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MONITORING SEDIMENT BOUND CADMIUM IN SØMME BAY, HAFRSFJORD, NORWAY

(Master in Water Science and Technology)

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ABSTRACT

Cadmium is considered to be a very toxic heavy metal for organisms at all levels of organisation. Therefore, careful analysis is made in Sømme bay, Hafrsfjord as this area is a very important marine wetland habitat, particularly for migrating birds.

It was found that cadmium flows with the treated drainage water from the airport water treatment plant and we measured a mean concentration of 2.72 µg/g dryweight which has important effect on animal life like oxygen depth depletion, development of harmful algae and species modifications. Sedimented cadmium flows through sediment to the deepest areas of the fjord. We found out that the deep water sediments contain 10-84 µg/g cadmium, values which make life impossible in any form. There is a strong correlation between cadmium and organic content.

We recommend that special attention is attributed to cadmium containing drainage water, waste dumping sites and runoff of agricultural pesticides into the fjord's ecosystem.

Key words: cadmium, pollution, atomic absorption spectrometry, total volatile solids

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ABBREVIATIONS

AAS Atomic absorption spectrometry

DIW Deionized water

EDL Electrode Discharge Lamp

EDTA ethylenediaminetetraacetic acid

EEC European Economic Community

GF AAS Graphite Furnace Atomic absorption Spectrometry

IRIS International Research Institute of Stavanger

MDS Multi Digestion System

PVC Polyvinil Chloride

TS Total Solids

TVS Total Volatile Solids

TIS Total Inorganic Solids

I. INTRODUCTION

Norway is known to be one of the most prestine countries in the world. For this reason, and others, it was called in 2009 "the best country where to live in" [1]. Norway lies on the west coast of the Scandinavian Peninsula and has a coast line of more than 2500 km in straight line (baseline), and over 83000 km including islands and fjords. Fjords are characteristic not only for Norway, but they are an important element of Norway's image around the world. Coast land offered in the past the best possibilities to live in a cold country. Even now it is considered that 80% of the Norwegian population (approximately 4.8 million inhabitants live less than 10 km from the coast). Coast lines offer mild weather conditions and more fauna, flora, agricultural lands and possibilities to develop industry and life conditions.

Stavanger is Norway's fourth largest city (as number of inhabitants, approximately 120.000 without surrounding area) and it is situated on the peninsula Jæren, in the county Rogaland, a predominant agricultural and industrial area in south west of Norway. In 1969, oil was discovered in the North Sea and Stavanger became the oil capital of Norway and Scandinavia. The city developed fast and is now the fastest growing city in Norway [2].

German army used Stavanger as an important strategic base during the Second World War and they built a large airport at Sola near Stavanger. Some years after the war, the airport became public and now is one of the most important international airports in Norway.

Sola International Airport is situated near Hafrsfjord, one of the small, partially closed fjords of Norway. Hafrsfjord ends at south in Sømme bay (Sømmebukta in Norwegian) which is close to Sola Airport. Drainage waters from Sola Airport are disposed directly into the Sømme bay waters. This water is known to have a high concentration of cadmium, one of the most toxic heavy metals [3]. This metal is toxic both for human and animal life.

Hafrsfjord is known to be one of the most important places during bird migration. Particularly Sømme and Strandsnes bays are the last feeding grounds for birds before starting the long flight to Great Britain and southern warm areas for winter periods.

The purpose of this paper is determination of cadmium content in Sømme bay in water sediment. The first chapter makes a short brief of cadmium properties and influences to human and animal life. It offers a general frame over cadmium behavior. We summarize cadmium concentration data in different places on the world and we focus on Norwegian coast sediments and more on Hafrsfjord and Sømme bay.

The second chapter describes materials, instruments and methodology used in determination of cadmium concentration in sediment. It focuses on microwave digestion and graphite furnace atomic absorption spectrometry. It contains also a method for determination of organic content and total volatile solids. We can find estimation of method errors at the end of the chapter.

The third chapter deals with the results obtained from cadmium analysis and total volatile solids determinations. The last two chapters form a discussion regarding results, quality of determination, methodology discussions, and analysis of result with respect to theoretical aspects and other results. At the end of the paper you find a small chapter of conclusions and recommendations.

II. BACKGROUND THEORY

2.1. General description

Cadmium (Greek Cadmean (earth), calamine) is a second row transition metal belonging to group 12 in the periodic table, along with Zn and Hg. The element has an atomic number of 48, an atomic mass of 112, one main oxidation state (+2) and eight naturally occurring isotopes (^{106}Cd, ^{108}Cd and ^{110}Cd to ^{116}Cd), of which ^{114}Cd, ^{112}Cd, ^{111}Cd, ^{110}Cd and ^{113}Cd have abundances of 28.73%, 24.13%, 12.80%, 12.49% and 12.22% respectively. The chemistry of cadmium is similar to that of Zn.

Cadmium was first isolated by F. Strohmeyer in 1817 from the zinc ore smithsonite ($ZnCO_3$) [4]. It has been released into the environment since the early days from the smelting of a variety of ores and the burning of wood and coal [*ibid*]. Cadmium is among the rarer trace elements and is seldom found in pure minerals. It is extracted commercially from zinc ores e.g zincblende (ZnS) in which occurs at 0.1-5.0% [*ibid*].

It is also found in trace amounts in some silicate minerals, such as biotite and amphibole. Cadmium occasionally forms minerals in its own right, most notably greenockite CdS, but also the rarer octavite $CdCO_3$ and monteponite CdO (Reimann and de Caritat 1998). There is also evidence of an affinity with organic matter; some types of coal, peat, and crude oil contain relatively high cadmium levels, which may be due to selective adsorption and complexation by humic compounds [*ibid*].

The average crustal abundance of cadmium is rather low, between 0.1 and 0.2 mg/kg. Generally lower levels occur in igneous and metamorphic rocks (granite typically 0.09 mg/kg, basalt 0.13 mg/kg), metamorphic rocks (0.04-1.0 mg/kg), sedimentary rocks (0.3-15 mg/kg), but higher levels are found in shale (0.8 mg/kg), especially organic-rich sediments, and in marine manganese nodules and phosphorite. The concentration of cadmium in river particulates has been estimated as 1 mg/kg [*ibid*].

In the surface environment cadmium is mobile at pH below 8. Because Cd^{2+} is the only stable oxidation state, the solubility of elemental cadmium is unaffected by changes in E_h. The critical pH point for cadmium is 4.0-4.5 in soils at which a drop of 0.2 points increases the concentration of cadmium 3 to 5 times [*ibid*]. The sulfate and the carbonate of cadmium are less soluble than the similar ones for zinc and therefore cadmium mobility is more restricted in carbonate rich sediments and soils.

Cadmium readily forms complexes in solution with halides, cyanides and ammonium species, and has a strong affinity for organic matter. Humic substances bind Cd^{2+} to a greater extent than the major inorganic ligands, especially at high pH levels.

Cadmium tends to volatilize at high temperatures and in this way it enters into the hydrologic cycle in industrialized areas. Cadmium has a relatively high vapor pressure. The vapor is oxidized quickly to produce cadmium oxide in the air. When reactive gases or vapors, such as carbon dioxide, water vapor, sulfur dioxide, sulfur trioxide or hydrogen chloride, are present, the vapor reacts to produce cadmium carbonate, hydroxide, sulfite, sulfate or chloride, respectively [5]. These salts may be formed in stacks and emitted to the environment.

Some of the cadmium salts, such as the sulfide, carbonate or oxide, are practically insoluble in water. However, these can be converted to water-soluble salts in nature under the influence of oxygen and acids; the sulfate, nitrate, and halogenates are soluble in water.

In oxic environments CdO, $CdCO_3$ and $Cd (OH)_2$ precipitation (dependent on pH) dominate sediment – water phase distribution while in anoxic marine sediments CdS is the dominating species. Aerobic forms are more dynamic in sediment – water interphase as complexation reactions keep the Cd^{2+} in solution and pH dependent precipitation products have higher solubility products. In oxic environments cadmium absorption is stronger than in anoxic environments.

2.2. Sources

Volcanic activity is the major natural occurring source. It is estimated that the global annual flux coming from volcanic activity is 100-500 tones. Deep sea volcanism is also a source of cadmium, but further quantitative determinations needs to be done [4]. Other natural sources are forest fires and windblown dusts [6].

The main anthropogenic sources relate to ore mines, metallurgical industries and disposal of sewage sludge [*ibid*]. Cadmium concentrations in the fumes of copper, lead, nickel and zinc sulfide smelters can be high due to high volatility of metals. Another major input comes from the combustion of fossil fuels in industries using coal and domestic refuse incineration. Cadmium can be introduced in atmosphere by urban and motorway dusts, cadmium phosphorus fertilizers and sewage sludge applications on land [*ibid*].

In aquatic environment the major source of cadmium release are non-ferrous metal mines. Contamination arises from drainage water, waste water and overflow from the tailing ponds and rainwater runoff from the entire mining area. The release of these effluents to local water courses can lead to extensive contamination downstream of the mining operation. Mines disused for many years can still be responsible for the continuing contamination of adjacent watercourses. In the table below are represented the main anthropogenic cadmium pollution sources.

Table 1. Cadmium – sources of pollution (Source IPCS 1992)

Source	United Kingdom	EEC	Worldwide
Natural sources	Nd	20	150-2600
Non-ferrous metal production			
Mining	Nd	nd	0.6-3
Zinc and cadmium		20	920-4600
Copper	3.7	6	1700-3400
Lead		7	39-195
Secondary production	Nd	nd	2.3-3.6
Production of cadmium containing substances	Nd	3	ND
Iron and steel production	2.3	34	28-284
Fossil fuel combustion			
Coal	1.9	6	176-882
Oil	Nd	0.5	41-246
Refuse incineration	5	31	56-1400
Sewage sludge incineration	0.2	2	3.36
Phospate fertilizer manufacture	Nd	nd	68-274
Cement manufacture	1	nd	08/09/34
Wood combustion	Nd	nd	60-180
Total emissions	14	130	3350-14640

nd - no data available

Agricultural soils are mainly polluted by phosphate fertilizers which contain a varied amount of cadmium depending on the rock phosphate (160-255 g/ton of phosphate peroxide from west African rocks to 35 g/ton from southeastern USA rocks). In EEC the annual cadmium input from fertilizers was estimated to 5 g/ha in 1985. Agricultural soils can be polluted with cadmium coming from municipal sewage sludge [5].

2.3. Usage

Cadmium is mainly used during industrial production. The principal categories of usage of cadmium are protective plating/coating on steel, stabilizers for PVC, pigments in plastics and glass, electrode material in nickel-cadmium batteries and as a component of various alloys. The electroplating registered a decrease from 50% in 1960 to 25% in 1985 [5]. This decline is linked to the introduction of stringent limits for plating works and cadmium consumption.

The use of cadmium as a constituent of alloys is relatively small. Cadmium is mainly applied via electroplating or dipping to another metal as a thin film coating for protection against corrosion. Recently the plane industry began to use cadmium for coating planes because it offers protection against corrosion and more flexibility [7]. Therefore, plane dyes contain a significant percentage of cadmium. The organic compounds of cadmium are widely used in plastic industry as polymerizing catalysts. As seen in the table 2, plating is the most common industry for cadmium.

Table 2. Cadmium in industry (GESAMP Report 1985)

Use	1965		1970		1975	
	Tonnes	%	Tonnes	%	tonnes	%
Batteries	669	7	842	8	1102	14
Pigments	2463	25	2733	25	1980	25
Stabilizers	905	9	2089	19	1249	16
Plating	4518	47	4068	37	2614	33
Alloys	804	8	803	7	658	8
Others	333	4	382	4	300	4
Total	9692		10917		7903	

2.4. Transport, transformation and bioacummulation

Cadmium is transported from air into two main environmental compartments: soils and water. In soils, cadmium is transported from atmosphere by deposition and precipitation. In EEC the mean value for deposition is 3 g/ha while in Scandinavia we can find only 0.4-0.9 g/ha [5]. Cadmium concentration is higher in the industrial areas where it spread from tall stack sources (especially metal refining and processing plants).

Cadmium enters seas and oceans from air and in some parts dissolved in rain and snow.

The transport of cadmium from fresh waters to marine recipients occurs either in particulate or soluble form. The specific form depends on the state of the river, its dissolved mineral composition and its sources of pollution and significant unidentified local factors. River sediments generally reflect the neighboring soils and mineral workings. High cadmium levels are accompanied by high level of other trace metals. In general, there are enhanced levels of cadmium in near shore sediments and sea waters compared to offshore and oceanic sediments and waters.

The transformation of inorganic forms in sea water does not affect cadmium solubility [6]. Cadmium is held in sewage sludge as carbonates, sulfides and complex organic combinations. In aerobic waters and sediments the biodegradability of organic complexes release cadmium. In anaerobic environments organic complexes are hardly biodegradable and cadmium carbonates and sulphides may be more persistent.

Uptake (absorption) of cadmium by phytoplankton followed by grazing by herbivores and elimination in fecal pellets is a major factor in the photic zone. This can lead to high concentrations in superficial sediments or anaerobic environments (as during Red Sea blooming) [*ibid*].

Cadmium accumulates in marine flora and fauna. Marine organisms accumulate cadmium and retain it for very long periods. The only way of elimination seems to be over the kidneys, and therefore we can find high concentration in marine fauna kidney and blood [5].

Bioaccumulation occurs when the concentration in the organism exceeds the concentration in the nutrient medium and is expressed quantitatively as a bio concentration factor. Progressive bioaccumulation at each trophic level is termed bio magnification. The bio concentration factor has a wide range from 16 (*Eichhornia crassipes*) to 130.000 (*Acer rubrum*) while some molluscs, arthropods have the bioconcentration factor of the order of tens of thousands (certain tissues eaten by men) [6] and it does not have a specific pattern [5].

According to some experiments, cadmium located in sediments seems not to be available to pelagic marine organisms, only to sediment living polychetaes like *Nereis virens* and bivalves [6].

Cadmium is eliminated in some cases through excretion systems. The same bioaccumulation has been registered at sea birds, seals and porpoises, but no harmful effects were identified [*ibid*].

2.5. Toxicity for fauna and flora

Cadmium uptake from water by aquatic organisms is extremely variable and depends on the species and various environmental conditions such as water hardness (notably the calcium ion concentration), salinity, temperature, pH, chelating agents and organic matter content. As a consequence of the variability in cadmium uptake, the toxic impact to aquatic organisms also varies across a wide range of concentrations and is dependent on the species of organism and on the presence of other metal ions, notably calcium and zinc.

Fresh water microorganisms are more affected by cadmium at lower concentrations (50 µg/l affects growth in many freshwater species of algae) while marine microorganisms are affected at higher concentrations (100-1000 µg/l) in growth process [5]. In some studies the oxygen consumption decreased at cadmium levels above 10 mg/liter in *Pseudomonas marina* growth and oxygen consumption study [*ibid*].

Cadmium is moderately to highly toxic to aquatic invertebrates. Its toxic effect is dependent on a variety of environmental variables. Factors that reduce the free ionic concentration tend to reduce the toxic effect of cadmium [*ibid*]. The presence of zinc increases the toxic effect of cadmium on invertebrates [*ibid*].

The increase of temperature and decrease of salinity leads to an increase of toxicity for a large range of organisms studied [*ibid*]. Hard water amplifies the cadmium toxicity for approximately two times. In sediment contamination studies, cadmium dissolved in interstitial water and amplified the concentration of cadmium. The embryo and larvar states are more sensitive to cadmium than the adult organisms. Cadmium exposure showed very small reduction in reproduction and longevity for some tests made on marine organisms.

Regarding toxicity to fish, cadmium concentration is increased with temperature and decreased with dissolved salts [5]. There were reported some sub-lethal effect and malformation of the spine [*ibid*].

A field study has shown that fish from a cadmium-contaminated river have physiological abnormalities [*ibid*].

Both terrestrial plants and animals accumulate cadmium, but the rate of accumulation is much higher under experimental conditions, where cadmium is available in solution, than it is with plants grown in soil, when part of the cadmium is bound and less available [*ibid*].

Cadmium has adverse effects on hydroponically grown plants at concentrations in the mg/l range, whereas plants grown in soil only show reduced growth in contaminated soils with hundreds of mg cadmium/kg [*ibid*]. Terrestrial invertebrates are relatively insensitive to cadmium-induced toxic effects, probably due to effective sequestration mechanisms in specific organs [*ibid*]. When toxic effects do occur, they consist of reduced growth and reproduction [*ibid*].

The studies made on birds showed an insignificant effect on short term on some bird species except in pheasants which was very sensitive to cadmium exposure [*ibid*]. Reproductive effects were greater. An intra testicular injected cadmium solution produced a reduction of full testicular development and local necrosis of testis when injected in the testis of feral pigeons. The spermatogenesis was reduced with a dietary concentration of 200 mg/kg in the form of cadmium at male mallards [*ibid*].

In sea birds studies, kidney cells were affected at exposure to 60-480 and 95-240 mg/kg. Damage included included cell necrosis, nuclear pyknosis, mitochondrial swelling, and some tubularhexis [*ibid*].

Kidney damage has been found in pelagic sea-birds from areas away from industrial or other anthropogenic sources of cadmium, but there was no effect on survival or reproduction of populations [*ibid*]. In industrially contaminated areas, kidney damage has been observed in several species of birds found to contain cadmium plus other metals [*ibid*].

Tolerance to cadmium has been demonstrated in soil fungi, plants, aquatic invertebrates, and fish from cadmium-contaminated sites. Some field evidence suggests that cadmium is responsible for reduced leaf litter degradation and a failure to recycle nutrients due to adverse effects on populations, particularly of microorganisms [*ibid*]. However, no studies have identified cadmium as the sole cause of the effect, since it is always associated with other metals. Although soil invertebrates in contaminated sites accumulate cadmium and other metals, there is evidence that most populations are not affected [*ibid*].

In cadmium polluted environments, some fish produce protective metal bind proteins (mettalothioneins). Cadmium is proved to inhibit ion transporting enzymes like Ca-ATPase or Na/K-ATPase [*ibid*].

2.6. Effects on human health

The average absorption of cadmium in food is 5% and up to 20% for anemic and calcium deficiency people [6]. Cadmium is transported through red cells in blood and bound to metalothionein. Most cadmium is stored in liver and kidney and half of total body cadmium content can be found here. Accumulation takes place also in muscles but concentration is very low. The newborn is protected to cadmium through placenta and the concentration raises from 1 µg/kg to 15-50 µg/kg at the age of 50 years. The biological half time in the kidneys is approximately 20 years or shorter after the age of 50. In blood the major part of cadmium is related to recent exposure and has a half time of 2-3 months [*ibid*]. Thus cadmium can be an indicator of recent contamination. Smoking can increase cadmium concentration in blood from 1 µg/kg to several µg/kg. In time cadmium is eliminated through urine and the urine cadmium concentration can be used to estimate the daily intake.

Ingestion of highly contaminated food and drink can produce gastrointestinal symptoms including vomiting, diarrhorea and in some cases, shock [*ibid*]. Contamination can come from water pipes, cooling or heating pipes or pottery painted with cadmium containing pigments. Chronic cadmium intoxication can cause a decrease in renal tubular re absorption of proteins. A major sign of this effect is increase of urinary excretion of low molecular weight proteins.

Industrial exposure to cadmium can cause osteoporosis and/or osteomalacia [*ibid*]. In Japan the disease known to have these effects is Itai-Itai disease. Cadmium is an essential element in this disease in addition to calcium, proteins and vitamin D.

Exposure to cadmium at human beings is due mainly to working environment, ambient air (5 ng/mc), drinking water, tobacco and food. For non working exposed persons, food and tobacco (0.1-0.2 µg from one cigarette) are the main sources of contamination. In the absence of specific source of contamination food contain less than 0.5 mg/kg cadmium. Marine food contains a small percentage of cadmium (fish 0.4 µg/kg, mussels, oysters 1 mg/kg).

Cadmium must be taken into account for smokers and people with special food habits (wheat, rice from contaminated fields, liver and kidney from contaminated animals, marine species). The critical cadmium concentration level must be adapted to each person's body. The most likely critical concentration is 200 µg/g wetweight in kidney cortex.

2.7. Cadmium concentration in the world

The concentration in sea water has different values for different areas related to distance from shore. The concentration is very low in oceans and deep waters and higher in estuaries, inshore waters and shelf waters [4]. The stabile region of the open ocean present a significant reduction of cadmium content.

Extremely high values are reported for enclosed waters affected by local ore mining (US east coast before dredging 30-18400 µg/g; after dredging 40-5000 µg/g), but values in fjords, harbors and estuaries with urban influence are more commonly in the range of 10 µg/g [6]. In many of the cleaner inshore areas, a broad range (0.2-5.0 µg/g) is common at each site, with upper values extending to 10 µg/g where mineralization and other influences occur (such as oil activities) [*ibid*]. Sediments in the Baltic Sea range from 0.2-2.2 µg/g while the values for the North Sea are below 1.0 µg/g with some higher values in three oil activity areas [*ibid*].

In the open oceans values are below 0.5 µg/g (0.23 µg/g for deep sediments in North Atlantic and 0.65 µg/g near mid Atlantic ridge). The upwelling influences cadmium concentration. Thus near Walvis bay diatomaceous ooze contain 3-60 µg/g comparing to 0.17-0.88 µg/g for diatomaceous ooze in farther offshore samples. The Red Sea also registers high values in the range of 2-600 µg/g and 30-3900 µg/liter in interstitial water [6, page 12].

A study was made in Mombasa, Kenya in Makupa and Tudor creeks, two bays situated on the west side of Mombasa Island which has Kilindini port and a beef factory situated near some of the sampling points. The maximum cadmium concentration value was 1.0 µg/g of dry weight with the majority of samples lying in the lower range [8].

In stream sediments, a Turkish team found in 1998 and 1999 a mean concentration below 3 µg/g at all the stations in stream sediments in Yozgat, Turkey [9].

B.P.L. Goh and L.M. Chou demonstrated a connection between the level of heavy metals and particle size in marine sediments of Singapore. Multidimensional scaling (MDS), a non parameter multivariate statistical ordination method was applied to non standardized data and the results were put in two dimensions. The proportion of silt/clay fraction was superimposed on MDS configuration in order to determine correlation between metal concentration and particle size. The size of particle modified the values in two offshore location. Cadmium concentration reached the high limit of 1.6 µg/g and the size of particles did not influence the values (like the other heavy metals) [10].

In 1999 and 2001 E. Povlesen et.al. measured the heavy metals in the golf of Suez, a highly polluted area south from Cairo. They showed that except with two sampling points, the other samples are not significantly polluted. The northern stations had elevated concentration of heavy metals. Cadmium concentration was the only one which was increasing when taking samples in south (2.5-3.0 µg/g) while the north samples had 0-500 ng/g. Concentrations of 2.5-3.0 µg/g were found similar to those in Mediteranean Sea [11].

In 2006 S. Tautkus et.al. measured cadmium and zinc accumulation in bottom sediments in different waters of Lithuania and found out that cadmium and zinc concentrations are higher in Kursiu Sea (cadmium 4.75 µg/g with standard deviation of 2.5 µg/g) compared to lakes Druskiai and Zalieji (3.52µg/g and 2.14µg/g respectively) situated near capital of Lithuania and the Ignalina nuclear power station. The waters from Kursiu Sea come from river Nemunas which get its waters from the whole area of Lithuania and

Belarus. The values are lower than standard sludge from Environment Institute of European Comitee (14.6 µg/g) [12].

In 2003 the Australian and New Zeeland Environment and Conservation Council (ANZECC) measured some pollutants including cadmium in five places in Southern Firth of Thames and five places in Whaingaroa (Raglan) Harbor. They measured cadmium concentration between 0.67 and 5.3 µg/g at different sites and concluded that this concentration has some adverse effects on mammals. In southern firth of Thames the average cadmium concentration was 3.52 µg/g with some possible adverse effects on mammals. This means that no effects were possible in 2003 measurements [13].

R. Baudo et.al. collected data from different experiments and they showed that cadmium concentration is 1.6 µg/g at upper sediments and decreases with depth up to 0.3 µg/g at 400 cm depth. This last level is considered a basis in bay of Helgoland, North Sea 200-300 years ago before human pollution. So this can be considered a reference level [14, p. 67].

In 2006 at the HELCOM stakeholder conference on the Baltic Sea Action Plan, the scientific documentation showed that there are a lot of hazardous substances in the Baltic Sea since 1960 even if the loads were considerably reduced after 1985. They demonstrated, based on other documentation, that cadmium has a 12-16 µg/g concentration, 20-30 times more than in the Atlantic and they proposed some methods to reduce the cadmium concentration in time [15].

The cadmium concentration in prestine areas was established at 0.3 µg/g [14], 1.6 0.3 µg/g [10] to 4.75 0.3 µg/g [12] in urban area affected sediments and up to 5000 0.3 µg/g in polluted industrial sites [6].

