

Spring Valley Lake Spring 2016 Baseline Data Collection



Prepared for
Spring Valley Lake Association

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LLC

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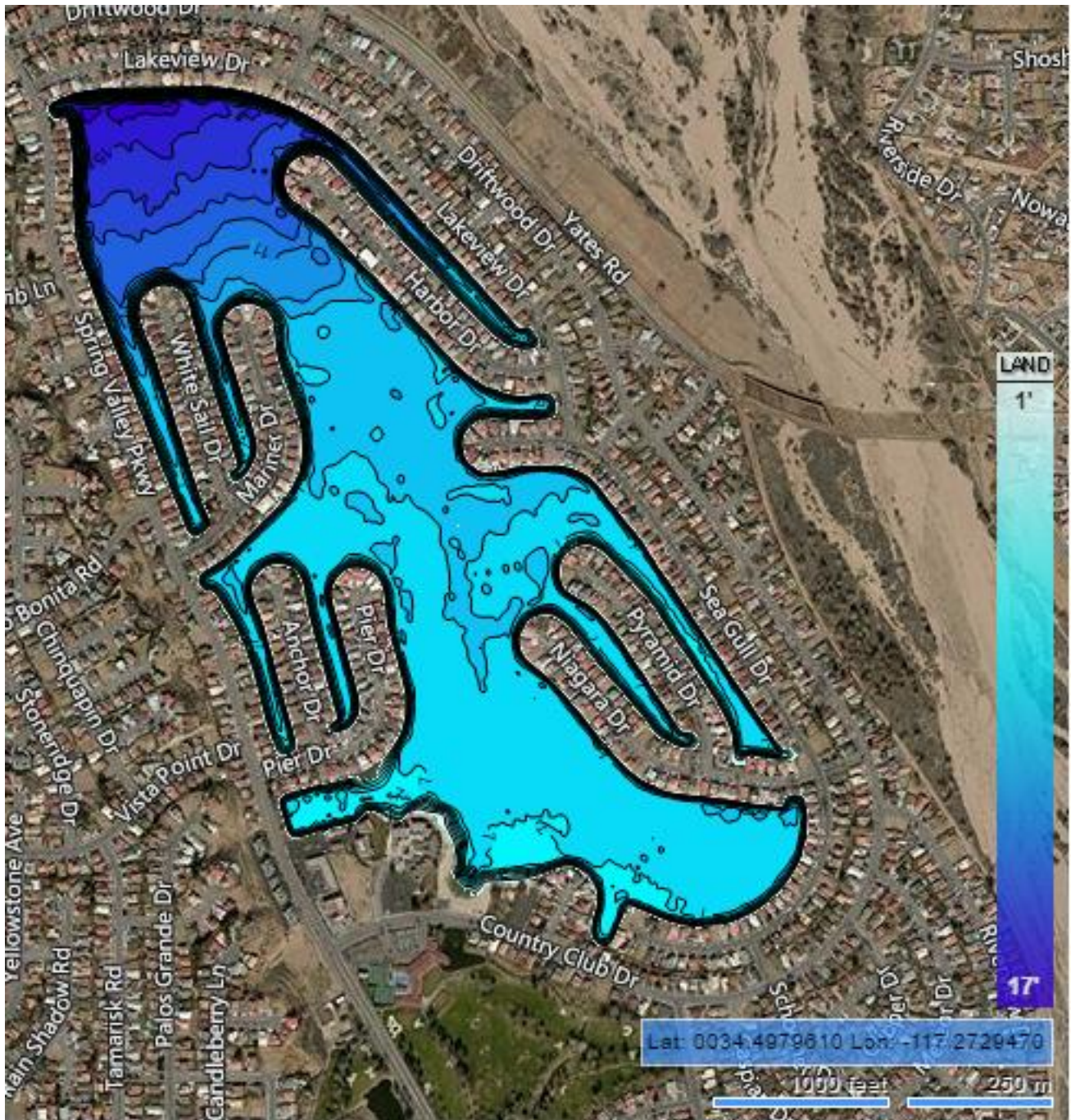
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Introduction

