

## State Water Resources Control Board

Division of Drinking Water

February 29, 2016

Mr. Phil Chandler, Managing Director  
Ionex SG Ltd  
Unit 25 Nailsworth Mills Estate  
Avening Road  
Nailsworth  
Gloucestershire GL6 0BS

Dear Mr. Chandler:

### **Conditional Acceptance of Ionex SG Strong Base Anion Exchange Nitrate Treatment with Sulfate Return Treatment Process**

Ionex SG LLC has submitted a Conditional Acceptance Challenge Study Report, dated May 2015, to the State Water Resources Control Board, Division of Drinking Water (Division) to request the conditional acceptance of the Ionex SG Strong Base Anion Exchange Nitrate Treatment System with Sulfate Return (treatment system). Although ion exchange is a best available technology (BAT) for nitrate, Ionex SG has demonstrated that through the optimized design and operation of: a) the ion exchange distributor system, b) a multi-stage multi-column lead-lag process, c) a segmented regeneration process, and d) a sulfate return process, it is capable of designing, manufacturing and implementing a full-scale ion exchange treatment system that can produce safe drinking water and reduce the brine waste volumes from the typical 2% range of traditional systems to less than 0.5% of drinking water produced.

Since 2011, Ionex SG has conducted three demonstration scale studies in California to demonstrate and fine-tune the strong base anion exchange treatment process for the treatment of drinking water with elevated nitrate concentration. The submitted report summarized the study results and documented the performance of the treatment system. Currently, the Ionex SG has continued to operate its 125 gallons per minute IXN unit at the Triple R Mutual Water Company at Springville, CA to demonstrate the long-term reliability of the treatment system.

Based on the information provided in the referenced May 2015 report and additional performance data provided on January 28, 2016 to the Division's Water Treatment Committee (WTC), the committee hereby accepts the Ionex SG Strong Base Anion Exchange Nitrate Treatment System with Sulfate Return as a conditionally accepted nitrate treatment process that can be used by any public water system in California. It should be noted that this conditional acceptance only applies to Ionex SG designed treatment systems. Any water system or treatment vendor that is considering the implementation of the sulfate return concept will be required to complete a conditional acceptance study to demonstrate its control over the ion exchange treatment process and the reproducibility of the treatment results.

This conditional acceptance is subject to the following conditions:

- 1) Approval for the design and use of your technology in any drinking water application will be handled on a case-by-case basis by the Division's district offices or by local primacy agencies (LPA) and is granted through the domestic water supply permitting process.
- 2) The permit technical report, that is required as part of the permit application for the addition of treatment, must be prepared by a qualified engineer experienced in water treatment systems and must include the pilot study results and recommendations from Ionex SG for the sizing and specifications of the full-scale system.
- 3) The treatment system, including but not limited to, the system's piping, ion exchange resin and ion exchange vessels, must comply with Section 64591 of the California Waterworks Standards for indirect additives.
- 4) Any chemicals used in the routine operation and periodic maintenance of the treatment system, such as salt and disinfectant, must comply with Section 64590 of the California Waterworks Standards for direct additives.
- 5) A dedicated continuous on-line nitrate analyzer must be provided on the final effluent of the treatment plant to control and shutdown the treatment plant if the treatment plant's maximum treated water nitrate set-point is ever exceeded. For most installations, the maximum nitrate set-point should not exceed 80% of the nitrate maximum contaminant level during the initial start-up. Following sustained reliable operation, the water system may request and the Division's local district office or LPA office may consider allowing an increase in the maximum nitrate set-point on a case-by-case basis. However, the maximum nitrate set-point must always be lower than the nitrate maximum contaminant level. The treatment plant must be operated in a manner to ensure the treated water entering the distribution system complies with the nitrate drinking water standard at all times.
- 6) Routine verification, calibration and maintenance of the on-line analyzers shall be provided per the manufacturer's recommended calibration and maintenance schedules. A weekly or monthly paired verification laboratory sample must be collected for the treated water nitrate sampling point.
- 7) If the treated water on-line nitrate analyzer fails on the treatment system, the system should be removed from service until a replacement analyzer is installed. If continued operation with a non-working treated water nitrate analyzer is required at a specific site, the water system and Ionex SG must propose a detailed fail-safe operating mode that will ensure continuous compliance with the nitrate drinking water standard. Water system personnel will likely be required to collect frequent laboratory and grab samples until a replacement nitrate analyzer is installed. The acceptability of the proposal will be reviewed and determined during the permit application process.
- 8) The commissioning of all newly installed or modified treatment systems must not include the "sulfate return" process until each and every column has been regenerated at least twice and the water quality of the "sulfate return" fraction has been analyzed for anionic