2.8. Cadmium in Norway

In general Norway's marine areas pollution state is good but aquaculture, oil industry and agriculture influence especially the archipelagos and the fjords [16]. The small opening of the fjords to the sea make human pollution a real challenge on the west norwegian coast due to reduced transportation of accumulated pollutants. Many coastal areas are contaminated by hazardous substances from industry and dumping [*ibid*]. Disposal of these substances in the coastal waters produce local acute pollution which must be treated consequently. It is known that the release of some hazardous substances has been reduced [*ibid*]. But most of the substances are persistent and have been detected in the fjords over the last 20-30 years at least [*ibid*].

Analysis of cadmium content is compliant with EU waste directive 1991/271/EU and 1998/15/EU Recipients studies in fjords and coastal waters. The degree of pollution is analyzed in relation with water quality and biological conditions. A high content of phosphorus and nitrogen leads to increased growth of phytoplankton and harmful algae and decomposition of plant material. High organic material increases fouling, consume of oxygen and modifies the benthic fauna. Pollutants may have acute or toxic effects and modify the diet of marine organisms. Bacteria and viruses cause hygienic problems and pollute seafood and particles sediment on bottom and beaches, damage bottom flora and fauna and are unattractive [*ibid*].

The increased level of cadmium in some fjords and rivers in Norway comes from local sources, especially from smelters and mines [*ibid*]. Use of cadmium in charged batteries, protection against corrosion, stabilizers and dyes can also represent an important source of pollution.

At the beginning a high nutrient content have a positive increase of biomass and if the quantity continues to grow, it can lead finally to a complete collapse of the ecosystem. High concentration of nutrients equals high food availability which increase growth and possibly modify the species composition of planktonic algae and benthonic macroalgae. Food availability lead to a decrease in oxygen concentration in deep waters, harmful algae develop and fish die of low oxygen content (anoxic environment). Harmful algae can also have toxic effects like diarrheic ant paralytic shellfish poisoning.

In pollution classification systems, relating to cadmium, there are the following categories :

1. primary effects - <0.5 µg/g
2. secondary effects – 0.5-1 µg/g
3. important effects – 1-10 µg/g
4. extreme effects – 10-20 µg/g
5. critical effects - > 20 µg/g

In this perspective the Environment Department of the County Cancellor of Rogaland analyzed cadmium content beginning with year 1977 in some of the fjords and marine areas [17]. With some exceptions the cadmium concentration is very low (0.04-0.52 µg/g). In Egersund in 1994 the value registered was 1.35 µg/g, in Hafrsfjord 2.0 µg/g in 1977 and 1.45 µg/g in 1983, In Karmsundet 2.8 µg/g in 1978 and 1.53 µg/g in 1981 and 1.23 µg/g in Vistevika. An extreme value of 24.6 µg/g was registered in Saudafjorden in 1981 due to incineration of varnished, painted and pressure treated wood.

The updated measurements in 2007 show [17] an important change in concentration reflected in high values in most of the fjords. This is due to industrial activity in a continuous growth in Rogaland county.

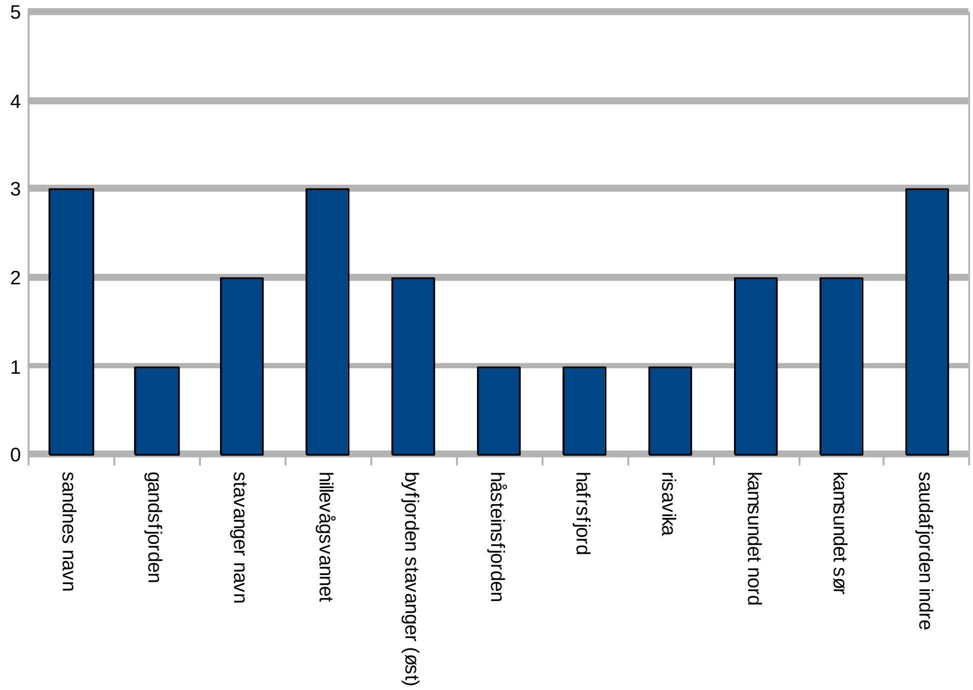

Figure 1. Cadmium concentration in Rogaland fjords and marine areas

Source: www.rogaland.milijostatus.no

As we see, cadmium concentration in Hafrsfjord is in category 1 which means that the average concentration in less than 0.5 µg/g. We must have in mind the fact that there were two sampling points situated in the deep anoxic waters of the fjord (as seen in figure 2). The concentrations in sediments situaited close to shore are higher due to human activity and influence.

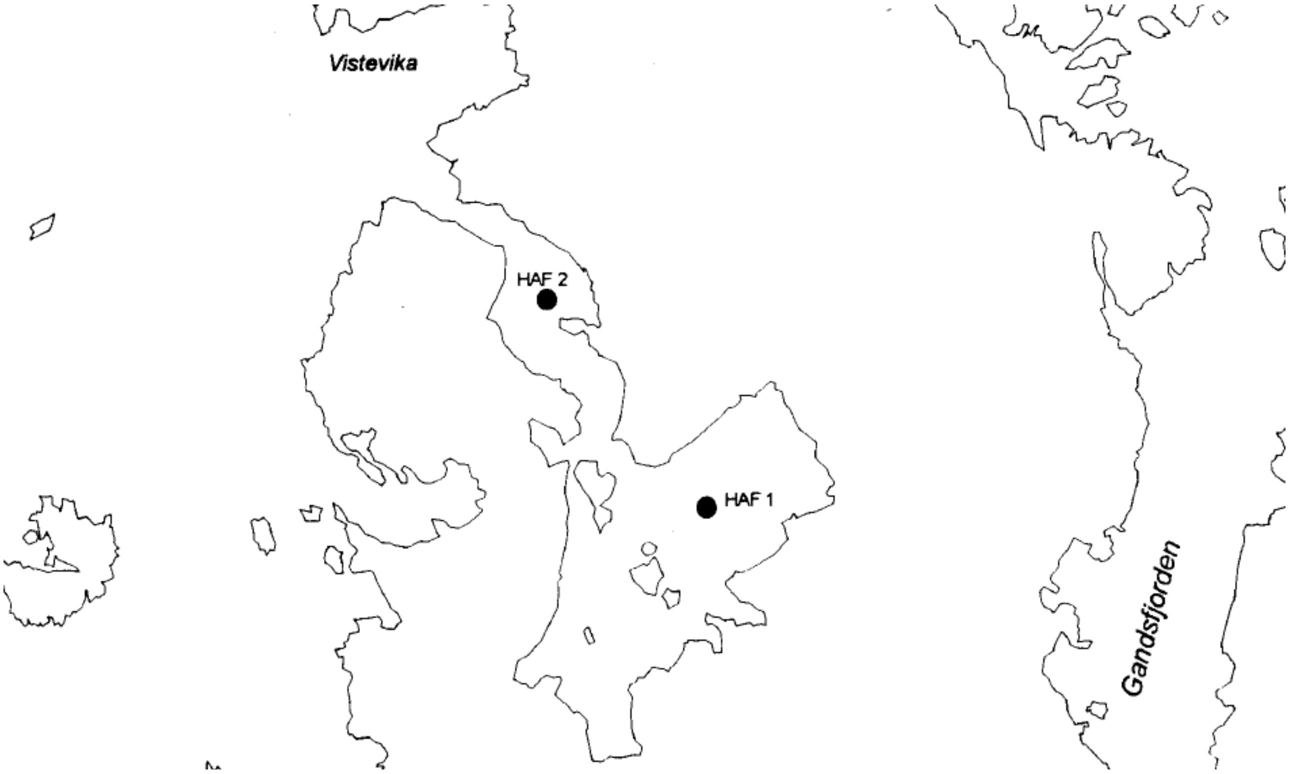

Figure 2. Sampling points in Hafrsfjord in statistics

Source: www.rogaland.miljiostatus.no

2.9. Hafrsfjord and Sømme Bay

Hafrsfjord is one of the very closed fjords in Rogaland. It lies between the Stavanger peninsula and Tananger-Sola peninsula. Hafrsfjord is the historical place where king Harald Haarfagre won the fight in 872 and realized the kingdom of Norway.

Figure 3. Hafrsfjord – general view

Source: www.gulesider.no

Hafrsfjord is stretching 9 kilometers in the north part of Jæren from south (Sola) to north (Madla). The depth of the fjord is between 3.5m and 60m, depth which make impossible navigation for large boats. Hafrsfjord is surrounded by agricultural area and some populated areas. These can be sources of different pollutants. One potential source is Sola International Airport which release drainage waters into the southern part of the fjord, at Sømme bay. There are some multiple sources of pollution which will be detailed later. Hafrsfjord waters are affected by tides. This means that during the day the water level can oscillates 40-50 cm. This creates some mud flat areas at the edges of the fjord. Sømme bay is one of these zones and is situated in the south of the fjord.

Hafrsfjord has some particularities. The tide and the waves create a continuous flow of organic matter at the margins of the fjord thus making these areas very rich in food for certain species of sea birds. It is proved that the area is one of the most important breeding areas for migrating birds [18]. Details will be given later. The sedimentation process and water movement both on horizontal and vertical make the deepest areas of the fjord (in the middle) very rich in organic matter.

Hafrsfjord sediments are very anoxic. The sediment contains only a few centimeters (2-3 cm) of oxic sediment and the bottom part is completely anoxic. The presence of oxygen creates different electron donor environments and different physical and chemical reactions thereafter. For example presence of oxygen gives the possibility for cadmium to form stabile salts which are insoluble in water. The salts stay in the sediment and are accumulated by marine fauna like oysters and polychetes which live in sediment. The anoxic environment transforms the cadmium salts into humic forms which are less stable and are easily accumulated in marine organisms. Both oxic and anoxic environments lead to bioaccumulation of cadmium.

Hafrsfjord is known to be a very important place in migration of birds. It has been studied since 1974 and Jan Michaelse and Viggo Ree demonstrated that the area between Bergen and Kristiansand is a very important place of feeding in the migration trajectory of two siberian birds called yellow browed warbler *Phylloscopus inornatus* and Pallas's warbler *Phylloscopus proregulus.* They come from the north and central parts of Siberia and stay in this area between 15th of september and 1st of november. They accumulate food necessary for the next migrations steps to England and south Europe [18]. There are a lot of bird species which usually take food from this area and a massive bird life can be seen beginning with 1st of April every year. During all the summer a lot of sea bird species can be found here. This year the breeding period began later because the winter was unusually

Figure 4. Hafrsfjord detailed map

Source: www.kart.kystverket.no

long. At the date of sampling (21st -22nd of April 2010) the bird population began to develop in Sømme and Strandsnes bays.

As said before, Sola International Airport discharge drainage waters from the airplane parking and taxing areas into the fjord at Sømme bay. The dye used for anticorrosion and flexibility at planes contain a certain percentage of cadmium. Cadmium has some properties which make it a good fastener in aircraft manufacture. These properties include corrosion resistance, sacrificial protection, freedom from gummy or bulky corrosion products, galvanic compatibility with aluminum, excellent lubricity and freedom from stick-slip for consistent torquing, softness and malleability, non-galling, the ability to accept chromate conversion post-treatments, and the ability to be deposited in forms that will not trap hydrogen so baking can relieve the potential of hydrogen embrittlement. The essential properties are sacrificial coating for steel with improved corrosion resistance due to chromate conversion and the galvanic compatibility with aluminium. Due to rain water, plane cleaning and defrosting and other technical activities which help for a good air traffic, the drainage waters contain cadmium at an elevated level. It has been studied in a bachelor thesis in 2006 that cadmium concentration in drainage water coming from the airport is as high as 40-50 µg/l [3].

There is a lack of knowledge in heavy metals concentration in Sømme bay sediments, area affected by Sola Airport drainage water system. There are some other possible sources of pollution coming from close road and agricultural areas around the fjord.

The objective of this work is determination of cadmium concentration in Sømme bay and possible influences to wild bird life here.

III. MATERIALS AND METHODS

Cadmium is analyzed according to Norwegian and international standards. Determination of cadmium and other metals in sediments are detailed in standards NS 4780 – General principles and guidelines for determination by flame AAS or GF-AAS and NS 4781 – Special guidelines for aluminum, lead, iron, cadmium, copper, cobalt, chromium, manganese and nickel for determination by flame AAS or GF-AAS. Sampling was performed according to standard NS 9421 – Requirements for sampling and analysis of sludge [19, 20, 22].

There were performed two analyses: determination of cadmium content for sediment samples and determination of total volatile solids (standard method 2540).

3.1. Sampling

Sampling was performed according to NS 9421 and NS EN ISO 5667-13. Samples were taken with a cylindrical sample (30 cm length, 4 cm diameter, polycarbonate tube) corer from IRIS Research Institute. The sample corer has a polycarbonate tube with a rubber end cap. This rubber cap creates a void space when the sediment closes the bottom end of the plastic tube. All the system is fixed in a metallic pliers and this has attached a metallic wire.

Figure 5. Core sampler

On 21st and 22nd of April weather conditions allowed good sampling. We used an easy aluminium stabile boat with wooden oars. The temperature was 5-7ºC and the wind was slow (0-4 m/s). On 21st we took 17 samples and on 22nd the remaining samples.

We established a sample grid including all possible pollution sources according to the form of Sømme bay. We supposed that there are two possible sources of pollution at points O and 10 (figure 6, tables 3, 5 and appendix 1). We fixed three transects in each part of the bay separated by the airport guiding line peninsula and three more transects in the common bay. The samples taken in the first day were taken by simple pushing the corer in the sediment because the area covered was not covered by water deeper than 40 cm due to daily low tide period. Sediment samples contain the first five centimeters (0-5 cm) because cadmium salts form and are mainly kept in this area. For some samples we took two samples for 0-5 cm and 5-10 cm in order to check the sedimentation in time. The deeper samples are marked with the position and number of sample and a “d”. Samples were transferred to food industry quality plastic bags equipped with zip locks and closed immediately. Samples were only exposed to polycarbonate (corer) and polyethylene (bag) materials during sampling and storage. Every sample was marked with the number of sample and positioned by a handheld Garmin GPS. We made a table containing all other necessary data (see appendix 1). Samples were transported and kept in -18ºC freezer until analysis. On 22nd of April samples were taken from deep sediments (down to 29 m). We followed the same sample grid as the day before and the same procedure for storing the samples.

A total of 36 samples were taken for analyse.

Figure 6. Hafrsfjord – sampling points (scale 1:7500)

Source: http://kart.kystverket.no/default.aspx?gui=1&lang=2

3.2. Digestion

Digestion is the process whereby the heavy metal ions (in our case Cadmium^{2+}) are released from sample matrix material and transferred to digestion solution. Four cadmium salts are obtained from concentrated strong nitric acid, hydrochloric acid and hydrofluoric acid. Boric acid (fine powder crystals) is used after digestion as an antiseptic.

High temperature digestion was performed using a MDS 2000 (CEM corp.) microwave digestor using closed digestor (Teflon) vessels. Due to strong corrosive and toxic acids, high temperature and pressure safety precaution as eye, hands and clothes protection were taken. MDS 2000 system is a closed system which provide 0-630 W power at 2450 MHz in one percent increments. It has a exhaust air tube connected to a corrosion resistant laboratory air outlet system. MDS 2000 consists of a microwave power system with operator selectable for power, a fluoropolymer coated microwave cavity, a cavity exhaust fan with 10% increment progressive speed, exhausting tubing to vent fumes, a digital computer programmable for 20 multi steps programs, a direct drive alternating turntable system, four inlet/outlet ports to accommodate tap and/or pressure measurement and control line, three door safety interlocks and interlocking monitoring system to prevent microwave emission when the cavity door is open.

MDS 2000 uses microwave energy to heat samples. Polar compounds absorb microwave energy rapidly. A sample placed inside a microwave-transparent vessel with a polar liquid or ionic solution (usually an acid) in the MDS 2000 is subjected to rapid heating and elevated pressures, causing the sample to digest or dissolve in a short time.

The laboratory equipment consists of 100 ml volumetric graduated flasks, 5 ml semiautomatic pipettes, filter equipment and an analytical balance with an error of ±0.0001 g. The specific digestion vessels are made of polytetrafluorethylen and the reagents have an analytical grade quality according to EN ISO 3696:1995: hydrochloric acid (HCl) – mass fraction of 35% to 37%; nitric acid HNO_3 – mass fraction of 65% to 70%; hydrofluoric acid – mass fraction of 40% to 45% and boric acid ($B(OH)_3$) – solid, dealer VWR Norway, manufacturer Merck. Due to the volatility of some compound it is of a great importance to take care that the sample is not heated before the digestion and that the volatile reaction products which might be formed during the digestion are not allowed to escape.

The contamination can come from the container of the samples, the sample pre-treatment, cleaning of the vessels and the concentration of the acid solution. We used a blank test sample and we found no contamination from the vessels.

The digestion was made according to NS EN 13656/2002 – Characterization of waste microwave assisted digestion with hydrofluoric (HF), nitric (HNO_3) and hydrochloric (HCl) acid mixture for subsequent determination of elements. The procedure follows the specified steps in the above standard.

Digestion was performed during week 26-30 April 2010.

All the equipment used was kept in acid bath (0.5M HNO_3) for at least 24 hours to eliminate any possible contamination from ceramic plates, pipettes, digestion vessels, vials, plastic 50 ml bottles and caps.

Samples were dried in precleaned and acid washed ceramic cups. 20 g of each sample were heated at 105ºC until constant mass. We let the samples at least two hours at the first step of drying, measured the weight and then used 1-3 steps of one hour at 105ºC until the mass of the sample reached constant mass (with an error of ±0.001 g).

We weighted 0.5 g of dried sample and put it in a vessel. The difference of dried sample was conserved in a plastic bottle for further analysis. We added 10 ml of deionized water (DIW), 5 ml of HNO_3, 4 ml of HF, 1 ml of HCl.

We sealed all the vessels except the one used for pressure control. We sealed the pressure control vessel with a modified cap assembly and place the vessels onto the turntable. We connected the vent tubes to the collecting vessel, put the turntable into the system and connected the pressure sensing line to the pressure control vessel.

The microwave digestor was set up using the following parameters: power 100% (there are 5% decrease for each sample less than 12), pressure 120 psi, time 30 minutes, tap 20 minutes and fan speed 100, saved the program and used it for digestion.

After finishing the program we let the samples cool for 30-60 minutes, removed the control pressure sensing line and turntable from the system. We let the samples reach room temperature and manually vented and opened the vessels in the fume wood. The high concentrated acid vapors evaporated in the ventilation system. Some of the samples evaporated partially and we had to add DIW to corresponding samples. We added approximately 2 g of boric acid crystals and mixed well to dissolve it in the solution. We transferred the solutions to pre-washed in acid bath plastic bottles, marked each sample and kept them for further analysis. The filtration step will be made before GF-AAS by using 0.5 µm syringe filters. The filtration is necessary because possible particles from the digested sample might clog the nebulizers from the injection system from AAS.

All this procedure was repeated until all 36 samples were digested and prepared for AAS analysis. Furthermore, we kept the dried samples in plastic bottles for other analysis.

During digestion a part of the samples evaporated and the total weight of the sample decreased. With the same quantity of cadmium, the final concentration had to be adjusted with a digestion factor obtained from weight before and after digestion.

3.3. Graphite furnace atomic absorption spectrometry (GF AAS)

Atomic absorption is based on free atoms absorption of radiation. The technology is based on the principle that each element absorbs and emitter light with wavelengths that are atom specific. Atoms absorb electromagnetic radiation (EMS) and become excited. These excited atoms emit EMS and relax. The result is a spectrum which can be used for absorption, emission and fluorescence determinations.

The most common light source for exciting atoms is hollow cathode lamp, which is filled with an inert gas and a cathode layer of the metal to be determined, or an alloy of it. The lamp emits a line spectrum for the element in the cathode, and when light passes through it pulverizes the sample, it is absorbed selectively by this element's atoms.

Atomization process consist in nebulization when small droplets which are dissolved and volatilized. After this step we obtain free atoms which get excited as described above.

Generally the spectral lines are situated on a single wavelength (for cadmium is 228,8 nm) but basing on uncertainty principle, Doppler and pressure effects, we obtain a narrow band around the central wavelength.

For cadmium the hollow cathode lamp is replaces with a electrodeless discharge lamp (EDL) which contains a sealed quartz tube with inert gas (argon) and some metal salts. The general elements of the AAS are shown in Figure 7.

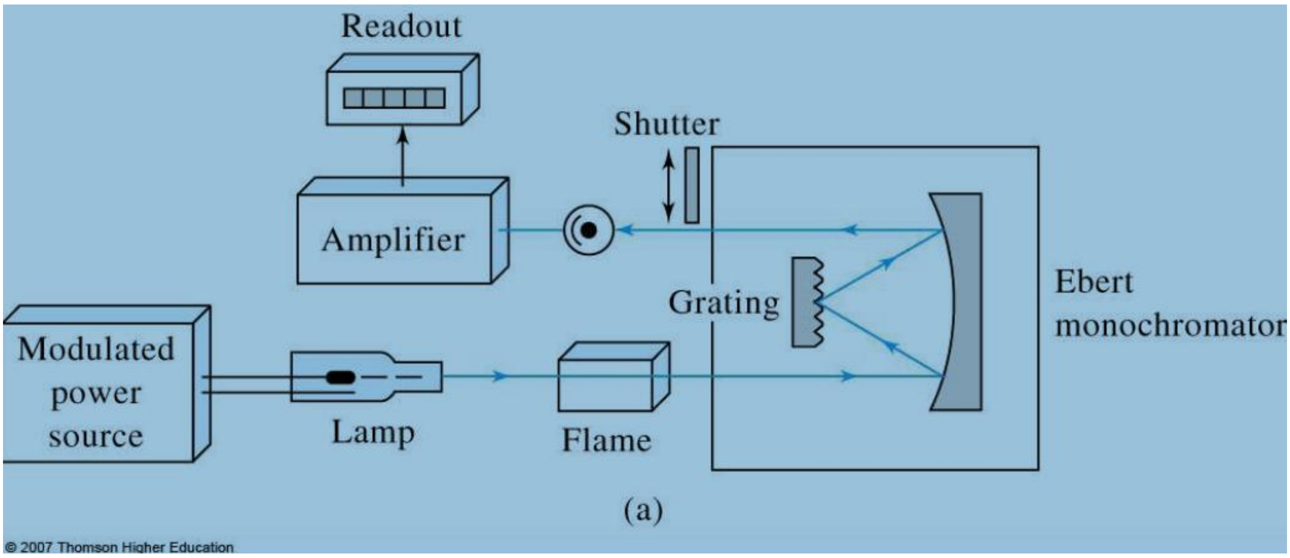

Figure 7. Atomic Absorption Spectrometry

Source Skoog et. al. – *Principles of instrumental analysis*

In GF AAS atomization step is obtained in an electrothermal atomizer. This is a graphite oven electrically heated and protected from oxidation by an inert gas (argon). For this reason the method is working only when the argon gas tank is open and has minimum 15 bars pressure. The sample is inserted in the oven with a syringe. The precision of the syringe is very important and thus the alignment of the instrument must be done as often as possible or when we observe miss calibrations. The sample is heated at 120ºC to evaporate solvents and then to 400ºC to decompose the matrix. We need a matrix modifier to keep the heavy metal inside the sample for analysis. Then the sample is heated rapidly to 1500ºC for the atomization step. In our case the analysis time is 5 seconds. During the atomization step the inert gas is stopped and the sensitivity increases. After reaching this temperature we must cool sample to room temperature and this is why analysis take some time (10-15 minutes for each sample).

Interferences can occur from many sources. We can have spectral interferences when atomic bands for two different atoms are less than 0.1 Å (a very rare interference). This is eliminated through standard addition method. Thus a standard solution is added and its interference is used to correct spectral interference. We can have matrix interference when an organic element from matrix gives a spectral line on a close wavelength to our element. This effect is corrected in our instrument with Zeeman correction. A strong magnetic field (10kG) split the electronic energy levels with 0.01 nm. Thus a spectral line is split in three and matrix absorption occurs. The monochromator select the middle line and detect the background signals.

