



January 31, 2014

Mr. Michael Cunningham
Environmental Protection Specialist
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, Colorado 80203

Via Fedex
TRK#797789649117

Re: CEMEX Lyons Mine Permit M-1977-208

4th Quarter 2013 Monitoring Data Sulfate & Chloride Report

Dear Mr. Cunningham:

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FEB 04 2014

**Division of Reclamation,
Mining & Safety**

Introduction

Information gathered during the fourth quarter of 2013 relating to the Monitoring Well CEM-004 (23 feet below grade) indicated that two monitoring parameters, sulfate and chloride, were greater than the monitoring goals identified in Technical Revision 11 (TR-11). CEMEX notified you (via telephone) of the sulfate and chloride concentrations on January 8, 2014, after the analytical data was received on January 7, 2014. The purpose of this letter is to provide the results of the fourth quarter monitoring, provide our assessment of factors that may have contributed to these observations, and to recommend a path forward.

Background

CEMEX, Inc. manufactures hydraulic Portland cement at the Lyons Plant. The Cement Plant consists of one dry-process rotary cement kiln. Hydraulic cement, one of the principle components of concrete, is generally produced from aluminum, silica, and iron as found in clay, shale, magnetite and other materials, and from a calcareous material commonly obtained from limestone. Cement manufacturing primarily involves the crushing, grinding, and blending of limestone and other raw materials into a chemically-proportioned mixture, which is heated in a rotary kiln to extremely high temperatures to produce fused cement nodules (or pellets), known as "clinker." The clinker is cooled and ground with a small amount of gypsum and other additives to produce finished cement. A stockpile of gypsum is maintained on site as shown on Figure 1 (attached).

Cement kiln dust (CKD) is created as part of its cement production process. The CKD is either returned to the production process, sold as product to various vendors, or used as backfill for reclamation in a previously mined quarry pit. On-site disposal of CKD in C-Pit has been taking place since 1998. Water accumulates in low areas of C-Pit. The C-Pit water is sampled along with two monitoring wells: CEM -001 and CEM-004. A compliance well has also been drilled at the edge of the CEMEX property to assess whether C-Pit water is migrating in the groundwater. To date, no water has accumulated in the compliance well. The CEM-004 well is an alluvial well (23 feet deep).

Monitoring goals for CEM-004 for chloride and sulfate are 250 mg/l. Samples collected from CEM-004 and C-Pit on December 20, 2013 indicate that CEM-004 concentration of sulfate was 1580 mg/l and chloride was 338mg/l.

Summary of C-Pit and CEM-004 Data

A summary of analytical data from CEM-004 is provided in Table 1. Analytical data from C-Pit is also provided in Table 1 for reference. Trend plots are provided on Figure 2 (chloride, sulfate, TDS, and pH) and Figure 3 (selenium and thallium). The trend plots indicate a general inverse relationship between the analyte concentrations and the seasonal water table fluctuations. Typically, higher concentrations of the analytes are observed during periods of lower water elevations in the well.

Additionally, a charge balance of principal cations and anions was performed as a basis for preparation of Stiff diagrams (shown in Figure 4). Stiff diagrams provide a way to evaluate the geochemical signature (finger print) for both the CEM-004 groundwater and the accumulated C-Pit water (Figure 4). In order to conduct a thorough analysis and create valid Stiff diagrams, an assessment of the cations and anion charge balance is required. The charge balance performed for CEM-004 groundwater and C-Pit water confirms the electroneutrality of the water, namely that all the principal cations and anions are accounted for (i.e., meets the less than 5% percent error criteria). As shown in Figure 4, there continues to be a distinctive difference in the chemical signature between CEM-004 groundwater and C-Pit water. The C-Pit signature for December 2013 is consistent with the historical characteristics of the water from this area. The CEM-004 groundwater signature for December 2013, remains distinct from the C-Pit water signature. While the CEM-004 groundwater signature remains significantly different from the C-Pit water signature, it does exhibit a slightly different finger print in 2013 when compared to the other historical data presented. As shown in Figure 4, the December 2013 Stiff diagram for CEM-004 shows higher concentrations of calcium and sulfate than has been observed in previous years (Figure 4).