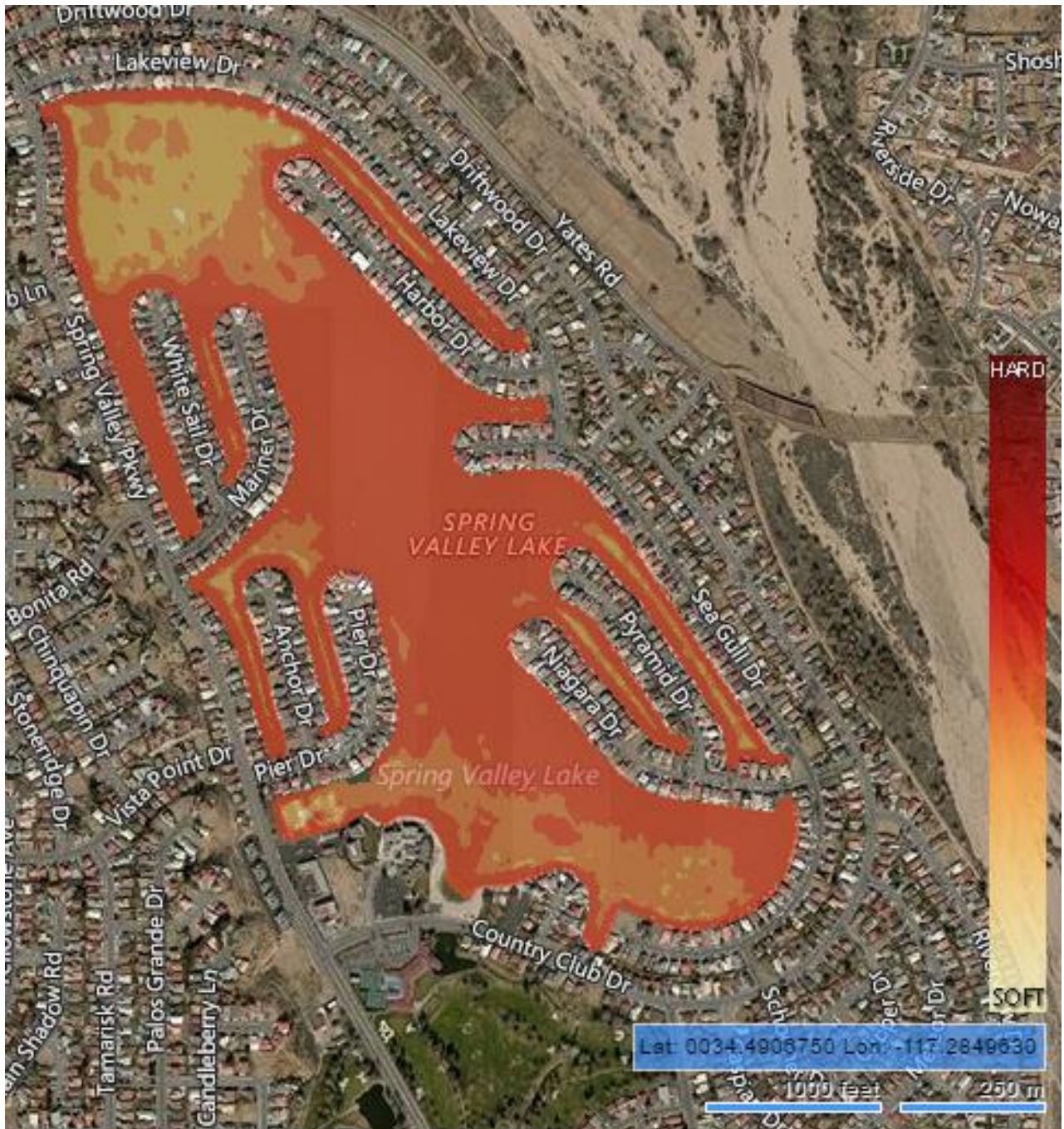
Spring Valley Lake Association is in the sixth year of working under a water clarity improvement program and has requested Aquatechnex to perform a number of monitoring tasks to support this work. In continuation of previous mapping projects performed at Spring Valley Lake, a hydroacoustic mapping event was performed on May 17th, 2016. In addition, two water sample was analyzed for a number of water quality parameters and algae species identification. This report will summarize these findings.

