## 1. Scope and Application

### 1.1 Analytes
Calcium, Magnesium, Aluminum, Silicon, Sodium, and Potassium

### 1.2 Reporting Limit
- Calcium: 2.0 µmol Ca\(^{2+}\)/L
- Magnesium: 1.0 µmol Mg\(^{2+}\)/L
- Aluminum: 1.0 µmol Al\(^{3+}\)/L
- Silicon: 6.0 µmol Si\(^{4+}\)/L
- Sodium: 1.0 µmol Na\(^+\)/L
- Potassium: 1.0 µmol K\(^+\)/L

### 1.3 Applicable Matrices
This method is used to determine the concentrations of Ca, Mg, Al, Si, Na, and K in precipitation, dilute surface waters and soil waters in both filtered and unfiltered samples.

### 1.4 Dynamic Range
The analytical range for the determination of calcium is from 1.0 µmol Ca\(^{2+}\)/L to 200.2 µmol Ca\(^{2+}\)/L. The analytical range for the determination of magnesium is from 0.5 µmol Mg\(^{2+}\)/L to 82.3 µmol Mg\(^{2+}\)/L. The analytical range for the determination of aluminum is from 0.5 µmol Al\(^{3+}\)/L to 7.40 µmol Al\(^{3+}\)/L. The analytical range for the determination of silicon is from 3.0 µmol Si\(^{4+}\)/L to 142.4 µmol Si\(^{4+}\)/L. The analytical range for the determination of sodium is from 0.5 µmol Na\(^+\)/L to 217.5 µmol Na\(^+\)/L. The analytical range for the determination of potassium is from 0.5 µmol K\(^+\)/L to 51.6 µmol K\(^+\)/L. Sample concentrations that exceed these ranges must be diluted and reanalyzed. Sample concentrations below the reporting limit are flagged "<" in the Laboratory Information Management System (LIMS).

## 2. Summary of Procedure
This analysis is performed by inductively coupled plasma – optical emission spectrometry. Samples are aspirated through a nebulizer and carried to the plasma. The concentration of the element is proportional to the intensity of light emitted as excited electrons return to ground state.

## 3. Safety Issues
### 3.1 Chemical Hazards
A. All strong acids and bases should be mixed in a fume hood.
B. Gloves, safety glasses, and lab coats should be worn when preparing and performing this analysis.
C. For proper handling techniques for specific chemicals, consult the appropriate Safety Data Sheets (SDS).

3.2 Miscellaneous
In case of malfunction, push the red emergency shut off button located on the front of the instrument.

4. Sample Preservation, Containers, Processing and Analysis Times

4.1 Sample Preservation
Samples are unfiltered or filtered through a 0.4-μm polycarbonate filter and are preserved with 0.1 mL ultrapure nitric acid (30 mL sample) or 0.3 mL ultrapure nitric acid (60 mL sample).

4.2 Containers
Samples are stored in new 30-mL or 60-mL polyethylene bottles.

4.3 Processing and Analysis Times
Sample processing: one week
Lab analysis: six months
LIMS entry: one week

5. Reagents and Standards

5.1 General Information
All reagents are commercially purchased, reagent grade or higher quality, and should be stored in the original container. Date the reagent bottles when received and when opened. Note expiration date, if any. No verification of the reagents is necessary.

5.2 Reagents
A. Liquid Argon
   Commercially purchased liquid argon in an XL-45 tank.
B. Nitric Acid
   Use commercially purchased ultrapure nitric acid (HNO₃). Analyze each new lot for contaminants prior to use.
C. 1% Nitric Acid
   1. Fill a 2,000-mL volumetric flask with approximately 1000 mL of Milli-Q water.
   2. Add 20 mL of ultrapure HNO₃.
   3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
   4. Prepare as needed.

5.3 Standards
A. Calcium, Magnesium, Aluminum, Silicon, Sodium, and Potassium Stock Solutions, 1,000 mg Ca²⁺/L, 1,000 mg Mg²⁺/L, 1,000 mg Al³⁺/L, 1,000 mg Si⁴⁺/L, 1,000 mg Na⁺/L, 1,000 mg K⁺/L
   1. All stock solutions are purchased commercially.
2. The stock solutions are valid until the expiration date listed on the bottle.
3. To avoid contamination, aliquots of stock solution must not be withdrawn directly from bottle.
4. The solutions come with certificates of analysis from the provider.

