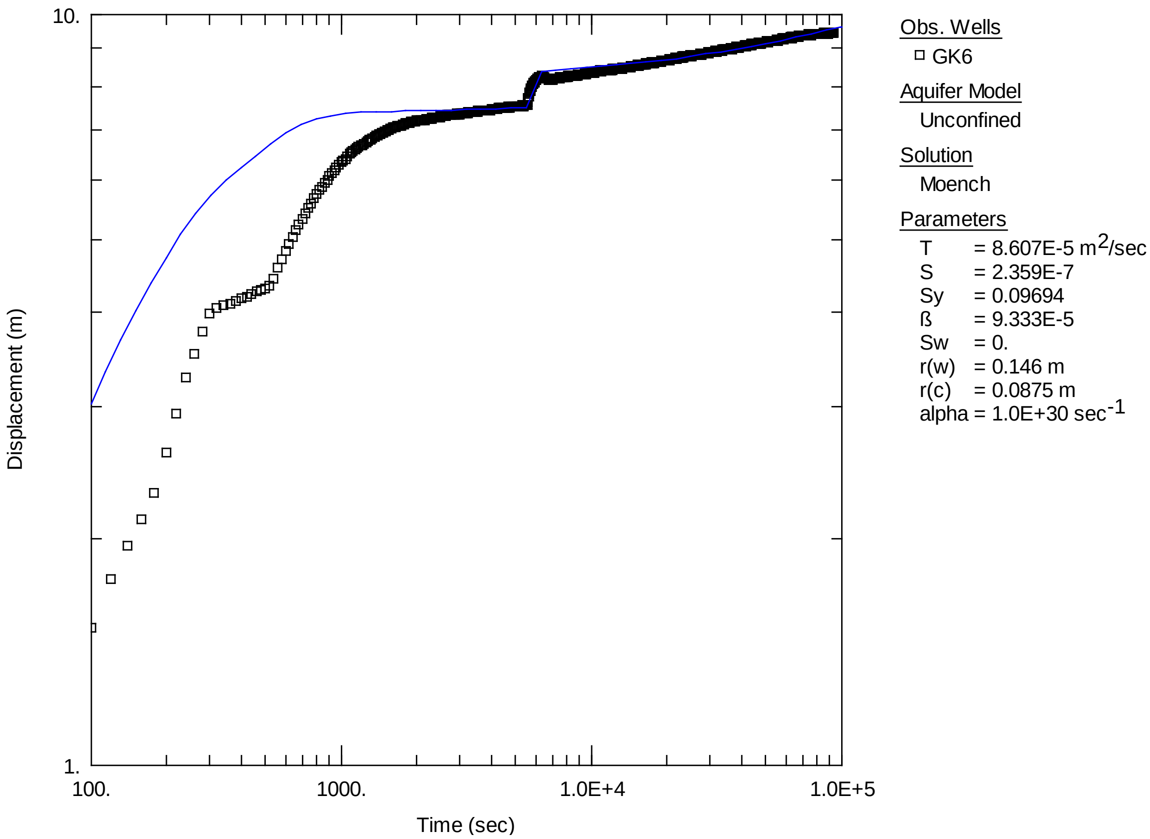


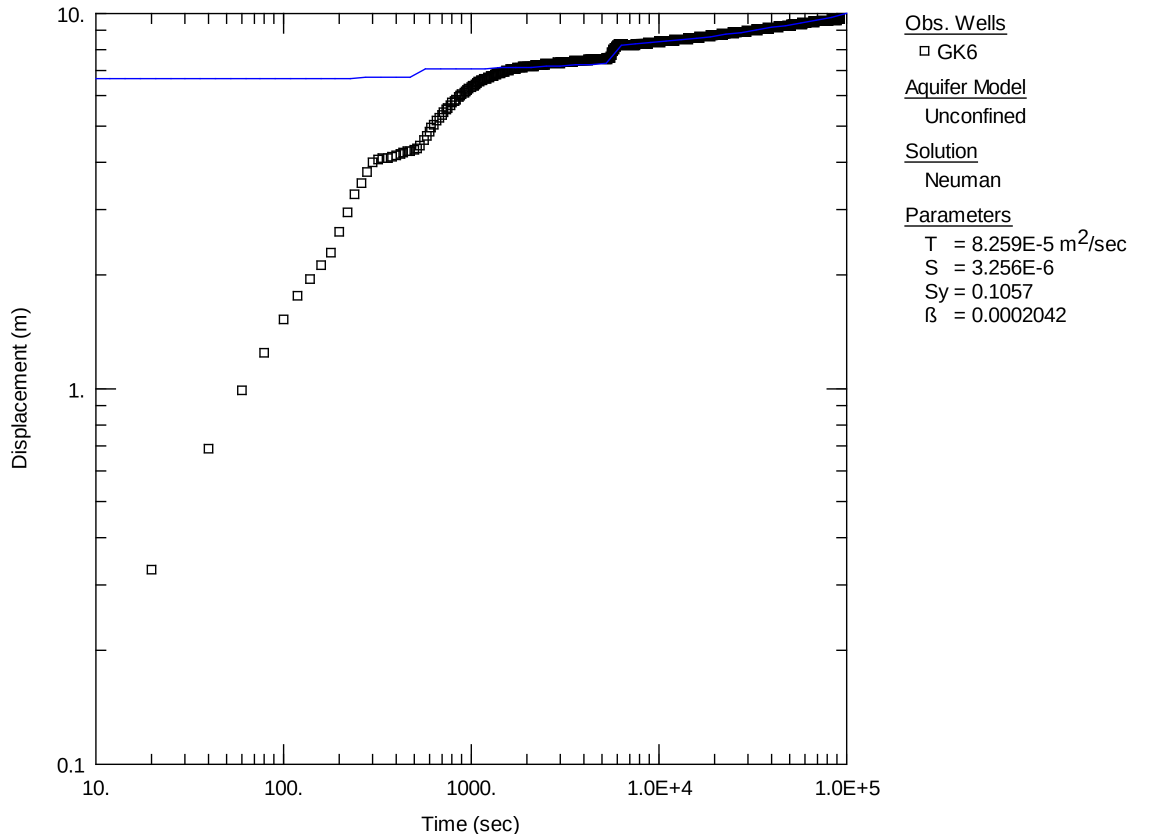
0.6
0.528
0.456
0.384
0.312
0.24
Corrected Displacement (m)
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK4
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 0.001322 m2/sec
S = 42.82
Kz/Kr = 0.1
b = 42. m

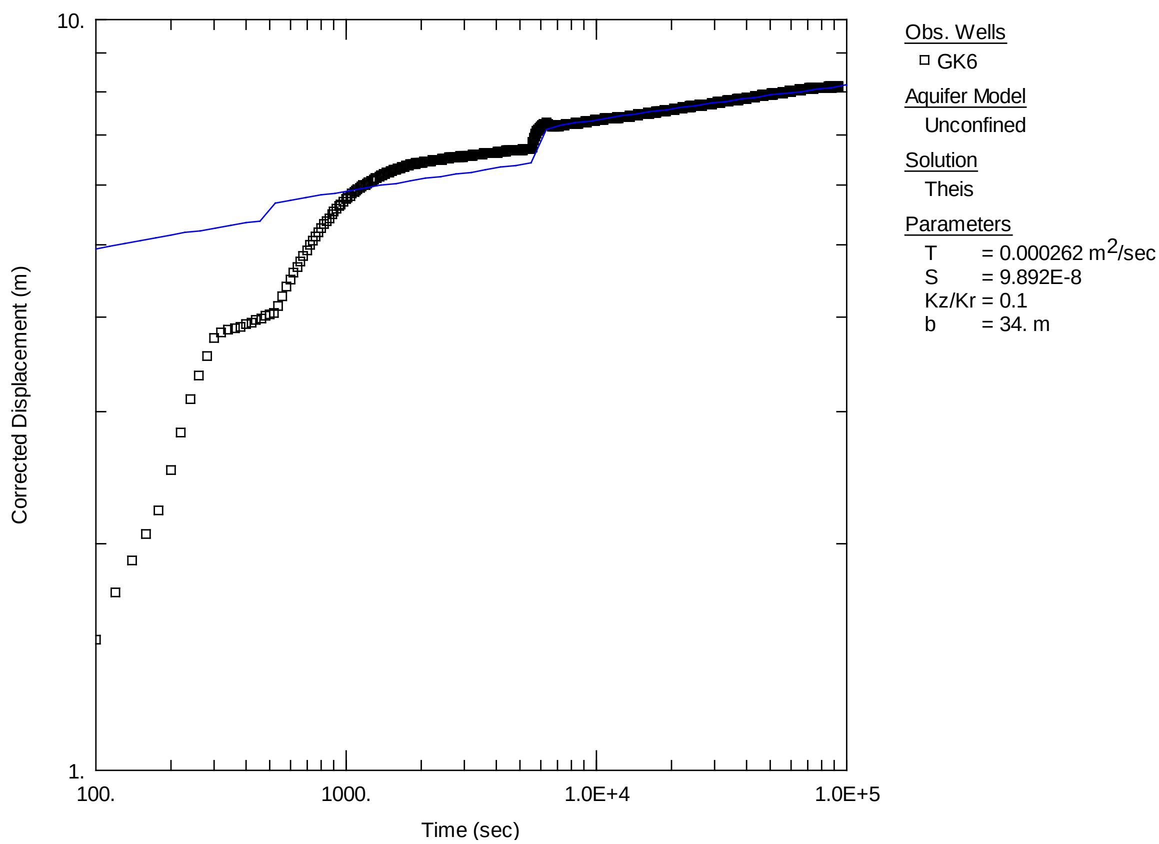


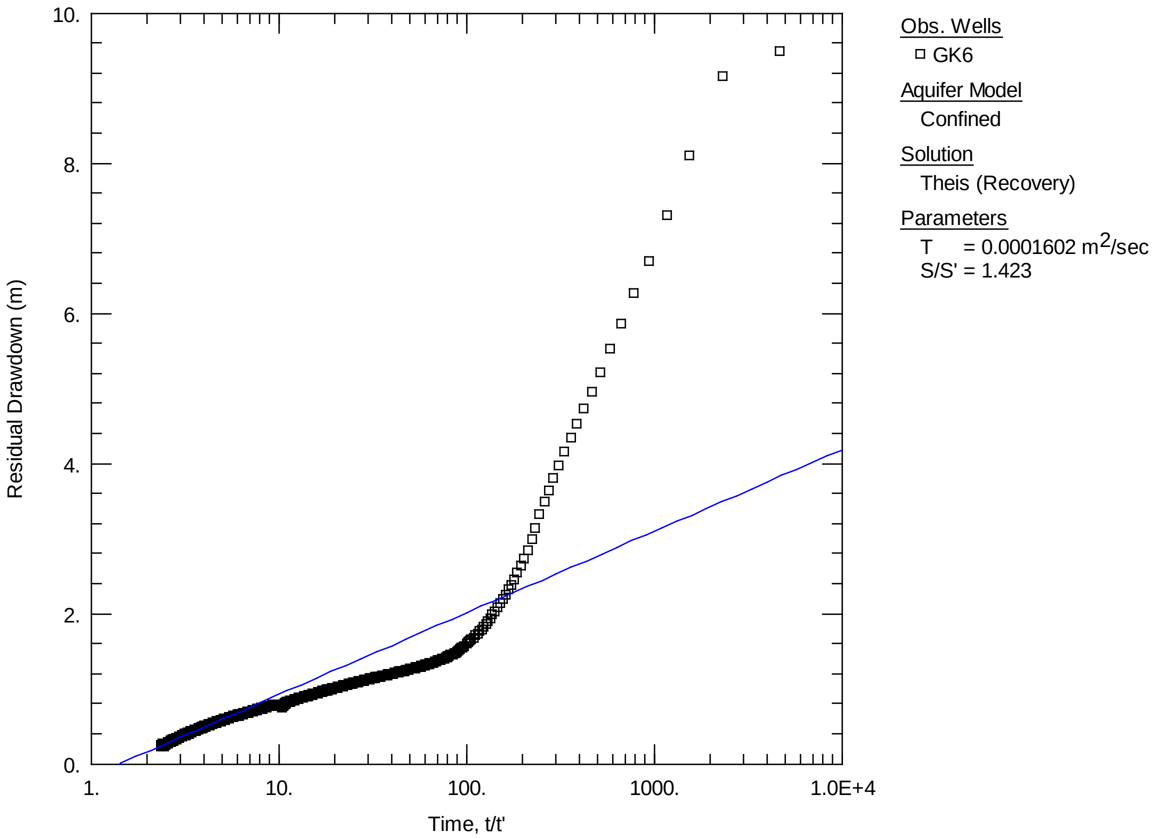
0.6
0.528
0.456
0.384
0.312
0.24
Displacement (m)
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK4
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 0.001387 m2/sec
S = 35.72
Sy = 0.1545
Kz/Kr = 0.1
kD = 5.


Corrected Displacement (m)
0.
2.
4.
6.
8.
10.
100.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Obs. Wells
GK6
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.0002296 m2/sec
S = 1.451E-6

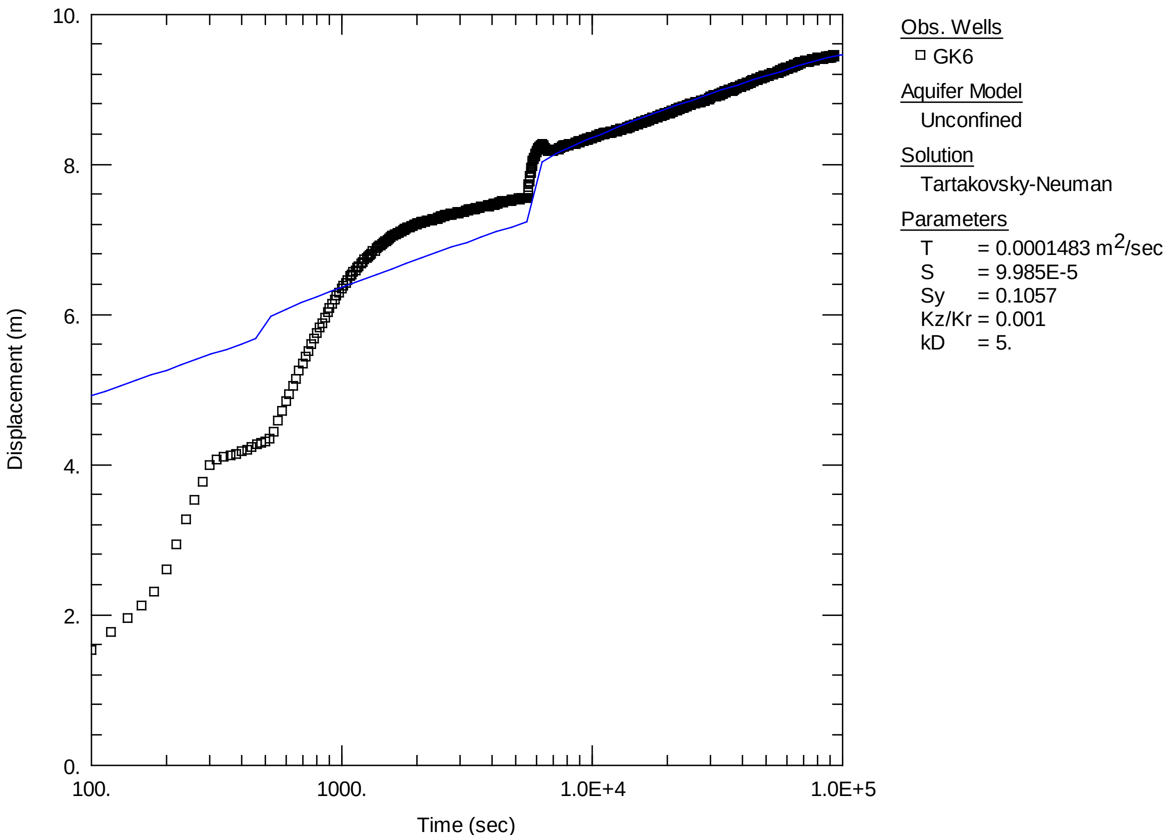

Displacement (m)
1.
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK6
Aquifer Model
Unconfined
Solution
Moench
Parameters
T = 8.607E-5 m2/sec
S = 2.359E-7
Sy = 0.09694
ß = 9.333E-5
Sw = 0.
r(w) = 0.146 m
r(c) = 0.0875 m
alpha = 1.0E+30 sec-1


10.
1.
0.1
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK6
Aquifer Model
Unconfined
Solution
Neuman
Parameters
T = 8.259E-5 m2/sec
S = 3.256E-6
Sy = 0.1057
ß = 0.0002042

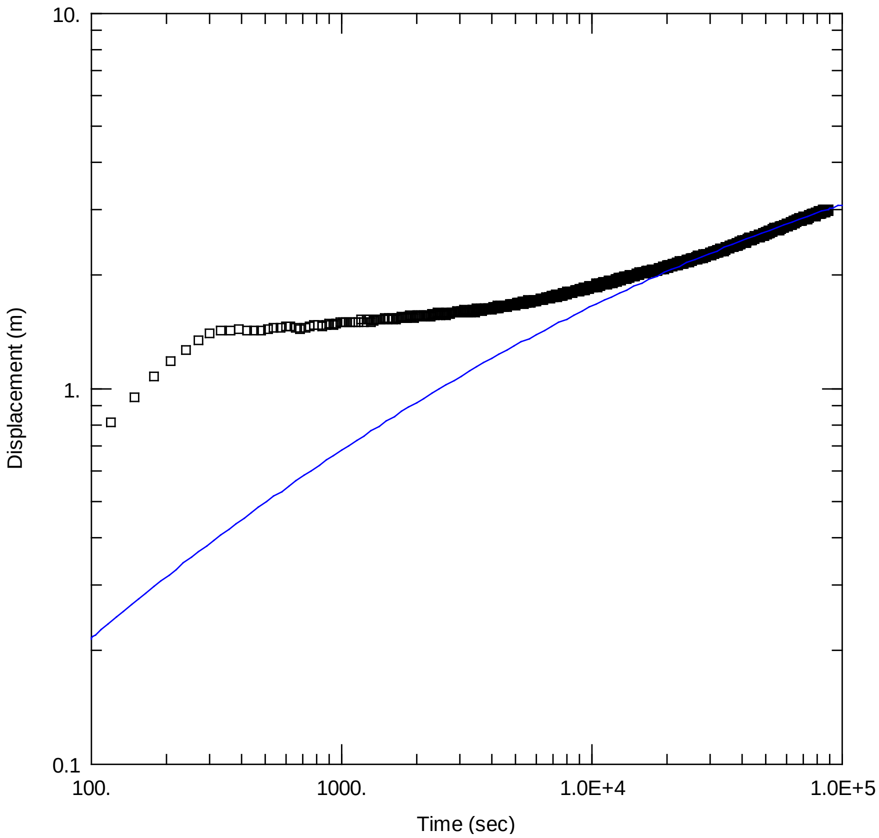

10.
1.
Corrected Displacement (m)
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK6
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 0.000262 m2/sec
S = 9.892E-8
Kz/Kr = 0.1
b = 34. m



Residual Drawdown (m)
Time, t/t'
Obs. Wells
GK6
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.0001602 m2/sec
S/S' = 1.423



Displacement (m)
Time (sec)
Obs. Wells
GK6
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 0.0001483 m2/sec
S = 9.985E-5
Sy = 0.1057
Kz/Kr = 0.001
kD = 5.

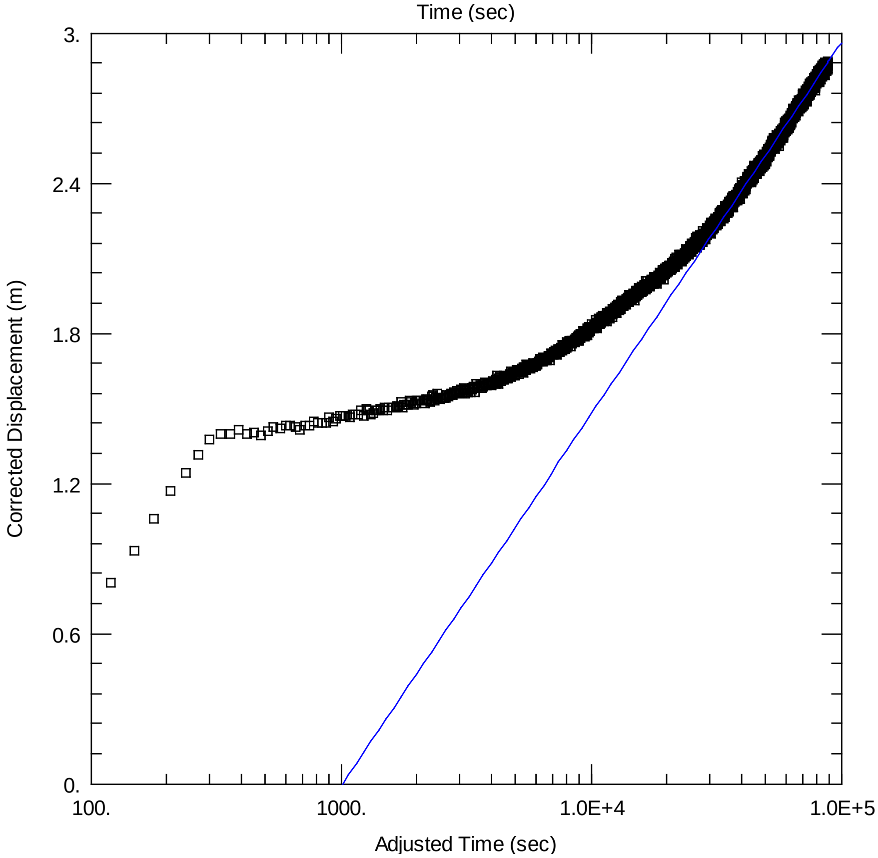


Obs. Wells
□ GK_10

Aquifer Model
Unconfined

Solution
Moench

Parameters
T = 2.732E-5 m^2/sec
S = 4.427
Sy = 0.1274
ß = 0.004
Sw = 0.
r(w) = 0.146 m
r(c) = 0.0875 m
alpha = 1.0E+30 sec^{-1}

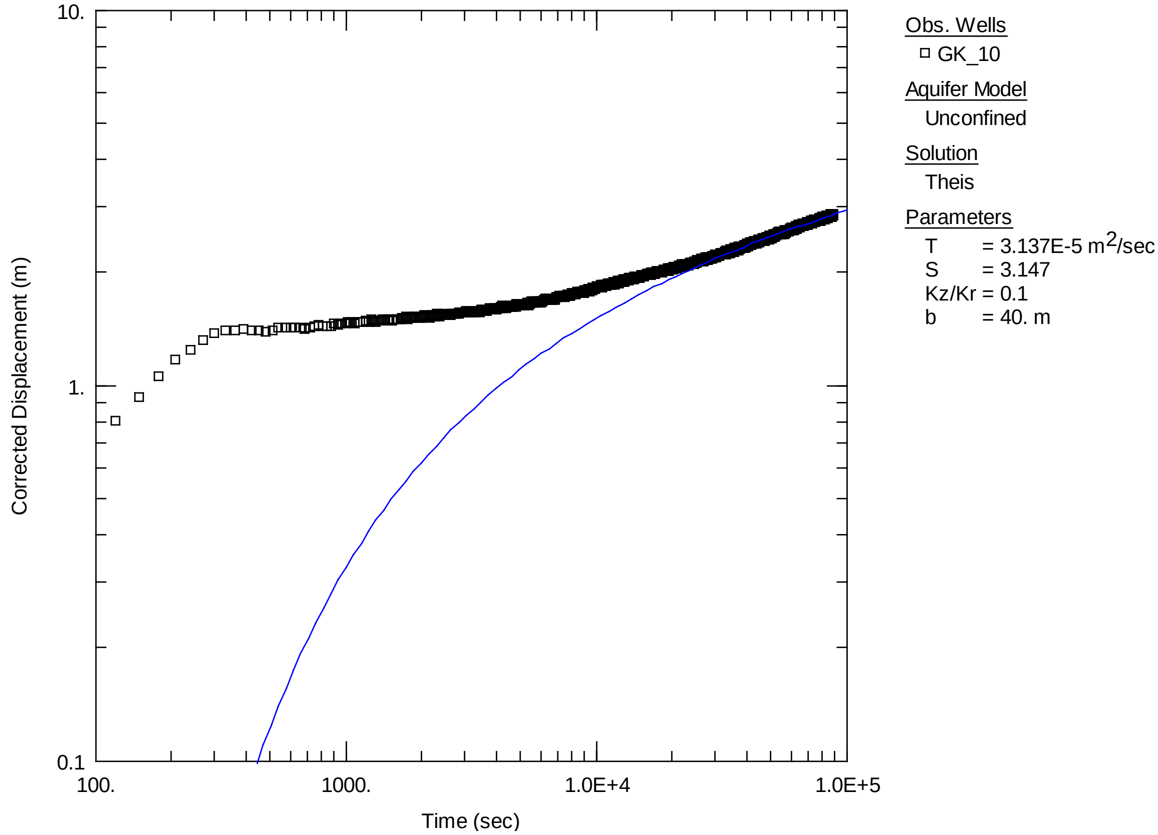


Obs. Wells
□ GK_10

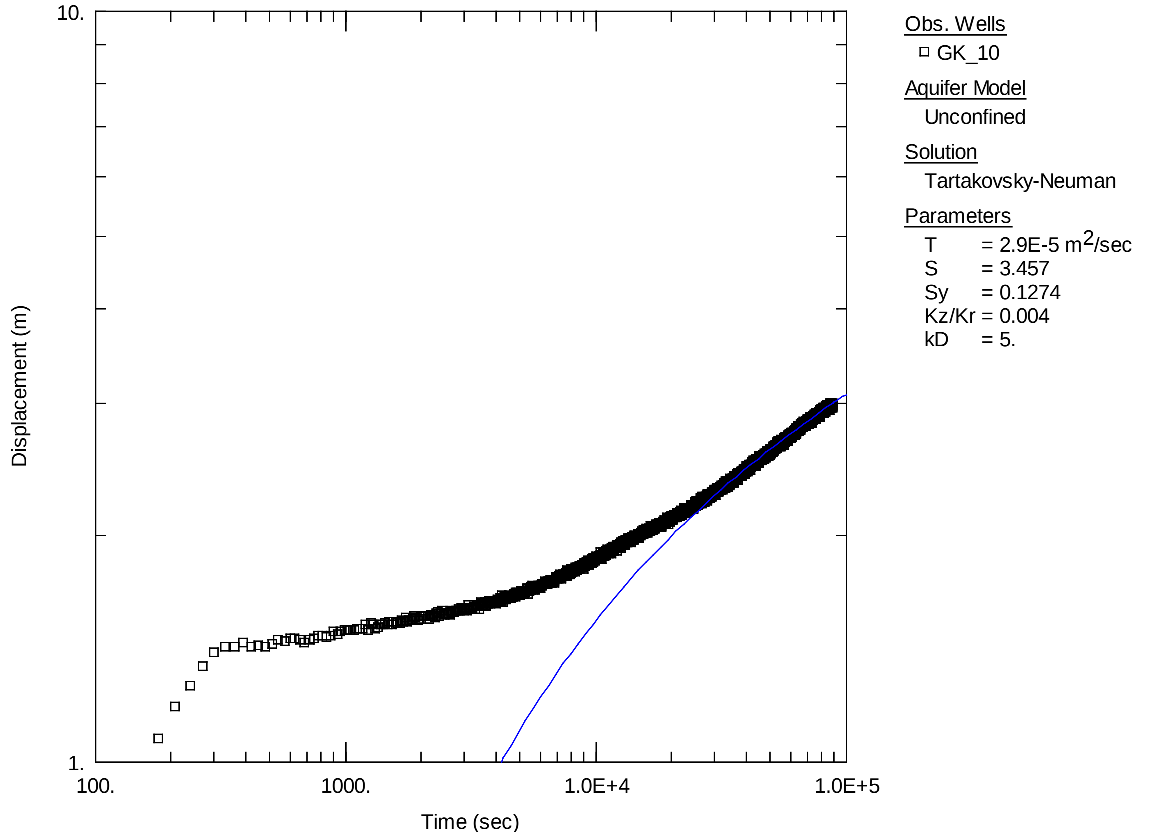
Aquifer Model
Unconfined

Solution
Cooper-Jacob

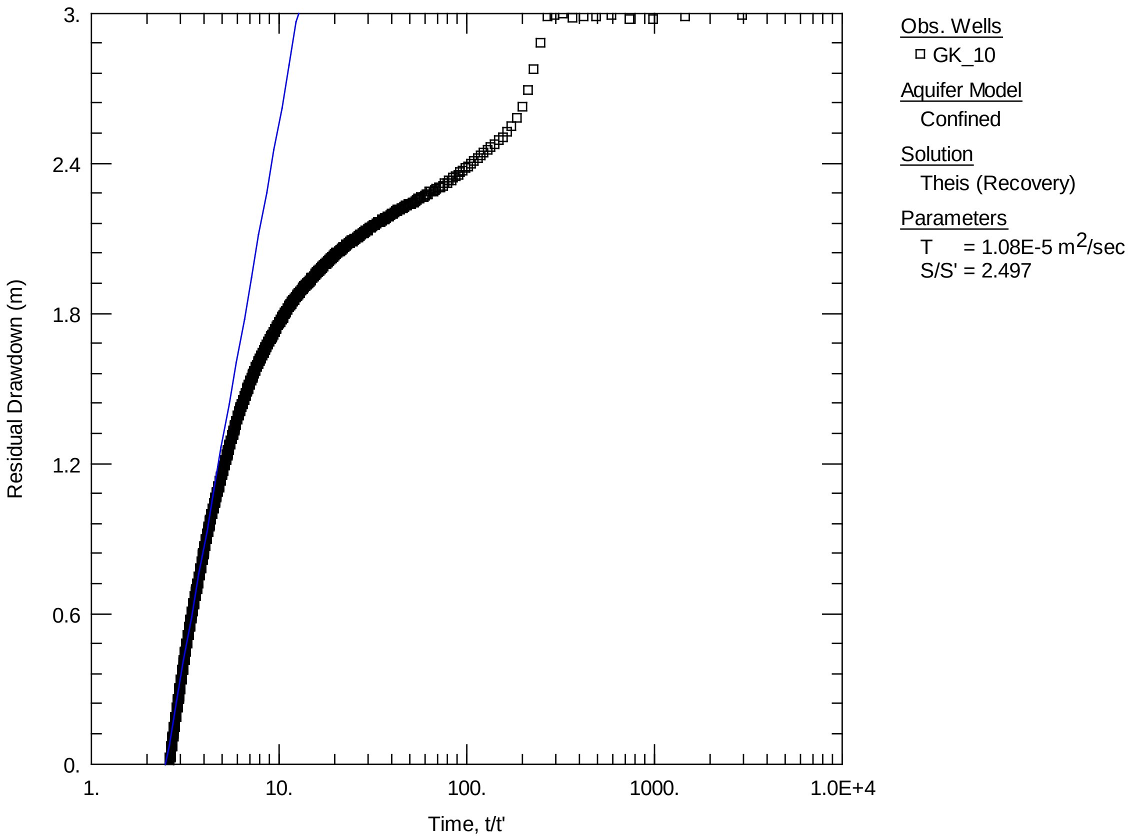
Parameters
T = 3.083E-5 m^2/sec
S = 3.308



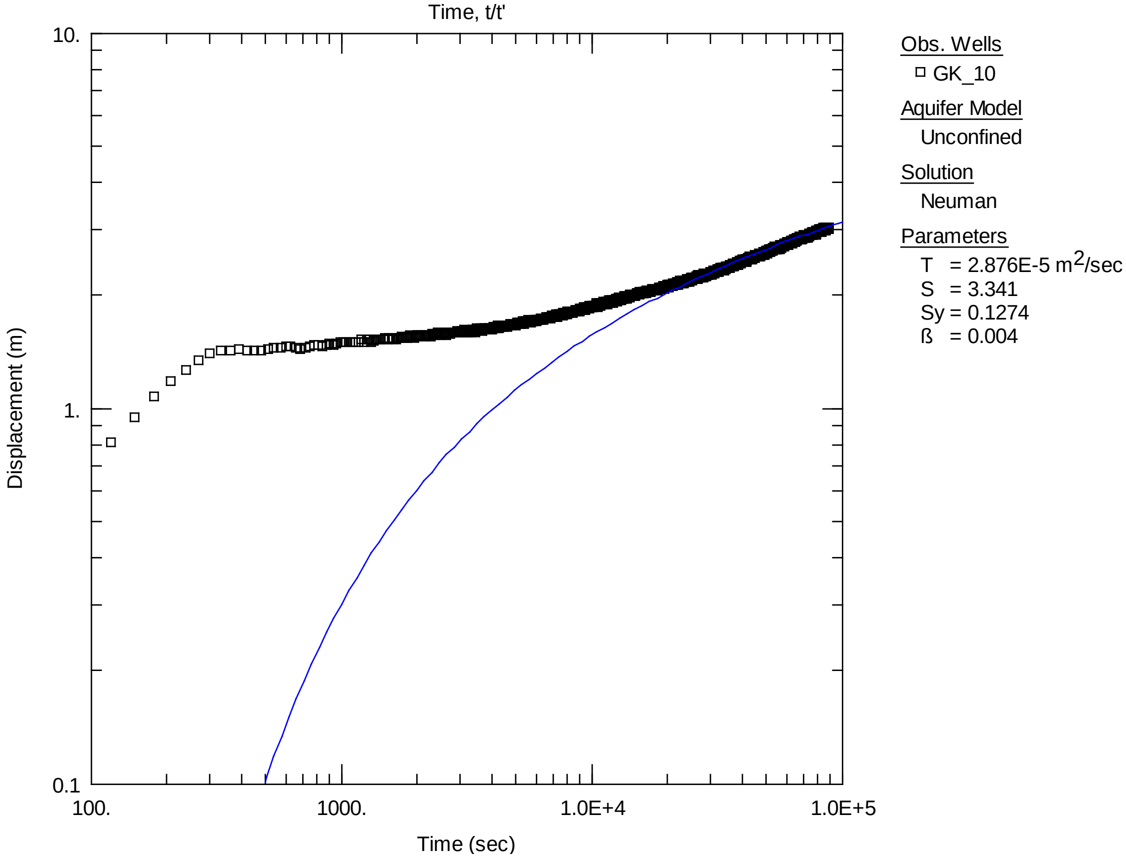
10.
1.
0.1
100.
1000.
1.0E+4
1.0E+5
Corrected Displacement (m)
Time (sec)
Obs. Wells
GK_10
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 3.137E-5 m2/sec
S = 3.147
Kz/Kr = 0.1
b = 40. m



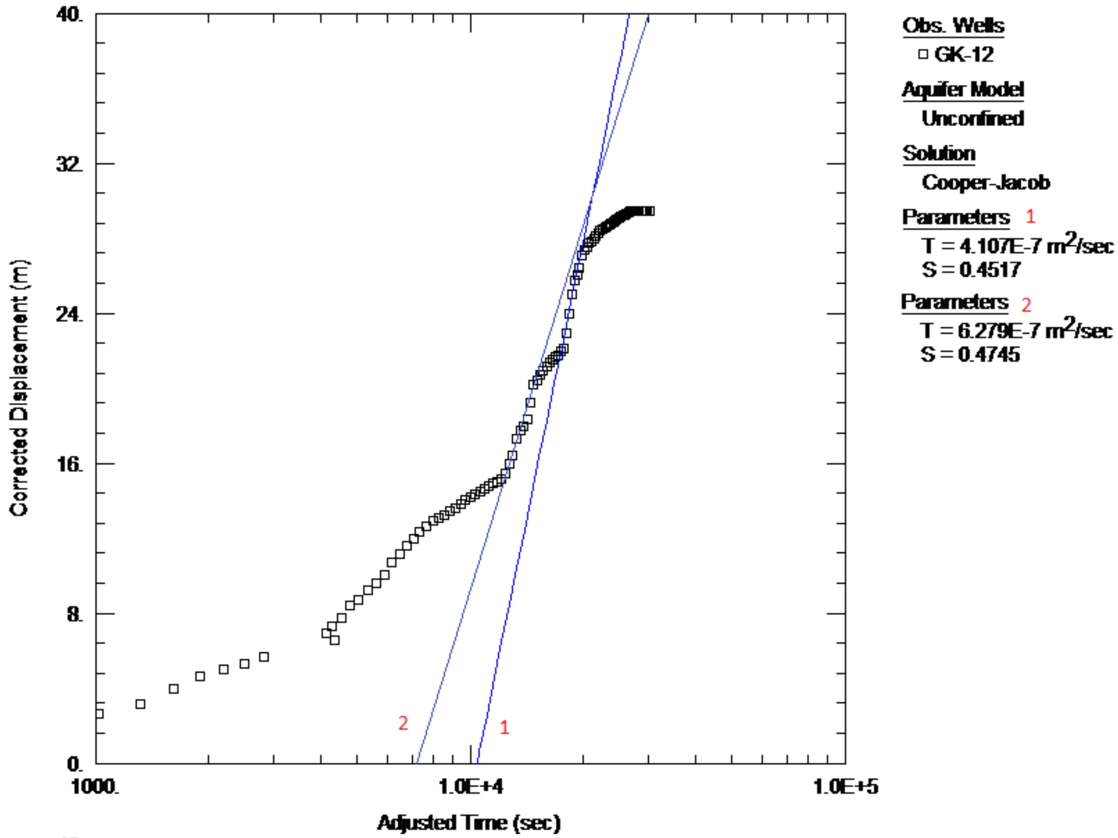
10.
1.
100.
1000.
1.0E+4
1.0E+5
Displacement (m)
Time (sec)
Obs. Wells
GK_10
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 2.9E-5 m2/sec
S = 3.457
Sy = 0.1274
Kz/Kr = 0.004
kD = 5.

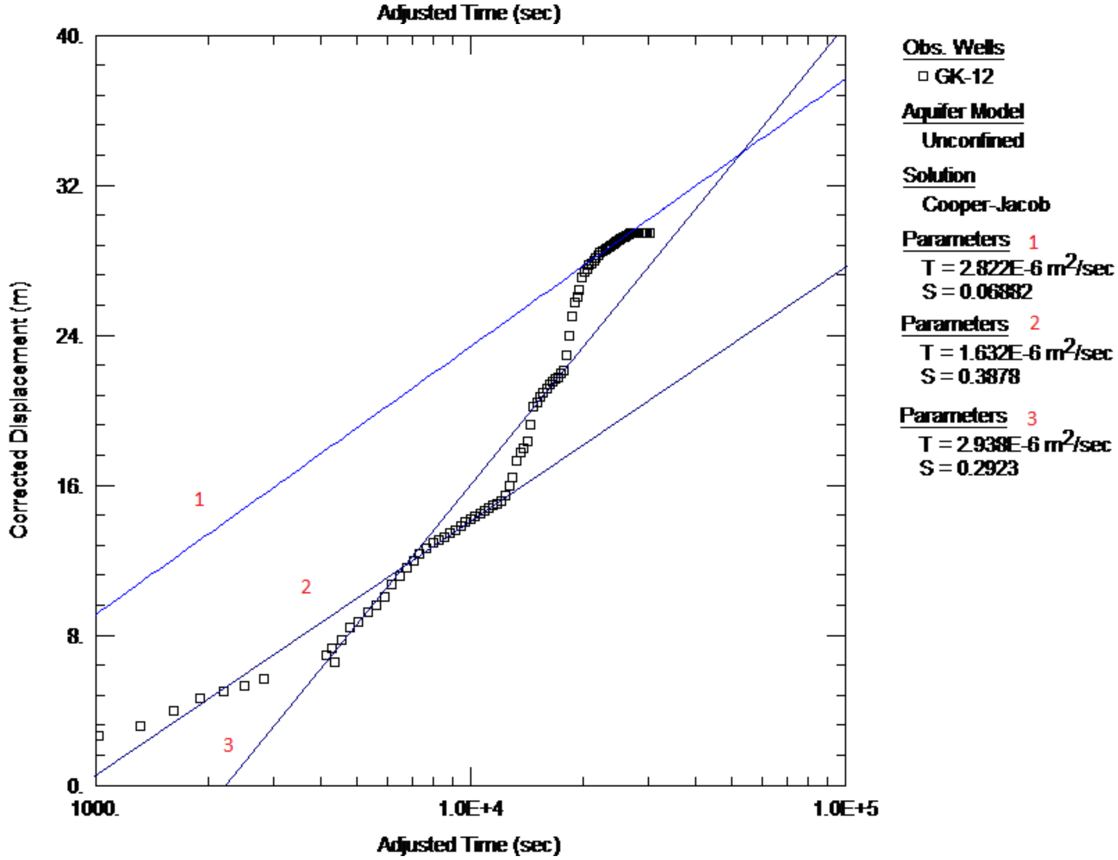


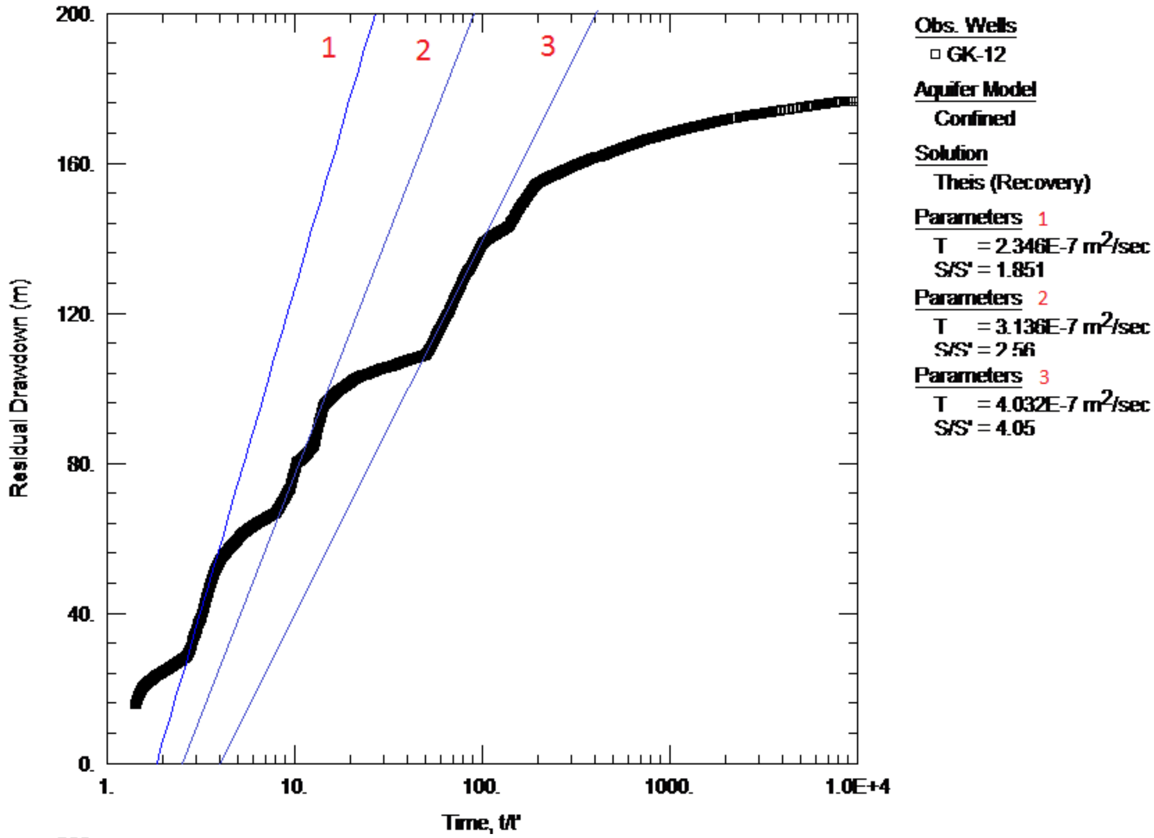
3.
2.4
1.8
1.2
0.6
0.
Residual Drawdown (m)
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
GK_10
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 1.08E-5 m2/sec
S/S' = 2.497

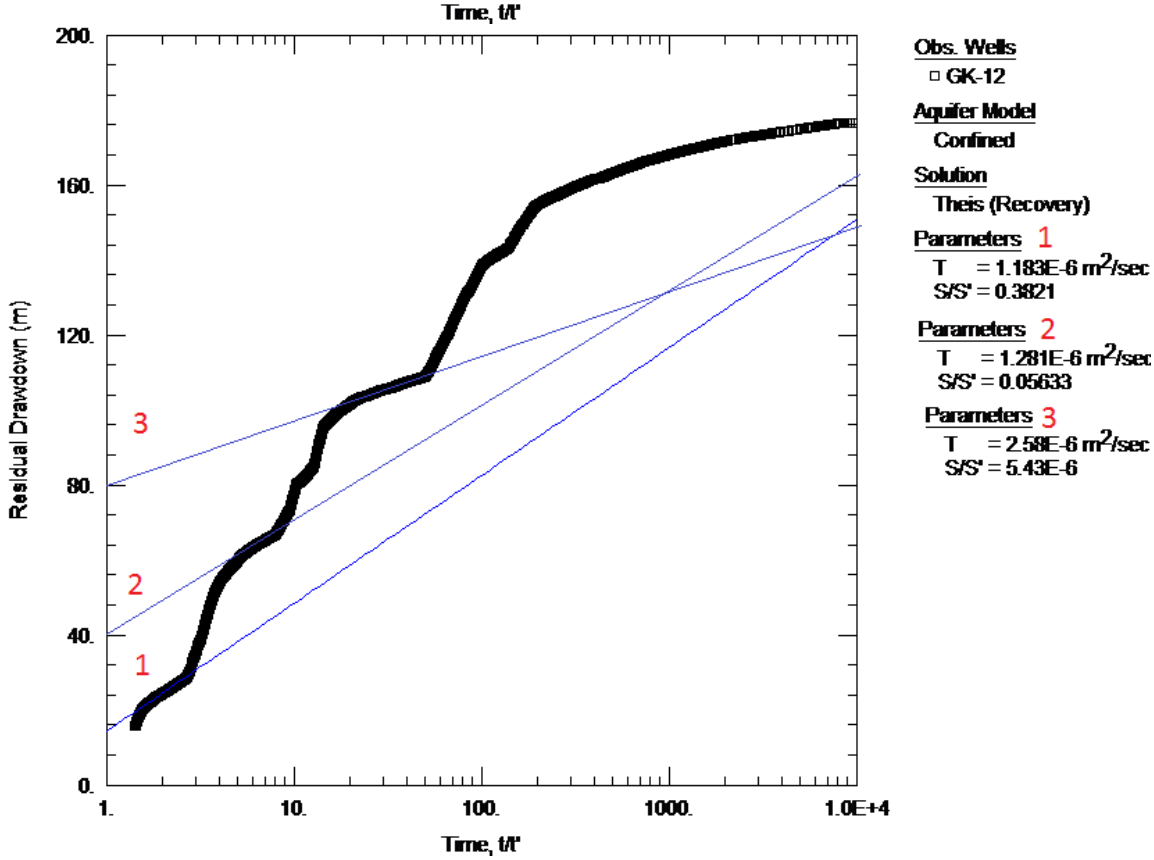


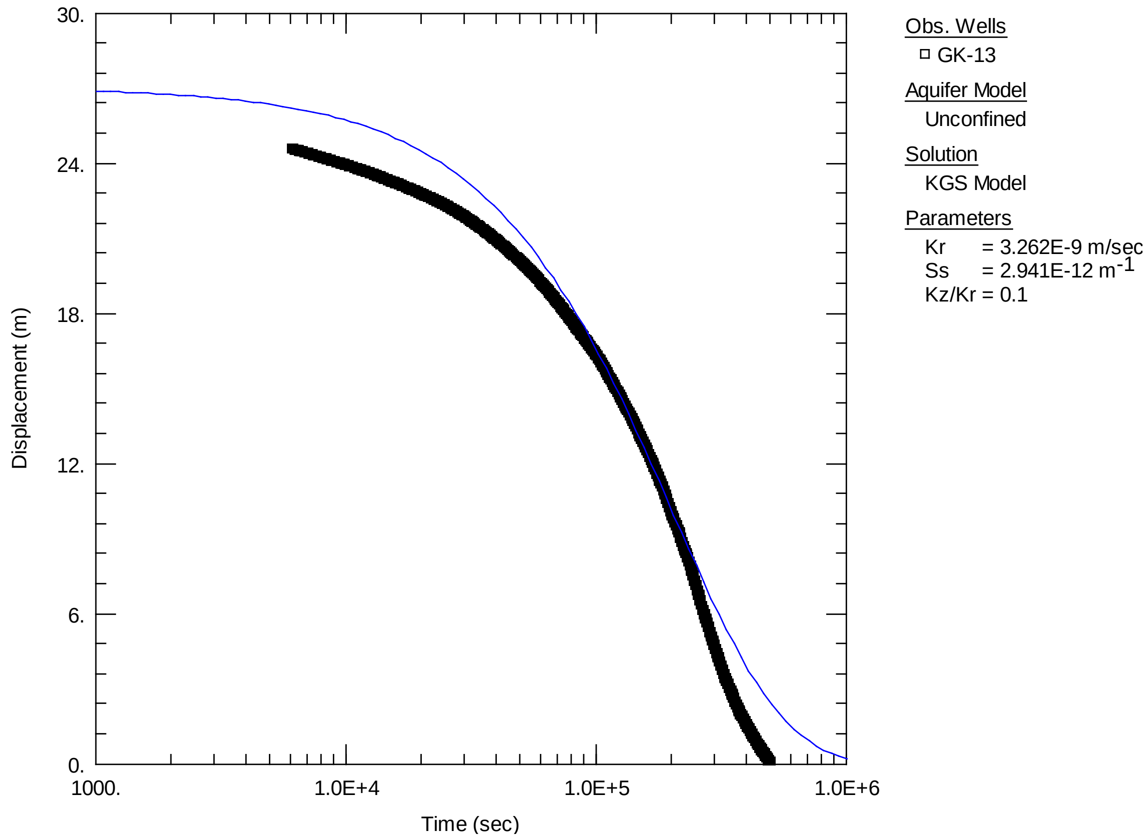
10.
1.
0.1
Displacement (m)
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
GK_10
Aquifer Model
Unconfined
Solution
Neuman
Parameters
T = 2.876E-5 m2/sec
S = 3.341
Sy = 0.1274
ß = 0.004


40.
32.
24.
16.
8.
0.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Corrected Displacement (m)
2
1
Obs. Wells
GK-12
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters 1
T = 4.107E-7 m2/sec
S = 0.4517
Parameters 2
T = 6.279E-7 m2/sec
S = 0.4745

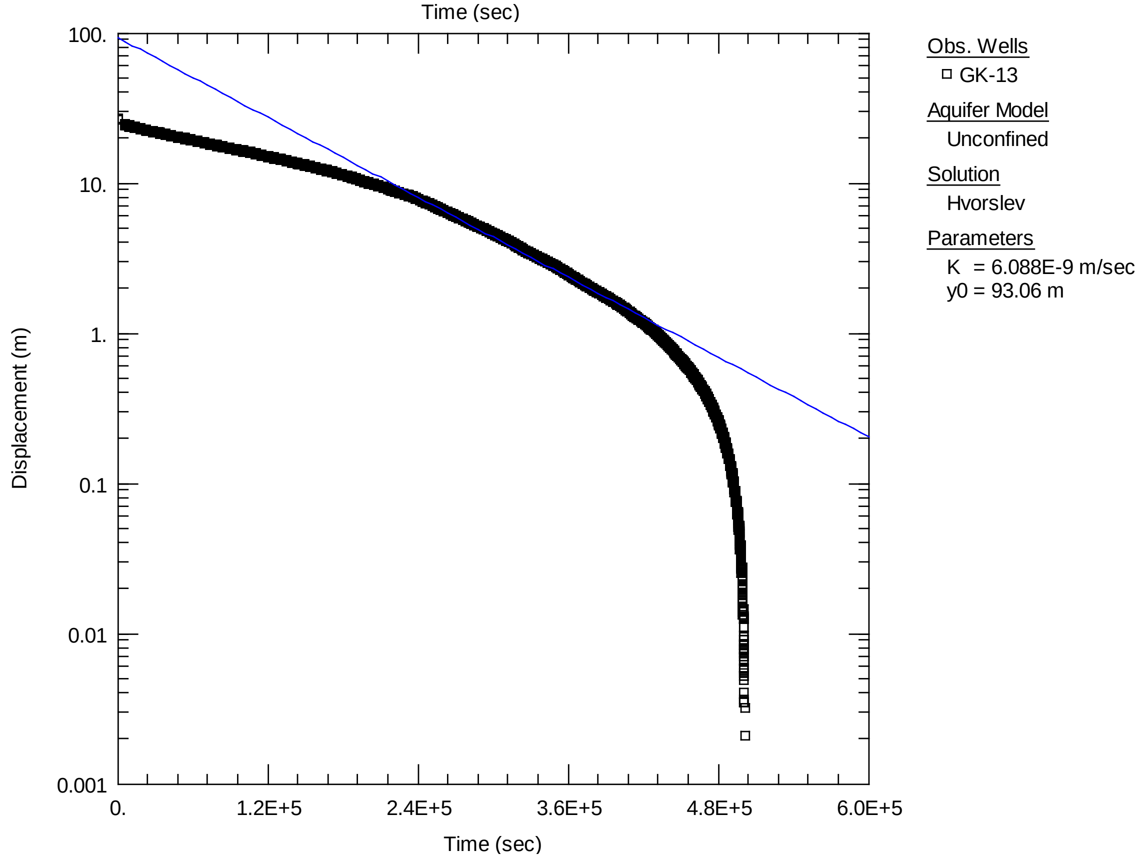

40.
32.
24.
16.
8.
0.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Corrected Displacement (m)
1
2
3
Obs. Wells
GK-12
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters 1
T = 2.822E-6 m2/sec
S = 0.06882
Parameters 2
T = 1.632E-6 m2/sec
S = 0.3878
Parameters 3
T = 2.938E-6 m2/sec
S = 0.2923


200.
160.
120.
80.
40.
0.
Residual Drawdown (m)
1
2
3
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
GK-12
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters 1
T = 2.346E-7 m2/sec
S/S' = 1.851
Parameters 2
T = 3.136E-7 m2/sec
S/S' = 2.56
Parameters 3
T = 4.032E-7 m2/sec
S/S' = 4.05

