TRITIUM ANALYSIS SERVICES

APPENDIX A

TRITIUM ANALYSIS SERVICES

1. SCOPE OF SERVICE
The “Contractor” shall provide tritium analysis in water samples by using the Gas Proportional Counting method at an Enrichment level with a minimum detection level of 0.3pCi L⁻¹; and by using Direct Gas Proportional Counting method with a minimum detection level of 10pCi L⁻¹ for Miami-Dade County Department of Regulatory and Economic Resources (RER) staff. This procedure establishes requirements for the collection and analysis of water samples (rain, springs, creeks, rivers, groundwater, etc.) for tritium bounds as water. The procedure also develops quality control and quality assurance guidelines for these types of water samples.

The two different detection levels are desired due to the fact that samples from some of the monitoring sites are already in excess of the 10pCi/L standard and there is no point in requesting the more expensive lower detection limit analysis. In addition, as time progresses the levels in some of the wells will change and RER wishes to be able to adjust our request accordingly so as to be more cost efficient.

RER staff will collect and provide bottle tritium water samples to the Contractor for analyzing. The Contractor signs bottle tritium water samples acceptance Chain Of Custody forms from RER staff. The Contractor will provide the following:

- tritium water samples turnaround time within six (6) weeks after receipt of samples
- both written and electronic reports signed by the Contractor laboratory Director within six weeks of samples completion
- tritium trip blanks (Trip Blank: A clean sample of a matrix (ultra clean water in this case) that is taken from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures. This sample will be analyzed for Tritium as well. Purpose: Assess contamination introduced during shipping and field handling procedures. These trip blanks must be prepared using “dead water”. That is, water with no tritium in it. The Contractor laboratory collects this dead water from a known source and provides it to RER at no cost.)

1.1 Tritium Methods
The both analysis methods, the sample water is electrolyzed and converted to Hydrogen gas.

Sample that is known to be higher than 10pCi/L⁻¹, the Direct Gas Proportional Counting analysis method is used. Following conversion to hydrogen gas, low-level detection limits (without enrichment) are used, which are 3 TU (9.6 pCi L⁻³ of H₂O) or 3.5%, whichever is greater; this resulting matrix is admitted to the tritium decay detector/counters directly (this is results in a lower cost).

Samples where Tritium levels are unknown, or where levels are known to be under 10pCi/L⁻¹ go through an electrolytic enrichment step, in which tritium concentrations are increased even further resulting in about a 60-fold volume reduction. Accuracy of the low-level measurement with enrichment is 0.10 TU (0.3 pCi L⁻¹ of H₂O), or 3.5%, whichever is greater. This is called Gas Proportional Counting and results in a higher cost. An additional step in this low level analysis procedure is outlined below:
A. Low-Level Counting
The low-level gas proportional counters have an active volume of 1 L and are shielded by 2.5 cm of selected lead, a ring of anti-coincidence Geiger counters, 10 cm of paraffin wax, boric acid and/or borated polyethylene, and at least 20 cm of iron, plus the walls and ceiling of the building. The counter is first filled with 10 psi (67 kPa) of propane. Thereafter, the sample hydrogen gas, under pressure in its cylinder, is added to the counter for a total pressure of 40 psi (300 kPa). The counter is then sealed off, and the gas amplification is set to specifications by adjusting working voltage. After that, counting proceeds until criteria for accuracy or sensitivity have been met. The pulses are sorted into several channels, of which some are used for continuous control of the gas amplification, as shown in the cosmic radiation spectrum, etc. Counting times are 6 to 20 hours. A 1 TU original sample enriched from 275 to 6 mL typically shows 0.6 cpm in the tritium channel above a background of 0.40 cpm, known to – 0.02 cpm. The control of filling and counting procedures and calculation of results, as well as numerous checks on the performance of the machinery, are computerized.

2. PURCHASE ORDER
The County’s authorized representative shall generate and issue a Purchase Order for each bottle water samples to be performed under this Agreement. The Purchase Order shall include the location, description and plans, if necessary, covering the scope of service to be completed. The Purchase Order shall also include a cost estimate calculated by the County for the work listed in the scope of service. This estimate shall be based on the prices total bid the Contractor’s proposal. For purposes of identification and payment, the Purchase Order shall be numbered and dated. The preliminary Purchase Order describing the description of work and cost estimates shall be issued to Contractor which have been qualified to perform work under this Agreement. The Contractor name shall be entered on each Purchase Order and issued to the Contractor. The Purchase Order shall also direct the Contractor to commence work on a certain day and it shall specify the amount of time allotted for completion of work covered by the Purchase Order. All work covered by a Purchase Order shall constitute an Agreement Schedule.

3. GUARANTEE AGAINST DEFECTS
The Contractor shall be responsible for faulty labor samples results. The Contractor shall promptly correct all deficiencies, without cost to the County, within the timeframe stated in paragraph 3.1. Payment in full for work does not constitute a waiver of guarantee.

3.1 DEFICIENCIES
Contractor shall promptly correct all apparent and latent deficiencies and/or defects in work, and/or any work that fails to conform to the Agreement documents regardless of bottle water samples completion. All corrections shall be made within three (3) calendar days after such rejected defects, deficiencies, and/or non-conformances are reported to the Contractor by the County representative via written and/or electronic notification.

Contractor shall bear all costs of correcting such rejected work. If the Contractor fails to correct the work within the period specified in the notice, the County shall place the Contractor in default, obtain the services of another source to correct the deficiencies, and charge the incumbent Contractor for these costs; either through a deduction from the final payment owed to the Contractor or through invoicing. If the Contractor fails to honor this invoice or credit memo, the County may terminate the Contractor for default.
4. PURCHASE ADDITIONAL SERVICES
Given the range of environmental situations that may arise, improvements in analytical methodologies, new regulator mandates etc., the analytical tests as listed herein are not all encompassing. While the County has listed all major services within this Agreement which is utilized by RER in conjunction with their operations, there may be similar services that may be needed by the County during the term of this Agreement. Under these circumstances, a County representative will solicit the Contractor to obtain a price quote for the similar services.
## APPENDIX B
### PRICE SCHEDULE
### TRITIUM ANALYSIS SERVICES

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item Description</th>
<th>Estimated Annual Quantity / Unit Measure</th>
<th>Unit Price Per Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tritium analysis by gas proportional counting method at an enrichment minimum detection level 0.3pCi L⁻¹</td>
<td>48 Samples</td>
<td>$325.00</td>
</tr>
<tr>
<td>2.</td>
<td>Tritium analysis by using direct gas proportional counting method minimum detection level 10pCi L⁻¹</td>
<td>8 Samples</td>
<td>$175.00</td>
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