B. Blank Standard
1. Fill a 500-mL volumetric flask with approximately 250 mL of Milli-Q water.
2. Add 0.5 mL ultrapure HNO₃.
3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
4. Store in a polyethylene bottle; label and date.
5. Prepare every six months.

C. Calcium, Magnesium, Aluminum, Silicon, Sodium, and Potassium Working Standard
1. Pipet desired amount of stock solutions into a 500-mL volumetric flask containing 250 mL Milli-Q water.
2. Add 0.5 mL ultrapure HNO₃.
3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
4. Store in a polyethylene bottle; label and date.
5. Record preparation date and lot numbers and expiration dates of stock solutions in the instrument notebook.
6. Prepare every six months.

<table>
<thead>
<tr>
<th>Stock Solution</th>
<th>Stock Added (mL)</th>
<th>Analyte Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>4.0</td>
<td>200.2 μmol/L (8.0 mg/L)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1.0</td>
<td>82.3 μmol/L (2.0 mg/L)</td>
</tr>
<tr>
<td>Silicon</td>
<td>2.0</td>
<td>142.4 μmol/L (4.0 mg/L)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.1</td>
<td>7.40 μmol/L (0.20 mg/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>2.5</td>
<td>217.5 μmol/L (5.0 mg/L)</td>
</tr>
<tr>
<td>Potassium</td>
<td>1.0</td>
<td>51.16 μmol/L (2.0 mg/L)</td>
</tr>
</tbody>
</table>

D. Calcium, Magnesium, Aluminum, Silicon, Sodium, and Potassium Quality-Control (QC) Stock Solutions, 1,000 mg Ca²⁺/L, 1,000 mg Mg²⁺/L, 1,000 mg Al³⁺/L, 1,000 mg Si⁴⁺/L, 1,000 mg Na⁺/L, 1,000 mg K⁺/L
1. All stock solutions are purchased commercially. This stock must be from a manufacturer or lot different from the standard stock.
2. The stock solutions are valid until the expiration date listed on the bottle.

Author: Tricia Lincoln    SME: Greg Lawrence    QA Officer: Noel Deyette    WSC Director: Gary Wall
3. To avoid contamination, aliquots of stock solutions must not be withdrawn directly from bottle.

4. The solutions come with certificates of analysis from the provider.

E. Calcium, Magnesium, Aluminum, Silicon, Sodium, and Potassium QC Samples
   1. Pipet desired amount of QC stock solutions into a 1,000-mL volumetric flask containing 500 mL Milli-Q water.
   2. Add 1.0 mL ultrapure HNO₃.
   3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
   4. Store in a polyethylene bottle; label and date.
   5. Record preparation date and lot numbers and expiration dates of stock solutions in the instrument notebook.
   6. Prepare every six months.

<table>
<thead>
<tr>
<th>QC-high Sample</th>
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<tbody>
<tr>
<td>Stock Solution</td>
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</tr>
<tr>
<td>Calcium</td>
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<tr>
<td>Magnesium</td>
</tr>
<tr>
<td>Silicon</td>
</tr>
<tr>
<td>Aluminum</td>
</tr>
<tr>
<td>Sodium</td>
</tr>
<tr>
<td>Potassium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QC-low Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Solution</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Calcium</td>
</tr>
<tr>
<td>Magnesium</td>
</tr>
<tr>
<td>Silicon</td>
</tr>
<tr>
<td>Aluminum</td>
</tr>
<tr>
<td>Sodium</td>
</tr>
<tr>
<td>Potassium</td>
</tr>
</tbody>
</table>

F. Instrument Performance Check Solution (IPC) Solution
   1. Pipet desired amount of standard stock solutions into a 500-mL volumetric flask containing about 250 mL Milli-Q water.
   2. Add 0.5 mL ultrapure HNO₃.
   3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
   4. Store in a polyethylene bottle; label and date.
5. Record preparation date and lot numbers and expiration dates of stock solutions in the instrument notebook.