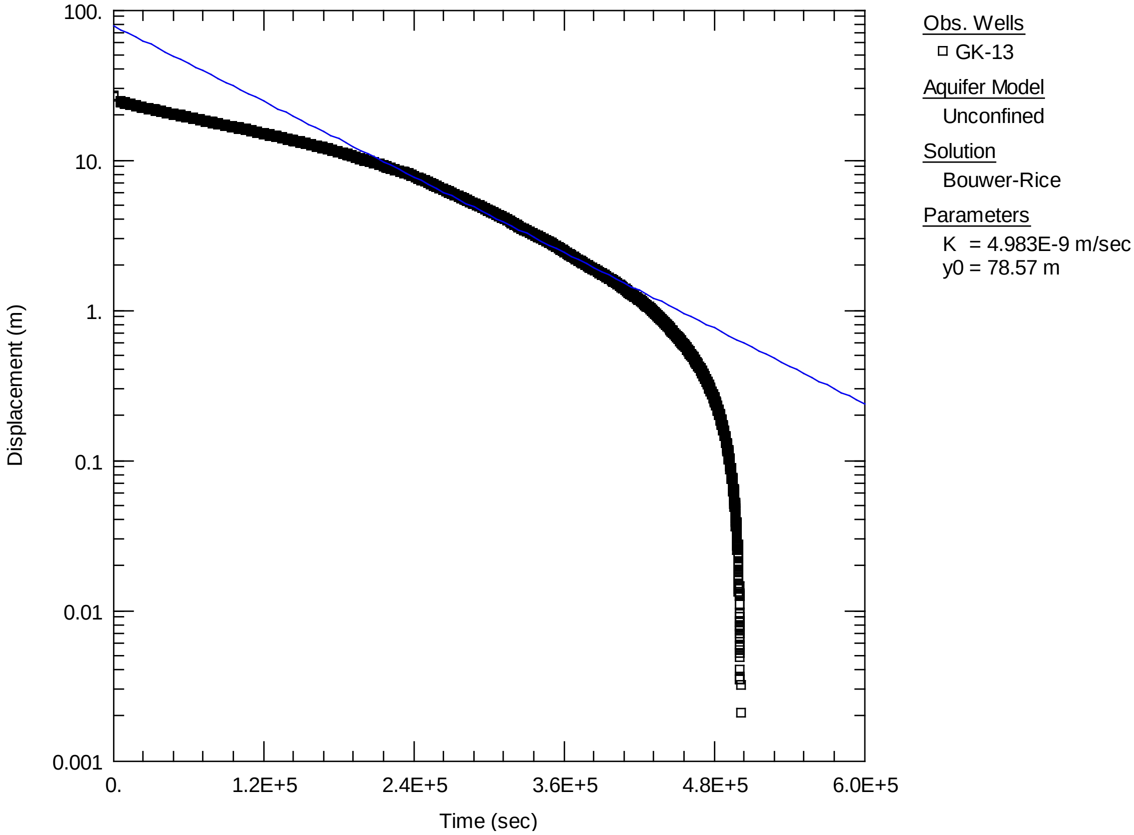

200.
160.
120.
80.
40.
0.
Residual Drawdown (m)
3
2
1
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
GK-12
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters 1
T = 1.183E-6 m2/sec
S/S' = 0.3821
Parameters 2
T = 1.281E-6 m2/sec
S/S' = 0.05633
Parameters 3
T = 2.58E-6 m2/sec
S/S' = 5.43E-6



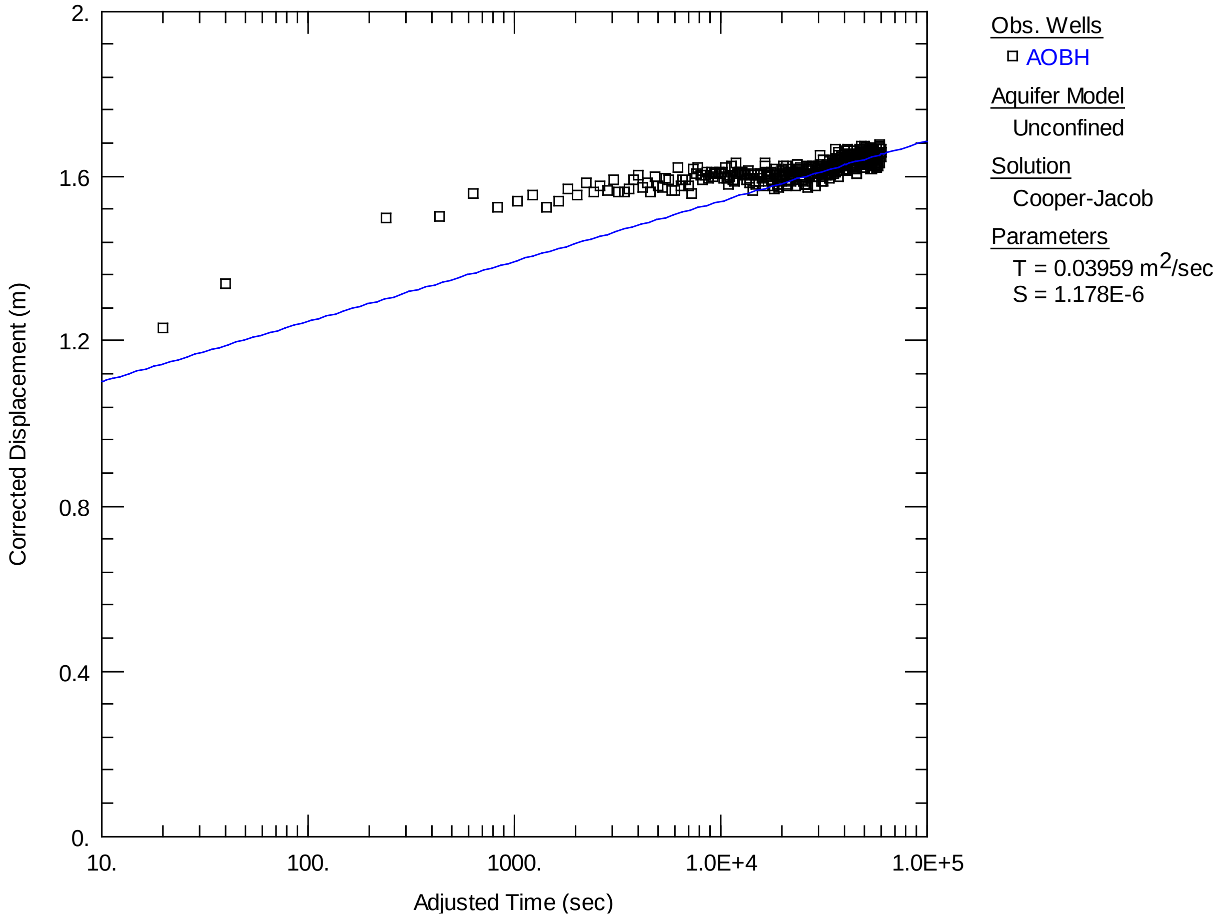
30.
24.
18.
12.
6.
0.
Displacement (m)
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
GK-13
Aquifer Model
Unconfined
Solution
KGS Model
Parameters
Kr = 3.262E-9 m/sec
Ss = 2.941E-12 m-1
Kz/Kr = 0.1



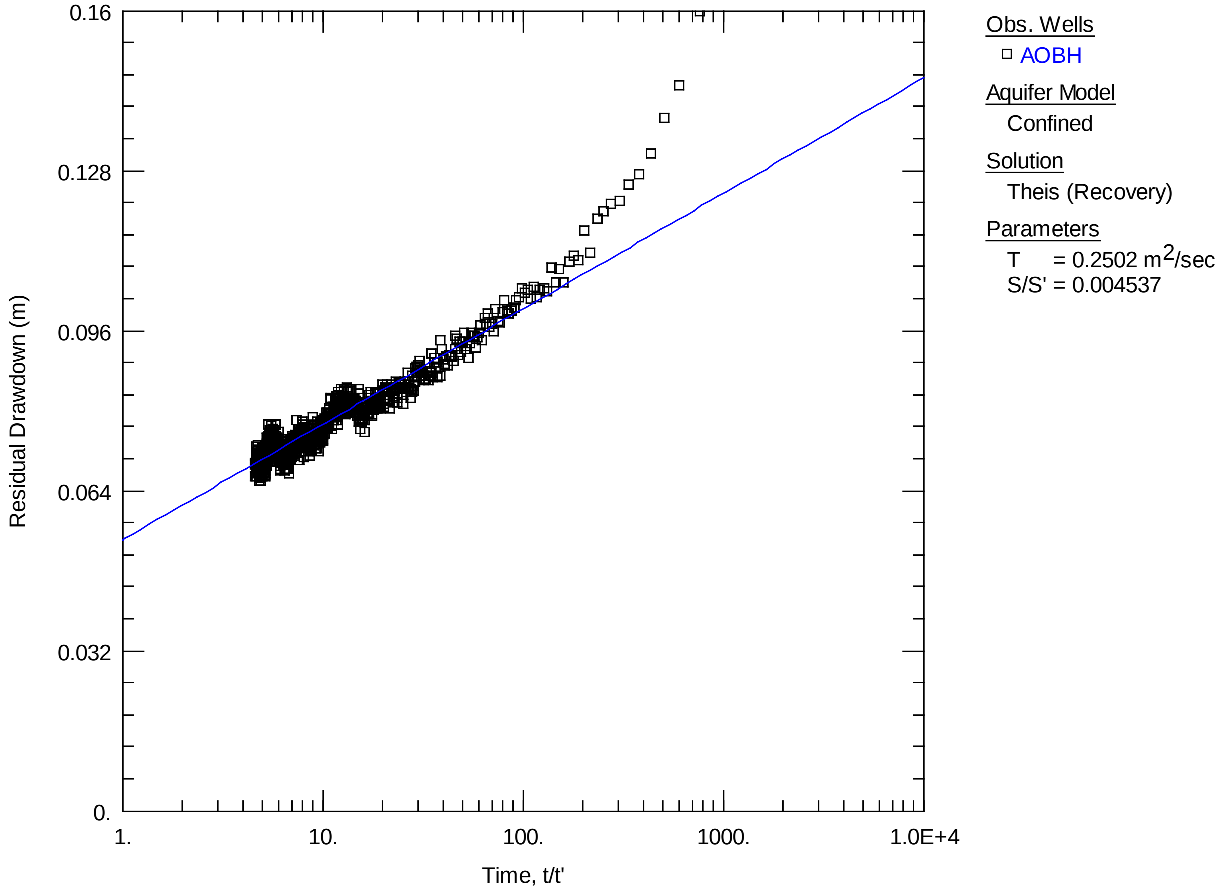
100.
10.
1.
0.1
0.01
0.001
Displacement (m)
0.
1.2E+5
2.4E+5
3.6E+5
4.8E+5
6.0E+5
Time (sec)
Obs. Wells
GK-13
Aquifer Model
Unconfined
Solution
Hvorslev
Parameters
K = 6.088E-9 m/sec
y0 = 93.06 m



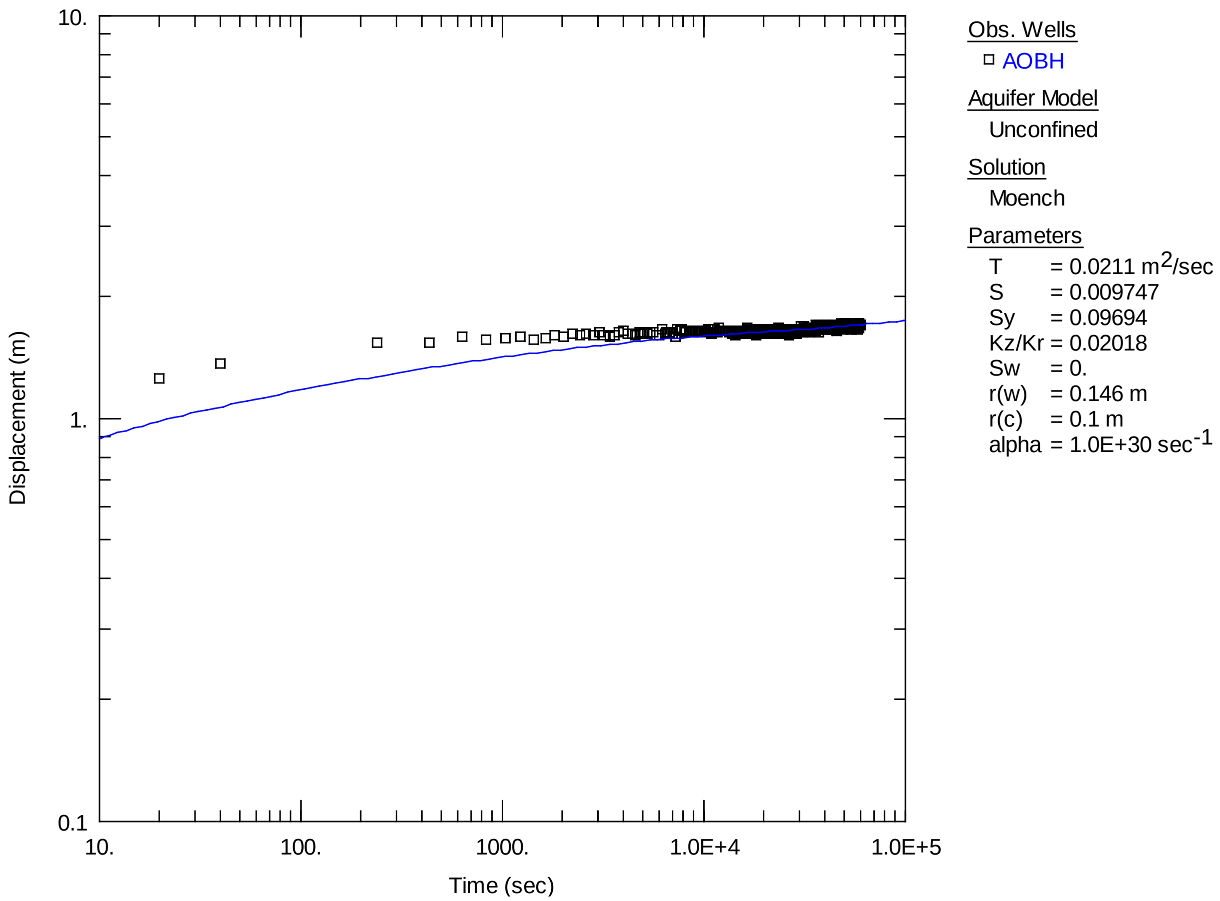
100.
10.
1.
0.1
0.01
0.001
Displacement (m)
0.
1.2E+5
2.4E+5
3.6E+5
4.8E+5
6.0E+5
Time (sec)
Obs. Wells
GK-13
Aquifer Model
Unconfined
Solution
Bouwer-Rice
Parameters
K = 4.983E-9 m/sec
y0 = 78.57 m

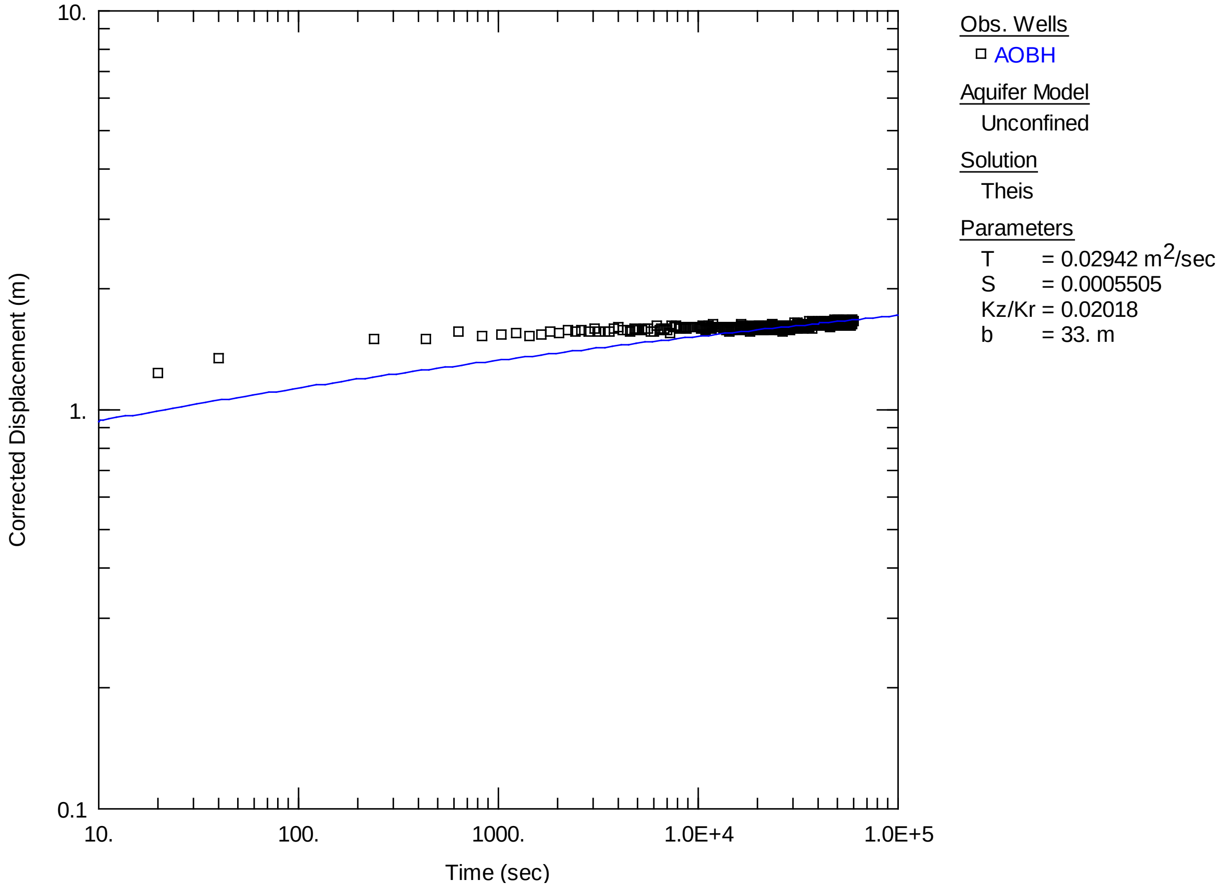


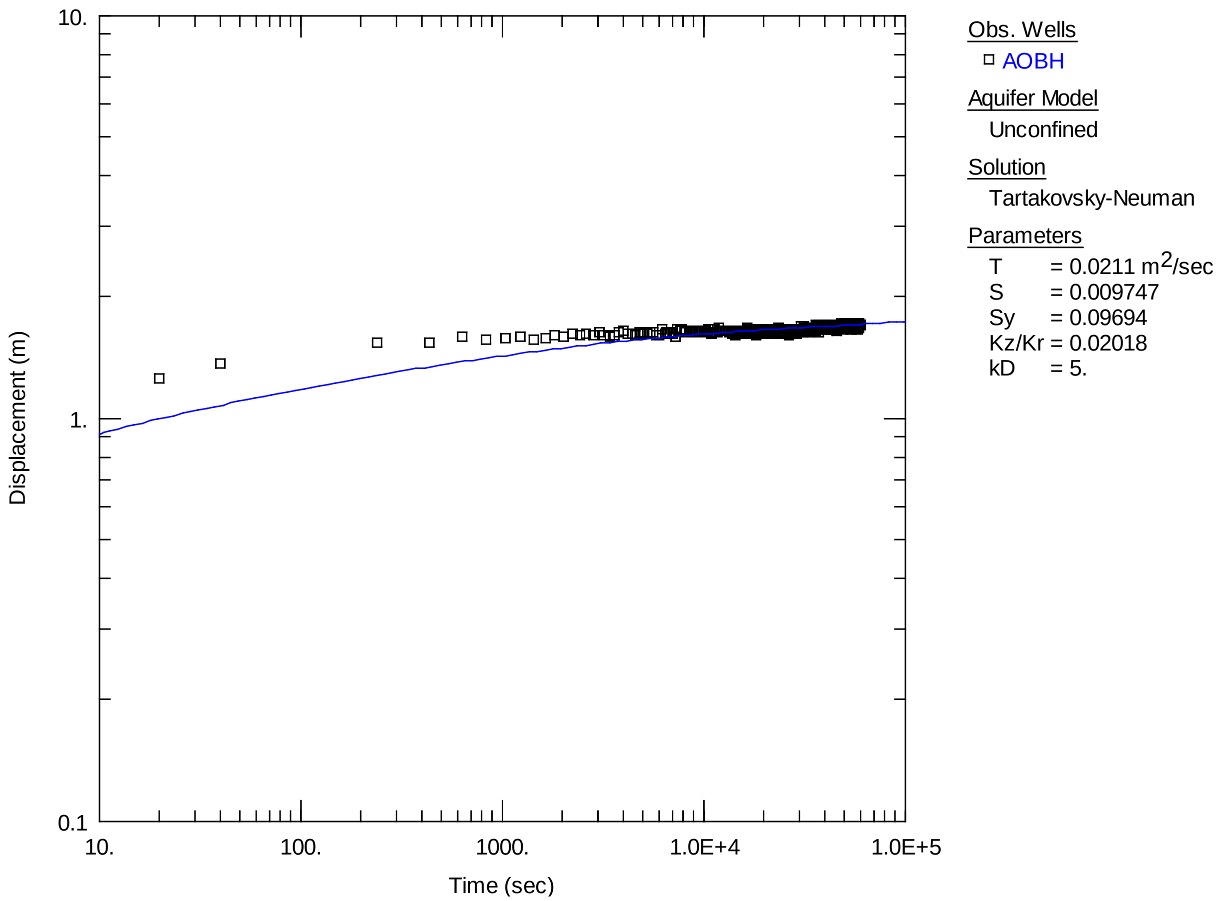
Corrected Displacement (m)
Adjusted Time (sec)
0.
0.4
0.8
1.2
1.6
2.
10.
100.
1000.
1.0E+4
1.0E+5
Obs. Wells
AOBH
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.03959 m2/sec
S = 1.178E-6

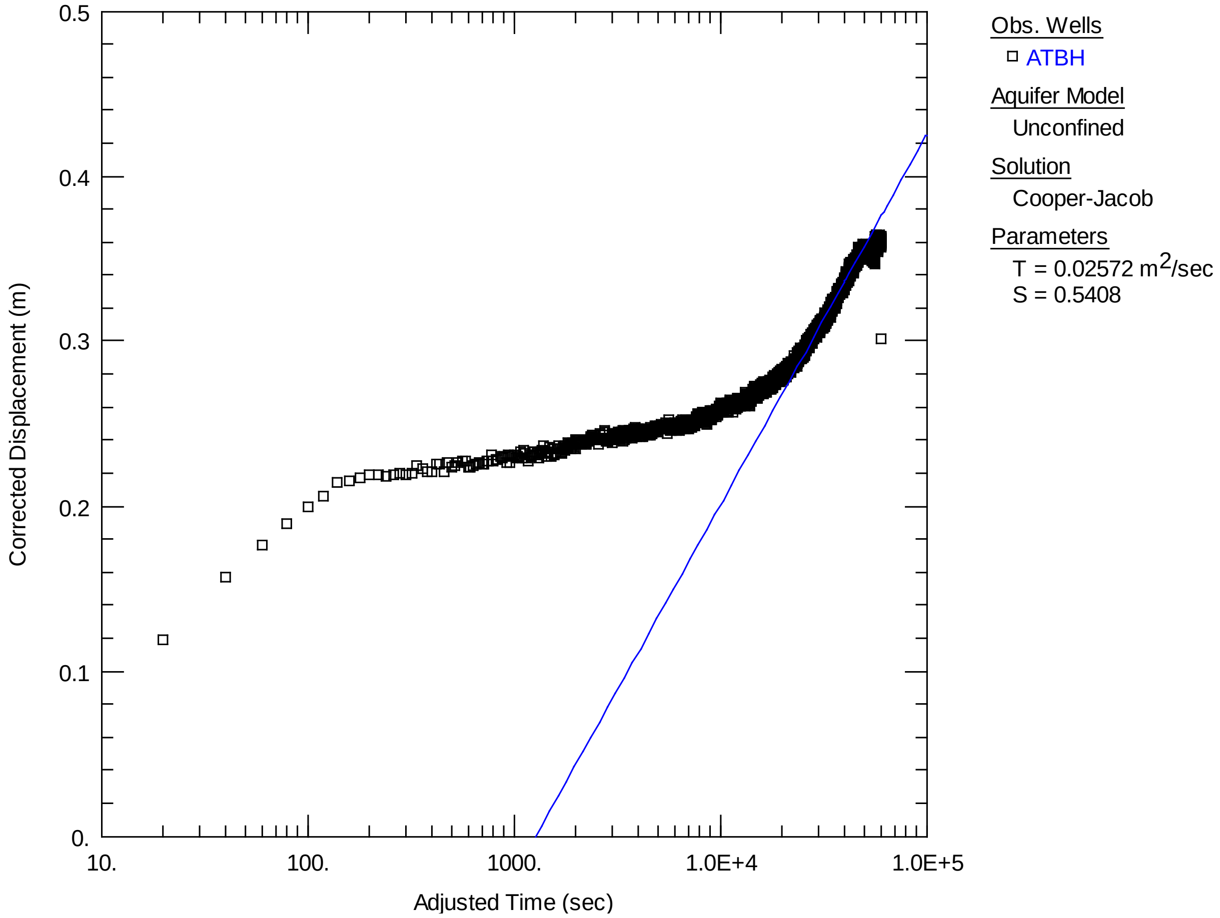


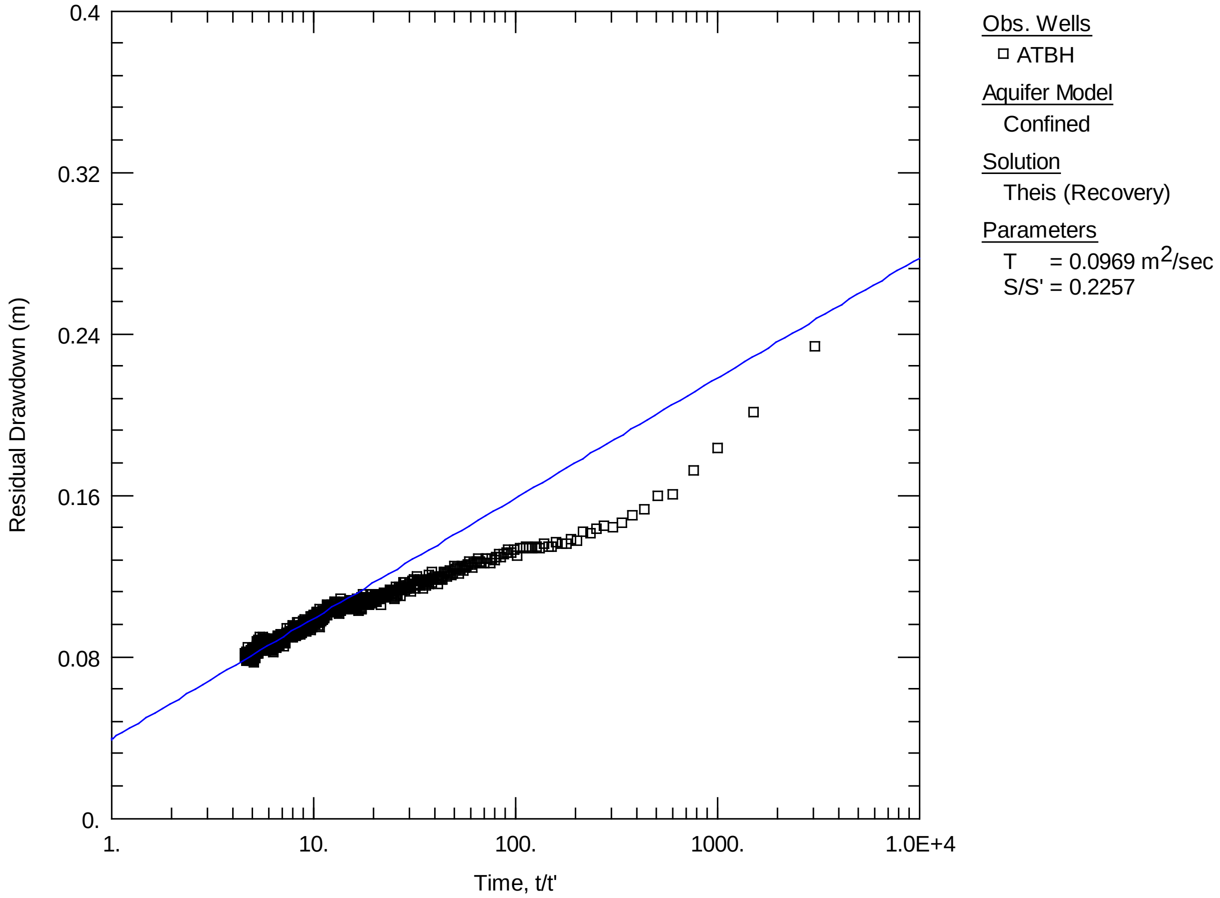
Residual Drawdown (m)
Time, t/t'
0.
0.032
0.064
0.096
0.128
0.16
1.
10.
100.
1000.
1.0E+4
Obs. Wells
AOBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.2502 m2/sec
S/S' = 0.004537


10.
1.
0.1
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Displacement (m)
Obs. Wells
AOBH
Aquifer Model
Unconfined
Solution
Moench
Parameters
T = 0.0211 m2/sec
S = 0.009747
Sy = 0.09694
Kz/Kr = 0.02018
Sw = 0.
r(w) = 0.146 m
r(c) = 0.1 m
alpha = 1.0E+30 sec-1

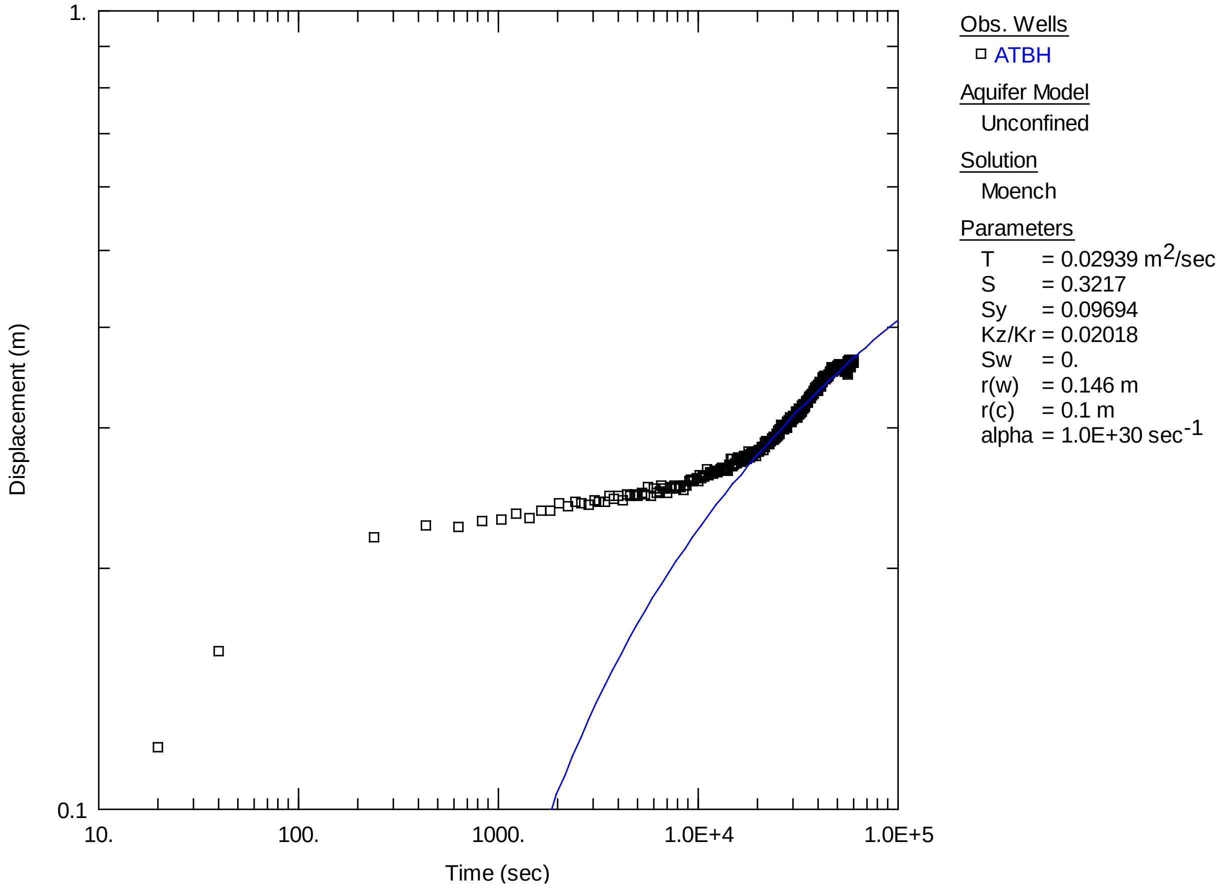

10.
1.
0.1
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Corrected Displacement (m)
Obs. Wells
AOBH
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 0.02942 m2/sec
S = 0.0005505
Kz/Kr = 0.02018
b = 33. m


10.
1.
0.1
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
AOBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 0.0211 m2/sec
S = 0.009747
Sy = 0.09694
Kz/Kr = 0.02018
kD = 5.

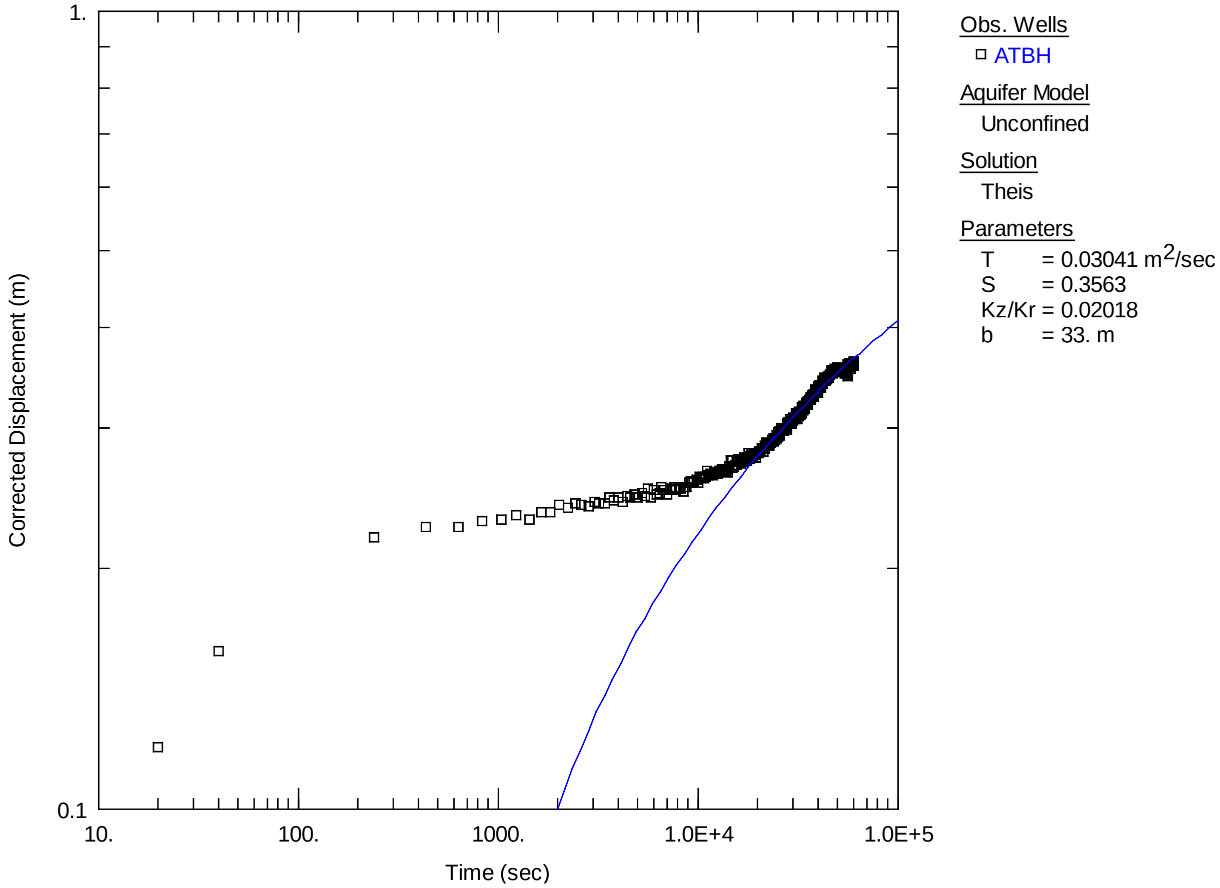

0.5
0.4
0.3
0.2
0.1
0.
Corrected Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Obs. Wells
ATBH
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.02572 m2/sec
S = 0.5408



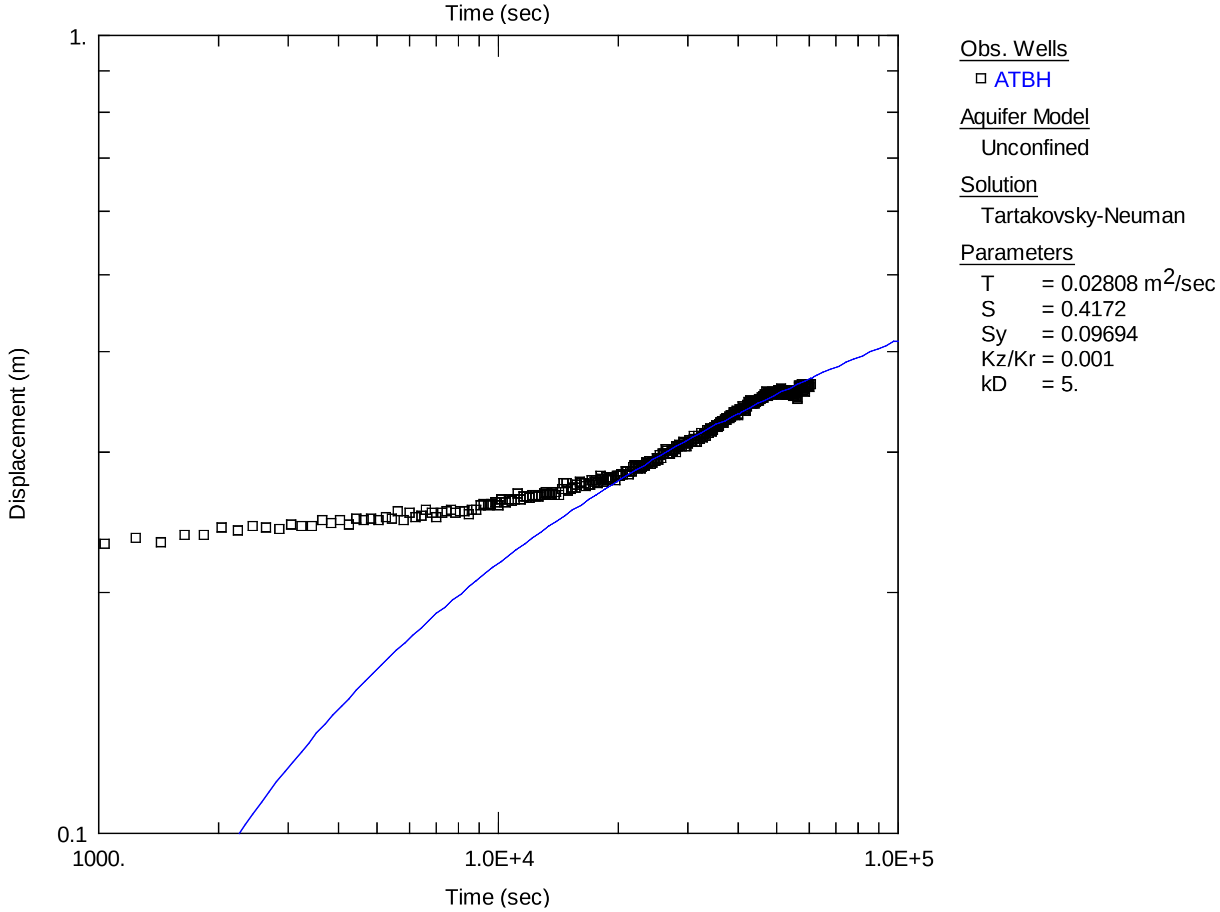
Residual Drawdown (m)
0.4
0.32
0.24
0.16
0.08
0.
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
ATBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.0969 m2/sec
S/S' = 0.2257



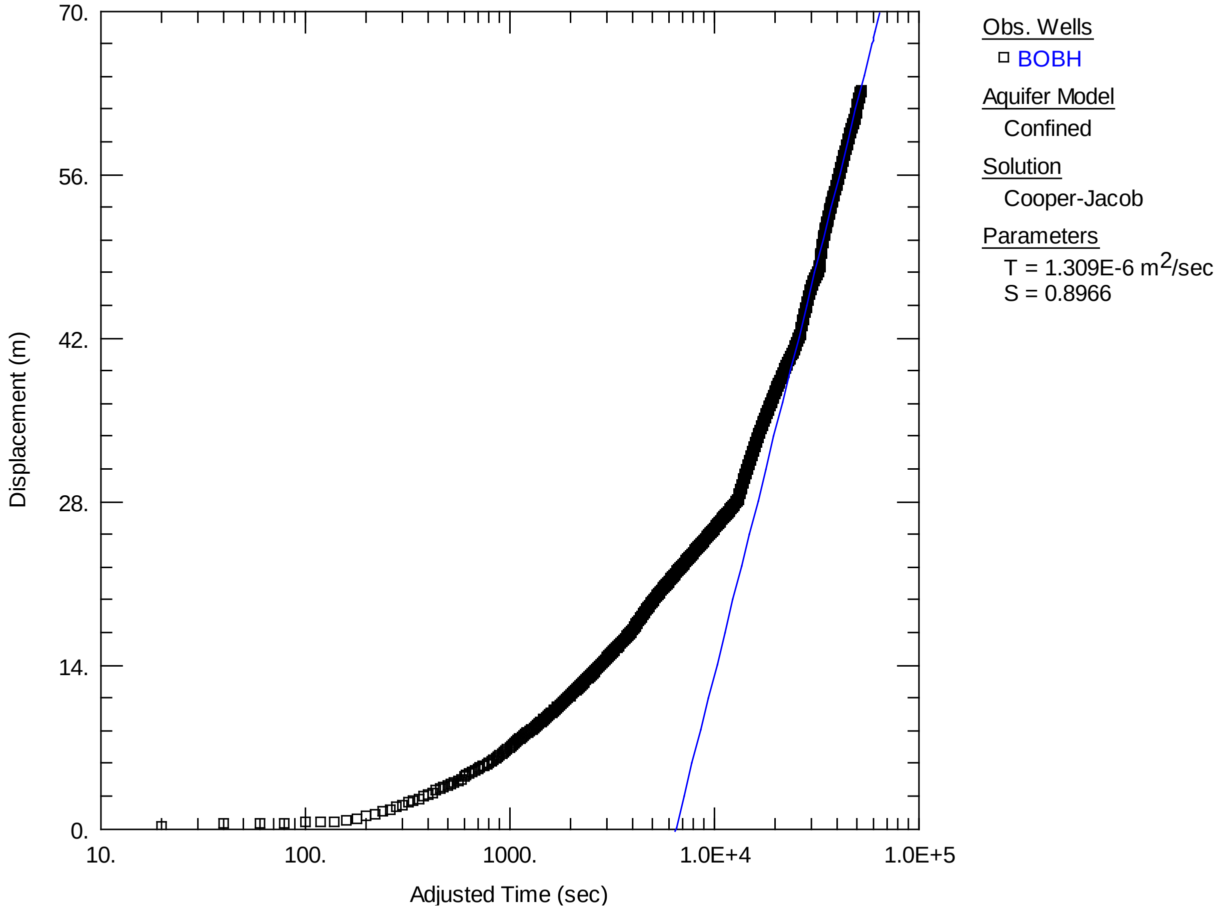
Displacement (m)
1.
0.1
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
ATBH
Aquifer Model
Unconfined
Solution
Moench
Parameters
T = 0.02939 m2/sec
S = 0.3217
Sy = 0.09694
Kz/Kr = 0.02018
Sw = 0.
r(w) = 0.146 m
r(c) = 0.1 m
alpha = 1.0E+30 sec-1

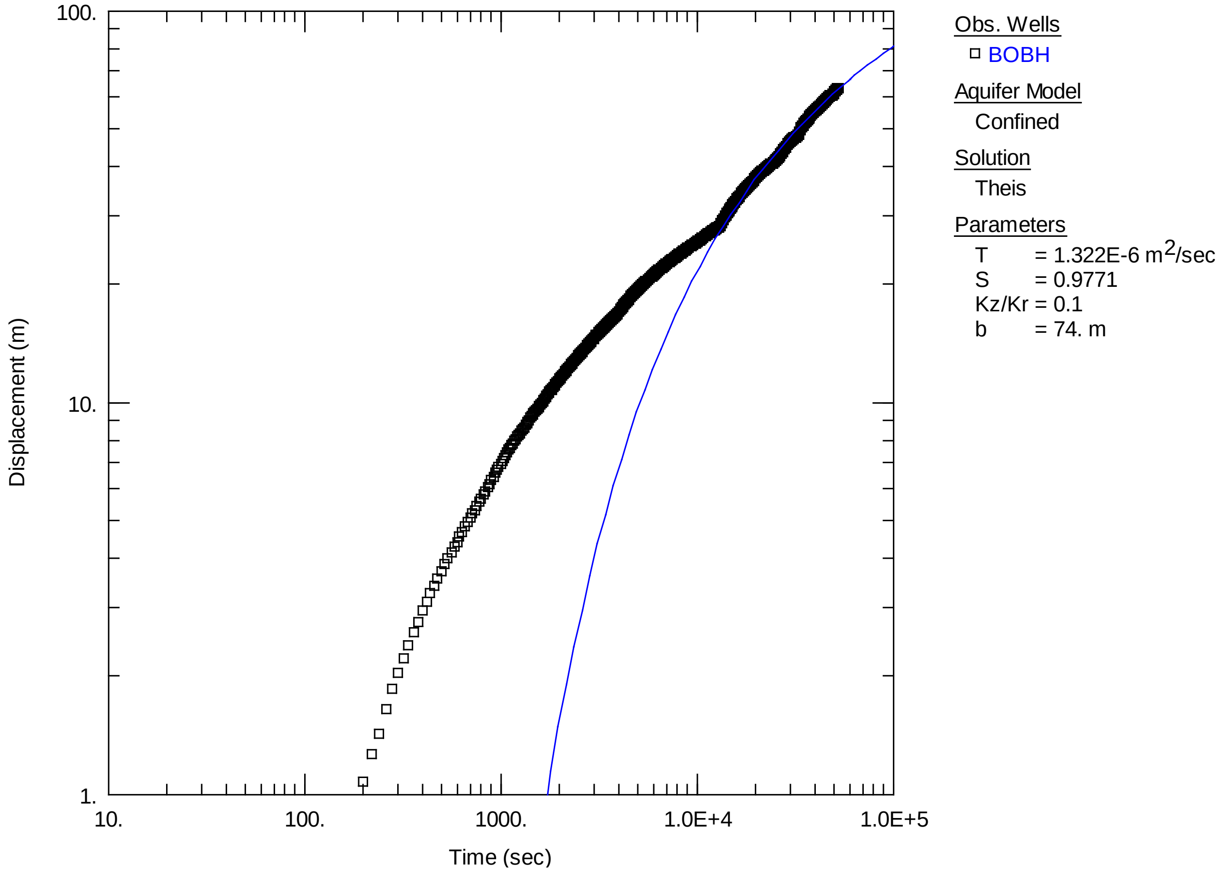


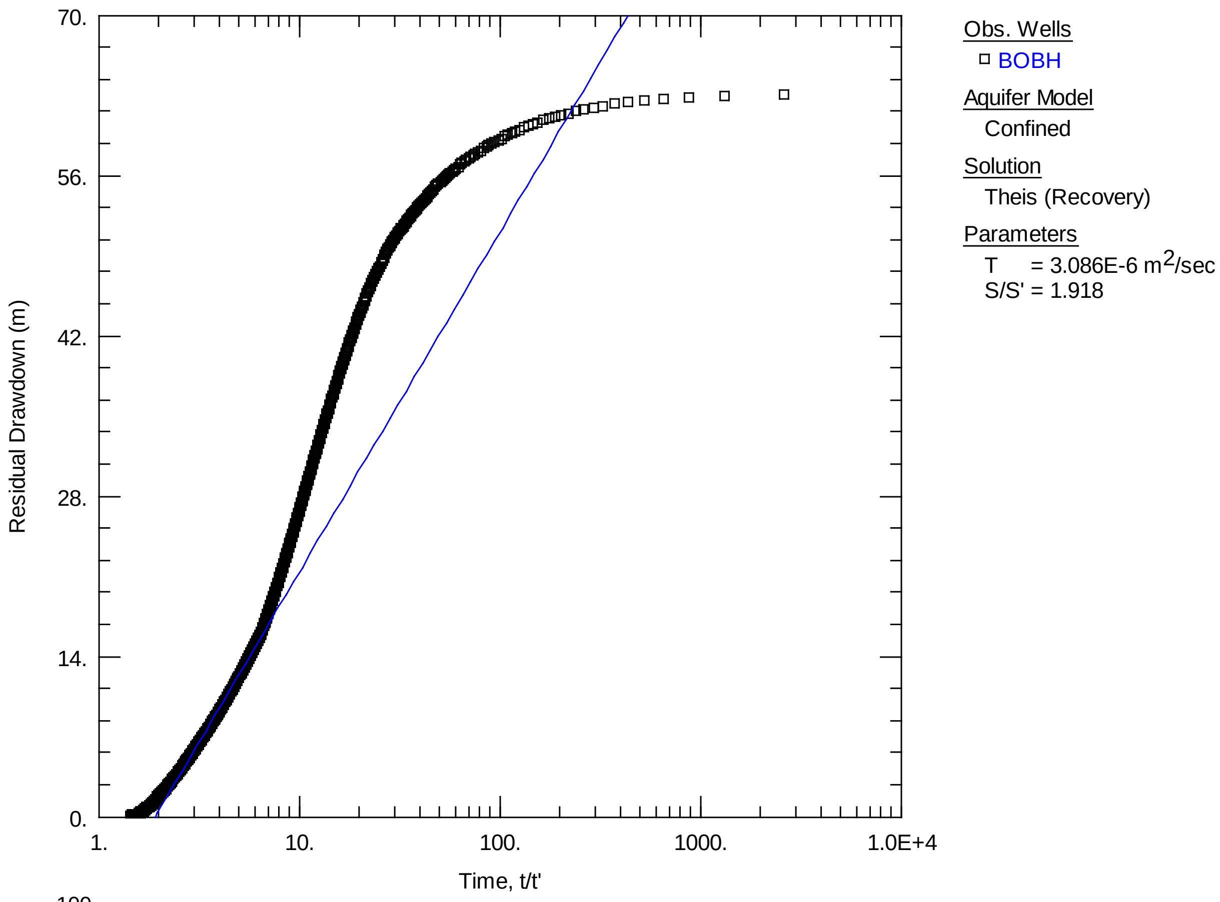
1.
0.1
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Corrected Displacement (m)
Obs. Wells
ATBH
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 0.03041 m2/sec
S = 0.3563
Kz/Kr = 0.02018
b = 33. m

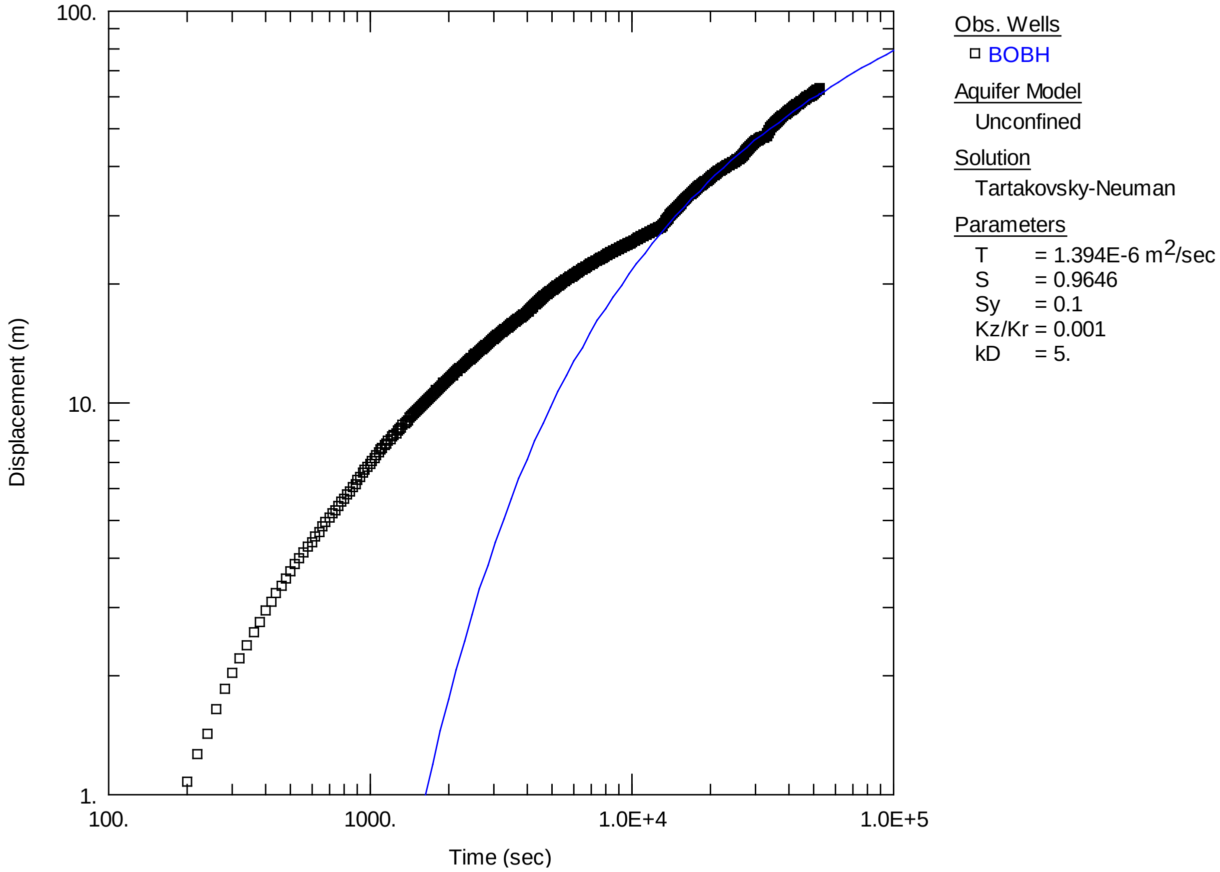


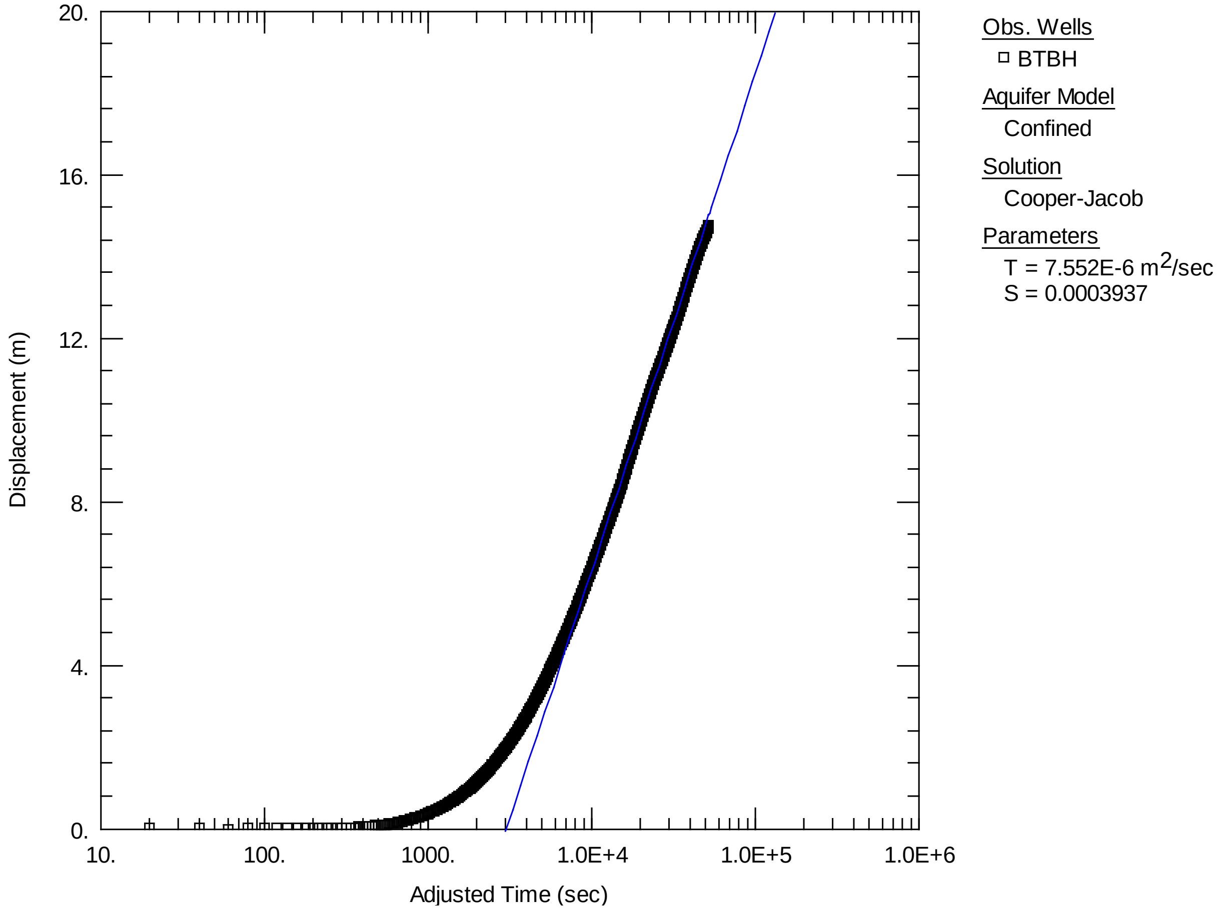
1.
0.1
1000.
1.0E+4
1.0E+5
Time (sec)
Displacement (m)
Obs. Wells
ATBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 0.02808 m2/sec
S = 0.4172
Sy = 0.09694
Kz/Kr = 0.001
kD = 5.