Data Evaluation

As stated in CEMEX's previous letter to you dated May 29, 2013, the data still does not indicate the presence of a direct hydrogeologic connection between CEM-004 and C-Pit. Based on the distinctly different chemical signatures of the C-Pit water and the CEM-004 water, we do not believe that C-Pit is the source of the higher sulfate and chloride detections in CEM-004 in December 2013.

There are potentially two contributing factors that may explain the recent elevated levels of sulfate and chloride in CEM-004 when compared to past analysis.

1. As you are aware, CEM-004 is a shallow alluvial well and as a result, water elevations are readily influenced by surface water recharge in the surrounding area. There appears to be a consistent seasonal trend between the lower water levels in CEM-004 and higher analyte concentrations. It is believed that when there are seasonal periods of higher alluvial water in the system, corresponding to higher water levels in the CEM-004-well, measured analyte concentrations are lower. Conversely, when water levels are lower,

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concentrations of analytes in the groundwater typically increase. This general correlation is shown on Figures 2 and 3.

2. During the major flooding event in September 2013, CEM-004 was within the extent of the flood plain (Figure 1). CEMEX experienced severe impacts and damage from flooding of the St. Vrain River. Stockpiles of materials were severely eroded, including a stockpile of gypsum (CaSO_4). As shown in Figure 1, the gypsum stockpile is located near CEM-004. It is hypothesized that erosion of this stockpile may be responsible for the higher calcium and sulfate concentrations observed compared to previous years. The gypsum stockpile is delivered as an aggregate, and is located upgradient from CEM-004, so as the flood waters moved through the site it is suspected that some of the gypsum went into solution migrating into the ground water.

Conclusion and Recommendations

CEMEX will continue to conduct quarterly monitoring for cations and anions. If the chloride and sulfate are above the monitoring targets, then the Stiff diagrams will be developed and will be provided with the quarterly report. It seems as though we are seeing seasonal variation with regard to the chloride and sulfate and not a chemical connection between the CEM-004 Well and C-Pit. Therefore, I would like to discuss with you some reporting flexibility when chloride and sulfate are high due to the observe seasonal variation since the monitoring targets for these analytes are based on drinking water standards.

If possible I would like to schedule a meeting in the next few weeks to discuss our path forward. Please let me know what time is most convenient for you. If there are any questions regarding the above information or the attachments, please contact me at (303) 823-2115.

Sincerely,

A handwritten signature in blue ink, appearing to read "Denise Arthur", with a long, sweeping horizontal line extending to the right.

Denise Arthur, Ph.D.
Environmental Manager
5134 Ute Hwy PO Box 529
Lyons, CO 80540

Table 1: Summary of CEM-004 and C-Pit Analytical Data, 2010 through 2013

CEM-004 Analytical Data

Date	3/19/10	6/4/10	9/28/10	12/10/10	3/31/11	6/17/11	8/18/11	12/19/11	3/8/2012	3/27/12	4/4/12	6/13/12	7/20/12	10/11/12	2/7/13	2/21/13	4/10/13	4/25/13	8/22/13	12/20/13
Chloride (mg/l)	8.3	9.8	4.7	8.6	51.2	7.7	1.7	23.1	324	29.6	76	2.1	2.1	3.1	478	554	157	27	1.9	338
Sulfate (mg/l)	19	38	20	53	151	32.9	9.1	185	1020	113	240	11.5	9.2	24.4	1630	1820	542	161	8	1580
TDS (mg/l)	110	220	130	220	436	195	148.0	488	2250	304	574	108	92	158	3478	3830	1260	NA	100.0	3030
Selenium (mg/l)	0.0013	0.0036	0.0038	0.0024	<0.002	<0.002	<0.002	0.0049	0.0140	0.0040	0.0023	<0.002	0.00091	<0.0008	0.0025	0.0021	0.0047	NA	<0.0008	0.0052
Thallium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	NA	<0.0004	<0.001