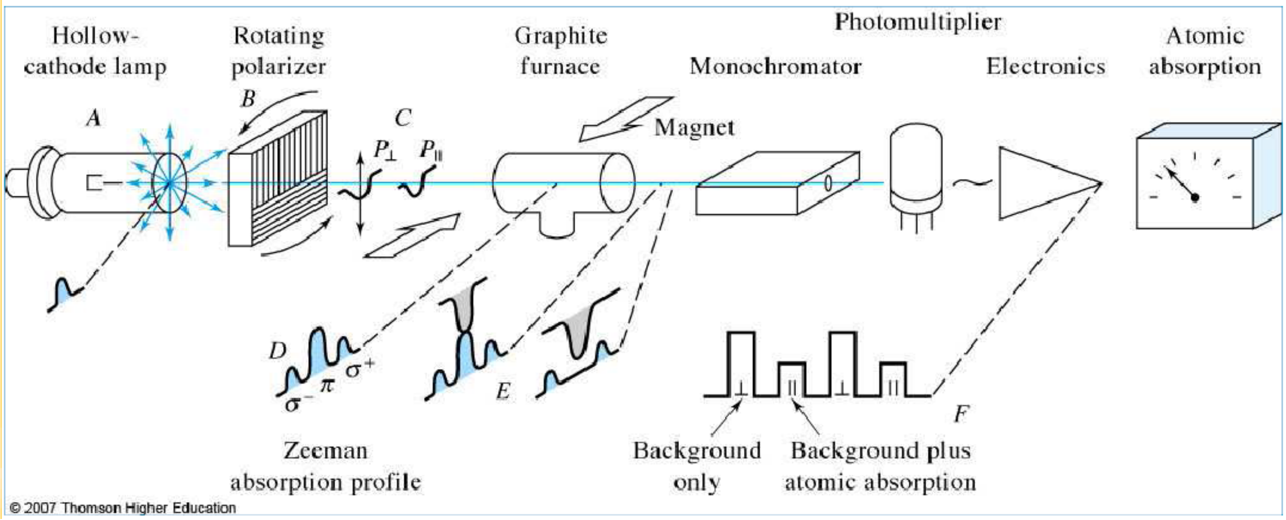

Figure 8. Zeeman correction

Source Skoog et. al. – *Principles of instrumental analysis*

We can have chemical interferences ions form salts which do not give the same signal. These interferences are avoided by using protective agents like EDTA which form stabile and volatile compounds with the analyte preventing interference. Interference effects can be reduced by gradual dilution or matrix modification (e.g cadmium made less volatile by using ammonium hydrogenphsphat).

Before starting the analysis we must be sure that all the vials, bottles of polyetylene or teflon, final bottles and micropipettes stood in acid bath at least 24 hours. We verify that we used appropriate filters after digestion. We verify the cooling system attached to Perkin Elmer A600 spectrometer to have a continuous flux of 2.5-3 l/s. We verify that the graphite oven is operational, the autosampler is functional and the software is working properly.

Determination of cadmium concentration with GF AAS was performed during week 3-6 May 2010.

We prepare 1.5 liters of rinsing solution by adding 20 ml of laboratory cleaning solution to the full quantity of water. We check that the syringe tip is aligned with the graphite tube and it is long enough to take sample liquid from the vials in the autosampler.

We prepare the matrix modifier by $NH_4H_2PO_4$ and $Mg(NO_3)_2$ and the standard solution bought from Perkin Elmer. The standard stock solution has the concentration of 1000 mg/l and in analysis it will be diluted to 40 mg/l. We also prepare dilution solution for possible dilution of samples.

We turn on the spectrometer and the computer connected to it. We open the AA (atomic absorption) software and check for the availability of all the parts of the instrument (spectrometer, autosampler, lamp). We must turn on the cadmium EDL lamp and let it warm for 15-20 minutes or until the lamp power stays constant at the highest value. In our analysis this power was 55-58% of the initial lamp power.

We create a program for analysis by using all the elements described above. We set the autosampler position and the quantity for calibration solution, matrix modifier, blank solution and dilution solution. These values (in µl) will be taken by the syringe tip and introduced in the graphite oven. We also check how much liquid will be taken from each sample (3 µl). We define the steps for analysis: first step is evaporation of solvents up to 120ºC followed by decomposing of matrix up to 400ºC. The next step is atomization at 1500ºC when atoms are released from the sample. These atoms are excited passed through light beam coming from the EDL lamp which excites the atoms and then these atoms emit light on the own wavelength of 228.8 nm.

We rinse the pipette tip for a few times and clean the oven at 2700ºC to assure than nothing remained in the oven from previous analysis.

We create a sample file with the autosampler position where we put the samples to analyze. We take every sample bottle and, by using a 5 ml pipette, fill vials with approximately 2 ml of liquid from each sample and put them in the autosampler.

We specify in the method that we calculate a calibration curve before each measurement. We set the calibration dilutions that will be used in calibration curve and set the type of the curve (we set it as nonlinear through zero). We also set the number of aliquots taken and analyzed from each sample and calibration solution and dilutions to three (good enough to calculate the standard error).

With everything prepared, we start the analysis. The instrument builds a calibration curve using calibration dilutions and blank solution and analyze each sample. If the absorbance of the sample is higher than 80%, the sample is diluted and reanalyzed. This dilution is made automatically in two steps: 1:5 and 1:20. If the absorbance is still higher than 80% after the second dilution, the sample must be diluted manually and reanalyzed. If the concentration of the sample is higher than the maximum concentration used in the calibration curve, the real concentration is automatically calculated from the calibration curve coefficients.

All the results are saved in a temporary file and it is recommended that after each analysis to save this temporary file in a specified place in the computer for viewing the results later. The results can be found in appendix 2.

When the analysis is finished, it is recommended to clean all the equipment and put the necessary in acid bath for other analysis. We close the software and all the lamps used and then we turn off the spectrometer. For saving cooling solution and argon gas, we turn off the cooling system and the argon gas tank until other analysis begins.

3.4. Total Volatile Solids

The method is found in standard 2540 [23] and it relates to determination of organic content for each sample. This analysis was included in this paper to make a correlation between the cadmium concentration in samples and the organic content. It is known from theory that in marine environment cadmium can bio accumulate in organic matter and we wanted to find the organic content of the samples.

The procedure is based on organic matter volatilization at high temperature and evaporation through CO_2. We measure the total solid content and the mineral solid content and find the percentage of organic content from sample.

The sample is dried at 105ºC until constant weight. As described before, the samples are let in the oven overnight for the first step of drying and another step of obtaining the constant weight. We cool the samples in a dessicator and measure the weight with all significant numbers. The error of determination comes from the analytical error of the balance (±0.0001), the instability of the balance and the human error in measurement. We obtain total solids weight (TS).

From TS we measure a precise aliquot between 0.5 and 1.5 g (the result is more precise as close as the value is to 1.0 g) on a ceramic/porcelain cup.

We combust the aliquot at 550ºC for 30 minutes in a special programmable oven . We set the warming time to 15 minutes and period of time at high fixed temperature for 30 minutes. At 550ºC all organic matter is dissolved and evaporated in CO_2. We have now only the mineral solids (also with all significant numbers) (TIS, total inorganic solids).

We calculate total volatile solids (TVS) in percents as difference between total solids (TS) and total TIS. The values can be found in the results part of this paper. Weight measurement was made with a ±0.0001 mechanical error balance.

IV. RESULTS

4.1. Cadmium content

Samples were taken during two days of partially closed air traffic at Sola Airport. Air traffic was affected by Eyjafjallajoekull volcanic eruption and ash cloud. Thus our sampling activity had better conditions.

Sampling location details and field book system are found in appendix 1. On maps and graphic presentations we used only altitude and longitude minutes and thousand parts of minutes (table 3).

Table 3. Geographical coordinates

Sample	North 58º	East 5º
0A-1	53718	38054
0A-2	53718	38054
0B	53712	38049
1	53730	38069
2	53732	38077
3	53729	38088
4	53772	38051
5	53776	38106
6	53771	38164
7	53880	38000
7d	53880	38000
8	53874	38081
8d	53874	38081
9	53827	38399
10A	53786	38307
10B	53769	38357
11	53802	38292
12	53814	38334
13	53827	38399
14	53838	38279
15	53853	38336
16	53870	38407
21	54099	38005
21d	54099	38005
22	54126	38220
22d	54126	38220
23	54149	38461
24	54439	37137
25	54469	37256
26	54550	37703
27	54555	38129
27d	54555	38129
28	54523	38475
28d	54523	38475
Ref N	55888	37549
Ref N 2	55624	37549

Figure 9. Hafrsfjord map with coordinates Source www.gulesider.no

Figure 10. Detailed reference samples (scale 1:15000) Source: http://kart.kystverket.no/default.aspx?gui=1&lang=2)

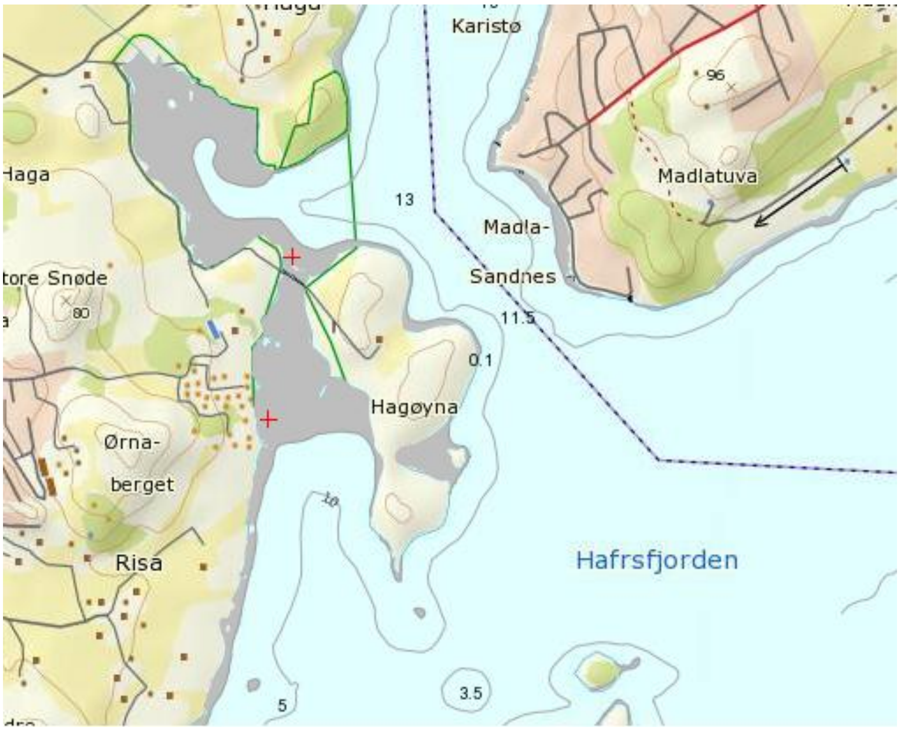

Figure 11. Detailed sampling (scale 1:15000)

Source http://kart.kystverket.no/default.aspx?gui=1&lang=2)

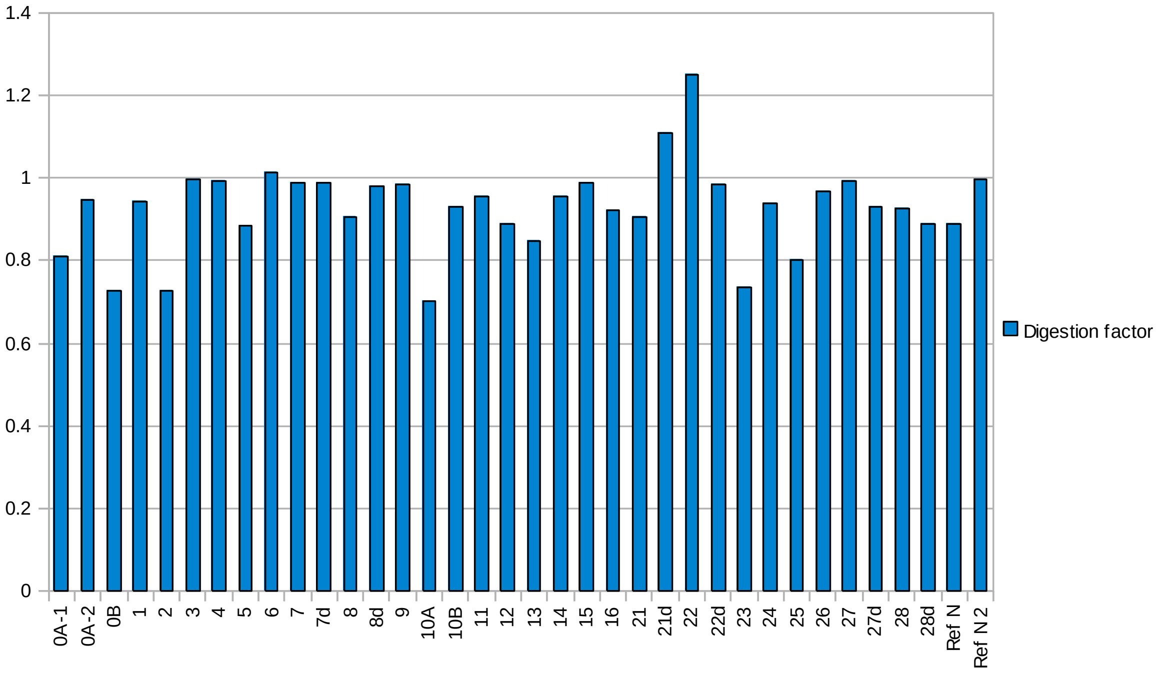

Figure 12. Digestion factor

Table 4. Digestion factor

Nr.	Sample	Liquid weight (including HBO3)	Liquid weight (after digestion)	Digestion factor
1	0A-1	24.57	19.87	0.81
2	0A-2	24.57	23.31	0.95
3	0B	24.57	17.82	0.73
4	1	24.57	23.21	0.94
5	2	24.57	17.88	0.73
6	3	24.57	24.52	1
7	4	24.57	24.4	0.99
8	5	24.57	21.7	0.88
9	6	24.57	24.91	1.01
10	7	24.57	24.32	0.99
11	7d	24.57	24.32	0.99
12	8	24.57	22.24	0.91
13	8d	24.57	24.05	0.98
14	9	24.57	24.22	0.99
15	10A	24.57	17.21	0.7
16	10B	24.57	22.9	0.93
17	11	24.57	23.42	0.95
18	12	24.57	21.79	0.89
19	13	24.57	20.79	0.85
20	14	24.57	23.48	0.96
21	15	24.57	24.24	0.99
22	16	24.57	22.62	0.92
23	21	24.57	22.29	0.91
24	21d	24.57	27.27	1.11
25	22	24.57	30.67	1.25
26	22d	24.57	24.13	0.98
27	23	24.57	18.03	0.73
28	24	24.57	23.07	0.94
29	25	24.57	19.72	0.8
30	26	24.57	23.82	0.97
31	27	24.57	24.41	0.99
32	27d	24.57	22.82	0.93
33	28	24.57	22.78	0.93
34	28d	24.57	21.87	0.89
35	Ref N	24.57	21.79	0.89
36	Ref N 2	24.57	24.53	1

From figure 12 we observe that there are a few samples with digestion factor higher than 1. This is due to the fact that after digestion these samples evaporated completely and we needed to add some DIW water to obtain a liquid solution. This adding is compensated by the next calculations and it can not be considered an error.

As we can see in table 5, measured concentrations had to be adjusted with the dilution factor to obtain the real concentrations. Some samples could not be measured after two automatic dilutions because the absorbance was higher than 80%.They needed a manual dilution performed by adding the appropiate DIW water content to the initial sample solution. Automatic dilution does not affect the results. AAS determines the concentration after automatic dilution and it multiplies the value with an automatic dilution factor internally calculated. Manual dilution instead modified concentration and the measured value was modified according to the corresponding dilution. Final concentration values from table 5 include manual dilution correction.

We also find in table 5 the standard error measured values. The values were calculated using quadratic square root method. The concentrations involved in standard error calculation were obtained from three different analysis for each sample. We can find the complete AAS results file in appendix 2.

Table 5. Cadmium concentration with GF AAS

Nr.	Sample	Conc (after AAS)	Conc (real)	Dilution	SD calculated	SD deviation (%)
1	0A-1	1.80	1.46	diluted 1:10	0.01	0.69
2	0A-2	10.46	9.92		0.19	1.91
3	0B	20.82	15.10		0.65	4.30
4	1	2.99	2.82		0.11	3.89
5	2	9.67	7.04		0.48	6.82
6	3	1.86	1.86		0.02	1.08
7	4	2.35	2.33		0.14	6.00
8	5	2.30	2.03		0.07	3.45
9	6	1.39	1.41		0.02	1.42
10	7	1.95	1.93		0.02	1.04
11	7d	2.44	2.42		0.01	0.41
12	8	1.89	1.71		0.02	1.17
13	8d	1.70	1.66		0.10	6.01
14	9	1.63	1.61		0.01	0.62
15	10A	3.61	2.53		0.08	3.16
16	10B	6.51	6.07		0.02	0.33
17	11	4.37	4.17		0.08	1.92
18	12	5.38	4.77		0.23	4.82
19	13	4.09	3.46		0.06	1.73
20	14	4.93	4.71		0.10	2.12
21	15	4.68	4.62		0.24	5.20
22	16	2.21	2.03		0.08	3.93
23	21	19.51	17.70		1.00	5.65
24	21d	7.64	8.48		2.30	27.12
25	22	45.15	56.36	diluted 1:5	0.05	0.09
26	22d	22.40	22.00	diluted 1:20	0.80	3.64
27	23	28.00	20.55	diluted 1:10	0.10	0.49
28	24	1.91	1.79		0.02	1.12
29	25	12.97	10.41		1.76	16.91
30	26	4.67	4.53		0.03	0.66
31	27	11.80	11.72	diluted 1:20	0.40	3.41
32	27d	25.40	23.59	diluted 1:20	2.40	10.17
33	28	55.20	51.18	diluted 1:20	3.60	7.03
34	28d	93.60	83.31	diluted 1:10	16.30	19.56
35	Ref N	3.31	2.94		0.11	3.75
36	Ref N 2	1.38	1.38		0.01	0.73

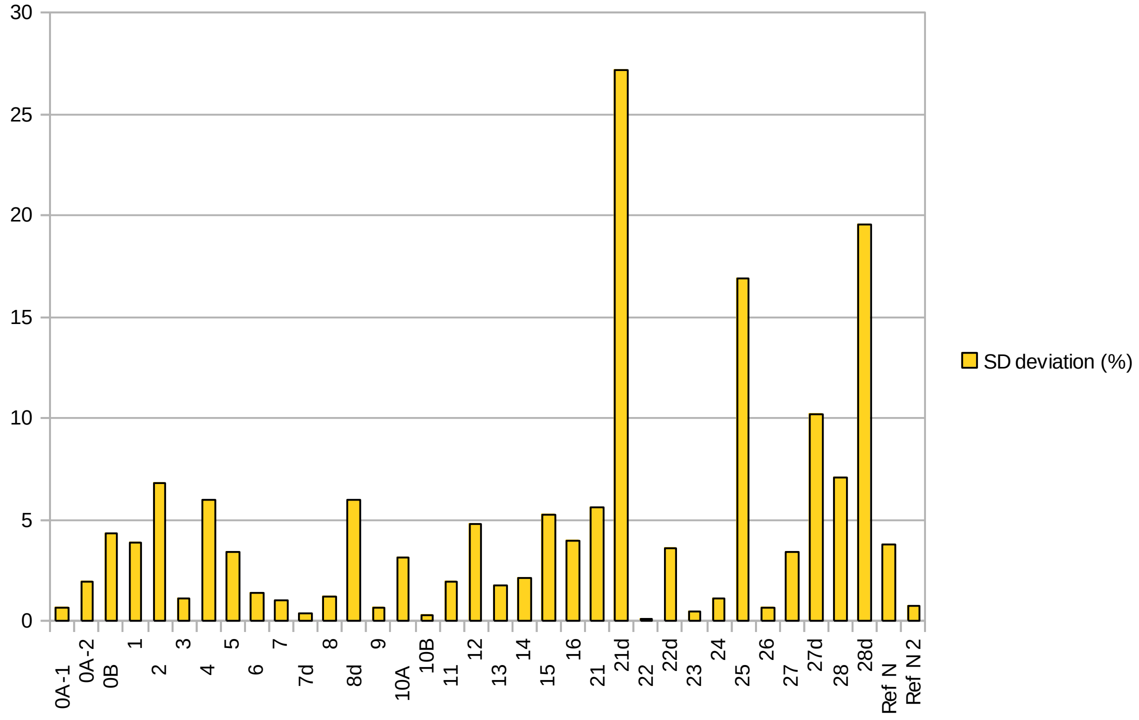

Figure 13. Standard deviation

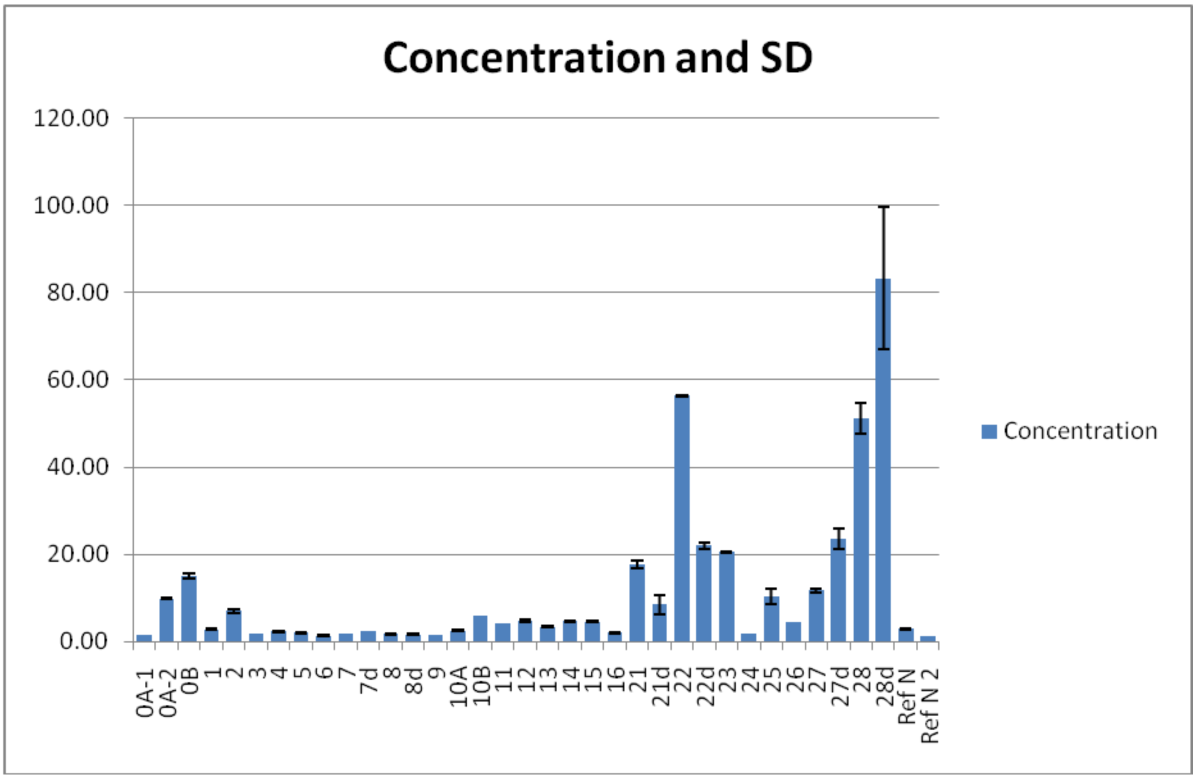

Figure 14. Concentration and standard error

The error in determination of cadmium concentration is generally 5-7% with a few exceptions. These exceptions are found at the samples with high concentration which goes over the calibration curve limit.