70.
56.
42.
28.
14.
0.
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Adjusted Time (sec)
Obs. Wells
BOBH
Aquifer Model
Confined
Solution
Cooper-Jacob
Parameters
T = 1.309E-6 m2/sec
S = 0.8966

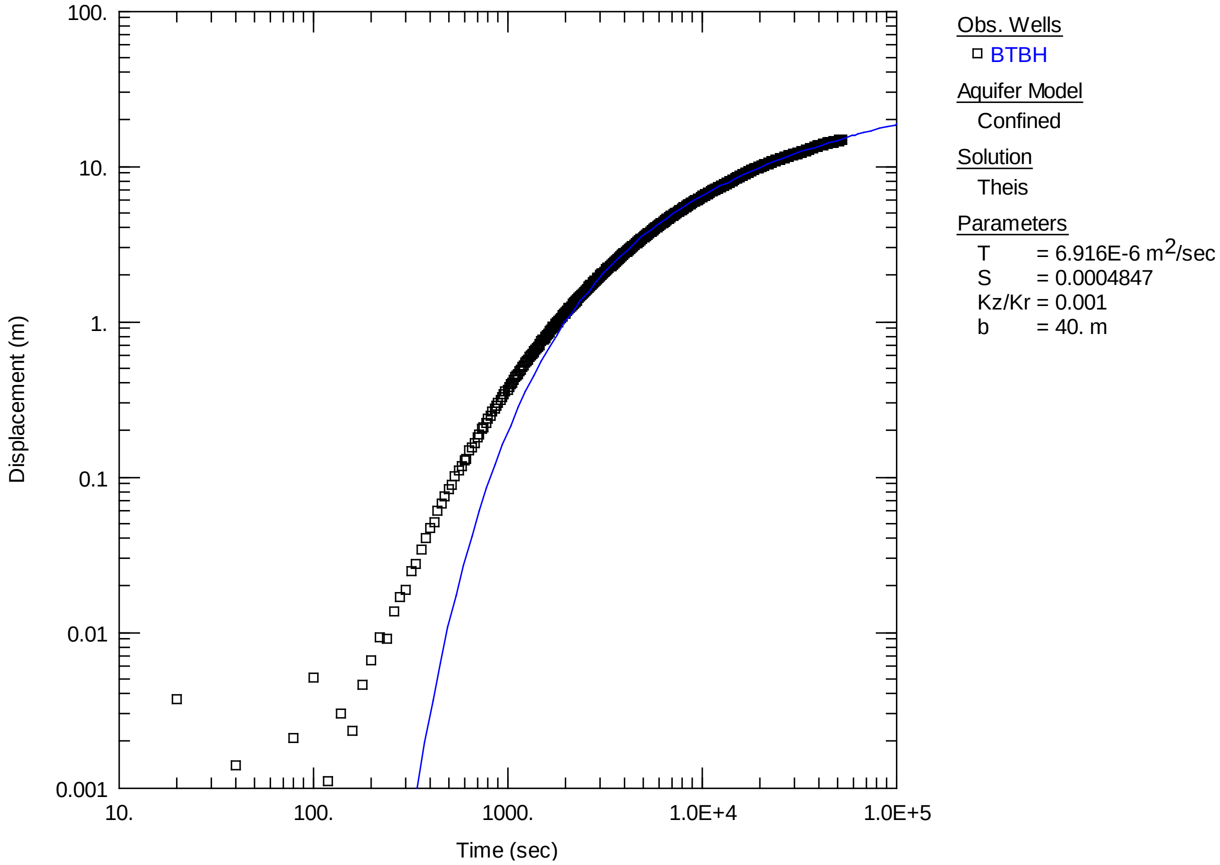

100.
10.
1.
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
BOBH
Aquifer Model
Confined
Solution
Theis
Parameters
T = 1.322E-6 m2/sec
S = 0.9771
Kz/Kr = 0.1
b = 74. m


Residual Drawdown (m)
70.
56.
42.
28.
14.
0.
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
BOBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 3.086E-6 m2/sec
S/S' = 1.918

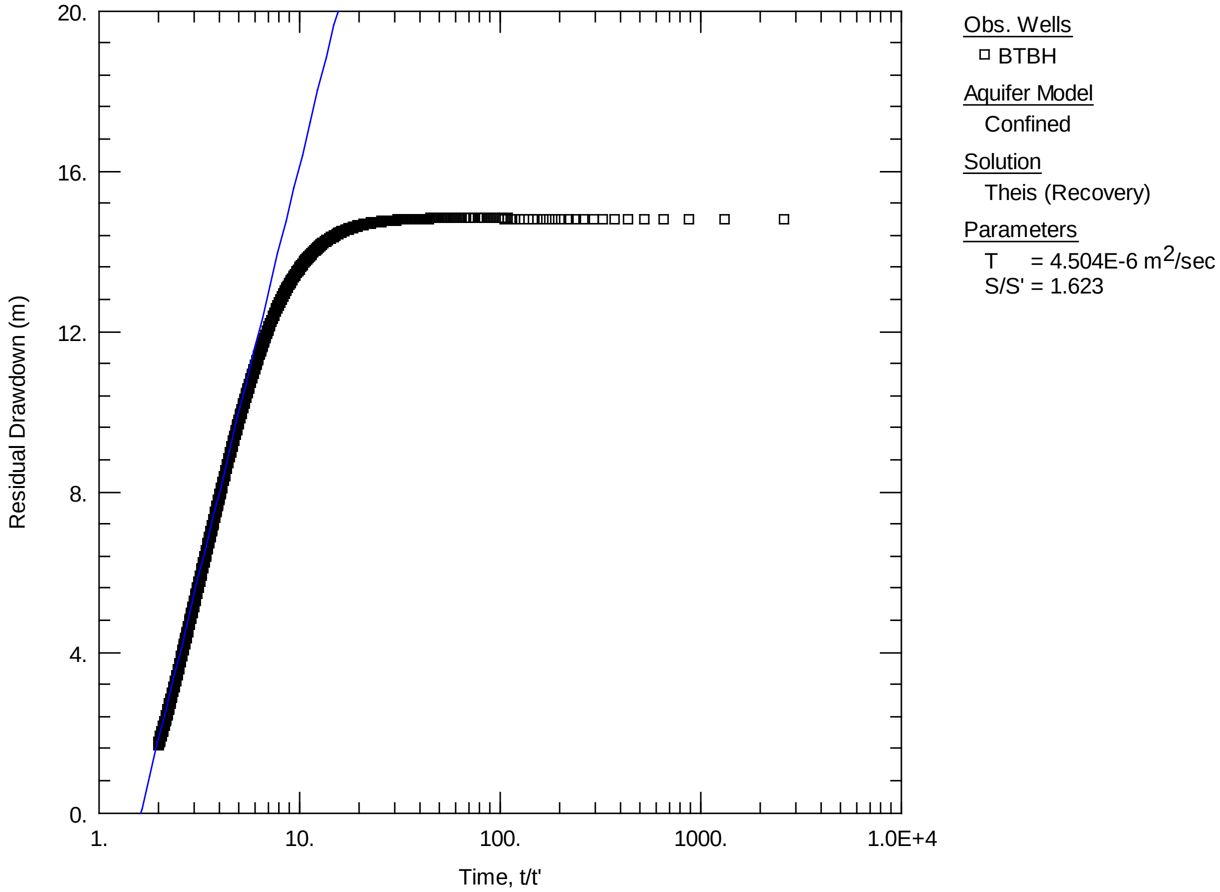

Displacement (m)
100.
10.
1.
100.
1000.
1.0E+4
1.0E+5
Time (sec)
Obs. Wells
BOBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 1.394E-6 m2/sec
S = 0.9646
Sy = 0.1
Kz/Kr = 0.001
kD = 5.



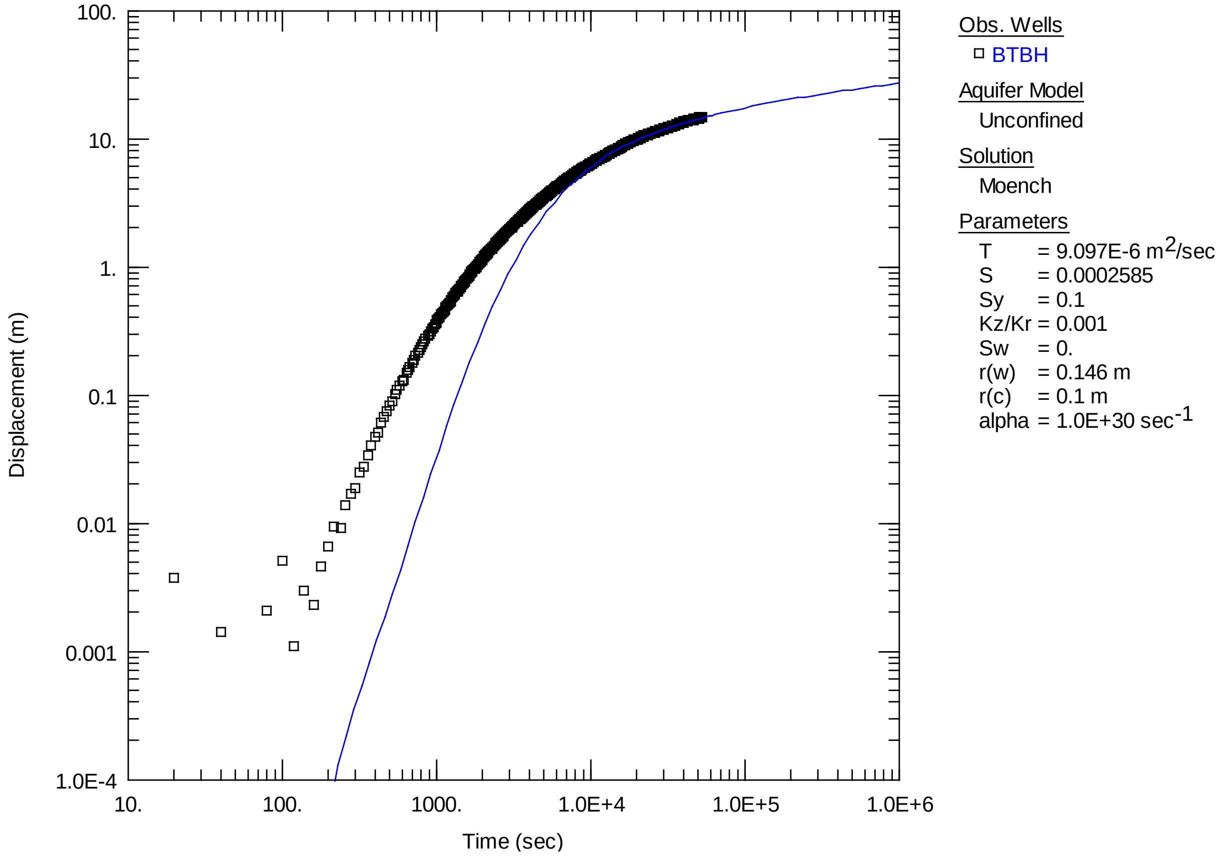
Displacement (m)
Adjusted Time (sec)
0.
4.
8.
12.
16.
20.
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Obs. Wells
BTBH
Aquifer Model
Confined
Solution
Cooper-Jacob
Parameters
T = 7.552E-6 m2/sec
S = 0.0003937



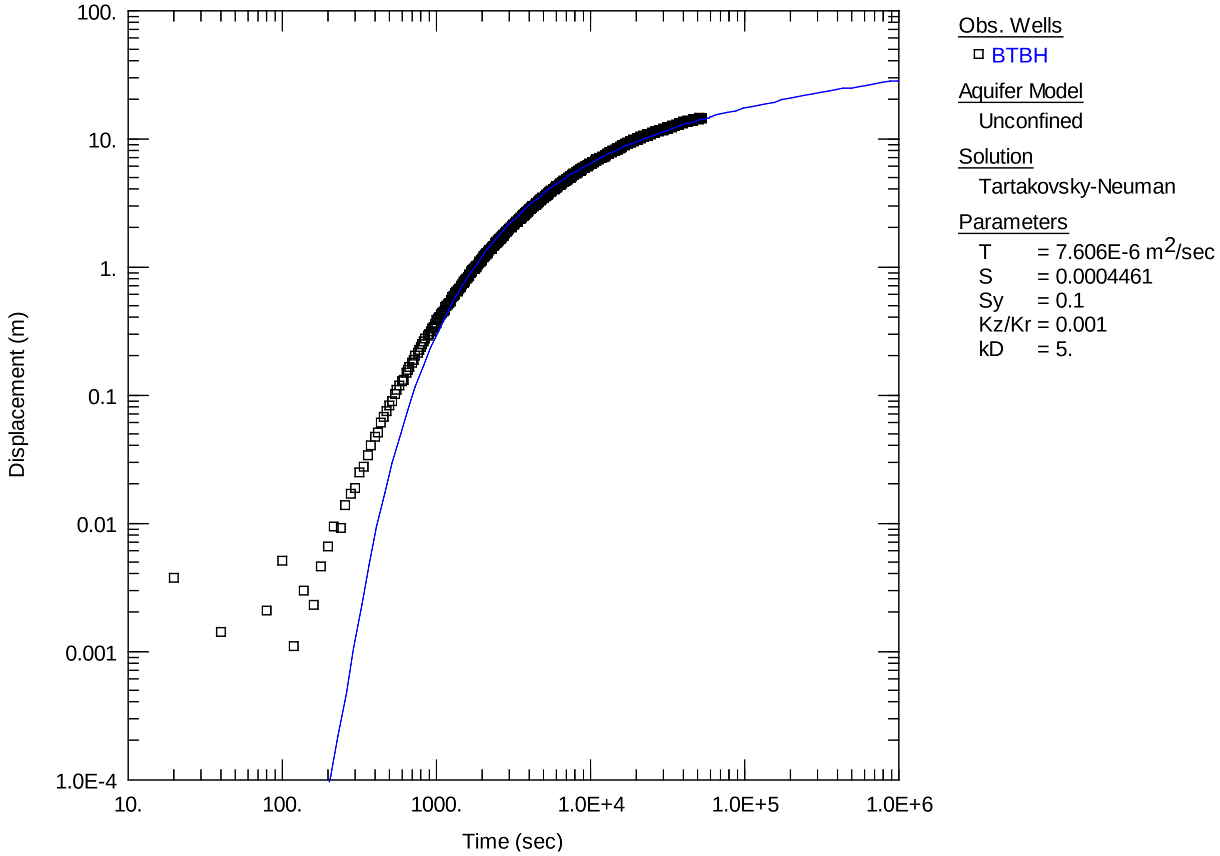
Displacement (m)
Time (sec)
0.001
0.01
0.1
1.
10.
100.
10.
100.
1000.
1.0E+4
1.0E+5
Obs. Wells
BTBH
Aquifer Model
Confined
Solution
Theis
Parameters
T = 6.916E-6 m2/sec
S = 0.0004847
Kz/Kr = 0.001
b = 40. m



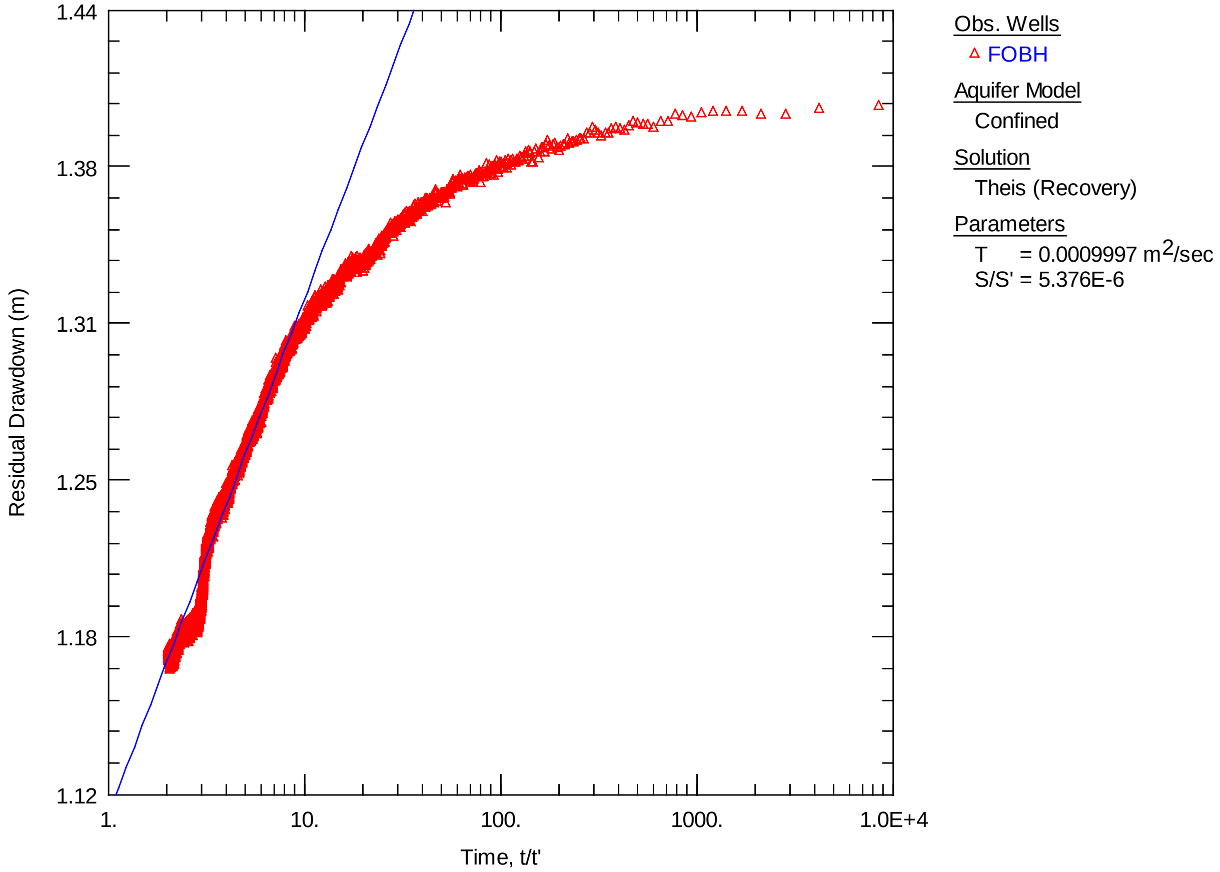
20.
16.
12.
8.
4.
0.
Residual Drawdown (m)
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
BTBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 4.504E-6 m2/sec
S/S' = 1.623



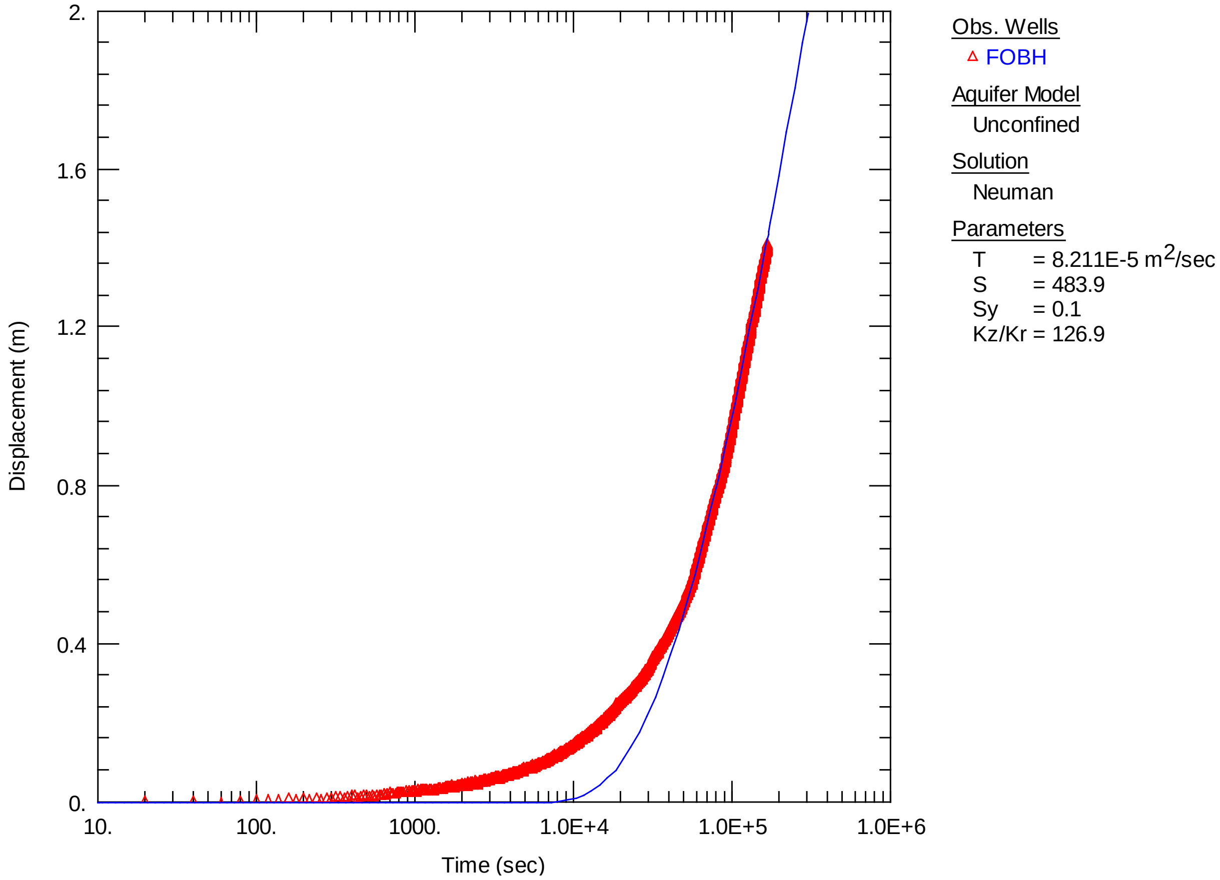
100.
10.
1.
0.1
0.01
0.001
1.0E-4
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
BTBH
Aquifer Model
Unconfined
Solution
Moench
Parameters
T = 9.097E-6 m2/sec
S = 0.0002585
Sy = 0.1
Kz/Kr = 0.001
Sw = 0.
r(w) = 0.146 m
r(c) = 0.1 m
alpha = 1.0E+30 sec-1



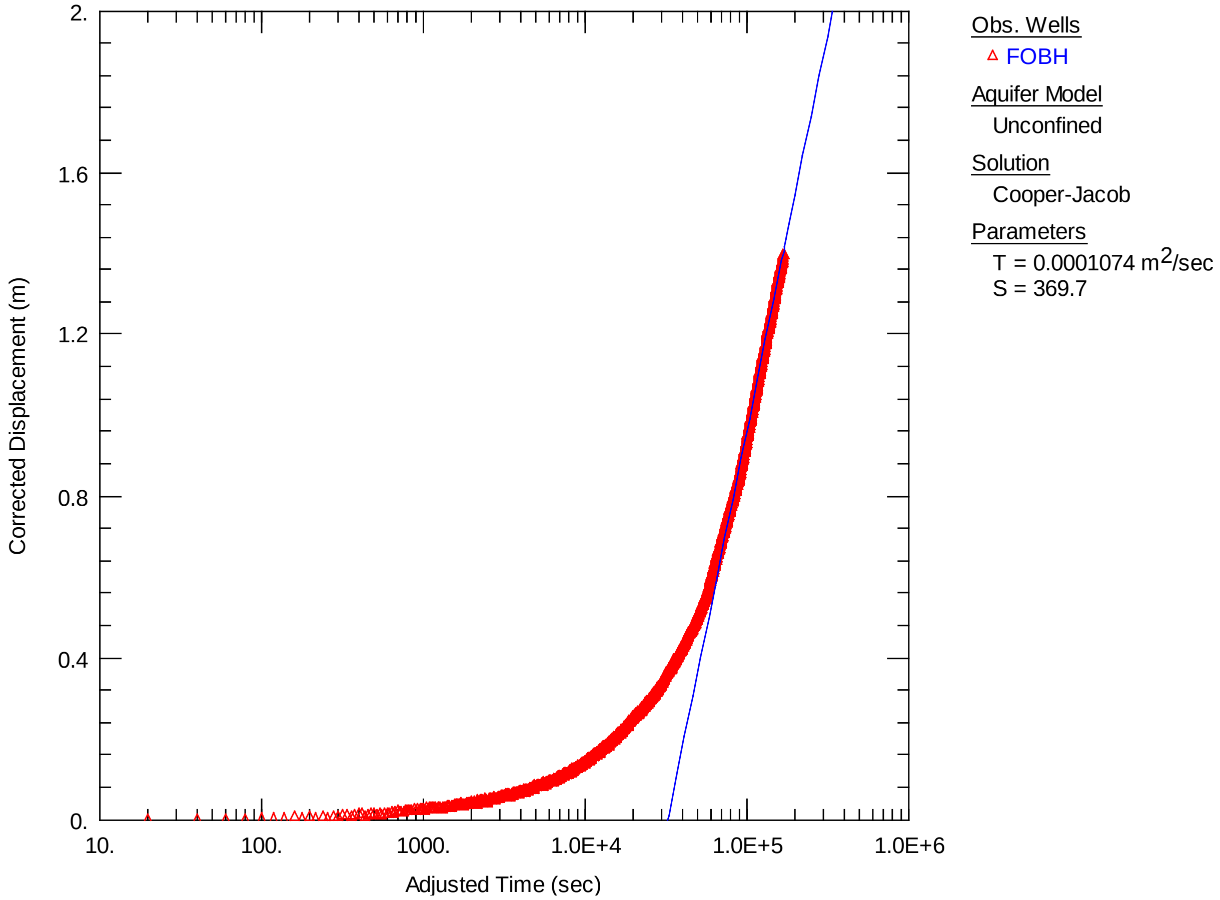
100.
10.
1.
0.1
0.01
0.001
1.0E-4
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
BTBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 7.606E-6 m2/sec
S = 0.0004461
Sy = 0.1
Kz/Kr = 0.001
kD = 5.



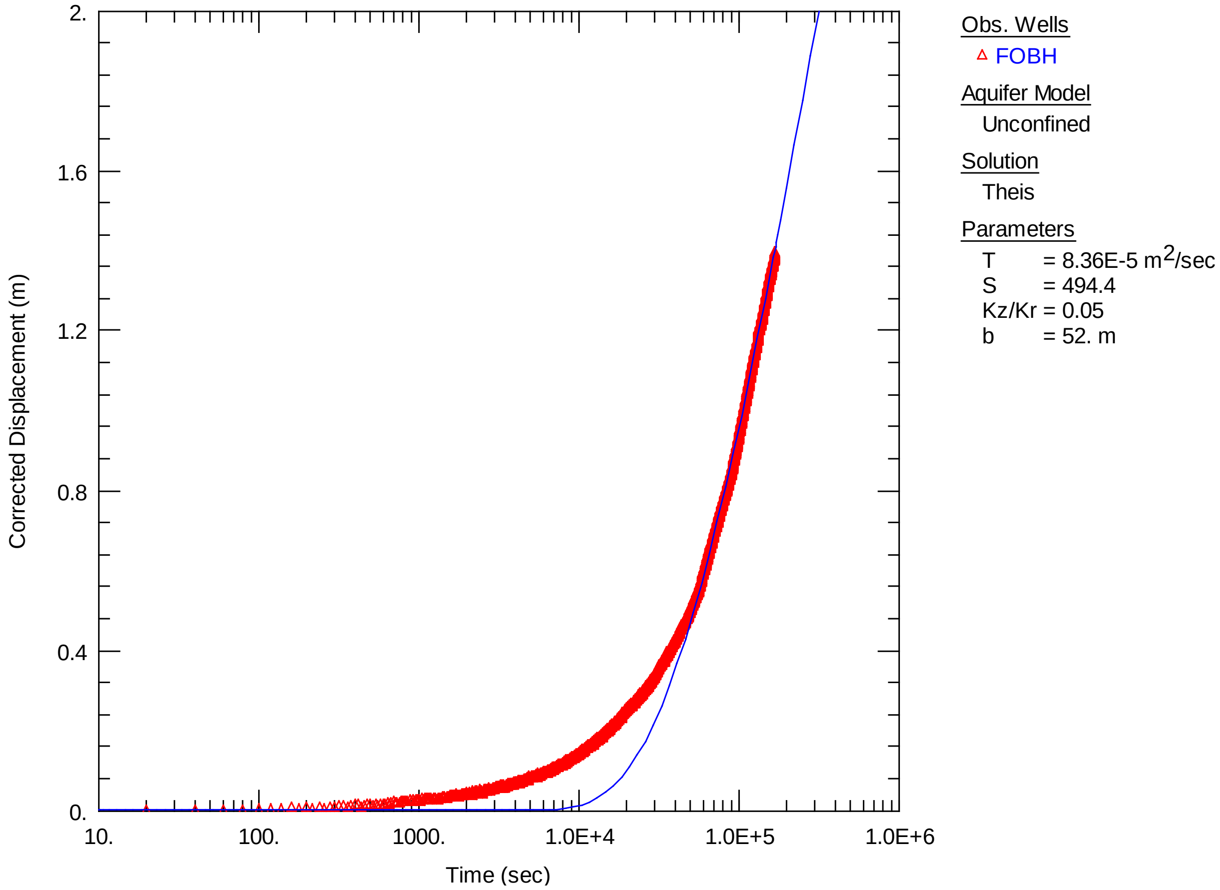
1.44
1.38
1.31
1.25
1.18
1.12
Residual Drawdown (m)
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Obs. Wells
FOBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.0009997 m2/sec
S/S' = 5.376E-6



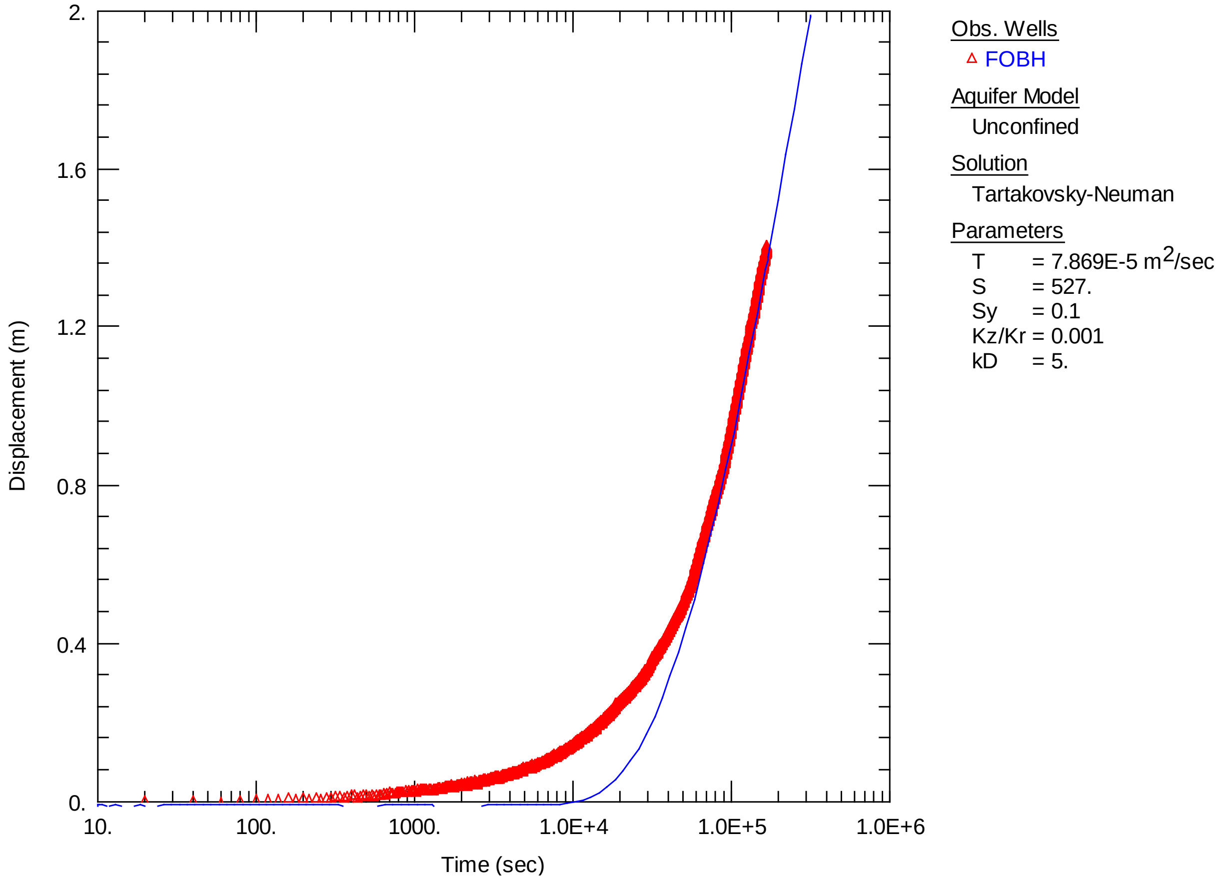
2.
1.6
1.2
0.8
0.4
0.
Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
FOBH
Aquifer Model
Unconfined
Solution
Neuman
Parameters
T = 8.211E-5 m2/sec
S = 483.9
Sy = 0.1
Kz/Kr = 126.9



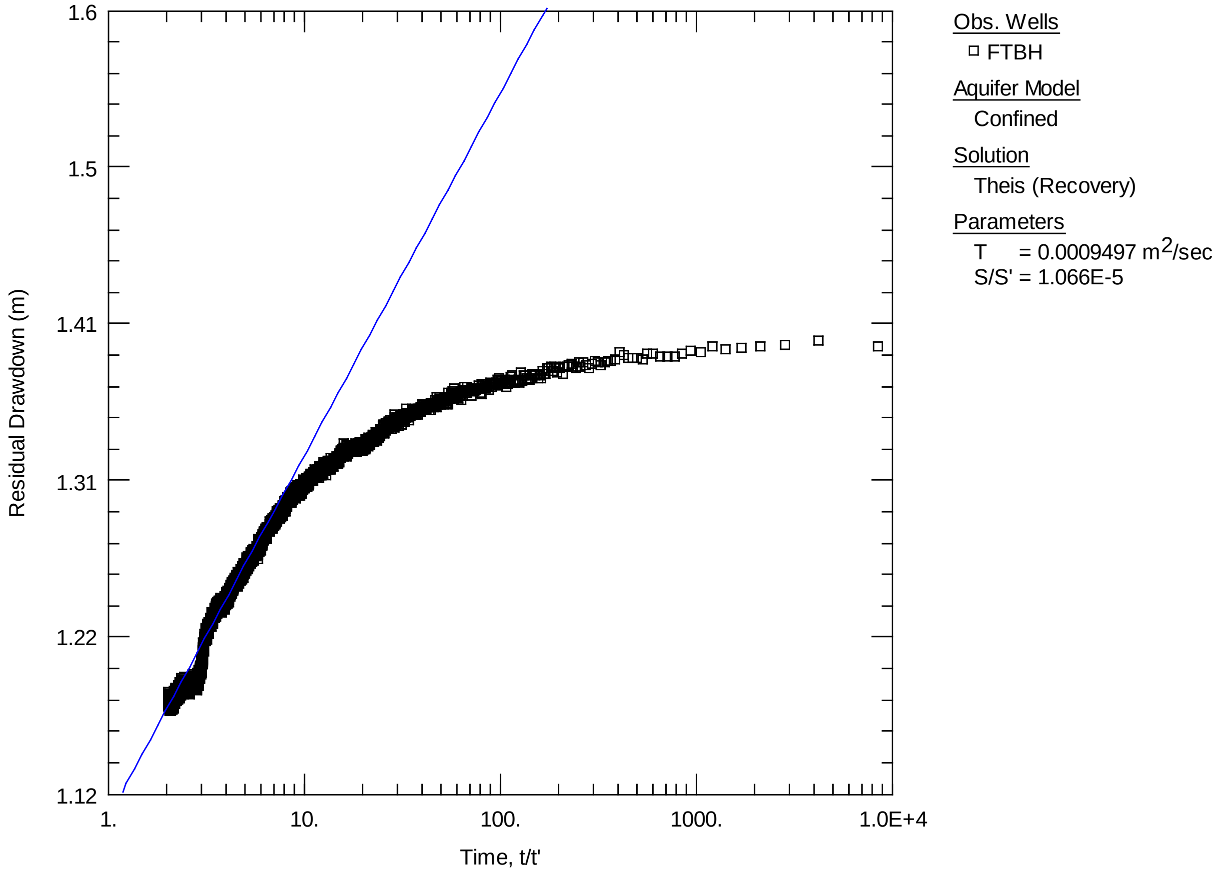
2.
1.6
1.2
0.8
0.4
0.
Corrected Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Adjusted Time (sec)
Obs. Wells
FOBH
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.0001074 m2/sec
S = 369.7



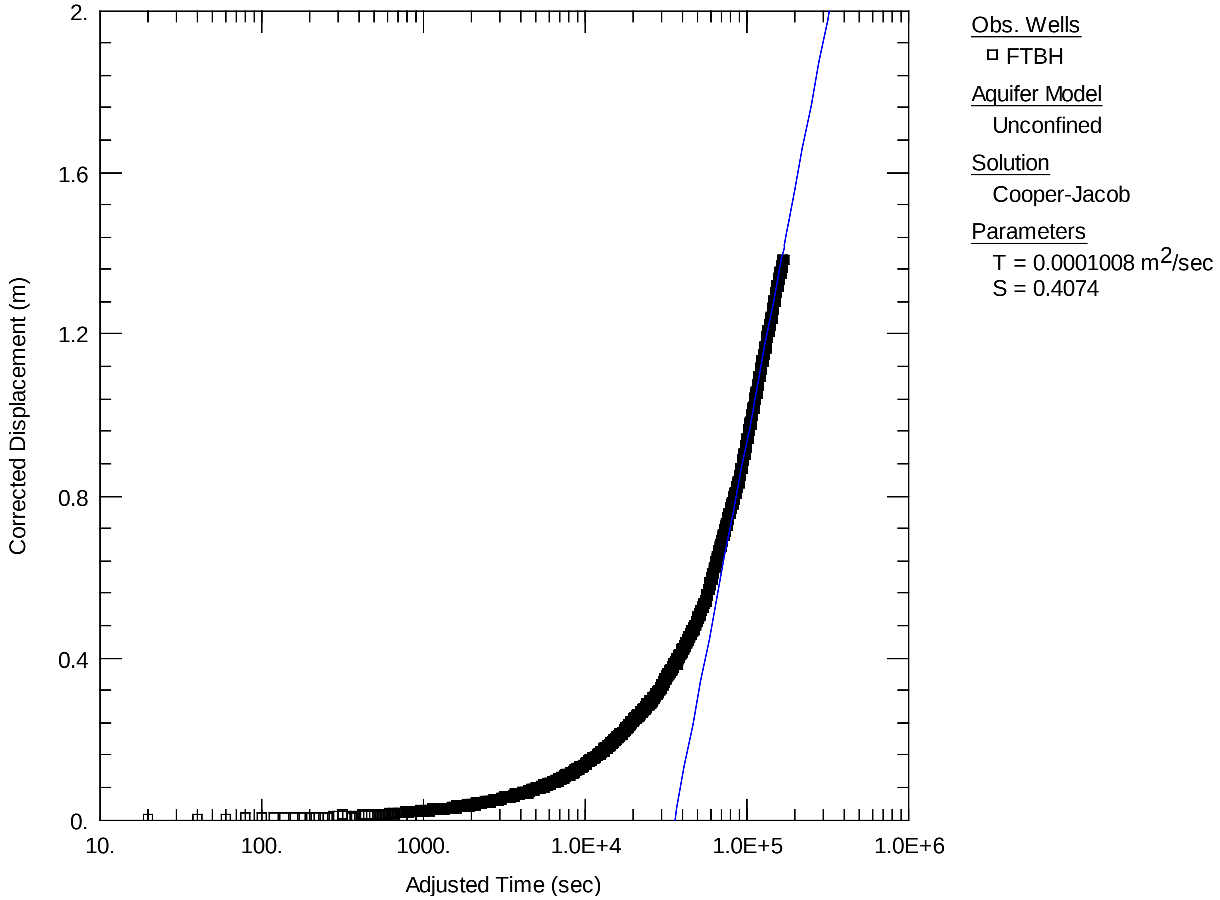
2.
1.6
1.2
0.8
0.4
0.
Corrected Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
FOBH
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 8.36E-5 m2/sec
S = 494.4
Kz/Kr = 0.05
b = 52. m

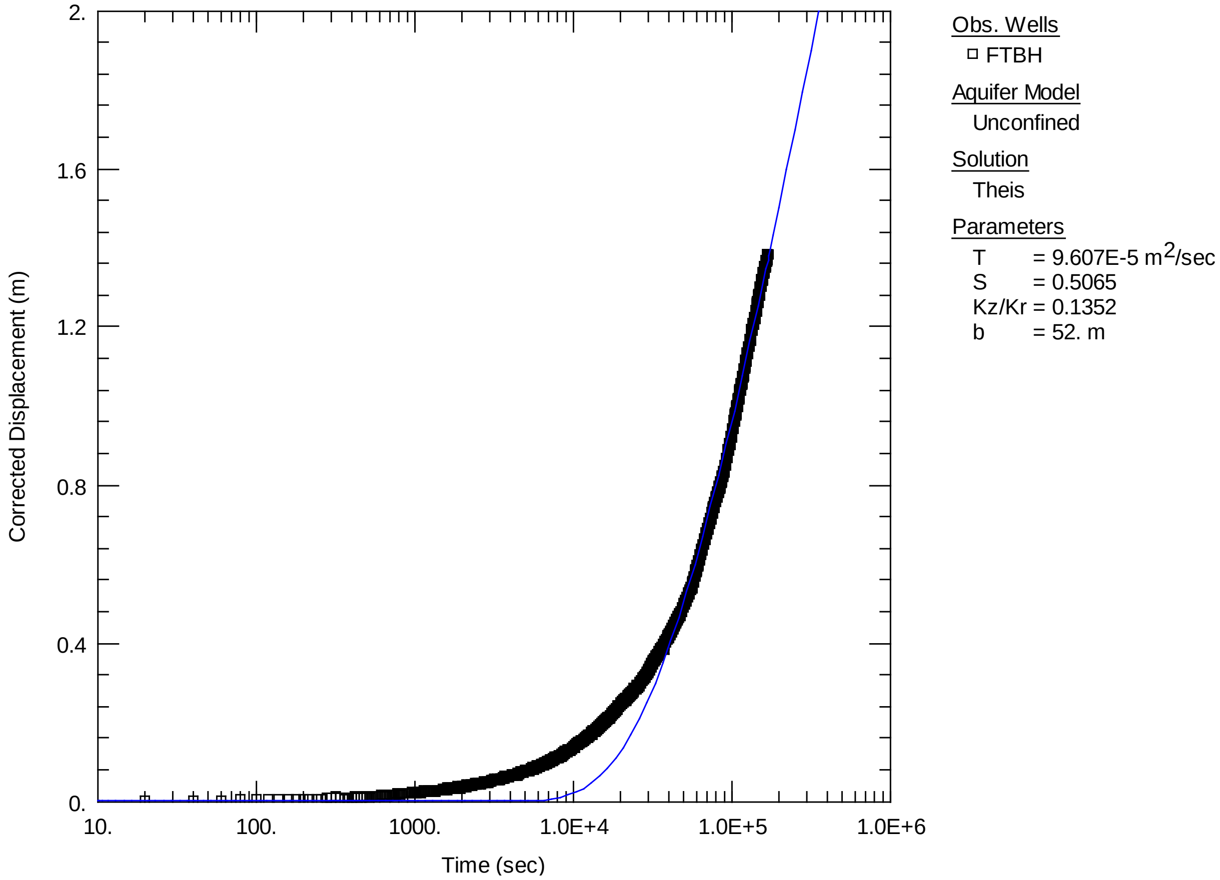


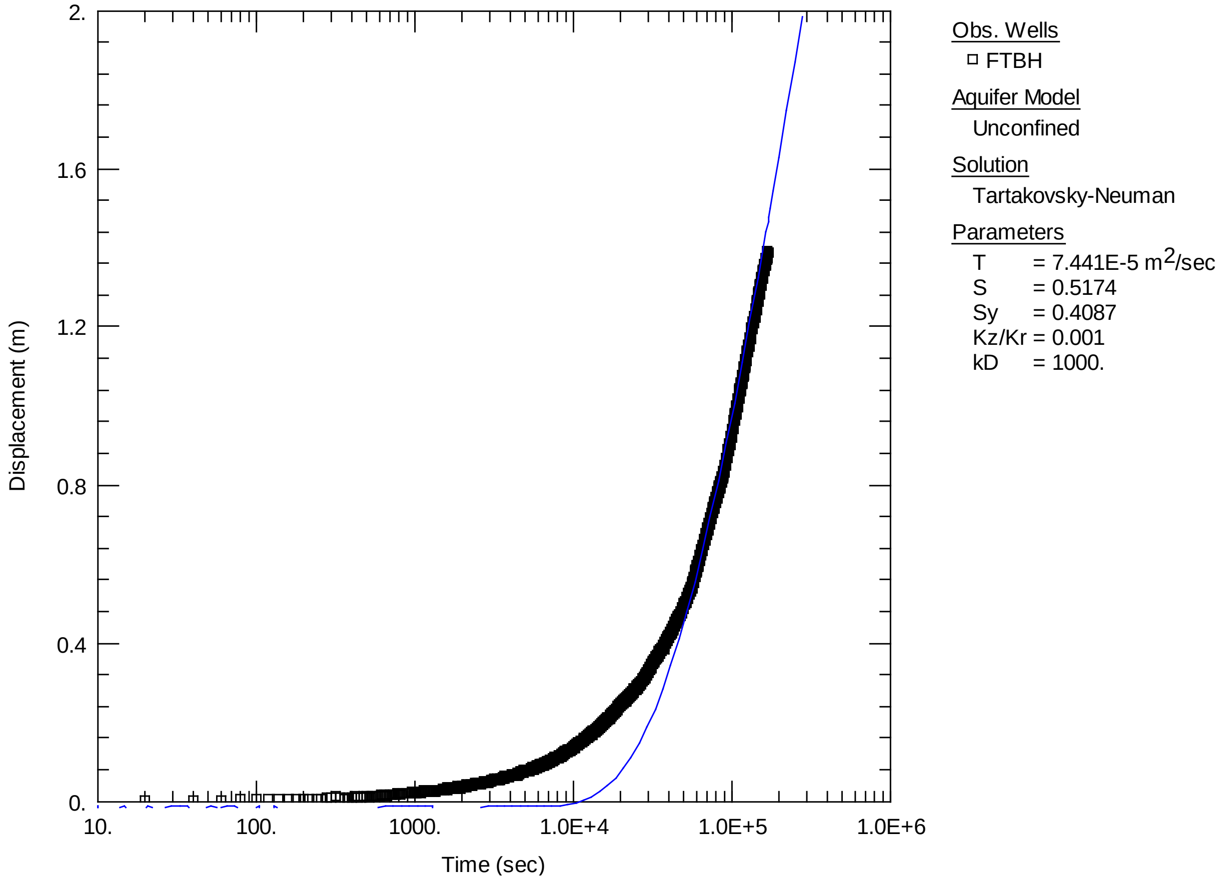
2.
1.6
1.2
0.8
0.4
0.
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Displacement (m)
Obs. Wells
FOBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 7.869E-5 m2/sec
S = 527.
Sy = 0.1
Kz/Kr = 0.001
kD = 5.



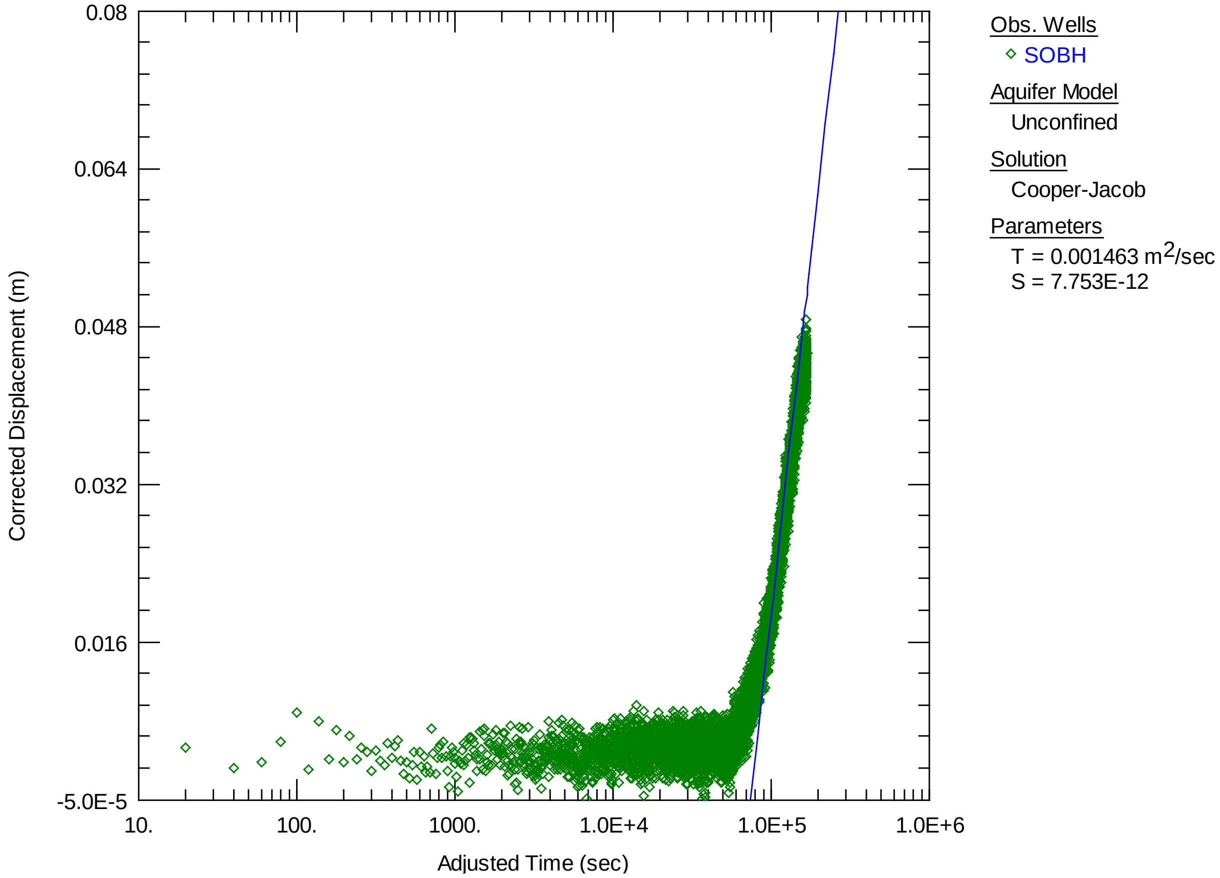
1.6
1.5
1.41
1.31
1.22
1.12
1.
10.
100.
1000.
1.0E+4
Time, t/t'
Residual Drawdown (m)
Obs. Wells
FTBH
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 0.0009497 m2/sec
S/S' = 1.066E-5


Obs. Wells
FTBH
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.0001008 m²/sec
S = 0.4074
Corrected Displacement (m)
Adjusted Time (sec)
2.
1.6
1.2
0.8
0.4
0.
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6

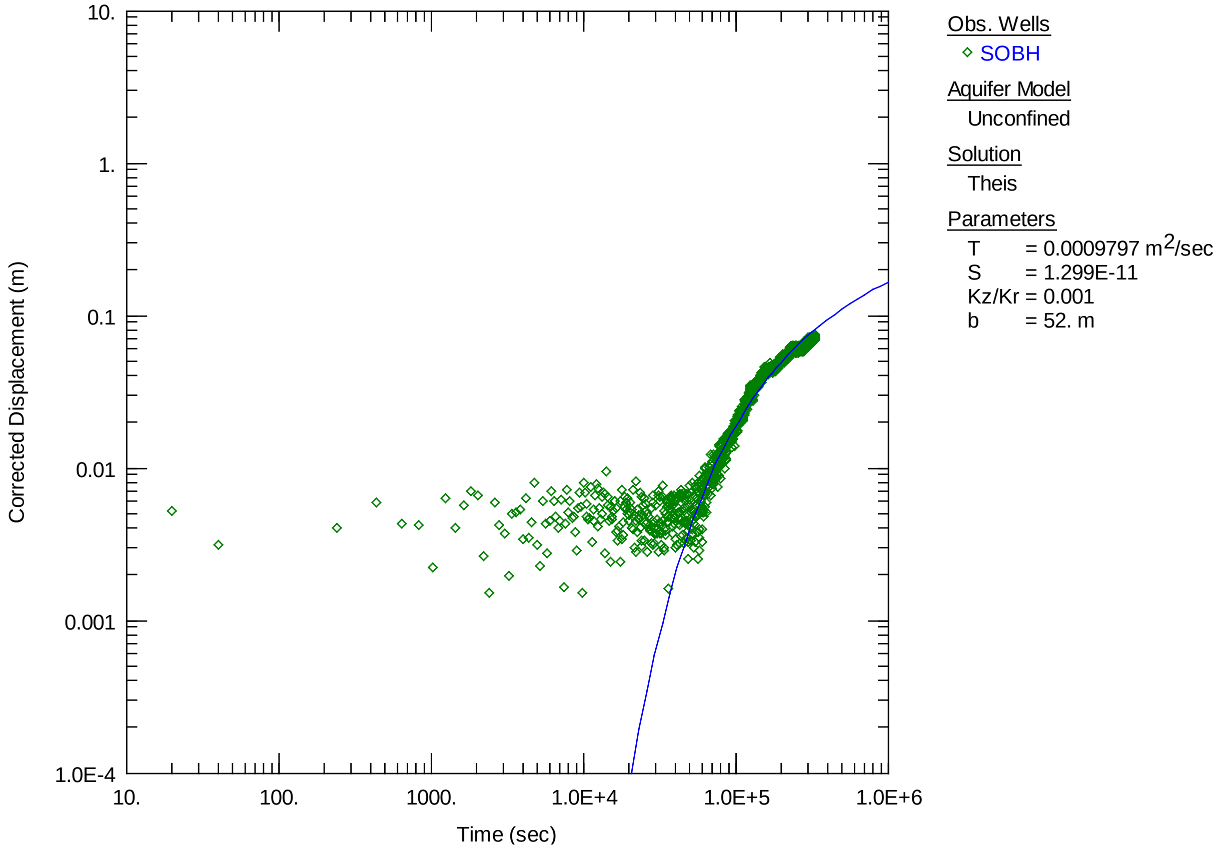

Obs. Wells
FTBH
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 9.607E-5 m²/sec
S = 0.5065
Kz/Kr = 0.1352
b = 52. m
Corrected Displacement (m)
Time (sec)
2.
1.6
1.2
0.8
0.4
0.
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6



Displacement (m)
Time (sec)
2.
1.6
1.2
0.8
0.4
0.
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Obs. Wells
FTBH
Aquifer Model
Unconfined
Solution
Tartakovsky-Neuman
Parameters
T = 7.441E-5 m2/sec
S = 0.5174
Sy = 0.4087
Kz/Kr = 0.001
kD = 1000.