C-Pit Analytical Data

Date	3/19/10	6/4/10	9/29/10	12/10/10	3/31/11	6/17/11	8/18/11	12/19/11	3/8/2012	3/27/12	4/4/12	6/14/12	7/18/12	10/10/12	2/7/13	2/21/13	4/10/13	4/25/13	8/22/13	12/19/13
Chloride (mg/l)	1100	1100	1600	1500	1540	1410	1420	982	1120	NA	NA	1270	1000	1250	837	NA	1090	1250	1220	941
Sulfate (mg/l)	3200	3100	4500	3100	3510	3350	3020	2190	2880	NA	NA	3150	2570	2960	1660	NA	2670	2860	2880	1810
TDS (mg/l)	6500	6900	9200	7700	8370	8150	8030	5680	7190	NA	NA	7500	6690	7240	4430	NA	6920	NA	8230	5800
Selenium (mg/l)	0.04	0.12	0.13	0.07	0.04	0.054	0.10	0.18	0.11	NA	NA	0.11	0.116	0.175	0.107	NA	0.101	NA	0.137	0.163
Thallium (mg/l)	0.005	0.0015	<0.001	<0.001	<0.001	0.0033	<0.001	<0.001	<0.001	NA	NA	<0.001	0.0014	0.001	0.001	NA	<0.0004	NA	0.0012	<0.001

Figure 1

CEMEX Monitoring Well

CEM-004

2013 Flood Analysis

Legend

Label



Gypsum Stockpile



CEM-004



Flood Inundation



Source:
2013 Colorado Flood Situational Awareness,
FEMA Modeling Task Force (MOTF)



Figure 2: CEM-004 Historical Water Level, Chloride, Sulfate, and Dissolved Solid Concentrations