6. Prepare every six months.

<table>
<thead>
<tr>
<th>Stock Solution</th>
<th>Stock Added (mL)</th>
<th>Analyte Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>4.0</td>
<td>200.2 ( \mu \text{mol/L} ) (8.0 mg/L)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1.0</td>
<td>82.3 ( \mu \text{mol/L} ) (2.0 mg/L)</td>
</tr>
<tr>
<td>Silicon</td>
<td>2.0</td>
<td>142.4 ( \mu \text{mol/L} ) (4.0 mg/L)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.1</td>
<td>7.40 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>2.5</td>
<td>217.5 ( \mu \text{mol/L} ) (5.0 mg/L)</td>
</tr>
<tr>
<td>Potassium</td>
<td>1.0</td>
<td>51.16 ( \mu \text{mol/L} ) (2.0 mg/L)</td>
</tr>
</tbody>
</table>

G. Laboratory Reagent Blank (LRB) Solution
1. Add 1.0 mL ultrapure HNO\(_3\) to a 1,000-mL volumetric flask containing about 750 mL Milli-Q water.
2. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
3. Store in a polyethylene bottle; label and date.
4. Prepare as needed or when a new lot of acid is received.

H. Laboratory Fortified Blank (LFB) Solution
1. Pipet desired amount of QC stock solutions into a 500-mL volumetric flask containing about 250 mL Milli-Q water.
2. Add 0.5 mL ultrapure HNO\(_3\).
3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
4. Store in a polyethylene bottle; label and date.
5. Prepare every six months.

<table>
<thead>
<tr>
<th>Stock Solution</th>
<th>Stock Added (mL)</th>
<th>Analyte Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>0.1</td>
<td>4.99 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.1</td>
<td>8.23 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.1</td>
<td>7.12 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.05</td>
<td>3.70 ( \mu \text{mol/L} ) (0.10 mg/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.1</td>
<td>8.70 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.1</td>
<td>5.11 ( \mu \text{mol/L} ) (0.20 mg/L)</td>
</tr>
</tbody>
</table>

I. Laboratory Fortified Matrix (LFM) Solution
1. Pipet desired amount of QC stock solutions into a 250-mL volumetric flask containing about 200 mL Milli-Q water.
2. Add 0.25 mL ultrapure HNO\(_3\).
3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
4. Store in a polyethylene bottle; label and date.
5. Prepare every six months.

<table>
<thead>
<tr>
<th>Stock Solution</th>
<th>Stock Added (mL)</th>
<th>Analyte Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>12.5</td>
<td>1248 μmol/L (50.0 mg/L)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>12.5</td>
<td>2057 μmol/L (50.0 mg/L)</td>
</tr>
<tr>
<td>Silicon</td>
<td>12.5</td>
<td>1780 μmol/L (50.0 mg/L)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>12.5</td>
<td>1853 μmol/L (50.0 mg/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>12.5</td>
<td>2175 μmol/L (50.0 mg/L)</td>
</tr>
<tr>
<td>Potassium</td>
<td>12.5</td>
<td>1279 μmol/L (50.0 mg/L)</td>
</tr>
</tbody>
</table>

J. Limit of Quantitation (LOQ) Solution
1. Pipet desired amount of standard stock solutions into a 1,000-mL volumetric flask containing about 500 mL Milli-Q water.
2. Add 1.0 mL ultrapure HNO₃.
3. Fill close to final volume with Milli-Q water, mix, then fill to final volume and mix again.
4. Store in a polyethylene bottle; label and date.
5. Prepare every six months.

<table>
<thead>
<tr>
<th>Stock Solution</th>
<th>Stock Added (mL)</th>
<th>Analyte Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>0.5</td>
<td>12.5 μmol/L (0.5 mg/L)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.15</td>
<td>6.2 μmol/L (0.15 mg/L)</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.5</td>
<td>17.8 μmol/L (0.5 mg/L)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.06</td>
<td>2.22 μmol/L (0.06 mg/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.15</td>
<td>6.5 μmol/L (0.15 mg/L)</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.15</td>
<td>3.8 μmol/L (0.15 mg/L)</td>
</tr>
</tbody>
</table>

6. Laboratory Performance
A. The Method Detection Limit (MDL) is determined annually for each analyte according to 40 CFR Part 136, Appendix B
B. The MDL is verified quarterly by analyzing two MDL spike samples to verify or adjust the existing MDL.
C. The Linear Dynamic Range (LDR) is verified annually for each analyte using the method specific LDR procedure.
D. A Laboratory Reagent Blank (LRB) comprised of Milli-Q water is analyzed once per run, directly after the first QCs after calibration. The result should be less than the instrument reporting limit.
E. A Rinse Blank comprised of a sample of the rinse reservoir solution is analyzed once per run, directly after the first QCs after calibration. The result should be less than the instrument reporting limit.