Corrected Displacement (m)
Adjusted Time (sec)
0.08
0.064
0.048
0.032
0.016
-5.0E-5
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Obs. Wells
SOBH
Aquifer Model
Unconfined
Solution
Cooper-Jacob
Parameters
T = 0.001463 m2/sec
S = 7.753E-12



10.
1.
0.1
0.01
0.001
1.0E-4
Corrected Displacement (m)
10.
100.
1000.
1.0E+4
1.0E+5
1.0E+6
Time (sec)
Obs. Wells
SOBH
Aquifer Model
Unconfined
Solution
Theis
Parameters
T = 0.0009797 m2/sec
S = 1.299E-11
Kz/Kr = 0.001
b = 52. m

Appendix D Field Parameter Measurements for the Water Monitoring Locations

FIELD WORK INFO SHEET

AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring
Date of Fieldwork: 04 - 05 May 2016
Number of Field Work: 1
Client: Asya Maden İşletmeleri AŞ
Name of Field Contacts: Deniz Arslan
Site Weather Conditions: Cloudy
Location: Kastamonu, Hanönü
Notes: Sampling and Field Parameter Measurements - See Analysis Results

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (°C)	EC (µS/cm)	DO (%)	DO (mg/L)	pH	Notes
		X	Y										
Surface Waters	SW-2	616650	4609497	SW	S, M	May 04 2016	11:40	15.77	348	62.8	6.21	8.35	
	SW-4	622476	4610174	SW	S, M	May 04 2016	19:00	13.71	321	54.6	5.66	8.08	
	SW-5	623446	4608738	SW	S, M	May 04 2016	15:30	13.43	384	78.5	8.17	8.38	
	SW-7	616230	4604875	SW	S, M	May 04 2016	-						No access
	SW-8	615793	4607025	SW	S, M	May 04 2016	11:53	13.40	362	51.4	5.36	7.55	
	SW-9	617223	4608480	SW	S, M	May 04 2016	-						Dry
	SW-11	623604	4608918	SW	S, M	May 04 2016	-						Dry
	SW-12	617672	4610643	SW	S, M	May 04 2016	15:45	18.50	1193	57.3	5.34	8.1	
	SW-15	616333	4605951	SW	S, M	May 04 2016	14:10	12.43	349	34.6	3.66	8.19	
	SW-17	622022	4607830	SW	S, M	May 04 2016	-						
	YS-2	615075	4607146	SW	S, M	May 04 2016	10:35	15.27	494	64.0	6.40	7.23	
Water Depots	C-7	622110	4607942	FO	S, M	May 04 2016	17:36	14.30	338	52.0	5.31	8.17	
	D-2	620114	4606808	DE	S, M	May 04 2016	-						Same water depot with D-3
	D-3	620769	4607000	DE	S, M	May 04 2016	18:04	12.23	374	45.6	4.88	8.14	
	D-6	622371	4609856	DE	S, M	May 04 2016	18:45	11.98	489	66.9	7.19	7.8	
	D-7	621805	4606823	DE	S, M	May 04 2016	-						Same water depot with C-7
	D-8	616394	4609372	DE	S, M	May 04 2016	14:15	16.45	1043	74.2	7.22	8.24	
	D-9	619252	4610054	DE	S, M	May 04 2016	16:38	15.43	737	51.0	5.08	7.46	
	D-10	616993	4610799	DE	S, M	May 04 2016	15:00	14.40	395	72.7	7.33	8.34	
	D-11	622718	4610872	DE	S, M	May 04 2016	-						Same water depot with D-6
	D-12	620161	4608882	DE	S, M	May 04 2016	16:02	14.71	519	50.4	5.10	7.9	
	D-13	619469	4607924	DE	S, M	May 04 2016	15:38	14.00	373	53.0	5.50	7.89	
Springs	K-1	618238	4607137	FO	S, M	May 04 2016	15:11	13.89	433	74.7	7.60	7.87	
Groundwater Wells	IK-1	622766	4609993	GW	S, M	May 04 2016	12:00	12.98	4919	32.7	3.35	7.84	
	IK-2	623487	4610198	GW	S, M	May 04 2016	10:00	12.49	3754	20.2	2.11	8.13	
	IK-3	622944	4610325	GW	S, M	May 04 2016	09:00	14.53	3779	35.1	3.32	7.88	
	IK-4	623147	4610596	GW	S, M	May 04 2016	11:00	13.54	1457	4.4	0.45	8	
	OW-3	617580	4607694	GW	S, M	May 04 2016	16:40	12.90	902	30.8	3.21	8.02	
	FTBH	617526	4607385	GW	S, M	May 04 2016	17:15	12.76	951	19.0	2.01	7.42	
	WD-001	617742	4608536	GW	S, M	May 04 2016	-						The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW	S, M	May 04 2016	01:00	15.37	2401	24.0	2.38	8.06	
	WD-003	618060	4608775	GW	S, M	May 04 2016	-						The well is not vertical. Bailer use is not available.

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring	**Date of Fieldwork:** 02 - 03 June 2016	**Number of Field Work:** 2
Client: Asya Maden İşletmeleri AŞ	**Name of Field Contacts:** Deniz Arslan	**Site Weather Conditions:** Sunny, warm
Location: Kastamonu, Hanönü		**Notes:** Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Location	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y										
Surface Waters	SW-2	616650	4609497	SW		M	02 June 2016	14:24	23.8	408	7.97	-	
	SW-4	622476	4610174	SW		M	02 June 2016	9:20	18.6	425	8.09	8.39	
	SW-5	623446	4608738	SW		M	02 June 2016	10:28	18.4	456	8.04	8.9	
	SW-7	616230	4604875	SW		M	02 June 2016	16:40	14.3	630	8.46	8.3	
	SW-8	615793	4607025	SW		M	02 June 2016	15:33	17.9	421	8.17	-	
	SW-9	617223	4608480	SW		M	02 June 2016	9:51	24.2	1873	9.08	7.73	
	SW-11	623604	4608918	SW		M	02 June 2016			-			Dry
	SW-12	617672	4610643	SW		M	02 June 2016	14:33	30.0	1162	6.95	8.64	
	SW-15	616333	4605951	SW		M	02 June 2016			-			
	SW-17	622022	4607830	SW		M	02 June 2016	10:53	20.1	263	8.46	8.79	
	YS-2	615075	4607146	SW		M	02 June 2016	13:28	20.0	462	6.91	8.89	
Water Depots	C-7	622110	4607942	FO		M	02 June 2016	10:50	22.2	366	8.24	8.65	
	D-2	620114	4606808	DE		M	02 June 2016			-			Same water depot with D-3
	D-3	620769	4607000	DE		M	02 June 2016	11:24	18.2	556	7.45	8.66	
	D-6	622371	4609856	DE		M	02 June 2016	10.:05	22.2	612	8.26	9.1	
	D-7	621805	4606823	DE		M	02 June 2016			-			Same water depot with C-7
	D-8	616394	4609372	DE		M	02 June 2016	13:50	25.0	1381	5.92	8.6	
	D-9	619252	4610054	DE		M	02 June 2016	14:44	31.1	927	6.06	8.14	
	D-10	616993	4610799	DE		M	02 June 2016	14:04	22.0	621	7.15	8.23	
	D-11	622718	4610872	DE		M	02 June 2016			-			Same water depot with D-6
	D-12	620161	4608882	DE		M	02 June 2016	11:47	19.2	649	8.05	9.33	
	D-13	619469	4607924	DE		M	02 June 2016	16:04	10.0	392	9.21	8.1	
Springs	K-1	618238	4607137	FO		M	02 June 2016	13:06	20.1	518	8.13	8.81	
Groundwater Wells	IK-1	622766	4609993	GW		M	02 June 2016	11:33	16.2	5865	2.89	8.3	
	IK-2	623487	4610198	GW		M	02 June 2016	10:58	17.9	4130	2.51	8.85	
	IK-3	622944	4610325	GW		M	02 June 2016	10:45	18.2	4160	3.81	7.28	
	IK-4	623147	4610596	GW		M	02 June 2016	11:16	20.1	1842	1.86	8.2	
	OW-3	617580	4607694	GW		M	02 June 2016	8:56	16.5	1176	2.26	8.1	
	FTBH	617526	4607385	GW		M	02 June 2016	9:14	15.2	1320	3.05	7.43	
	WD-001	617742	4608536	GW		M	02 June 2016			-			The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW		M	02 June 2016	10:18	18.1	507	1.97	8.3	
	WD-003	618060	4608775	GW		M	02 June 2016			-			The well is not vertical. Bailer use is not available.

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET

AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring	**Date of Fieldwork:** June 29, 2016	**Number of Field Work:** 3
Client: Asya Maden İşletmeleri AŞ	**Name of Field Contacts:** Deniz Arslan	**Site Weather Conditions:** Sunny, warm: 35-40ºC
Location: Kastamonu, Hanönü		**Notes:** Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Location	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y										
Surface Waters	SW-2	616650	4609497	SW		M	30.06.2016	9:30	20.36	432	10.74	7.9	
	SW-4	622476	4610174	SW		M	01.07.2016			-			DRY
	SW-5	623446	4608738	SW		M	02.07.2016	10:54	20.30	594	9.76	7.72	
	SW-7	616230	4604875	SW		M	04.07.2016	16:42	13.83	382	10.41	7.44	
	SW-8	615793	4607025	SW		M	05.07.2016			-			DRY
	SW-9	617223	4608480	SW		M	06.07.2016			-			DRY
	SW-11	623604	4608918	SW		M	08.07.2016			-			DRY
	SW-12	617672	4610643	SW		M	09.07.2016	9:59	18.53	1346	9.72	7.62	
	SW-15	616333	4605951	SW		M	11.07.2016			-			DRY
	SW-17	622022	4607830	SW		M	12.07.2016			-			DRY
	YS-2	615075	4607146	SW		M	13.07.2016	8:50	20.81	607	11.2	7.85	
Water Depots	C-7	622110	4607942	FO		M	14.07.2016	10:47	24.52	486	7.41	7.8	
	D-2	620114	4606808	DE		M	15.07.2016			-			Same water depot with D-3
	D-3	620769	4607000	DE		M	16.07.2016	10:35	22.06	502	7.39	7.66	
	D-6	622371	4609856	DE		M	17.07.2016	11:28	21.46	634	7.77	7.66	
	D-7	621805	4606823	DE		M	18.07.2016			-			Same water depot with C-7
	D-8	616394	4609372	DE		M	19.07.2016	9:20	22.00	1160	10.11	7.9	
	D-9	619252	4610054	DE		M	20.07.2016	10:05	25.34	989	8.14	7.68	
	D-10	616993	4610799	DE		M	21.07.2016	9:25	22.14	528	10.29	7.24	
	D-11	622718	4610872	DE		M	22.07.2016			-			Same water depot with D-6
	D-12	620161	4608882	DE		M	23.07.2016	10:17	20.93	628	9.99	7.73	
	D-13	619469	4607924	DE		M	24.07.2016	17:00	18.81	507	12.91	7.61	
Springs	K-1	618238	4607137	FO		M	25.07.2016	16:05	11.34	464	15.42	7.15	
Groundwater Wells	IK-1	622766	4609993	GW		M	26.07.2016	14:05	15.67	5106	3.42	7.68	
	IK-2	623487	4610198	GW		M	27.07.2016	13:30	16.66	4154	4.72	7.68	
	IK-3	622944	4610325	GW		M	28.07.2016	12:50	19.51	4594	5.33	7.23	
	IK-4	623147	4610596	GW		M	29.07.2016	13:40	16.07	1579	3.72	8.08	
	OW-1	617504	4607774	GW		M	30.07.2016			-			The well is contaminated by mud.
	OW-2	617500	4607770	GW		M	31.07.2016	15:15	14.51	2711	5.33	6.92	
	OW-3	617580	4607694	GW		M	01.08.2016	15:30	16.9	1084	4.39	7.21	
	OW-4	617708	4607857	GW		M	02.08.2016	15:00	14.7	923	3.37	7.75	
	OW-5	617788	4607860	GW		M	03.08.2016	15:10	13.8	758	6.32	7.43	
	FTBH	617526	4607385	GW		M	04.08.2016	16:00	14.7	1126	5.87	7.15	
	WD-001	617742	4608536	GW		M	05.08.2016			-			The well is covered with excavated material. The well is not visible on the ground.
	WD-003	618060	4608775	GW		M	07.08.2016			-			The well is not vertical. Bailer use is not available.

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring | **Date of Fieldwork:** 01 - 02 - 03 Aug 2016 | **Number of Field Work:** 4

Client: Acacia Maden İşletmeleri AŞ | **Name of Field Contacts:** Deniz Arslan | **Site Weather Conditions:**

Location: Kastamonu, Hanönü | **Notes:** Sampling and Field Parameter Measurements - See Analysis Results

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y									
Surface Waters	SW-2	616650	4609497	SW	S, M	01.08.2016			-			DRY
	SW-4	622476	4610174	SW	S, M	01.08.2016			-			DRY
	SW-5	623446	4608738	SW	S, M	01.08.2016			-			DRY
	SW-7	616230	4604875	SW	S, M	01.08.2016			-			DRY
	SW-8	615793	4607025	SW	S, M	01.08.2016			-			DRY
	SW-9	617223	4608480	SW	S, M	01.08.2016			-			DRY
	SW-11	623604	4608918	SW	S, M	01.08.2016			-			DRY
	SW-12	617672	4610643	SW	S, M	01.08.2016			-			DRY
	SW-15	616333	4605951	SW	S, M	01.08.2016			-			DRY
	SW-17	622022	4607830	SW	S, M	01.08.2016			-			DRY
	YS-2	615075	4607146	SW	S, M	01.08.2016		21.20	700	11.76	7.87	
Water Depots	C-7	622110	4607942	FO	S, M	01.08.2016		29.00	332.2	6.53	7.92	
	D-2	620114	4606808	DE	S, M	01.08.2016			-			Same water depot with D-3
	D-3	620769	4607000	DE	S, M	01.08.2016		22.00	289.8	6.19	7.79	
	D-7	621805	4606823	DE	S, M	01.08.2016			-			Same water depot with C-7
	D-8	616394	4609372	DE	S, M	01.08.2016			-			Water source that feeds this depot is dry.
	D-9	619252	4610054	DE	S, M	01.08.2016		22.10	919	8.72	7.61	
	D-10	616993	4610799	DE	S, M	01.08.2016		22.40	549	9.85	7.77	
	D-11	622718	4610872	DE	S, M	01.08.2016			-			Same water depot with D-6
	D-12	620161	4608882	DE	S, M	01.08.2016		20.40	547	11.96	7.79	
	D-13	619469	4607924	DE	S, M	01.08.2016		21.50	327.5	5.92	7.55	
Springs	K-1	618238	4607137	FO	S, M	01.08.2016		14.10	282.5	7.85	7.43	
Groundwater Wells	IK-1	622766	4609993	GW	S, M	01.08.2016		17.90	3688	2.94	7.61	
	IK-2	623487	4610198	GW	S, M	01.08.2016		15.10	2411	2.04	7.78	
	IK-3	622944	4610325	GW	S, M	01.08.2016		18.30	2758	2.46	7.26	
	IK-4	623147	4610596	GW	S, M	01.08.2016		19.40	800	2.27	7.8	
	OW-3	617580	4607694	GW	S, M	01.08.2016		15.50	565	2.50	7.09	
	FTBH	617526	4607385	GW	S, M	01.08.2016		15.90	655	2.80	6.93	
	WD-001	617742	4608536	GW	S, M	01.08.2016			-			The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW	S, M	01.08.2016			-			
	WD-003	618060	4608775	GW	S, M	01.08.2016			-			The well is not vertical. Bailer use is not available.

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET

AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring
Date of Fieldwork: 05 Sep 2016
Number of Field Work: 5

Client: Acacia Maden İşletmeleri AŞ
Name of Field Contacts: Deniz Arslan
Site Weather Conditions:

Location: Kastamonu, Hanönü
Notes: Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y									
Surface Waters	SW-2	616650	4609497	SW	M				-			Dry
	SW-4	622476	4610174	SW	M				-			Dry
	SW-5	623446	4608738	SW	M	06.09.2016	09:45	17.74	444	8.90	8.25	
	SW-7	616230	4604875	SW	M				-			Dry
	SW-8	615793	4607025	SW	M				-			Dry
	SW-9	617223	4608480	SW	M				-			Dry
	SW-11	623604	4608918	SW	M				-			Dry
	SW-12	617672	4610643	SW	M				-			Dry
	SW-15	616333	4605951	SW	M				-			Dry
	SW-17	622022	4607830	SW	M	06.09.2016	09:25	17.13	228	8.7	8.71	
	YS-2	615075	4607146	SW	M	06.09.2016	10:11	17.65	246	10.25	8.54	
Water Depots	C-7	622110	4607942	FO	M	06.09.2016	09:30	19.40	357	7.30	8.52	
	D-2	620114	4606808	DE	M				-			Same water depot with D-3
	D-3	620769	4607000	DE	M	06.09.2016	09:13	17.45	322	7.14	8.83	
	D-6	622371	4609856	DE	M	06.09.2016	15:23	19.52	594	10.64	8.34	
	D-7	621805	4606823	DE	M				-			Same water depot with C-7
	D-8	616394	4609372	DE	M				-			Empty Depot
	D-9	619252	4610054	DE	M	06.09.2016	10:57	18.51	610	7.03	8.26	
	D-10	616993	4610799	DE	M	06.09.2016	10:30	20.49	419	7.56	8.44	
	D-11	622718	4610872	DE	M				-			Same water depot with D-6
	D-12	620161	4608882	DE	M	06.09.2016	11:11	19.85	514	9.14	8.46	
	D-13	619469	4607924	DE	M	06.09.2016	11:22	18.45	439	10.24	8.16	
Springs	K-1	618238	4607137	FO	M	06.09.2016	14:11	15.38	352	11.70	7.67	
Groundwater Wells	IK-1	622766	4609993	GW	M	06.09.2016	15:15	16.41	4770	5.20	7.96	
	IK-2	623487	4610198	GW	M				-			The well is covered with excavated material.
	IK-3	622944	4610325	GW	M	06.09.2016	14:54	19.40	3120	4.90	4.73	
	IK-4	623147	4610596	GW	M	06.09.2016	15:03	18.71	1435	4.73	8.13	
	OW-1	617504	4607774	GW	M				-			The well is contaminated by mud.
	OW-2	617500	4607770	GW	M	06.09.2016	13:43	15.39	1821	4.10	7.18	
	OW-3	617580	4607694	GW	M	06.09.2016	13:52	14.25	639	5.06	7.31	
	OW-4	617708	4607857	GW	M	06.09.2016	13:29	19.55	483	4.82	8.55	
	OW-5	617788	4607860	GW	M	06.09.2016	13:36	16.14	657	7.33	7.83	
	ATBH	617413	4608019	GW	M	06.09.2016	13:24	24.05	1775	7.13	9.1	
	FTBH	617526	4607385	GW	M	06.09.2016	14:03	13.82	777	4.70	7.47	
	WD-001	617742	4608536	GW	M				-			The well is covered with excavated material.
	WD-002	617186	4608870	GW	M				-			Mud
	WD-003	618060	4608775	GW	M				-			The well is not vertical. Bailer use is not available.
	GK-9			GW	M	06.09.2016	12:52	17.06	1851	10.15	8.16	
	GK-13			GW	M	06.09.2016	14:38	21.93	2371	7.3	7.58	

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET

AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring

Date of Fieldwork: 03 Oct 2016

Number of Field Work: 6

Client: Acacia Maden İşletmeleri AŞ

Name of Field Contacts: Deniz Arslan

Site Weather Conditions:

Location: Kastamonu, Hanönü

Notes: Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y									
Surface Waters	SW-2	616650	4609497	SW	M				-			Dry
	SW-4	622476	4610174	SW	M				-			Dry
	SW-5	623446	4608738	SW	M	03.10.2016	15:40	17.12	494	15.23	8.3	
	SW-7	616230	4604875	SW	M				-			Dry
	SW-8	615793	4607025	SW	M				-			Dry
	SW-9	617223	4608480	SW	M				-			Dry
	SW-11	623604	4608918	SW	M				-			Dry
	SW-12	617672	4610643	SW	M				-			Dry
	SW-15	616333	4605951	SW	M				-			Dry
	SW-17	622022	4607830	SW	M				-			Dry
	YS-2	615075	4607146	SW	M	03.10.2016	13:17	16.08	480	14.19	8	
Water Depots	C-7	622110	4607942	FO	M	03.10.2016	11:46	16.06	391	12.70	7.91	
	D-2	620114	4606808	DE	M				-			Same water depot with D-3
	D-3	620769	4607000	DE	M	03.10.2016	11:33	15.05	351	9.44	8.04	
	D-6	622371	4609856	DE	M	03.10.2016	16:40	17.40	573	12.74	7.98	
	D-7	621805	4606823	DE	M				-			Same water depot with C-7
	D-8	616394	4609372	DE	M				-			Empty Depot
	D-9	619252	4610054	DE	M	03.10.2016	15:29	16.81	629	9.66	7.86	
	D-10	616993	4610799	DE	M	03.10.2016	13:31	18.21	419	13.26	8.04	
	D-11	622718	4610872	DE	M				-			Same water depot with D-6
	D-12	620161	4608882	DE	M	03.10.2016	15:21	17.29	502	11.30	7.57	
	D-13	619469	4607924	DE	M	03.10.2016	15:12	16.56	472	11.95	7.36	
Springs	K-1	618238	4607137	FO	M	03.10.2016	15:02	13.76	360	10.52	7.32	
Groundwater Wells	IK-1	622766	4609993	GW	M	03.10.2016	16:30	15.51	4829	5.60	7.58	
	IK-2	623487	4610198	GW	M				-			The well is covered with excavated material.
	IK-3	622944	4610325	GW	M	03.10.2016	16:16	17.83	3127	6.22	7.62	
	IK-4	623147	4610596	GW	M	03.10.2016	16:25	16.40	1377	4.73	7.89	
	OW-1	617504	4607774	GW	M				-			The well is contaminated by mud.
	OW-2	617500	4607770	GW	M	03.10.2016	14:37	13.93	2046	23.30	6.96	
	OW-3	617580	4607694	GW	M	03.10.2016	14:43	12.98	772	6.58	7.16	
	OW-4	617708	4607857	GW	M	03.10.2016	14:24	17.44	848	5.06	8.35	
	OW-5	617788	4607860	GW	M	03.10.2016	14:31	14.38	692	22.75	7.59	
	ATBH	617413	4608019	GW	M	03.10.2016	14:16	21.19	1702	3.76	9.08	
	FTBH	617526	4607385	GW	M	03.10.2016	14:53	13.35	807	9.20	7.09	
	WD-001	617742	4608536	GW	M				-			The well is covered with excavated material.
	WD-002	617186	4608870	GW	M				-			The well is contaminated by mud.
	WD-003	618060	4608775	GW	M				-			The well is not vertical. Bailer use is not available.
	GK-9			GW	M	03.10.2016	13:41	16.4	4076	5.67	7.6	

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET													AECOM
Project No and Name: 440.02.07 - GCP Environmental Monitoring							**Date of Fieldwork:** 02 - 04 - 05 Nov 2016			**Number of Field Work: 7**			
Client: Acacia Maden İşletmeleri AŞ							**Name of Field Contacts:** Deniz Arslan, Tuncay Mısır, Sezgin Uçar			**Site Weather Conditions:**			
Location: Kastamonu, Hanönü										**Notes:** Sampling and Field Parameter Measurements - See Analysis Results			

	Station ID	UTM Coordinates (ED50 Zone 36N) X	UTM Coordinates (ED50 Zone 36N) Y	Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
Surface Waters	SW-2	616650	4609497	SW	S, M	03.11.2016	11:00	7.80	348	11.00	8.31	
	SW-4	622476	4610174	SW	S, M				-			Dry
	SW-5	623446	4608738	SW	S, M	03.11.2016	14:39	8.80	506	9.41	8.55	
	SW-7	616230	4604875	SW	S, M				-			Dry
	SW-8	615793	4607025	SW	S, M				-			Dry
	SW-9	617223	4608480	SW	S, M				-			Dry
	SW-11	623604	4608918	SW	S, M				-			Dry
	SW-12	617672	4610643	SW	S, M				-			Dry
	SW-15	616333	4605951	SW	S, M				-			Dry
	SW-17	622022	4607830	SW	S, M	03.11.2016	13:17	9.6	409	9.65	8.8	
	YS-2	615075	4607146	SW	S, M	03.11.2016	10:40	7.90	509	11.31	7.82	
Water Depots	C-7	622110	4607942	FO	S, M	03.11.2016	13:20	11.00	409	6.67	7.62	
	D-2	620114	4606808	DE	S, M				-			Same water depot with D-3
	D-3	620769	4607000	DE	S, M	03.11.2016	14:11	8.00	310	9.56	8.44	
	D-6	622371	4609856	DE	S, M	03.11.2016	16:02	11.20	536	9.36	7.62	
	D-7	621805	4606823	DE	S, M				-			Same water depot with C-7
	D-8	616394	4609372	DE	S, M				-			Empty Depot
	D-9	619252	4610054	DE	S, M	03.11.2016	13:27	7.60	597	8.94	8.45	
	D-10	616993	4610799	DE	S, M	03.11.2016	11:30	12.70	458	10.90	7.34	
	D-11	622718	4610872	DE	S, M				-			Same water depot with D-6
	D-12	620161	4608882	DE	S, M	03.11.2016	13:45	13.50	564	9.94	8.03	
	D-13	619469	4607924	DE	S, M	03.11.2016	15:18	11.70	540	10.01	7.71	
Springs	K-1	618238	4607137	FO	S, M	03.11.2016	11:08	9.60	402	9.17	7.75	
Groundwater Wells	IK-1	622766	4609993	GW	M				-			Only groundwater level was measured
	IK-2	623487	4610198	GW	S, M				-			The well is covered with excavated material.
	IK-4	623147	4610596	GW	S, M				-			The well is contaminated with mud.
	OW-1	617504	4607774	GW	M				-			The well is contaminated with mud.
	OW-2	617500	4607770	GW	M				-			
	OW-3	617580	4607694	GW	S, M	03.11.2016	10:10	11.60	901	2.43	7.39	
	OW-4	617708	4607857	GW	M	03.11.2016	09:53	11.30	865		7.25	
	OW-5	617788	4607860	GW	M	03.11.2016	09:58	12.2	851		7.44	
	ATBH	617413	4608019	GW	M	03.11.2016	09:27	17.5	1982	4.4	9.09	
	FTBH	617526	4607385	GW	S, M	03.11.2016	10:34	11.50	985	2.65	7.1	
	WD-001	617742	4608536	GW	M				-			The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW	M				-			The well is contaminated with mud.
	WD-003	618060	4608775	GW	M				-			The well is not vertical. Bailer use is not available.

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

FIELD WORK INFO SHEET

AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring	**Date of Fieldwork:** 06 - 07 Dec 2016	**Number of Field Work:** 8
Client: Acacia Maden İşletmeleri AŞ	**Name of Field Contacts:** Deniz Arslan, Tuncay Mısır, Sezgin Uçar	**Site Weather Conditions:**
Location: Kastamonu, Hanönü		**Notes:** Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N) X	Y	Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (ºC)	EC (µS/cm)	DO (mg/L)	pH	Notes
Surface Waters	SW-2	616650	4609497	SW	M	06.12.2016			-			Frozen-Dry
	SW-4	622476	4610174	SW	M	06.12.2016			-			Frozen-Dry
	SW-5	623446	4608738	SW	M	06.12.2016		1.30	712	-	8.67	
	SW-7	616230	4604875	SW	M	06.12.2016			-			Frozen-Dry
	SW-8	615793	4607025	SW	M	06.12.2016			-			Frozen-Dry
	SW-9	617223	4608480	SW	M	06.12.2016			-			Frozen-Dry
	SW-11	623604	4608918	SW	M	06.12.2016			-			Frozen-Dry
	SW-12	617672	4610643	SW	M	06.12.2016			-			Frozen-Dry
	SW-15	616333	4605951	SW	M	06.12.2016			-			Frozen-Dry
	SW-17	622022	4607830	SW	M	06.12.2016			-			Frozen-Dry
	YS-2	615075	4607146	SW	M	06.12.2016		1.70	790	12.51	7.37	
Water Depots	C-7	622110	4607942	FO	M	06.12.2016		3.60	584	12.08	8.42	
	D-2	620114	4606808	DE	M	06.12.2016			-			Same water depot with D-3
	D-3	620769	4607000	DE	M	06.12.2016			-			Frozen-Dry
	D-6	622371	4609856	DE	M	06.12.2016		5.70	648	10.48	7.77	
	D-7	621805	4606823	DE	M	06.12.2016			-			Same water depot with C-7
	D-8	616394	4609372	DE	M	06.12.2016		2.60	740	12.65	7.21	
	D-9	619252	4610054	DE	M	06.12.2016		2.10	603	12.79	8.32	
	D-10	616993	4610799	DE	M	06.12.2016		5.60	569	12.13	7.35	
	D-11	622718	4610872	DE	M	06.12.2016			-			Same water depot with D-6
	D-12	620161	4608882	DE	M	06.12.2016		6.30	692	10.95	7.78	
	D-13	619469	4607924	DE	M	06.12.2016			-			Frozen-Dry
Springs	K-1	618238	4607137	FO	M	06.12.2016		3.90	533	9.58	7.8	
Groundwater Wells	IK-1	622766	4609993	GW	M	06.12.2016			-			No access due to weather and road conditions
	IK-2	623487	4610198	GW	M	06.12.2016			-			The well is covered with excavated material.
	IK-3	622944	4610325	GW	M	06.12.2016		10.60	4430	4.23	8.51	
	IK-4	623147	4610596	GW	M	06.12.2016			-			No access due to weather and road conditions
	OW-1	617504	4607774	GW	M	06.12.2016			-			Mud
	OW-2	617500	4607770	GW	M	06.12.2016		10.90	2800	3.12	7.16	
	OW-3	617580	4607694	GW	M	06.12.2016		9.50	11.8	3.85	7.51	
	OW-4	617708	4607857	GW	M	06.12.2016		8.20	1088	4.82	7.49	
	OW-5	617788	4607860	GW	M	06.12.2016		9.5	1066	3.85	7.47	
	FTBH	617526	4607385	GW	M	06.12.2016		10.30	1301	4.81	7.96	
	SOBH	617540	4607388	GW	M	06.12.2016						
	WD-001	617742	4608536	GW	M	06.12.2016			-			The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW	M	06.12.2016			-			The well is contaminated with mud.
	WD-003	618060	4608775	GW	M	06.12.2016			-			The well is not vertical. Bailer use is not available.
	GK-1	623981	4609146	GW	M	06.12.2016		13.33	5814	5.18	7.41	
	GK-2	623666	4608939	GW	M	06.12.2016		14.92	3845	3.71	6.76	
	GK-3	623597	4609148	GW	M	06.12.2016		12.6	4540	3.25	7.18	
	GK-4	623516	4608838	GW	M	06.12.2016		13.9	951	6.08	6.8	
	GK-5	623875	4609096	GW	M	06.12.2016		12.4	5871	5.18	7.44	
	GK-6	618863	4608836	GW	M	06.12.2016		13.8	1928	3.96	7.88	

FIELD WORK INFO SHEET AECOM

Project No and Name: 440.02.07 - GCP Environmental Monitoring	**Date of Fieldwork:** 05 - 06 January 2017	**Number of Field Work: 9**
Client: Acacia Maden İşletmeleri AŞ	**Name of Field Contacts:** Deniz Arslan, Tuncay Mısır, Sezgin Uçar	**Site Weather Conditions:**
Location: Kastamonu, Hanönü		**Notes:** Field Parameter Measurements

	Station ID	UTM Coordinates (ED50 Zone 36N)		Type[1]	Activity[2] (S or M)	Monitoring Date	Monitoring Time	T (°C)	EC (µS/cm)	DO (mg/L)	pH	Notes
		X	Y									
Surface Waters	SW-2	616650	4609497	SW	M	05.01.2017		1.00	274	14.15	7.14	
	SW-4	622476	4610174	SW	M	05.01.2017			-			Frozen-Dry
	SW-5	623446	4608738	SW	M	05.01.2017		3.03	446	13.42	7.05	
	SW-7	616230	4604875	SW	M	05.01.2017			-			No access due to weather and road conditions
	SW-8	615793	4607025	SW	M	05.01.2017			-			Frozen-Dry
	SW-9	617223	4608480	SW	M	05.01.2017			-			Frozen-Dry
	SW-11	623604	4608918	SW	M	05.01.2017			-			Frozen-Dry
	SW-12	617672	4610643	SW	M	05.01.2017			-			Frozen-Dry
	SW-15	616333	4605951	SW	M	05.01.2017			-			Frozen-Dry
	SW-17	622022	4607830	SW	M	05.01.2017			-			Frozen-Dry
	YS-2	615075	4607146	SW	M	05.01.2017		2.20	431	11.80	7.19	
Water Depots	C-7	622110	4607942	FO	M	05.01.2017			-			Frozen-Dry
	D-2	620114	4606808	DE	M	05.01.2017			-			Same water depot with D-3 / Frozen-Dry
	D-3	620769	4607000	DE	M	05.01.2017			-			Frozen-Dry
	D-6	622371	4609856	DE	M	05.01.2017		7.20	441	10.40	7.06	
	D-7	621805	4606823	DE	M	05.01.2017			-			Same water depot with C-7 / Frozen-Dry
	D-8	616394	4609372	DE	M	05.01.2017		1.60	400	14.25	7.42	
	D-9	619252	4610054	DE	M	05.01.2017		1.07	489	13.28	8.02	
	D-10	616993	4610799	DE	M	05.01.2017		4.17	390	12.15	7.19	
	D-11	622718	4610872	DE	M	05.01.2017			-			Same water depot with D-6
	D-12	620161	4608882	DE	M	05.01.2017		4.71	452	10.75	7.56	
	D-13	619469	4607924	DE	M	05.01.2017		4.44	387	12.45	7.06	
Springs	K-1	618238	4607137	FO	M	05.01.2017		4.04	329	10.76	7.11	
Groundwater Wells	IK-1	622766	4609993	GW	M	05.01.2017			-			No access due to weather and road conditions
	IK-2	623487	4610198	GW	M	05.01.2017			-			The well is covered with excavated material.
	IK-3	622944	4610325	GW	M	05.01.2017		14.70	4508	3.62	7.6	
	IK-4	623147	4610596	GW	M	05.01.2017			-			No access due to weather and road conditions
	OW-1	617504	4607774	GW	M	05.01.2017			-			No access due to continuing road construction
	OW-2	617500	4607770	GW	M	05.01.2017			-			No access due to continuing road construction
	OW-3	617580	4607694	GW	M	05.01.2017			-			No access due to continuing road construction
	OW-4	617708	4607857	GW	M	05.01.2017		10.59	809	4.33	7.02	
	OW-5	617788	4607860	GW	M	05.01.2017		10.86	739	5.28	7.45	
	AOBH	617425	4608023	GW	M	05.01.2017		13.95	456	5.3	6.99	New height from cementation to the top of casing (1.20 meter)
	BOBH	617408	4608032	GW	M	05.01.2017		14.48	2116	3.58	7.81	
	FOBH	617527	4607380	GW	M	05.01.2017			-			No access due to continuing road construction
	FTBH	617526	4607385	GW	M	05.01.2017			-			No access due to continuing road construction
	SOBH	617540	4607388	GW	M	05.01.2017			-			No access due to continuing road construction
	WD-001	617742	4608536	GW	M	05.01.2017			-			The well is covered with excavated material. The well is not visible on the ground.
	WD-002	617186	4608870	GW	M	05.01.2017			-			The well is contaminated with mud.
	WD-003	618060	4608775	GW	M	05.01.2017			-			The well is not vertical. Bailer use is not available.
	GK-1	623981	4609146	GW	M	05.01.2017		12.05	5640	5.68	7.34	
	GK-2	623666	4608939	GW	M	05.01.2017		12.68	1155	3.9	6.83	
	GK-3	623597	4609148	GW	M	05.01.2017		12.31	4471	4.48	6.8	
	GK-4	623516	4608838	GW	M	05.01.2017		12.55	877	5.79	6.98	
	GK-5	623875	4609096	GW	M	05.01.2017		11.74	5981	4.2	7.44	
	GK-6	618863	4608836	GW	M	05.01.2017		12.8	1913	3.38	7.78	
	GK-7	618992	4609550	GW	M	05.01.2017		11.27	1508	4.65	-	
	GK-8	618323	4609330	GW	M	05.01.2017		9.6	1195	4.55	7.72	
	GK-9	617625	4609531	GW	M	05.01.2017		11	8090	3.39	-	
	GK-10	616318	4605880	GW	M	05.01.2017			-			No access due to continuing road construction
	GK-11	615811	4606749	GW	M	05.01.2017		9.82	677	3.32	-	
	GK-12	617484	4607598	GW	M	05.01.2017		11.6	1185	4.25	7.33	
	GK-13	622869	4610091	GW	M	05.01.2017		13.38	3370	6.73	7.74	
	GK-A	620177	4606970	GW	M	05.01.2017		10.17	292	4.31	8.14	
	GK-B	620689	4607231	GW	M	05.01.2017		11.93	320	2.94	8.2	
	ST-3	616720	4609227	GW	M	05.01.2017			-			No access due to weather and road conditions

[1]**Type:** SW for surface waters, GW for groundwater, DE for water depot, SP for natural spring, FO for village fountain.

[2]**Activity:** S for sampling, M for field parameter monitoring.

Appendix E Water Quality Comparisons with Regulatory Limit Values

Drinking Water Guidelines	Unit	EU Drinking Water Quality Criteria, 1998[1]	WHO Drinking Water Guidelines, 2011[2]	C-7			D-3			D-6			D-8	D-9			D-10			D-12			D-13			K-1		K-1
Parameters				**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**	**May.16**	**Aug.16**	**Nov.16**
Antimony	mg/L	0.005	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.01	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	mg/L	-	0.7	0.00239	0.00258	0.00296	0.00121	0.00055	0.00074	0.0508	0.0498	0.0483	0.0527	0.182	0.15	0.114	0.0223	0.0271	0.0258	0.0499	0.0418	0.0486	0.00232	0.00356	0.00398	0.00393	0.00144	<0.0005
Benzene	mg/L	0.001	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	1	2.4	0.033	0.06	0.053	0.01	0.015	0.01	0.077	0.086	0.092	0.396	0.213	0.232	0.268	0.08	0.094	0.107	0.078	0.109	0.094	0.014	0.052	0.052	0.044	0.051	0.012
Cadmium	mg/L	0.005	0.003	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chromium	mg/L	0.05	0.05	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	2	2	0.006	0.0061	0.0025	<0.002	<0.002	<0.002	0.0022	<0.002	<0.002	0.0067	0.007	0.0025	<0.002	0.0025	0.0023	<0.002	<0.002	<0.002	<0.002	0.0061	0.0047	0.0159	<0.002	<0.002	<0.002
Cyanide	mg/L	0.05	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.5	1.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.32	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Lead	mg/L	0.01	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.001	0.006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Nickel	mg/L	0.02	0.07	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as NO3	mg/L	50	50	<0.27	<0.27	<0.27	14.1	14.8	17.1	3.26	3.36	4.85	5.3	<0.27	0.94	1.1	3.09	4.35	2.14	3.32	2.54	4.44	<0.27	2.65	2.86	1.2	0.89	1.15
Nitrite as NO2	mg/L	0.5	3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0823	<0.005	<0.005	<0.005	0.0103	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	mg/L	0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminum	mg/L	0.2	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.017	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonium as NH4	mg/L	0.5	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	250	-	3.49	4.78	4.64	2.67	2.55	2.78	5.46	78.3	4.89	18.8	2.8	3.26	4.4	3.21	4.03	4.5	4.64	4.6	4.93	2.58	5.67	6.71	1.88	2.09	1.81
Conductivity	µS/cm	2500	-	338	332.2	409	374	289.8	310	489	-	536	1043	737	919	597	395	549	458	519	547	564	373	327.5	540	433	282.5	402
pH	-	6.5≤pH≤9.5	-	8.17	7.92	7.62	8.14	7.79	8.44	7.8	-	7.62	8.24	7.46	7.61	8.45	8.34	7.77	7.34	7.9	7.79	8.03	7.89	7.55	7.71	7.87	7.43	7.75
Iron	mg/L	0.2	-	0.0023	0.0031	<0.002	<0.002	<0.002	<0.002	<0.002	0.0101	<0.002	0.0033	0.0042	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0087	0.0086	<0.002
Manganese	mg/L	0.05	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00059	<0.0005	<0.0005
Sulfate as SO4	mg/L	250	-	26.4	35.1	26.4	14.3	17.4	14.6	106	124	113	133	19.9	21.8	34.9	63.2	76.6	73.5	105	85.2	113	32.2	52.9	63.1	10.4	16.3	9.75
Sodium	mg/L	200	-	5.15	8.05	6.92	7.18	6.71	6.29	15.4	31.4	18.7	310	109	120	110	10.6	10.2	9.55	14.8	18.8	18.7	6.66	11.4	13	9.36	10.1	8.4
Uranium	mg/L	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1]: European Union Quality Criteria for Waters Intended for Human Consumption – Council Directive 98/83/EC of 3 November 1998,

[2]: Guidelines for Drinking Water Quality – World Health Organization (WHO), 2011.

		TS-266[1] (Turkish Standards Institution)		RWIHC[2] (Ministry of Health, 2005)	KS-01		KS-02		KS-03		DG-01	K-1	D-2	D-3	C-3	KK-2	D-4	K-4	D-5
Parameters	Unit	Class I and Class II Type I Limits	Class II Type II Limits	Limit Values	May.12	Aug.2012	May.12	Aug.2012	May.12	Aug.2012	Aug.2012	Sep.15	Sep.15	Sep.15	Sep.15	Sep.15	Sep.15	Sep.15	Sep.15
Antimony (Sb)	mg/L	0.005	0.005	0.005	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic (As)	mg/L	0.01	0.01	0.01	0.0018	<0.001	0.0019	<0.001	0.0023	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Boron (B)	mg/L	1	1	1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.015	0.012	0.014	0.013	0.1	0.068	0.023	0.107
Cadmium (Cd)	mg/L	0.005	0.005	0.005	<0.003	<0.003	0.011	<0.003	<0.003	<0.003	0.08	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chromium (Cr)	mg/L	0.05	0.05	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.114	0.0013	0.0011	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Copper (Cu)	mg/L	0.1	2	2	<0.01	<0.01	0.077	<0.01	<0.01	<0.01	0.015	0.0097	0.001	0.0018	0.0061	0.0014	0.0047	0.0033	0.0029
Total Cyanide (CN)	mg/L	0.05	0.05	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride (F-)	mg/L	1	1.5	1.5	<0.1	<0.1	<0.1	1.33	<0.1	0.25	2.13	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Lead (Pb)	mg/L	0.01	0.01	0.01	<0.05	0.055	0.309	0.249	<0.05	0.072	0.69	0.0118	<0.005	<0.005	0.0076	<0.005	<0.005	<0.005	<0.005
Mercury (Hg)	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.025	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Nickel (Ni)	mg/L	0.02	0.02	0.02	<0.02	0.023	0.037	0.07	<0.02	0.03	1.1	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate (NO3)	mg/L	25	50	50	3.08	2.01	3.75	0.064	1.59	1.21	1.19	0.83	0.4	18.4	16.6	5.08	4.29	1.04	4.03
Nitrite (NO2)	mg/L	0.1	0.5	0.5	<0.002	0.012	<0.002	0.027	<0.002	0.0094	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	mg/L	0.01	0.01	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminum (Al)	mg/L	0.2	0.2	0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.084	0.011	0.021	0.035	0.034	0.012	0.021	0.036
Ammonium (NH4)	mg/L	0.05	0.5	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride (Cl)	mg/L	30	250	250	18	18	1125	1200	11	13.5	12	2.11	2.32	2.52	2.54	9.34	6.37	3.21	4.05
Conductivity	µS/cm	650	2500	2500	-	-	-	-	-	-	-	587	596	514	486	731	630	660	669
pH	-	6.5≤pH≤9.5	6.5≤pH≤9.5	6.5≤pH≤9.5	6.8	7.55	7.76	7.86	6.8	7.84	6.15	7.93	8.13	8.24	8.3	7.9	8.05	7.95	8.09
Iron (Fe)	mg/L	0.05	0.2	0.2	<0.02	<0.02	2.24	0.119	0.289	0.132	1222	0.259	0.0152	0.0371	0.0984	0.0671	0.027	0.045	0.11
Manganese (Mn)	mg/L	0.02	0.05	0.05	<0.01	0.2	0.207	<0.01	<0.01	0.027	265	0.0551	0.00185	0.00695	0.0208	0.0153	0.00321	0.00809	0.0147
Sulfate (SO4)	mg/L	25	250	250	298.2	111.3	4405	3904.7	73.8	68.4	9117	15.6	<5	17.9	17.5	129	62.2	70.3	121
Sodium (Na)	mg/L	100	200	200	44.5	26.5	1975	1353.25	16.5	16.2	504	9.49	8.94	7.2	7.26	25.9	16.8	9.69	23.7

[1]: TS-266: Turkish Standards - 266 - Drinking Water Criteria

[2]: RWIHC: Regulation on Waters Intended for human Consumption (Turkish Ministry of Health, 2005)

WATER POLLUTION AND CONTROL REGULATION (WPCR) Inland Water Quality Criteria	Unit	Class I	Class II	Class III	Class IV	C-7			D-3			D-6			D-8	D-9			D-10			D-12		
						May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16
Physical and inorganic-chemical parameters																								
Temperature	°C	25	25	30	> 30	14.3	29	11	12.23	22	8	11.98	-	11.2	16.45	15.43	22.1	7.6	14.4	22.4	12.7	14.71	20.4	13.5
pH	-	6.5-8.5	6.5-8.5	6.0-9.0	out of 6.0-9.0	8.17	7.92	7.62	8.14	7.79	8.44	7.8	-	7.62	8.24	7.46	7.61	8.45	8.34	7.77	7.34	7.9	7.79	8.03
Dissolved Oxygen (O_2)	mg/L	8	6	3	< 3	5.31	6.53	6.67	4.88	6.19	9.56	7.19	-	9.36	7.22	5.08	8.72	8.94	7.33	9.85	10.9	5.1	11.96	9.94
Chloride (Cl^-)	mg/L	25	200	400[b]	> 400	3.49	4.78	4.64	2.67	2.55	2.78	5.46	78.3	4.89	18.8	2.8	3.26	4.4	3.21	4.03	4.5	4.64	4.6	4.93
Sulphate (SO_4^{-2})	mg/L	200	200	400	> 400	26.4	35.1	26.4	14.3	17.4	14.6	106	124	113	133	19.9	21.8	34.9	63.2	76.6	73.5	105	85.2	113
Ammonium (NH_4^+-N)	mg/L	0.2[c]	1[c]	2[c]	> 2	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Nitrite Nitrogen (NO_2^--N)	mg/L	0.002	0.01	0.05	> 0.05	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.025	<0.002	<0.002	<0.002	0.0031	0.0039	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate Nitrogen (NO_3^--N)	mg/L	5	10	20	> 20	<0.06	<0.06	<0.06	3.19	3.36	3.87	0.737	0.76	1.1	1.2	<0.06	0.213	0.248	0.698	0.984	0.484	0.75	0.573	1
Total Phosphorus (P)	mg/L	0.02	0.16	0.65	> 0.65	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	0.029	0.042	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium (Na^+)	mg/L	125	125	250	> 250	5.4	8.18	7.1	7.36	6.89	6.34	17.5	33.8	18	300	112	124	102	11.2	10.2	9.53	15.8	19.1	18.2
Chemical Oxygen Demand (COD)	mg/L	25	50	70	> 70	10	8	7	<5	<5	10	<5	<5	<5	<5	<5	6	<5	<5	<5	5	<5	<5	8
Total Organic Carbon	mg/L	5	8	12	> 12	2.89	2.67	1.55	<0.5	0.85	0.6	0.7	1.19	0.68	2.9	0.72	1.57	0.98	0.56	1.49	0.66	<0.5	0.87	0.66
Total Kjeldahl-Nitrogen	mg/L	0.5	1.5	5	> 5	0.54	0.61	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.62	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mercury (Hg)	mg Hg/L	0.0001	0.0005	0.002	> 0.002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Cadmium (Cd)	mg Cd/L	0.003	0.005	0.01	> 0.01	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.002	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Lead (Pb)	mg Pb/L	0.01	0.02	0.05	> 0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic (As)	mg As/L	0.02	0.05	0.1	> 0.1	<0.005	<0.005	<0.005	<0.005	0.0064	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0068	<0.005
Copper (Cu)	mg Cu/L	0.02	0.05	0.2	> 0.2	0.0131	0.0087	0.0032	0.0024	0.0027	<0.001	0.0038	0.0038	<0.001	0.0093	0.0072	0.0032	<0.001	0.0025	0.0028	0.0017	0.0012	0.0028	<0.001
Chromium (total) (Cr)	mg Cr/L	0.02	0.05	0.2	> 0.2	0.0012	<0.001	0.0014	<0.001	<0.001	<0.001	0.0027	<0.001	<0.001	<0.002	0.0018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (Co)	mg Co/L	0.01	0.02	0.2	> 0.2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (Ni)	mg Ni/L	0.02	0.05	0.2	> 0.2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (Zn)	mg Zn/L	0.2	0.5	2	> 2	0.013	0.017	0.0072	0.0991	0.076	0.0462	<0.002	0.0035	<0.002	0.011	0.0094	0.0073	0.0027	0.017	0.0112	0.0095	0.006	0.0126	<0.002
Cyanide (Total) (CN)	mg CN/L	0.01	0.05	0.1	> 0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Flouride (F^-)	mg F^-/L	1	1.5	2	> 2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.32	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Iron (Fe)	mg Fe/L	0.3	1	5	> 5	0.0059	0.0076	0.0142	0.0042	0.0034	0.0124	0.007	0.0076	0.0128	2.21	0.0121	0.0048	0.0022	0.0097	0.011	0.0107	0.0067	0.197	0.147
Manganese (Mn)	mg Mn/L	0.1	0.5	3	> 3	<0.0005	0.00128	0.0014	<0.0005	<0.0005	0.0016	<0.0005	<0.0005	0.00057	0.0196	<0.0005	0.00082	<0.0005	0.00083	0.00161	0.00159	<0.0005	0.00585	0.00227
Boron (B)	mg B/L	1	1	1	> 1	0.034	0.07	0.057	0.01	0.021	0.014	0.083	0.09	0.096	0.394	0.225	0.239	0.268	0.087	0.1	0.107	0.082	0.115	0.094
Selenium (Se)	mg Se/L	0.01	0.01	0.02	> 0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Barium (Ba)	mg Ba/L	1	2	2	> 2	0.00256	0.00337	0.0034	0.00128	0.00066	0.00112	0.0537	0.0535	0.0478	0.0626	0.184	0.154	0.128	0.0228	0.0277	0.0245	0.0504	0.0445	0.0495
Aluminum (Al)	mg Al/L	0.3	0.3	1	> 1	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	0.011	<0.01	0.014	2.75	0.012	0.02	<0.01	0.011	0.01	<0.01	0.016	0.054	0.035