Hydro-acoustic Mapping

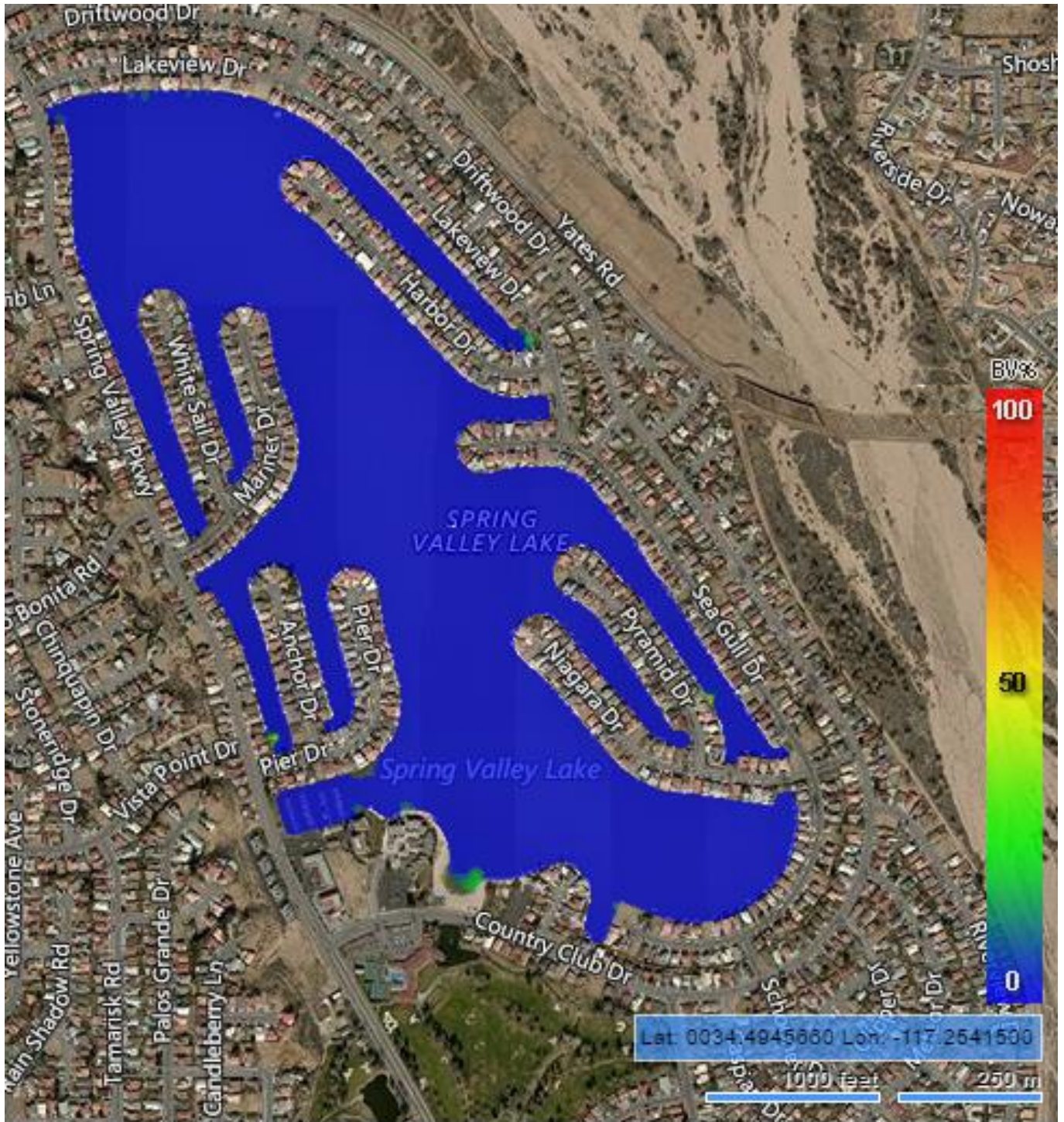
AquaTechnex mobilized a hydro-acoustic mapping vessel to the lake on May 17th, 2016 to collect data on the potential presence and distribution of aquatic plant growth in the lake. In the previous spring mapping event, very minimal amounts of aquatic weeds were detected. The mapping vessel traveled across the lake at regular intervals providing complete coverage of the water body. The sensing equipment collects a GPS point linked to hydro-acoustic soundings and this data is processed using algorithms to map bathymetry, aquatic plant bio-volume and sediment hardness. The resulting maps are presented in the following pages.