F. A Laboratory Fortified Blank (LFB) is analyzed daily. The LFB is comprised of an aliquot of Milli-Q water to which known quantities of analytes are added. Accuracy is calculated as percent recovery. The percent recovery is noted on the bench sheet. LFB results should be within 15 percent from the known concentration.

G. A Laboratory Fortified Matrix (LFM) sample is analyzed daily. The LFM is a duplicate aliquot of an environmental sample to which a known concentration of analyte is added. Percent recovery is calculated and recorded on the bench sheet. Recovery should be within 15 percent.

H. A Limit of Quantitation (LOQ) sample is analyzed daily to verify the calibration at the lower end of the curve. The LOQ is processed through the same preparation steps as an environmental sample. Accuracy is calculated as percent recovery. The percent recovery is noted on the bench sheet. LOQ results should be within 10 percent from the known concentration.

I. An Instrument Performance Check (IPC) solution is analyzed after each set of QCs. The IPC is comprised of Milli-Q water to which a known quantity of analyte is added using stock solution. The first IPC sample on the run should be within 5 percent from the known IPC concentration with a standard deviation less than 3 percent between four replicate readings, subsequent results should be within 10 percent from the known IPC concentration.

J. An environmental sample is analyzed in duplicate once per run. Duplicates should be within 10 percent difference between the samples. Only the first sample value of the duplicate is entered into the database.

7. QC Procedure

A. The standard curve is a linear plot of intensity vs. concentration using the blank and high standard. A new calibration is performed each day the instrument is run.

B. Quality-control samples are analyzed at the start of a run, after every 10 samples during the run, and at the end of the run.

C. A quality-control sample is acceptable if the analyzed value is within 10 percent of the known value of the QC sample.

D. If one of the QC samples fails the acceptance criteria, the QC sample is re-run. If the QC sample fails again the run is stopped, the QC sample is remade, and/or the instrument is re-calibrated. Samples associated with the failed QC sample are re-analyzed.
8. Chemical Analysis Procedure

8.1 Instrumentation
PerkinElmer – Avio 200 Inductively Coupled Plasma – Optical Emission Spectrometer
Syngistix for ICP Software v 4.0

8.2 Start-Up
A. Check the wastewater container and empty if nearing capacity.
B. Make sure that the torch is correctly installed and the torch compartment door is shut.
C. Make sure the argon pressure to the instrument is set at 100 psi (between 80-120 psi is acceptable).
D. Turn valve to open the compressed air line. Make sure the shear gas is set at 100 psi (between 80-120 psi is acceptable).
E. Fill 2,000-mL plastic rinse bottle with 1% nitric acid and put in the rinse tube.
F. Engage pump tube windings.
G. Turn on the chiller. Make sure the temperature setting is between 15-18 degrees Celsius.
H. Turn the hood on high power.
I. Open Syngistix for ICP software by clicking on the icon on the desktop. Login using username: Administrator and password: Avio2001. Click OK.
J. The instrument will perform internal checks. When they are complete, click the Analysis tab. Load the Water Cations method if it is not the default. Click on the Method Open dropdown, choose Water Cations from the table, and then click OK.
K. Make sure the sample probe is in the rinse. The F11 key will raise or lower the probe.
L. Click the blue Plasma on/off button in the Plasma Control window to light the plasma.
M. Let the instrument warm up until the initialize optics has completed (this will happen automatically after about 20 minutes in a pop-up window). Close the Spectrometer Control pop-up window.

8.3 Calibration
A. In the Analysis window Automated tab, click the Open folder icon for the Save data to Results Data Set box. At the top of the pop-up window, enter the run date (mmddyyyy) in the Name box and the desired title in the Description box. Click OK.
B. In the Analysis tab tool bar, click the Enable/Disable Analytes button. Enable or disable an analyte analysis if desired.
C. Load the calibration blank, standard, QCH, QCL, and IPC in tray positions 1-5.
D. In the Analysis window Automated tab, click **Calibrate**. (Alternately, the instrument will calibrate after the bench sheet is created by replacing **Analyze Samples** with **Analyze All** instead in step 8.4.E).