WATER POLLUTION AND CONTROL REGULATION (WPCR) Inland Water Quality Criteria	Unit	Class I	Class II	Class III	Class IV	D-12			D-13			FTBH			IK-1		IK-2		IK-3			IK-4	
						May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	May.16	Aug.16	May.16	Aug.16	Nov.16	May.16	Aug.16
Physical and inorganic-chemical parameters																							
Temperature	°C	25	25	30	> 30	14.71	20.4	13.5	14	21.5	11.7	12.76	15.9	11.5	12.98	17.9	12.49	15.1	14.53	18.3	-	13.54	19.4
pH	-	6.5-8.5	6.5-8.5	6.0-9.0	out of 6.0-9.0	7.9	7.79	8.03	7.89	7.55	7.71	7.42	6.93	7.1	7.84	7.61	8.13	7.78	7.88	7.26	-	8	7.8
Dissolved Oxygen (O_2)	mg/L	8	6	3	< 3	5.1	11.96	9.94	5.5	5.92	10.01	2.01	2.8	2.65	3.35	2.94	2.11	2.04	3.32	2.46	-	0.45	2.27
Chloride (Cl^-)	mg/L	25	200	400[b]	> 400	4.64	4.6	4.93	2.58	5.67	6.71	10.8	24.1	16.1	71.7	32.4	1120	1100	62	77.6	83.5	27.3	27
Sulphate (SO_4^{-2})	mg/L	200	200	400	> 400	105	85.2	113	32.2	52.9	63.1	105	180	161	2680	3610	468	492	2970	3710	3690	360	404
Ammonium (NH_4^+-N)	mg/L	0.2[c]	1[c]	2[c]	> 2	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.056	<0.04	0.07	0.984	1.99	0.721	1.19	0.451	0.231	0.786	0.58	0.822
Nitrite Nitrogen (NO_2^--N)	mg/L	0.002	0.01	0.05	> 0.05	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0038	<0.002	<0.002	0.0111	<0.002	0.0048	0.0069	<0.01	<0.002	0.003	0.0027
Nitrate Nitrogen (NO_3^--N)	mg/L	5	10	20	> 20	0.75	0.573	1	<0.06	0.598	0.647	<0.06	0.093	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.15	<0.06	0.063	<0.06
Total Phosphorus (P)	mg/L	0.02	0.16	0.65	> 0.65	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.028	0.185	0.017	<0.01	0.076	<0.02	0.085	2.75	0.029	0.414	2.72	0.015
Total Sodium (Na^+)	mg/L	125	125	250	> 250	15.8	19.1	18.2	6.86	11.5	13.5	83.2	96.4	71.6	1570	1860	965	1300	398	588	591	402	445
Chemical Oxygen Demand (COD)	mg/L	25	50	70	> 70	<5	<5	8	9	5	<5	<5	28	119	12	18	11	35	17	244	176	18	27
Total Organic Carbon	mg/L	5	8	12	> 12	<0.5	0.87	0.66	2.34	1.8	1.3	<0.5	1.21	1.57	3.64	1.09	2.79	1.98	4.56	2.37	3.1	4.8	4.97
Total Kjeldahl-Nitrogen	mg/L	0.5	1.5	5	> 5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.71	1.05	2.08	1.26	1.27	14.2	0.78	2.44	11.6	1.37
Mercury (Hg)	mg Hg/L	0.0001	0.0005	0.002	> 0.002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000407	0.000056	<0.00001	0.000235	0.000055
Cadmium (Cd)	mg Cd/L	0.003	0.005	0.01	> 0.01	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0008	<0.002	<0.0008	0.0063	<0.0008	<0.0004	<0.002	<0.0004
Lead (Pb)	mg Pb/L	0.01	0.02	0.05	> 0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0122	0.0405	<0.005	<0.005	0.0125	<0.01	<0.01	0.095	0.0109	0.0236	0.103	<0.005
Arsenic (As)	mg As/L	0.02	0.05	0.1	> 0.1	<0.005	0.0068	<0.005	<0.005	<0.005	<0.005	0.0115	0.0076	<0.005	<0.005	<0.01	<0.01	<0.01	0.066	<0.01	<0.005	0.106	<0.005
Copper (Cu)	mg Cu/L	0.02	0.05	0.2	> 0.2	0.0012	0.0028	<0.001	0.0067	0.0168	0.0201	0.0079	0.0833	0.0301	0.0014	0.0132	<0.002	0.008	0.389	0.0027	0.0117	0.332	0.0012
Chromium (total) (Cr)	mg Cr/L	0.02	0.05	0.2	> 0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0016	0.0047	0.0012	0.0016	0.0058	<0.002	0.0046	0.756	<0.002	0.0226	0.72	<0.001
Cobalt (Co)	mg Co/L	0.01	0.02	0.2	> 0.2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0032	0.0106	0.0028	<0.002	<0.004	<0.002	<0.004	0.135	0.0144	0.0149	0.129	0.0073
Nickel (Ni)	mg Ni/L	0.02	0.05	0.2	> 0.2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0041	0.0093	<0.002	<0.002	0.0055	<0.005	<0.004	0.672	0.0238	0.0431	0.547	0.0128
Zinc (Zn)	mg Zn/L	0.2	0.5	2	> 2	0.006	0.0126	<0.002	0.0066	0.0107	0.0264	0.136	2.97	1.65	5.42	23	4.88	9.15	31	18.6	38.8	38.7	5.74
Cyanide (Total) (CN)	mg CN/L	0.01	0.05	0.1	> 0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Flouride (F^-)	mg F^-/L	1	1.5	2	> 2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.261	<0.2	0.47	0.705	1.06	1.37	0.271	0.47	0.467	0.753	1.01
Iron (Fe)	mg Fe/L	0.3	1	5	> 5	0.0067	0.197	0.147	0.0109	0.0092	0.0102	0.661	2.33	0.0289	0.427	2.24	1.77	2.48	338	0.0097	9.8	283	0.013
Manganese (Mn)	mg Mn/L	0.1	0.5	3	> 3	<0.0005	0.00585	0.00227	0.0005	0.00268	0.00374	0.0737	0.336	0.368	0.42	0.327	0.0763	0.0824	4.98	1.87	1.07	3.91	1.17
Boron (B)	mg B/L	1	1	1	> 1	0.082	0.115	0.094	0.016	0.057	0.051	0.145	0.158	0.131	3.48	4.22	2.34	2.73	1.67	2.16	2.28	2.42	2.53
Selenium (Se)	mg Se/L	0.01	0.01	0.02	> 0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.03	<0.02	<0.03	<0.02	<0.01	<0.03	<0.01
Barium (Ba)	mg Ba/L	1	2	2	> 2	0.0504	0.0445	0.0495	0.00244	0.00358	0.00395	0.03	0.0331	0.0245	0.0242	0.0285	0.052	0.0643	1.32	0.0534	0.041	0.703	0.125
Aluminum (Al)	mg Al/L	0.3	0.3	1	> 1	0.016	0.054	0.035	<0.01	<0.01	<0.01	0.145	0.573	0.058	0.126	0.838	1.52	0.862	198	<0.02	4.77	209	0.027

WATER POLLUTION AND CONTROL REGULATION (WPCR) **Inland Water Quality Criteria**	Unit	Class I	Class II	Class III	Class IV	K-1			OW-3			WD-1	ST-1A	GK-4	GK-6	GK-10	GK-12	GK-13
						May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	Nov.16	Nov.16	Dec.16	Dec.16
Physical and inorganic-chemical parameters																		
Temperature	°C	25	25	30	> 30	13.89	14.1	9.6	12.9	15.5	11.6	-	-	13.9	13.8	9.94	16.1	12.9
pH	-	6.5-8.5	6.5-8.5	6.0-9.0	out of 6.0-9.0	7.87	7.43	7.75	8.02	7.09	7.39	-	-	6.8	7.88	7.34	5.84	8.66
Dissolved Oxygen (O_2)	mg/L	8	6	3	< 3	7.6	7.85	9.17	3.21	2.5	2.43	-	-	6.08	3.96	4.68	3.76	2.28
Chloride (Cl^-)	mg/L	25	200	400[b]	> 400	1.88	2.09	1.81	7.39	8.26	8.92	24.6	4.35	16	16.2	4.84	8.28	752
Sulphate (SO_4^{-2})	mg/L	200	200	400	> 400	10.4	16.3	9.75	216	217	198	1470	28.9	268	1190	103	214	1920
Ammonium (NH_4^+-N)	mg/L	0.2[c]	1[c]	2[c]	> 2	<0.04	<0.04	<0.04	0.102	0.137	0.187	0.191	<0.04	<0.04	0.205	0.041	0.243	0.631
Nitrite Nitrogen (NO_2^--N)	mg/L	0.002	0.01	0.05	> 0.05	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0022	<0.002	<0.002	<0.002	<0.002	<0.002	0.248
Nitrate Nitrogen (NO_3^--N)	mg/L	5	10	20	> 20	0.272	0.202	0.26	<0.06	<0.06	<0.06	<0.06	0.784	7.85	1.34	<0.06	<0.06	1.46
Total Phosphorus (P)	mg/L	0.02	0.16	0.65	> 0.65	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01		
Total Sodium (Na^+)	mg/L	125	125	250	> 250	9.48	10.6	8.71	33.1	37.9	29.5	511	11	83.8	597	16.6	66.4	1460
Chemical Oxygen Demand (COD)	mg/L	25	50	70	> 70	<5	<5	5	5	8	24	<5	<5	<5	<5	<5	23	7
Total Organic Carbon	mg/L	5	8	12	> 12	<0.5	0.92	<0.5	1.13	0.64	2.5	1.14	1.7	0.74	<0.5	<0.5	<0.5	1.03
Total Kjeldahl-Nitrogen	mg/L	0.5	1.5	5	> 5	<0.5	<0.5	<0.5	0.59	<0.5	0.75	0.52	<0.5	<0.5	<0.5	<0.5	0.92	1
Mercury (Hg)	mg Hg/L	0.0001	0.0005	0.002	> 0.002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Cadmium (Cd)	mg Cd/L	0.003	0.005	0.01	> 0.01	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.002	<0.0004	<0.0004	<0.0008	<0.0004	<0.0004	<0.0008
Lead (Pb)	mg Pb/L	0.01	0.02	0.05	> 0.05	<0.005	<0.005	<0.005	<0.005	<0.005	0.0068	0.185	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01
Arsenic (As)	mg As/L	0.02	0.05	0.1	> 0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01
Copper (Cu)	mg Cu/L	0.02	0.05	0.2	> 0.2	<0.001	<0.001	<0.001	0.0013	0.0129	0.0821	0.0192	<0.001	<0.001	<0.002	<0.001	<0.001	<0.002
Chromium (total) (Cr)	mg Cr/L	0.02	0.05	0.2	> 0.2	<0.001	<0.001	<0.001	<0.001	0.0017	<0.001	0.014	0.0014	<0.001	<0.002	<0.001	<0.001	<0.002
Cobalt (Co)	mg Co/L	0.01	0.02	0.2	> 0.2	<0.002	<0.002	<0.002	0.002	0.0022	0.0023	<0.002	<0.002	0.0022	<0.004	<0.002	0.0137	<0.004
Nickel (Ni)	mg Ni/L	0.02	0.05	0.2	> 0.2	<0.002	0.002	<0.002	0.0085	0.0082	0.0026	0.0103	0.0043	<0.002	<0.004	<0.002	<0.002	<0.004
Zinc (Zn)	mg Zn/L	0.2	0.5	2	> 2	<0.002	0.0221	<0.002	16.6	16.6	18.8	0.0252	0.0281	0.003	<0.004	0.005	1.64	<0.004
Cyanide (Total) (CN)	mg CN/L	0.01	0.05	0.1	> 0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Flouride (F^-)	mg F^-/L	1	1.5	2	> 2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.438	<0.2	<0.2	0.558	<0.2	0.221	0.5
Iron (Fe)	mg Fe/L	0.3	1	5	> 5	0.0122	<0.002	0.0039	11.1	12.8	15.7	5.95	0.0473	0.0178	0.015	<0.002	0.0801	0.108
Manganese (Mn)	mg Mn/L	0.1	0.5	3	> 3	0.00164	0.00155	<0.0005	0.288	0.275	0.27	0.285	0.00055	0.00142	0.0331	0.0538	0.33	0.00298
Boron (B)	mg B/L	1	1	1	> 1	0.046	0.053	0.016	0.112	0.118	0.088	0.816	0.059	0.156	0.436	0.018	0.623	2.63
Selenium (Se)	mg Se/L	0.01	0.01	0.02	> 0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02
Barium (Ba)	mg Ba/L	1	2	2	> 2	0.0042	0.0015	0.00122	0.0178	0.0198	0.0198	0.0373	0.0233	0.0517	0.00724	0.00536	0.0277	0.0169
Aluminum (Al)	mg Al/L	0.3	0.3	1	> 1	0.01	0.015	<0.01	0.03	0.102	0.199	6.23	<0.01	<0.01	<0.02	<0.01	0.224	0.098

Surface Water Quality Regulation (SWQR) Inland Surface Water Resources Quality Criteria (Ministry of Forestry and Water Works, 2012)		Class I	Class II	Class III	Class IV	SW-2		YS-2			SW-5			SW-4	SW-8	SW-12	SW-17
Parameters						May.16	Nov.16	May.16	Aug.16	Nov.16	May.16	Aug.16	Nov.16	May.16	May.16	May.16	Nov.16
pH		6.5-8.5	6.5-8.5	6.0-9.0	out of 6.0-9.0	8.35	8.31	7.23	7.87	7.82	8.38	-	8.55	8.08	7.55	8.1	8.8
Electrical Concuctivity (µS/cm)		400	1000	3000	> 3000	348	348	494	700	509	384	-	506	321	362	1193	409
Dissolved Oxygen (mg O_2/L)[a]	mg/L	8	6	3	< 3	6.21	11	6.4	-	11.31	8.17	-	9.41	5.66	5.36	5.34	9.65
Ammonium (mg NH_4^+-N/L)	mg/L	0.2[c]	1[c]	2[c]	> 2	<0.04	0.04	0.154	0.069	0.408	0.369	<0.04	0.18	0.067	<0.04	<0.04	<0.04
Nitrate Nitrogen (mg NO_3^--N/L)	mg/L	5	10	20	> 20	0.301	<0.06	1.6	1.07	1.77	1.45	0.795	1.62	0.092	<0.06	<0.06	<0.06
Nitrite Nitrogen (mg NO_2^--N/L)	mg/L	0.01	0.06	0.12	> 0.3	<0.002	<0.002	0.0557	0.12	0.283	0.0494	0.0172	0.15	<0.002	0.0024	<0.002	<0.002
Total Kjeldahl-Nitrogen (mg/L)	mg/L	0.5	1.5	5	> 5	<0.5	<0.5	<0.5	0.54	0.64	3.94	<0.5	<0.5	0.62	<0.5	<0.5	<0.5
Total Phosphorus (mg P/L)	mg/L	0.03	0.16	0.65	> 0.65	<0.02	<0.01	0.129	0.011	0.051	3.78	<0.01	0.027	<0.02	<0.01	<0.01	0.016
Flouride (F-)	mg/L	1	1.5	2	> 2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.272	<0.2
Manganese (Mn)	mg/L	0.1	0.5	3	> 3	0.143	0.00283	0.155	0.0244	0.0658	2.27	0.0153	0.0379	0.089	0.00195	0.0101	0.00948
Selenium (Se)	mg/L	0.01	0.01	0.02	> 0.02	<0.03	<0.01	<0.03	<0.01	<0.01	<0.03	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01

Appendix F Water Quality Analysis Results

CERTIFICATE OF ANALYSIS

Work Order	: **PR1631660**	Issue Date	: 26-MAY-2016
Client	: **AECOM Turkey Dan ve Muh Ltd Sti**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Ozan Atak	Contact	: Client Service
Address	: Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266, B Blok No: 50-51 Cankaya 06800 Ankara / Turkey	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: ----	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	Page	: 1 of 22
Order number	: ----	Date Samples Received	: 10-MAY-2016
C-O-C number	: ----	Quote number	: PR2014ARTMU-TR0129 (AECOM BQ)
Site	: Hanonu	Date of test	: 10-MAY-2016 - 23-MAY-2016
Sampled by	: client TKD	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

This report shall not be reproduced except in full, without prior written approval from the laboratory.
The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR1631660/010, 011, 012, method W-CR6-IC - particular sample(s) required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.
Sample(s) PR1631660/012.013, method W-NH4-SPC, W-NO2-SPC, W-NNO-SPC, W-NO3-SPC was/were filtered prior to analysis (filter porosity 0.45 µm).
Samples PR1631660/001 - 022 method W-O2D-ELE were determined in laboratory.
Sample(s) PR1631660/012,013,016-019, method W-ALK-PCT, W-CON-PCT, W-PH-PCT was/were decanted prior to analysis.

Responsible for accuracy

Testing Laboratory Accredited by CAI according to CSN EN ISO/IEC 17025:2005

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA TESTING LABORATORY ACCREDITED BY CAI ALS Czech Republic, s.r.o. 1 L1163

ilac-MRA

L 1163

Analytical Results

Sub-Matrix: **DRINKING WATER**			Client sample ID	C-7		D-3		D-6	
			Laboratory sample ID	PR1631660001		PR1631660002		PR1631660003	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**37.3**	±10.0 %	**41.7**	±10.0 %	**58.6**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.98**	±1.0 %	**8.35**	±1.0 %	**8.11**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.89**	±20.0 %	<0.50	----	**0.70**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**2.27**	----	**2.68**	----	**3.54**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.02**	----	**1.78**	----	**2.40**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.26**	----	**0.896**	----	**1.14**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**227**	----	**268**	----	**354**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**10.0**	±20.0 %	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**3.49**	±15.0 %	**2.67**	±15.0 %	**5.46**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**10.8**	±30.0 %	**10.1**	±30.0 %	**11.4**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	<0.500	----	**3.19**	----	**0.737**	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**14.1**	----	**3.26**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**3.19**	±20.0 %	**0.737**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	**0.54**	----	**0.70**	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**26.4**	±15.0 %	**14.3**	±15.0 %	**106**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.54**	±64.9 %	**0.70**	±51.6 %	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**3.9**	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**3.19**	----	**0.737**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**117**	±30.0 %	**112**	±30.0 %	**126**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**227**	±10.0 %	**262**	±10.0 %	**376**	±9.9 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**187**	±12.0 %	**231**	±12.0 %	**218**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	**5.8**	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**187**	----	**225**	----	**218**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	**0.011**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----

Sub-Matrix: **DRINKING WATER**			*Client sample ID*	**C-7**		**D-3**		**D-6**	
			Laboratory sample ID	*PR1631660001*		*PR1631660002*		*PR1631660003*	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Barium	W-METAXFX1	0.00050	mg/L	**0.00256**	±10.0 %	**0.00128**	±10.0 %	**0.0537**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.034**	±10.0 %	**0.010**	±10.0 %	**0.083**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**40.7**	±10.0 %	**71.4**	±10.0 %	**96.2**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	**0.0012**	±10.1 %	<0.0010	----	**0.0027**	±10.0 %
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0131**	±10.0 %	**0.0024**	±10.0 %	**0.0038**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0059**	±10.0 %	**0.0042**	±10.0 %	**0.0070**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0028**	±10.0 %	**0.0038**	±10.0 %	**0.0249**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**30.6**	±10.0 %	**21.8**	±10.0 %	**27.6**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**0.566**	±10.0 %	**1.39**	±10.0 %	**2.43**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**5.40**	±10.0 %	**7.36**	±10.0 %	**17.5**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0130**	±10.0 %	**0.0991**	±10.0 %	<0.0020	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.00239**	±10.0 %	**0.00121**	±10.1 %	**0.0508**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.033**	±10.0 %	<0.010	----	**0.077**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**37.0**	±10.0 %	**63.7**	±10.0 %	**90.9**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	**0.0012**	±10.0 %	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0060**	±10.0 %	<0.0020	----	**0.0022**	±10.0 %
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0023**	±10.0 %	<0.0020	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0021**	±10.0 %	**0.0029**	±10.0 %	**0.0224**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**28.3**	±10.0 %	**21.3**	±10.0 %	**24.8**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**0.517**	±10.0 %	**1.33**	±10.0 %	**2.04**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**5.15**	±10.0 %	**7.18**	±10.0 %	**15.4**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0066**	±10.0 %	**0.0967**	±10.0 %	<0.0020	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-8		D-9		D-10	
			Laboratory sample ID	PR1631660004		PR1631660005		PR1631660006	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**110**	±10.0 %	**82.7**	±10.0 %	**45.7**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.28**	±1.0 %	**8.04**	±1.0 %	**7.91**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.90**	±20.0 %	**0.72**	±20.0 %	**0.56**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**0.493**	----	**2.80**	----	**2.47**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**0.317**	----	**1.25**	----	**1.77**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**0.176**	----	**1.55**	----	**0.695**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**49.3**	----	**280**	----	**247**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**18.8**	±15.0 %	**2.80**	±15.0 %	**3.21**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**17.1**	±30.0 %	**9.74**	±30.0 %	**13.6**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	**0.320**	±15.0 %	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	**1.20**	----	<0.500	----	**0.698**	----
Nitrates	W-NO3-SPC	0.27	mg/L	**5.30**	----	<0.27	----	**3.09**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**1.20**	±20.0 %	<0.060	----	**0.698**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	**0.62**	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.072**	±20.0 %	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**133**	±15.0 %	**19.9**	±15.0 %	**63.2**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.62**	±57.4 %	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.8**	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.031**	±20.0 %	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.096**	±20.0 %	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**1.20**	----	<0.060	----	**0.698**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**187**	±30.0 %	**107**	±30.0 %	**153**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**754**	±9.7 %	**424**	±9.8 %	**244**	±10.0 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**13.0**	±11.2 %	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**501**	±12.0 %	**458**	±12.0 %	**179**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**501**	----	**458**	----	**179**	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	**2.75**	±10.0 %	----	----	----	----
Aluminium	W-METAXFX1	0.010	mg/L	----	----	**0.012**	±10.0 %	**0.011**	±10.0 %
Antimony	W-METAXDG1	0.020	mg/L	<0.020	----	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	----	----	<0.0050	----	<0.0050	----

Sub-Matrix: **DRINKING WATER**			*Client sample ID*	**D-8**		**D-9**		**D-10**	
			Laboratory sample ID	*PR1631660004*		*PR1631660005*		*PR1631660006*	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Arsenic	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Barium	W-METAXDG1	0.00050	mg/L	**0.0626**	±10.0 %	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	----	----	**0.184**	±10.0 %	**0.0228**	±10.0 %
Beryllium	W-METAXDG1	0.00020	mg/L	<0.00020	----	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	----	----	<0.00020	----	<0.00020	----
Boron	W-METAXDG1	0.010	mg/L	**0.394**	±10.0 %	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	----	----	**0.225**	±10.0 %	**0.087**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	----	----	<0.00040	----	<0.00040	----
Cadmium	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**12.7**	±10.0 %	**50.2**	±10.0 %	**71.0**	±10.0 %
Calcium	W-METAXDG1	0.050	mg/L	**12.7**	±10.0 %	----	----	----	----
Chromium	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	----	----	**0.0018**	±10.0 %	<0.0010	----
Cobalt	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	<0.0020	----
Copper	W-METAXDG1	0.0020	mg/L	**0.0093**	±10.0 %	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	----	----	**0.0072**	±10.0 %	**0.0025**	±10.0 %
Iron	W-METAXDG1	0.0050	mg/L	**2.21**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	----	----	**0.0121**	±10.0 %	**0.0097**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	----	----	<0.0050	----	<0.0050	----
Lead	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Lithium	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	----	----	**0.0041**	±10.0 %	**0.0111**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**4.28**	±10.0 %	**37.7**	±10.0 %	**16.9**	±10.0 %
Magnesium	W-METAXDG1	0.020	mg/L	**4.28**	±10.0 %	----	----	----	----
Manganese	W-METAXDG1	0.00050	mg/L	**0.0196**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	----	----	<0.00050	----	**0.00083**	±10.1 %
Mercury	W-HG-AFSDG	0.020	µg/L	<0.020	----	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	----	----	<0.010	----	<0.010	----
Mercury	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXDG1	0.0030	mg/L	<0.0030	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	<0.0020	----
Nickel	W-METAXDG1	0.0050	mg/L	<0.0050	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXDG1	0.020	mg/L	<0.020	----	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Potassium	W-METAXDG1	0.015	mg/L	**1.62**	±10.0 %	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	----	----	**1.62**	±10.0 %	**1.59**	±10.0 %
Selenium	W-METAXDG1	0.030	mg/L	<0.030	----	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Silver	W-METAXDG1	0.0050	mg/L	<0.0050	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	----	----	<0.0010	----	<0.0010	----
Sodium	W-METAXDG1	0.030	mg/L	**300**	±10.0 %	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	----	----	**112**	±10.0 %	**11.2**	±10.0 %
Thallium	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Vanadium	W-METAXDG1	0.0020	mg/L	**0.0243**	±10.0 %	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	----	----	<0.0010	----	<0.0010	----
Zinc	W-METAXDG1	0.0030	mg/L	**0.0110**	±10.0 %	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	----	----	**0.0094**	±10.0 %	**0.0170**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-8		D-9		D-10	
			Laboratory sample ID	PR1631660004		PR1631660005		PR1631660006	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Dissolved Metals / Major Cations - Continued									
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0527**	±10.0 %	**0.182**	±10.0 %	**0.0223**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.396**	±10.0 %	**0.213**	±10.0 %	**0.080**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**10.4**	±10.0 %	**43.8**	±10.0 %	**61.4**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0067**	±10.0 %	**0.0070**	±10.0 %	**0.0025**	±10.0 %
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0033**	±10.0 %	**0.0042**	±10.0 %	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0116**	±10.0 %	**0.0033**	±10.0 %	**0.0103**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**2.25**	±10.0 %	**35.8**	±10.0 %	**16.2**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**0.928**	±10.0 %	**1.45**	±10.0 %	**1.44**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**310**	±10.0 %	**109**	±10.0 %	**10.6**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	**0.0175**	±10.0 %	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0074**	±10.0 %	**0.0143**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-12		D-13		FTBH	
			Laboratory sample ID	PR1631660007		PR1631660008		PR1631660009	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**60.2**	±10.0 %	**45.1**	±10.0 %	**114**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.93**	±1.0 %	**8.14**	±1.0 %	**7.28**	±1.1 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	<0.50	----	**2.34**	±20.0 %	<0.50	----
Hardness	W-HARD-FX	0.00020	mmol/L	**3.32**	----	**2.55**	----	**5.72**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.24**	----	**1.64**	----	**3.23**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.07**	----	**0.919**	----	**2.49**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**332**	----	**255**	----	**572**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	**0.056**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	**0.072**	±15.0 %
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	**2.0**	±24.8 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	**9.0**	±20.6 %	<5.0	----

Sub-Matrix: **DRINKING WATER**			Client sample ID	**D-12**		**D-13**		**FTBH**	
			Laboratory sample ID	*PR1631660007*		*PR1631660008*		*PR1631660009*	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued									
Chloride	W-CL-IC	1.00	mg/L	**4.64**	±15.0 %	**2.58**	±15.0 %	**10.8**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**11.5**	±30.0 %	**11.2**	±30.0 %	**4.25**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	**0.750**	----	<0.500	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	**3.32**	----	<0.27	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.750**	±20.0 %	<0.060	----	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	**0.093**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**105**	±15.0 %	**32.2**	±15.0 %	**105**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	**0.040**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	**0.124**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.750**	----	<0.060	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**121**	±30.0 %	**120**	±30.0 %	**45**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**388**	±9.8 %	**222**	±10.0 %	**640**	±9.8 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	**102**	±10.1 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**228**	±12.0 %	**221**	±12.0 %	**586**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**228**	----	**221**	----	**586**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.016**	±10.0 %	<0.010	----	**0.145**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.0115**	±10.0 %
Barium	W-METAXFX1	0.00050	mg/L	**0.0504**	±10.0 %	**0.00244**	±10.0 %	**0.0300**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.082**	±10.0 %	**0.016**	±10.0 %	**0.145**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**89.9**	±10.0 %	**65.6**	±10.0 %	**129**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0016**	±10.1 %
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0032**	±10.0 %
Copper	W-METAXFX1	0.0010	mg/L	**0.0012**	±10.1 %	**0.0067**	±10.0 %	**0.0079**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0067**	±10.0 %	**0.0109**	±10.0 %	**0.661**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.0122**	±10.0 %
Lithium	W-METAXFX1	0.0010	mg/L	**0.0232**	±10.0 %	**0.0048**	±10.0 %	**0.0476**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**26.1**	±10.0 %	**22.3**	±10.0 %	**60.4**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	<0.00050	----	**0.00050**	±10.0 %	**0.0737**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0029**	±10.0 %
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0041**	±10.0 %
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	**0.028**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**2.26**	±10.0 %	**0.485**	±10.0 %	**2.18**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-12		D-13		FTBH	
			Laboratory sample ID	PR1631660007		PR1631660008		PR1631660009	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Sodium	W-METAXFX1	0.030	mg/L	**15.8**	±10.0 %	**6.86**	±10.0 %	**83.2**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0060**	±10.0 %	**0.0066**	±10.0 %	**0.136**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0499**	±10.0 %	**0.00232**	±10.0 %	**0.0291**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.078**	±10.0 %	**0.014**	±10.0 %	**0.139**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**74.2**	±10.0 %	**59.0**	±10.0 %	**116**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0061**	±10.0 %	**0.0037**	±10.0 %
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0074**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0222**	±10.0 %	**0.0040**	±10.0 %	**0.0466**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**24.4**	±10.0 %	**21.6**	±10.0 %	**57.7**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	**0.0372**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0028**	±10.0 %
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0040**	±10.0 %
Phosphorus	W-METAXFL1	0.010	mg/L	**0.014**	±10.0 %	<0.010	----	**0.027**	±10.0 %
Potassium	W-METAXFL1	0.015	mg/L	**1.99**	±10.0 %	**0.442**	±10.0 %	**2.14**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**14.8**	±10.0 %	**6.66**	±10.0 %	**79.1**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0048**	±10.0 %	**0.0065**	±10.0 %	**0.134**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-1		IK-2		IK-3	
			Laboratory sample ID	PR1631660010		PR1631660011		PR1631660012	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**518**	±10.0 %	**434**	±10.0 %	**406**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.18**	±1.0 %	**8.11**	±1.0 %	**7.72**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**3.64**	±20.0 %	**2.79**	±20.0 %	**4.56**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**7.24**	----	**0.978**	----	**46.5**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.56**	----	**0.566**	----	**27.5**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**4.68**	----	**0.411**	----	**19.0**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**724**	----	**97.8**	----	**4650**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.090**	----	**0.060**	----	**0.020**	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.984**	±15.0 %	**0.721**	±15.0 %	**0.451**	±15.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-1		IK-2		IK-3	
			Laboratory sample ID	*PR1631660010*		*PR1631660011*		*PR1631660012*	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued									
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**1.27**	±15.0 %	**0.928**	±15.0 %	**0.581**	±15.0 %
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	**3.3**	±21.0 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	**4.14**	±20.0 %	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**12.0**	±19.2 %	**11.0**	±19.5 %	**17.0**	±17.9 %
Chloride	W-CL-IC	1.00	mg/L	**71.7**	±15.0 %	**1120**	±15.0 %	**62.0**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**2.24**	±30.0 %	**0.87**	±30.0 %	**2.95**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	**0.470**	±15.0 %	**1.06**	±15.0 %	**0.271**	±15.0 %
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	**0.984**	----	**0.721**	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	<0.27	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	<0.060	----	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.0227**	±15.0 %
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	<0.50	----	**0.54**	----	**13.7**	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	**0.060**	±20.0 %	**8.42**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**2680**	±15.0 %	**468**	±15.0 %	**2970**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**1.05**	±37.5 %	**1.26**	±33.2 %	**14.2**	±20.1 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.0**	----	**1.3**	----	**14.2**	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	**0.026**	±20.0 %	**3.68**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	**0.080**	±20.0 %	**11.3**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	**0.074**	----	**0.049**	----	**0.016**	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	<0.060	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0069**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**26**	±30.0 %	**10**	±30.0 %	**33**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**4480**	±9.6 %	**2560**	±9.6 %	**4670**	±9.6 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**52.6**	±10.3 %	**66.6**	±10.2 %	**1120**	±10.0 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**658**	±12.0 %	**386**	±12.0 %	**209**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**658**	----	**386**	----	**209**	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	----	----	**1.52**	±10.0 %	**198**	±10.0 %
Aluminium	W-METAXFX1	0.010	mg/L	**0.126**	±10.0 %	----	----	----	----
Antimony	W-METAXDG1	0.020	mg/L	----	----	<0.020	----	<0.020	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Arsenic	W-METAXDG1	0.010	mg/L	----	----	<0.010	----	**0.066**	±10.0 %
Barium	W-METAXDG1	0.00050	mg/L	----	----	**0.0520**	±10.0 %	**1.32**	±10.0 %
Barium	W-METAXFX1	0.00050	mg/L	**0.0242**	±10.0 %	----	----	----	----
Beryllium	W-METAXDG1	0.00020	mg/L	----	----	<0.00020	----	**0.00482**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXDG1	0.010	mg/L	----	----	**2.34**	±10.0 %	**1.67**	±10.0 %
Boron	W-METAXFX1	0.010	mg/L	**3.48**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Cadmium	W-METAXDG1	0.0020	mg/L	----	----	<0.0020	----	**0.0063**	±10.0 %
Calcium	W-METAXFX1	0.0050	mg/L	**102**	±10.0 %	**22.7**	±10.0 %	**1100**	±10.0 %
Calcium	W-METAXDG1	0.050	mg/L	----	----	**22.7**	±10.0 %	**1100**	±10.0 %
Chromium	W-METAXDG1	0.0020	mg/L	----	----	<0.0020	----	**0.756**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-1		IK-2		IK-3	
			Laboratory sample ID	PR1631660010		PR1631660011		PR1631660012	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Total Metals / Major Cations - Continued									
Chromium	W-METAXFX1	0.0010	mg/L	**0.0016**	±10.0 %	----	----	----	----
Cobalt	W-METAXDG1	0.0020	mg/L	----	----	<0.0020	----	**0.135**	±10.0 %
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXDG1	0.0020	mg/L	----	----	<0.0020	----	**0.389**	±10.0 %
Copper	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.1 %	----	----	----	----
Iron	W-METAXDG1	0.0050	mg/L	----	----	**1.77**	±10.0 %	**338**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.427**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lead	W-METAXDG1	0.010	mg/L	----	----	<0.010	----	**0.095**	±10.0 %
Lithium	W-METAXDG1	0.0020	mg/L	----	----	**0.0910**	±10.0 %	**0.841**	±10.0 %
Lithium	W-METAXFX1	0.0010	mg/L	**0.160**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**114**	±10.0 %	**10.0**	±10.0 %	**463**	±10.0 %
Magnesium	W-METAXDG1	0.020	mg/L	----	----	**10.0**	±10.0 %	**463**	±10.0 %
Manganese	W-METAXDG1	0.00050	mg/L	----	----	**0.0763**	±10.0 %	**4.98**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.420**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSDG	0.020	µg/L	----	----	<0.020	----	**0.407**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Mercury	W-METAXDG1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Molybdenum	W-METAXDG1	0.0030	mg/L	----	----	**0.0064**	±10.0 %	<0.0030	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXDG1	0.0050	mg/L	----	----	<0.0050	----	**0.672**	±10.0 %
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXDG1	0.020	mg/L	----	----	<0.020	----	**2.75**	±10.0 %
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXDG1	0.015	mg/L	----	----	**6.44**	±10.0 %	**46.1**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**14.2**	±10.0 %	----	----	----	----
Selenium	W-METAXDG1	0.030	mg/L	----	----	<0.030	----	<0.030	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXDG1	0.0050	mg/L	----	----	<0.0050	----	<0.0050	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXDG1	0.030	mg/L	----	----	**965**	±10.0 %	**398**	±10.0 %
Sodium	W-METAXFX1	0.030	mg/L	**1570**	±10.0 %	----	----	----	----
Thallium	W-METAXDG1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXDG1	0.0020	mg/L	----	----	**0.0026**	±10.0 %	**0.615**	±10.0 %
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXDG1	0.0030	mg/L	----	----	**4.88**	±10.0 %	**31.0**	±10.0 %
Zinc	W-METAXFX1	0.0020	mg/L	**5.42**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	**0.012**	±10.0 %	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0236**	±10.0 %	**0.0453**	±10.0 %	**0.0368**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**3.46**	±10.0 %	**2.56**	±10.0 %	**1.65**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**89.5**	±10.0 %	**15.2**	±10.0 %	**437**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0057**	±10.0 %
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<4.00	----	<4.00	----	<4.00	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-1		IK-2		IK-3	
			Laboratory sample ID	PR1631660010		PR1631660011		PR1631660012	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Dissolved Metals / Major Cations - Continued									
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.156**	±10.0 %	**0.0799**	±10.0 %	**0.0731**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**105**	±10.0 %	**7.63**	±10.0 %	**297**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.409**	±10.0 %	**0.0332**	±10.0 %	**0.917**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0055**	±10.0 %	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0108**	±10.0 %
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	**0.013**	±10.0 %
Potassium	W-METAXFL1	0.015	mg/L	**13.5**	±10.0 %	**6.93**	±10.0 %	**13.5**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**1440**	±10.0 %	**1200**	±10.0 %	**441**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**3.02**	±10.0 %	**0.942**	±10.0 %	**2.50**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-4		K-1		OW-3	
			Laboratory sample ID	PR1631660013		PR1631660014		PR1631660015	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**171**	±10.0 %	**51.6**	±10.0 %	**106**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.96**	±1.0 %	**7.71**	±1.0 %	**7.54**	±1.1 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**4.80**	±20.0 %	<0.50	----	**1.13**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**10.4**	----	**2.90**	----	**6.34**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**5.36**	----	**1.74**	----	**4.20**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**5.00**	----	**1.16**	----	**2.14**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**1040**	----	**290**	----	**634**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.030**	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.580**	±15.0 %	<0.040	----	**0.102**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.747**	±15.0 %	<0.050	----	**0.132**	±15.0 %
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	**3.8**	±20.2 %	<1.0	----	**1.4**	±29.4 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**18.0**	±17.8 %	<5.0	----	**5.0**	±25.0 %
Chloride	W-CL-IC	1.00	mg/L	**27.3**	±15.0 %	**1.88**	±15.0 %	**7.39**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**1.08**	±30.0 %	**11.2**	±30.0 %	**4.54**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	**0.753**	±15.0 %	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	**0.646**	----	<0.500	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	**0.28**	----	**1.20**	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.066**	±20.0 %	**0.272**	±20.0 %	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.0098**	±15.0 %	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	**11.0**	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**5.32**	±20.0 %	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**360**	±15.0 %	**10.4**	±15.0 %	**216**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	IK-4 Result	IK-4 MU	K-1 Result	K-1 MU	OW-3 Result	OW-3 MU
			Laboratory sample ID	PR1631660013		PR1631660014		PR1631660015	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Nonmetallic Inorganic Parameters - Continued									
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**11.6**	±20.2 %	<0.50	----	**0.59**	±59.9 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**11.7**	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**2.32**	±20.0 %	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**7.11**	±20.0 %	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	**0.025**	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.063**	----	**0.272**	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0030**	±15.0 %	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**11**	±30.0 %	**125**	±30.0 %	**50**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**1090**	±9.7 %	**381**	±9.9 %	**880**	±9.7 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**750**	±10.0 %	<5.0	----	**23.4**	±10.6 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**569**	±12.0 %	**277**	±12.0 %	**439**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**569**	----	**277**	----	**439**	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	**209**	±10.0 %	----	----	----	----
Aluminium	W-METAXFX1	0.010	mg/L	----	----	**0.010**	±10.0 %	**0.030**	±10.0 %
Antimony	W-METAXDG1	0.020	mg/L	<0.020	----	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	----	----	<0.0050	----	<0.0050	----
Arsenic	W-METAXDG1	0.010	mg/L	**0.106**	±10.0 %	----	----	----	----
Barium	W-METAXDG1	0.00050	mg/L	**0.703**	±10.0 %	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	----	----	**0.00420**	±10.0 %	**0.0178**	±10.0 %
Beryllium	W-METAXDG1	0.00020	mg/L	**0.00491**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	----	----	<0.00020	----	<0.00020	----
Boron	W-METAXDG1	0.010	mg/L	**2.42**	±10.0 %	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	----	----	**0.046**	±10.0 %	**0.112**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	----	----	<0.00040	----	<0.00040	----
Cadmium	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**215**	±10.0 %	**69.6**	±10.0 %	**168**	±10.0 %
Calcium	W-METAXDG1	0.050	mg/L	**215**	±10.0 %	----	----	----	----
Chromium	W-METAXDG1	0.0020	mg/L	**0.720**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	----	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXDG1	0.0020	mg/L	**0.129**	±10.0 %	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	**0.0020**	±10.0 %
Copper	W-METAXDG1	0.0020	mg/L	**0.332**	±10.0 %	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	----	----	<0.0010	----	**0.0013**	±10.1 %
Iron	W-METAXDG1	0.0050	mg/L	**283**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	----	----	**0.0122**	±10.0 %	**11.1**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	----	----	<0.0050	----	<0.0050	----
Lead	W-METAXDG1	0.010	mg/L	**0.103**	±10.0 %	----	----	----	----
Lithium	W-METAXDG1	0.0020	mg/L	**0.588**	±10.0 %	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	----	----	**0.0038**	±10.0 %	**0.0410**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**122**	±10.0 %	**28.2**	±10.0 %	**52.0**	±10.0 %
Magnesium	W-METAXDG1	0.020	mg/L	**122**	±10.0 %	----	----	----	----
Manganese	W-METAXDG1	0.00050	mg/L	**3.91**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	----	----	**0.00164**	±10.0 %	**0.288**	±10.0 %
Mercury	W-HG-AFSDG	0.020	µg/L	**0.235**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	----	----	<0.010	----	<0.010	----
Mercury	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-4		K-1		OW-3	
			Laboratory sample ID	*PR1631660013*		*PR1631660014*		*PR1631660015*	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Molybdenum	W-METAXDG1	0.0030	mg/L	<0.0030	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	<0.0020	----
Nickel	W-METAXDG1	0.0050	mg/L	**0.547**	±10.0 %	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	**0.0085**	±10.0 %
Phosphorus	W-METAXDG1	0.020	mg/L	**2.72**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Potassium	W-METAXDG1	0.015	mg/L	**39.5**	±10.0 %	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	----	----	**1.32**	±10.0 %	**2.25**	±10.0 %
Selenium	W-METAXDG1	0.030	mg/L	<0.030	----	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Silver	W-METAXDG1	0.0050	mg/L	<0.0050	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	----	----	<0.0010	----	<0.0010	----
Sodium	W-METAXDG1	0.030	mg/L	**402**	±10.0 %	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	----	----	**9.48**	±10.0 %	**33.1**	±10.0 %
Thallium	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	----	----	<0.010	----	<0.010	----
Vanadium	W-METAXDG1	0.0020	mg/L	**0.604**	±10.0 %	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	----	----	**0.0018**	±10.0 %	<0.0010	----
Zinc	W-METAXDG1	0.0030	mg/L	**38.7**	±10.0 %	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	----	----	<0.0020	----	**16.6**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	**0.0057**	±10.0 %	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0590**	±10.0 %	**0.00393**	±10.0 %	**0.0147**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**2.46**	±10.0 %	**0.044**	±10.0 %	**0.109**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**23.0**	±10.0 %	**61.9**	±10.0 %	**133**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0022**	±10.0 %
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0138**	±10.0 %	**0.0087**	±10.0 %	**0.0023**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0112**	±10.0 %	**0.0031**	±10.0 %	**0.0404**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**7.09**	±10.0 %	**26.9**	±10.0 %	**48.6**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.413**	±10.0 %	**0.00059**	±10.2 %	**0.287**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	**0.0042**	±10.0 %	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0034**	±10.0 %	<0.0020	----	**0.0057**	±10.0 %
Phosphorus	W-METAXFL1	0.010	mg/L	**0.014**	±10.0 %	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**4.21**	±10.0 %	**1.23**	±10.0 %	**2.16**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**434**	±10.0 %	**9.36**	±10.0 %	**33.0**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	**0.0039**	±10.0 %	**0.0011**	±10.0 %	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.835**	±10.0 %	<0.0020	----	**8.57**	±10.0 %

Sub-Matrix: **DRINKING WATER**

	Client sample ID	SW-2	SW-4	SW-5
	Laboratory sample ID	*PR1631660016*	*PR1631660017*	*PR1631660018*

Sub-Matrix: **DRINKING WATER**			Client sample ID	SW-2		SW-4		SW-5	
			Laboratory sample ID	PR1631660016		PR1631660017		PR1631660018	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**35.1**	±10.0 %	**37.3**	±10.0 %	**38.0**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.98**	±1.0 %	**8.30**	±1.0 %	**8.01**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.86**	±20.0 %	**2.39**	±20.0 %	**5.11**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**1.95**	----	**2.12**	----	**10.2**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.35**	----	**1.44**	----	**7.84**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**0.594**	----	**0.680**	----	**2.41**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**195**	----	**212**	----	**1020**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.010**	----	**0.020**	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	**0.067**	±15.0 %	**0.369**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	**0.086**	±15.0 %	**0.475**	±15.0 %
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	**7.5**	±17.7 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**18.0**	±17.8 %	**12.0**	±19.2 %	**134**	±15.4 %
Chloride	W-CL-IC	1.00	mg/L	**4.04**	±15.0 %	**2.30**	±15.0 %	**5.08**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**10.5**	±30.0 %	**8.99**	±30.0 %	**4.02**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	<0.500	----	<0.500	----	**1.86**	----
Nitrates	W-NO3-SPC	0.27	mg/L	**1.33**	----	**0.41**	----	**6.41**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.301**	±20.0 %	**0.092**	±20.0 %	**1.50**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.162**	±15.0 %
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	<0.50	----	**0.55**	----	**3.57**	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.103**	±20.0 %	<0.023	----	**8.13**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**37.5**	±15.0 %	**43.5**	±15.0 %	**25.9**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	**0.62**	±57.4 %	**3.94**	±21.7 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	**5.4**	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.045**	±20.0 %	<0.010	----	**3.55**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.138**	±20.0 %	<0.040	----	**10.9**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	**0.016**	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.301**	----	**0.092**	----	**1.45**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0494**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**120**	±30.0 %	**104**	±30.0 %	**47**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**223**	±10.0 %	**252**	±10.0 %	**264**	±10.0 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**90.7**	±10.2 %	**143**	±10.1 %	**2350**	±10.0 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**145**	±12.0 %	**161**	±12.0 %	**173**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**145**	----	**159**	----	**173**	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	**4.85**	±10.0 %	**4.94**	±10.0 %	**84.4**	±10.0 %
Antimony	W-METAXDG1	0.020	mg/L	<0.020	----	<0.020	----	<0.020	----
Arsenic	W-METAXDG1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Barium	W-METAXDG1	0.00050	mg/L	**0.0440**	±10.0 %	**0.0731**	±10.0 %	**0.254**	±10.0 %
Beryllium	W-METAXDG1	0.00020	mg/L	<0.00020	----	<0.00020	----	**0.00191**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	SW-2		SW-4		SW-5	
			Laboratory sample ID	PR1631660016		PR1631660017		PR1631660018	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Total Metals / Major Cations - Continued									
Boron	W-METAXDG1	0.010	mg/L	**0.054**	±10.0 %	**0.053**	±10.0 %	**0.082**	±10.0 %
Cadmium	W-METAXDG1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Calcium	W-METAXFX1	0.0050	mg/L	**54.3**	±10.0 %	**57.6**	±10.0 %	**314**	±10.0 %
Calcium	W-METAXDG1	0.050	mg/L	**54.3**	±10.0 %	**57.6**	±10.0 %	**314**	±10.0 %
Chromium	W-METAXDG1	0.0020	mg/L	**0.0078**	±10.0 %	**0.0098**	±10.0 %	**0.363**	±10.0 %
Cobalt	W-METAXDG1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0546**	±10.0 %
Copper	W-METAXDG1	0.0020	mg/L	**0.0080**	±10.0 %	**0.0058**	±10.0 %	**0.180**	±10.0 %
Iron	W-METAXDG1	0.0050	mg/L	**5.08**	±10.0 %	**4.24**	±10.0 %	**104**	±10.0 %
Lead	W-METAXDG1	0.010	mg/L	<0.010	----	<0.010	----	**0.032**	±10.0 %
Lithium	W-METAXDG1	0.0020	mg/L	**0.0081**	±10.0 %	**0.0130**	±10.0 %	**0.125**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**14.4**	±10.0 %	**16.5**	±10.0 %	**58.6**	±10.0 %
Magnesium	W-METAXDG1	0.020	mg/L	**14.4**	±10.0 %	**16.5**	±10.0 %	**58.6**	±10.0 %
Manganese	W-METAXDG1	0.00050	mg/L	**0.143**	±10.0 %	**0.0890**	±10.0 %	**2.27**	±10.0 %
Mercury	W-HG-AFSDG	0.020	µg/L	<0.020	----	<0.020	----	**0.088**	±10.0 %
Mercury	W-METAXDG1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXDG1	0.0030	mg/L	<0.0030	----	<0.0030	----	<0.0030	----
Nickel	W-METAXDG1	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.266**	±10.0 %
Phosphorus	W-METAXDG1	0.020	mg/L	<0.020	----	<0.020	----	**3.78**	±10.0 %
Potassium	W-METAXDG1	0.015	mg/L	**2.98**	±10.0 %	**3.68**	±10.0 %	**17.3**	±10.0 %
Selenium	W-METAXDG1	0.030	mg/L	<0.030	----	<0.030	----	<0.030	----
Silver	W-METAXDG1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Sodium	W-METAXDG1	0.030	mg/L	**7.60**	±10.0 %	**8.25**	±10.0 %	**11.5**	±10.0 %
Thallium	W-METAXDG1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXDG1	0.0020	mg/L	**0.0101**	±10.0 %	**0.0100**	±10.0 %	**0.213**	±10.0 %
Zinc	W-METAXDG1	0.0030	mg/L	**0.0148**	±10.0 %	**0.0178**	±10.0 %	**0.353**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0215**	±10.0 %	**0.0368**	±10.0 %	**0.0260**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.054**	±10.0 %	**0.043**	±10.0 %	**0.041**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**47.7**	±10.0 %	**49.8**	±10.0 %	**47.6**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0043**	±10.0 %	**0.0057**	±10.0 %	**0.0306**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0062**	±10.0 %	**0.0107**	±10.0 %	**0.0052**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**13.1**	±10.0 %	**15.3**	±10.0 %	**14.4**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.00185**	±10.0 %	<0.00050	----	**0.0852**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	**0.108**	±10.0 %
Potassium	W-METAXFL1	0.015	mg/L	**1.04**	±10.0 %	**1.36**	±10.0 %	**3.10**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**7.20**	±10.0 %	**8.06**	±10.0 %	**9.93**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0015**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	SW-2		SW-4		SW-5	
			Laboratory sample ID	PR1631660016		PR1631660017		PR1631660018	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Dissolved Metals / Major Cations - Continued									
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	SW-8		SW-12		WD-1	
			Laboratory sample ID	PR1631660019		PR1631660020		PR1631660021	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**39.9**	±10.0 %	**126**	±10.0 %	**268**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.41**	±1.0 %	**8.22**	±1.0 %	**7.92**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**3.26**	±20.0 %	**1.08**	±20.0 %	**1.14**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**2.58**	----	**4.37**	----	**6.62**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.53**	----	**2.65**	----	**2.92**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.05**	----	**1.72**	----	**3.70**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**258**	----	**437**	----	**662**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	**0.010**	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	**0.191**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	**0.246**	±15.0 %
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	<1.0	----	<1.0	----	**4.4**	±19.5 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**16.0**	±18.1 %	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**3.34**	±15.0 %	**9.36**	±15.0 %	**24.6**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**11.1**	±30.0 %	**8.46**	±30.0 %	<0.20	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	**0.272**	±15.0 %	**0.438**	±15.0 %
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	<0.500	----	<0.500	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	<0.27	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	<0.060	----	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.0078**	±15.0 %	<0.0050	----	**0.0071**	±15.0 %
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	**0.204**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**18.5**	±15.0 %	**495**	±15.0 %	**1470**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	**0.52**	±67.2 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	**0.089**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	**0.272**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	<0.060	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0024**	±15.0 %	<0.0020	----	**0.0022**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**131**	±30.0 %	**95**	±30.0 %	**2**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**272**	±10.0 %	**942**	±9.7 %	**2170**	±9.6 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	**143**	±10.1 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**218**	±12.0 %	**227**	±12.0 %	**133**	±12.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	SW-8		SW-12		WD-1	
			Laboratory sample ID	PR1631660019		PR1631660020		PR1631660021	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued									
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**8.6**	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**209**	----	**227**	----	**133**	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	----	----	----	----	**6.23**	±10.0 %
Aluminium	W-METAXFX1	0.010	mg/L	**0.017**	±10.0 %	**0.052**	±10.0 %	----	----
Antimony	W-METAXDG1	0.020	mg/L	----	----	----	----	<0.020	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Arsenic	W-METAXDG1	0.010	mg/L	----	----	----	----	<0.010	----
Barium	W-METAXDG1	0.00050	mg/L	----	----	----	----	**0.0373**	±10.0 %
Barium	W-METAXFX1	0.00050	mg/L	**0.00222**	±10.0 %	**0.0336**	±10.0 %	----	----
Beryllium	W-METAXDG1	0.00020	mg/L	----	----	----	----	**0.00027**	±10.4 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	----	----
Boron	W-METAXDG1	0.010	mg/L	----	----	----	----	**0.816**	±10.0 %
Boron	W-METAXFX1	0.010	mg/L	**0.021**	±10.0 %	**0.526**	±10.0 %	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	----	----
Cadmium	W-METAXDG1	0.0020	mg/L	----	----	----	----	<0.0020	----
Calcium	W-METAXFX1	0.0050	mg/L	**61.3**	±10.0 %	**106**	±10.0 %	**117**	±10.0 %
Calcium	W-METAXDG1	0.050	mg/L	----	----	----	----	**117**	±10.0 %
Chromium	W-METAXDG1	0.0020	mg/L	----	----	----	----	**0.0140**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.1 %	<0.0010	----	----	----
Cobalt	W-METAXDG1	0.0020	mg/L	----	----	----	----	<0.0020	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Copper	W-METAXDG1	0.0020	mg/L	----	----	----	----	**0.0192**	±10.0 %
Copper	W-METAXFX1	0.0010	mg/L	**0.0023**	±10.0 %	**0.0011**	±10.1 %	----	----
Iron	W-METAXDG1	0.0050	mg/L	----	----	----	----	**5.95**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0215**	±10.0 %	**0.0666**	±10.0 %	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Lead	W-METAXDG1	0.010	mg/L	----	----	----	----	**0.185**	±10.0 %
Lithium	W-METAXDG1	0.0020	mg/L	----	----	----	----	**0.0640**	±10.0 %
Lithium	W-METAXFX1	0.0010	mg/L	**0.0031**	±10.0 %	**0.0229**	±10.0 %	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**25.6**	±10.0 %	**41.8**	±10.0 %	**89.9**	±10.0 %
Magnesium	W-METAXDG1	0.020	mg/L	----	----	----	----	**89.9**	±10.0 %
Manganese	W-METAXDG1	0.00050	mg/L	----	----	----	----	**0.285**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00195**	±10.0 %	**0.0101**	±10.0 %	----	----
Mercury	W-HG-AFSDG	0.020	µg/L	----	----	----	----	<0.020	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	----	----
Mercury	W-METAXDG1	0.010	mg/L	----	----	----	----	<0.010	----
Molybdenum	W-METAXDG1	0.0030	mg/L	----	----	----	----	**0.0071**	±10.0 %
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Nickel	W-METAXDG1	0.0050	mg/L	----	----	----	----	**0.0103**	±10.0 %
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Phosphorus	W-METAXDG1	0.020	mg/L	----	----	----	----	<0.020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Potassium	W-METAXDG1	0.015	mg/L	----	----	----	----	**3.33**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**0.468**	±10.0 %	**5.11**	±10.0 %	----	----
Selenium	W-METAXDG1	0.030	mg/L	----	----	----	----	<0.030	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Silver	W-METAXDG1	0.0050	mg/L	----	----	----	----	<0.0050	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Sodium	W-METAXDG1	0.030	mg/L	----	----	----	----	**511**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	SW-8 Result	SW-8 MU	SW-12 Result	SW-12 MU	WD-1 Result	WD-1 MU
			Laboratory sample ID	PR1631660019		PR1631660020		PR1631660021	
			Client sampling date / time	04-MAY-2016 00:00		04-MAY-2016 00:00		04-MAY-2016 00:00	
Total Metals / Major Cations - Continued									
Sodium	W-METAXFX1	0.030	mg/L	**8.19**	±10.0 %	**174**	±10.0 %	----	----
Thallium	W-METAXDG1	0.010	mg/L	----	----	----	----	<0.010	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Vanadium	W-METAXDG1	0.0020	mg/L	----	----	----	----	**0.0210**	±10.0 %
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Zinc	W-METAXDG1	0.0030	mg/L	----	----	----	----	**0.0252**	±10.0 %
Zinc	W-METAXFX1	0.0020	mg/L	**0.0033**	±10.0 %	<0.0020	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.00216**	±10.0 %	**0.0332**	±10.0 %	**0.0156**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.013**	±10.0 %	**0.521**	±10.0 %	**0.878**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**59.4**	±10.0 %	**88.7**	±10.0 %	**97.8**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0020**	±10.0 %	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0024**	±10.0 %	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0028**	±10.0 %	**0.0225**	±10.0 %	**0.0523**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**23.9**	±10.0 %	**41.0**	±10.0 %	**74.4**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	**0.00126**	±10.0 %	**0.0932**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0060**	±10.0 %
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**0.467**	±10.0 %	**4.72**	±10.0 %	**1.96**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**7.71**	±10.0 %	**173**	±10.0 %	**532**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0032**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	YS-2 Result	YS-2 MU	----	----	----	----
			Laboratory sample ID	PR1631660022		----		----	
			Client sampling date / time	04-MAY-2016 00:00		----		----	
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**50.8**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**8.19**	±1.0 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.14**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**2.96**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.03**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**0.926**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**296**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.020**	----	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	YS-2		----		----	
			Laboratory sample ID	PR1631660022		----		----	
			Client sampling date / time	04-MAY-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Nonmetallic Inorganic Parameters - Continued									
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.154**	±15.0 %	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.198**	±15.0 %	----	----	----	----
Biochemical Oxygen Demand (BOD 5)	W-BOD5-OXY	1.0	mg/L	**2.4**	±23.4 %	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**8.0**	±21.2 %	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**8.51**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**7.62**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	----	----	----	----
Inorganic Nitrogen as N	W-NING-SPC	0.500	mg/L	**1.81**	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	**7.08**	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**1.65**	±20.0 %	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.183**	±15.0 %	----	----	----	----
Organic Nitrogen as N	W-NORG-SPC	0.50	mg/L	<0.50	----	----	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.509**	±20.0 %	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**35.7**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.6**	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.222**	±20.0 %	----	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.681**	±20.0 %	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	**0.016**	----	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**1.60**	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0557**	±15.0 %	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**88**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**292**	±9.9 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**120**	±10.1 %	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**219**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**219**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXDG1	0.010	mg/L	**4.45**	±10.0 %	----	----	----	----
Antimony	W-METAXDG1	0.020	mg/L	<0.020	----	----	----	----	----
Arsenic	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Barium	W-METAXDG1	0.00050	mg/L	**0.0482**	±10.0 %	----	----	----	----
Beryllium	W-METAXDG1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXDG1	0.010	mg/L	**0.052**	±10.0 %	----	----	----	----
Cadmium	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**81.3**	±10.0 %	----	----	----	----
Calcium	W-METAXDG1	0.050	mg/L	**81.3**	±10.0 %	----	----	----	----
Chromium	W-METAXDG1	0.0020	mg/L	**0.0176**	±10.0 %	----	----	----	----
Cobalt	W-METAXDG1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXDG1	0.0020	mg/L	**0.0044**	±10.0 %	----	----	----	----
Iron	W-METAXDG1	0.0050	mg/L	**5.24**	±10.0 %	----	----	----	----
Lead	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Lithium	W-METAXDG1	0.0020	mg/L	**0.0118**	±10.0 %	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	**YS-2**		----		----	
			Laboratory sample ID	PR1631660022		----		----	
			Client sampling date / time	04-MAY-2016 00:00		----		----	
Parameter	Method	LOR	Unit	**Result**	**MU**	----	----	----	----
Total Metals / Major Cations - Continued									
Magnesium	W-METAXFX1	0.0030	mg/L	**22.5**	±10.0 %	----	----	----	----
Magnesium	W-METAXDG1	0.020	mg/L	**22.5**	±10.0 %	----	----	----	----
Manganese	W-METAXDG1	0.00050	mg/L	**0.155**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSDG	0.020	µg/L	<0.020	----	----	----	----	----
Mercury	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXDG1	0.0030	mg/L	<0.0030	----	----	----	----	----
Nickel	W-METAXDG1	0.0050	mg/L	**0.0128**	±10.0 %	----	----	----	----
Phosphorus	W-METAXDG1	0.020	mg/L	**0.129**	±10.0 %	----	----	----	----
Potassium	W-METAXDG1	0.015	mg/L	**3.88**	±10.0 %	----	----	----	----
Selenium	W-METAXDG1	0.030	mg/L	<0.030	----	----	----	----	----
Silver	W-METAXDG1	0.0050	mg/L	<0.0050	----	----	----	----	----
Sodium	W-METAXDG1	0.030	mg/L	**14.1**	±10.0 %	----	----	----	----
Thallium	W-METAXDG1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXDG1	0.0020	mg/L	**0.0094**	±10.0 %	----	----	----	----
Zinc	W-METAXDG1	0.0030	mg/L	**0.0162**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0367**	±10.0 %	----	----	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.061**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**62.2**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0582**	±10.0 %	----	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0076**	±10.0 %	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**19.0**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	**0.074**	±10.0 %	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**2.19**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**12.8**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----