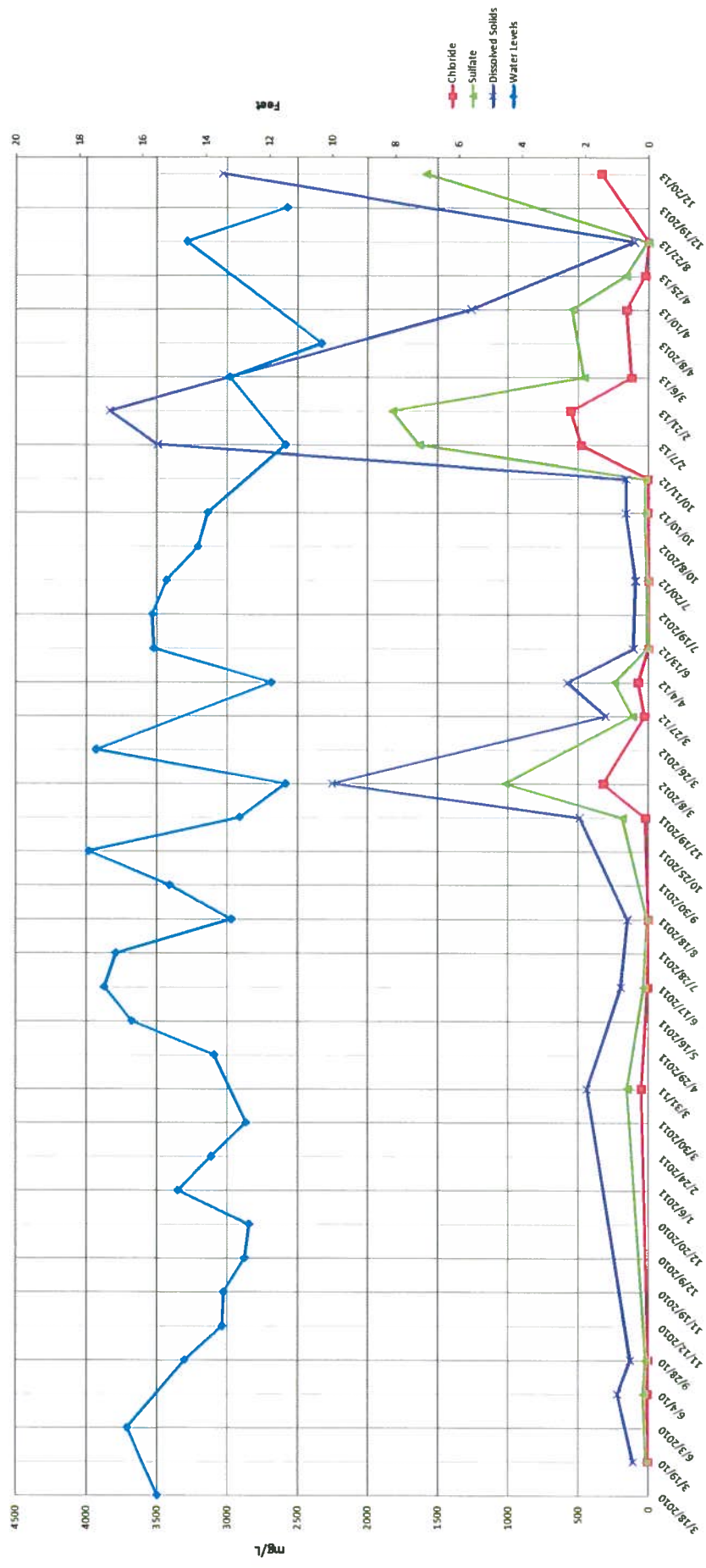


Figure 3: CEM-004 Historical Water Level, Selenium, and Thallium Concentrations

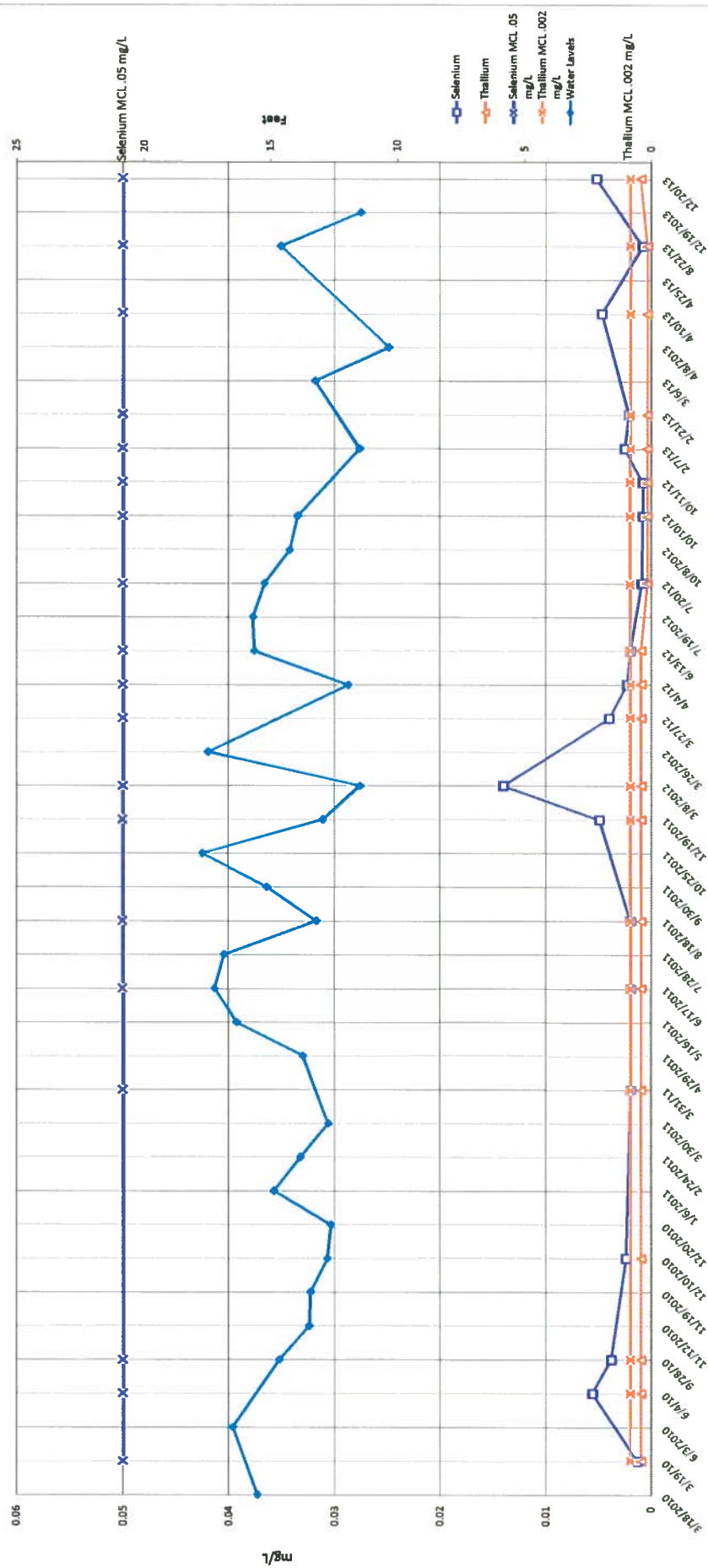
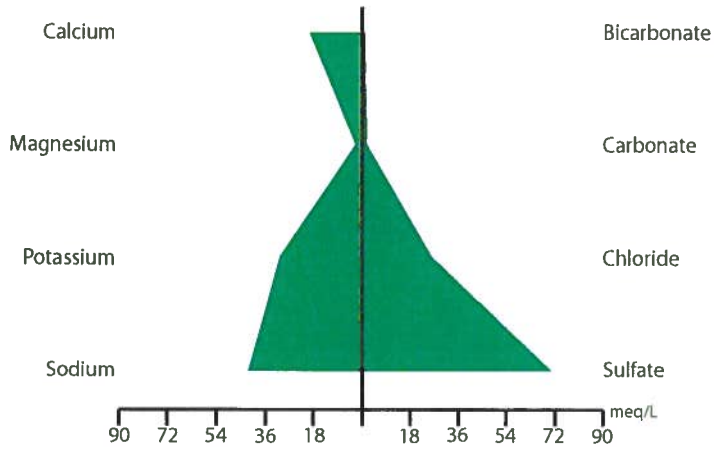


