

## CERTIFICATE OF ANALYSIS



**CLIENT** **Sears Ecological Applications Company, LLC**  
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**ATTENTION** **Dennis Violante**

**RECEIVED / TEMP** Nov-15-11 10:07 / NA **WORK ORDER** CK10194  
**REPORTED** Nov-30-11 **PROJECT** Analysis of Anti-Icer

**General Comments:**

CARO Analytical Services employs methods which are based on those found in "Standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005, published by the American Public Health Association (APHA); US EPA protocols found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846", 3rd Edition; protocols published by the British Columbia Ministry of Environment (BCMOE); and/or CCME Canada-wide Standard Reference methods.

Methods not described in these publications are conducted according to procedures accepted by appropriate regulatory agencies, and/or are done in accordance with recognized professional standards using accepted testing methodologies and quality control efforts except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

- All solids results are reported on a dry weight basis unless otherwise noted
- Units: mg/kg = milligrams per kilogram, equivalent to parts per million (ppm)  
mg/L = milligrams per litre, equivalent to parts per million (ppm)  
ug/L = micrograms per litre, equivalent to parts per billion (ppb)  
ug/g = micrograms per gram, equivalent to parts per million (ppm)  
ug/m3 = micrograms per cubic meter of air
- "RDL" Reported detection limit
- "<" Less than reported detection limit
- "AO" Aesthetic objective
- "MAC" Maximum acceptable concentration (health-related guideline)
- "LAB" RMD = Richmond location, KEL = Kelowna location, EDM = Edmonton location, SUB = Subcontracted

**Please contact CARO if more information is needed or to provide feedback on our services.**

### CARO Analytical Services

Final Review Per: **DRAFT REPORT**  
DATA SUBJECT TO CHANGE

**CARO Analytical Services**

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**SAMPLE DATA**



**CLIENT** Sears Ecological Applications Company, LLC  
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**WORK ORDER #** CK10194  
**REPORTED** Nov-30-11

Analyte	Result	Pacific Northwest Snowfighters	RDL	Units	Prepared	Analyzed	Notes
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**DRAFT: General Parameters**

**IBG1-20 (CK10194-01) Matrix: Brine Sampled: Nov-14-11**

Magnesium Chloride	14	> 25	0.04	%	N/A	N/A	
Freezing Point	-26		-42	C	Nov-21-11	Nov-25-11	
Cyanide (total)	< 0.1	0.2	0.1	mg/kg	Nov-15-11	Nov-24-11	
Nitrogen, Ammonia as N	400		40	mg/kg	Nov-15-11	Nov-22-11	
BOD, 5-day	54000		20	mg/kg	Nov-16-11	Nov-21-11	
Chemical Oxygen Demand	180000		5000	mg/kg	Nov-16-11	Nov-17-11	
Chloride	11.2		0.01	% Weight	Nov-17-11	Nov-22-11	
pH (1:4 Solution)	5.4		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.241		0.001	g/mL	Nov-16-11	Nov-16-11	
Nitrogen, Nitrate+Nitrite as N	40		1	mg/kg	Nov-17-11	Nov-21-11	
Phosphorus, Total	390	2500	20	mg/kg	Nov-15-11	Nov-22-11	
Nitrogen, Total Kjeldahl	2660		100	mg/kg	Nov-15-11	Nov-22-11	

**IBG1-20 (92%) (CK10194-02) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-22		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.4		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.219		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (84%) (CK10194-03) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-19		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.5		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.204		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (76%) (CK10194-04) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-16		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.5		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.184		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (68%) (CK10194-05) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-13		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.5		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.166		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (60%) (CK10194-06) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-10		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.6		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.147		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (52%) (CK10194-07) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-9		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.6		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.128		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (44%) (CK10194-08) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-8		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.7		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.111		0.001	g/mL	Nov-16-11	Nov-16-11	

**SAMPLE DATA**



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**DRAFT: General Parameters, Continued**

**IBG1-20 (36%) (CK10194-09) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-5		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.7		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.089		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (28%) (CK10194-10) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-4		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.8		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.069		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (20%) (CK10194-11) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-2		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	5.9		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.049		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (12%) (CK10194-12) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	-1		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	6.0		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.032		0.001	g/mL	Nov-16-11	Nov-16-11	

**IBG1-20 (4%) (CK10194-13) Matrix: Brine Sampled: Nov-14-11**

Freezing Point	0		-42	C	Nov-21-11	Nov-25-11	
pH (1:4 Solution)	6.3		0.1	pH units	Nov-15-11	Nov-16-11	
Specific Gravity	1.013		0.001	g/mL	Nov-16-11	Nov-16-11	

**DRAFT: Freeze Testing, as per PNS**

**IBG1-20 (CK10194-01) Matrix: Brine Sampled: Nov-14-11**

Solids, Total Settleable	< 1.0	1.0	1.0	%	Nov-23-11	Nov-30-11	
Solids Passing Through #10 Sieve	100	> 99.0	1.0	%	Nov-23-11	Nov-30-11	