If the client does not specify the date and time of sample collection, the laboratory will specify the date on sample delivery in parentheses, instead. If the time of sample collection is specified as 0:00 it means that the client did specify the date but not the time. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO_2 forms by calculation from measured values including the calculation of total mineralization.
W-BOD5-OXY	CZ_SOP_D06_02_077/CZ_SOP_D06_07_042 Determination of biochemical oxygen demand after n days (BODn)-by dilution method with allylthiourea addition (based on CSN EN 1899-1). CZ_SOP_D06_02_078/CZ_SOP_D06_07_043 Determination of biochemical oxygen demand after n days (BODn) by method for undiluted samples (based on CSN EN 1899-2).
W-BR-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CL-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CNF-PHO	CZ_SOP_D06_02_090 (CSN ISO 6703-2, CSN EN ISO 14403-2) Determination of easily releasable cyanide (free cyanide) and weak acid dissociable cyanide by spectrophotometry/ CZ_SOP_D06_07_011 (CSN ISO 6703-2) Determination of easily releasable cyanide (free cyanide) by spectrophotometry.
W-CNT-PHO	CZ_SOP_D06_02_089 (CSN 75 7415, CSN EN ISO 14403-2)/ CZ_SOP_D06_07_010 (CSN 75 7415) Determination of total cyanide by spectrophotometry and determination of complex cyanide by calculation from measured values.
W-COD-SPC	CZ_SOP_D06_02_076 Determination of chemical oxygen demand using dichromate (COD-Cr) by photometry (based on CSN ISO 15705) / CZ_SOP_D06_02_076A / CZ_SOP_D06_07_040 Determination of chemical oxygen demand using dichromate (COD-Cr) by titration (based on CSN ISO 6060, CSN ISO 15705) .
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-CR6-IC	CZ_SOP_D06_02_122 except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (CSN EN 16192, EPA 7199, SM 3500-Cr) Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and trivalent chromium determination by calculation from measured values.
W-F-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-HARD-FX	CZ_SOP_D06_02_J06 Stoichiometric calculations and calculations of inorganic parameters from measured values by accredited methods. Calculation of total hardness as a sum of calcium and magnesium.
W-HG-AFSDG	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-HG-AFSFX	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was fixed by nitric acid addition prior to analysis.
W-METAXDG1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-METAXFL1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was filtered by microfilter with porosity 0.45 µm followed by nitric acid addition prior to analysis.
W-METAXFX1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was fixed by nitric acid addition prior to analysis.
W-NH3-CC2	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.

Analytical Methods	*Method Descriptions*
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NING-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NNO-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NO2-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NO3-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NORG-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-NTOT-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of ammonium, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen and free ammonia by calculation from measured values including the calculation of total mineralization.
W-O2D-ELE	CZ_SOP_D06_07_044 (CSN EN ISO 5814) Determination of dissolved oxygen by electrochemical method.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-TDS-GR	CZ_SOP_D06_02_071 Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express), (based on CSN 757346, CSN 757347, CSN EN 16192).
W-TOC-IR	CZ_SOP_D06_02_056 Determination of total organic carbon (TOC), dissolved organic carbon (DOC) and total inorganic carbon (TIC) by IR detection (based on CSN EN 1484, CSN EN 16192, SM 5310).
W-TSS-GR	CZ_SOP_D06_02_070 Determination of dry suspended solids and annealed suspended solids by gravimetry and determination of loos of ignition of suspended solids and total solids by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express) (based on CSN EN 872, CSN 757350)

A `*` symbol preceeding any method indicates non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information.

The calculation methods of summation parameters are available on request in the client service.

QUALITY CONTROL REPORT

Work Order	: **PR1631660**	Page	: 1 of 16
Client	: **ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: AECOM Turkey Dan ve Muh Ltd Sti Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266 B Blok No: 50-51 Cankaya Ankara Turkey 06800	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: kaan.duz@aecom.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	QC Level	: ALS CR Standard Quality Control Schedule
Site	: Hanonu		
C-O-C number	: ----	Date Samples Received	: 10-MAY-2016
Sampled by	: client TKD	Issue Date	: 26-MAY-2016
Order number	: ----		
		No. of samples received	: 22
Quote number	: AECOM BQ	No. of samples analysed	: 22

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Testing Laboratory Accredited by CAI

L 1163

Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

General Comments

The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO, CEN and APHA. In house developed procedures are employed in the absence of documented standards or by client request.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting (LOQ of analytical method or higher)
RPD = Relative Percentage Difference
\# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity. The permitted ranges for the Relative Percentage Difference (RPD) of Laboratory Duplicates are specified in internal ALS documents.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*
Physical Parameters (QC Lot: 4200669)								
PR1631449-003	Anonymous	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	481	481	0.0
Physical Parameters (QC Lot: 4201026)								
PR1631660-013	IK-4	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	1710	1680	2.2
Agregate Parameters (QC Lot: 4201593)								
PR1631431-026	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	79.1	76.1	3.9
Agregate Parameters (QC Lot: 4201597)								
PR1631660-014	K-1	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	<0.50	<0.50	0.0
Agregate Parameters (QC Lot: 4201598)								
PR1631848-002	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	1.90	1.96	3.1
Nonmetallic Inorganic Parameters (QC Lot: 4200295)								
PR1631522-004	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.712	0.696	2.2
Nonmetallic Inorganic Parameters (QC Lot: 4200359)								
PR1631434-001	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	535	545	1.8
Nonmetallic Inorganic Parameters (QC Lot: 4200648)								
PR1631694-001	Anonymous	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	4410	4480	1.6
Nonmetallic Inorganic Parameters (QC Lot: 4200660)								
PR1631522-001	Anonymous	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	169	173	2.2
Nonmetallic Inorganic Parameters (QC Lot: 4200682)								
PR1630860-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	<0.010	<0.010	0.0
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	<0.023	0.0
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	<0.040	<0.040	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4200688)								
PR1631482-009	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	<0.060	<0.060	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4200732)								
PR1631694-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	913	916	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4200964)								
PR1631660-020	SW-12	W-BOD5-OXY: Biochemical Oxygen Demand (BOD 5)	----	1.0	mg/L	<1.0	<1.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4200965)								
PR1631660-003	D-6	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	376	377	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4200966)								
PR1631725-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	87.3	94.7	8.1
Nonmetallic Inorganic Parameters (QC Lot: 4200967)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
Nonmetallic Inorganic Parameters (QC Lot: 4200967) - continued								
PR1631660-011	IK-2	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	11.0	12.0	8.7
Nonmetallic Inorganic Parameters (QC Lot: 4200969)								
PR1631660-001	C-7	W-O2D-ELE: Oxygen Saturation	----	1	%	117	116	0.9
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	10.8	10.8	0.5
Nonmetallic Inorganic Parameters (QC Lot: 4200973)								
PR1631660-004	D-8	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4200974)								
PR1631660-004	D-8	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	133	132	1.3
Nonmetallic Inorganic Parameters (QC Lot: 4200975)								
PR1631660-004	D-8	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.320	0.342	6.8
Nonmetallic Inorganic Parameters (QC Lot: 4200976)								
PR1631660-004	D-8	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	18.8	17.5	7.2
Nonmetallic Inorganic Parameters (QC Lot: 4200977)								
PR1631742-001	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	89.6	88.5	1.3
Nonmetallic Inorganic Parameters (QC Lot: 4201025)								
PR1631660-013	IK-4	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	2.0	mg CaCO3/L	569	566	0.4
Nonmetallic Inorganic Parameters (QC Lot: 4201046)								
PR1631631-002	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	0.0056	0.0060	7.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	0.0184	0.0197	7.0
Nonmetallic Inorganic Parameters (QC Lot: 4201054)								
PR1631797-001	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.020	mg/L	0.032	0.036	11.5
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.026	mg/L	0.041	0.046	11.5
Nonmetallic Inorganic Parameters (QC Lot: 4201061)								
PR1631660-002	D-3	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	3.19	3.20	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4201063)								
PR1631660-013	IK-4	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	0.0030	0.0030	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	0.0098	0.0099	1.6
Nonmetallic Inorganic Parameters (QC Lot: 4201064)								
PR1631660-013	IK-4	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	0.580	0.562	3.1
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	0.747	0.724	3.1
Nonmetallic Inorganic Parameters (QC Lot: 4201094)								
PR1631660-018	SW-5	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201095)								
PR1631660-018	SW-5	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	5.08	5.10	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4201107)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)
Nonmetallic Inorganic Parameters (QC Lot: 4201107) - continued								
PR1631301-001	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	81	93	13.8
Nonmetallic Inorganic Parameters (QC Lot: 4201174)								
PR1631670-003	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	10.2	10.2	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4201175)								
PR1631670-003	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201176)								
PR1631864-005	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	<0.040	<0.040	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201177)								
PR1631660-018	SW-5	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	1.50	1.50	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4201180)								
PR1631660-008	D-13	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	<0.010	<0.010	0.0
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	<0.023	0.0
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	<0.040	<0.040	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201194)								
PR1631660-016	SW-2	W-O2D-ELE: Oxygen Saturation	----	1	%	120	120	0.0
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	10.5	10.4	0.7
Nonmetallic Inorganic Parameters (QC Lot: 4201555)								
PR1631621-002	Anonymous	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	0.269	0.272	1.1
Nonmetallic Inorganic Parameters (QC Lot: 4201556)								
PR1631621-002	Anonymous	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	0.012	0.011	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	0.012	0.011	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201557)								
PR1631660-020	SW-12	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4201558)								
PR1631660-020	SW-12	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	<0.005	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4202049)								
PR1631330-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	66.0	66.8	1.2
PR1631660-007	D-12	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	<0.50	<0.50	0.0
PR1631704-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	10.3	10.1	2.0
Total Metals / Major Cations (QC Lot: 4201534)								
PR1631887-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4201535)								
PR1631863-003	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.0132	0.0123	7.0

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Total Metals / Major Cations (QC Lot: 4201535) - continued								
PR1631863-003	Anonymous	W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.0424	0.0423	0.2
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	0.0019	0.0018	5.4
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0024	0.0024	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	0.0057	0.0057	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.0361	0.0374	3.6
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	0.0158	0.0161	1.7
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	4.26	4.22	0.8
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	15.4	15.4	0.08
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	0.019	0.019	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.128	0.132	3.1
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	1.93	1.93	0.0
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	127	127	0.2
Total Metals / Major Cations (QC Lot: 4201542)								
PR1631660-007	D-12	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4203990)								
PR1632881-014	Anonymous	W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	8.67	8.51	1.8
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	14.6	14.4	0.7
Total Metals / Major Cations (QC Lot: 4203997)								
PR1632705-001	Anonymous	W-METAXDG1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXDG1: Barium	7440-39-3	0.00050	mg/L	0.0270	0.0267	1.3
		W-METAXDG1: Manganese	7439-96-5	0.00050	mg/L	0.00906	0.00863	4.9
		W-METAXDG1: Cadmium	7440-43-9	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXDG1: Chromium	7440-47-3	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXDG1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXDG1: Copper	7440-50-8	0.0020	mg/L	0.0140	0.0148	5.6
		W-METAXDG1: Vanadium	7440-62-2	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXDG1: Zinc	7440-66-6	0.0030	mg/L	0.341	0.341	0.0
		W-METAXDG1: Iron	7439-89-6	0.0050	mg/L	0.448	0.446	0.6
		W-METAXDG1: Nickel	7440-02-0	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXDG1: Silver	7440-22-4	0.0050	mg/L	<0.0050	<0.0050	0.0

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Total Metals / Major Cations (QC Lot: 4203997) - continued								
PR1632705-001	Anonymous	W-METAXDG1: Aluminium	7429-90-5	0.010	mg/L	0.247	0.240	2.9
		W-METAXDG1: Arsenic	7440-38-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXDG1: Lead	7439-92-1	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXDG1: Mercury	7439-97-6	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXDG1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXDG1: Antimony	7440-36-0	0.020	mg/L	<0.020	<0.020	0.0
		W-METAXDG1: Magnesium	7439-95-4	0.020	mg/L	8.78	8.91	1.4
		W-METAXDG1: Selenium	7782-49-2	0.030	mg/L	<0.030	<0.030	0.0
		W-METAXDG1: Sodium	7440-23-5	0.030	mg/L	254	254	0.06
		W-METAXDG1: Calcium	7440-70-2	0.050	mg/L	96.3	96.5	0.2
PR1632996-003	Anonymous	W-METAXDG1: Lithium	7439-93-2	0.0020	mg/L	----	4.19	# Not Determined
Total Metals / Major Cations (QC Lot: 4203998)								
PR1631660-021	WD-1	W-HG-AFSDG: Mercury	7439-97-6	0.020	µg/L	<0.020	<0.020	0.0
Dissolved Metals / Major Cations (QC Lot: 4200970)								
PR1631280-001	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4200971)								
PR1631660-020	SW-12	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4201088)								
PR1631660-016	SW-2	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4201643)								
PR1631973-007	Anonymous	W-METAXFL1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.00379	0.00365	3.8
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	0.0565	0.0560	0.9
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	0.375	0.376	0.4
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	0.0064	0.0065	1.7
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	0.244	0.248	1.6
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	0.521	0.556	6.6
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	0.100	0.099	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	<0.010	<0.010	0.0

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Dissolved Metals / Major Cations (QC Lot: 4201643) - continued								
PR1631973-007	Anonymous	W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	1.93	1.95	0.8
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	0.567	0.575	1.4
Dissolved Metals / Major Cations (QC Lot: 4201658)								
PR1631660-007	D-12	W-METAXFL1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.0499	0.0503	0.8
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	<0.00050	<0.00050	0.0
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	0.0222	0.0220	0.8
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Copper	7440-50-8	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	0.0048	0.0046	4.2
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	24.4	24.5	0.5
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	74.2	75.1	1.2
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	0.078	0.077	2.0
		W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	0.014	0.010	27.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	1.99	2.03	1.9
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	14.8	14.8	0.5

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method accuracy (both precision and trueness) independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Physical Parameters (QCLot: 4200669)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	100	96	106
Physical Parameters (QCLot: 4201026)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	98.2	96	106
Agregate Parameters (QCLot: 4201593)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	97.7	80	120
Agregate Parameters (QCLot: 4201597)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	101	80	120
Agregate Parameters (QCLot: 4201598)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	92.2	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200295)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	101	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200359)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200503)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	102	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200648)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200660)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	98.2	88	112
Nonmetallic Inorganic Parameters (QCLot: 4200682)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	90.4	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	90.4	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	90.4	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200688)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	101	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200732)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	98.0	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200964)							
W-BOD5-OXY: Biochemical Oxygen Demand (BOD 5)	----	1.0	mg/L	<1.0	107	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200965)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	103	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*LCS*	*Low*	*High*
Nonmetallic Inorganic Parameters (QCLot: 4200966)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	98.0	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200967)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	98.0	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200969)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4200973)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	80.3	80	120
Nonmetallic Inorganic Parameters (QCLot: 4200974)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	102	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200975)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	102	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200976)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	111	85	115
Nonmetallic Inorganic Parameters (QCLot: 4200977)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201025)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	99.1	88	112
Nonmetallic Inorganic Parameters (QCLot: 4201046)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	104	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	104	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201054)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	106	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201061)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201063)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	109	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	109	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201064)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	98.2	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	97.8	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201094)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	97.0	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201095)							

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4201095) - continued							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	98.4	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201107)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201174)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	109	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201175)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	104	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	104	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201176)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	109	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201177)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201180)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	103	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	103	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201194)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4201555)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	105	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201556)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	110	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	110	80	120
Nonmetallic Inorganic Parameters (QCLot: 4201557)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	105	85	115
Nonmetallic Inorganic Parameters (QCLot: 4201558)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	110	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	110	80	120
Nonmetallic Inorganic Parameters (QCLot: 4202049)							
W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	----	97.2	80	120
				----	98.1	80	120
				<0.50	102	80	120
Total Metals / Major Cations (QCLot: 4201534)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	<0.010	93.5	80	120
Total Metals / Major Cations (QCLot: 4201535)							

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4201535) - continued							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	99.2	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	99.0	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	94.6	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	94.2	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	101	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	98.3	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	95.8	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	97.8	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	100	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	95.9	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	99.2	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	95.1	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	103	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	103	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	96.1	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	101	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	107	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	98.0	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	100	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	101	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	106	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	104	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	103	80	120
Total Metals / Major Cations (QCLot: 4201541)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	92.2	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	103	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	101	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	106	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	108	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	96.8	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	100	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	103	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	104	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	99.0	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4201541) - continued							
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	100	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	97.6	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	102	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	106	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	102	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	106	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	106	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	102	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	105	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	98.4	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	99.3	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	104	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	104	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	102	80	120
Total Metals / Major Cations (QCLot: 4201542)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	<0.010	91.8	80	120
Total Metals / Major Cations (QCLot: 4203990)							
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	101	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	102	80	120
Total Metals / Major Cations (QCLot: 4203997)							
W-METAXDG1: Aluminium	7429-90-5	0.01	mg/L	<0.010	92.5	80	120
W-METAXDG1: Antimony	7440-36-0	0.02	mg/L	<0.020	99.8	80	120
W-METAXDG1: Arsenic	7440-38-2	0.01	mg/L	<0.010	105	80	120
W-METAXDG1: Barium	7440-39-3	0.0005	mg/L	<0.00050	103	80	120
W-METAXDG1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	108	80	120
W-METAXDG1: Boron	7440-42-8	0.01	mg/L	# 0.018	89.7	80	120
W-METAXDG1: Cadmium	7440-43-9	0.002	mg/L	<0.0020	98.8	80	120
W-METAXDG1: Calcium	7440-70-2	0.05	mg/L	<0.050	93.9	80	120
W-METAXDG1: Chromium	7440-47-3	0.002	mg/L	<0.0020	98.4	80	120
W-METAXDG1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	97.6	80	120
W-METAXDG1: Copper	7440-50-8	0.002	mg/L	<0.0020	100	80	120
W-METAXDG1: Iron	7439-89-6	0.005	mg/L	<0.0050	102	80	120
W-METAXDG1: Lead	7439-92-1	0.01	mg/L	<0.010	101	80	120
W-METAXDG1: Lithium	7439-93-2	0.002	mg/L	<0.0020	104	80	120
				<0.0020	104	80	120
W-METAXDG1: Magnesium	7439-95-4	0.02	mg/L	<0.020	100	80	120
W-METAXDG1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	106	80	120
W-METAXDG1: Mercury	7439-97-6	0.01	mg/L	<0.010	92.6	80	120
W-METAXDG1: Molybdenum	7439-98-7	0.003	mg/L	<0.0030	106	80	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4203997) - continued							
W-METAXDG1: Nickel	7440-02-0	0.005	mg/L	<0.0050	100	80	120
W-METAXDG1: Phosphorus	7723-14-0	0.02	mg/L	<0.020	103	80	120
W-METAXDG1: Potassium	7440-09-7	0.015	mg/L	<0.015	108	80	120
W-METAXDG1: Selenium	7782-49-2	0.03	mg/L	<0.030	98.3	80	120
W-METAXDG1: Silver	7440-22-4	0.005	mg/L	<0.0050	108	80	120
W-METAXDG1: Sodium	7440-23-5	0.03	mg/L	<0.030	96.0	80	120
W-METAXDG1: Thallium	7440-28-0	0.01	mg/L	<0.010	96.7	80	120
W-METAXDG1: Vanadium	7440-62-2	0.002	mg/L	<0.0020	105	80	120
W-METAXDG1: Zinc	7440-66-6	0.003	mg/L	<0.0030	101	80	120
Total Metals / Major Cations (QCLot: 4203998)							
W-HG-AFSDG: Mercury	7439-97-6	0.02	µg/L	<0.020	93.7	80	120
Dissolved Metals / Major Cations (QCLot: 4200970)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	104	90	110
Dissolved Metals / Major Cations (QCLot: 4200971)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	99.5	90	110
Dissolved Metals / Major Cations (QCLot: 4201088)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	91.2	90	110
Dissolved Metals / Major Cations (QCLot: 4201643)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	98.1	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	91.4	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	95.7	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	105	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	104	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	106	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	100	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	97.7	80	120
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	102	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	99.2	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	102	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	98.6	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	102	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	99.5	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	106	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	105	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	97.6	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	104	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	106	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	101	80	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Recovery (%) LCS	Recovery (%) Low	Recovery (%) High
Dissolved Metals / Major Cations (QCLot: 4201643) - continued							
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	99.6	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	110	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	90.4	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	108	80	120
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	103	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	105	80	120
Dissolved Metals / Major Cations (QCLot: 4201658)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	99.5	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	94.3	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	104	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	101	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	109	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	107	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	98.2	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	104	80	120
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	107	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	104	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	102	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	99.8	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	100	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	101	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	106	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	106	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	104	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	105	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	104	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	102	80	120
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	106	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	94.6	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	102	80	120
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	104	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	101	80	120

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Recovery (%)	Recovery (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4200295)							
PR1631522-002	Anonymous	W-F-IC: Fluoride	16984-48-8	2 mg/L	102	85	115
Total Metals / Major Cations (QCLot: 4201534)							
PR1631431-023	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.5 µg/L	95.3	70	130
Total Metals / Major Cations (QCLot: 4201542)							
PR1631831-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.5 µg/L	81.0	70	130
Total Metals / Major Cations (QCLot: 4203998)							
PR1632106-021	Anonymous	W-HG-AFSDG: Mercury	7439-97-6	5 µg/L	108	70	130

CERTIFICATE OF ANALYSIS

Work Order	: **PR1659241**	Issue Date	: 25-AUG-2016
Client	: **AECOM Turkey Dan ve Muh Ltd Sti**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Ozan Atak	Contact	: Client Service
Address	: Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266, B Blok No: 50-51 Cankaya 06800 Ankara / Turkey	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: ----	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	Page	: 1 of 5
Order number	: ----	Date Samples Received	: 15-AUG-2016
C-O-C number	: ----	Quote number	: PR2014ARTMU-TR0129 (AECOM BQ)
Site	: TKD	Date of test	: 15-AUG-2016 - 24-AUG-2016
Sampled by	: client	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

This report shall not be reproduced except in full, without prior written approval from the laboratory.
The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR1659241/001, method W-O2D-ELE - were determinated in laboratory

Responsible for accuracy

Testing Laboratory Accredited by CAI according to CSN EN ISO/IEC 17025:2005

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA TESTING LABORATORY ACCREDITED BY CAI ALS Czech Republic, s.r.o. 1 L1163

ilac-MRA

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Analytical Results

Sub-Matrix: **GROUNDWATER**			*Client sample ID*	**ST-1A**		----		----	
			Laboratory sample ID	*PR1659241001*		----		----	
			Client sampling date / time	09-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	----	----	----	----
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**44.7**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**7.77**	±1.0 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.70**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**2.45**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.47**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**0.980**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**245**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**4.35**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**8.00**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	----	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**0.784**	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	**3.47**	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.784**	±20.0 %	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	----	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	----	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**28.9**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	----	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.784**	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**97**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**271**	±10.0 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**217**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**217**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0233**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.059**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**59.1**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.0 %	----	----	----	----

Sub-Matrix: **GROUNDWATER**			Client sample ID	**ST-1A**		----		----	
			Laboratory sample ID	PR1659241001		----		----	
			Client sampling date / time	09-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Total Metals / Major Cations - Continued									
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0473**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0045**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**23.8**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.00055**	±10.2 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0043**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**1.33**	±10.0 %	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**11.0**	±10.0 %	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0281**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0228**	±10.0 %	----	----	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.058**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**56.9**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	**0.0013**	±10.0 %	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	**1.04**	±14.6 %	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0039**	±10.0 %	----	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0043**	±10.0 %	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**22.8**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0026**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**1.27**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**10.6**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0261**	±10.0 %	----	----	----	----

If the client does not specify the date and time of sample collection, the laboratory will specify the date on sample delivery in parentheses, instead. If the time of sample collection is specified as 0:00 it means that the client did specify the date but not the time. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1, SM2320) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO_2 forms by calculation from measured values including the calculation of total mineralization.
W-BR-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CL-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CNF-PHO	CZ_SOP_D06_02_090.A (CSN ISO 6703-2, CSN EN ISO 14403-2, SM 4500 CN) Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry/ CZ_SOP_D06_07_011 (CSN ISO 6703-2) Determination of easily releasable cyanide (free cyanide) by spectrophotometry.
W-CNT-PHO	CZ_SOP_D06_02_089.A (CSN 75 7415, CSN EN ISO 14403-2)/ CZ_SOP_D06_07_010 (CSN 75 7415) Determination of total cyanide by spectrophotometry and determination of complex-forming cyanides by calculation from measure values.
W-COD-SPC	CZ_SOP_D06_02_076 Determination of chemical oxygen demand using dichromate (COD-Cr) by photometry (based on CSN ISO 15705) / CZ_SOP_D06_02_076.A / CZ_SOP_D06_07_040 Determination of chemical oxygen demand using dichromate (COD-Cr) by titration (based on CSN ISO 6060, CSN ISO 15705) .
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-CR6-IC	CZ_SOP_D06_02_122 except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (CSN EN 16192, EPA 7199, SM 3500-Cr) Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and trivalent chromium determination by calculation from measured values.
W-F-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-HARD-FX	CZ_SOP_D06_02_J06 Stoichiometric calculations and calculations of inorganic parameters from measured values by accredited methods. Calculation of total hardness as a sum of calcium and magnesium.
W-HG-AFSFX	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was fixed by nitric acid addition prior to analysis.
W-METAXFL1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was filtered by microfilter with porosity 0.45 µm followed by nitric acid addition prior to analysis.
W-METAXFX1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was fixed by nitric acid addition prior to analysis.
W-NH3-CC2	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NING-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NNO-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO2-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.

Analytical Methods	*Method Descriptions*
W-NO3-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NORG-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NTOT-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-O2D-ELE	CZ_SOP_D06_07_044 (CSN EN ISO 5814) Determination of dissolved oxygen by electrochemical method.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-TDS-GR	CZ_SOP_D06_02_071 Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express), (based on CSN 757346, CSN 757347, CSN EN 16192).
W-TOC-IR	CZ_SOP_D06_02_056 Determination of total organic carbon (TOC), dissolved organic carbon (DOC), total inorganic carbon (TIC) and total carbon (TC) by IR detection (based on CSN EN 1484, CSN EN 16192, SM 5310).
W-TSS-GR	CZ_SOP_D06_02_070 Determination of dry suspended solids and annealed suspended solids by gravimetry and determination of loos of ignition of suspended solids and total solids by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express) (based on CSN EN 872, CSN 757350)

A `*` symbol preceeding any method indicates non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information.
The calculation methods of summation parameters are available on request in the client service.

QUALITY CONTROL REPORT

Work Order	: **PR1659241**	Page	: 1 of 9
Client	: **ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: AECOM Turkey Dan ve Muh Ltd Sti Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266 B Blok No: 50-51 Cankaya Ankara Turkey 06800	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: kaan.duz@aecom.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	QC Level	: ALS CR Standard Quality Control Schedule
Site	: TKD		
C-O-C number	: ----	Date Samples Received	: 15-AUG-2016
Sampled by	: client	Issue Date	: 25-AUG-2016
Order number	: ----		
		No. of samples received	: 1
Quote number	: AECOM BQ	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA / TESTING LABORATORY ACCREDITED BY CAI
ALS Czech Republic, s.r.o.
1
L1163

Testing Laboratory
Accredited by CAI
ilac-MRA
L 1163

Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

General Comments

The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO, CEN and APHA. In house developed procedures are employed in the absence of documented standards or by client request.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
- Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
- CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
- LOR = Limit of reporting (LOQ of analytical method or higher)
- RPD = Relative Percentage Difference
- # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity. The permitted ranges for the Relative Percentage Difference (RPD) of Laboratory Duplicates are specified in internal ALS documents.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
Physical Parameters (QC Lot: 4278470)								
PR1657935-001	Anonymous	W-PH-PCT: pH Value	----	1.00	-	12.7	12.7	0.0
Physical Parameters (QC Lot: 4278471)								
PR1658627-001	Anonymous	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	116	115	0.6
Agregate Parameters (QC Lot: 4278459)								
PR1659215-003	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	2.84	2.50	12.7
Nonmetallic Inorganic Parameters (QC Lot: 4278358)								
PR1659241-001	ST-1A	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	<5.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278365)								
PR1659190-009	Anonymous	W-O2D-ELE: Oxygen Saturation	----	1	%	82	81	0.0
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	6.77	6.75	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4278417)								
PR1659205-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	<5.0	<5.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278418)								
PR1659214-003	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	<10	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278474)								
PR1659132-007	Anonymous	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	150	162	7.5
Nonmetallic Inorganic Parameters (QC Lot: 4278622)								
PR1658947-001	Anonymous	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	13300	13300	0.09
Nonmetallic Inorganic Parameters (QC Lot: 4278625)								
PR1659172-001	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	13.9	13.9	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278651)								
PR1659132-001	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.236	0.242	2.7
Nonmetallic Inorganic Parameters (QC Lot: 4278654)								
PR1659241-001	ST-1A	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278864)								
PR1659241-001	ST-1A	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	<0.040	<0.040	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278865)								
PR1659241-001	ST-1A	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4278866)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Nonmetallic Inorganic Parameters (QC Lot: 4278866) - continued								
PR1659241-001	ST-1A	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	0.784	0.790	0.8
Nonmetallic Inorganic Parameters (QC Lot: 4279082)								
PR1656385-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	2.41	2.45	1.7
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	5.52	5.62	1.7
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	7.40	7.52	1.7
Nonmetallic Inorganic Parameters (QC Lot: 4279528)								
PR1658678-001	Anonymous	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4279529)								
PR1658678-001	Anonymous	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	<0.005	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4279927)								
PR1656385-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	4.84	4.91	1.4
PR1659424-007	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	5.23	5.15	1.5
Total Metals / Major Cations (QC Lot: 4282047)								
PR1660306-075	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4282048)								
PR1660306-092	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.0132	0.0131	0.4
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.00375	0.00374	0.3
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	0.0026	0.0024	7.2
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0104	0.0104	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.0170	0.0169	1.0
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	0.0246	0.0247	0.5
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	2.60	2.60	0.2
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	8.75	8.74	0.1
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	0.025	0.026	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.020	0.020	0.0
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Total Metals / Major Cations (QC Lot: 4282048) - continued								
PR1660306-092	Anonymous	W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	2.81	2.81	0.0
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	35.4	35.4	0.03
Dissolved Metals / Major Cations (QC Lot: 4278407)								
PR1658480-001	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4278543)								
PR1658851-001	Anonymous	W-METAXFL1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.0295	0.0288	2.2
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	0.00496	0.00485	2.2
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Copper	7440-50-8	0.0010	mg/L	0.0150	0.0150	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	0.0063	0.0061	2.3
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	0.0138	0.0135	2.2
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	0.0390	0.0365	6.6
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	9.90	9.68	2.3
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	18.0	17.8	1.0
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	0.025	0.024	5.4
		W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	0.014	0.014	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	1.75	1.73	1.3
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	5.95	5.86	1.6

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method accuracy (both precision and trueness) independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Physical Parameters (QCLot: 4278470)							
W-PH-PCT: pH Value	----	1.00	-	----	100	99	101
Physical Parameters (QCLot: 4278471)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	104	96	106
Agregate Parameters (QCLot: 4278459)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	100	80	120
Nonmetallic Inorganic Parameters (QCLot: 4278358)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	90.0	85	115
Nonmetallic Inorganic Parameters (QCLot: 4278365)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4278417)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	99.8	80	120
Nonmetallic Inorganic Parameters (QCLot: 4278418)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	98.0	80	120
Nonmetallic Inorganic Parameters (QCLot: 4278474)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	96.5	88	112
Nonmetallic Inorganic Parameters (QCLot: 4278622)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	98.3	85	115
Nonmetallic Inorganic Parameters (QCLot: 4278625)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	94.4	85	115
Nonmetallic Inorganic Parameters (QCLot: 4278651)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	96.2	85	115
Nonmetallic Inorganic Parameters (QCLot: 4278654)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	112	80	120
Nonmetallic Inorganic Parameters (QCLot: 4278864)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	106	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4278865)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	99.7	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	99.8	85	115

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4278866)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	102	80	120
Nonmetallic Inorganic Parameters (QCLot: 4279082)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	94.6	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	94.6	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	94.6	80	120
Nonmetallic Inorganic Parameters (QCLot: 4279528)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	97.5	85	115
Nonmetallic Inorganic Parameters (QCLot: 4279529)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	94.3	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	94.3	80	120
Nonmetallic Inorganic Parameters (QCLot: 4279927)							
W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	----	99.6	80	120
				<0.50	101	80	120
Total Metals / Major Cations (QCLot: 4282047)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	<0.010	100	80	120
Total Metals / Major Cations (QCLot: 4282048)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	106	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	99.5	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	102	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	107	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	102	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	105	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	105	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	100	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	100	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	107	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	106	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	103	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	108	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	101	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	107	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	110	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	106	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	108	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	110	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	104	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4282048) - continued							
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	97.6	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	97.4	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	98.1	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	106	80	120
Dissolved Metals / Major Cations (QCLot: 4278407)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	108	90	110
Dissolved Metals / Major Cations (QCLot: 4278543)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	106	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	98.8	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	100	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	107	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	100	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	100	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	109	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	105	80	120
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	102	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	102	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	108	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	105	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	109	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	108	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	109	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	106	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	109	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	105	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	107	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	102	80	120
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	104	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	102	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	97.2	80	120
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	0.0010	103	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	105	80	120

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Recovery (%)	Recovery (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	Low	High
Total Metals / Major Cations (QCLot: 4282047)							
PR1660306-081	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.5 µg/L	85.6	70	130

QUALITY CONTROL REPORT

Work Order	: **PR1657761**	Page	: 1 of 14
Client	: **ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: AECOM Turkey Dan ve Muh Ltd Sti Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266 B Blok No: 50-51 Cankaya Ankara Turkey 06800	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: kaan.duz@aecom.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	QC Level	: ALS CR Standard Quality Control Schedule
Site	: TKD		
C-O-C number	: ----	Date Samples Received	: 08-AUG-2016
Sampled by	: Client	Issue Date	: 02-SEP-2016
Order number	: ----		
		No. of samples received	: 16
Quote number	: AECOM BQ	No. of samples analysed	: 16

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Testing Laboratory
Accredited by CAI

L 1163

Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

General Comments

The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO, CEN and APHA. In house developed procedures are employed in the absence of documented standards or by client request.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting (LOQ of analytical method or higher)

RPD = Relative Percentage Difference

= Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity. The permitted ranges for the Relative Percentage Difference (RPD) of Laboratory Duplicates are specified in internal ALS documents.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Physical Parameters (QC Lot: 4273081)								
PR1657570-001	Anonymous	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	543	541	0.4
Physical Parameters (QC Lot: 4273082)								
PR1657570-001	Anonymous	W-PH-PCT: pH Value	----	1.00	-	7.50	7.50	0.0
Agregate Parameters (QC Lot: 4273554)								
PR1657745-009	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	179	184	2.5
Agregate Parameters (QC Lot: 4273555)								
PR1657761-015	YS-2	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	2.38	2.53	6.1
Nonmetallic Inorganic Parameters (QC Lot: 4272814)								
PR1657452-001	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	46.3	46.4	0.2
Nonmetallic Inorganic Parameters (QC Lot: 4272821)								
PR1657358-001	Anonymous	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	2.68	2.68	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4272822)								
PR1657408-001	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	1.47	1.47	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273083)								
PR1657761-012	IK-4	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	2.0	mg CaCO3/L	542	542	0.1
Nonmetallic Inorganic Parameters (QC Lot: 4273087)								
PR1657761-008	FTBH	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273088)								
PR1657761-008	FTBH	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	180	178	1.0
Nonmetallic Inorganic Parameters (QC Lot: 4273089)								
PR1657596-001	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	<0.016	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273090)								
PR1657596-001	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0012	mg/L	<0.0012	<0.0012	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273091)								
PR1657596-001	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	2.56	2.56	0.1
Nonmetallic Inorganic Parameters (QC Lot: 4273092)								
PR1657761-011	IK-3	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	77.6	76.6	1.2
Nonmetallic Inorganic Parameters (QC Lot: 4273093)								
PR1657761-011	IK-3	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.470	0.429	9.1
Nonmetallic Inorganic Parameters (QC Lot: 4273120)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Nonmetallic Inorganic Parameters (QC Lot: 4273120) - continued								
PR1657170-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	0.557	0.568	1.9
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	1.28	1.30	1.9
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	1.71	1.74	1.9
Nonmetallic Inorganic Parameters (QC Lot: 4273121)								
PR1657761-008	FTBH	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	0.229	0.237	3.6
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	0.525	0.544	3.6
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	0.702	0.728	3.6
Nonmetallic Inorganic Parameters (QC Lot: 4273126)								
PR1657761-004	D-9	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	<0.040	<0.040	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273127)								
PR1657761-004	D-9	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	0.0031	0.0029	8.3
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	0.0103	0.0095	8.3
Nonmetallic Inorganic Parameters (QC Lot: 4273128)								
PR1657761-004	D-9	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	0.216	0.208	3.8
Nonmetallic Inorganic Parameters (QC Lot: 4273154)								
PR1657712-001	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	<0.040	<0.040	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273155)								
PR1657712-001	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273156)								
PR1657712-001	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	1.92	1.94	1.0
Nonmetallic Inorganic Parameters (QC Lot: 4273462)								
PR1656894-002	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	393	396	0.6
Nonmetallic Inorganic Parameters (QC Lot: 4273463)								
PR1656894-002	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.775	0.800	3.1
Nonmetallic Inorganic Parameters (QC Lot: 4273474)								
PR1657726-001	Anonymous	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	1850	1860	0.5
Nonmetallic Inorganic Parameters (QC Lot: 4273481)								
PR1656598-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	15.5	13.3	14.9
Nonmetallic Inorganic Parameters (QC Lot: 4273490)								
PR1657761-001	C-7	W-O2D-ELE: Oxygen Saturation	----	1	%	101	101	0.0
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	8.56	8.58	0.2
Nonmetallic Inorganic Parameters (QC Lot: 4273544)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Nonmetallic Inorganic Parameters (QC Lot: 4273544) - continued								
PR1656598-001	Anonymous	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273545)								
PR1657641-001	Anonymous	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	0.010	0.011	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	0.010	0.011	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273546)								
PR1657761-007	D-13	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4273606)								
PR1657745-028	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	1140	1020	11.1
Nonmetallic Inorganic Parameters (QC Lot: 4273607)								
PR1657725-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	5.3	6.5	19.2
Nonmetallic Inorganic Parameters (QC Lot: 4273801)								
PR1657761-001	C-7	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	4.78	4.60	3.6
Nonmetallic Inorganic Parameters (QC Lot: 4273802)								
PR1657761-001	C-7	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<1.25	85.7
Nonmetallic Inorganic Parameters (QC Lot: 4273820)								
PR1657098-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	0.198	0.207	4.6
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	0.454	0.475	4.6
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	0.607	0.636	4.6
Nonmetallic Inorganic Parameters (QC Lot: 4274183)								
PR1657228-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	529	536	1.3
Total Metals / Major Cations (QC Lot: 4273551)								
PR1657639-002	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.0316	0.0319	0.8
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.970	0.978	0.8
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	0.0064	0.0063	1.7
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0142	0.0142	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	1.04	1.04	0.5
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	0.0281	0.0278	1.2
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	22.4	22.6	0.8
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	82.1	83.0	1.2
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Total Metals / Major Cations (QC Lot: 4273551) - continued								
PR1657639-002	Anonymous	W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	0.031	0.032	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.024	0.024	0.0
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	0.268	0.266	0.7
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	9.90	10.2	3.2
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	35.3	35.8	1.3
Total Metals / Major Cations (QC Lot: 4273553)								
PR1657761-009	IK-1	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4274742)								
PR1658028-002	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.0200	0.0198	0.8
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.0286	0.0286	0.07
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0131	0.0131	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.0692	0.0684	1.2
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	0.0024	0.0026	9.9
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	0.0027	0.0025	6.1
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	3.90	3.86	1.0
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	21.8	21.7	0.7
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.092	0.094	1.4
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	3.87	3.86	0.09
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	82.0	82.0	0.07
Total Metals / Major Cations (QC Lot: 4274743)								
PR1658141-006	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	0.016	0.015	8.8
Dissolved Metals / Major Cations (QC Lot: 4273110)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
Dissolved Metals / Major Cations (QC Lot: 4273110) - continued								
PR1656598-001	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4273594)								
PR1657761-009	IK-1	W-METAXFL1: Beryllium	7440-41-7	0.00020	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00080	<0.00080	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.0236	0.0244	3.1
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	0.218	0.224	3.0
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	0.229	0.239	4.2
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	<0.0040	<0.0040	0.0
		W-METAXFL1: Copper	7440-50-8	0.0020	mg/L	<0.0040	<0.0040	0.0
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	0.0048	0.0047	2.5
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0040	<0.0040	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0040	<0.0040	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	4.32	4.49	3.8
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	131	136	3.9
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	<0.0100	<0.0100	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	102	105	3.2
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0100	<0.0100	0.0
		W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	<0.020	<0.020	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.020	<0.020	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	4.11	4.25	3.4
		W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	<0.020	<0.020	0.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	<0.020	<0.020	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.020	<0.020	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	16.6	17.2	3.6
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	1740	1810	3.9
Dissolved Metals / Major Cations (QC Lot: 4273754)								
PR1657725-001	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4278380)								
PR1657761-008	FTBH	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method accuracy (both precision and trueness) independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Physical Parameters (QCLot: 4273081)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	103	96	106
Physical Parameters (QCLot: 4273082)							
W-PH-PCT: pH Value	----	1.00	-	----	100	99	101
Physical Parameters (QCLot: 4273158)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	99.4	96	106
Agregate Parameters (QCLot: 4273554)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	99.0	80	120
Agregate Parameters (QCLot: 4273555)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	108	80	120
Nonmetallic Inorganic Parameters (QCLot: 4272814)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	105	85	115
Nonmetallic Inorganic Parameters (QCLot: 4272821)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	100	85	115
Nonmetallic Inorganic Parameters (QCLot: 4272822)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	112	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273083)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	96.6	88	112
Nonmetallic Inorganic Parameters (QCLot: 4273087)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	107	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273088)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	107	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273089)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	102	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	102	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273090)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	100	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	100	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273091)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	107	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273092)							

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4273092) - continued							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	101	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273093)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	95.5	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273120)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	87.7	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	87.7	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	87.7	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273121)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	106	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	106	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	106	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273126)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	103	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	102	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273127)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	104	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	105	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273128)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	107	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273154)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	101	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	100	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273155)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	103	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	103	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273156)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	107	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273462)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	105	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273463)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	91.6	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273474)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	96.0	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273481)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	97.6	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4273490)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4273544)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	93.1	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273545)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	92.9	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	92.9	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273546)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	93.1	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273606)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	95.7	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273607)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	93.8	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273801)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	99.4	85	115
Nonmetallic Inorganic Parameters (QCLot: 4273802)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	97.3	80	120
Nonmetallic Inorganic Parameters (QCLot: 4273820)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	94.8	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	94.8	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	94.8	80	120
Nonmetallic Inorganic Parameters (QCLot: 4274183)							
W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	<0.50	99.2	80	120
Total Metals / Major Cations (QCLot: 4273551)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	108	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	98.0	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	101	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	105	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	102	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	101	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	109	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	107	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	102	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	109	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	109	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4273551) - continued							
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	106	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	101	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	102	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	110	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	101	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	100	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	102	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	102	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	99.8	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	101	80	120
Total Metals / Major Cations (QCLot: 4273553)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	<0.010	95.5	80	120
Total Metals / Major Cations (QCLot: 4274742)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	107	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	94.9	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	106	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	106	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	101	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	110	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	101	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	99.3	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	109	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	108	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	106	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	101	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	108	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	101	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	101	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	104	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	109	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	103	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	99.1	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	101	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4274742) - continued							
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	101	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	99.8	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	110	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	101	80	120
Total Metals / Major Cations (QCLot: 4274743)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	<0.010	90.0	80	120
Dissolved Metals / Major Cations (QCLot: 4273110)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	105	90	110
Dissolved Metals / Major Cations (QCLot: 4273594)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	101	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	99.9	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	101	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	101	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	102	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	102	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	101	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	106	80	120
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	102	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	101	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	101	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	101	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	101	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	101	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	102	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	102	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	110	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	102	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	102	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	108	80	120
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	101	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	102	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	109	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	98.0	80	120
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	102	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	101	80	120
Dissolved Metals / Major Cations (QCLot: 4273754)							

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Dissolved Metals / Major Cations (QCLot: 4273754) - continued							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	102	90	110
Dissolved Metals / Major Cations (QCLot: 4278380)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	106	90	110

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Recovery (%)	Recovery (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	Low	High
Total Metals / Major Cations (QCLot: 4274743)							
PR1658141-006	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.5 µg/L	98.0	70	130

CERTIFICATE OF ANALYSIS

Work Order	: **PR1657761**	Issue Date	: 02-SEP-2016
Client	: **AECOM Turkey Dan ve Muh Ltd Sti**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Ozan Atak	Contact	: Client Service
Address	: Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266, B Blok No: 50-51 Cankaya 06800 Ankara / Turkey	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: ----	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Asyamaden	Page	: 1 of 16
Order number	: ----	Date Samples Received	: 08-AUG-2016
C-O-C number	: ----	Quote number	: PR2014ARTMU-TR0129 (AECOM BQ)
Site	: TKD	Date of test	: 09-AUG-2016 - 01-SEP-2016
Sampled by	: Client	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

This report shall not be reproduced except in full, without prior written approval from the laboratory.
The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR1657761/009, 010, 011, method W-METAXFL1/FX1 - LOR for particular sample(s) raised due to matrix interference - high conductivity.
Sample(s) PR1657761/009, method W-Br-IC, W-CR6-IC - particular sample(s) required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.
Sample(s) PR1657761/011, method W-NNO-SPC, W-NO2-SPC, W-NO3-SPC - particular sample(s) required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.
Samples PR1657761-001-006,009-014,016 were tested from original bottle.
Sample(s) PR1658930/001 - 016, method W-O2D-ELE was/were determinated in lab.

