Anatoxin-a, Cylindrospermopsin, Microcystin & Saxitoxin Report
(Utah Division of Water Quality)

Sample Identification	Site	Collection Date
4994790	Jordon R @ Utah Lake Outlet	10/22/2014
4994720	Jordon R @ Narrows Pump Station	10/22/2014
NA	Middle of Lindon Harbor	10/22/2014
NA	East Side of Lindon Harbor	10/22/2014
NA	Middle of Utah Lake State Park Harbor	10/22/2014

Toxins – Anatoxin-a (ANTX-A), cylindrospermopsin (CYN), microcystin (MC), saxitoxin (STX)

Sample Prep – The samples were ultra-sonicated to lyse all cells and release toxins. Solid phase extraction (SPE) was also utilized for anatoxin-a prep and pre-concentration (20x) followed by filtration. Lab Fortified Matrix (LFM) duplicates were prepared at 1.0 µg/L ANTX-A, 1.0 µg/L CYN and 0.2 µg/L STX.

Analytical Methodology – Liquid chromatography/ mass spectrometry/ mass spectrometry (LC/MS/MS) was utilized for the determination of ANTX-A. The $[M+H]^+$ ion for ANTX-A (*m/z* 166) was fragmented and the major product ions (*m/z* 91, 106, 131, 149) were monitored. The current method limit of detection (LOD) is 0.05 µg/L, with a limit of quantification (LOQ) of 0.1 µg/L for ANTX-A.

A microcystins enzyme linked immunosorbent assay (ELISA) was utilized for the quantitative and sensitive congener-independent detection of MCs. The current assay is sensitive to down to a LOD/LOQ of 0.15 µg/L for total MCs. The average recoveries of laboratory fortified blanks (LFB) spiked with 1 µg/L MCLR were 104%.

A cylindrospermopsin enzyme linked immunosorbent assay (ELISA) was also utilized for the quantitative detection of CYN. The current assay is sensitive down to a LOD/LOQ of 0.1 µg/L for CYN. A lab fortified blank (LFB) spiked with 1.0 µg/L CYN was recovered at 106%.

A saxitoxin enzyme linked immunosorbent assay (ELISA) was utilized for the quantitative detection of saxitoxin. The current assay is sensitive down to a LOD/LOQ of 0.02 µg/L saxitoxin. The LFB (0.2 µg/L STX spike) recovery was 85%.

Summary of Results
(µg/L)

Sample	MC (ELISA)	CYN (ELISA)	STX (ELISA)	ANTX-A (LC-MS/MS)
Jordon R @ Utah Lake Outlet	ND	ND	ND	ND
Jordon R @ Narrows Pump Station	**0.19**	ND	ND	ND
Middle of Lindon Harbor	ND	ND	ND	ND
East Side of Lindon Harbor	**3.05**	ND	ND	ND
Middle of Utah Lake State Park Harbor	ND	ND	ND	ND
Detection Limits (µg/L)	*0.15*	*0.10*	*0.05*	*0.05*

ND = Not detected above the detection limit

Submitted by: Mark T. Aubel, Ph.D.
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