E. If any of the calibration, QCs, or IPC verifications fail then recalibrate.

F. If the calibration, QCs, or IPC verifications fail after the recalibration, refill the standard tubes, prepare new standards, and/or initialize the optics again. Click the **Instrument** tab. Click the **Initialize optics**. Close the Spectrometer Control pop up window when complete.

8.4 **Analysis**

A. In the Analysis tab tool bar, click the **Sample Info** icon. In the Sample Information Editor pop up window, enter Batch ID (mmddyyyy), Sample IDs and the A/S locations (autosampler location 9 is the starting sample). Use a template from a previous run or load the tray starting with a Milli-Q water blank, the rinse blank, LRB, LFB, and LOQ. Analyze one sample in duplicate once during each run. In the Analysis tab tool bar, click the **Sample Info Save As** dropdown. Save as file name mmddyyyy. Click **Save**.

B. Right click in the Sample Information Editor pop up window and print the bench sheet.

C. In the Analysis window Automated tab, click **Rebuild list**.

D. Prior to loading samples in tray, each sample must be tested with pH paper range 0-2.5 to ensure that the sample was acidified to a pH below 2.0. Record the findings on the bench sheet printout.

E. Fill sample tubes and load the autosampler tray according to the bench sheet.

F. In the Analysis window Automated tab, click **Analyze Samples**.

G. If the QC and IPC samples pass, the autosampler will go to the first sample and start the run.

H. The QC and IPC locations are preset in the method and will be analyzed and evaluated by the software after every 10 samples and at the end of the run. If either QC sample fails twice, the instrument will automatically recalibrate and re-run the previous 10 samples.

I. To add samples to the run during analysis, enter them into the Sample Information Editor, highlight the new rows, and click **Append to analysis list**. Save the changes.

J. Review the sample peaks and analysis data as the run progresses.

K. Sample data that show saturation error codes during the run must be diluted and reanalyzed.

L. Hit **F1** from any window in the software for Syngistix-ICP help.
8.5 Shutdown
   A. To stop the analysis prior to the end of the run, click on the green circle
      highlighted Analyze All or Analyze Samples button. In the pop-up
      window choose Stop Immediately and then click OK.
   B. Leave the sipper in the rinse water for about 2 minutes to rinse the spray
      chamber. Then raise the sample probe (F11 Key) from the rinse. Pump
      for a few minutes until the spray chamber is relatively dry.
   C. Click the green Plasma on/off button in the plasma control window to
      extinguish the plasma.
   D. Release the pump tube windings.
   E. Turn off the chiller.
   F. Turn the hood down to low power.
   G. Close the valve to the compressed air line.
   H. Exit software if desired.
   I. Rinse sample tubes with DI water and soak in DI water overnight. Rinse
      again and air or oven dry.

8.6 Maintenance
   A. Clean injector tube as needed and let it dry overnight.
   B. Pump tubes must be changed when they appear to be worn. Note dates
      in instrument notebook.
   C. Empty the wastewater container when full.
   D. Make sure coolant reservoir in the chiller is full (check periodically). Fill
      with circulation fluid (Poly-Clear).
   E. Periodically, the torch, bonnet, spray chamber, nebulizer, injector, axial
      window and radial window may need to be cleaned or replaced.
   F. If the torch is removed for maintenance, an X-Y alignment should be
      performed through the Instrument tab. Click Spectrometer Control.
      In the spectrometer control window, choose Axial. Put the autosampler
      sipper probe in 1 mg/L Mn solution, wait 15 seconds, then click Align
      View. Repeat the same steps for Radial using 10 mg/L Mn solution for
      the radial alignment.

8.7 Data Processing and LIMS entry
   A. From the Utilities tab, click on Data Manager.
   B. Data manager opens in a separate window.
   C. Highlight the desired dataset in the results list.
   D. Click Report icon in the upper window bar.
   E. Choose Use existing design, click on the open folder icon, and open
      USGS.repx.
   F. Click Preview then click the Print icon. Click OK.
   G. Close the report preview window and click Cancel to close the data
      reporting wizard window.
   H. Click Export icon in the upper window bar.
I. Choose **Use existing design**, click on the **open folder** icon, and open **USGS.xptx**.