Responsible for accuracy

Testing Laboratory Accredited by CAI according to CSN EN ISO/IEC 17025:2005

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA
TESTING LABORATORY ACCREDITED BY CAI
ALS Czech Republic, s.r.o.
1
L1163

ilac-MRA

L 1163

Analytical Results

Sub-Matrix: **DRINKING WATER**

			Client sample ID	**C-7**		**D-3**		**D-6**	
			Laboratory sample ID	*PR1657761001*		*PR1657761002*		*PR1657761003*	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**51.3**	±10.0 %	**48.1**	±10.0 %	**92.7**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.25**	±1.0 %	**8.28**	±1.0 %	**8.20**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.67**	±20.0 %	**0.85**	±20.0 %	**1.19**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**3.32**	----	**2.96**	----	**3.60**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.53**	----	**2.04**	----	**2.35**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.79**	----	**0.916**	----	**1.26**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**332**	----	**296**	----	**360**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	**17.6**	±20.0 %
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**8.0**	±21.2 %	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**4.78**	±15.0 %	**2.55**	±15.0 %	**78.3**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**8.56**	±30.0 %	**8.01**	±30.0 %	**11.1**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**3.36**	----	**0.785**	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**14.8**	----	**3.36**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**3.36**	±20.0 %	**0.785**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.0823**	±15.0 %
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	**0.61**	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**35.1**	±15.0 %	**17.4**	±15.0 %	**124**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.61**	±58.2 %	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**3.4**	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**3.36**	----	**0.760**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0250**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**101**	±30.0 %	**95**	±30.0 %	**133**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**346**	±9.9 %	**287**	±9.9 %	**553**	±9.8 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**268**	±12.0 %	**257**	±12.0 %	**248**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**268**	----	**257**	----	**248**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	**0.0064**	±10.0 %	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.00337**	±10.0 %	**0.00066**	±10.0 %	**0.0535**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.070**	±10.0 %	**0.021**	±10.0 %	**0.090**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**61.3**	±10.0 %	**81.9**	±10.0 %	**94.2**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	C-7		D-3		D-6	
			Laboratory sample ID	PR1657761001		PR1657761002		PR1657761003	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Total Metals / Major Cations - Continued									
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0087**	±10.0 %	**0.0027**	±10.0 %	**0.0038**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0076**	±10.0 %	**0.0034**	±10.0 %	**0.0076**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0039**	±10.0 %	**0.0029**	±10.0 %	**0.0267**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**43.6**	±10.0 %	**22.3**	±10.0 %	**30.5**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00128**	±10.0 %	<0.00050	----	<0.00050	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**0.763**	±10.0 %	**0.390**	±10.0 %	**2.81**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**8.18**	±10.0 %	**6.89**	±10.0 %	**33.8**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0170**	±10.0 %	**0.0760**	±10.0 %	**0.0035**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.00258**	±10.0 %	**0.00055**	±10.2 %	**0.0498**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.060**	±10.0 %	**0.015**	±10.0 %	**0.086**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**59.9**	±10.0 %	**80.0**	±10.0 %	**85.4**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0061**	±10.0 %	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0031**	±10.0 %	<0.0020	----	**0.0101**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0038**	±10.0 %	**0.0028**	±10.0 %	**0.0260**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**42.6**	±10.0 %	**21.8**	±10.0 %	**29.7**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**0.756**	±10.0 %	**0.377**	±10.0 %	**2.80**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**8.05**	±10.0 %	**6.71**	±10.0 %	**31.4**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0136**	±10.0 %	**0.0754**	±10.0 %	<0.0020	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-9		D-10		D-12	
			Laboratory sample ID	PR1657761004		PR1657761005		PR1657761006	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**91.2**	±10.0 %	**57.3**	±10.0 %	**59.3**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.36**	±1.0 %	**7.82**	±1.0 %	**7.81**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.57**	±20.0 %	**1.49**	±20.0 %	**0.87**	±20.0 %

Sub-Matrix: **DRINKING WATER**			Client sample ID	**D-9**		**D-10**		**D-12**	
			Laboratory sample ID	PR1657761004		PR1657761005		PR1657761006	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	Method	LOR	Unit	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Agregate Parameters - Continued									
Hardness	W-HARD-FX	0.00020	mmol/L	**2.83**	----	**3.06**	----	**3.01**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.09**	----	**2.21**	----	**2.23**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.74**	----	**0.849**	----	**0.780**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**283**	----	**306**	----	**301**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**6.0**	±23.3 %	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**3.26**	±15.0 %	**4.03**	±15.0 %	**4.60**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**6.56**	±30.0 %	**8.98**	±30.0 %	**8.25**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**0.984**	----	**0.573**	----
Nitrates	W-NO3-SPC	0.27	mg/L	**0.94**	----	**4.35**	----	**2.54**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.216**	±20.0 %	**0.984**	±20.0 %	**0.573**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.0103**	±15.0 %	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.041**	±20.0 %	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**21.8**	±15.0 %	**76.6**	±15.0 %	**85.2**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.018**	±20.0 %	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.055**	±20.0 %	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.213**	----	**0.984**	----	**0.573**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0031**	±15.0 %	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**79**	±30.0 %	**106**	±30.0 %	**97**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**549**	±9.8 %	**363**	±9.9 %	**317**	±9.9 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	**7.7**	±12.0 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**494**	±12.0 %	**206**	±12.0 %	**208**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**7.4**	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**487**	----	**206**	----	**208**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.020**	±10.0 %	**0.010**	±10.0 %	**0.054**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	**0.0068**	±10.0 %
Barium	W-METAXFX1	0.00050	mg/L	**0.154**	±10.0 %	**0.0277**	±10.0 %	**0.0445**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.239**	±10.0 %	**0.100**	±10.0 %	**0.115**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**43.6**	±10.0 %	**88.6**	±10.0 %	**89.3**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0032**	±10.0 %	**0.0028**	±10.0 %	**0.0028**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0048**	±10.0 %	**0.0110**	±10.0 %	**0.197**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0044**	±10.0 %	**0.0147**	±10.0 %	**0.0136**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**42.4**	±10.0 %	**20.6**	±10.0 %	**19.0**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-9		D-10		D-12	
			Laboratory sample ID	PR1657761004		PR1657761005		PR1657761006	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Manganese	W-METAXFX1	0.00050	mg/L	**0.00082**	±10.0 %	**0.00161**	±10.1 %	**0.00585**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.029**	±10.0 %	<0.010	----	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**2.39**	±10.0 %	**1.98**	±10.0 %	**2.23**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**124**	±10.0 %	**10.2**	±10.0 %	**19.1**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0073**	±10.0 %	**0.0112**	±10.0 %	**0.0126**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	**0.017**	±10.0 %	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.150**	±10.0 %	**0.0271**	±10.0 %	**0.0418**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.232**	±10.0 %	**0.094**	±10.0 %	**0.109**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**42.4**	±10.0 %	**87.3**	±10.0 %	**80.1**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0025**	±10.0 %	**0.0023**	±10.0 %	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0042**	±10.0 %	**0.0147**	±10.0 %	**0.0132**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**41.2**	±10.0 %	**20.4**	±10.0 %	**18.7**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	**0.015**	±10.0 %	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**2.34**	±10.0 %	**1.96**	±10.0 %	**2.20**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**120**	±10.0 %	**10.2**	±10.0 %	**18.8**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0068**	±10.0 %	**0.0104**	±10.0 %	<0.0020	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-13		IK-1		IK-2	
			Laboratory sample ID	PR1657761007		PR1657761009		PR1657761010	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**63.2**	±10.0 %	**736**	±10.0 %	**531**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.82**	±1.0 %	**7.71**	±1.0 %	**7.91**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.80**	±20.0 %	**1.09**	±20.0 %	**1.98**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**3.32**	----	**9.31**	----	**1.10**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.10**	----	**3.09**	----	**0.640**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.22**	----	**6.22**	----	**0.465**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**332**	----	**931**	----	**110**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.070**	----	**0.060**	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-13		IK-1		IK-2	
			Laboratory sample ID	PR1657761007		PR1657761009		PR1657761010	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued									
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	**2.57**	±15.0 %	**1.53**	±15.0 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.60	----	**2.45**	±20.0 %
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**5.0**	±25.0 %	**18.0**	±17.8 %	**35.0**	±16.4 %
Chloride	W-CL-IC	1.00	mg/L	**5.67**	±15.0 %	**32.4**	±15.0 %	**1100**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**7.71**	±30.0 %	**5.48**	±30.0 %	**2.01**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	**0.705**	±15.0 %	**1.37**	±15.0 %
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**0.598**	----	**1.99**	----	**1.19**	----
Nitrates	W-NO3-SPC	0.27	mg/L	**2.65**	----	<0.27	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.598**	±20.0 %	<0.060	----	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	**0.0364**	±15.0 %	**0.0159**	±15.0 %
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	**0.195**	±20.0 %	**0.062**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**52.9**	±15.0 %	**3610**	±15.0 %	**492**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	**2.08**	±25.6 %	**1.27**	±33.0 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**2.1**	----	**1.3**	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	**0.085**	±20.0 %	**0.027**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	**0.260**	±20.0 %	**0.083**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.058**	----	**0.049**	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	**1.99**	±15.0 %	**1.19**	±15.0 %
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.598**	----	<0.060	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	**0.0111**	±15.0 %	**0.0048**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**91**	±30.0 %	**68**	±30.0 %	**18**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**355**	±9.9 %	**5230**	±9.6 %	**2800**	±9.6 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	**363**	±10.0 %	**51.8**	±10.3 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**268**	±12.0 %	**678**	±12.0 %	**417**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**268**	----	**678**	----	**417**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	**0.838**	±10.0 %	**0.862**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0100	----
Barium	W-METAXFX1	0.00050	mg/L	**0.00358**	±10.0 %	**0.0285**	±10.0 %	**0.0643**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00040	----	<0.00040	----
Boron	W-METAXFX1	0.010	mg/L	**0.057**	±10.0 %	**4.22**	±10.0 %	**2.73**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00080	----	<0.00080	----
Calcium	W-METAXFX1	0.0050	mg/L	**84.3**	±10.0 %	**124**	±10.0 %	**25.7**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	**0.0058**	±10.0 %	**0.0046**	±10.0 %
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0040	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0168**	±10.0 %	**0.0132**	±10.0 %	**0.0080**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0092**	±10.0 %	**2.24**	±10.0 %	**2.48**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	**0.0125**	±10.0 %	<0.0100	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0076**	±10.0 %	**0.238**	±10.0 %	**0.101**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**29.7**	±10.0 %	**151**	±10.0 %	**11.3**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00268**	±10.0 %	**0.327**	±10.0 %	**0.0824**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0040	----	**0.0073**	±10.0 %
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	**0.0055**	±10.0 %	<0.0040	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	**0.076**	±10.0 %	**0.085**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**1.83**	±10.0 %	**17.4**	±10.0 %	**7.63**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	D-13 Result	D-13 MU	IK-1 Result	IK-1 MU	IK-2 Result	IK-2 MU
			Client sample ID	D-13		IK-1		IK-2	
			Laboratory sample ID	PR1657761007		PR1657761009		PR1657761010	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Total Metals / Major Cations - Continued									
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0020	----
Sodium	W-METAXFX1	0.030	mg/L	**11.5**	±10.0 %	**1860**	±10.0 %	**1300**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0020	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0107**	±10.0 %	**23.0**	±10.0 %	**9.15**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0100	----
Barium	W-METAXFL1	0.00050	mg/L	**0.00356**	±10.0 %	**0.0236**	±10.0 %	**0.0596**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00040	----	<0.00040	----
Boron	W-METAXFL1	0.010	mg/L	**0.052**	±10.0 %	**4.11**	±10.0 %	**2.70**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00080	----	<0.00080	----
Calcium	W-METAXFL1	0.0050	mg/L	**83.5**	±10.0 %	**102**	±10.0 %	**20.9**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0020	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0040	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0047**	±10.0 %	<0.0040	----	<0.0040	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<4.00	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0048**	±10.0 %	**0.0072**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0100	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0075**	±10.0 %	**0.229**	±10.0 %	**0.0952**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**29.3**	±10.0 %	**131**	±10.0 %	**10.1**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	**0.218**	±10.0 %	**0.0407**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	**0.0048**	±10.0 %
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0040	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Potassium	W-METAXFL1	0.015	mg/L	**1.83**	±10.0 %	**16.6**	±10.0 %	**7.37**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0020	----
Sodium	W-METAXFL1	0.030	mg/L	**11.4**	±10.0 %	**1740**	±10.0 %	**1290**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.020	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0020	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0042**	±10.0 %	**4.32**	±10.0 %	**1.42**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	IK-3 Result	IK-3 MU	IK-4 Result	IK-4 MU	K-1 Result	K-1 MU
			Client sample ID	IK-3		IK-4		K-1	
			Laboratory sample ID	PR1657761011		PR1657761012		PR1657761013	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**559**	±10.0 %	**196**	±10.0 %	**65.3**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.39**	±1.1 %	**7.90**	±1.0 %	**7.77**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.37**	±20.0 %	**4.97**	±20.0 %	**0.92**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**35.1**	----	**4.10**	----	**3.62**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**17.8**	----	**3.70**	----	**2.18**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**17.2**	----	**0.404**	----	**1.45**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**3510**	----	**410**	----	**362**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.040**	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-PHO	0.040	mg/L	**0.231**	±15.3 %	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	----	----	**1.06**	±15.0 %	<0.050	----
Ammonia and ammonium ions as NH4	W-NH4-PHO	0.050	mg/L	**0.297**	±15.0 %	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-3		IK-4		K-1	
			Laboratory sample ID	PR1657761011		PR1657761012		PR1657761013	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Nonmetallic Inorganic Parameters - Continued									
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**244**	±15.2 %	**27.0**	±16.8 %	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**77.6**	±15.0 %	**27.0**	±15.0 %	**2.09**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**1.93**	±30.0 %	**1.23**	±30.0 %	**9.43**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	**0.470**	±15.0 %	**1.01**	±15.0 %	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**0.822**	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.66	----	<0.27	----	**0.89**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.150	----	<0.060	----	**0.202**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0329	----	**0.0089**	±15.0 %	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	**0.55**	----	**0.55**	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.081**	±20.0 %	**0.983**	±20.0 %	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**3710**	±15.0 %	**404**	±15.0 %	**16.3**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.78**	±47.2 %	**1.37**	±31.5 %	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**1.4**	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.036**	±20.0 %	**0.429**	±20.0 %	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.109**	±20.0 %	**1.32**	±20.0 %	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.033**	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	----	----	**0.822**	±15.0 %	<0.040	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.150	----	<0.060	----	**0.202**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0100	----	**0.0027**	±15.0 %	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**17**	±30.0 %	**16**	±30.0 %	**111**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**5170**	±9.6 %	**1100**	±9.7 %	**357**	±9.9 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**1490**	±10.0 %	**859**	±10.0 %	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**230**	±12.0 %	**542**	±12.0 %	**335**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**230**	----	**542**	----	**335**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.020	----	**0.027**	±10.0 %	**0.015**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0100	----	<0.0050	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0534**	±10.0 %	**0.125**	±10.0 %	**0.00150**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00040	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**2.16**	±10.0 %	**2.53**	±10.0 %	**0.053**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00080	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**716**	±10.0 %	**148**	±10.0 %	**87.2**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0020	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0144**	±10.0 %	**0.0073**	±10.0 %	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0027**	±10.0 %	**0.0012**	±10.1 %	<0.0010	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0097**	±10.0 %	**0.0130**	±10.0 %	<0.0020	----
Lead	W-METAXFX1	0.0050	mg/L	**0.0109**	±10.0 %	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.110**	±10.0 %	**0.0135**	±10.0 %	**0.0056**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**418**	±10.0 %	**9.83**	±10.0 %	**35.2**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**1.87**	±10.0 %	**1.17**	±10.0 %	**0.00155**	±10.1 %
Mercury	W-HG-AFSFX	0.010	µg/L	**0.056**	±10.0 %	**0.055**	±10.0 %	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0040	----	**0.0090**	±10.0 %	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0238**	±10.0 %	**0.0128**	±10.0 %	**0.0020**	±10.0 %
Phosphorus	W-METAXFX1	0.010	mg/L	**0.029**	±10.0 %	**0.015**	±10.0 %	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**17.2**	±10.0 %	**4.88**	±10.0 %	**0.994**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0020	----	<0.0010	----	<0.0010	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	IK-3		IK-4		K-1	
			Laboratory sample ID	*PR1657761011*		*PR1657761012*		*PR1657761013*	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		02-AUG-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Sodium	W-METAXFX1	0.030	mg/L	**588**	±10.0 %	**445**	±10.0 %	**10.6**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0020	----	**0.0016**	±10.0 %	**0.0017**	±10.0 %
Zinc	W-METAXFX1	0.0020	mg/L	**18.6**	±10.0 %	**5.74**	±10.0 %	**0.0221**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0100	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0363**	±10.0 %	**0.0487**	±10.0 %	**0.00144**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00040	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**2.04**	±10.0 %	**2.49**	±10.0 %	**0.051**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00080	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**499**	±10.0 %	**25.0**	±10.0 %	**84.3**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0020	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	**0.0084**	±10.0 %	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0040	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0040	----	**0.0113**	±10.0 %	**0.0086**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0100	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.103**	±10.0 %	**0.0113**	±10.0 %	**0.0053**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**398**	±10.0 %	**7.14**	±10.0 %	**34.0**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.888**	±10.0 %	**0.311**	±10.0 %	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0040	----	**0.0052**	±10.0 %	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0102**	±10.0 %	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	**0.020**	±10.0 %	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**16.2**	±10.0 %	**4.29**	±10.0 %	**0.957**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0020	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**560**	±10.0 %	**422**	±10.0 %	**10.1**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.020	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0020	----	<0.0010	----	**0.0015**	±10.0 %
Zinc	W-METAXFL1	0.0020	mg/L	**7.64**	±10.0 %	**0.307**	±10.0 %	**0.0034**	±10.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	OW-3		SW-5		----	
			Laboratory sample ID	*PR1657761014*		*PR1657761016*		----	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**121**	±10.0 %	**67.5**	±10.0 %	----	----
pH Value	W-PH-PCT	1.00	-	**7.42**	±1.1 %	**8.10**	±1.0 %	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**0.64**	±20.0 %	**1.64**	±20.0 %	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**6.55**	----	**3.40**	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**4.18**	----	**2.11**	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**2.37**	----	**1.29**	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**655**	----	**340**	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.176**	±15.0 %	<0.050	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**8.0**	±21.2 %	<5.0	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**8.26**	±15.0 %	**9.37**	±15.0 %	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**2.16**	±30.0 %	**7.74**	±30.0 %	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	**OW-3**		**SW-5**		----	
			Laboratory sample ID	*PR1657761014*		*PR1657761016*		----	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Nonmetallic Inorganic Parameters - Continued									
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**0.812**	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**3.52**	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**0.812**	±20.0 %	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	**0.0564**	±15.0 %	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**217**	±15.0 %	**92.4**	±15.0 %	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.137**	±15.0 %	<0.040	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**0.795**	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	**0.0172**	±15.0 %	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**28**	±30.0 %	**92**	±30.0 %	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**444**	±9.8 %	**384**	±9.9 %	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**56.3**	±10.3 %	**5.9**	±12.6 %	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**428**	±12.0 %	**262**	±12.0 %	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**428**	----	**262**	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.102**	±10.0 %	**0.065**	±10.0 %	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0198**	±10.0 %	**0.0440**	±10.0 %	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.118**	±10.0 %	**0.118**	±10.0 %	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**168**	±10.0 %	**84.6**	±10.0 %	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0017**	±10.0 %	<0.0010	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0022**	±10.0 %	<0.0020	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0129**	±10.0 %	**0.0018**	±10.0 %	----	----
Iron	W-METAXFX1	0.0020	mg/L	**12.8**	±10.0 %	**0.0878**	±10.0 %	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0428**	±10.0 %	**0.0115**	±10.0 %	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**57.6**	±10.0 %	**31.3**	±10.0 %	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.275**	±10.0 %	**0.0153**	±10.0 %	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0082**	±10.0 %	<0.0020	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**2.46**	±10.0 %	**2.60**	±10.0 %	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**37.9**	±10.0 %	**29.2**	±10.0 %	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**16.6**	±10.0 %	**0.0066**	±10.0 %	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	OW-3		SW-5		----	
			Laboratory sample ID	PR1657761014		PR1657761016		----	
			Client sampling date / time	02-AUG-2016 00:00		02-AUG-2016 00:00		----	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	----	----
Dissolved Metals / Major Cations - Continued									
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0149**	±10.0 %	**0.0425**	±10.0 %	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.114**	±10.0 %	**0.115**	±10.0 %	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**159**	±10.0 %	**83.0**	±10.0 %	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0037**	±10.0 %	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0407**	±10.0 %	**0.0113**	±10.0 %	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**55.2**	±10.0 %	**30.8**	±10.0 %	----	----
Manganese	W-METAXFL1	0.00050	mg/L	**0.253**	±10.0 %	<0.00050	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0052**	±10.0 %	<0.0020	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**2.37**	±10.0 %	**2.54**	±10.0 %	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**36.2**	±10.0 %	**28.6**	±10.0 %	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**7.85**	±10.0 %	**0.0022**	±10.0 %	----	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	FTBH		----		----	
			Laboratory sample ID	PR1657761008		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	Method	LOR	Unit	Result	MU	----	----	----	----
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**141**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**7.15**	±1.1 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.21**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**6.54**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**3.60**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**2.94**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**654**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**28.0**	±16.8 %	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**24.1**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**2.50**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	**0.261**	±15.0 %	----	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	**0.41**	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.097**	±20.0 %	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.0126**	±15.0 %	----	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	----	----	----	----

Sub-Matrix: **GROUNDWATER**			Client sample ID	**FTBH**		----		----	
			Laboratory sample ID	PR1657761008		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	----	----	----	----
Nonmetallic Inorganic Parameters - Continued									
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.525**	±20.0 %	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**180**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.229**	±20.0 %	----	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.702**	±20.0 %	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.093**	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0038**	±15.0 %	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**27**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**824**	±9.7 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**396**	±10.0 %	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**561**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**561**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.573**	±10.0 %	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	**0.0076**	±10.0 %	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0331**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.158**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**144**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0047**	±10.0 %	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0106**	±10.0 %	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0833**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**2.33**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	**0.0405**	±10.0 %	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0483**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**71.5**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.336**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0093**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.185**	±10.0 %	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**2.38**	±10.0 %	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**96.4**	±10.0 %	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.0 %	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**2.97**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0263**	±10.0 %	----	----	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.147**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	**FTBH**		----		----	
			Laboratory sample ID	*PR1657761008*		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Dissolved Metals / Major Cations - Continued									
Calcium	W-METAXFL1	0.0050	mg/L	**134**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0025**	±10.0 %	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0458**	±10.0 %	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**68.6**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	**0.0780**	±10.0 %	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0040**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**2.28**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**92.9**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**1.80**	±10.0 %	----	----	----	----

Sub-Matrix: **SURFACE WATER**

			Client sample ID	**YS-2**		----		----	
			Laboratory sample ID	*PR1657761015*		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**73.6**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**8.09**	±1.0 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.38**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**3.46**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.01**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.45**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**346**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.010**	----	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.088**	±15.0 %	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**14.5**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**5.65**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	----	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**1.26**	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	**4.75**	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**1.19**	±20.0 %	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.393**	±15.0 %	----	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	----	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.024**	±20.0 %	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**75.0**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.54**	±64.9 %	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.7**	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.011**	±20.0 %	----	----	----	----

Sub-Matrix: **SURFACE WATER**

			Client sample ID	YS-2		----		----	
			Laboratory sample ID	PR1657761015		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	Method	LOR	Unit	Result	MU	----	----	----	----
Nonmetallic Inorganic Parameters - Continued									
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.069**	±15.0 %	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**1.07**	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.120**	±15.0 %	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**66**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**414**	±9.8 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**7.5**	±12.0 %	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**269**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**269**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.079**	±10.0 %	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0371**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.108**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**80.5**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0010**	±10.0 %	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0020**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0998**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0121**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**35.2**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.0244**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.011**	±10.0 %	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**3.50**	±10.0 %	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**34.4**	±10.0 %	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0079**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0351**	±10.0 %	----	----	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.101**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**77.6**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----

Sub-Matrix: **SURFACE WATER**			Client sample ID	**YS-2**		----		----	
			Laboratory sample ID	PR1657761015		----		----	
			Client sampling date / time	02-AUG-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Dissolved Metals / Major Cations - Continued									
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0117**	±10.0 %	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**33.9**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**3.39**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**33.3**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0054**	±10.0 %	----	----	----	----

If the client does not specify the date and time of sample collection, the laboratory will specify the date on sample delivery in parentheses, instead. If the time of sample collection is specified as 0:00 it means that the client did specify the date but not the time. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NH4-PHO	CZ_SOP_D06_07_020 (CSN ISO 7150-1) Determination of sum of ammonia and ammonium ions by spectrophotometry and determination of ammonia nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values.
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1, SM2320) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO_2 forms by calculation from measured values including the calculation of total mineralization.
W-BR-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CL-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CNF-PHO	CZ_SOP_D06_02_090.A (CSN ISO 6703-2, CSN EN ISO 14403-2, SM 4500 CN) Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry/ CZ_SOP_D06_07_011 (CSN ISO 6703-2) Determination of easily releasable cyanide (free cyanide) by spectrophotometry.
W-CNT-PHO	CZ_SOP_D06_02_089.A (CSN 75 7415, CSN EN ISO 14403-2)/ CZ_SOP_D06_07_010 (CSN 75 7415) Determination of total cyanide by spectrophotometry and determination of complex-forming cyanides by calculation from measure values.
W-COD-SPC	CZ_SOP_D06_02_076 Determination of chemical oxygen demand using dichromate (COD-Cr) by photometry (based on CSN ISO 15705) / CZ_SOP_D06_02_076.A / CZ_SOP_D06_07_040 Determination of chemical oxygen demand using dichromate (COD-Cr) by titration (based on CSN ISO 6060, CSN ISO 15705) .
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-CR6-IC	CZ_SOP_D06_02_122 except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (CSN EN 16192, EPA 7199, SM 3500-Cr) Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and trivalent chromium determination by calculation from measured values.
W-F-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-HARD-FX	CZ_SOP_D06_02_J06 Stoichiometric calculations and calculations of inorganic parameters from measured values by accredited methods. Calculation of total hardness as a sum of calcium and magnesium.

Analytical Methods	*Method Descriptions*
W-HG-AFSFX	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was fixed by nitric acid addition prior to analysis.
W-METAXFL1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was filtered by microfilter with porosity 0.45 µm followed by nitric acid addition prior to analysis.
W-METAXFX1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was fixed by nitric acid addition prior to analysis.
W-NH3-CC2	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NING-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NNO-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO2-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO3-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NORG-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NTOT-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-O2D-ELE	CZ_SOP_D06_07_044 (CSN EN ISO 5814) Determination of dissolved oxygen by electrochemical method.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-TDS-GR	CZ_SOP_D06_02_071 Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express), (based on CSN 757346, CSN 757347, CSN EN 16192).
W-TOC-IR	CZ_SOP_D06_02_056 Determination of total organic carbon (TOC), dissolved organic carbon (DOC), total inorganic carbon (TIC) and total carbon (TC) by IR detection (based on CSN EN 1484, CSN EN 16192, SM 5310).
W-TSS-GR	CZ_SOP_D06_02_070 Determination of dry suspended solids and annealed suspended solids by gravimetry and determination of loos of ignition of suspended solids and total solids by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express) (based on CSN EN 872, CSN 757350)

A `*` symbol preceeding any method indicates non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information.
The calculation methods of summation parameters are available on request in the client service.

CERTIFICATE OF ANALYSIS

Work Order	: **PR1686758**	Issue Date	: 15-NOV-2016
Client	: **AECOM Turkey Dan ve Muh Ltd Sti**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266, B Blok No: 50-51 Cankaya 06800 Ankara / Turkey	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: ----	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Acacia Maden A S	Page	: 1 of 16
Order number	: ----	Date Samples Received	: 07-NOV-2016
C-O-C number	: ----	Quote number	: PR2014ARTMU-TR0129 (AECOM BQ)
Site	: TKD	Date of test	: 08-NOV-2016 - 14-NOV-2016
Sampled by	: client	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

This report shall not be reproduced except in full, without prior written approval from the laboratory.
The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR1686758/015,016, method W-F-IC, W-BR-IC, W-CL-IC, W-SO4-IC was/were filtered prior to analysis (filter porosity 0.45 µm).
Samples PR1686758/001-016, method W-O2D-ELE were determinated in laboratory.

Responsible for accuracy

Testing Laboratory Accredited by CAI according to CSN EN ISO/IEC 17025:2005

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA TESTING LABORATORY ACCREDITED BY CAI ALS Czech Republic, s.r.o. 1 L1163

ilac-MRA

L 1163

Analytical Results

Sub-Matrix: **DRINKING WATER**			Client sample ID	D-12		D-3		D-6	
			Laboratory sample ID	PR1686758002		PR1686758004		PR1686758005	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**69.5**	±10.0 %	**44.4**	±10.0 %	**69.2**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.11**	±1.0 %	**8.26**	±1.0 %	**7.86**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**0.66**	±20.0 %	**0.60**	±20.0 %	**0.68**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**3.48**	----	**2.30**	----	**3.44**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.33**	----	**1.50**	----	**2.29**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.16**	----	**0.802**	----	**1.14**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**348**	----	**230**	----	**344**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**8.0**	±21.2 %	**10.0**	±20.0 %	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**4.93**	±15.0 %	**2.78**	±15.0 %	**4.89**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**7.78**	±30.0 %	**7.70**	±30.0 %	**10.1**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**1.00**	----	**3.87**	----	**1.10**	----
Nitrates	W-NO3-SPC	0.27	mg/L	**4.44**	----	**17.1**	----	**4.85**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**1.00**	±20.0 %	**3.87**	±20.0 %	**1.10**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	**3.51**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**113**	±15.0 %	**14.6**	±15.0 %	**113**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.0**	----	**3.9**	----	**1.1**	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	**1.53**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	**4.70**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**1.00**	----	**3.87**	----	**1.10**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**86**	±30.0 %	**89**	±30.0 %	**98**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**427**	±9.8 %	**237**	±10.0 %	**431**	±9.8 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**255**	±12.0 %	**207**	±12.0 %	**269**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**255**	----	**207**	----	**269**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.035**	±10.0 %	**0.013**	±10.0 %	**0.014**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0495**	±10.0 %	**0.00112**	±10.0 %	**0.0478**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.094**	±10.0 %	**0.014**	±10.0 %	**0.096**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**93.3**	±10.0 %	**60.2**	±10.0 %	**91.9**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	D-12 Result	D-12 MU	D-3 Result	D-3 MU	D-6 Result	D-6 MU
			Laboratory sample ID	PR1686758002		PR1686758004		PR1686758005	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Total Metals / Major Cations - Continued									
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Iron	W-METAXFX1	0.0020	mg/L	**0.147**	±10.0 %	**0.0124**	±10.0 %	**0.0128**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0302**	±10.0 %	**0.0019**	±10.0 %	**0.0299**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**28.1**	±10.0 %	**19.5**	±10.0 %	**27.8**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00227**	±10.0 %	**0.00160**	±10.0 %	**0.00057**	±10.2 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**3.36**	±10.0 %	**0.997**	±10.0 %	**3.27**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**18.2**	±10.0 %	**6.34**	±10.0 %	**18.0**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	<0.0020	----	**0.0462**	±10.0 %	<0.0020	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0486**	±10.0 %	**0.00074**	±10.0 %	**0.0483**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.094**	±10.0 %	<0.010	----	**0.092**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**96.7**	±10.0 %	**60.3**	±10.0 %	**95.0**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0291**	±10.0 %	**0.0013**	±10.1 %	**0.0266**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**25.9**	±10.0 %	**18.5**	±10.0 %	**25.8**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**2.93**	±10.0 %	**0.938**	±10.0 %	**2.94**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**18.7**	±10.0 %	**6.29**	±10.0 %	**18.7**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0420**	±10.0 %	<0.0020	----

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	D-9 Result	D-9 MU	D-13 Result	D-13 MU	D-10 Result	D-10 MU
			Laboratory sample ID	PR1686758007		PR1686758009		PR1686758011	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**89.3**	±10.0 %	**70.6**	±10.0 %	**57.0**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.41**	±1.0 %	**8.12**	±1.0 %	**7.92**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**0.98**	±20.0 %	**1.30**	±20.0 %	**0.66**	±20.0 %

Sub-Matrix: **DRINKING WATER**

			Client sample ID	D-9		D-13		D-10	
			Laboratory sample ID	PR1686758007		PR1686758009		PR1686758011	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Agregate Parameters - Continued									
Hardness	W-HARD-FX	0.00020	mmol/L	**2.53**	----	**3.63**	----	**2.80**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.02**	----	**2.37**	----	**2.06**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.51**	----	**1.25**	----	**0.737**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**253**	----	**363**	----	**280**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	<0.050	----	<0.050	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	<5.0	----	**5.0**	±25.0 %
Chloride	W-CL-IC	1.00	mg/L	**4.40**	±15.0 %	**6.71**	±15.0 %	**4.50**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**9.35**	±30.0 %	**9.34**	±30.0 %	**12.6**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**0.647**	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	**1.10**	----	**2.86**	----	**2.14**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**0.252**	±20.0 %	**0.647**	±20.0 %	**0.484**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.0130**	±15.0 %	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.053**	±20.0 %	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**34.9**	±15.0 %	**63.1**	±15.0 %	**73.5**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.023**	±20.0 %	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.071**	±20.0 %	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**0.248**	----	**0.647**	----	**0.484**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.0039**	±15.0 %	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**110**	±30.0 %	**109**	±30.0 %	**127**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**519**	±9.8 %	**414**	±9.8 %	**336**	±9.9 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**469**	±12.0 %	**325**	±12.0 %	**220**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**13.8**	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**455**	----	**325**	----	**220**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.128**	±10.0 %	**0.00395**	±10.0 %	**0.0245**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.268**	±10.0 %	**0.051**	±10.0 %	**0.107**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**40.8**	±10.0 %	**95.1**	±10.0 %	**82.6**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	**0.0201**	±10.0 %	**0.0017**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0022**	±10.0 %	**0.0102**	±10.0 %	**0.0107**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0045**	±10.0 %	**0.0080**	±10.0 %	**0.0140**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**36.8**	±10.0 %	**30.5**	±10.0 %	**17.9**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	D-9 Result	D-9 MU	D-13 Result	D-13 MU	D-10 Result	D-10 MU
			Laboratory sample ID	PR1686758007		PR1686758009		PR1686758011	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Total Metals / Major Cations - Continued									
Manganese	W-METAXFX1	0.00050	mg/L	<0.00050	----	**0.00374**	±10.0 %	**0.00159**	±10.1 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.042**	±10.0 %	**0.020**	±10.0 %	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**2.63**	±10.0 %	**2.04**	±10.0 %	**2.57**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**102**	±10.0 %	**13.5**	±10.0 %	**9.53**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0027**	±10.0 %	**0.0264**	±10.0 %	**0.0095**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.114**	±10.0 %	**0.00398**	±10.0 %	**0.0258**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.268**	±10.0 %	**0.052**	±10.0 %	**0.107**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**38.7**	±10.0 %	**93.8**	±10.0 %	**83.3**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0159**	±10.0 %	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0028**	±10.0 %	**0.0040**	±10.0 %	**0.0104**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**33.8**	±10.0 %	**29.9**	±10.0 %	**17.1**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	<0.00050	----	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	**0.033**	±10.0 %	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**2.34**	±10.0 %	**1.95**	±10.0 %	**2.34**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**110**	±10.0 %	**13.0**	±10.0 %	**9.55**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0242**	±10.0 %	**0.0140**	±10.0 %

Sub-Matrix: **DRINKING WATER**

Parameter	Method	LOR	Unit	C-7 Result	C-7 MU	----	----	----	----
			Laboratory sample ID	PR1686758013		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**57.0**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**8.05**	±1.0 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**1.55**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**3.10**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.39**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.70**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**310**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	C-7		----		----	
			Laboratory sample ID	PR1686758013		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Parameter	Method	LOR	Unit	Result	MU	----	----	----	----
Nonmetallic Inorganic Parameters - Continued									
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**7.0**	±22.1 %	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**4.64**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**10.8**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	----	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	----	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	----	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**26.4**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	----	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**108**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**324**	±9.9 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**289**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**289**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.00340**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.057**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**55.8**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.1 %	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0032**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0142**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0032**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**41.4**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.00140**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**0.910**	±10.0 %	----	----	----	----

Sub-Matrix: **DRINKING WATER**

			Client sample ID	C-7		----		----	
			Laboratory sample ID	PR1686758013		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Total Metals / Major Cations - Continued									
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**7.10**	±10.0 %	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**0.0072**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.00296**	±10.0 %	----	----	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.053**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**56.3**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	**0.0025**	±10.0 %	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**39.2**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**0.804**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**6.92**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	OW-3		K-1		FTBH	
			Laboratory sample ID	PR1686758010		PR1686758014		PR1686758015	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**112**	±10.0 %	**51.5**	±10.0 %	**131**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.62**	±1.0 %	**7.73**	±1.0 %	**7.38**	±1.1 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.50**	±20.0 %	<0.50	----	**1.57**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**5.79**	----	**3.02**	----	**6.26**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**3.72**	----	**1.91**	----	**3.82**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**2.07**	----	**1.12**	----	**2.44**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**579**	----	**302**	----	**626**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.010**	----	<0.010	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.187**	±15.0 %	<0.040	----	**0.070**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.241**	±15.0 %	<0.050	----	**0.090**	±15.0 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	OW-3		K-1		FTBH	
			Laboratory sample ID	PR1686758010		PR1686758014		PR1686758015	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Nonmetallic Inorganic Parameters - Continued									
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**24.0**	±17.1 %	**5.0**	±25.0 %	**119**	±15.4 %
Chloride	W-CL-IC	1.00	mg/L	**8.92**	±15.0 %	**1.81**	±15.0 %	**16.1**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**4.60**	±30.0 %	**9.71**	±30.0 %	**4.34**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	<0.500	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**1.15**	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**0.260**	±20.0 %	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	**0.56**	----	<0.50	----	**0.64**	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.064**	±20.0 %	<0.023	----	**1.74**	±20.0 %
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**198**	±15.0 %	**9.75**	±15.0 %	**161**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.75**	±48.8 %	<0.50	----	**0.71**	±51.2 %
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	<1.0	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.028**	±20.0 %	<0.010	----	**0.758**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.086**	±20.0 %	<0.040	----	**2.32**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**0.260**	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**52**	±30.0 %	**97**	±30.0 %	**43**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**754**	±9.7 %	**284**	±10.0 %	**776**	±9.7 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**81.5**	±10.2 %	<5.0	----	**893**	±10.0 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**432**	±12.0 %	**281**	±12.0 %	**295**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**432**	----	**281**	----	**608**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.199**	±10.0 %	<0.010	----	**0.058**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0198**	±10.0 %	**0.00122**	±10.0 %	**0.0245**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.088**	±10.0 %	**0.016**	±10.0 %	**0.131**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**149**	±10.0 %	**76.4**	±10.0 %	**153**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0012**	±10.1 %
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0023**	±10.0 %	<0.0020	----	**0.0028**	±10.0 %
Copper	W-METAXFX1	0.0010	mg/L	**0.0821**	±10.0 %	<0.0010	----	**0.0301**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**15.7**	±10.0 %	**0.0039**	±10.0 %	**0.0289**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	**0.0068**	±10.0 %	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0408**	±10.0 %	**0.0054**	±10.0 %	**0.0534**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**50.2**	±10.0 %	**27.2**	±10.0 %	**59.3**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.270**	±10.0 %	<0.00050	----	**0.368**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0026**	±10.0 %	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	**0.017**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**3.08**	±10.0 %	**1.51**	±10.0 %	**2.61**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**29.5**	±10.0 %	**8.71**	±10.0 %	**71.6**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	**0.0020**	±10.0 %	<0.0010	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	OW-3		K-1		FTBH	
			Laboratory sample ID	PR1686758010		PR1686758014		PR1686758015	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	Method	LOR	Unit	Result	MU	Result	MU	Result	MU
Total Metals / Major Cations - Continued									
Zinc	W-METAXFX1	0.0020	mg/L	**18.8**	±10.0 %	<0.0020	----	**1.65**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0146**	±10.0 %	<0.00050	----	**0.0217**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.090**	±10.0 %	**0.012**	±10.0 %	**0.125**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**146**	±10.0 %	**69.2**	±10.0 %	**150**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0295**	±10.0 %
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0414**	±10.0 %	<0.0010	----	**0.0498**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**44.8**	±10.0 %	**25.5**	±10.0 %	**58.0**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.267**	±10.0 %	<0.00050	----	**0.218**	±10.0 %
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**2.55**	±10.0 %	**1.10**	±10.0 %	**2.46**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**32.1**	±10.0 %	**8.40**	±10.0 %	**72.9**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	**0.0018**	±10.0 %	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**8.82**	±10.0 %	<0.0020	----	**1.27**	±10.0 %

Sub-Matrix: **GROUNDWATER**

			Client sample ID	IK-3		----		----	
			Laboratory sample ID	PR1686758016		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Parameter	Method	LOR	Unit	Result	MU	----	----	----	----
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**556**	±10.0 %	----	----	----	----
pH Value	W-PH-PCT	1.00	-	**7.78**	±1.0 %	----	----	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**3.10**	±20.0 %	----	----	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**27.4**	----	----	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**12.2**	----	----	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**15.2**	----	----	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**2740**	----	----	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.030**	----	----	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.786**	±15.0 %	----	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**1.01**	±15.0 %	----	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	----	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**176**	±15.3 %	----	----	----	----
Chloride	W-CL-IC	1.00	mg/L	**83.5**	±15.0 %	----	----	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**3.90**	±30.0 %	----	----	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Fluoride	W-F-IC	0.200	mg/L	**0.467**	±15.0 %	----	----	----	----

Sub-Matrix: **GROUNDWATER**

			Client sample ID	IK-3		----		----	
			Laboratory sample ID	PR1686758016		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Parameter	Method	LOR	Unit	Result	MU	----	----	----	----
Nonmetallic Inorganic Parameters - Continued									
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**0.786**	----	----	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	----	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	----	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	----	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	**1.65**	----	----	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**1.48**	±20.0 %	----	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**3690**	±15.0 %	----	----	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**2.44**	±24.2 %	----	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**2.4**	----	----	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.645**	±20.0 %	----	----	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**1.98**	±20.0 %	----	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	**0.025**	----	----	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	----	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	----	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	----	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**39**	±30.0 %	----	----	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**5470**	±9.6 %	----	----	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**2200**	±10.0 %	----	----	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**232**	±12.0 %	----	----	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**232**	----	----	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**4.77**	±10.0 %	----	----	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0410**	±10.0 %	----	----	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	**0.00050**	±10.0 %	----	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**2.28**	±10.0 %	----	----	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**488**	±10.0 %	----	----	----	----
Chromium	W-METAXFX1	0.0010	mg/L	**0.0226**	±10.0 %	----	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0149**	±10.0 %	----	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	**0.0117**	±10.0 %	----	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**9.80**	±10.0 %	----	----	----	----
Lead	W-METAXFX1	0.0050	mg/L	**0.0236**	±10.0 %	----	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.152**	±10.0 %	----	----	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**369**	±10.0 %	----	----	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**1.07**	±10.0 %	----	----	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	----	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	**0.0431**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.414**	±10.0 %	----	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**15.4**	±10.0 %	----	----	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**591**	±10.0 %	----	----	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	**0.0258**	±10.0 %	----	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**38.8**	±10.0 %	----	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	**0.015**	±10.0 %	----	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0321**	±10.0 %	----	----	----	----

Sub-Matrix: **GROUNDWATER**			Client sample ID	**IK-3**		----		----	
			Laboratory sample ID	PR1686758016		----		----	
			Client sampling date / time	03-NOV-2016 00:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**----**	**----**	**----**	**----**
Dissolved Metals / Major Cations - Continued									
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	----	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**2.33**	±10.0 %	----	----	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	----	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**463**	±10.0 %	----	----	----	----
Chromium	W-METAXFL1	0.0010	mg/L	**0.0020**	±10.0 %	----	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	**0.0056**	±10.0 %	----	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	----	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	----	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.145**	±10.0 %	----	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**347**	±10.0 %	----	----	----	----
Manganese	W-METAXFL1	0.00050	mg/L	**0.734**	±10.0 %	----	----	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	----	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	**0.0104**	±10.0 %	----	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**14.6**	±10.0 %	----	----	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**581**	±10.0 %	----	----	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	----	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	----	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**7.74**	±10.0 %	----	----	----	----

Sub-Matrix: **SURFACE WATER**			Client sample ID	**SW-2**		**YS-2**		**SW-5**	
			Laboratory sample ID	PR1686758001		PR1686758003		PR1686758006	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**48.6**	±10.0 %	**73.2**	±10.0 %	**68.3**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**8.10**	±1.0 %	**8.14**	±1.0 %	**8.04**	±1.0 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**0.70**	±20.0 %	**2.96**	±20.0 %	**2.09**	±20.0 %
Hardness	W-HARD-FX	0.00020	mmol/L	**2.49**	----	**3.46**	----	**3.37**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**1.70**	----	**2.34**	----	**2.20**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**0.787**	----	**1.13**	----	**1.17**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**249**	----	**346**	----	**337**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.040**	----	**0.010**	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.040**	±15.0 %	**0.408**	±15.0 %	**0.180**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.052**	±15.0 %	**0.525**	±15.0 %	**0.232**	±15.0 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**11.0**	±19.5 %	**21.0**	±17.4 %	**5.0**	±25.0 %
Chloride	W-CL-IC	1.00	mg/L	**4.40**	±15.0 %	**15.8**	±15.0 %	**14.8**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**10.3**	±30.0 %	**8.77**	±30.0 %	**7.60**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**2.46**	----	**1.95**	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**7.84**	----	**7.15**	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**2.05**	±20.0 %	**1.77**	±20.0 %
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	**0.929**	±15.0 %	**0.494**	±15.0 %
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	**0.195**	±20.0 %	**0.121**	±20.0 %

Sub-Matrix: **SURFACE WATER**			*Client sample ID*	**SW-2**		**YS-2**		**SW-5**	
			Laboratory sample ID	*PR1686758001*		*PR1686758003*		*PR1686758006*	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued									
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**69.2**	±15.0 %	**53.4**	±15.0 %	**62.1**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	**0.64**	±55.8 %	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**2.7**	----	**1.8**	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	**0.085**	±20.0 %	**0.053**	±20.0 %
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	**0.261**	±20.0 %	**0.162**	±20.0 %
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.033**	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**1.77**	----	**1.62**	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	**0.283**	±15.0 %	**0.150**	±15.0 %
Oxygen Saturation	W-O2D-ELE	1	%	**99**	±30.0 %	**92**	±30.0 %	**86**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**291**	±9.9 %	**420**	±9.8 %	**400**	±9.8 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**7.0**	±12.1 %	**32.6**	±10.5 %	**27.6**	±10.5 %
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**180**	±12.0 %	**314**	±12.0 %	**281**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**180**	----	**314**	----	**281**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.034**	±10.0 %	**0.096**	±10.0 %	**0.241**	±10.0 %
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0238**	±10.0 %	**0.0376**	±10.0 %	**0.0403**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.096**	±10.0 %	**0.091**	±10.0 %	**0.092**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**68.2**	±10.0 %	**93.7**	±10.0 %	**88.4**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0017**	±10.0 %
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0017**	±10.0 %
Iron	W-METAXFX1	0.0020	mg/L	**0.0443**	±10.0 %	**0.159**	±10.0 %	**0.420**	±10.0 %
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0130**	±10.0 %	**0.0133**	±10.0 %	**0.0140**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**19.1**	±10.0 %	**27.4**	±10.0 %	**28.4**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00283**	±10.0 %	**0.0658**	±10.0 %	**0.0379**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	**0.051**	±10.0 %	**0.027**	±10.0 %
Potassium	W-METAXFX1	0.015	mg/L	**2.42**	±10.0 %	**5.06**	±10.0 %	**4.64**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**10.4**	±10.0 %	**23.8**	±10.0 %	**24.1**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0040**	±10.0 %
Zinc	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	**0.0029**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0241**	±10.0 %	**0.0373**	±10.0 %	**0.0383**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.090**	±10.0 %	**0.090**	±10.0 %	**0.091**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**67.1**	±10.0 %	**92.8**	±10.0 %	**87.0**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	**0.0014**	±10.1 %
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----

Sub-Matrix: **SURFACE WATER**

			Client sample ID	SW-2		YS-2		SW-5	
			Laboratory sample ID	PR1686758001		PR1686758003		PR1686758006	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		03-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Dissolved Metals / Major Cations - Continued									
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	**0.0190**	±10.0 %	**0.0046**	±10.0 %
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0090**	±10.0 %	**0.0094**	±10.0 %	**0.0103**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**18.2**	±10.0 %	**26.4**	±10.0 %	**26.4**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	**0.00095**	±10.1 %	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	**0.069**	±10.0 %	**0.026**	±10.0 %
Potassium	W-METAXFL1	0.015	mg/L	**2.15**	±10.0 %	**4.67**	±10.0 %	**3.96**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**10.3**	±10.0 %	**23.8**	±10.0 %	**26.8**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----

Sub-Matrix: **SURFACE WATER**

			Client sample ID	HAN-1		SW-17		----	
			Laboratory sample ID	PR1686758008		PR1686758012		----	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**69.4**	±10.0 %	**55.4**	±10.0 %	----	----
pH Value	W-PH-PCT	1.00	-	**8.10**	±1.0 %	**8.49**	±0.9 %	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**2.24**	±20.0 %	**2.27**	±20.0 %	----	----
Hardness	W-HARD-FX	0.00020	mmol/L	**3.38**	----	**3.16**	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.20**	----	**1.23**	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.17**	----	**1.93**	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**338**	----	**316**	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.020**	----	<0.010	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.224**	±15.0 %	<0.040	----	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.289**	±15.0 %	<0.050	----	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**13.0**	±18.8 %	**16.0**	±18.1 %	----	----
Chloride	W-CL-IC	1.00	mg/L	**14.6**	±15.0 %	**4.84**	±15.0 %	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**8.47**	±30.0 %	**10.8**	±30.0 %	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	<0.200	----	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**2.08**	----	<0.500	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	**7.64**	----	<0.27	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**1.86**	±20.0 %	<0.060	----	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	**0.431**	±15.0 %	<0.0050	----	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	----	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	**0.120**	±20.0 %	**0.060**	±20.0 %	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**61.5**	±15.0 %	**22.2**	±15.0 %	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**1.8**	----	<1.0	----	----	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	**0.052**	±20.0 %	**0.026**	±20.0 %	----	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	**0.161**	±20.0 %	**0.081**	±20.0 %	----	----

Sub-Matrix: **SURFACE WATER**

Parameter	Method	LOR	Unit	HAN-1 Result	HAN-1 MU	SW-17 Result	SW-17 MU	----	----
			Client sample ID	**HAN-1**		**SW-17**		----	
			Laboratory sample ID	PR1686758008		PR1686758012		----	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		----	
Nonmetallic Inorganic Parameters - Continued									
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	**0.016**	----	<0.010	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**1.72**	----	<0.060	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	**0.131**	±15.0 %	<0.0020	----	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**98**	±30.0 %	**109**	±30.0 %	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**400**	±9.8 %	**320**	±9.9 %	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**11.4**	±11.3 %	**8.7**	±11.7 %	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**286**	±12.0 %	**325**	±12.0 %	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	**15.7**	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**286**	----	**279**	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.183**	±10.0 %	**0.042**	±10.0 %	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0387**	±10.0 %	**0.00354**	±10.0 %	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00020	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.092**	±10.0 %	**0.054**	±10.0 %	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00040	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**88.3**	±10.0 %	**49.5**	±10.0 %	----	----
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**0.317**	±10.0 %	**0.0249**	±10.0 %	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0140**	±10.0 %	**0.0028**	±10.0 %	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**28.5**	±10.0 %	**46.9**	±10.0 %	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.0366**	±10.0 %	**0.00948**	±10.0 %	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Phosphorus	W-METAXFX1	0.010	mg/L	**0.038**	±10.0 %	**0.016**	±10.0 %	----	----
Potassium	W-METAXFX1	0.015	mg/L	**4.48**	±10.0 %	**0.961**	±10.0 %	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**24.9**	±10.0 %	**6.99**	±10.0 %	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	**0.0012**	±10.0 %	**0.0013**	±10.1 %	----	----
Zinc	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0389**	±10.0 %	**0.00300**	±10.0 %	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00020	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.088**	±10.0 %	**0.053**	±10.0 %	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00040	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**85.6**	±10.0 %	**47.7**	±10.0 %	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0049**	±10.0 %	**0.0044**	±10.0 %	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0050	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0095**	±10.0 %	<0.0010	----	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**26.6**	±10.0 %	**45.8**	±10.0 %	----	----

Sub-Matrix: **SURFACE WATER**			Client sample ID	**HAN-1**		**SW-17**		----	
			Laboratory sample ID	*PR1686758008*		*PR1686758012*		----	
			Client sampling date / time	03-NOV-2016 00:00		03-NOV-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Dissolved Metals / Major Cations - Continued									
Manganese	W-METAXFL1	0.00050	mg/L	<0.00050	----	**0.00133**	±10.1 %	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**4.00**	±10.0 %	**0.834**	±10.0 %	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**25.4**	±10.0 %	**6.71**	±10.0 %	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.010	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0010	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0020	----	----	----

If the client does not specify the date and time of sample collection, the laboratory will specify the date on sample delivery in parentheses, instead. If the time of sample collection is specified as 0:00 it means that the client did specify the date but not the time. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1, SM2320) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO 2 forms by calculation from measured values including the calculation of total mineralization.
W-BR-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CL-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-CNF-PHO	CZ_SOP_D06_02_090.A (CSN ISO 6703-2, CSN EN ISO 14403-2, SM 4500 CN) Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry/ CZ_SOP_D06_07_011 (CSN ISO 6703-2) Determination of easily releasable cyanide (free cyanide) by spectrophotometry.
W-CNT-PHO	CZ_SOP_D06_02_089.A (CSN 75 7415, CSN EN ISO 14403-2)/ CZ_SOP_D06_07_010 (CSN 75 7415) Determination of total cyanide by spectrophotometry and determination of complex-forming cyanides by calculation from measure values.
W-COD-SPC	CZ_SOP_D06_02_076 Determination of chemical oxygen demand using dichromate (COD-Cr) by photometry (based on CSN ISO 15705) / CZ_SOP_D06_02_076.A / CZ_SOP_D06_07_040 Determination of chemical oxygen demand using dichromate (COD-Cr) by titration (based on CSN ISO 6060, CSN ISO 15705) .
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-CR6-IC	CZ_SOP_D06_02_122 except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (CSN EN 16192, EPA 7199, SM 3500-Cr) Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and trivalent chromium determination by calculation from measured values.
W-F-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-HARD-FX	CZ_SOP_D06_02_J06 Stoichiometric calculations and calculations of inorganic parameters from measured values by accredited methods. Calculation of total hardness as a sum of calcium and magnesium.
W-HG-AFSFX	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was fixed by nitric acid addition prior to analysis.