This image shows the current bathymetry of Spring Valley Lake. Slight changes have occurred since the previous spring, although this degree of variation is not concerning.



This map shows the current bottom hardness present in the lake. The legend bar on the right shows the graduated scale.

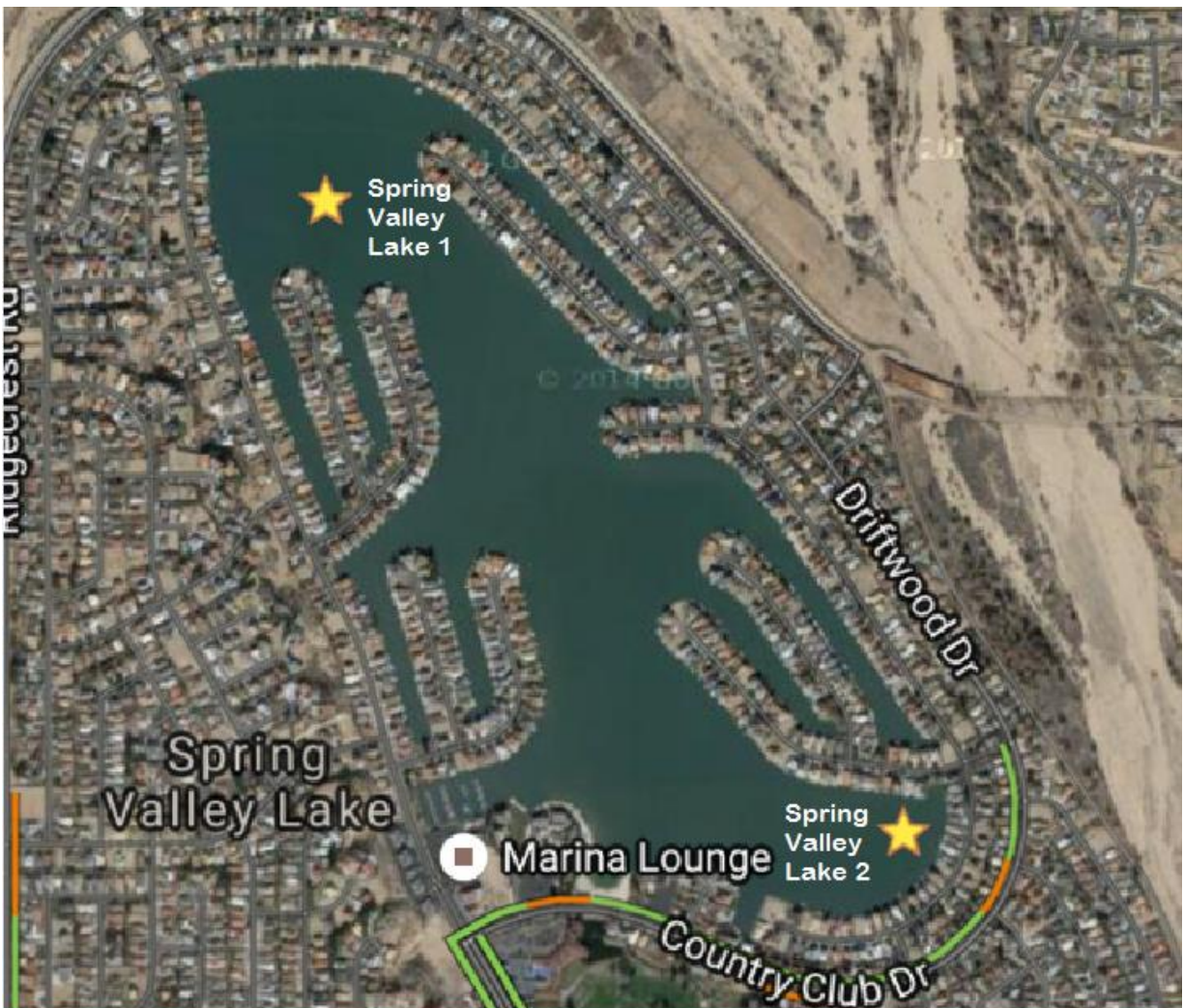


At this point in the spring of 2016, the general aquatic plant coverage in Spring Valley Lake is very low. Plant growth was detected in a few areas, including the Beach areas, and in a couple fingers. The past few years have shown this type of sparse growth pattern. This pattern is not unusual with Spring Valley Lake. Water clarity can limit light penetration into the lake bottom and plants have a hard time establishing. As a response to increased clarity as a result of the Aluminum Sulfate treatments, we might expect plant growth to increase and spread to areas it previously could not colonize.

Water Quality Data

Two water samples were collected around 2PM on 5/17/16. Samples were collected in the North and South portions of the lake indicated on the map below. The samples were analyzed for a variety of water quality data and algae identification. At the time the sample was collected, aluminum sulfate treatments were occurring throughout the lake. While the biologist did collect samples away from recently treated areas, the effects of the alum treatment have affected the test results, as evidenced by the variability in some of the data points. Below is a summarization of the data.