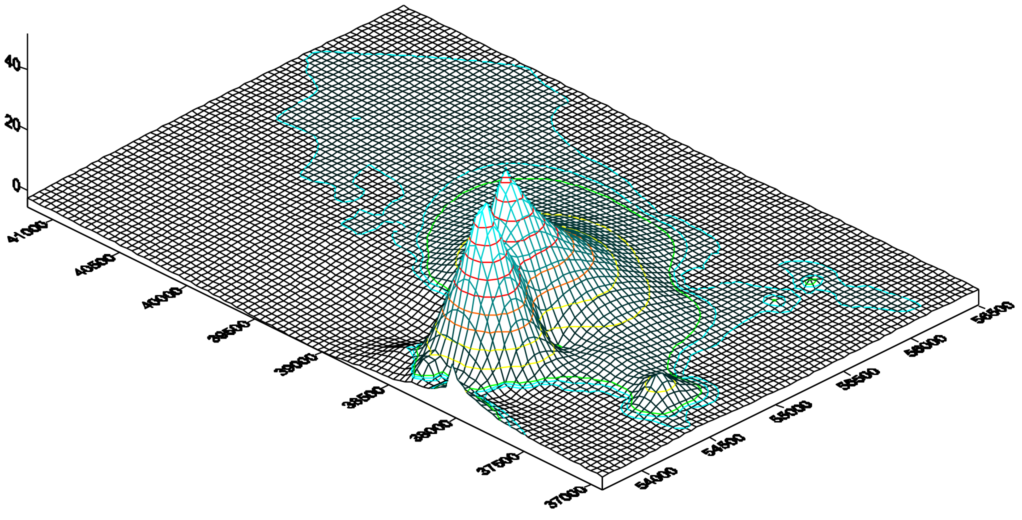

Figure 15. Cadmium concentration

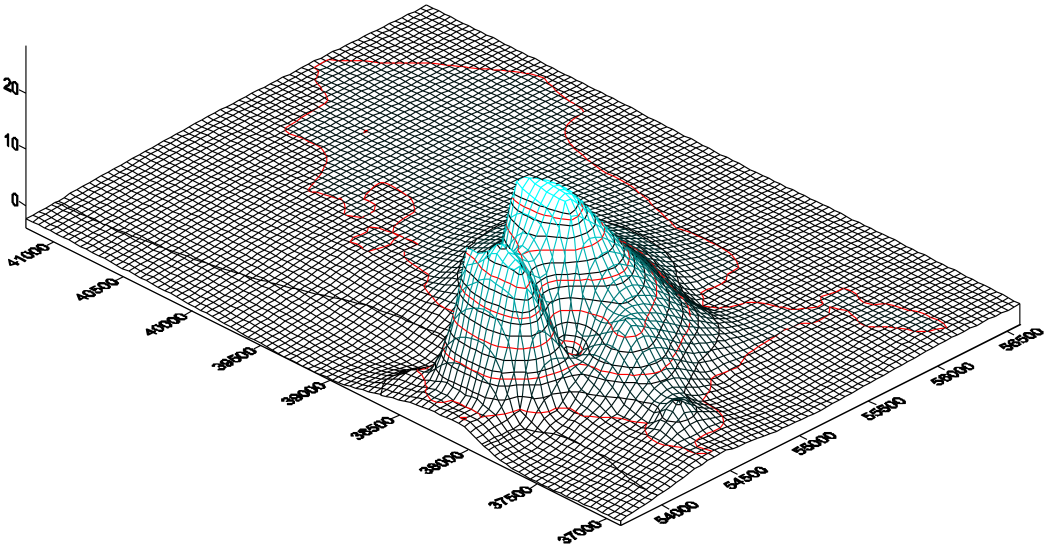

Figure 16. Water depth

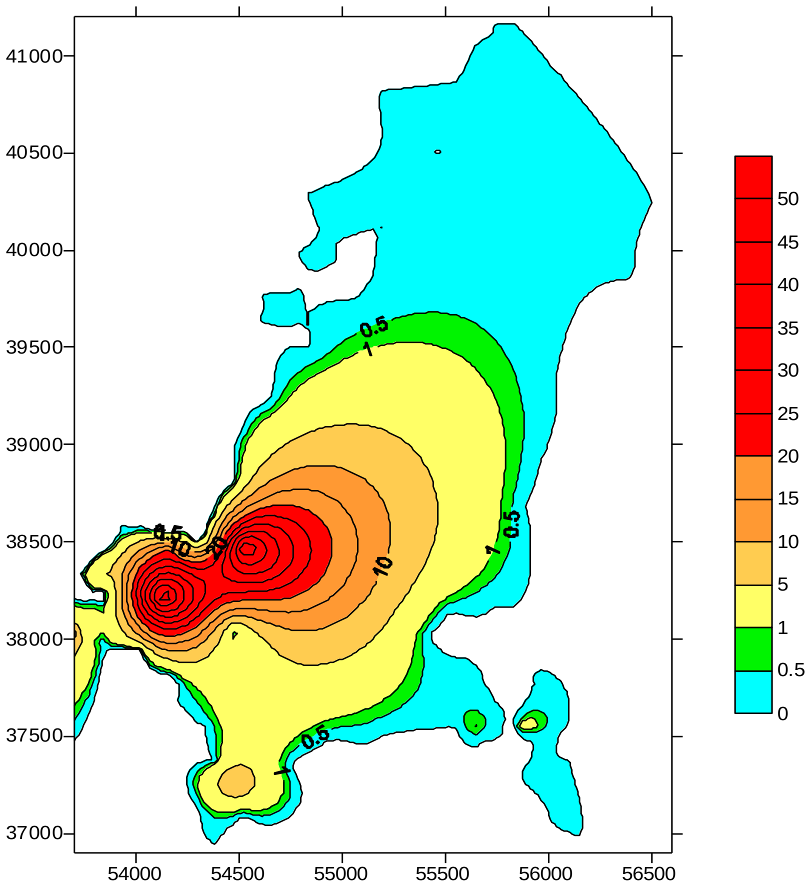

Figure 17. Cadmium level

4.2. Total volatile solids

The organic content of samples is considered important from an ecologic point of view and it is used to interpret cadmium distribution and potential mobility. By measuring organic content we can appreciate if cadmium salts and form a mineral deposit in the sediment or are bio accumulated by marine fauna.

Using the method described in the methodology chapter, we determined TVS as percentage of TS from the sample (sample organic content [in %]). Results are shown in table 6 and figure 18.

Table 6. Determination of TVS

Sample	Empty cup	Weight (before burnig at 550 C) TS	Weight (after burning at 550C) TIS	Organic content (%) = (TS-TIS)/TS*100
0A-1	36.9910	38.0030	37.9808	2.19
0A-2	28.0307	29.1014	29.0854	1.49
0B	31.2240	32.2338	32.0750	15.73
1	30.8566	31.8636	31.8529	1.06
2	32.1705	33.1957	33.1408	5.36
3	31.0037	32.0105	31.9653	4.49
4	28.0380	29.0575	29.0425	1.47
5	36.9919	38.1095	38.0972	1.1
6	31.1050	32.1525	31.8983	24.27
7	34.0810	35.0862	35.0799	0.63
7d	32.1372	33.1431	33.1365	0.66
8	31.1549	32.1796	32.1730	0.64
8d	36.9379	37.9524	37.9454	0.69
9	34.0810	35.1183	35.1105	0.75
10A	37.6974	38.6904	38.6838	0.66
10B	34.9851	36.0563	36.0444	1.11
11	34.9847	36.0294	36.0039	2.44
12	37.4702	38.5238	37.9876	50.89
13	31.1716	32.2904	32.2422	4.31
14	38.0619	39.0909	39.0819	0.87
15	37.7029	38.7499	38.7396	0.98
16	31.1373	32.1647	32.1551	0.93
21	31.2371	32.3590	32.2443	10.22
21d	28.0295	29.0442	28.9621	8.09
22	38.0604	39.0530	38.8461	20.84
22d	34.9824	36.0572	35.8528	19.02
23	32.2444	33.2502	32.9628	28.57
24	31.2198	32.3215	32.1858	12.32
25	38.1580	39.1831	39.0526	12.73
26	30.9682	31.9819	31.9484	3.3
27	30.9671	31.9787	31.7709	20.54
27d	34.0810	35.0824	34.8974	18.47
28	36.9368	37.9745	37.7625	20.43
28d	36.9907	38.0237	37.8094	20.75
Ref N	30.8563	31.9752	31.9639	1.01
Ref N 2	37.6956	39.1858	39.1518	2.28

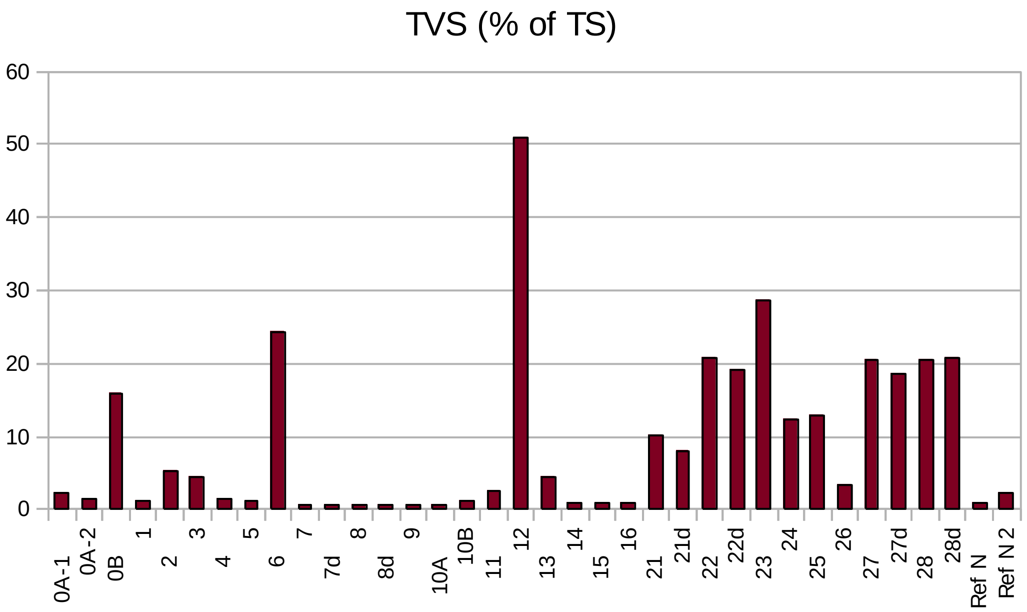

Figure 18. Total Volatile Solids

The correlation between cadmium organic content is analyzed by comparing the values for each sample (fig. 19 and table 7).

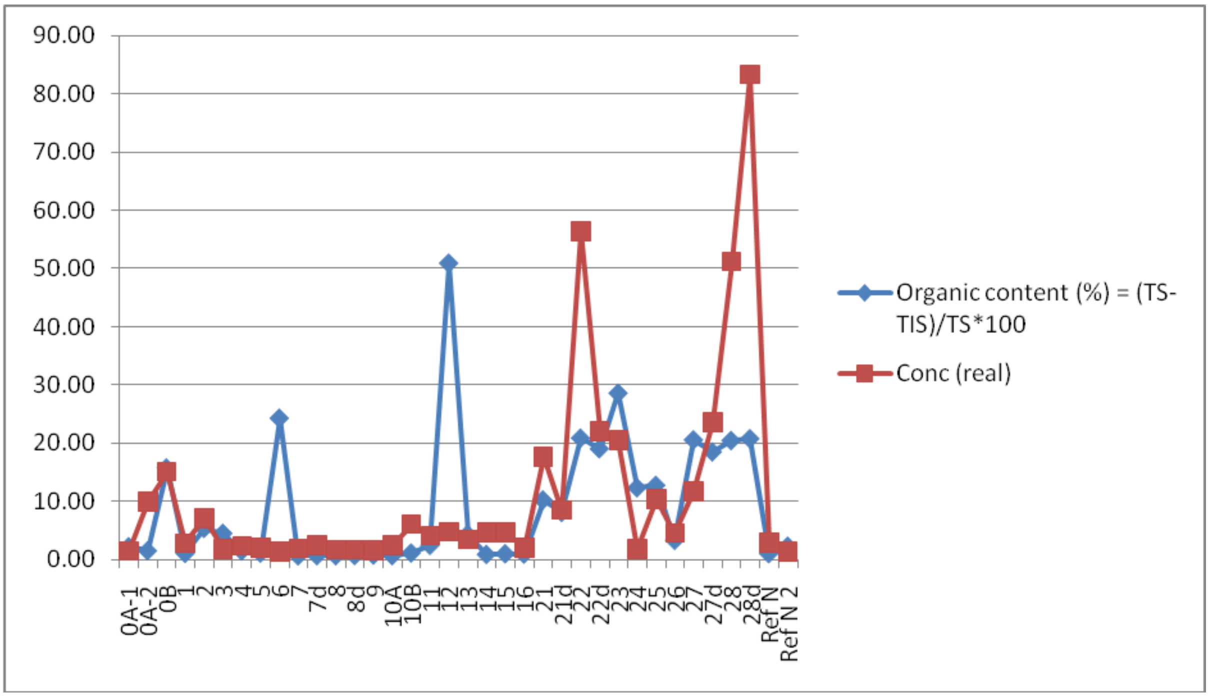

Figure 19. Cadmium vs. organic content

With a few exceptions, there is a correlation between organic content and the bio accumulated cadmium. The 0B sample, source of contamination, has a high concentration of both organic matter (due to every organism found in the concrete pipe) and cadmium (being the source, the heavy metal content is higher than in other samples). Sample 6 has a high organic content due to blue shells bank but cadmium content is low. This means that cadmium does not bio accumulate in shells. All the deep sediment samples have a high concentration for both of the elements registered. The reference sources have a small quantity of organic matter (most of the sample is inorganic sand) and also a small concentration of cadmium because they are less affected by air traffic and contamination from the airport.

Table 7. Cadmium vs. organic content

Nr.	Sample	Organic content (%) = (TS-TIS)/TS*100	Conc (real)
1	0A-1	2.19	1.46
2	0A-2	1.49	9.92
3	0B	15.73	15.10
4	1	1.06	2.82
5	2	5.36	7.04
6	3	4.49	1.86
7	4	1.47	2.33
8	5	1.10	2.03
9	6	24.27	1.41
10	7	0.63	1.93
11	7d	0.66	2.42
12	8	0.64	1.71
13	8d	0.69	1.66
14	9	0.75	1.61
15	10A	0.66	2.53
16	10B	1.11	6.07
17	11	2.44	4.17
18	12	50.89	4.77
19	13	4.31	3.46
20	14	0.87	4.71
21	15	0.98	4.62
22	16	0.93	2.03
23	21	10.22	17.70
24	21d	8.09	8.48
25	22	20.84	56.36
26	22d	19.02	22.00
27	23	28.57	20.55
28	24	12.32	1.79
29	25	12.73	10.41
30	26	3.30	4.53
31	27	20.54	11.72
32	27d	18.47	23.59
33	28	20.43	51.18
34	28d	20.75	83.31
35	Ref N	1.01	2.94
36	Ref N 2	2.28	1.38

4.3. Estimate and sources of errors

Errors can come from different sources. The first possible source is human factor which can modify the sample content when sampling and registration of data related to samples, errors in manipulation of equipment and saving essential data, errors in adding of different substances like matrix modifier, strong acids (digestion), complete dissolving of boric acid after digestion, introduction of wrong settings in digestion and determination of cadmium programs and more in interpretation of data. Another possibility of errors can be the imperfection and mechanical errors of instruments. In acid digestion mechanical errors are not so important because the digestion time is more important. Still the vessels have to be very well closed and all the valves and filters checked. The mechanical errors of AAS are eliminated with the specialist of Perkin Elmer visit. The instrument was cleaned and calibrated two days before the analysis began. Errors in determination of concentration and background signals are eliminated through internal Zeeman correction.

It is considered that errors are in the average limits and therefore they are negligible. The quantitative errors are given by analytical instruments.

V. DISCUSSION

Cadmium is a toxic heavy metal for humans and wild life. It is widely used in a lot of industry areas and especially in dyes. Cadmium composition of dyes offers an anticorrosion plate at extreme conditions. Moreover in plane industry cadmium has been used massively (in American air forces) in out plating because it offers greater flexibility for the material covered.

Situated near Sola International Airport, Hafrsfjord and Sømme bay (Sømmebukta in norwegian) are susceptible to be contaminated with cadmium and other heavy metals from drainage and sewage waters coming from the public and private airports. Sewage water was analyzed in 2006 in a bachelor thesis at University of Stavanger [3]. They found out that the pollution coming from the water treatment station has a very high concentration of cadmium, approximately 15 µg/l.

From first field observations the first centimeter in the shallow water is oxic and the rest of the sediment is anoxic. Even with this high stability, sediment is drilled by polychetes which absorb cadmium salts. Sedimented cadmium is a potential danger for fish and sea birds because it can influence internal organs and reproduction systems. More studies need to be made in this direction.

Analysis showed that the samples have a higher concentration than it was measured by the Norwegian authority for environment for Hafrsfjord [17]. The most important samples (samples closer to pollution source) have a concentration between 1.4 and 7.0 µg/g dry weight, 3 to 14 times more than the average concentration found in the deepest sediments (<0.5 µg/g). This is due to 0B source which obviously comes from airport drainage system (including undefined sewage loadings). The data show the flux of polluted sediment to the deeper parts of the analyzed area. Tide and wave movement have a strong influence in transportation of cadmium salts.

In deeper waters and sediments the cadmium concentration changes. While we find more cadmium in some samples closer to shore (sample 25), cadmium has a higher concentration (value which kills all the organisms) in deeper part of the studied sample (21d, 27d, 28d). This result is explained by sedimentation process and slow flow of sediment to the deeper areas found in the middle of the fjord and the potential for CdS precipitation in the anoxic sulphate reducing (H_2S abundant) water. The high value of cadmium in sample 25 is a proof of possible recent contamination. The extreme value found in the deeper sediment at sample 21d demonstrate that the garbage site close to the shore contained a lot of cadmium (probably from thrown Cadmium-Al batteries) in the last 50-100 years and it went directly in the sediment.

Digestion offers a good and clean stabilization of cadmium with strong acids. Though, cadmium is easily isolated in salts with nitric, fluoric and hydrochloric acids. The method is safe and it can be improved with a future automatic system of dropping strong acids in the vessels. Contamination of vessels, bottles and other equipment is assured with 0.5M nitric acid bath.

The standard deviation error given by GF AAS analysis demonstrated the validity of the method and assures that the measurements are appropriate and can be repeated anytime. Sampling, digestion and analysis according to national and international standards also assures the validity of cadmium concentration determination.

The method has the possibility to be improved by using other matrix modifiers and by realizing more than three separate analyses for each sample. In this way the standard error decreases and get closer to reality. If it is possible, all the equipment can be washed with concentrated nitric acid more than one time.

With a few exceptions, we find a strong correlation between cadmium, organic content and depth. This is indicated by elevated concentrations in anoxic vs. oxic environment. We can see that most of the samples containing a high organic part tend to bio accumulate cadmium and thus the value is higher. One exception occurs at a blue shell bank where we don't have a high concentration of cadmium.

With a few exceptions, the shallow water sediment samples present a low organic content (5%). This organic content has no power to assimilate cadmium carbonate and we conclude that at most of the samples, cadmium salts stay in sediment and its transportation is influenced only by tidal and wave movement. Presence of ice during winter keeps the sediment more stabile and it offers more sedimentation than in summer time. Sample taken from pollution source (0B) has a higher organic content which develops along the cement pipe from water treatment plant. Samples 6 and 12 are exceptions regarding organic content and they are situated in blue shells banks. Weathering of shells and organic internal body determines high organic content. These organisms can accumulate cadmium salts but the results prove that this is not happening in Sømme bay because the measured cadmium concentration is similar to the other close sampling points. Samples taken from deeper sediment contain more organic matter which evaporated at 550ºC and this proves that organisms are adapted both to oxic and anoxic sediment environment. High cadmium concentration in deeper sediment may come from natural cadmium sedimentation in humic components and also from organic bio accumulated cadmium. This is an opportunity to develop multiple studies on marine organic environment.

The concentration found in this work is in the range of urban affected sediments. The results are confirmed by the presence of Sola locality and the presence of the airport seems to affect the Sømme bay water with a normal concentration value. Though, special attention must be given to this area because the breeding bird area should have a lower concentration for an insignificant influenceon a prestine area (as this should be considered).

VI. CONCLUSIONS

Cadmium is one of the toxic heavy metals which need special attention in populated areas. Moreover, attention must be focused on places which are very important for wild life, whether it is aquatic or terrestrial. Sømme bay is one of these places. It is situated near an important source of cadmium pollution (Sola International Airport) beside the agricultural chemical pollution and waste disposal on unprotected sites.

Cadmium was measured in Sømme bay in significant sampling points and it was demonstrated that mean cadmium concentration in the area where bird life is more intense (especially during autumn migration) has the value of 2.72 µg/g dry weight which is higher than the value measured for the entire Hafrsfjord (<0.5µg/g dry weight). The samples taken from deep water have a higher content of cadmium because cadmium salts tend to sediment more in anoxic environment. There is a strong correlation between organic content and cadmium concentration which leads to the bioaccumulation process in all the regions (and more in the deeper areas).

The reference samples concentrations are higher than the mean concentration measured for Hafrsfjord and this is a proof of a continuing contamination caused by land use on the shores of the fjord. The reference values show that most of the samples in the interest area have a concentration in a normal range (given by reference).

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Appendix 1 Sampling files

Sømme bay Cadmium sampling

Sampling date: 21.04.2010
Sampling time: 10.00-14.00
Sampling persons: Cezar Partheniu, Roald Kommedal

Sampling point	Coordinates	Depth	Observations
0A (source 1)	N 58°53’718’’	< 0.5m	
	E 5°38’054’’		
0B (source 2)	N 58°53’712	< 0.5m	
	E 5°38’049’’		
1	N 58°53’730’’	< 0.5m	
	E 5°38’069’’		
2	N 58°53’732’’	< 0.5m	
	E 5°38’077’’		
3	N 58°53’729’’	< 0.5m	
	E 5°38’088’’		
4	N 58°53’772’’	< 0.5m	
	E 5°38’051’’		
5	N 58°53’776’’	< 0.5m	
	E 5°38’106’’		
6	N 58°53’771’’	< 0.5m	
	E 5°38’164’’		
9	N 58°53’869’’	< 0.5m	
	E 5°38’165’’		
10A (source 3)	N 58°53’786’’	< 0.5m	
	E 5°38’307’’		
10B (source 4)	N 58°53’769’’	< 0.5m	
	E 5°38’357’’		
11	N 58°53’802’’	< 0.5m	
	E 5°38’292’’		
12	N 58°53’814’’	< 0.5m	
	E 5°38’334’’		
13	N 58°53’827’’	< 0.5m	
	E 5°38’399’’		
14	N 58°53’838’’	< 0.5m	
	E 5°38’279’’		
15	N 58°53’853’’	< 0.5m	
	E 5°38’336’’		
16	N 58°53’870’’	< 0.5m	
	E 5°38’407’’		

Sampling date: 22.04.2010
Sampling time: 09.30-15.00
Sampling persons: Cezar Partheniu, Roald Kommedal

Sampling point	Coordinates	Depth	Observations
24	N 58°54’439’’	< 0.5m	
	E 5°37’137’’		
25	N 58°54’469’’	5m	
	E 5°37’256’’		
26, 26d	N 58°54’550’’	12.5m	Totally black sediment
	E 5°37’703’’		
27, 27d	N 58°54’555’’	28m	2-3 cm brown layer on top of black
	E 5°38’129’’		
28, 28d	N 58°54’523’’	29m	
	E 5°38’475’’		
29	N 58°54’460’’	17m	No sample
	E 5°38’659’’		
23	N 58°54’149’’	22m	Brownish
	E 5°38’461’’		
22, 22d	N 58°54’126’’	25m	Brownish
	E 5°38’220’’		
21, 21d	N 58°54’099’’	24m	Brownish
	E 5°38’005’’		
8, 8d	N 58°53’874’’	< 0.5m	
	E 5°38’081’’		
7, 7d, 7 organic	N 58°53’880’’	< 0.5m	
	E 5°38’000’’		
Ref N, Ref N organic	N 58°55’888’’	< 0.5m	
	E 5°37’549’’		
Ref N2	N 58°55’624’’	< 0.5m	
	E 5°37’549’’		
9 organic	N 58°53’827’’	< 0.5m	
	E 5°38’399’’		