Analytical Methods	*Method Descriptions*
W-METAXFL1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was filtered by microfilter with porosity 0.45 µm followed by nitric acid addition prior to analysis.
W-METAXFX1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was fixed by nitric acid addition prior to analysis.
W-NH3-CC2	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NING-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NNO-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO2-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO3-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NORG-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NTOT-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-O2D-ELE	CZ_SOP_D06_07_044 (CSN EN ISO 5814) Determination of dissolved oxygen by electrochemical method.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values.
W-TDS-GR	CZ_SOP_D06_02_071 Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express), (based on CSN 757346, CSN 757347, CSN EN 16192).
W-TOC-IR	CZ_SOP_D06_02_056 Determination of total organic carbon (TOC), dissolved organic carbon (DOC), total inorganic carbon (TIC) and total carbon (TC) by IR detection (based on CSN EN 1484, CSN EN 16192, SM 5310).
W-TSS-GR	CZ_SOP_D06_02_070 Determination of dry suspended solids and annealed suspended solids by gravimetry and determination of loos of ignition of suspended solids and total solids by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express) (based on CSN EN 872, CSN 757350)

A `*` symbol preceeding any method indicates non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information.
The calculation methods of summation parameters are available on request in the client service.

QUALITY CONTROL REPORT

Work Order	: **PR1686758**	Page	: 1 of 14
Client	: **ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: AECOM Turkey Dan ve Muh Ltd Sti Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266 B Blok No: 50-51 Cankaya Ankara Turkey 06800	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: kaan.duz@aecom.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Acacia Maden A S	QC Level	: ALS CR Standard Quality Control Schedule
Site	: TKD		
C-O-C number	: ----	Date Samples Received	: 07-NOV-2016
Sampled by	: client	Issue Date	: 15-NOV-2016
Order number	: ----		
		No. of samples received	: 16
Quote number	: AECOM BQ	No. of samples analysed	: 16

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA
TESTING LABORATORY ACCREDITED BY CAI
ALS Czech Republic, s.r.o.
1
L1163

Testing Laboratory
Accredited by CAI

ilac-MRA

L 1163

Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

General Comments

The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO, CEN and APHA. In house developed procedures are employed in the absence of documented standards or by client request.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting (LOQ of analytical method or higher)
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity. The permitted ranges for the Relative Percentage Difference (RPD) of Laboratory Duplicates are specified in internal ALS documents.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Physical Parameters (QC Lot: 4352022)								
PR1686678-001	Anonymous	W-PH-PCT: pH Value	----	1.00	-	6.13	6.19	1.0
Physical Parameters (QC Lot: 4352023)								
PR1686678-001	Anonymous	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	66.3	66.0	0.4
Physical Parameters (QC Lot: 4352039)								
PR1686758-003	YS-2	W-PH-PCT: pH Value	----	1.00	-	8.14	8.14	0.0
Agregate Parameters (QC Lot: 4351903)								
PR1684555-001	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	1.22	1.33	8.2
Agregate Parameters (QC Lot: 4351904)								
PR1686758-013	C-7	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	1.55	1.56	0.6
Nonmetallic Inorganic Parameters (QC Lot: 4351434)								
PR1686666-001	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	13.3	13.4	1.2
Nonmetallic Inorganic Parameters (QC Lot: 4351435)								
PR1686666-001	Anonymous	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	33.1	33.9	2.2
Nonmetallic Inorganic Parameters (QC Lot: 4351505)								
PR1686461-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	<5.0	<5.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351572)								
PR1684809-002	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	268	242	10.2
Nonmetallic Inorganic Parameters (QC Lot: 4351592)								
PR1685173-001	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	<0.016	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351593)								
PR1685173-001	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0012	mg/L	<0.0012	<0.0012	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351594)								
PR1685173-001	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	0.321	0.297	8.0
Nonmetallic Inorganic Parameters (QC Lot: 4351607)								
PR1686461-003	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	0.696	0.702	0.9
Nonmetallic Inorganic Parameters (QC Lot: 4351609)								
PR1686758-007	D-9	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351610)								
PR1686461-003	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	757	759	0.2
Nonmetallic Inorganic Parameters (QC Lot: 4351615)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Nonmetallic Inorganic Parameters (QC Lot: 4351615) - continued								
PR1685328-001	Anonymous	W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.020	mg/L	11.1	11.2	0.9
		W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	8.65	8.72	0.9
Nonmetallic Inorganic Parameters (QC Lot: 4351616)								
PR1685328-001	Anonymous	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351617)								
PR1685328-001	Anonymous	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	<0.060	<0.060	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351851)								
PR1686977-004	Anonymous	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	15.0	16.0	6.4
Nonmetallic Inorganic Parameters (QC Lot: 4351852)								
PR1686758-008	HAN-1	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	13.0	13.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4351857)								
PR1686403-001	Anonymous	W-O2D-ELE: Oxygen Saturation	----	1	%	107	104	3.0
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	9.00	8.63	4.2
Nonmetallic Inorganic Parameters (QC Lot: 4351931)								
PR1686800-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	15.8	15.9	1.0
Nonmetallic Inorganic Parameters (QC Lot: 4351933)								
PR1685919-001	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	154	161	4.4
Nonmetallic Inorganic Parameters (QC Lot: 4351934)								
PR1686804-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	5.0	mg/L	24.0	24.2	1.0
Nonmetallic Inorganic Parameters (QC Lot: 4352037)								
PR1686758-003	YS-2	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as $CaCO_3$ pH 4.5	----	2.0	mg $CaCO_3$/L	314	326	3.5
Nonmetallic Inorganic Parameters (QC Lot: 4352129)								
PR1685919-001	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	<0.200	<0.200	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352130)								
PR1685919-001	Anonymous	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	4.62	4.60	0.5
Nonmetallic Inorganic Parameters (QC Lot: 4352131)								
PR1685919-001	Anonymous	W-SO4-IC: Sulphate as SO_4 2-	14808-79-8	5.00	mg/L	8.17	7.81	4.6
Nonmetallic Inorganic Parameters (QC Lot: 4352137)								
PR1686758-002	D-12	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352138)								
PR1686758-002	D-12	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	<0.200	<0.200	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352139)								
PR1686758-002	D-12	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	4.93	4.93	0.0

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)
Nonmetallic Inorganic Parameters (QC Lot: 4352172)								
PR1686011-001	Anonymous	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	27.0	25.0	7.7
Nonmetallic Inorganic Parameters (QC Lot: 4352217)								
PR1685328-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	0.012	0.012	0.0
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	0.027	0.028	6.7
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	<0.040	<0.040	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352218)								
PR1686758-013	C-7	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	<0.010	<0.010	0.0
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	<0.023	0.0
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	<0.040	<0.040	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352221)								
PR1686758-001	SW-2	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	0.040	0.041	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	0.052	0.053	2.3
Nonmetallic Inorganic Parameters (QC Lot: 4352222)								
PR1686758-001	SW-2	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	<0.0050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352223)								
PR1686758-001	SW-2	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	<0.060	<0.060	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352242)								
PR1686758-001	SW-2	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352243)								
PR1686758-001	SW-2	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	<0.005	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4352693)								
PR1685378-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	85.3	86.5	1.4
PR1686717-003	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	54.4	55.9	2.7
Nonmetallic Inorganic Parameters (QC Lot: 4353465)								
PR1687415-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	23.1	23.2	0.2
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	53.0	53.2	0.2
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	71.0	71.2	0.2
Total Metals / Major Cations (QC Lot: 4351873)								
PR1685045-020	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	<0.00050	<0.00050	0.0
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	<0.00050	<0.00050	0.0
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	<0.0010	<0.0010	0.0

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Total Metals / Major Cations (QC Lot: 4351873) - continued								
PR1685045-020	Anonymous	W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	<0.0030	<0.0030	0.0
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	<0.015	0.0
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	<0.030	<0.030	0.0
Total Metals / Major Cations (QC Lot: 4351881)								
PR1686758-007	D-9	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4351882)								
PR1686758-002	D-12	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.0495	0.0490	1.0
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.00227	0.00221	2.7
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0302	0.0296	2.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.147	0.148	0.7
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	28.1	26.0	7.9
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	93.3	92.3	1.1
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*
Total Metals / Major Cations (QC Lot: 4351882) - continued								
PR1686758-002	D-12	W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	0.035	0.035	0.0
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.094	0.095	0.0
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	3.36	3.35	0.3
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	18.2	18.2	0.05
Dissolved Metals / Major Cations (QC Lot: 4351611)								
PR1686461-001	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0
Dissolved Metals / Major Cations (QC Lot: 4351901)								
PR1686540-002	Anonymous	W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.0931	0.0904	2.9
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	0.614	0.594	3.4
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	0.0225	0.0204	9.8
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	0.0024	0.0026	7.9
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	8.68	8.66	0.2
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	20.8	20.3	2.8
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	0.0080	0.0080	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	77.3	74.5	3.8
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	0.018	0.019	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	0.134	0.130	3.3
		W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	5.10	4.93	3.4
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	22.8	22.5	1.0
Dissolved Metals / Major Cations (QC Lot: 4352142)								
PR1686758-001	SW-2	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<0.40	<0.40	0.0

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method accuracy (both precision and trueness) independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Physical Parameters (QCLot: 4352022)							
W-PH-PCT: pH Value	----	1.00	-	----	100	99	101
Physical Parameters (QCLot: 4352023)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	101	96	106
Physical Parameters (QCLot: 4352039)							
W-PH-PCT: pH Value	----	1.00	-	----	101	99	101
Agregate Parameters (QCLot: 4351903)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	97.5	80	120
Agregate Parameters (QCLot: 4351904)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	101	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351434)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	99.9	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351435)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	101	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351505)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	103	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351572)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	97.6	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351592)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	108	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351593)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	97.0	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	97.1	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351594)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	111	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351607)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	100	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351609)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	86.3	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351610)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	97.5	85	115

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4351615)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	107	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351616)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	89.2	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	89.3	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351617)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	109	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351851)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351852)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4351857)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4351931)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	92.2	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351933)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	110	80	120
Nonmetallic Inorganic Parameters (QCLot: 4351934)							
W-TSS-GR: Suspended solids dried at 105 °C	----	2.0	mg/L	<2.0	92.2	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352037)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	103	88	112
Nonmetallic Inorganic Parameters (QCLot: 4352129)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	104	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352130)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	94.0	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352131)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	95.2	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352137)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	88.1	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352138)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	86.3	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352139)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	95.5	85	115

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4352172)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	97.4	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352217)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	95.6	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	95.6	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	95.6	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352218)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	112	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	112	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	112	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352221)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	107	85	115
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	106	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352222)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	90.2	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	90.3	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352223)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	109	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352242)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	98.5	85	115
Nonmetallic Inorganic Parameters (QCLot: 4352243)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	92.1	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	92.1	80	120
Nonmetallic Inorganic Parameters (QCLot: 4352693)							
W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	----	101	80	120
				<0.50	104	80	120
Nonmetallic Inorganic Parameters (QCLot: 4353465)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	111	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	111	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	111	80	120
Total Metals / Major Cations (QCLot: 4351873)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	99.0	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	108	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	93.5	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	0.00059	99.0	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	107	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	104	80	120

Work Order : PR1686758
Client : ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.
Project : Sampling for Acacia Maden A S

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Recovery (%) LCS	Recovery (%) Low	Recovery (%) High
Total Metals / Major Cations (QCLot: 4351873) - continued							
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	103	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	102	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	106	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	101	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	107	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	106	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	101	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	102	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	103	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	104	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	94.7	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	106	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	101	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	102	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	95.7	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	109	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	98.6	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	109	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	96.9	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	108	80	120
Total Metals / Major Cations (QCLot: 4351881)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	----	94.1	80	120
Total Metals / Major Cations (QCLot: 4351882)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	98.8	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	98.8	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	98.1	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	98.8	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	109	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	98.4	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	98.6	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	90.5	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	104	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	97.8	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	93.9	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	98.1	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	98.0	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	93.7	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4351882) - continued							
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	98.4	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	92.9	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	90.8	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	91.8	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	88.8	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	87.6	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	94.0	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	87.1	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	98.8	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	99.4	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	98.9	80	120
Dissolved Metals / Major Cations (QCLot: 4351611)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	92.8	90	110
Dissolved Metals / Major Cations (QCLot: 4351901)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	100	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	98.1	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	96.7	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	97.1	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	106	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	100	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	99.9	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	100	80	120
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	103	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	97.7	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	104	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	103	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	98.1	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	110	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	106	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	102	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	95.1	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	103	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	99.2	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	100	80	120
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	98.6	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	106	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	97.4	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	107	80	120

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Dissolved Metals / Major Cations (QCLot: 4351901) - continued							
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	95.2	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	102	80	120
Dissolved Metals / Major Cations (QCLot: 4352142)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	97.6	90	110

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Recovery (%)	Recovery (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	Low	High
Nonmetallic Inorganic Parameters (QCLot: 4351931)							
PR1686667-001	Anonymous	W-TSS-GR: Suspended solids dried at 105 °C	----	26.08 mg/L	102	80	120
Total Metals / Major Cations (QCLot: 4351881)							
PR1686758-007	D-9	W-HG-AFSFX: Mercury	7439-97-6	0.5 µg/L	102	70	130

CERTIFICATE OF ANALYSIS

Work Order	: **PR16A0735**	Issue Date	: 23-DEC-2016 14:04
Amendment	: **(Preliminary Report)**		
Client	: **AECOM Turkey Dan ve Muh Ltd Sti**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan DUZ	Contact	: Client Service
Address	: Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266, B Blok No: 50-51 Cankaya 06800 Ankara / Turkey	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: ----	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Acacia Maden A S	Page	: 1 of 7
Order number	: ----	Date Samples Received	: 13-DEC-2016
C-O-C number	: ----	Quote number	: PR2014ARTMU-TR0129 (AECOM BQ)
Site	: MO_TKD, Hanonu	Date of test	: 15-DEC-2016 - 22-DEC-2016
Sampled by	: Client	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR16A0735/005, method W-CR6-IC - particular sample(s) required dilution due to high conductivity of the sample and due to negative peak in retention time of Cr^{6+}. LOR values have been adjusted accordingly.
Samples PR16A0735/001-005, method W-02D-ELE were determined in laboratory.
Sample(s) PR16A0735/002, 005, method W-METAXFX1, W-METAXFL1 - LOR for particular sample(s) raised due to matrix interference.

Responsible for accuracy

Testing Laboratory Accredited by CAI according to CSN EN ISO/IEC 17025:2005

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

L 1163

Analytical Results

Sub-Matrix: **GROUNDWATER**			Client sample ID	**GK-4**		**GK-6**		**GK-10**	
			Laboratory sample ID	*PR16A0735001*		*PR16A0735002*		*PR16A0735003*	
			Client sampling date / time	27-NOV-2016 00:00		26-NOV-2016 00:00		24-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**116**	±10.0 %	**284**	±10.0 %	**80.0**	±10.0 %
pH Value	W-PH-PCT	1.00	-	**7.61**	±1.0 %	**8.26**	±1.0 %	**7.49**	±1.1 %
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	**0.74**	±20.0 %	<0.50	----	<0.50	----
Hardness	W-HARD-FX	0.00020	mmol/L	**4.61**	----	**1.69**	----	**4.12**	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.97**	----	**0.585**	----	**2.45**	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**1.64**	----	**1.10**	----	**1.67**	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**461**	----	**169**	----	**412**	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.020**	----	<0.010	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	<0.040	----	**0.205**	±15.0 %	**0.041**	±15.0 %
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	<0.050	----	**0.264**	±15.0 %	**0.053**	±15.0 %
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Chloride	W-CL-IC	1.00	mg/L	**16.0**	±15.0 %	**16.2**	±15.0 %	**4.84**	±15.0 %
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**8.28**	±30.0 %	**5.62**	±30.0 %	**5.83**	±30.0 %
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Fluoride	W-F-IC	0.200	mg/L	<0.200	----	**0.558**	±15.0 %	<0.200	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	**7.85**	----	**1.55**	----	<0.500	----
Nitrates	W-NO3-SPC	0.27	mg/L	**34.8**	----	**5.95**	----	<0.27	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	**7.85**	±20.0 %	**1.34**	±20.0 %	<0.060	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	<0.0050	----	<0.0050	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.023	mg/L	<0.023	----	<0.023	----	<0.023	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**268**	±15.0 %	**1190**	±15.0 %	**103**	±15.0 %
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	<0.50	----	<0.50	----	<0.50	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	**7.8**	----	**1.3**	----	<1.0	----
Total Phosphorus as P	W-PTOT-SPC	0.010	mg/L	<0.010	----	<0.010	----	<0.010	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.040	mg/L	<0.040	----	<0.040	----	<0.040	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.016**	----	<0.010	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	<0.005	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	**7.85**	----	**1.34**	----	<0.060	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	<0.0020	----	<0.0020	----
Oxygen Saturation	W-O2D-ELE	1	%	**71**	±30.0 %	**50**	±30.0 %	**53**	±30.0 %
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**834**	±9.7 %	**1950**	±9.6 %	**541**	±9.8 %
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	<5.0	----	<5.0	----	<5.0	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**314**	±12.0 %	**223**	±12.0 %	**347**	±12.0 %
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**314**	----	**223**	----	**347**	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0050	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0517**	±10.0 %	**0.00724**	±10.0 %	**0.00536**	±10.0 %
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00040	----	<0.00020	----
Boron	W-METAXFX1	0.010	mg/L	**0.156**	±10.0 %	**0.436**	±10.0 %	**0.018**	±10.0 %
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00080	----	<0.00040	----
Calcium	W-METAXFX1	0.0050	mg/L	**119**	±10.0 %	**23.4**	±10.0 %	**98.0**	±10.0 %
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----

(Preliminary Report)

Sub-Matrix: **GROUNDWATER**

			Client sample ID	GK-4		GK-6		GK-10	
			Laboratory sample ID	PR16A0735001		PR16A0735002		PR16A0735003	
			Client sampling date / time	27-NOV-2016 00:00		26-NOV-2016 00:00		24-NOV-2016 00:00	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0022**	±10.0 %	<0.0040	----	<0.0020	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0178**	±10.0 %	**0.0150**	±10.0 %	<0.0020	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0050	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.0045**	±10.0 %	**0.0648**	±10.0 %	**0.0361**	±10.0 %
Magnesium	W-METAXFX1	0.0030	mg/L	**39.9**	±10.0 %	**26.9**	±10.0 %	**40.7**	±10.0 %
Manganese	W-METAXFX1	0.00050	mg/L	**0.00142**	±10.0 %	**0.0331**	±10.0 %	**0.0538**	±10.0 %
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	<0.010	----
Molybdenum	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Phosphorus	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Potassium	W-METAXFX1	0.015	mg/L	**2.19**	±10.0 %	**1.71**	±10.0 %	**1.23**	±10.0 %
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----
Sodium	W-METAXFX1	0.030	mg/L	**83.8**	±10.0 %	**597**	±10.0 %	**16.6**	±10.0 %
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Vanadium	W-METAXFX1	0.0010	mg/L	**0.0014**	±10.1 %	<0.0020	----	**0.0012**	±10.1 %
Zinc	W-METAXFX1	0.0020	mg/L	**0.0029**	±10.0 %	<0.0040	----	**0.0052**	±10.0 %
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0050	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0523**	±10.0 %	**0.00744**	±10.0 %	**0.00577**	±10.0 %
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00040	----	<0.00020	----
Boron	W-METAXFL1	0.010	mg/L	**0.150**	±10.0 %	**0.456**	±10.0 %	**0.014**	±10.0 %
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00080	----	<0.00040	----
Calcium	W-METAXFL1	0.0050	mg/L	**119**	±10.0 %	**23.5**	±10.0 %	**102**	±10.0 %
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----
Cobalt	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<0.40	----	<0.40	----
Iron	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	<0.0050	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.0031**	±10.0 %	**0.0682**	±10.0 %	**0.0368**	±10.0 %
Magnesium	W-METAXFL1	0.0030	mg/L	**39.8**	±10.0 %	**27.0**	±10.0 %	**42.4**	±10.0 %
Manganese	W-METAXFL1	0.00050	mg/L	**0.00075**	±10.1 %	**0.0304**	±10.0 %	<0.00050	----
Molybdenum	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	<0.0020	----
Phosphorus	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Potassium	W-METAXFL1	0.015	mg/L	**1.87**	±10.0 %	**1.42**	±10.0 %	**1.11**	±10.0 %
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----
Sodium	W-METAXFL1	0.030	mg/L	**84.1**	±10.0 %	**616**	±10.0 %	**17.7**	±10.0 %
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	<0.010	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	<0.0010	----
Zinc	W-METAXFL1	0.0020	mg/L	**0.0020**	±10.0 %	<0.0040	----	**0.0042**	±10.0 %

Sub-Matrix: **GROUNDWATER**

			Client sample ID	GK-12		GK-13		----	
			Laboratory sample ID	PR16A0735004		PR16A0735005		----	
			Client sampling date / time	02-DEC-2016 00:00		06-DEC-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Physical Parameters									
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m	**104**	±10.0 %	**660**	±10.0 %	----	----
pH Value	W-PH-PCT	1.00	-	**7.75**	±1.0 %	**7.75**	±1.0 %	----	----
Agregate Parameters									
Total Organic Carbon	W-TOC-IR	0.50	mg/L	<0.50	----	**1.03**	±20.0 %	----	----

Sub-Matrix: **GROUNDWATER**			*Client sample ID*	**GK-12**		**GK-13**		----	
			Laboratory sample ID	*PR16A0735004*		*PR16A0735005*		----	
			Client sampling date / time	02-DEC-2016 00:00		06-DEC-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Agregate Parameters - Continued									
Hardness	W-HARD-FX	0.00020	mmol/L	**5.02**	----	**4.52**	----	----	----
Calcium Hardness	W-HARD-FX	0.00020	mmol/L	**2.85**	----	**2.44**	----	----	----
Magnesium Hardness	W-HARD-FX	0.00020	mmol/L	**2.17**	----	**2.08**	----	----	----
Hardness as CaCO3	W-HARD-FX	0.020	mg CaCO3/L	**502**	----	**452**	----	----	----
Nonmetallic Inorganic Parameters									
Ammonia (free)	W-NH3-CC2	0.010	mg/L	**0.010**	----	**0.020**	----	----	----
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**0.243**	±15.0 %	**0.631**	±15.0 %	----	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**0.314**	±15.0 %	**0.812**	±15.0 %	----	----
Bromide	W-BR-IC	0.50	mg/L	<0.50	----	**3.14**	±20.0 %	----	----
Chemical Oxygen Demand (COD-Cr)	W-COD-SPC	5.0	mg/L	**23.0**	±17.2 %	**7.0**	±22.1 %	----	----
Chloride	W-CL-IC	1.00	mg/L	**8.28**	±15.0 %	**752**	±15.0 %	----	----
Dissolved Oxygen	W-O2D-ELE	0.20	mg/L	**5.92**	±30.0 %	**3.01**	±30.0 %	----	----
Easily released cyanides	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Fluoride	W-F-IC	0.200	mg/L	**0.221**	±15.0 %	**0.500**	±15.0 %	----	----
Inorganic Nitrogen as N	W-NING-CC	0.500	mg/L	<0.500	----	**2.34**	----	----	----
Nitrates	W-NO3-SPC	0.27	mg/L	<0.27	----	**6.49**	----	----	----
Nitrite + Nitrate as N	W-NNO-SPC	0.060	mg/L	<0.060	----	**1.71**	±20.0 %	----	----
Nitrites	W-NO2-SPC	0.0050	mg/L	<0.0050	----	**0.817**	±15.0 %	----	----
Organic Nitrogen as N	W-NORG-CC	0.50	mg/L	**0.68**	----	<0.50	----	----	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**214**	±15.0 %	**1920**	±15.0 %	----	----
Total Cyanide	W-CNT-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**0.92**	±41.4 %	**1.00**	±38.9 %	----	----
Total Nitrogen as N	W-NTOT-CC	1.0	mg/L	<1.0	----	**2.7**	----	----	----
Ammonia (free) as N	W-NH3-CC2	0.010	mg/L	<0.010	----	**0.016**	----	----	----
Free Cyanide	W-CNF-PHO	0.005	mg/L	<0.005	----	<0.005	----	----	----
Nitrate as N	W-NO3-SPC	0.060	mg/L	<0.060	----	**1.46**	----	----	----
Nitrite as N	W-NO2-SPC	0.0020	mg/L	<0.0020	----	**0.248**	±15.0 %	----	----
Oxygen Saturation	W-O2D-ELE	1	%	**54**	±30.0 %	**27**	±30.0 %	----	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**692**	±9.7 %	**4470**	±9.6 %	----	----
Suspended solids dried at 105 °C	W-TSS-GR	5.0	mg/L	**947**	±10.0 %	**214**	±10.1 %	----	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**348**	±12.0 %	**492**	±12.0 %	----	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	----	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	<2.0	----	----	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**348**	----	**492**	----	----	----
Total Metals / Major Cations									
Aluminium	W-METAXFX1	0.010	mg/L	**0.224**	±10.0 %	**0.098**	±10.0 %	----	----
Antimony	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Arsenic	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0100	----	----	----
Barium	W-METAXFX1	0.00050	mg/L	**0.0277**	±10.0 %	**0.0169**	±10.0 %	----	----
Beryllium	W-METAXFX1	0.00020	mg/L	<0.00020	----	<0.00040	----	----	----
Boron	W-METAXFX1	0.010	mg/L	**0.623**	±10.0 %	**2.63**	±10.0 %	----	----
Cadmium	W-METAXFX1	0.00040	mg/L	<0.00040	----	<0.00080	----	----	----
Calcium	W-METAXFX1	0.0050	mg/L	**114**	±10.0 %	**97.7**	±10.0 %	----	----
Chromium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Cobalt	W-METAXFX1	0.0020	mg/L	**0.0137**	±10.0 %	<0.0040	----	----	----
Copper	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Iron	W-METAXFX1	0.0020	mg/L	**0.0801**	±10.0 %	**0.108**	±10.0 %	----	----
Lead	W-METAXFX1	0.0050	mg/L	<0.0050	----	<0.0100	----	----	----
Lithium	W-METAXFX1	0.0010	mg/L	**0.125**	±10.0 %	**0.123**	±10.0 %	----	----
Magnesium	W-METAXFX1	0.0030	mg/L	**52.9**	±10.0 %	**50.6**	±10.0 %	----	----
Manganese	W-METAXFX1	0.00050	mg/L	**0.330**	±10.0 %	**0.00298**	±10.0 %	----	----
Mercury	W-HG-AFSFX	0.010	µg/L	<0.010	----	<0.010	----	----	----
Molybdenum	W-METAXFX1	0.0020	mg/L	**0.0094**	±10.0 %	<0.0040	----	----	----

Sub-Matrix: **GROUNDWATER**			*Client sample ID*	**GK-12**		**GK-13**		----	
			Laboratory sample ID	*PR16A0735004*		*PR16A0735005*		----	
			Client sampling date / time	02-DEC-2016 00:00		06-DEC-2016 00:00		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**----**	**----**
Total Metals / Major Cations - Continued									
Nickel	W-METAXFX1	0.0020	mg/L	<0.0020	----	<0.0040	----	----	----
Potassium	W-METAXFX1	0.015	mg/L	**5.97**	±10.0 %	**9.01**	±10.0 %	----	----
Selenium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Silver	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Sodium	W-METAXFX1	0.030	mg/L	**66.4**	±10.0 %	**1460**	±10.0 %	----	----
Thallium	W-METAXFX1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Vanadium	W-METAXFX1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Zinc	W-METAXFX1	0.0020	mg/L	**1.64**	±10.0 %	<0.0040	----	----	----
Dissolved Metals / Major Cations									
Aluminium	W-METAXFL1	0.010	mg/L	**0.014**	±10.0 %	**0.028**	±10.0 %	----	----
Antimony	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Arsenic	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	----	----
Barium	W-METAXFL1	0.00050	mg/L	**0.0263**	±10.0 %	**0.0160**	±10.0 %	----	----
Beryllium	W-METAXFL1	0.00020	mg/L	<0.00020	----	<0.00040	----	----	----
Boron	W-METAXFL1	0.010	mg/L	**0.439**	±10.0 %	**1.89**	±10.0 %	----	----
Cadmium	W-METAXFL1	0.00040	mg/L	<0.00040	----	<0.00080	----	----	----
Calcium	W-METAXFL1	0.0050	mg/L	**112**	±10.0 %	**94.9**	±10.0 %	----	----
Chromium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Cobalt	W-METAXFL1	0.0020	mg/L	**0.0128**	±10.0 %	<0.0040	----	----	----
Copper	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	----	----
Hexavalent Chromium - Soluble	W-CR6-IC	0.40	µg/L	<0.40	----	<4.00	----	----	----
Iron	W-METAXFL1	0.0020	mg/L	**0.0041**	±10.0 %	<0.0040	----	----	----
Lead	W-METAXFL1	0.0050	mg/L	<0.0050	----	<0.0100	----	----	----
Lithium	W-METAXFL1	0.0010	mg/L	**0.124**	±10.0 %	**0.123**	±10.0 %	----	----
Magnesium	W-METAXFL1	0.0030	mg/L	**52.1**	±10.0 %	**48.9**	±10.0 %	----	----
Manganese	W-METAXFL1	0.00050	mg/L	**0.323**	±10.0 %	**0.00110**	±10.0 %	----	----
Molybdenum	W-METAXFL1	0.0020	mg/L	**0.0094**	±10.0 %	<0.0040	----	----	----
Nickel	W-METAXFL1	0.0020	mg/L	<0.0020	----	<0.0040	----	----	----
Potassium	W-METAXFL1	0.015	mg/L	**5.85**	±10.0 %	**8.70**	±10.0 %	----	----
Selenium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Silver	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Sodium	W-METAXFL1	0.030	mg/L	**66.2**	±10.0 %	**1440**	±10.0 %	----	----
Thallium	W-METAXFL1	0.010	mg/L	<0.010	----	<0.020	----	----	----
Vanadium	W-METAXFL1	0.0010	mg/L	<0.0010	----	<0.0020	----	----	----
Zinc	W-METAXFL1	0.0020	mg/L	**1.59**	±10.0 %	<0.0040	----	----	----

If the client does not specify the date and time of sample collection, the laboratory will specify the date on sample delivery in parentheses, instead. If the time of sample collection is specified as 0:00 it means that the client did specify the date but not the time. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1, SM2320) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO 2 forms by calculation from measured values including the calculation of total mineralization.
W-BR-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-CL-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.

Analytical Methods	*Method Descriptions*
W-CNF-PHO	CZ_SOP_D06_02_090.A (CSN ISO 6703-2, CSN EN ISO 14403-2, SM 4500 CN) Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry/ CZ_SOP_D06_07_011 (CSN ISO 6703-2) Determination of easily releasable cyanide (free cyanide) by spectrophotometry.
W-CNT-PHO	CZ_SOP_D06_02_089.A (CSN 75 7415, CSN EN ISO 14403-2)/ CZ_SOP_D06_07_010 (CSN 75 7415) Determination of total cyanide by spectrophotometry and determination of complex-forming cyanides by calculation from measure values.
W-COD-SPC	CZ_SOP_D06_02_076 Determination of chemical oxygen demand using dichromate (COD-Cr) by photometry (based on CSN ISO 15705) / CZ_SOP_D06_02_076.A / CZ_SOP_D06_07_040 Determination of chemical oxygen demand using dichromate (COD-Cr) by titration (based on CSN ISO 6060, CSN ISO 15705) .
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-CR6-IC	CZ_SOP_D06_02_122 except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (CSN EN 16192, EPA 7199, SM 3500-Cr) Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and trivalent chromium determination by calculation from measured values.
W-F-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-HARD-FX	CZ_SOP_D06_02_J06 Stoichiometric calculations and calculations of inorganic parameters from measured values by accredited methods. Calculation of total hardness as a sum of calcium and magnesium.
W-HG-AFSFX	CZ_SOP_D06_02_096 (US EPA 245.7, US EPA 1631, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was fixed by nitric acid addition prior to analysis.
W-METAXFL1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was filtered by microfilter with porosity 0.45 µm followed by nitric acid addition prior to analysis.
W-METAXFX1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was fixed by nitric acid addition prior to analysis.
W-NH3-CC2	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NING-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NNO-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO2-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO3-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NORG-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NTOT-CC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-O2D-ELE	CZ_SOP_D06_07_044 (CSN EN ISO 5814) Determination of dissolved oxygen by electrochemical method.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).

Analytical Methods	*Method Descriptions*
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-TDS-GR	CZ_SOP_D06_02_071 Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express), (based on CSN 757346, CSN 757347, CSN EN 16192).
W-TOC-IR	CZ_SOP_D06_02_056 Determination of total organic carbon (TOC), dissolved organic carbon (DOC), total inorganic carbon (TIC) and total carbon (TC) by IR detection (based on CSN EN 1484, CSN EN 16192, SM 5310).
W-TSS-GR	CZ_SOP_D06_02_070 Determination of dry suspended solids and annealed suspended solids by gravimetry and determination of loos of ignition of suspended solids and total solids by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express) (based on CSN EN 872, CSN 757350)

A `*` symbol preceeding any method indicates non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information.
The calculation methods of summation parameters are available on request in the client service.

QUALITY CONTROL REPORT

Work Order	: **PR16A0735**	Page	: 1 of 14
Amendment	: **(Preliminary Report)**		
Client	: **ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: Tevfik Kaan Duz	Contact	: Client Service
Address	: AECOM Turkey Dan ve Muh Ltd Sti Mustafa Kemal Mah. Dumlupinar Bulvari Tepe Prime No: 266 B Blok No: 50-51 Cankaya Ankara Turkey 06800	Address	: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00
E-mail	: kaan.duz@aecom.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: Sampling for Acacia Maden A S	QC Level	: ALS CR Standard Quality Control Schedule
Site	: MO_TKD, Hanonu		
C-O-C number	: ----	Date Samples Received	: 13-DEC-2016
Sampled by	: Client	Issue Date	: 23-DEC-2016 14:26
Order number	: ----		
		No. of samples received	: 5
Quote number	: AECOM BQ	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

ZKUŠEBNÍ LABORATOŘ AKREDITOVANÁ ČIA
TESTING LABORATORY ACCREDITED BY CAI
ALS Czech Republic, s.r.o.
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Testing Laboratory
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ilac-MRA

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Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*
Zdenek Jirak	Environmental Business Unit Manager

General Comments

The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO, CEN and APHA. In house developed procedures are employed in the absence of documented standards or by client request.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting (LOQ of analytical method or higher)
RPD = Relative Percentage Difference
# = Indicates failed QC

(Preliminary Report)

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity. The permitted ranges for the Relative Percentage Difference (RPD) of Laboratory Duplicates are specified in internal ALS documents.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Physical Parameters (QC Lot: 4384387)								
PR16A0870-001	Anonymous	W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	414	414	0.0
Physical Parameters (QC Lot: 4384388)								
PR16A0870-001	Anonymous	W-PH-PCT: pH Value	----	1.00	-	6.92	6.90	0.3
Agregate Parameters (QC Lot: 4385322)								
PR16A1188-005	Anonymous	W-TOC-IR: Total Organic Carbon	----	0.50	mg/L	0.72	0.76	5.4
Nonmetallic Inorganic Parameters (QC Lot: 4383935)								
PR16A0600-001	Anonymous	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	6.39	6.47	1.2
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	14.6	14.8	1.2
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	19.6	19.8	1.2
Nonmetallic Inorganic Parameters (QC Lot: 4384004)								
PR1699378-001	Anonymous	W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	532	533	0.2
Nonmetallic Inorganic Parameters (QC Lot: 4384214)								
PR16A0887-001	Anonymous	W-BR-IC: Bromide	24959-67-9	0.50	mg/L	<0.50	<0.50	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384363)								
PR16A0742-007	Anonymous	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	287	286	0.3
Nonmetallic Inorganic Parameters (QC Lot: 4384366)								
PR16A0871-001	Anonymous	W-F-IC: Fluoride	16984-48-8	0.200	mg/L	<0.200	0.200	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384367)								
PR16A0871-001	Anonymous	W-CL-IC: Chloride	16887-00-6	1.00	mg/L	32.5	33.9	4.4
Nonmetallic Inorganic Parameters (QC Lot: 4384389)								
PR1694275-004	Anonymous	W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	0.162	0.165	2.1
Nonmetallic Inorganic Parameters (QC Lot: 4384390)								
PR16A0735-001	GK-4	W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	<0.005	0.0
		W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	<0.005	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384393)								
PR16A0887-001	Anonymous	W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	164	164	0.2
Nonmetallic Inorganic Parameters (QC Lot: 4384401)								
PR16A0735-004	GK-12	W-SO4-IC: Sulphate as SO4 2-	14808-79-8	5.00	mg/L	214	213	0.4
Nonmetallic Inorganic Parameters (QC Lot: 4384431)								
PR16A0735-001	GK-4	W-NH4-SPC: Ammonia and ammonium ions as N	----	0.040	mg/L	<0.040	<0.040	0.0
		W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.050	mg/L	<0.050	<0.050	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384432)								

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Nonmetallic Inorganic Parameters (QC Lot: 4384432) - continued								
PR16A0735-001	GK-4	W-NO2-SPC: Nitrite as N	14797-65-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-NO2-SPC: Nitrites	14797-65-0	0.0050	mg/L	<0.0050	0.0058	14.6
Nonmetallic Inorganic Parameters (QC Lot: 4384433)								
PR16A0735-001	GK-4	W-NNO-SPC: Nitrite + Nitrate as N	----	0.060	mg/L	7.85	8.18	4.1
Nonmetallic Inorganic Parameters (QC Lot: 4384435)								
PR16A0735-003	GK-10	W-PTOT-SPC: Total Phosphorus as P	----	0.010	mg/L	<0.010	<0.010	0.0
		W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	<0.023	0.0
		W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.040	mg/L	<0.040	<0.040	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384782)								
PR16A0735-001	GK-4	W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	<5.0	0.0
Nonmetallic Inorganic Parameters (QC Lot: 4384783)								
PR16A0553-001	Anonymous	W-O2D-ELE: Oxygen Saturation	----	1	%	72	72	0.0
		W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	6.18	6.15	0.5
Nonmetallic Inorganic Parameters (QC Lot: 4386469)								
PR16A1365-001	Anonymous	W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	41.8	42.3	1.2
Total Metals / Major Cations (QC Lot: 4385247)								
PR16A0452-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	0.010	µg/L	<0.010	<0.010	0.0
Total Metals / Major Cations (QC Lot: 4385297)								
PR16A1259-001	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.103	0.102	0.2
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.267	0.268	0.1
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0191	0.0191	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.161	0.164	1.9
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	25.5	25.6	0.3
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	135	135	0.09
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	0.123	0.127	3.7
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
				Laboratory Duplicate (DUP) Report				
Total Metals / Major Cations (QC Lot: 4385297) - continued								
PR16A1259-001	Anonymous	W-METAXFX1: Boron	7440-42-8	0.010	mg/L	0.030	0.029	0.0
		W-METAXFX1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	1.68	1.62	3.6
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	11.3	11.3	0.6
Total Metals / Major Cations (QC Lot: 4387529)								
PR16A2155-005	Anonymous	W-METAXFX1: Aluminium	7429-90-5	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Antimony	7440-36-0	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Arsenic	7440-38-2	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Barium	7440-39-3	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Beryllium	7440-41-7	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Boron	7440-42-8	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Cadmium	7440-43-9	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Calcium	7440-70-2	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Chromium	7440-47-3	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Cobalt	7440-48-4	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Copper	7440-50-8	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Iron	7439-89-6	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Lead	7439-92-1	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Lithium	7439-93-2	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Magnesium	7439-95-4	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Manganese	7439-96-5	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Molybdenum	7439-98-7	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Nickel	7440-02-0	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Potassium	7440-09-7	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Selenium	7782-49-2	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Silver	7440-22-4	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Sodium	7440-23-5	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Thallium	7440-28-0	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Vanadium	7440-62-2	----	-	Not Authorised	# Not Authorised	# ----
		W-METAXFX1: Zinc	7440-66-6	----	-	Not Authorised	# Not Authorised	# ----
Total Metals / Major Cations (QC Lot: 4387553)								
PR1699932-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	1.00	µg/L	<1.00	<1.00	0.0
Total Metals / Major Cations (QC Lot: 4387554)								
PR16A2035-002	Anonymous	W-METAXFX1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFX1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFX1: Barium	7440-39-3	0.00050	mg/L	0.00701	0.00761	8.2
		W-METAXFX1: Manganese	7439-96-5	0.00050	mg/L	0.0501	0.0506	1.0
		W-METAXFX1: Chromium	7440-47-3	0.0010	mg/L	0.0187	0.0184	1.5

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report				
				LOR	Unit	Original Result	Duplicate Result	RPD (%)
Total Metals / Major Cations (QC Lot: 4387554) - continued								
PR16A2035-002	Anonymous	W-METAXFX1: Copper	7440-50-8	0.0010	mg/L	0.0041	0.0042	0.0
		W-METAXFX1: Lithium	7439-93-2	0.0010	mg/L	0.0241	0.0242	0.0
		W-METAXFX1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFX1: Iron	7439-89-6	0.0020	mg/L	0.0616	0.0639	3.7
		W-METAXFX1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFX1: Zinc	7440-66-6	0.0020	mg/L	0.887	0.940	5.8
		W-METAXFX1: Magnesium	7439-95-4	0.0030	mg/L	0.351	0.359	2.2
		W-METAXFX1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Calcium	7440-70-2	0.0050	mg/L	0.198	0.204	3.4
		W-METAXFX1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFX1: Aluminium	7429-90-5	0.010	mg/L	21.9	22.1	0.6
		W-METAXFX1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Boron	7440-42-8	0.010	mg/L	13.8	13.6	1.4
		W-METAXFX1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	92.5	94.3	2.0
		W-METAXFX1: Sodium	7440-23-5	0.030	mg/L	20.0	20.0	0.0
Dissolved Metals / Major Cations (QC Lot: 4384384)								
PR1694275-004	Anonymous	W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.40	µg/L	<40.0	<40.0	0.0
Dissolved Metals / Major Cations (QC Lot: 4385228)								
PR16A0735-001	GK-4	W-METAXFL1: Beryllium	7440-41-7	0.00020	mg/L	<0.00020	<0.00020	0.0
		W-METAXFL1: Cadmium	7440-43-9	0.00040	mg/L	<0.00040	<0.00040	0.0
		W-METAXFL1: Barium	7440-39-3	0.00050	mg/L	0.0523	0.0531	1.6
		W-METAXFL1: Manganese	7439-96-5	0.00050	mg/L	0.00075	0.00082	8.9
		W-METAXFL1: Chromium	7440-47-3	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Lithium	7439-93-2	0.0010	mg/L	0.0031	0.0031	0.0
		W-METAXFL1: Silver	7440-22-4	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Vanadium	7440-62-2	0.0010	mg/L	<0.0010	<0.0010	0.0
		W-METAXFL1: Cobalt	7440-48-4	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Copper	7440-50-8	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Iron	7439-89-6	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Molybdenum	7439-98-7	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Nickel	7440-02-0	0.0020	mg/L	<0.0020	<0.0020	0.0
		W-METAXFL1: Zinc	7440-66-6	0.0020	mg/L	0.0020	<0.0020	0.0
		W-METAXFL1: Magnesium	7439-95-4	0.0030	mg/L	39.8	40.4	1.5
		W-METAXFL1: Arsenic	7440-38-2	0.0050	mg/L	<0.0050	<0.0050	0.0
		W-METAXFL1: Calcium	7440-70-2	0.0050	mg/L	119	122	2.6
		W-METAXFL1: Lead	7439-92-1	0.0050	mg/L	<0.0050	<0.0050	0.0

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
Dissolved Metals / Major Cations (QC Lot: 4385228) - continued								
PR16A0735-001	GK-4	W-METAXFL1: Aluminium	7429-90-5	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Antimony	7440-36-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Boron	7440-42-8	0.010	mg/L	0.150	0.148	1.3
		W-METAXFL1: Phosphorus	7723-14-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Selenium	7782-49-2	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Thallium	7440-28-0	0.010	mg/L	<0.010	<0.010	0.0
		W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	1.87	1.90	1.9
		W-METAXFL1: Sodium	7440-23-5	0.030	mg/L	84.1	87.0	3.4

(Preliminary Report)

Work Order : PR16A0735
Client : ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.
Project : Sampling for Acacia Maden A S

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method accuracy (both precision and trueness) independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Physical Parameters (QCLot: 4384387)							
W-CON-PCT: Electrical Conductivity @ 25°C	----	1.0	µS/cm	<1.0	100	96	106
Physical Parameters (QCLot: 4384388)							
W-PH-PCT: pH Value	----	1.00	-	----	99.8	99	101
Agregate Parameters (QCLot: 4385322)							
W-TOC-IR: Total Organic Carbon	----	0.5	mg/L	<0.50	97.2	80	120
Nonmetallic Inorganic Parameters (QCLot: 4383935)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	93.2	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	93.2	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	93.2	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384004)							
W-TDS-GR: Dissolved solids dried at 105 °C	----	10	mg/L	<10	100	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384214)							
W-BR-IC: Bromide	24959-67-9	0.19	mg/L	<0.19	106	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384363)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	99.0	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384366)							
W-F-IC: Fluoride	16984-48-8	0.06	mg/L	<0.060	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384367)							
W-CL-IC: Chloride	16887-00-6	0.07	mg/L	<0.070	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384389)							
W-CNT-PHO: Total Cyanide	57-12-5	0.005	mg/L	<0.005	92.8	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384390)							
W-CNF-PHO: Easily released cyanides	----	0.005	mg/L	<0.005	93.8	80	120
W-CNF-PHO: Free Cyanide	----	0.005	mg/L	<0.005	93.8	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384393)							
W-ALK-PCT: Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	----	0.8	mg CaCO3/L	<0.8	100	88	112
Nonmetallic Inorganic Parameters (QCLot: 4384401)							
W-SO4-IC: Sulphate as SO4 2-	14808-79-8	0.4	mg/L	<0.40	101	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384431)							
W-NH4-SPC: Ammonia and ammonium ions as NH4	----	0.02	mg/L	<0.020	100	85	115

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Recovery (%) LCS	Recovery (%) Low	Recovery (%) High
Nonmetallic Inorganic Parameters (QCLot: 4384431) - continued							
W-NH4-SPC: Ammonia and ammonium ions as N	----	0.016	mg/L	<0.016	99.6	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384432)							
W-NO2-SPC: Nitrites	14797-65-0	0.0030	mg/L	<0.0030	95.2	85	115
W-NO2-SPC: Nitrite as N	14797-65-0	0.0010	mg/L	<0.0010	95.4	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384433)							
W-NNO-SPC: Nitrite + Nitrate as N	----	0.400	mg/L	<0.400	110	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384435)							
W-PTOT-SPC: Phosphorus (as P2O5)	1314-56-3	0.023	mg/L	<0.023	97.4	80	120
W-PTOT-SPC: Total Phosphorus as P	----	0.01	mg/L	<0.010	97.4	80	120
W-PTOT-SPC: Total Phosphorus as PO4 3-	----	0.04	mg/L	<0.040	97.4	80	120
Nonmetallic Inorganic Parameters (QCLot: 4384782)							
W-COD-SPC: Chemical Oxygen Demand (COD-Cr)	----	5.0	mg/L	<5.0	108	85	115
Nonmetallic Inorganic Parameters (QCLot: 4384783)							
W-O2D-ELE: Dissolved Oxygen	----	0.20	mg/L	<0.20	----	----	----
W-O2D-ELE: Oxygen Saturation	----	1.0	%	<1	----	----	----
Nonmetallic Inorganic Parameters (QCLot: 4386469)							
W-NKJ-PHO: Total Kjeldahl Nitrogen as N	----	0.50	mg/L	<0.50	99.2	80	120
Total Metals / Major Cations (QCLot: 4385247)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	----	93.0	80	120
Total Metals / Major Cations (QCLot: 4385297)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	94.8	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	94.4	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	98.5	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	96.9	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	98.9	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	91.7	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	95.7	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	99.4	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	90.0	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	92.6	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	97.5	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	91.4	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	94.8	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	98.0	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	96.1	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	98.8	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	90.8	80	120

(Preliminary Report)

Work Order : PR16A0735
Client : ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.
Project : Sampling for Acacia Maden A S

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4385297) - continued							
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	99.0	80	120
W-METAXFX1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	99.8	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	99.3	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	102	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	98.7	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	98.4	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	98.4	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	93.0	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	95.8	80	120
Total Metals / Major Cations (QCLot: 4387513)							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	----	# Not Authorised	80	120
Total Metals / Major Cations (QCLot: 4387529)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	Not Authorised	# Not Authorised	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	Not Authorised	# Not Authorised	80	120
Total Metals / Major Cations (QCLot: 4387553)							

(Preliminary Report)

Work Order : PR16A0735
Client : ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.
Project : Sampling for Acacia Maden A S

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
				Result	LCS	Low	High
Total Metals / Major Cations (QCLot: 4387553) - continued							
W-HG-AFSFX: Mercury	7439-97-6	0.01	µg/L	----	102	80	120
Total Metals / Major Cations (QCLot: 4387554)							
W-METAXFX1: Aluminium	7429-90-5	0.01	mg/L	<0.010	97.7	80	120
W-METAXFX1: Antimony	7440-36-0	0.01	mg/L	<0.010	98.3	80	120
W-METAXFX1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	107	80	120
W-METAXFX1: Barium	7440-39-3	0.0005	mg/L	<0.00050	108	80	120
W-METAXFX1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	98.3	80	120
W-METAXFX1: Boron	7440-42-8	0.01	mg/L	<0.010	100	80	120
W-METAXFX1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	101	80	120
W-METAXFX1: Calcium	7440-70-2	0.005	mg/L	<0.0050	98.9	80	120
W-METAXFX1: Chromium	7440-47-3	0.001	mg/L	<0.0010	104	80	120
W-METAXFX1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	101	80	120
W-METAXFX1: Copper	7440-50-8	0.001	mg/L	<0.0010	104	80	120
W-METAXFX1: Iron	7439-89-6	0.002	mg/L	<0.0020	108	80	120
W-METAXFX1: Lead	7439-92-1	0.005	mg/L	<0.0050	101	80	120
W-METAXFX1: Lithium	7439-93-2	0.001	mg/L	<0.0010	93.1	80	120
W-METAXFX1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	103	80	120
W-METAXFX1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	108	80	120
W-METAXFX1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	108	80	120
W-METAXFX1: Nickel	7440-02-0	0.002	mg/L	<0.0020	98.2	80	120
W-METAXFX1: Potassium	7440-09-7	0.015	mg/L	<0.015	100	80	120
W-METAXFX1: Selenium	7782-49-2	0.01	mg/L	<0.010	108	80	120
W-METAXFX1: Silver	7440-22-4	0.001	mg/L	<0.0010	95.8	80	120
W-METAXFX1: Sodium	7440-23-5	0.03	mg/L	<0.030	99.8	80	120
W-METAXFX1: Thallium	7440-28-0	0.01	mg/L	<0.010	98.6	80	120
W-METAXFX1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	108	80	120
W-METAXFX1: Zinc	7440-66-6	0.002	mg/L	<0.0020	98.4	80	120
Dissolved Metals / Major Cations (QCLot: 4384384)							
W-CR6-IC: Hexavalent Chromium - Soluble	18540-29-9	0.4	µg/L	<0.40	101	90	110
Dissolved Metals / Major Cations (QCLot: 4385228)							
W-METAXFL1: Aluminium	7429-90-5	0.01	mg/L	<0.010	99.3	80	120
W-METAXFL1: Antimony	7440-36-0	0.01	mg/L	<0.010	103	80	120
W-METAXFL1: Arsenic	7440-38-2	0.005	mg/L	<0.0050	93.5	80	120
W-METAXFL1: Barium	7440-39-3	0.0005	mg/L	<0.00050	99.8	80	120
W-METAXFL1: Beryllium	7440-41-7	0.0002	mg/L	<0.00020	91.2	80	120
W-METAXFL1: Boron	7440-42-8	0.01	mg/L	<0.010	102	80	120
W-METAXFL1: Cadmium	7440-43-9	0.0004	mg/L	<0.00040	98.9	80	120
W-METAXFL1: Calcium	7440-70-2	0.005	mg/L	<0.0050	90.4	80	120

(Preliminary Report)

Work Order : PR16A0735

Client : ARTEK MUHENDISLIK CEVRE OLCUM VE DANISMANLIK HIZM. TIC. A.S.

Project : Sampling for Acacia Maden A S

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
					Recovery (%)	Recovery (%)	
Method: Compound	CAS Number	LOR	Unit	Result	LCS	Low	High
Dissolved Metals / Major Cations (QCLot: 4385228) - continued							
W-METAXFL1: Chromium	7440-47-3	0.001	mg/L	<0.0010	93.3	80	120
W-METAXFL1: Cobalt	7440-48-4	0.002	mg/L	<0.0020	95.6	80	120
W-METAXFL1: Copper	7440-50-8	0.002	mg/L	<0.0020	90.5	80	120
W-METAXFL1: Iron	7439-89-6	0.002	mg/L	<0.0020	95.4	80	120
W-METAXFL1: Lead	7439-92-1	0.005	mg/L	<0.0050	97.8	80	120
W-METAXFL1: Lithium	7439-93-2	0.001	mg/L	<0.0010	98.3	80	120
W-METAXFL1: Magnesium	7439-95-4	0.003	mg/L	<0.0030	91.1	80	120
W-METAXFL1: Manganese	7439-96-5	0.0005	mg/L	<0.00050	91.4	80	120
W-METAXFL1: Molybdenum	7439-98-7	0.002	mg/L	<0.0020	92.6	80	120
W-METAXFL1: Nickel	7440-02-0	0.002	mg/L	<0.0020	99.1	80	120
W-METAXFL1: Phosphorus	7723-14-0	0.01	mg/L	<0.010	101	80	120
W-METAXFL1: Potassium	7440-09-7	0.015	mg/L	<0.015	99.9	80	120
W-METAXFL1: Selenium	7782-49-2	0.01	mg/L	<0.010	91.7	80	120
W-METAXFL1: Silver	7440-22-4	0.001	mg/L	<0.0010	101	80	120
W-METAXFL1: Sodium	7440-23-5	0.03	mg/L	<0.030	99.1	80	120
W-METAXFL1: Thallium	7440-28-0	0.01	mg/L	<0.010	90.1	80	120
W-METAXFL1: Vanadium	7440-62-2	0.001	mg/L	<0.0010	94.5	80	120
W-METAXFL1: Zinc	7440-66-6	0.002	mg/L	<0.0020	98.2	80	120

(Preliminary Report)

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Recovery (%): MS	Recovery (%): Low	Recovery (%): High
Total Metals / Major Cations (QCLot: 4385247)							
PR16A0452-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	1 µg/L	98.7	70	130
Total Metals / Major Cations (QCLot: 4387513)							
PR1696818-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	----	# Not Authorised	70	130
Total Metals / Major Cations (QCLot: 4387553)							
PR1699932-001	Anonymous	W-HG-AFSFX: Mercury	7439-97-6	1 µg/L	95.7	70	130

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