Generally speaking, the data is fairly similar to the previous year's results. Spring valley lake exhibits a good level of clarity, which is measured by turbidity. Chlorophyll *a* has been low as well, indicating a low overall algal composition. Algae counts are lower compared to the previous year, and a lack of cyanobacteria indicates a healthy and balanced algae population. Phosphorous levels are still in the eutrophic range, although there is some variability in total Phosphorous this year. Free Reactive Phosphorous has increased from past year in both samples.



Above: map showing sample locations and sample name

SeSCRIPT Analysis Report: *Spring Valley Lake 1*

Company: AquaTechnex, LLC

Address: P.O. Box 30824, Bellingham, WA 98228

Contact Person: Ben Chen

Phone: 760-272-5842

Email: ben@aquatechnex.com

Project Name: Spring Valley Lake 1

Surface Area: 200 acres

Average depth: 8.5 feet

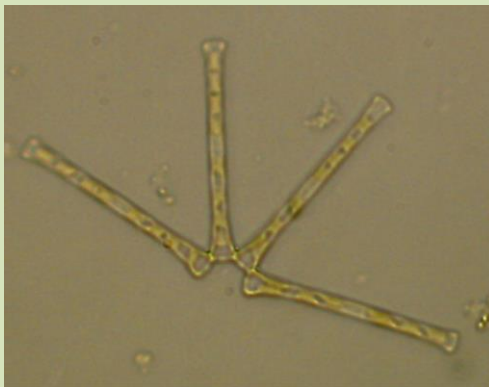
Date Sample Received: 5/18/16

SeSCRIPT Analysis Performed: Algae and Water
Quality Baseline Plus Bundle

Algae ID Results Spring Valley Lake 1

Identification	Classification	Description	Density (cells/mL)
<i>Aulacoseira</i> sp. (some present)	Bacillariophyta- Diatoms	Filamentous, planktonic	140
<i>Asterionella</i> sp. (some present)	Bacillariophyta- Diatoms	Colonial/single-celled, planktonic	80
<i>Scenedesmus</i> sp. (little present)	Chlorophyta- Green algae	Colonial, planktonic	< 40

Other algae in the sample, at lower densities, include: *Sphaerocystis*, *Oocystis* (Chlorophyta); *Synedra* (Bacillariophyta); Notable particulate dead organic matter observed