Appendix 2 AAS Results

```
Analysis Begun

Logged In Analyst: c-drangeid               Technique: AA Furnace
Spectrometer Model: AA600                    Autosampler Model: AS-800

Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file.sif
Batch ID: Somme bay 2010
Results Data Set: Somme bay 2010 Cezar
Results Library: C:\data-AA\Administrator\Results\Results.mdb

Method Loaded
Method Name: Cezar Cadmium Method 1               Method Last Saved: 03.05.2010
12:51:37
Method Description: 0-10 ug/l marius and kjerand

Sequence No.: 1                          Autosampler Location: 141
Sample ID: Calib Blank 1                       Date Collected: 03.05.2010 13:00:28
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 141
Replicate Data: Calib Blank 1
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal    Area   Height  Area    Height           Stored
 1              [0.00]    0.0043    0.0043  0.0045  -0.0153  0.0028  13:01:19     Yes
 2              [0.00]    0.0040    0.0040  0.0056  -0.0154  0.0022  13:04:18     Yes
 3              [0.00]    0.0035    0.0035  0.0055  -0.0147  0.0027  13:07:18     Yes
Mean:              [0.00]    0.0039
SD:              0.00      0.0004
%RSD:              0.00     9.42
Auto-zero performed.

Sequence No.: 2                          Autosampler Location: 142
Sample ID: Calib Std 2                        Date Collected: 03.05.2010 13:09:27
Analyst:                              Data Type: Original
uL dispensed: 18 from 143, 3 from 121, 2 from 142
Replicate Data: Calib Std 2
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal    Area   Height  Area    Height           Stored
 1              [2.5]    0.6101    0.6140  0.7295   0.0681   0.0967  13:10:21     Yes
 2              [2.5]    0.6104    0.6144  0.7307   0.0665   0.0983  13:13:29     Yes
 3              [2.5]    0.6121    0.6160  0.7568   0.0685   0.0997  13:16:29     Yes
Mean:              [2.5]     0.6109
SD:              0.0       0.0010
%RSD:              0.0       0.17
Standard number 2 applied. [2.5]
Correlation Coef.: 1.000000   Slope: 0.24435    Intercept: 0.00000

Sequence No.: 3                          Autosampler Location: 142
```

```
Sample ID: Calib Std 3                    Date Collected: 03.05.2010 13:18:37
Analyst:                             Data Type: Original
uL dispensed: 16 from 143, 3 from 121, 4 from 142
Replicate Data: Calib Std 3
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1              [5]       1.0875     1.0914  1.0802   0.1442   0.1708  13:19:30      Yes
 2              [5]       1.0878     1.0917  1.1180   0.1445   0.1776  13:22:32      Yes
 3              [5]       1.0865     1.0904  1.1256   0.1456   0.1789  13:25:40      Yes
Mean:              [5]      1.0873
SD:              0        0.0007
%RSD:              0        0.06
Standard number 3 applied. [5]
Correlation Coef.: 1.000000   Slope: 0.27884    Intercept: 0.00000

Sequence No.: 4                         Autosampler Location: 142
Sample ID: Calib Std 4                    Date Collected: 03.05.2010 13:27:47
Analyst:                             Data Type: Original
uL dispensed: 10 from 143, 3 from 121, 10 from 142
Replicate Data: Calib Std 4
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1              [12.5]    2.0094     2.0133  1.4464   0.3358   0.2961  13:28:40      Yes
 2              [12.5]    2.0197     2.0237  1.4082   0.3358   0.2846  13:31:42      Yes
 3              [12.5]    2.0090     2.0129  1.4880   0.3358   0.2890  13:34:43      Yes
Mean:              [12.5]    2.0127
SD:              0.0       0.0061
%RSD:              0.0       0.30
Standard number 4 applied. [12.5]
Correlation Coef.: 1.000000   Slope: 0.27692    Intercept: 0.00000

Sequence No.: 5                         Autosampler Location: 142
Sample ID: Calib Stid 5                   Date Collected: 03.05.2010 13:36:52
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 142
Replicate Data: Calib Stid 5
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1              [25]      2.9077     2.9117  1.6216   0.6289   0.4740  13:37:44      Yes
 2              [25]      2.8964     2.9003  1.7246   0.6270   0.4530  13:41:00      Yes
 3              [25]      2.8645     2.8684  1.6619   0.6278   0.4929  13:43:59      Yes
Mean:              [25]      2.8895
SD:              0        0.0224
%RSD:              0        0.78
Standard number 5 applied. [25]
Correlation Coef.: 0.999971   Slope: 0.28473    Intercept: 0.00000

Calibration data for Cadmium 228.8                 Equation: Nonlinear Through Zero
                           Entered  Calculated
               Mean Signal     Conc.      Conc.     Standard
```

```
      ID           (Abs)       ug/L      ug/L     Deviation     %RSD
   Calib Blank 1        0.0000        0       0.00        0.00        9.4
    Calib Std 2        0.6109       2.5       2.49       0.00       0.2
    Calib Std 3        1.0873       5.0       5.04       0.00       0.1
    Calib Std 4        2.0127      12.5       12.41      0.01       0.3
    Calib Stid 5       2.8895      25.0       25.09      0.02       0.8
Correlation Coef.: 0.999971   Slope: 0.28473   Intercept: 0.00000

Sequence No.: 6                          Autosampler Location: 2
Sample ID: 15                            Date Collected: 03.05.2010 13:46:08
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 2
Replicate Data: 15
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     1.48        1.48      0.3845     0.3884  0.7964  0.2303   0.1873  13:46:56      Yes
 2     1.40        1.40      0.3653     0.3692  0.7577  0.2122   0.1705  13:49:51      Yes
 3     1.40        1.40      0.3656     0.3695  0.7498  0.2111   0.1708  13:52:46      Yes
Mean:  1.43        1.43      0.3718
SD:    0.05        0.05      0.0110
%RSD:  3.24        3.24      2.96

Sequence No.: 7                          Autosampler Location: 3
Sample ID: 1                             Date Collected: 03.05.2010 13:54:54
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 3
Replicate Data: 1
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     1.09        1.09      0.2894     0.2933  0.6415  0.1819   0.1408  13:55:42      Yes
 2     1.09        1.09      0.2895     0.2934  0.6407  0.1842   0.1425  13:58:38      Yes
 3     1.08        1.08      0.2868     0.2908  0.6278  0.1975   0.1409  14:01:33      Yes
Mean:  1.09        1.09      0.2886
SD:    0.01        0.01      0.0015
%RSD:  0.56        0.56      0.52

Sequence No.: 8                          Autosampler Location: 4
Sample ID: 4                             Date Collected: 03.05.2010 14:03:41
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 4
Replicate Data: 4
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     0.96        0.96      0.2572     0.2611  0.5460  0.2210   0.1572  14:04:29      Yes
 2     0.93        0.93      0.2493     0.2532  0.5500  0.2223   0.1558  14:07:24      Yes
 3     0.94        0.94      0.2515     0.2554  0.5485  0.2304   0.1514  14:10:20      Yes
Mean:  0.94        0.94      0.2527
SD:    0.02        0.02      0.0041
%RSD:  1.71        1.71      1.61
```

```
Sequence No.: 9                       Autosampler Location: 5
Sample ID: 14                        Date Collected: 03.05.2010 14:12:27
Analyst:                           Data Type: Original
uL dispensed: 3 from 121, 20 from 5
Replicate Data: 14
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L       ug/L     Signal    Area    Height   Area    Height          Stored
 1    1.54       1.54     0.3993    0.4033  0.8706   0.2676   0.2024  14:13:16     Yes
 2    1.56       1.56     0.4030    0.4069  0.8712   0.2725   0.2034  14:16:11     Yes
 3    1.56       1.56     0.4038    0.4077  0.8828   0.2747   0.2046  14:19:06     Yes
Mean:  1.56       1.56      0.4021
SD:    0.01       0.01      0.0024
%RSD:  0.65       0.65      0.59

Sequence No.: 10                      Autosampler Location: 6
Sample ID: 10A                        Date Collected: 03.05.2010 14:21:14
Analyst:                           Data Type: Original
uL dispensed: 3 from 121, 20 from 6

Replicate Data: 10A
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L       ug/L     Signal    Area    Height   Area    Height          Stored
 1    1.31       1.31     0.3430    0.3469  0.5517   0.5531   0.2941  14:22:02     Yes
 2    1.30       1.30     0.3401    0.3441  0.5111   0.5237   0.2155  14:24:57     Yes
 3    1.28       1.28     0.3352    0.3392  0.5296   0.6339   0.2613  14:27:52     Yes
Mean:  1.29       1.29      0.3394
SD:    0.02       0.02      0.0039
%RSD:  1.25       1.25      1.15

Sequence No.: 11                      Autosampler Location: 7
Sample ID: 10B                        Date Collected: 03.05.2010 14:30:00
Analyst:                           Data Type: Original
uL dispensed: 3 from 121, 20 from 7
Replicate Data: 10B
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L       ug/L     Signal    Area    Height   Area    Height          Stored
 1    1.94       1.94     0.4907    0.4946  0.9017   0.7062   0.3080  14:30:48     Yes
 2    1.86       1.86     0.4726    0.4766  0.9466   0.6793   0.2818  14:33:44     Yes
 3    1.86       1.86     0.4728    0.4767  0.9729   0.6466   0.2656  14:36:39     Yes
Mean:  1.89       1.89      0.4787
SD:    0.05       0.05      0.0104
%RSD:  2.43       2.43      2.17

Sequence No.: 12                      Autosampler Location: 8
Sample ID: 8                        Date Collected: 03.05.2010 14:38:47
Analyst:                           Data Type: Original
uL dispensed: 3 from 121, 20 from 8
Replicate Data: 8
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L       ug/L     Signal    Area    Height   Area    Height          Stored
```

```
 1    0.83       0.83      0.2229     0.2268  0.5469   0.5031   0.2317  14:39:34     Yes
 2    0.80       0.80      0.2170     0.2209  0.5434   0.4899   0.2183  14:42:30     Yes
 3    0.81       0.81      0.2194     0.2233  0.5522   0.4562   0.2039  14:45:26     Yes
Mean:  0.81       0.81      0.2198
SD:    0.01       0.01      0.0030
%RSD:  1.43       1.43      1.35

Sequence No.: 13                         Autosampler Location: 9
Sample ID: 9                           Date Collected: 03.05.2010 14:47:33
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 9
Replicate Data: 9
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal     Area    Height  Area    Height         Stored
 1    -0.01      -0.01     -0.0038    0.0001  0.0033  -0.0024  0.0203  14:48:20     Yes
 2    0.69       0.69      0.1866     0.1905  0.5015   0.3969   0.1753  14:51:15     Yes
 3    0.70       0.70      0.1894     0.1933  0.4907   0.3785   0.1649  14:54:11     Yes
Mean:  0.46       0.46      0.1241
SD:    0.41       0.41      0.1108
%RSD:  89.14      89.14     89.25

Sequence No.: 14                         Autosampler Location: 10
Sample ID: 12                           Date Collected: 03.05.2010 14:56:18
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 10
Replicate Data: 12
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal     Area    Height  Area    Height         Stored
 1    1.59       1.59      0.4108     0.4147  0.6969   0.7537   0.2743  14:57:07     Yes
 2    1.67       1.67      0.4286     0.4325  0.6131   0.7608   0.2786  15:00:02     Yes
 3    1.64       1.64      0.4225     0.4264  0.6018   0.7378   0.2723  15:02:57     Yes
Mean:  1.64       1.64      0.4206
SD:    0.04       0.04      0.0090
%RSD:  2.37       2.37      2.15

Sequence No.: 15                         Autosampler Location: 11
Sample ID: 0B                           Date Collected: 03.05.2010 15:05:05
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 11
Replicate Data: 0B
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal     Area    Height  Area    Height         Stored
 1    4.55       4.55      1.0040     1.0079  1.6084   0.8163   0.3629  15:05:53     Yes
 2    4.64       4.64      1.0198     1.0237  1.4480   0.7985   0.3614  15:08:49     Yes
 3    4.49       4.49      0.9950     0.9989  1.4306   0.8864   0.3721  15:11:44     Yes
Mean:  4.56       4.56      1.0063
SD:    0.07       0.07      0.0125
%RSD:  1.59       1.59      1.25

Sequence No.: 16                         Autosampler Location: 12
```

```
Sample ID: 7                          Date Collected: 03.05.2010 15:13:52
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 12
Replicate Data: 7
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height         Stored
 1    0.86       0.86     0.2323    0.2362  0.5708  0.7620  0.2736  15:14:39    Yes
 2    0.84       0.84     0.2268    0.2307  0.5737  0.6541  0.2520  15:17:35    Yes
 3    0.88       0.88     0.2365    0.2404  0.5889  0.6537  0.2557  15:20:31    Yes
Mean:  0.86       0.86     0.2319
SD:    0.02       0.02     0.0048
%RSD:  2.20       2.20     2.09


Sequence No.: 17                        Autosampler Location: 13
Sample ID: 8d                          Date Collected: 03.05.2010 15:22:38
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 13
Replicate Data: 8d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height         Stored
 1    0.80       0.80     0.2164    0.2204  0.5311  0.6073  0.2351  15:23:26    Yes
 2    0.82       0.82     0.2203    0.2242  0.5475  0.6094  0.2421  15:26:21    Yes
 3    0.82       0.82     0.2220    0.2259  0.5413  0.5776  0.2224  15:29:17    Yes
Mean:  0.81       0.81     0.2196
SD:    0.01       0.01     0.0028
%RSD:  1.36       1.36     1.29

Sequence No.: 18                        Autosampler Location: 14
Sample ID: 7d                          Date Collected: 03.05.2010 15:31:24
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 14
Replicate Data: 7d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height         Stored
 1    1.07       1.07     0.2841    0.2880  0.6784  0.5696  0.2007  15:32:13    Yes
 2    1.03       1.03     0.2752    0.2791  0.6810  0.5700  0.2082  15:35:08    Yes
 3    1.06       1.06     0.2833    0.2872  0.6622  0.5578  0.2162  15:38:03    Yes
Mean:  1.05       1.05     0.2809
SD:    0.02       0.02     0.0049
%RSD:  1.87       1.87     1.76

Sequence No.: 19                        Autosampler Location: 15
Sample ID: 16                          Date Collected: 03.05.2010 15:40:11
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 15
Replicate Data: 16
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height         Stored
 1    0.92       0.92     0.2468    0.2507  0.6354  0.5919  0.2639  15:40:59    Yes
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 2   0.93      0.93     0.2499    0.2539  0.6582   0.5416   0.2400  15:43:54     Yes
 3   0.94      0.94     0.2509    0.2548  0.6609   0.5470   0.2462  15:46:49     Yes
Mean:  0.93      0.93     0.2492
SD:    0.01      0.01     0.0022
%RSD:  0.92      0.92     0.86

Sequence No.: 20                        Autosampler Location: 16
Sample ID: 0A-1                         Date Collected: 03.05.2010 15:48:57
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 16
Replicate Data: 0A-1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time        Peak
 #   ug/L      ug/L     Signal    Area   Height  Area    Height         Stored
 1   4.81      4.81     1.0491    1.0530  1.5967   0.7353   0.6020  15:49:45     Yes
 2   4.87      4.87     1.0590    1.0629  1.8604   0.7363   0.5979  15:52:41     Yes
 3   4.81      4.81     1.0492    1.0531  1.6397   0.7150   0.5864  15:55:36     Yes
Mean:  4.83      4.83     1.0524
SD:    0.03      0.03     0.0057
%RSD:  0.70      0.70     0.54
Sequence No.: 21                        Autosampler Location: 17
Sample ID: 26                         Date Collected: 03.05.2010 15:57:43
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 17
Replicate Data: 26
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time        Peak
 #   ug/L      ug/L     Signal    Area   Height  Area    Height         Stored
 1   1.64      1.64     0.4208    0.4247  0.9225   0.5833   0.3270  15:58:31     Yes
 2   1.66      1.66     0.4261    0.4300  0.9674   0.5729   0.3135  16:01:26     Yes
 3   1.64      1.64     0.4227    0.4267  0.9959   0.5543   0.3066  16:04:22     Yes
Mean:  1.65      1.65     0.4232
SD:    0.01      0.01     0.0027
%RSD:  0.70      0.70     0.63

Sequence No.: 22                        Autosampler Location: 18
Sample ID: 0A-2                         Date Collected: 03.05.2010 16:06:29
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 18
Replicate Data: 0A-2
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time        Peak
 #   ug/L      ug/L     Signal    Area   Height  Area    Height         Stored
 1   2.07      2.07     0.5203    0.5243  0.9308   0.5130   0.2307  16:07:18     Yes
 2   2.10      2.10     0.5262    0.5301  0.9360   0.5105   0.2382  16:10:13     Yes
 3   2.06      2.06     0.5181    0.5221  0.9188   0.5078   0.2385  16:13:08     Yes
Mean:  2.08      2.08     0.5215
SD:    0.02      0.02     0.0041
%RSD:  0.90      0.90     0.79

Sequence No.: 23                        Autosampler Location: 19
Sample ID: 6                          Date Collected: 03.05.2010 16:15:16
Analyst:                            Data Type: Original
```

```
uL dispensed: 3 from 121, 20 from 19
Replicate Data: 6
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     0.60        0.60      0.1640    0.1679  0.3676  0.5405  0.3909  16:16:05    Yes
 2     0.61        0.61      0.1674    0.1713  0.3741  0.5217  0.3762  16:19:01    Yes
 3     0.60        0.60      0.1645    0.1684  0.3641  0.5201  0.3851  16:21:56    Yes
Mean:  0.60        0.60      0.1653
SD:    0.01        0.01      0.0018
%RSD:  1.16        1.16      1.11

Sequence No.: 24                        Autosampler Location: 20
Sample ID: 22                          Date Collected: 03.05.2010 16:24:04
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 20
Replicate Data: 22
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     4.97        4.97      1.0753    1.0792  1.7399  0.7942  0.8280  16:24:51    Yes
 2     5.03        5.03      1.0868    1.0908  1.6507  0.7918  0.8524  16:27:47    Yes
 3     5.15        5.15      1.1051    1.1090  1.7361  0.7913  0.8380  16:30:42    Yes
Mean:  5.05        5.05      1.0891
SD:    0.09        0.09      0.0150
%RSD:  1.80        1.80      1.38

Sequence No.: 25                        Autosampler Location: 21
Sample ID: Ref N 2                       Date Collected: 03.05.2010 16:32:49
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 21
Replicate Data: Ref N 2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     0.70        0.70      0.1893    0.1933  0.4188  0.5752  0.4544  16:33:38    Yes
 2     0.67        0.67      0.1820    0.1859  0.4248  0.5420  0.4165  16:36:33    Yes
 3     0.64        0.64      0.1745    0.1784  0.4221  0.4964  0.3789  16:39:29    Yes
Mean:  0.67        0.67      0.1819
SD:    0.03        0.03      0.0074
%RSD:  4.27        4.27      4.09

Sequence No.: 26                        Autosampler Location: 22
Sample ID: 13                          Date Collected: 03.05.2010 16:41:36
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 22
Replicate Data: 13
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     1.62        1.62      0.4163    0.4202  0.7225  0.7981  0.3049  16:42:24    Yes
 2     1.66        1.66      0.4270    0.4309  0.6859  0.7657  0.2877  16:45:19    Yes
 3     1.65        1.65      0.4250    0.4289  0.6963  0.7631  0.2881  16:48:14    Yes
Mean:  1.64        1.64      0.4228
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SD:    0.02       0.02      0.0057
%RSD:  1.48       1.48      1.34

Sequence No.: 27                          Autosampler Location: 23
Sample ID: 2                            Date Collected: 03.05.2010 16:50:22
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 23
Replicate Data: 2
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak     Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area     Height            Stored
 1     2.94        2.94      0.7037     0.7076  1.0823   0.6599   0.2321  16:51:10     Yes
 2     2.95        2.95      0.7048     0.7088  1.0941   0.6938   0.2361  16:54:05     Yes
 3     2.91        2.91      0.6981     0.7020  1.1117   0.7051   0.2453  16:57:01     Yes
Mean:  2.93       2.93      0.7022
SD:    0.02       0.02      0.0036
%RSD:  0.61       0.61      0.52

Sequence No.: 28                          Autosampler Location: 24
Sample ID: 23                           Date Collected: 03.05.2010 16:59:09
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 24
Replicate Data: 23
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak     Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area     Height            Stored
 1     5.85        5.85      1.2178     1.2218  1.7462   1.7157   0.7494  16:59:57     Yes
 2     5.75        5.75      1.2021     1.2060  1.7151   1.5104   0.7678  17:02:53     Yes
 3     6.10        6.10      1.2556     1.2596  1.7303   1.4004   0.8519  17:05:48     Yes
Mean:  5.90       5.90      1.2252
SD:    0.18       0.18      0.0275
%RSD:  3.04       3.04      2.25

Sequence No.: 29                          Autosampler Location: 25
Sample ID: 25                           Date Collected: 03.05.2010 17:07:56
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 25
Replicate Data: 25
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak     Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area     Height            Stored
 1     3.74        3.74      0.8600     0.8639  1.3360   0.9694   0.3365  17:08:44     Yes
 2     3.77        3.77      0.8647     0.8686  1.3560   0.8531   0.3054  17:11:40     Yes
 3     3.73        3.73      0.8568     0.8607  1.3442   0.8689   0.3115  17:14:36     Yes
Mean:  3.75       3.75      0.8605
SD:    0.02       0.02      0.0040
%RSD:  0.57       0.57      0.46

Sequence No.: 30                          Autosampler Location: 26
Sample ID: 11                           Date Collected: 03.05.2010 17:16:43
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 26
Replicate Data: 11
```

```
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height  Area     Height           Stored
 1     1.95       1.95      0.4932     0.4971  1.0587  0.8361   0.3053  17:17:32    Yes
 2     1.92       1.92      0.4867     0.4906  1.1547  0.8487   0.3464  17:20:27    Yes
 3     1.89       1.89      0.4802     0.4842  1.0261  0.8030   0.3774  17:23:22    Yes
Mean:  1.92       1.92      0.4867
SD:    0.03       0.03      0.0065
%RSD:  1.50       1.50      1.33

Sequence No.: 31                          Autosampler Location: 27
Sample ID: 5                            Date Collected: 03.05.2010 17:25:30
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 27
Replicate Data: 5
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height  Area     Height           Stored
 1     0.96       0.96      0.2575     0.2614  0.5202  1.0106   0.4229  17:26:18    Yes
 2     0.98       0.98      0.2619     0.2658  0.5006  1.0121   0.4420  17:29:13    Yes
 3     0.97       0.97      0.2608     0.2648  0.4949  1.0207   0.4462  17:32:08    Yes
Mean:  0.97       0.97      0.2601
SD:    0.01       0.01      0.0023
%RSD:  0.94       0.94      0.88

Sequence No.: 32                          Autosampler Location: 28
Sample ID: 3                            Date Collected: 03.05.2010 17:34:16
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 28
Replicate Data: 3
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height  Area     Height           Stored
 1     0.87       0.87      0.2336     0.2375  0.5374  0.7727   0.3208  17:35:05    Yes
 2     0.87       0.87      0.2340     0.2380  0.5271  0.7350   0.5196  17:38:01    Yes
 3     0.89       0.89      0.2386     0.2425  0.5106  0.7419   0.5630  17:40:56    Yes
Mean:  0.87       0.87      0.2354
SD:    0.01       0.01      0.0028
%RSD:  1.25       1.25      1.18

Sequence No.: 33                          Autosampler Location: 29
Sample ID: 21                            Date Collected: 03.05.2010 17:43:04
Analyst:                              Data Type: Original
uL dispensed: 3 from 121, 20 from 29
Replicate Data: 21
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height  Area     Height           Stored
 1     4.11       4.11      0.9279     0.9318  1.5552  1.2346   0.4388  17:43:52    Yes
 2     4.27       4.27      0.9559     0.9599  1.5616  1.2101   0.4526  17:46:47    Yes
 3     4.19       4.19      0.9422     0.9461  1.5259  1.1586   0.4252  17:49:43    Yes
Mean:  4.19       4.19      0.9420
SD:    0.08       0.08      0.0140
%RSD:  1.87       1.87      1.49
```

```
Sequence No.: 34                          Autosampler Location: 30
Sample ID: 24                           Date Collected: 03.05.2010 17:51:50
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 30
Replicate Data: 24
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height          Stored
 1    1.02       1.02     0.2718    0.2758  0.7497  0.7201  0.2597  17:52:39    Yes
 2    1.02       1.02     0.2724    0.2763  0.7461  0.6940  0.3388  17:55:34    Yes
 3    1.04       1.04     0.2760    0.2799  0.7037  0.6602  0.3802  17:58:30    Yes
Mean:  1.02       1.02     0.2734
SD:    0.01       0.01     0.0023
%RSD:  0.89       0.89     0.83

Sequence No.: 35                          Autosampler Location: 31
Sample ID: 28d                           Date Collected: 03.05.2010 18:00:37
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 31
Replicate Data: 28d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height          Stored
 1    5.99       5.99     1.2378    1.2417  1.5754  2.1113  1.1282  18:01:26    Yes
 2    6.25       6.25     1.2783    1.2822  1.7609  2.1739  1.1446  18:04:21    Yes
 3    6.14       6.14     1.2606    1.2645  1.9388  2.1949  1.1944  18:07:16    Yes
Mean:  6.12       6.12     1.2589
SD:    0.13       0.13     0.0203
%RSD:  2.20       2.20     1.61

Sequence No.: 36                          Autosampler Location: 32
Sample ID: 28                           Date Collected: 03.05.2010 18:09:24
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 32
Replicate Data: 28
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height          Stored
 1    12.07      12.07     1.9795    1.9835  1.6879  1.6995  0.8155  18:10:12    Yes
 2    8.08       8.08     1.5311    1.5350  1.5749  1.8352  0.9944  18:13:08    Yes
 3    8.40       8.40     1.5724    1.5763  1.6867  1.8893  0.9682  18:16:03    Yes
Mean:  9.51       9.51     1.6943
SD:    2.22       2.22     0.2479
%RSD:  23.29      23.29    14.63

Sequence No.: 37                          Autosampler Location: 33
Sample ID: 27d                           Date Collected: 03.05.2010 18:18:11
Analyst:                             Data Type: Original
uL dispensed: 3 from 121, 20 from 33
Replicate Data: 27d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area   Height          Stored
```

```
 1   8.46      8.46     1.5806    1.5845  1.6531  1.7262  0.8463  18:18:59     Yes
 2   6.67      6.67     1.3396    1.3435  1.6573  1.5793  0.8771  18:21:55     Yes
 3   7.75      7.75     1.4891    1.4930  1.6978  1.6954  0.8710  18:24:51     Yes
Mean:  7.63      7.63     1.4697
SD:    0.90      0.90     0.1217
%RSD:  11.83     11.83    8.28

Sequence No.: 38                    Autosampler Location: 34
Sample ID: Ref N                     Date Collected: 03.05.2010 18:26:58
Analyst:                         Data Type: Original
uL dispensed: 3 from 121, 20 from 34
Replicate Data: Ref N
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area   Height          Stored
 1   1.41      1.41     0.3667    0.3706  0.7610  1.0564  0.3258  18:27:46     Yes
 2   1.38      1.38     0.3605    0.3644  0.8032  0.9752  0.3397  18:30:41     Yes
 3   1.35      1.35     0.3538    0.3578  0.8711  0.9624  0.3484  18:33:36     Yes
Mean:  1.38      1.38     0.3603
SD:    0.03      0.03     0.0064
%RSD:  1.94      1.94     1.79

Sequence No.: 39                    Autosampler Location: 35
Sample ID: 21d                      Date Collected: 03.05.2010 18:35:44
Analyst:                         Data Type: Original
uL dispensed: 3 from 121, 20 from 35
Replicate Data: 21d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area   Height          Stored
 1   3.52      3.52     0.8175    0.8214  1.3224  1.0141  0.4031  18:36:32     Yes
 2   3.50      3.50     0.8133    0.8173  1.3196  0.8717  0.2996  18:39:27     Yes
 3   3.49      3.49     0.8119    0.8158  1.3626  0.9110  0.3544  18:42:22     Yes
Mean:  3.50      3.50     0.8142
SD:    0.02      0.02     0.0029
%RSD:  0.43      0.43     0.36

Sequence No.: 40                    Autosampler Location: 36
Sample ID: 22d                      Date Collected: 03.05.2010 18:44:30
Analyst:                         Data Type: Original
uL dispensed: 3 from 121, 20 from 36
Replicate Data: 22d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area   Height          Stored
 1   5.24      5.24     1.1208    1.1248  1.7613  1.9558  1.2425  18:45:18     Yes
 2   4.98      4.98     1.0772    1.0811  1.7098  1.4718  1.2702  18:48:15     Yes
 3   5.26      5.26     1.1230    1.1269  1.8225  1.2583  1.1661  18:51:11     Yes
Mean:  5.16      5.16     1.1070
SD:    0.16      0.16     0.0258
%RSD:  3.05      3.05     2.33

Sequence No.: 41                    Autosampler Location: 37
```

```
Sample ID: 27                          Date Collected: 03.05.2010 18:53:19
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 37
Replicate Data: 27
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height         Stored
 1    4.92       4.92      1.0678    1.0717 1.5133  1.1937  1.1166 18:54:06    Yes
 2    4.95       4.95      1.0735    1.0774 1.6853  1.0916  1.1147 18:57:01    Yes
 3    5.04       5.04      1.0883    1.0922 1.9990  1.0708  1.1263 18:59:57    Yes
Mean:  4.97       4.97      1.0765
SD:    0.06       0.06      0.0106
%RSD:  1.28       1.28      0.98

Sequence No.: 42                        Autosampler Location: 141
Sample ID: Calib Blank 1                   Date Collected: 03.05.2010 19:02:04
Analyst:                            Data Type: Original
uL dispensed: 3 from 121, 20 from 141
Replicate Data: Calib Blank 1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height         Stored
 1    0.01       0.01      0.0028    0.0067 0.0076  -0.0120 0.0019 19:02:55    Yes
 2    0.01       0.01      0.0020    0.0059 0.0076  -0.0131 0.0015 19:05:55    Yes
 3    0.00       0.00      0.0005    0.0044 0.0074  -0.0137 0.0015 19:08:54    Yes
Mean:  0.01       0.01      0.0018
SD:    0.00       0.00      0.0012
%RSD:  66.55      66.55     66.54


Sequence No.: 43                        Autosampler Location: 142
Sample ID: Calib Std 2                   Date Collected: 03.05.2010 19:11:03
Analyst:                            Data Type: Original
uL dispensed: 18 from 143, 3 from 121, 2 from 142
Replicate Data: Calib Std 2
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height         Stored
 1    2.48       2.48      0.6093    0.6132 0.9535  0.0720  0.1390 19:11:56    Yes
 2    2.48       2.48      0.6077    0.6116 0.9329  0.0705  0.1355 19:14:56    Yes
 3    2.48       2.48      0.6091    0.6130 0.9840  0.0726  0.1438 19:17:56    Yes
Mean:  2.48       2.48      0.6087
SD:    0.00       0.00      0.0009
%RSD:  0.17       0.17      0.14

Sequence No.: 44                        Autosampler Location: 142
Sample ID: Calib Std 3                   Date Collected: 03.05.2010 19:20:04
Analyst:                            Data Type: Original
uL dispensed: 16 from 143, 3 from 121, 4 from 142
Replicate Data: Calib Std 3
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height         Stored
 1    3.69       3.69      0.8497    0.8537 1.2420  0.1173  0.2200 19:20:57    Yes
```

```
 2    4.21      4.21     0.9449    0.9488  1.3255   0.1355   0.2459  19:24:01     Yes
 3    3.30      3.30     0.7750    0.7789  1.1918   0.1032   0.1971  19:27:01     Yes
Mean:  3.73       3.73      0.8565
SD:    0.46       0.46      0.0851
%RSD:  12.24      12.24     9.94

Sequence No.: 45                         Autosampler Location: 142
Sample ID: Calib Std 4                     Date Collected: 03.05.2010 19:29:09
Analyst:                               Data Type: Original
uL dispensed: 10 from 143, 3 from 121, 10 from 142
Replicate Data: Calib Std 4
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #    ug/L      ug/L      Signal    Area    Height   Area    Height          Stored
 1    7.61      7.61     1.4701    1.4741  1.5883   0.3094   0.5236  19:30:02     Yes
 2    7.95      7.95     1.5148    1.5188  1.8100   0.3150   0.5154  19:33:02     Yes
 3    8.06      8.06     1.5289    1.5329  1.6184   0.3193   0.5005  19:36:03     Yes
Mean:  7.87       7.87      1.5046
SD:    0.23       0.23      0.0307
%RSD:  2.96       2.96      2.04

Sequence No.: 46                         Autosampler Location: 142
Sample ID: Calib Stid 5                    Date Collected: 03.05.2010 19:38:11
Analyst:                               Data Type: Original
uL dispensed: 3 from 121, 20 from 142
Replicate Data: Calib Stid 5
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #    ug/L      ug/L      Signal    Area    Height   Area    Height          Stored
 1    10.46     10.46     1.8136    1.8175  1.6315   0.5772   0.9143  19:39:02     Yes
 2    10.76     10.76     1.8460    1.8499  1.6270   0.5886   0.9023  19:42:01     Yes
 3    11.02     11.02     1.8733    1.8772  1.5319   0.5857   0.9073  19:45:01     Yes
Mean:  10.75      10.75     1.8443
SD:    0.28       0.28      0.0299
%RSD:  2.60       2.60      1.62

Analysis Begun

Logged In Analyst: c-drangeid                  Technique: AA Furnace
Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800

Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file.sif
Batch ID: Somme bay 2010
Results Data Set: Somme bay 2010 Cezar no2
Results Library: C:\data-AA\Administrator\Results\Results.mdb

Method Loaded
Method Name: Cezar Cadmium Method 2                 Method Last Saved: 04.05.2010
13:38:14
Method Description: 0-10 ug/l marius and kjerand
```