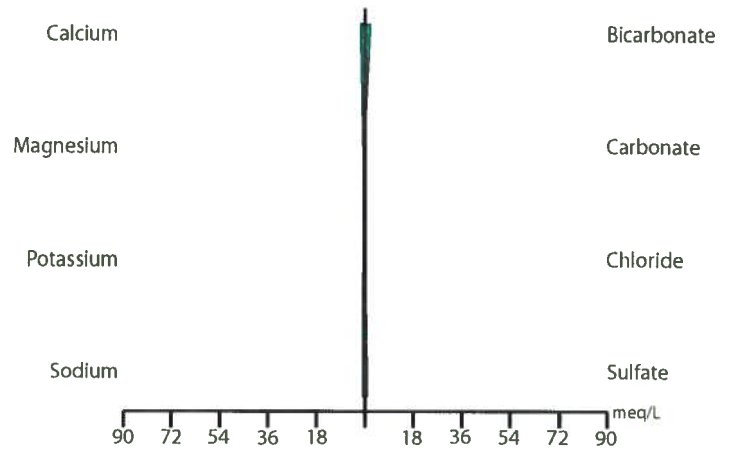
Figure 4

STIFF DIAGRAM

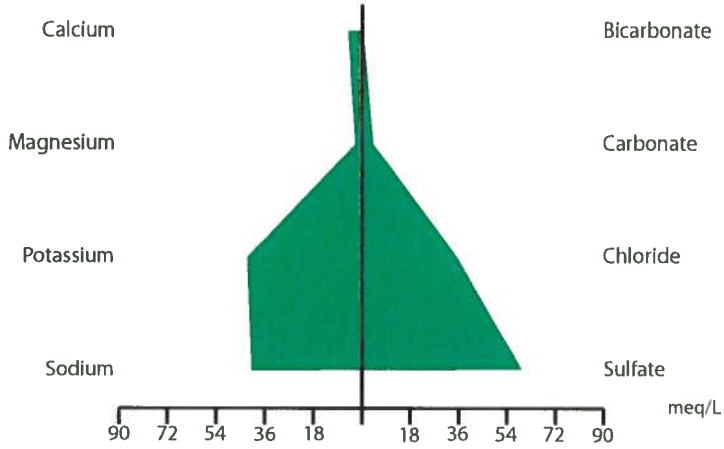
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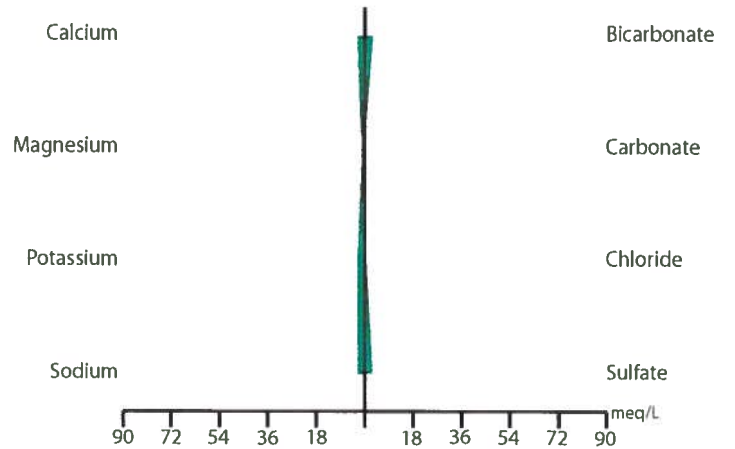
CEM-004 2007