constituents that may be eluted from the anionic exchange resin during the segmented regeneration process. Ionex SG shall provide to the water system and the water system should submit to the Division's local district office or LPA office with information regarding the predicted concentration of the treated water quality with and without "sulfate return" enabled. Approval for the initiation of the "sulfate return" process will be given by the Division's local district office or LPA office. The "sulfate return" flow rate should be set to minimize the impact on treated water quality.

- 9) Public water systems utilizing the Ionex SG nitrate treatment system (and any other treatment systems) are required to comply with Operator Certification regulations, as specified under Chapter 13, Title 22, *California Code of Regulations*. It should be noted that for water systems utilizing multiple treatment processes for the removal of multiple contaminants from a single or group of sources, the overall treatment train will be used to determine the treatment plant classification. For example, if a treatment plant includes ion exchange and GAC treatment processes, the point values from ion exchange treatment and GAC treatment will be combined to determine the overall treatment plant classification.
- 10) As a conditionally accepted technology, unless waived by the local district office or LPA office, a report shall be prepared to summarize the performance of the treatment plant. The report must be submitted by the water utility to the Division's local district office or LPA office and is due within 60 days after the first year of operation. The report is to include, as a minimum, results of all water quality tests performed, monthly treated water and brine waste volume, an evaluation of compliance with established performance standards under actual operating conditions, an assessment of problems experienced and corrective actions taken or needed, and a schedule for providing any needed improvements. These reports should be comprehensive, detailing problems encountered during the first year of operation as well as during startup and commissioning. The report should cover the period immediately following installation (commissioning; troubleshooting; start-up of sulfate return) through the first year of production. It is also requested that information on the monthly operator hours, and actual operations and maintenance costs incurred during the first year be included.

Any proposed changes to the treatment scheme that differs from the demonstrated treatment process outlined in the conditional acceptance challenge study report should be reported (in writing) to Division's WTC in advance of making any such changes at public water system installations in California. The detail of your written notification will be reviewed to determine if additional performance testing will be required. Consequently, the letter should provide sufficient detail for the WTC to render such a decision. Should additional testing be required, the WTC will review all study protocols proposed to be used as a condition of accepting the final report. Upon reviewing the final report, the WTC will make a recommendation regarding acceptance of the identified changes to the design and/or operating criteria. Revised operations plans with the proposed changes will need to be submitted to the Division's local district office or LPA office to request approval for the changes at each of the treatment plants.

Finally, on behalf of the Division, we appreciate all the time and efforts your company and team have made in optimizing ion exchange treatment systems and making it a more technically and financially feasible treatment technology for inland and smaller communities.

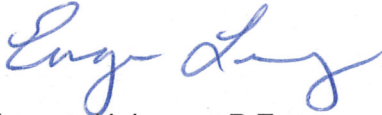
Mr. Phil Chandler  
Ionex SG

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Should you have any questions, please feel free to contact Mr. Eugene Leung at [eugene.leung@waterboards.ca.gov](mailto:eugene.leung@waterboards.ca.gov) or by phone at (510) 620-3460.

Sincerely,

A handwritten signature in blue ink, appearing to read "Eugene Leung". The signature is fluid and cursive, with the first name "Eugene" and last name "Leung" clearly distinguishable.

Eugene H. Leung, P.E.  
Senior Sanitary Engineer  
Technical Operations Section

cc: Water Treatment Committee