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Sequence No.: 1                        Autosampler Location: 141
Sample ID: Calib Blank 1                   Date Collected: 04.05.2010 13:46:59
Analyst:                           Data Type: Original
uL dispensed: 3 from 139, 20 from 141
Replicate Data: Calib Blank 1
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height         Stored
 1              [0.00]    0.0008    0.0008  0.0047   0.4264   0.1465  13:47:45      Yes
 2              [0.00]    0.0006    0.0006  0.0047   0.3300   0.1144  13:50:44      Yes
 3              [0.00]    0.0014    0.0014  0.0042   0.3467   0.1218  13:53:44      Yes
Mean:              [0.00]    0.0009
SD:              0.00      0.0004
%RSD:              0.00      45.63
Auto-zero performed.

Sequence No.: 2                        Autosampler Location: 142
Sample ID: Calib Std 2                   Date Collected: 04.05.2010 13:55:53
Analyst:                           Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 142
Replicate Data: Calib Std 2
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height         Stored
 1              [0.625]   0.2084    0.2093  0.4196   0.4625   0.1528  13:56:47      Yes
 2              [0.625]   0.2960    0.2970  0.5748   0.5570   0.1789  13:59:48      Yes
 3              [0.625]   0.2494    0.2503  0.4825   0.4994   0.1619  14:02:49      Yes
Mean:              [0.625]   0.2513
SD:              0.000     0.0438
%RSD:              0.000     17.45
Standard number 2 applied. [0.625]
Correlation Coef.: 1.000000   Slope: 0.40202    Intercept: 0.00000

Sequence No.: 3                        Autosampler Location: 142
Sample ID: Calib Std 3                   Date Collected: 04.05.2010 14:04:58
Analyst:                           Data Type: Original
uL dispensed: 18 from 143, 3 from 139, 2 from 142
Replicate Data: Calib Std 3
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height         Stored
 1              [1.25]    0.4290    0.4300  0.8234   0.4943   0.1535  14:05:53      Yes
 2              [1.25]    0.4144    0.4153  0.7746   0.4746   0.1505  14:08:54      Yes
 3              [1.25]    0.4109    0.4118  0.8059   0.4682   0.1462  14:11:57      Yes
Mean:              [1.25]    0.4181
SD:              0.00      0.0096
%RSD:              0.00      2.31
Standard number 3 applied. [1.25]
Correlation Coef.: 1.000000   Slope: 0.50375    Intercept: 0.00000

Sequence No.: 4                        Autosampler Location: 142
Sample ID: Calib Std 4                   Date Collected: 04.05.2010 14:14:04
Analyst:                           Data Type: Original
```

```
uL dispensed: 16 from 143, 3 from 139, 4 from 142
Replicate Data: Calib Std 4
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height         Stored
 1                [2.5]     0.6935    0.6944 1.2516  0.5549  0.2370 14:14:58    Yes
 2                [2.5]     0.6951    0.6960 1.2483  0.5366  0.2339 14:18:01    Yes
 3                [2.5]     0.6943    0.6953 1.2098  0.5249  0.2310 14:21:04    Yes
Mean:             [2.5]     0.6943
SD:               0.0       0.0008
%RSD:             0.0       0.12
Standard number 4 applied. [2.5]
Correlation Coef.: 1.000000   Slope: 0.71094    Intercept: 0.00000

Sequence No.: 5                       Autosampler Location: 142
Sample ID: Calib Std 5                   Date Collected: 04.05.2010 14:23:11
Analyst:                              Data Type: Original
uL dispensed: 12 from 143, 3 from 139, 8 from 142
Replicate Data: Calib Std 5
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height         Stored
 1                [5]       1.0427    1.0437 1.6549  0.5950  0.3937 14:24:04    Yes
 2                [5]       1.0614    1.0623 1.5750  0.6014  0.3793 14:27:06    Yes
 3                [5]       1.0567    1.0576 1.7809  0.5859  0.4026 14:30:09    Yes
Mean:             [5]       1.0536
SD:               0         0.0097
%RSD:             0         0.92
Standard number 5 applied. [5]
Correlation Coef.: 0.999886   Slope: 0.51574    Intercept: 0.00000

Sequence No.: 6                       Autosampler Location: 142
Sample ID: Calib Std 6                   Date Collected: 04.05.2010 14:32:16
Analyst:                              Data Type: Original
uL dispensed: 8 from 143, 3 from 139, 12 from 142
Replicate Data: Calib Std 6
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height         Stored
 1                [7.5]     1.2705    1.2714 1.9128  0.6578  0.5355 14:33:10    Yes
 2                [7.5]     1.2536    1.2546 1.7057  0.6624  0.5318 14:36:12    Yes
 3                [7.5]     1.2435    1.2444 1.8511  0.6491  0.5421 14:39:15    Yes
Mean:             [7.5]     1.2559
SD:               0.0       0.0136
%RSD:             0.0       1.09
Standard number 6 applied. [7.5]
Correlation Coef.: 0.999350   Slope: 0.48206    Intercept: 0.00000
Calibration data for Cadmium 228.8               Equation: Nonlinear Through Zero
                           Entered  Calculated
               Mean Signal   Conc.     Conc.     Standard
     ID           (Abs)       ug/L      ug/L     Deviation    %RSD
  Calib Blank 1   0.0000      0         0.00      0.00        45.6
   Calib Std 2    0.2513      0.625     0.64      0.04        17.4
```

```
  Calib Std 3      0.4181     1.25     1.21      0.01      2.3
  Calib Std 4      0.6943      2.5     2.51      0.00      0.1
  Calib Std 5      1.0536      5.0     5.15      0.01      0.9
  Calib Std 6      1.2559      7.5     7.36      0.01      1.1
Correlation Coef.: 0.999350   Slope: 0.48206   Intercept: 0.00000

Sequence No.: 7                     Autosampler Location: 2
Sample ID: 15                      Date Collected: 04.05.2010 14:41:22
Analyst:                         Data Type: Original
uL dispensed: 3 from 139, 20 from 2
Replicate Data: 15
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #     ug/L      ug/L     Signal    Area   Height   Area    Height         Stored
 1     1.18      1.18     0.4107    0.4116  1.0822  0.7820  0.3167  14:42:10     Yes
 2     1.20      1.20     0.4171    0.4180  1.0708  0.7899  0.3062  14:45:05     Yes
 3     1.22      1.22     0.4204    0.4213  1.0451  0.7718  0.3018  14:48:01     Yes
Mean:  1.20      1.20     0.4160
SD:    0.02      0.02     0.0049
%RSD:  1.58      1.58     1.19

Sequence No.: 8                     Autosampler Location: 3
Sample ID: 1                       Date Collected: 04.05.2010 14:50:08
Analyst:                         Data Type: Original
uL dispensed: 3 from 139, 20 from 3
Replicate Data: 1
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #     ug/L      ug/L     Signal    Area   Height   Area    Height         Stored
 1     0.95      0.95     0.3465    0.3475  0.9210  0.7789  0.2742  14:50:56     Yes
 2     0.92      0.92     0.3383    0.3392  0.8881  0.7184  0.2713  14:53:51     Yes
 3     0.92      0.92     0.3400    0.3410  0.9317  0.8153  0.2927  14:56:46     Yes
Mean:  0.93      0.93     0.3416
SD:    0.02      0.02     0.0043
%RSD:  1.62      1.62     1.27

Sequence No.: 9                     Autosampler Location: 4
Sample ID: 4                       Date Collected: 04.05.2010 14:58:54
Analyst:                         Data Type: Original
uL dispensed: 3 from 139, 20 from 4
Replicate Data: 4
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #     ug/L      ug/L     Signal    Area   Height   Area    Height         Stored
 1     0.76      0.76     0.2895    0.2904  0.7489  0.7022  0.3314  14:59:41     Yes
 2     0.77      0.77     0.2948    0.2957  0.7935  0.7267  0.3337  15:02:37     Yes
 3     0.77      0.77     0.2941    0.2951  0.7826  0.7980  0.3291  15:05:32     Yes
Mean:  0.77      0.77     0.2928
SD:    0.01      0.01     0.0029
%RSD:  1.21      1.21     0.99

Sequence No.: 10                    Autosampler Location: 5
Sample ID: 14                      Date Collected: 04.05.2010 15:07:40
```

```
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 5
Replicate Data: 14
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height Area    Height          Stored
 1    1.24        1.24      0.4259    0.4268 0.9823 0.6720  0.2999 15:08:27   Yes
 2    1.25        1.25      0.4281    0.4290 0.9854 0.6588  0.2997 15:11:23   Yes
 3    1.28        1.28      0.4373    0.4382 0.9949 0.6573  0.2975 15:14:18   Yes
Mean:  1.26       1.26      0.4304
SD:    0.02       0.02      0.0061
%RSD:  1.89       1.89      1.41

Sequence No.: 11                          Autosampler Location: 6
Sample ID: 10A                            Date Collected: 04.05.2010 15:16:25
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 6
Replicate Data: 10A
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height Area    Height          Stored
 1    1.07        1.07      0.3800    0.3810 0.6601 1.0973  0.4008 15:17:13   Yes
 2    1.07        1.07      0.3800    0.3809 0.5998 1.1355  0.4010 15:20:08   Yes
 3    1.06        1.06      0.3775    0.3784 0.6144 1.0954  0.3943 15:23:03   Yes
Mean:  1.06       1.06      0.3792
SD:    0.01       0.01      0.0015
%RSD:  0.50       0.50      0.39

Sequence No.: 12                          Autosampler Location: 7
Sample ID: 10B                            Date Collected: 04.05.2010 15:25:11
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 7
Replicate Data: 10B
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height Area    Height          Stored
 1    1.70        1.70      0.5353    0.5363 1.3048 1.0190  0.3897 15:25:59   Yes
 2    1.60        1.60      0.5126    0.5135 1.3011 1.0620  0.4507 15:28:54   Yes
 3    1.56        1.56      0.5034    0.5043 1.3801 1.0233  0.4399 15:31:49   Yes
Mean:  1.62       1.62      0.5171
SD:    0.07       0.07      0.0164
%RSD:  4.51       4.51      3.18

Sequence No.: 13                          Autosampler Location: 8
Sample ID: 8                            Date Collected: 04.05.2010 15:33:57
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 8
Replicate Data: 8
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L        ug/L      Signal    Area   Height Area    Height          Stored
 1    0.60        0.60      0.2384    0.2393 0.6179 0.9545  0.4074 15:34:44   Yes
 2    0.61        0.61      0.2423    0.2432 0.6900 0.9275  0.4418 15:37:40   Yes
 3    0.62        0.62      0.2469    0.2478 0.6686 0.8418  0.4001 15:40:35   Yes
```

```
Mean:  0.61       0.61      0.2425
SD:    0.01       0.01      0.0042
%RSD:  2.09       2.09      1.75

Sequence No.: 14                        Autosampler Location: 9
Sample ID: 9                          Date Collected: 04.05.2010 15:42:43
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 9
Replicate Data: 9
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     0.56        0.56      0.2252     0.2262  0.5803   0.7693   0.3313  15:43:30    Yes
 2     0.55        0.55      0.2227     0.2237  0.5734   0.7619   0.3092  15:46:25    Yes
 3     0.55        0.55      0.2237     0.2247  0.5864   0.7934   0.2942  15:49:21    Yes
Mean:  0.56       0.56      0.2239
SD:    0.00       0.00      0.0012
%RSD:  0.66       0.66      0.56

Sequence No.: 15                        Autosampler Location: 10
Sample ID: 12                          Date Collected: 04.05.2010 15:51:28
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 10
Replicate Data: 12
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     1.26        1.26      0.4318     0.4327  0.8779   1.3249   0.5070  15:52:16    Yes
 2     1.28        1.28      0.4351     0.4360  0.8981   1.3556   0.5337  15:55:11    Yes
 3     1.28        1.28      0.4351     0.4361  0.8575   1.1913   0.4552  15:58:06    Yes
Mean:  1.27       1.27      0.4340
SD:    0.01       0.01      0.0019
%RSD:  0.60       0.60      0.44

Sequence No.: 16                        Autosampler Location: 11
Sample ID: 0B                          Date Collected: 04.05.2010 16:00:14
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 11
Replicate Data: 0B
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1     4.31        4.31      0.9588     0.9597  1.5861   1.3469   0.4836  16:01:02    Yes
 2     4.33        4.33      0.9612     0.9621  1.5517   1.3623   0.4807  16:03:57    Yes
 3     4.19        4.19      0.9434     0.9443  1.9115   1.3872   0.5218  16:06:53    Yes
Mean:  4.28       4.28      0.9545
SD:    0.08       0.08      0.0097
%RSD:  1.83       1.83      1.01

Sequence No.: 17                        Autosampler Location: 12
Sample ID: 7                          Date Collected: 04.05.2010 16:09:00
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 12
```

```
Replicate Data: 7
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height           Stored
 1     0.59        0.59      0.2349     0.2358  0.6978  1.1752  0.5042  16:09:48    Yes
 2     0.63        0.63      0.2493     0.2503  0.7677  0.9621  0.4224  16:12:43    Yes
 3     0.64        0.64      0.2510     0.2519  0.7736  0.9183  0.3979  16:15:38    Yes
Mean:  0.62        0.62      0.2451
SD:    0.03        0.03      0.0089
%RSD:  4.30        4.30      3.61

Sequence No.: 18                    Autosampler Location: 13
Sample ID: 8d                       Date Collected: 04.05.2010 16:17:46
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 13
Replicate Data: 8d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height           Stored
 1     0.59        0.59      0.2353     0.2362  0.6690  0.8668  0.3970  16:18:33    Yes
 2     0.61        0.61      0.2413     0.2422  0.6474  0.9182  0.4214  16:21:29    Yes
 3     0.61        0.61      0.2416     0.2426  0.6312  0.8749  0.4231  16:24:24    Yes
Mean:  0.60        0.60      0.2394
SD:    0.01        0.01      0.0036
%RSD:  1.78        1.78      1.50

Sequence No.: 19                    Autosampler Location: 14
Sample ID: 7d                       Date Collected: 04.05.2010 16:26:32
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 14
Replicate Data: 7d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area    Height           Stored
 1     0.82        0.82      0.3085     0.3094  0.8177  0.8324  0.4072  16:27:20    Yes
 2     0.81        0.81      0.3070     0.3079  0.8285  0.8443  0.4140  16:30:14    Yes
 3     0.81        0.81      0.3070     0.3079  0.8063  0.8003  0.4097  16:33:10    Yes
Mean:  0.81        0.81      0.3075
SD:    0.00        0.00      0.0009
%RSD:  0.35        0.35      0.28

Sequence No.: 20                    Autosampler Location: 15
Sample ID: 16                       Date Collected: 04.05.2010 16:35:17
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 15
User canceled analysis.

Analysis Begun

Logged In Analyst: c-drangeid              Technique: AA Furnace
Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800
```

```
    Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file.sif
    Batch ID: Somme bay 2010
    Results Data Set: Somme bay 2010 Cezar no3
    Results Library: C:\data-AA\Administrator\Results\Results.mdb

    Method Loaded
    Method Name: Cezar Cadmium Method 3           Method Last Saved: 05.05.2010
11:44:04
    Method Description: 0-10 ug/l marius and kjerand

    Sequence No.: 1                         Autosampler Location: 141
    Sample ID: Calib Blank 1                  Date Collected: 05.05.2010 11:50:46
    Analyst:                              Data Type: Original
    uL dispensed: 3 from 139, 20 from 141
    User canceled analysis.

    Analysis Begun

    Logged In Analyst: c-drangeid              Technique: AA Furnace
    Spectrometer Model: AA600, S/N 600S2110102     Autosampler Model: AS-800

    Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file.sif
    Batch ID: Somme bay 2010
    Results Data Set: Somme bay 2010 Cezar no3
    Results Library: C:\data-AA\Administrator\Results\Results.mdb

    Sequence No.: 1                         Autosampler Location: 141
    Sample ID: Calib Blank 1                  Date Collected: 05.05.2010 11:53:04
    Analyst:                              Data Type: Original
    uL dispensed: 3 from 139, 20 from 141
    Replicate Data: Calib Blank 1
    Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time     Peak
     #     ug/L        ug/L      Signal    Area   Height   Area    Height           Stored
     1               [0.00]    0.0044    0.0044  0.0106   0.4108   0.1368  11:53:49    Yes
     2               [0.00]    0.0043    0.0043  0.0067  -0.0161  0.0040  11:56:48    Yes
     3               [0.00]    0.0047    0.0047  0.0069  -0.0150  0.0021  12:00:03    Yes
    Mean:              [0.00]    0.0045
    SD:               0.00     0.0002
    %RSD:               0.00     4.90
    Auto-zero performed.