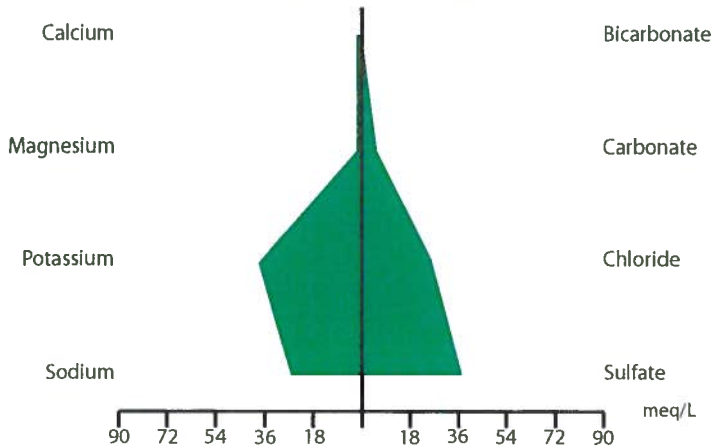
C-Pit April 2013



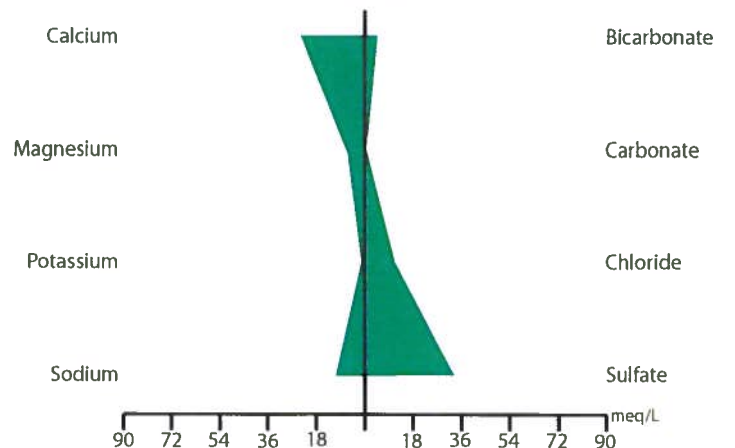
CEM-004 April 2013



C-Pit December 2013



CEM-004 December 2013



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Ship Date: 31 JAN 14
ActWgt: 1.0 LB
CAD: 8905491/NET3490

Delivery Address Bar Code



Ref # Y13Q4 C-pit-Add'lum (CEM 004)

Invoice #

PO #

Dept #



J14101312270226

BILL SENDER

Origin ID: FNLA

From: (303) 866-3567
Denise T. Arthur
Cemex
5134 Ute Highway
Lyons, CO 80540

SHIP TO: (303) 866-3567 X 8116

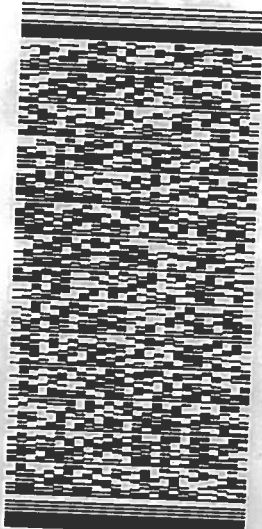
Michael Cunningham

DRMS

1313 SHERMAN ST STE 215

Dept. of Natural Resources

DENVER, CO 80203



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