Water Quality Results Spring Valley Lake 1

Analysis	Measurement	Description
pH (SU)	8.5	Near neutral
Dissolved Oxygen (mg/L)	6.88	Acceptable for fish
Conductivity ($\mu\text{S}/\text{cm}$)	839	Typical freshwaters
Alkalinity (mg/L as CaCO_3)	91.8	Moderately buffered
Hardness (mg/L as CaCO_3)	76.7	Moderately hard
Turbidity (NTU)	4.2	Relatively low

Nutrient Results Spring Valley Lake 1

Analysis	Measurement	Description
Total Phosphorus ($\mu\text{g}/\text{L}$)	94	High amount: eutrophic
Free Reactive Phosphorus ($\mu\text{g}/\text{L}$)	16.9	Moderate amount
Total Kjeldahl Nitrogen (mg/L)	1.96	Moderate
Nitrates & Nitrites (mg/L)	0.334	Moderate
Total Nitrogen (mg/L)	2.29	Moderate
Chlorophyll <i>a</i> ($\mu\text{g}/\text{L}$)	< 10	Low

SeSCRIPT Analysis Report: *Spring Valley Lake 2*

Company: AquaTechnex, LLC

Address: P.O. Box 30824, Bellingham, WA 98228

Contact Person: Ben Chen

Phone: 760-272-5842

Email: ben@aquatechnex.com

Project Name: Spring Valley Lake 2

Surface Area: 200 acres

Average depth: 8.5 feet

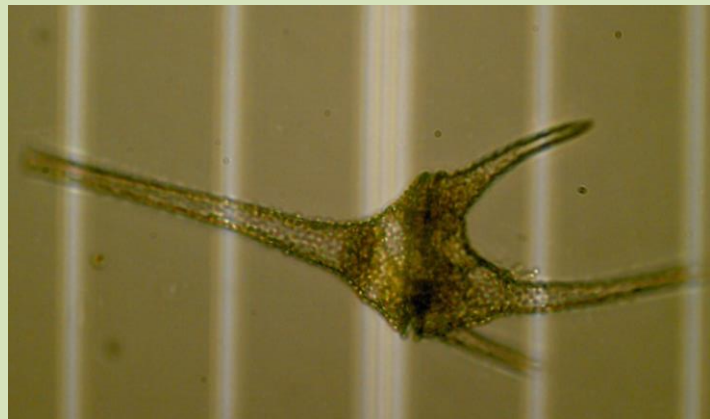
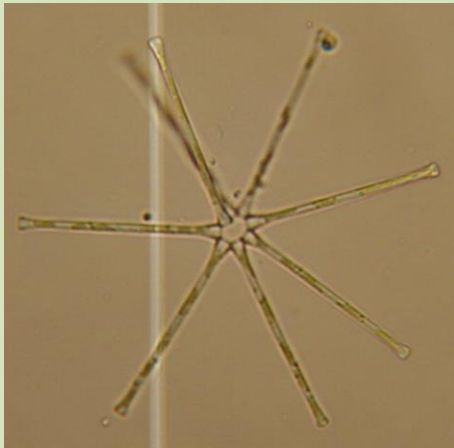
Date Sample Received: 5/18/16

SeSCRIPT Analysis Performed: Algae and Water
Quality Baseline Plus Bundle

Algae ID Results **Spring Valley Lake 2**

Identification	Classification	Description	Density (cells/mL)
<i>Oocystis</i> sp. (some present)	Chlorophyta- Green algae	Colonial, planktonic	90
<i>Staurastrum</i> sp. (little present)	Streptophyta- Desmids	Single-celled, planktonic	40

Other algae in the sample, at lower densities, include: *Ceratium* (Dinophyta); *Aulacoseira*, *Asterionella*, *Cyclotella* (Bacillariophyta); Notable particulate dead organic matter observed



Water Quality Results
Spring Valley Lake 2

Analysis	Measurement	Description
pH (SU)	7.9	Near neutral
Dissolved Oxygen (mg/L)	6.95	Acceptable for fish
Conductivity ($\mu\text{S}/\text{cm}$)	587	Typical freshwaters
Alkalinity (mg/L as CaCO_3)	104.8	Moderately buffered
Hardness (mg/L as CaCO_3)	75.7	Moderately hard
Turbidity (NTU)	5.58	Relatively low