    Sequence No.: 2                         Autosampler Location: 142
    Sample ID: Calib Std 2                   Date Collected: 05.05.2010 12:02:11
    Analyst:                              Data Type: Original
    uL dispensed: 19 from 143, 3 from 139, 1 from 142
    Replicate Data: Calib Std 2
    Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time     Peak
     #     ug/L        ug/L      Signal    Area   Height   Area    Height           Stored
```

```
 1          [0.05]   0.0147    0.0192  0.0364   0.0121   0.0145  12:03:05     Yes
 2          [0.05]   0.0105    0.0150  0.0188   0.0055   0.0086  12:06:05     Yes
 3          [0.05]   0.0075    0.0119  0.0209  -0.0129   0.0027  12:09:06     Yes
Mean:          [0.05]   0.0109
SD:           0.00     0.0036
%RSD:           0.00     33.40
Standard number 2 applied. [0.05]
Correlation Coef.: 1.000000   Slope: 0.21795    Intercept: 0.00000

Sequence No.: 3                         Autosampler Location: 142
Sample ID: Calib Std 3                    Date Collected: 05.05.2010 12:11:14
Analyst:                             Data Type: Original
uL dispensed: 18 from 143, 3 from 139, 2 from 142
Replicate Data: Calib Std 3
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area    Height  Area    Height          Stored
 1          [0.1]    0.0122    0.0167  0.0267  -0.0124  0.0034  12:12:13     Yes
 2          [0.1]    0.0145    0.0190  0.0259  -0.0120  0.0028  12:15:15     Yes
 3          [0.1]    0.0138    0.0182  0.0298  -0.0115  0.0036  12:18:16     Yes
Mean:          [0.1]    0.0135
SD:           0.0      0.0012
%RSD:           0.0      8.63
Standard number 3 applied. [0.1]
Correlation Coef.: 1.000000   Slope: 0.56747    Intercept: 0.00000

Sequence No.: 4                         Autosampler Location: 142
Sample ID: Calib Std 4                    Date Collected: 05.05.2010 12:20:23
Analyst:                             Data Type: Original
uL dispensed: 14 from 143, 3 from 139, 6 from 142
Replicate Data: Calib Std 4
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area    Height  Area    Height          Stored
 1          [0.3]    0.0404    0.0448  0.0658  -0.0095  0.0069  12:21:17     Yes
 2          [0.3]    0.0417    0.0461  0.0700  -0.0073  0.0063  12:24:18     Yes
 3          [0.3]    0.0410    0.0455  0.0677  -0.0081  0.0081  12:27:19     Yes
Mean:          [0.3]    0.0410
SD:           0.0      0.0006
%RSD:           0.0      1.57
Standard number 4 applied. [0.3]
Correlation Coef.: 0.979780   Slope: 0.21614    Intercept: 0.00000
   S-shaped calibration curve detected. Two-coefficient equation used.

Sequence No.: 5                         Autosampler Location: 142
Sample ID: Calib Std 5                    Date Collected: 05.05.2010 12:29:28
Analyst:                             Data Type: Original
uL dispensed: 8 from 143, 3 from 139, 12 from 142
Replicate Data: Calib Std 5
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area    Height  Area    Height          Stored
 1          [0.6]    0.0784    0.0828  0.1252  -0.0044  0.0149  12:30:21     Yes
```

```
 2           [0.6]    0.0782    0.0826  0.1202   -0.0047  0.0134  12:33:24     Yes
 3           [0.6]    0.0772    0.0817  0.1216   -0.0053  0.0135  12:36:26     Yes
Mean:          [0.6]    0.0779
SD:            0.0      0.0006
%RSD:            0.0      0.81
Standard number 5 applied. [0.6]
Correlation Coef.: 0.982768   Slope: 0.19622    Intercept: 0.00000
  S-shaped calibration curve detected. Two-coefficient equation used.

Sequence No.: 6                      Autosampler Location: 142
Sample ID: Calib Std 6                 Date Collected: 05.05.2010 12:38:35
Analyst:                          Data Type: Original
uL dispensed: 3 from 139, 20 from 142
Replicate Data: Calib Std 6
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal     Area    Height   Area    Height           Stored
 1           [1]      0.1207    0.1252  0.1965   0.0024   0.0234  12:39:24     Yes
 2           [1]      0.1246    0.1290  0.1980   0.0028   0.0236  12:42:23     Yes
 3           [1]      0.1195    0.1239  0.1966   0.0013   0.0225  12:45:23     Yes
Mean:          [1]      0.1216
SD:            0        0.0026
%RSD:            0        2.18
Standard number 6 applied. [1]
Correlation Coef.: 0.984342   Slope: 0.18703    Intercept: 0.00000
  S-shaped calibration curve detected. Two-coefficient equation used.
Calibration data for Cadmium 228.8                  Equation: Nonlinear Through Zero
                          Entered  Calculated
               Mean Signal    Conc.     Conc.    Standard
      ID            (Abs)       ug/L      ug/L     Deviation    %RSD
  Calib Blank 1        0.0000       0       0.00       0.00       4.9
   Calib Std 2        0.0109      0.05      0.06       0.00       33.4
   Calib Std 3        0.0135      0.1      0.08       0.00      8.6
   Calib Std 4        0.0410      0.3      0.26       0.00      1.6
   Calib Std 5        0.0779      0.6      0.57       0.00      0.8
   Calib Std 6        0.1216      1.0      1.13       0.00      2.2
Correlation Coef.: 0.984342   Slope: 0.18703    Intercept: 0.00000

Sequence No.: 7                      Autosampler Location: 2
Sample ID: 15                        Date Collected: 05.05.2010 12:47:31
Analyst:                          Data Type: Original
uL dispensed: 3 from 139, 20 from 2
Replicate Data: 15
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal     Area    Height   Area    Height           Stored
 1                    0.4135    0.4180  0.9539   0.6857   0.4701  12:48:18     Yes
  Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 8                      Autosampler Location: 2
Sample ID: 15                        Date Collected: 05.05.2010 12:50:26
```

```
Analyst:                          Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 2
Replicate Data: 15
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L       ug/L      Signal    Area    Height  Area    Height           Stored
 1    4.96       1.24      0.1284    0.1328  0.3418  0.2420  0.2527  12:51:18    Yes
   Sample concentration is greater than that of the highest standard.
 2    4.59       1.15      0.1229    0.1274  0.3191  0.2501  0.3200  12:54:19    Yes
   Sample concentration is greater than that of the highest standard.
 3    4.51       1.13      0.1217    0.1261  0.3241  0.2169  0.2414  12:57:19    Yes
   Sample concentration is greater than that of the highest standard.
Mean:  4.68      1.17      0.1243
SD:    0.24      0.06      0.0036
%RSD:  5.11      5.11      2.87
   Sample concentration is greater than that of the highest standard.

Sequence No.: 9                      Autosampler Location: 3
Sample ID: 1                         Date Collected: 05.05.2010 12:59:27
Analyst:                          Data Type: Original
uL dispensed: 3 from 139, 20 from 3
Replicate Data: 1
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L       ug/L      Signal    Area    Height  Area    Height           Stored
 1                         0.3338    0.3383  0.8117  0.6232  0.4266  13:00:14    Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 10                     Autosampler Location: 3
Sample ID: 1                         Date Collected: 05.05.2010 13:02:22
Analyst:                          Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 3
Replicate Data: 1
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L       ug/L      Signal    Area    Height  Area    Height           Stored
 1    3.06       0.77      0.0956    0.1001  0.2543  0.1743  0.1899  13:03:15    Yes
 2    3.03       0.76      0.0950    0.0994  0.2554  0.1786  0.2086  13:06:15    Yes
 3    2.86       0.72      0.0914    0.0959  0.2424  0.1759  0.2065  13:09:15    Yes
Mean:  2.99      0.75      0.0940
SD:    0.11      0.03      0.0023
%RSD:  3.56      3.56      2.41

Sequence No.: 11                     Autosampler Location: 4
Sample ID: 4                         Date Collected: 05.05.2010 13:11:23
Analyst:                          Data Type: Original
uL dispensed: 3 from 139, 20 from 4
Replicate Data: 4
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L       ug/L      Signal    Area    Height  Area    Height           Stored
 1    48.91      48.91     0.2790    0.2834  0.6936  0.6545  0.4142  13:12:10    Yes
   Sample concentration is greater than that of the highest standard.
```

```
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 12                        Autosampler Location: 4
Sample ID: 4                          Date Collected: 05.05.2010 13:14:18
Analyst:                            Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 4
Replicate Data: 4
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area    Height            Stored
 1     2.29        0.57      0.0781     0.0826  0.2072   0.1870   0.1843  13:15:11      Yes
 2     2.25        0.56      0.0771     0.0816  0.2045   0.2087   0.2160  13:18:11      Yes
 3     2.51        0.63      0.0833     0.0878  0.2209   0.1961   0.1916  13:21:11      Yes
Mean:  2.35        0.59      0.0795
SD:    0.14        0.03      0.0033
%RSD:  5.85        5.85      4.20

Sequence No.: 13                        Autosampler Location: 5
Sample ID: 14                          Date Collected: 05.05.2010 13:23:19
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 5
Replicate Data: 14
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area    Height            Stored
 1                    0.4222     0.4266  1.0075   0.6408   0.4051  13:24:06      Yes
  Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 14                        Autosampler Location: 5
Sample ID: 14                          Date Collected: 05.05.2010 13:26:14
Analyst:                            Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 5
Replicate Data: 14
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area    Height            Stored
 1     5.05        1.26      0.1297     0.1341  0.3435   0.1905   0.1673  13:27:06      Yes
  Sample concentration is greater than that of the highest standard.
 2     4.87        1.22      0.1271     0.1315  0.3347   0.2004   0.1850  13:30:06      Yes
  Sample concentration is greater than that of the highest standard.
 3     4.89        1.22      0.1274     0.1319  0.3362   0.1974   0.1774  13:33:06      Yes
  Sample concentration is greater than that of the highest standard.
Mean:  4.93        1.23      0.1280
SD:    0.10        0.02      0.0014
%RSD:  2.01        2.01      1.11
  Sample concentration is greater than that of the highest standard.

Sequence No.: 15                        Autosampler Location: 6
Sample ID: 10A                          Date Collected: 05.05.2010 13:35:14
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 6
Replicate Data: 10A
```

```
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1                0.3695    0.3740  0.7520   1.1704   0.4095  13:36:01     Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 16                          Autosampler Location: 6
Sample ID: 10A                            Date Collected: 05.05.2010 13:38:09
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 6
Replicate Data: 10A
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1    3.71        0.93      0.1082     0.1126  0.2158   0.5797   0.2443  13:39:02     Yes
 2    3.54        0.89      0.1051     0.1096  0.2206   0.5511   0.2365  13:42:02     Yes
 3    3.60        0.90      0.1061     0.1106  0.2252   0.5452   0.2359  13:45:02     Yes
Mean:  3.61       0.90      0.1065
SD:    0.08       0.02      0.0016
%RSD:  2.35       2.35      1.48

Sequence No.: 17                          Autosampler Location: 7
Sample ID: 10B                            Date Collected: 05.05.2010 13:47:10
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 7
Replicate Data: 10B
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1                0.4990    0.5035  1.1662   0.9536   0.4335  13:47:57     Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 18                          Autosampler Location: 7
Sample ID: 10B                            Date Collected: 05.05.2010 13:50:05
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 7
Replicate Data: 10B
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1    7.84        1.96      0.1612     0.1656  0.4156   0.3747   0.3194  13:50:58     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 19                          Autosampler Location: 7
Sample ID: 10B                            Date Collected: 05.05.2010 13:53:06
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 7
Replicate Data: 10B
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1    6.51        0.33      0.0503     0.0547  0.1506   0.0959   0.0840  13:54:00     Yes
```

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 2    6.54        0.33      0.0504     0.0549  0.1455   0.0863   0.0760  13:57:01      Yes
 3    6.50        0.32      0.0502     0.0546  0.1453   0.0775   0.0689  14:00:03      Yes
Mean:  6.51        0.33      0.0503
SD:    0.02        0.00      0.0001
%RSD:  0.32        0.32      0.26

Sequence No.: 20                          Autosampler Location: 8
Sample ID: 8                            Date Collected: 05.05.2010 14:02:10
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 8
Replicate Data: 8
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height   Area    Height          Stored
 1    6.40        6.40      0.2320     0.2365  0.6075   0.5668   0.3188  14:02:58      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 21                          Autosampler Location: 8
Sample ID: 8                            Date Collected: 05.05.2010 14:05:05
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 8
Replicate Data: 8
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height   Area    Height          Stored
 1    1.87        0.47      0.0669     0.0714  0.1905   0.1959   0.1911  14:06:00      Yes
 2    1.91        0.48      0.0681     0.0726  0.1805   0.2089   0.2049  14:09:02      Yes
 3    1.91        0.48      0.0680     0.0725  0.1869   0.2050   0.2062  14:12:04      Yes
Mean:  1.89        0.47      0.0677
SD:    0.02        0.01      0.0006
%RSD:  1.24        1.24      0.95

Sequence No.: 22                          Autosampler Location: 9
Sample ID: 9                            Date Collected: 05.05.2010 14:14:13
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 9
Replicate Data: 9
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height   Area    Height          Stored
 1    4.01        4.01      0.2080     0.2125  0.5168   0.5790   0.3391  14:15:01      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 23                          Autosampler Location: 9
Sample ID: 9                            Date Collected: 05.05.2010 14:17:08
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 9
Replicate Data: 9
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height   Area    Height          Stored
 1    1.64        0.41      0.0606     0.0650  0.1687   0.1939   0.1819  14:18:03      Yes
```

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 2    1.64       0.41      0.0605     0.0650  0.1626   0.2114   0.2061  14:21:05     Yes
 3    1.62       0.41      0.0600     0.0645  0.1625   0.2060   0.1809  14:24:07     Yes
Mean:  1.63       0.41      0.0604
SD:    0.01       0.00      0.0003
%RSD:  0.60       0.60      0.48

Sequence No.: 24                          Autosampler Location: 10
Sample ID: 12                             Date Collected: 05.05.2010 14:26:14
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 10
Replicate Data: 12
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1                      0.4165     0.4209  0.9925   0.9696   0.4382  14:27:02     Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 25                          Autosampler Location: 10
Sample ID: 12                             Date Collected: 05.05.2010 14:29:09
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 10
Replicate Data: 12
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1    5.43       1.36      0.1349     0.1394  0.3298   0.4118   0.2261  14:30:03     Yes
   Sample concentration is greater than that of the highest standard.
 2    5.57       1.39      0.1367     0.1412  0.3413   0.3660   0.2002  14:33:05     Yes
   Sample concentration is greater than that of the highest standard.
 3    5.12       1.28      0.1307     0.1352  0.3420   0.3374   0.2065  14:36:08     Yes
   Sample concentration is greater than that of the highest standard.
Mean:  5.38       1.34      0.1341
SD:    0.23       0.06      0.0031
%RSD:  4.27       4.27      2.30
   Sample concentration is greater than that of the highest standard.

Sequence No.: 26                          Autosampler Location: 11
Sample ID: 0B                             Date Collected: 05.05.2010 14:38:15
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 11
Replicate Data: 0B
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1                      0.8277     0.8322  1.6282   1.4140   0.5441  14:39:03     Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 27                          Autosampler Location: 11
Sample ID: 0B                             Date Collected: 05.05.2010 14:41:10
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 11
```

```
Replicate Data: 0B
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height         Stored
 1                     0.3620    0.3665  0.7522   0.8259   0.4178  14:42:04     Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 28                        Autosampler Location: 11
Sample ID: 0B                           Date Collected: 05.05.2010 14:44:12
Analyst:                            Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 11
Replicate Data: 0B
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height         Stored
 1    20.07      1.00     0.1136    0.1181  0.2568   0.2855   0.1956  14:45:06     Yes
 2    21.19      1.06     0.1173    0.1218  0.2500   0.2332   0.1655  14:48:07     Yes
 3    21.20      1.06     0.1174    0.1219  0.2517   0.2171   0.1604  14:51:08     Yes
Mean:  20.82      1.04     0.1161
SD:    0.65       0.03     0.0022
%RSD:  3.11       3.11     1.87

Sequence No.: 29                        Autosampler Location: 12
Sample ID: 7                            Date Collected: 05.05.2010 14:53:17
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 12
Replicate Data: 7
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height         Stored
 1    10.96      10.96    0.2523    0.2568  0.5842   0.8275   0.4025  14:54:05     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 30                        Autosampler Location: 12
Sample ID: 7                            Date Collected: 05.05.2010 14:56:13
Analyst:                            Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 12
Replicate Data: 7
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height         Stored
 1    1.97       0.49     0.0698    0.0743  0.1788   0.2675   0.2959  14:57:06     Yes
 2    1.96       0.49     0.0695    0.0740  0.1753   0.2317   0.2399  15:00:08     Yes
 3    1.93       0.48     0.0686    0.0730  0.1707   0.2232   0.2201  15:03:09     Yes
Mean:  1.95       0.49     0.0693
SD:    0.02       0.01     0.0006
%RSD:  1.20       1.20     0.91

Sequence No.: 31                        Autosampler Location: 13
Sample ID: 8d                           Date Collected: 05.05.2010 15:05:17
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 13
```

```
Replicate Data: 8d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area   Height  Area    Height          Stored
 1     5.40        5.40      0.2239    0.2284  0.5228  0.5896  0.3450  15:06:04    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 32                        Autosampler Location: 13
Sample ID: 8d                          Date Collected: 05.05.2010 15:08:12
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 13
Replicate Data: 8d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area   Height  Area    Height          Stored
 1     1.58        0.40      0.0589    0.0633  0.1465  0.2142  0.2284  15:09:06    Yes
 2     1.75        0.44      0.0638    0.0682  0.1561  0.2291  0.2336  15:12:07    Yes
 3     1.75        0.44      0.0638    0.0682  0.1540  0.2268  0.2256  15:15:07    Yes
Mean:  1.70       0.42      0.0621
SD:    0.10       0.02      0.0028
%RSD:  5.76       5.76      4.55

Sequence No.: 33                        Autosampler Location: 14
Sample ID: 7d                          Date Collected: 05.05.2010 15:17:15
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 14
Replicate Data: 7d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area   Height  Area    Height          Stored
 1     60.72       60.72     0.2806    0.2851  0.6603  0.5768  0.3805  15:18:02    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 34                        Autosampler Location: 14
Sample ID: 7d                          Date Collected: 05.05.2010 15:20:10
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 14
Replicate Data: 7d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
 #     ug/L        ug/L      Signal     Area   Height  Area    Height          Stored
 1     2.44        0.61      0.0817    0.0862  0.2001  0.2221  0.2194  15:21:05    Yes
 2     2.44        0.61      0.0817    0.0862  0.1962  0.2209  0.2080  15:24:08    Yes
 3     2.43        0.61      0.0814    0.0859  0.2096  0.2084  0.1838  15:27:13    Yes
Mean:  2.44       0.61      0.0816
SD:    0.01       0.00      0.0002
%RSD:  0.33       0.33      0.24

Sequence No.: 35                        Autosampler Location: 15
Sample ID: 16                          Date Collected: 05.05.2010 15:29:22
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 15
```

```
Replicate Data: 16
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #     ug/L        ug/L     Signal    Area   Height  Area   Height          Stored
 1     43.14       43.14    0.2778    0.2823  0.6228  0.5333  0.3416  15:30:09   Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 36                          Autosampler Location: 15
Sample ID: 16                            Date Collected: 05.05.2010 15:32:17
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 15
Replicate Data: 16
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #     ug/L        ug/L     Signal    Area   Height  Area   Height          Stored
 1     2.28       0.57     0.0777    0.0822  0.1837  0.2076  0.2274  15:33:11    Yes
 2     2.12       0.53     0.0738    0.0783  0.1653  0.1961  0.2046  15:36:14    Yes
 3     2.24       0.56     0.0767    0.0812  0.1864  0.2027  0.2123  15:39:15    Yes
Mean:  2.21       0.55     0.0761
SD:    0.08       0.02     0.0020
%RSD:  3.56       3.56     2.63