**DRAFT: Total Metals, as per PNS**

**IBG1-20 (CK10194-01) Matrix: Brine Sampled: Nov-14-11**

Arsenic	3.8	5	0.3	mg/kg	Nov-22-11	Nov-23-11	
Barium	2.0	100	1.0	mg/kg	Nov-22-11	Nov-23-11	
Cadmium	< 0.01	0.2	0.01	mg/kg	Nov-22-11	Nov-23-11	
Calcium	4000		10	mg/kg	Nov-22-11	Nov-23-11	
Chromium	1.2	1	0.1	mg/kg	Nov-22-11	Nov-23-11	
Copper	2.4	1	0.2	mg/kg	Nov-22-11	Nov-23-11	
Lead	< 0.1	1	0.1	mg/kg	Nov-22-11	Nov-23-11	
Magnesium	35800		100	mg/kg	Nov-22-11	Nov-23-11	
Mercury	< 0.03	0.05	0.03	mg/kg	Nov-22-11	Nov-23-11	
Potassium	19000		100	mg/kg	Nov-22-11	Nov-23-11	
Selenium	4.3	5	1.0	mg/kg	Nov-22-11	Nov-23-11	
Sodium	6090		10	mg/kg	Nov-22-11	Nov-23-11	
Zinc	15.0	10	0.5	mg/kg	Nov-22-11	Nov-23-11	

**SAMPLE DATA**



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Analysis Description	Method Reference(s) (* = modified from)		LAB
	Preparation	Analysis	
PNS Settleable Solids	N/A	Method C	RMD
BOD, 5-day	N/A	APHA 5210 B	RMD
Chloride	N/A	APHA 4500 Cl- D *	RMD
Chemical Oxygen Demand	N/A	APHA 5220 D	RMD
Cyanide, Total	APHA 4500-CN C	APHA 4500-CN	KEL
Freezing Point	N/A	ASTM D1177	SUB
Ammonia-N	N/A	APHA 4500-NH3 G *	KEL
Nitrate+Nitrite-N	N/A	APHA 4500-NO3- F	KEL
Total Kjeldahl Nitrogen	EPA 351.2 *	EPA 351.2 *	KEL
pH in Water	N/A	APHA 4500-H+	RMD
Phosphorus, Total (colour)	EPA 351.2 *	APHA 4500-P F *	KEL
Specific Gravity	N/A	ASTM D1429	RMD
Total Metals, as per PNS	N/A	EPA 6020A	RMD

## QUALITY CONTROL DATA



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The following section reports quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with quality control samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested for.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	Reporting Limit Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
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### DRAFT: General Parameters, Batch B1K0169

<b>Duplicate (B1K0169-DUP1)</b>		<b>Source: CK10194-04</b>		Prepared: Nov-15-11, Analyzed: Nov-16-11					
pH (1:4 Solution)	5.5	0.1	pH units	5.5			< 1	20	
<b>Duplicate (B1K0169-DUP2)</b>		<b>Source: CK10194-10</b>		Prepared: Nov-15-11, Analyzed: Nov-16-11					
pH (1:4 Solution)	5.8	0.1	pH units	5.8			< 1	20	

### DRAFT: General Parameters, Batch B1K0170

<b>Blank (B1K0170-BLK1)</b>		Prepared: Nov-16-11, Analyzed: Nov-21-11							
BOD, 5-day	< 20	20	mg/kg						
<b>LCS (B1K0170-BS1)</b>		Prepared: Nov-16-11, Analyzed: Nov-21-11							
BOD, 5-day	205	20	mg/kg	198	104	78-125			
<b>Duplicate (B1K0170-DUP1)</b>		<b>Source: CK10194-01</b>		Prepared: Nov-16-11, Analyzed: Nov-21-11					
BOD, 5-day	52300	20	mg/kg	54400			4	30	
<b>Reference (B1K0170-SRM1)</b>		Prepared: Nov-16-11, Analyzed: Nov-21-11							
BOD, 5-day	223	20	mg/kg	198	113	70-130			

### DRAFT: General Parameters, Batch B1K0174

<b>Blank (B1K0174-BLK1)</b>		Prepared: Nov-16-11, Analyzed: Nov-17-11							
Chemical Oxygen Demand	< 20	20	mg/kg						
<b>LCS (B1K0174-BS1)</b>		Prepared: Nov-16-11, Analyzed: Nov-17-11							
Chemical Oxygen Demand	488	20	mg/kg	500	98	80-120			
<b>Duplicate (B1K0174-DUP1)</b>		<b>Source: CK10194-01</b>		Prepared: Nov-16-11, Analyzed: Nov-17-11					
Chemical Oxygen Demand	175000	5000	mg/kg	178000			2	20	

### DRAFT: General Parameters, Batch B1K0188

<b>Duplicate (B1K0188-DUP1)</b>		<b>Source: CK10194-02</b>		Prepared: Nov-16-11, Analyzed: Nov-16-11					
Specific Gravity	1.220	0.001	g/mL	1.219			< 1	20	
<b>Duplicate (B1K0188-DUP2)</b>		<b>Source: CK10194-05</b>		Prepared: Nov-16-11, Analyzed: Nov-16-11					
Specific Gravity	1.168	0.001	g/mL	1.166			< 1	20	