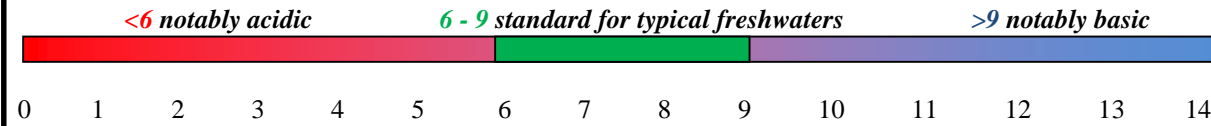
Nutrient Results
Spring Valley Lake 2

Analysis	Measurement	Description
Total Phosphorus ($\mu\text{g}/\text{L}$)	20.9	Moderate amount: mesotrophic
Free Reactive Phosphorus ($\mu\text{g}/\text{L}$)	15.2	Moderate amount
Total Kjeldahl Nitrogen (mg/L)	1.805	Moderate
Nitrates & Nitrites (mg/L)	0.311	Moderate
Total Nitrogen (mg/L)	2.11	Moderate
Chlorophyll <i>a</i> ($\mu\text{g}/\text{L}$)	< 10	Low

Water Quality Analysis Explanation

These water quality parameters are essential to document the condition of a water body and design custom treatment prescriptions to achieve desired management objectives.

pH: Measure of how acidic or basic the water is (pH 7 is considered neutral).



Hardness: Measure of the concentration of divalent cations, primarily consisting of calcium and magnesium in typical freshwaters. *0-60 mg/L as CaCO₃ soft; 61-120 moderately hard; 121-180 hard; > 181 very hard*

Alkalinity- Measure of the buffering capacity of water, primarily consisting of carbonate, bicarbonate and hydroxide in typical freshwaters. Waters with lower levels are more susceptible to pH shifts.
≤ 50 mg/L as CaCO₃ low buffered; 51-100 moderately buffered; 101-200 buffered; > 200 high buffered

Conductivity- Measure of the waters ability to transfer an electrical current, increases with more dissolved ions.
< 50 uS/cm relatively low concentration may not provide sufficient dissolved ions for ecosystem health; 50-1500 typical freshwaters; > 1500 may be stressful to some freshwater organisms, though not uncommon in many areas

Dissolved Oxygen- amount of diatomic oxygen dissolved in the water.
< 2 mg/L likely toxicity with sufficient exposure duration; < 5 stressful to many aquatic organisms; ≥ 5 able to support most fish and invertebrates

Phosphorus: Essential nutrient often correlating to growth of algae in freshwaters.

Total Phosphorus (TP) is the measure of all phosphorus in a sample as measured by persulfate strong digestion and includes: inorganic, oxidizable organic and polyphosphates. This includes what is readily available, potential to become available and stable forms.
<12 µg/L oligotrophic; 12-24 µg/L mesotrophic; 25-96 µg/L eutrophic; > 96 µg/L hypereutrophic

Free Reactive Phosphorus (FRP) is the measure of inorganic dissolved reactive phosphorus (PO₄⁻³, HPO₄⁻², etc). This form is readily available in the water column for algae growth.

Nitrogen: Essential nutrient that can enhance growth of algae.

Total N is all nitrogen in the sample (organic N⁺ and Ammonia) determined by the sum of the measurements for Total Kjeldhal Nitrogen (TKN) and ionic forms.

Nitrites and Nitrates are the sum of total oxidized nitrogen, often readily free for algae uptake.
< 1 mg/L typical freshwater; 1-10 potentially harmful; >10 possible toxicity, above many regulated guidelines

Chlorophyll a: primary light-harvesting pigment found in algae and a measure of the algal productivity and water quality in a system.
0-2.6µg/L oligotrophic; 2.7-20 µg/L mesotrophic; 21-56 µg/L eutrophic; > 56 µg/L hypereutrophic

Turbidity- Measurement of water clarity. Suspended particulates (algae, clay, silt, dead organic matter) are the common constituents impacting turbidity.
< 10 NTU drinking water standards and typical trout waters; 10-50 NTU moderate; > 50 NTU potential impact to aquatic life.