J. Click **Finish** then click **Export Data**. Click **Finish**.

K. The text file will be exported to \LAB\DATA\ICPData\Avio 200.

L. In Excel, open the file and edit if necessary.

M. Save as a .txt file using the format mmddyyyy.

N. Double click **Watershed LIMS** icon.

O. Click **Import Data** icon.

P. Under the **Import** drop down, choose **Water Cations**.

Q. Choose and open the desired file.

R. Choose **Client**, type in **Test Date**, and choose **Analyst**.

S. Exclude and/or edit any data necessary.

T. Click **Client ID to Sample No**.

U. Click **Check Analysis**.

V. Click **Check RL Flag**.

W. Click **Set Data**.

X. Investigate problems for data that did not transfer or are duplicated.

9. **Calculations and Data Reporting**

   A. Data are output from the instrument in units of micromoles per liter and stored in the same units in the LIMS. No conversions or computations are required before the data are stored.

   B. This method has been assigned USGS National Water Information System (NWIS) method code PL127 for filtered waters and PL126 for unfiltered waters.

   C. Data that are uploaded to NWIS must be converted to mass units. Multiply by the conversion factors and store under the parameter codes listed below.

<table>
<thead>
<tr>
<th>Analyte</th>
<th>NWIS Parameter Code</th>
<th>Conversion Factor (to mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>00916</td>
<td>0.040078</td>
</tr>
<tr>
<td>Filtered Calcium</td>
<td>00915</td>
<td>0.040078</td>
</tr>
<tr>
<td>Magnesium</td>
<td>00927</td>
<td>0.024305</td>
</tr>
<tr>
<td>Filtered Magnesium</td>
<td>00925</td>
<td>0.024305</td>
</tr>
<tr>
<td>Silicon (as SiO\textsubscript{2})</td>
<td>00956</td>
<td>0.060084</td>
</tr>
<tr>
<td>Filtered Silicon (as SiO\textsubscript{2})</td>
<td>00955</td>
<td>0.060084</td>
</tr>
<tr>
<td>Aluminum</td>
<td>01105</td>
<td>26.98154 (to (\mu)g/L)</td>
</tr>
<tr>
<td>Filtered Aluminum</td>
<td>01106</td>
<td>26.98154 (to (\mu)g/L)</td>
</tr>
<tr>
<td>Sodium</td>
<td>00929</td>
<td>0.022990</td>
</tr>
<tr>
<td>Filtered Sodium</td>
<td>00930</td>
<td>0.022990</td>
</tr>
<tr>
<td>Potassium</td>
<td>00937</td>
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<td>Filtered Potassium</td>
<td>00935</td>
<td>0.039098</td>
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10. **Archiving**
   A. Data files are backed-up daily by an automated back-up program. Hard copies of the runs are filed and retained indefinitely. The laboratory LIMS system is backed-up daily by an automated back-up program.
   B. Samples are stored at room temperature until data can be verified.

11. **References**
    Syngistix for ICP software v 4.0

12. **Key Words**
    Inductively coupled plasma, optical emission spectrometry, water samples, water analysis, chemical analysis, calcium, magnesium, aluminum, silicon, sodium, potassium.

13. **Revision Record**

    The SOP will be revised and approved as changes are required. A review will be performed no later than every two years from the last approval date and the SOP revised if necessary.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Responsible Person</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>1.0-2.5</td>
<td>Pre 01/10/2020</td>
<td>Tricia Lincoln</td>
<td>All released prior to the addition of the revision record table.</td>
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<tr>
<td>3.0</td>
<td>01/10/2020</td>
<td>Tricia Lincoln</td>
<td>Updated to reflect requisition of new ICP-OES instrument, software changes, and any additions/deletions to analytical procedures created by instrument upgrade. Also some housekeeping and incidental edits.</td>
</tr>
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<td>3.1</td>
<td>01/20/2022</td>
<td>Tricia Lincoln</td>
<td>Updated to include additions of LFM, MDL verification, and new QA officer.</td>
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