**QUALITY CONTROL DATA**



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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
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**DRAFT: General Parameters, Batch B1K0209**

<b>Blank (B1K0209-BLK1)</b>				Prepared: Nov-17-11, Analyzed: Nov-22-11						
Chloride	< 0.01	0.01	% Weight							
<b>LCS (B1K0209-BS1)</b>				Prepared: Nov-17-11, Analyzed: Nov-22-11						
Chloride	0.10	0.01	% Weight	0.100		100	90-110			
<b>Duplicate (B1K0209-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-17-11, Analyzed: Nov-22-11			
Chloride	11.4	0.01	% Weight		11.2			1	20	

**DRAFT: General Parameters, Batch K105061**

<b>Blank (K105061-BLK1)</b>				Prepared: Nov-17-11, Analyzed: Nov-21-11						
Nitrogen, Nitrate+Nitrite as N	< 1	1	mg/kg							
<b>Duplicate (K105061-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-17-11, Analyzed: Nov-21-11			
Nitrogen, Nitrate+Nitrite as N	40	1	mg/kg		40			< 1	20	

**DRAFT: General Parameters, Batch K105110**

<b>Blank (K105110-BLK1)</b>				Prepared: Nov-21-11, Analyzed: Nov-22-11						
Nitrogen, Total Kjeldahl	< 5	5	mg/kg							
<b>Duplicate (K105110-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-21-11, Analyzed: Nov-22-11			
Nitrogen, Total Kjeldahl	2680	100	mg/kg		2660			< 1	20	

**DRAFT: General Parameters, Batch K105111**

<b>Blank (K105111-BLK1)</b>				Prepared: Nov-21-11, Analyzed: Nov-22-11						
Phosphorus, Total	< 1	1	mg/kg							
<b>Duplicate (K105111-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-21-11, Analyzed: Nov-22-11			
Phosphorus, Total	390	20	mg/kg		390			< 1	19	

**DRAFT: General Parameters, Batch K105123**

<b>Blank (K105123-BLK1)</b>				Prepared: Nov-21-11, Analyzed: Nov-22-11						
Nitrogen, Ammonia as N	< 2	2	mg/kg							
<b>Duplicate (K105123-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-21-11, Analyzed: Nov-22-11			
Nitrogen, Ammonia as N	360	40	mg/kg		400			8	15	

**DRAFT: General Parameters, Batch K105137**

<b>Blank (K105137-BLK1)</b>				Prepared: Nov-22-11, Analyzed: Nov-24-11						
Cyanide (total)	< 0.1	0.1	mg/kg							
<b>Duplicate (K105137-DUP1)</b>				<b>Source: CK10194-01</b>			Prepared: Nov-22-11, Analyzed: Nov-24-11			
Cyanide (total)	< 0.1	0.1	mg/kg		< 0.1				20	

**DRAFT: Total Metals, as per PNS, Batch B1K0251**

<b>Blank (B1K0251-BLK1)</b>				Prepared: Nov-22-11, Analyzed: Nov-23-11						
Arsenic	< 0.3	0.3	mg/kg							
Barium	< 1.0	1.0	mg/kg							
Cadmium	< 0.01	0.01	mg/kg							
Calcium	< 10	10	mg/kg							
Chromium	< 0.1	0.1	mg/kg							
Copper	< 0.2	0.2	mg/kg							
Lead	< 0.1	0.1	mg/kg							
Magnesium	< 10	10	mg/kg							

**QUALITY CONTROL DATA**



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Analyte	Result	Reporting Limit Units	Spike Level	Source Result	% REC	% RPD	% REC Limits	% RPD Limit	Notes
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**DRAFT: Total Metals, as per PNS, Batch B1K0251, Continued**

**Blank (B1K0251-BLK1), Continued**

Prepared: Nov-22-11, Analyzed: Nov-23-11

Mercury	< 0.03	0.03 mg/kg							
Potassium	< 10	10 mg/kg							
Selenium	< 1.0	1.0 mg/kg							
Sodium	< 10	10 mg/kg							
Zinc	< 0.5	0.5 mg/kg							

**Duplicate (B1K0251-DUP1)**

**Source: CK10194-01**

Prepared: Nov-22-11, Analyzed: Nov-23-11

Arsenic	3.7	0.3 mg/kg		3.8		2	20		
Barium	2.2	1.0 mg/kg		2.0			20		
Cadmium	< 0.01	0.01 mg/kg		< 0.01			20		
Calcium	4370	10 mg/kg		4000		9	20		
Chromium	1.2	0.1 mg/kg		1.2		3	20		
Copper	2.5	0.2 mg/kg		2.4		4	20		
Lead	< 0.1	0.1 mg/kg		< 0.1			20		
Magnesium	37900	100 mg/kg		35800		6	20		
Mercury	< 0.03	0.03 mg/kg		< 0.03			20		
Potassium	19700	100 mg/kg		19000		3	20		
Selenium	3.4	1.0 mg/kg		4.3			20		
Sodium	6540	10 mg/kg		6090		7	20		
Zinc	15.9	0.5 mg/kg		15.0		6	20		