Sequence No.: 37                          Autosampler Location: 16
Sample ID: 0A-1                           Date Collected: 05.05.2010 15:41:23
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 16
Replicate Data: 0A-1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #     ug/L        ug/L     Signal    Area   Height  Area   Height          Stored
 1                       1.0909    1.0954  1.8446   0.9370   0.6785  15:42:10    Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 38                          Autosampler Location: 16
Sample ID: 0A-1                           Date Collected: 05.05.2010 15:44:18
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 16
Replicate Data: 0A-1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #     ug/L        ug/L     Signal    Area   Height  Area   Height          Stored
 1                       0.5068    0.5113  1.0112   0.3162   0.2358  15:45:13    Yes
   Sample absorbance is beyond the range of the calibration function.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 39                          Autosampler Location: 16
Sample ID: 0A-1                           Date Collected: 05.05.2010 15:47:21
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 16
Replicate Data: 0A-1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #     ug/L        ug/L     Signal    Area   Height  Area   Height          Stored
```

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 1    58.13      2.91     0.1881     0.1926  0.4642   0.1199   0.0795  15:48:17      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 40                         Autosampler Location: 17
Sample ID: 26                           Date Collected: 05.05.2010 15:50:24
Analyst:                             Data Type: Original
uL dispensed: 3 from 139
Replicate Data: 26
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     -0.01       -0.01     -0.0028    0.0017  0.0056   -0.0150  0.0023  15:51:13      Yes
 2     -0.01       -0.01     -0.0024    0.0021  0.0064   -0.0150  0.0022  15:54:10      Yes
 3     -0.02       -0.02     -0.0029    0.0016  0.0071   -0.0149  0.0023  15:57:06      Yes
Mean:  -0.01      -0.01     -0.0027
SD:    0.00       0.00      0.0003
%RSD:  9.72       9.72      9.80

Sequence No.: 41                         Autosampler Location: 18
Sample ID: 0A-2                          Date Collected: 05.05.2010 15:59:13
Analyst:                             Data Type: Original
uL dispensed: 3 from 139
Replicate Data: 0A-2
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     -0.02       -0.02     -0.0033    0.0011  0.0052   -0.0153  0.0026  16:00:02      Yes
 2     -0.01       -0.01     -0.0016    0.0029  0.0060   -0.0148  0.0024  16:02:58      Yes
 3     -0.02       -0.02     -0.0032    0.0013  0.0054   -0.0152  0.0018  16:05:55      Yes
Mean:  -0.01      -0.01     -0.0027
SD:    0.01       0.01      0.0010
%RSD:  35.34      35.34     35.58

Sequence No.: 42                         Autosampler Location: 19
Sample ID: 6                            Date Collected: 05.05.2010 16:08:02
Analyst:                             Data Type: Original
uL dispensed: 3 from 139
Replicate Data: 6
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     -0.01       -0.01     -0.0018    0.0027  0.0056   -0.0168  0.0014  16:08:51      Yes
 2     -0.01       -0.01     -0.0027    0.0018  0.0062   -0.0162  0.0012  16:11:47      Yes
 3     -0.01       -0.01     -0.0022    0.0022  0.0064   -0.0164  0.0010  16:14:43      Yes
Mean:  -0.01      -0.01     -0.0022
SD:    0.00       0.00      0.0004
%RSD:  19.74      19.74     19.89

Sequence No.: 43                         Autosampler Location: 20
Sample ID: 22                           Date Collected: 05.05.2010 16:16:51
Analyst:                             Data Type: Original
uL dispensed: 3 from 139
```

```
        Replicate Data: 22
        Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak   Bkgnd   Bkgnd  Time      Peak
         #    ug/L        ug/L      Signal    Area   Height  Area    Height           Stored
         1    0.01        0.01      0.0011    0.0056  0.0137  0.0079  0.0109  16:17:40    Yes
         2    -0.02       -0.02     -0.0034   0.0010  0.0055  -0.0142  0.0020  16:20:36   Yes
         3    -0.01       -0.01     -0.0017   0.0028  0.0051  -0.0163  0.0023  16:23:32   Yes
        Mean:  -0.01      -0.01     -0.0013
        SD:    0.01       0.01      0.0023
        %RSD:  172.9      172.9     171.76

        Sequence No.: 44                        Autosampler Location: 21
        Sample ID: Ref N 2                      Date Collected: 05.05.2010 16:25:40
        Analyst:                            Data Type: Original
        uL dispensed: 3 from 139
        User canceled analysis.

        Analysis Begun

        Logged In Analyst: c-drangeid                  Technique: AA Furnace
        Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800

        Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file reanalysis.sif
        Batch ID: Somme bay 2010
        Results Data Set: Somme bay 2010 Cezar n3b
        Results Library: C:\data-AA\Administrator\Results\Results.mdb

        Sequence No.: 1                         Autosampler Location: 16
        Sample ID: 0A-1                         Date Collected: 05.05.2010 17:04:09
        Analyst:                            Data Type: Original
        uL dispensed: 3 from 139, 20 from 16
        Replicate Data: 0A-1
        Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak   Bkgnd   Bkgnd  Time      Peak
         #    ug/L        ug/L      Signal    Area   Height  Area    Height           Stored
         1    0.08        0.08      0.0139    0.0183  0.0476  0.1477  0.1192  17:04:58    Yes
         2    0.10        0.10      0.0168    0.0212  0.0500  0.1381  0.1134  17:07:54    Yes
         3    0.09        0.09      0.0154    0.0199  0.0510  0.1478  0.1122  17:10:49    Yes
        Mean:  0.09       0.09      0.0154
        SD:    0.01       0.01      0.0015
        %RSD:  10.01      10.01     9.49

        Sequence No.: 2                         Autosampler Location: 17
        Sample ID: 26                           Date Collected: 05.05.2010 17:12:57
        Analyst:                            Data Type: Original
        uL dispensed: 3 from 139
        Replicate Data: 26
        Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak   Bkgnd   Bkgnd  Time      Peak
         #    ug/L        ug/L      Signal    Area   Height  Area    Height           Stored
         1    -0.02       -0.02     -0.0031   0.0014  0.0057  -0.0151  0.0014  17:13:46   Yes
         2    -0.02       -0.02     -0.0032   0.0013  0.0056  -0.0157  0.0012  17:16:42   Yes
```

```
        User canceled analysis.

        Analysis Begun

        Logged In Analyst: c-drangeid                 Technique: AA Furnace
        Spectrometer Model: AA600, S/N 600S2110102        Autosampler Model: AS-800

        Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file reanalysis.sif
        Batch ID: Somme bay 2010
        Results Data Set: Somme bay 2010 Cezar n3b
        Results Library: C:\data-AA\Administrator\Results\Results.mdb

        Sequence No.: 1                         Autosampler Location: 141
        Sample ID: Calib Blank 1                     Date Collected: 05.05.2010 17:20:18
        Analyst:                             Data Type: Original
        uL dispensed: 3 from 139, 20 from 141
        User canceled analysis.

        Analysis Begun

        Logged In Analyst: c-drangeid                 Technique: AA Furnace
        Spectrometer Model: AA600, S/N 600S2110102        Autosampler Model: AS-800

        Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file reanalysis.sif
        Batch ID: Somme bay 2010
        Results Data Set: Somme bay 2010 Cezar n3b
        Results Library: C:\data-AA\Administrator\Results\Results.mdb

        Sequence No.: 1                         Autosampler Location: 141
        Sample ID: Calib Blank 1                     Date Collected: 05.05.2010 17:22:07
        Analyst:                             Data Type: Original
        uL dispensed: 3 from 139, 20 from 141
        Replicate Data: Calib Blank 1
        Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time       Peak
         #     ug/L        ug/L     Signal     Area   Height   Area    Height            Stored
         1              [0.00]    0.0043    0.0043  0.0082  -0.0064  0.0034  17:22:56     Yes
         2              [0.00]    0.0021    0.0021  0.0068  -0.0155  0.0018  17:25:54     Yes
         3              [0.00]    0.0011    0.0011  0.0051  -0.0141  0.0030  17:28:53     Yes
        Mean:              [0.00]    0.0025
        SD:                 0.00      0.0016
        %RSD:                0.00     66.04
        Auto-zero performed.

        Sequence No.: 2                         Autosampler Location: 142
        Sample ID: Calib Std 2                      Date Collected: 05.05.2010 17:31:02
        Analyst:                             Data Type: Original
        uL dispensed: 19 from 143, 3 from 139, 1 from 142
        Replicate Data: Calib Std 2
```

```
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1               [0.05]    0.0069    0.0094  0.0184  -0.0137  0.0027  17:31:56     Yes
 2               [0.05]    0.0074    0.0098  0.0177  -0.0134  0.0023  17:34:59     Yes
 3               [0.05]    0.0057    0.0082  0.0174  -0.0134  0.0024  17:38:01     Yes
Mean:             [0.05]    0.0067
SD:                0.00      0.0009
%RSD:               0.00      12.95
Standard number 2 applied. [0.05]
Correlation Coef.: 1.000000   Slope: 0.13323    Intercept: 0.00000

Sequence No.: 3                          Autosampler Location: 142
Sample ID: Calib Std 3                      Date Collected: 05.05.2010 17:40:08
Analyst:                               Data Type: Original
uL dispensed: 18 from 143, 3 from 139, 2 from 142
Replicate Data: Calib Std 3
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1               [0.1]     0.0129    0.0153  0.0326  -0.0142  0.0032  17:41:02     Yes
 2               [0.1]     0.0132    0.0157  0.0314  -0.0134  0.0026  17:44:05     Yes
 3               [0.1]     0.0126    0.0151  0.0327  -0.0120  0.0043  17:47:07     Yes
Mean:             [0.1]     0.0129
SD:                0.0       0.0003
%RSD:               0.0       2.26
Standard number 3 applied. [0.1]
Correlation Coef.: 1.000000   Slope: 0.13802    Intercept: 0.00000

Sequence No.: 4                          Autosampler Location: 142
Sample ID: Calib Std 4                      Date Collected: 05.05.2010 17:49:16
Analyst:                               Data Type: Original
uL dispensed: 14 from 143, 3 from 139, 6 from 142
Replicate Data: Calib Std 4
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
 1               [0.3]     0.0369    0.0394  0.0797  -0.0110  0.0080  17:50:10     Yes
 2               [0.3]     0.0345    0.0370  0.0759  -0.0094  0.0077  17:53:11     Yes
 3               [0.3]     0.0347    0.0371  0.0748  -0.0096  0.0077  17:56:13     Yes
Mean:             [0.3]     0.0354
SD:                0.0       0.0014
%RSD:               0.0       3.88
Standard number 4 applied. [0.3]
Correlation Coef.: 1.000000   Slope: 0.13918    Intercept: 0.00000

Sequence No.: 5                          Autosampler Location: 142
Sample ID: Calib Std 5                      Date Collected: 05.05.2010 17:58:22
Analyst:                               Data Type: Original
uL dispensed: 8 from 143, 3 from 139, 12 from 142
Replicate Data: Calib Std 5
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area   Height   Area    Height           Stored
```

```
 1           [0.6]   0.0672    0.0697  0.1429   -0.0054  0.0170  17:59:14     Yes
 2           [0.6]   0.0668    0.0692  0.1398   -0.0063  0.0170  18:02:16     Yes
 3           [0.6]   0.0669    0.0694  0.1365   -0.0058  0.0164  18:05:19     Yes
Mean:           [0.6]    0.0669
SD:            0.0      0.0002
%RSD:           0.0      0.34
Standard number 5 applied. [0.6]
Correlation Coef.: 0.999999   Slope: 0.14127    Intercept: 0.00000

Sequence No.: 6                        Autosampler Location: 142
Sample ID: Calib Std 6                   Date Collected: 05.05.2010 18:07:26
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 142
Replicate Data: Calib Std 6
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #    ug/L       ug/L      Signal     Area    Height   Area    Height           Stored
 1           [1]      0.1080    0.1105  0.2127   -0.0007  0.0270  18:08:16     Yes
 2           [1]      0.1110    0.1134  0.2156   -0.0002  0.0256  18:11:16     Yes
 3           [1]      0.1083    0.1107  0.2105   0.0005   0.0264  18:14:15     Yes
Mean:           [1]      0.1091
SD:            0        0.0016
%RSD:           0        1.51
Standard number 6 applied. [1]
Correlation Coef.: 0.999991   Slope: 0.14388    Intercept: 0.00000
Calibration data for Cadmium 228.8                 Equation: Nonlinear Through Zero
                       Entered  Calculated
             Mean Signal    Conc.     Conc.    Standard
     ID           (Abs)       ug/L      ug/L     Deviation    %RSD
  Calib Blank 1       0.0000       0       0.00       0.00       66.0
   Calib Std 2        0.0067      0.05      0.05       0.00       13.0
   Calib Std 3        0.0129       0.1      0.10       0.00       2.3
   Calib Std 4        0.0354       0.3      0.30       0.00       3.9
   Calib Std 5        0.0669       0.6      0.60       0.00       0.3
   Calib Std 6        0.1091       1.0      1.00       0.00       1.5
Correlation Coef.: 0.999991   Slope: 0.14388    Intercept: 0.00000

Sequence No.: 7                        Autosampler Location: 16
Sample ID: 0A-1                        Date Collected: 05.05.2010 18:16:24
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 16
Replicate Data: 0A-1
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #    ug/L       ug/L      Signal     Area    Height   Area    Height           Stored
 1    0.18       0.18      0.0225     0.0250  0.0495   0.0965   0.0752  18:17:12     Yes
 2    0.17       0.17      0.0212     0.0237  0.0549   0.1249   0.0887  18:20:07     Yes
 3    0.18       0.18      0.0218     0.0242  0.0575   0.1271   0.0902  18:23:02     Yes
Mean:  0.18       0.18      0.0218
SD:    0.01       0.01      0.0007
%RSD:  3.24       3.24      2.98
```

```
Sequence No.: 8                          Autosampler Location: 17
Sample ID: 26                            Date Collected: 05.05.2010 18:25:10
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 17
Replicate Data: 26
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    3.69       3.69     0.3851    0.3875 0.9778  0.7169  0.4254 18:25:57    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 9                          Autosampler Location: 17
Sample ID: 26                            Date Collected: 05.05.2010 18:28:05
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 17
Replicate Data: 26
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    4.68       1.17     0.1264    0.1288 0.3179  0.2719  0.2892 18:29:00    Yes
   Sample concentration is greater than that of the highest standard.
 2    4.70       1.18     0.1270    0.1295 0.3344  0.2695  0.2955 18:32:04    Yes
   Sample concentration is greater than that of the highest standard.
 3    4.65       1.16     0.1256    0.1281 0.3221  0.2683  0.2918 18:35:08    Yes
   Sample concentration is greater than that of the highest standard.
Mean:  4.67      1.17     0.1263
SD:    0.03      0.01     0.0007
%RSD:  0.60      0.60     0.57
   Sample concentration is greater than that of the highest standard.

Sequence No.: 10                         Autosampler Location: 18
Sample ID: 0A-2                          Date Collected: 05.05.2010 18:37:17
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 18
Replicate Data: 0A-2
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    4.95       4.95     0.5140    0.5164 1.1445  0.6911  0.4407 18:38:04    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 11                         Autosampler Location: 18
Sample ID: 0A-2                          Date Collected: 05.05.2010 18:40:12
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 18
Replicate Data: 0A-2
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time     Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    6.71       1.68     0.1787    0.1812 0.4228  0.2937  0.2868 18:41:08    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.
```

```
Sequence No.: 12                          Autosampler Location: 18
Sample ID: 0A-2                           Date Collected: 05.05.2010 18:43:15
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 18
Replicate Data: 0A-2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height          Stored
 1    10.26      0.51     0.0581    0.0606  0.1504  0.1113  0.0574  18:44:11     Yes
 2    10.49      0.52     0.0593    0.0617  0.1490  0.1143  0.0601  18:47:14     Yes
 3    10.64      0.53     0.0601    0.0626  0.1486  0.1198  0.0680  18:50:17     Yes
Mean:  10.46      0.52     0.0591
SD:    0.19       0.01     0.0010
%RSD:  1.81       1.81     1.69

Sequence No.: 13                          Autosampler Location: 19
Sample ID: 6                            Date Collected: 05.05.2010 18:52:26
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 19
Replicate Data: 6
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height          Stored
 1    1.41       1.41    0.1515    0.1540  0.3777  0.6492  0.4046  18:53:14     Yes
  Sample concentration is greater than that of the highest standard.
 2    1.40       1.40    0.1497    0.1522  0.3723  0.5694  0.3561  18:56:09     Yes
  Sample concentration is greater than that of the highest standard.
 3    1.38       1.38    0.1478    0.1502  0.3763  0.5493  0.3273  18:59:04     Yes
  Sample concentration is greater than that of the highest standard.
Mean:  1.39       1.39     0.1497
SD:    0.02       0.02     0.0019
%RSD:  1.30       1.30     1.24
  Sample concentration is greater than that of the highest standard.

Sequence No.: 14                          Autosampler Location: 20
Sample ID: 22                            Date Collected: 05.05.2010 19:01:12
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 20
Replicate Data: 22
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area    Height          Stored
 1    9.79       9.79    1.0087    1.0112  2.0899  1.0197  1.1774  19:02:00     Yes
  Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 15                          Autosampler Location: 20
Sample ID: 22                            Date Collected: 05.05.2010 19:04:07
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 20
Replicate Data: 22
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
```

```
 #    ug/L      ug/L     Signal    Area    Height   Area     Height          Stored
 1    25.41      6.35     0.6573    0.6598  1.3530   0.4374   0.4930  19:05:03     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 16                          Autosampler Location: 20
Sample ID: 22                            Date Collected: 05.05.2010 19:07:10
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 20
Replicate Data: 22
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area    Height   Area     Height          Stored
 1    49.31      2.47     0.2596    0.2621  0.6398   0.0950   0.1270  19:08:06     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 17                          Autosampler Location: 21
Sample ID: Ref N 2                         Date Collected: 05.05.2010 19:10:14
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 21
Replicate Data: Ref N 2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area    Height   Area     Height          Stored
 1    1.39       1.39    0.1495    0.1519  0.3868   0.5554   0.3795  19:11:01     Yes
   Sample concentration is greater than that of the highest standard.
 2    1.38       1.38    0.1477    0.1502  0.3860   0.5413   0.3555  19:13:57     Yes
   Sample concentration is greater than that of the highest standard.
 3    1.38       1.38    0.1479    0.1503  0.3980   0.5292   0.3940  19:16:52     Yes
   Sample concentration is greater than that of the highest standard.
Mean:  1.38       1.38     0.1483
SD:    0.01       0.01     0.0010
%RSD:  0.69       0.69     0.66
   Sample concentration is greater than that of the highest standard.

Sequence No.: 18                          Autosampler Location: 22
Sample ID: 13                            Date Collected: 05.05.2010 19:18:59
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 22
Replicate Data: 13
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area    Height   Area     Height          Stored
 1    3.38       3.38    0.3536    0.3561  0.8814   0.6377   0.3244  19:19:47     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 19                          Autosampler Location: 22
Sample ID: 13                            Date Collected: 05.05.2010 19:21:55
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 22
Replicate Data: 13
```

```
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     4.13        1.03      0.1124     0.1148  0.2993  0.3266   0.4185  19:22:50     Yes
 2     4.12        1.03      0.1121     0.1146  0.3025  0.2653   0.3229  19:25:53     Yes
 3     4.02        1.00      0.1094     0.1119  0.2954  0.2339   0.2883  19:28:57     Yes
Mean:  4.09        1.02      0.1113
SD:    0.06        0.02      0.0016
%RSD:  1.55        1.55      1.47

Sequence No.: 20                          Autosampler Location: 23
Sample ID: 2                            Date Collected: 05.05.2010 19:31:05
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 23
Replicate Data: 2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     5.00        5.00      0.5188     0.5213  1.1663  1.4619   0.5460  19:31:52     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 21                          Autosampler Location: 23
Sample ID: 2                            Date Collected: 05.05.2010 19:34:00
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 23
Replicate Data: 2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     6.07        1.52      0.1623     0.1648  0.3844  0.7248   0.3439  19:34:54     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 22                          Autosampler Location: 23
Sample ID: 2                            Date Collected: 05.05.2010 19:37:03
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 23
Replicate Data: 2
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     9.34        0.47      0.0532     0.0557  0.1291  0.1088   0.1025  19:37:58     Yes
 2     9.46        0.47      0.0539     0.0563  0.1423  0.0839   0.0809  19:41:01     Yes
 3     10.22       0.51      0.0579     0.0603  0.1608  0.0814   0.0739  19:44:04     Yes
Mean:  9.67        0.48      0.0550
SD:    0.48        0.02      0.0025
%RSD:  4.93        4.93      4.60

Sequence No.: 23                          Autosampler Location: 24
Sample ID: 23                           Date Collected: 05.05.2010 19:46:12
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 24
Replicate Data: 23
```

```
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal    Area    Height  Area     Height            Stored
 1     11.62       11.62     1.1961    1.1986  2.2818   1.7834  1.3999  19:46:59     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 24                          Autosampler Location: 24
Sample ID: 23                             Date Collected: 05.05.2010 19:49:07
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 24
Replicate Data: 23
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal    Area    Height  Area     Height            Stored
 1     28.79       7.20      0.7439    0.7463  1.4508   0.7483   0.6819  19:50:02     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 25                          Autosampler Location: 24
Sample ID: 23                             Date Collected: 05.05.2010 19:52:10
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 24
Replicate Data: 23
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal    Area    Height  Area     Height            Stored
 1     58.77       2.94      0.3081    0.3105  0.8355   0.1867   0.1948  19:53:06     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 26                          Autosampler Location: 25
Sample ID: 25                             Date Collected: 05.05.2010 19:55:14
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 25
Replicate Data: 25
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal    Area    Height  Area     Height            Stored
 1     5.69        5.69      0.5900    0.5925  1.6087   1.2916   0.5645  19:56:01     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 27                          Autosampler Location: 25
Sample ID: 25                             Date Collected: 05.05.2010 19:58:09
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 25
Replicate Data: 25
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal    Area    Height  Area     Height            Stored
 1     8.74        2.18      0.2308    0.2333  0.5814   0.4157   0.2454  19:59:04     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.
```

```
Sequence No.: 28                    Autosampler Location: 25
Sample ID: 25                       Date Collected: 05.05.2010 20:01:12
Analyst:                            Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 25
Replicate Data: 25
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area    Height            Stored
 1    14.52       0.73      0.0804    0.0829  0.2008  0.0945  0.0718  20:02:08  Yes
 2    11.06       0.55      0.0623    0.0648  0.1576  0.0792  0.0469  20:05:11  Yes
 3    13.35       0.67      0.0743    0.0768  0.2030  0.0587  0.0594  20:08:15  Yes
Mean:  12.97      0.65      0.0723
SD:    1.76       0.09      0.0092
%RSD:  13.58      13.58     12.76
```

```
Sequence No.: 29                    Autosampler Location: 26
Sample ID: 11                       Date Collected: 05.05.2010 20:10:23
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 26
Replicate Data: 11
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area    Height            Stored
 1    3.55        3.55      0.3706    0.3730  1.0948  0.6244  0.5025  20:11:11  Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.
```

```
Sequence No.: 30                    Autosampler Location: 26
Sample ID: 11                       Date Collected: 05.05.2010 20:13:18
Analyst:                            Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 26
Replicate Data: 11
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area    Height            Stored
 1    4.39        1.10      0.1191    0.1216  0.3255  0.2822  0.2954  20:14:14  Yes
 2    4.44        1.11      0.1202    0.1227  0.3182  0.2441  0.2520  20:17:17  Yes
   Sample concentration is greater than that of the highest standard.
 3    4.28        1.07      0.1162    0.1187  0.3189  0.2518  0.2264  20:20:20  Yes
Mean:  4.37       1.09      0.1185
SD:    0.08       0.02      0.0021
%RSD:  1.83       1.83      1.75
```

```
Sequence No.: 31                    Autosampler Location: 27
Sample ID: 5                        Date Collected: 05.05.2010 20:22:28
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 27
Replicate Data: 5
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd   Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area    Height            Stored
 1    2.09        2.09      0.2207    0.2232  0.6268  0.6512  0.4852  20:23:16  Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.
```

```
Sequence No.: 32                          Autosampler Location: 27
Sample ID: 5                            Date Collected: 05.05.2010 20:25:23
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 27
Replicate Data: 5
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    2.26       0.56     0.0635    0.0660  0.1882  0.2040  0.2955  20:26:17     Yes
 2    2.28       0.57     0.0640    0.0664  0.1945  0.2443  0.3016  20:29:19     Yes
 3    2.38       0.59     0.0667    0.0692  0.1853  0.2468  0.2492  20:32:22     Yes
Mean:  2.30       0.58     0.0647
SD:    0.07       0.02     0.0017
%RSD:  2.83       2.83     2.65

Sequence No.: 33                          Autosampler Location: 28
Sample ID: 3                            Date Collected: 05.05.2010 20:34:29
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 28
Replicate Data: 3
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    1.61       1.61     0.1720    0.1745  0.4871  0.5034  0.3798  20:35:17     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 34                          Autosampler Location: 28
Sample ID: 3                            Date Collected: 05.05.2010 20:37:24
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 28
Replicate Data: 3
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    1.88       0.47     0.0535    0.0559  0.1512  0.2625  0.2351  20:38:18     Yes
 2    1.84       0.46     0.0524    0.0548  0.1461  0.2552  0.2263  20:41:20     Yes
 3    1.88       0.47     0.0534    0.0559  0.1512  0.2544  0.2264  20:44:21     Yes
Mean:  1.86       0.47     0.0531
SD:    0.02       0.01     0.0006
%RSD:  1.25       1.25     1.16

Sequence No.: 35                          Autosampler Location: 29
Sample ID: 21                           Date Collected: 05.05.2010 20:46:29
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 29
Replicate Data: 21
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd  Bkgnd  Time      Peak
 #    ug/L       ug/L     Signal    Area   Height  Area   Height        Stored
 1    6.37       6.37     0.6596    0.6620  1.5532  0.7919  0.6773  20:47:17     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.
```

```
Sequence No.: 36                         Autosampler Location: 29
Sample ID: 21                           Date Collected: 05.05.2010 20:49:24
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 29
Replicate Data: 21
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    11.89     2.97     0.3116    0.3140  0.7788  0.3515  0.4480  20:50:19     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 37                         Autosampler Location: 29
Sample ID: 21                           Date Collected: 05.05.2010 20:52:27
Analyst:                             Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 29
Replicate Data: 21
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    20.45     1.02     0.1112    0.1137  0.2868  0.0569  0.0811  20:53:20     Yes
 2    19.60     0.98     0.1068    0.1093  0.2880  0.0506  0.0719  20:56:22     Yes
 3    18.46     0.92     0.1009    0.1034  0.2497  0.0597  0.0709  20:59:22     Yes
Mean:  19.51     0.98     0.1063
SD:    1.00      0.05     0.0052
%RSD:  5.11      5.11     4.86

Sequence No.: 38                         Autosampler Location: 30
Sample ID: 24                           Date Collected: 05.05.2010 21:01:29
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 30
Replicate Data: 24
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    1.94      1.94     0.2054    0.2078  0.6077  0.4028  0.3767  21:02:17     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 39                         Autosampler Location: 30
Sample ID: 24                           Date Collected: 05.05.2010 21:04:25
Analyst:                             Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 30
Replicate Data: 24
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    1.89      0.47     0.0538    0.0563  0.1580  0.2542  0.2566  21:05:17     Yes
 2    1.91      0.48     0.0544    0.0569  0.1617  0.2183  0.2452  21:08:19     Yes
 3    1.92      0.48     0.0546    0.0570  0.1624  0.2194  0.2419  21:11:22     Yes
Mean:  1.91      0.48     0.0543
SD:    0.02      0.00     0.0004
%RSD:  0.84      0.84     0.78
```

```
Sequence No.: 40                         Autosampler Location: 31
Sample ID: 28d                          Date Collected: 05.05.2010 21:13:29
Analyst:                            Data Type: Original
uL dispensed: 3 from 139
Replicate Data: 28d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area     Height            Stored
 1     0.00        0.00      -0.0005    0.0020  0.0039   -0.0155  0.0021  21:14:18     Yes
 2     -0.01       -0.01     -0.0011    0.0014  0.0053   -0.0162  0.0024  21:17:15     Yes
 3     0.00        0.00      0.0002     0.0027  0.0060   -0.0157  0.0024  21:20:11     Yes
Mean:  0.00        0.00      -0.0005
SD:    0.00        0.00      0.0006
%RSD:  138.7       138.7     138.30

Sequence No.: 41                         Autosampler Location: 32
Sample ID: 28                           Date Collected: 05.05.2010 21:22:18
Analyst:                            Data Type: Original
uL dispensed: 3 from 139
User canceled analysis.

Analysis Begun

Logged In Analyst: c-drangeid                  Technique: AA Furnace
Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800

Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium sample file reanalysis 3.si
Batch ID: Somme bay 2010
Results Data Set: Somme bay 2010 Cezar n3d
Results Library: C:\data-AA\Administrator\Results\Results.mdb

Method Loaded
Method Name: Cezar Cadmium Method 3                Method Last Saved: 05.05.2010 17:19:34
Method Description: 0-10 ug/l marius and kjerand

Sequence No.: 1                          Autosampler Location: 31
Sample ID: 28d                          Date Collected: 06.05.2010 13:53:24
Analyst:                            Data Type: Original
uL dispensed: 3 from 139, 20 from 31
Replicate Data: 28d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height   Area     Height            Stored
 1                      0.3952     0.3952  0.9823   0.1187   0.2334  13:54:23     Yes
 2                      0.4148     0.4148  1.0920   0.1343   0.2617  13:57:21     Yes
User canceled analysis.

Analysis Begun
```

```
    Logged In Analyst: c-drangeid                Technique: AA Furnace
    Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800

    Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file reanalysis 3.si
    Batch ID: Somme bay 2010
    Results Data Set: Somme bay 2010 Cezar n3d
    Results Library: C:\data-AA\Administrator\Results\Results.mdb

    Sequence No.: 1                          Autosampler Location: 141
    Sample ID: Calib Blank 1                     Date Collected: 06.05.2010 14:00:45
    Analyst:                             Data Type: Original
    uL dispensed: 3 from 139, 20 from 141
    Replicate Data: Calib Blank 1
    Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
     #    ug/L       ug/L     Signal    Area   Height  Area   Height          Stored
     1             [0.00]   0.0018    0.0018  0.0057   -0.0196  0.0024  14:01:39     Yes
     2             [0.00]   0.0016    0.0016  0.0058   -0.0200  0.0016  14:04:38     Yes
     3             [0.00]   0.0013    0.0013  0.0058   -0.0184  0.0023  14:07:38     Yes
    Mean:             [0.00]   0.0016
    SD:              0.00     0.0002
    %RSD:              0.00     15.46
    Auto-zero performed.

    Sequence No.: 2                          Autosampler Location: 142
    Sample ID: Calib Std 2                     Date Collected: 06.05.2010 14:09:45
    Analyst:                             Data Type: Original
    uL dispensed: 19 from 143, 3 from 139, 1 from 142
    Replicate Data: Calib Std 2
    Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
     #    ug/L       ug/L     Signal    Area   Height  Area   Height          Stored
     1             [0.05]   0.0058    0.0074  0.0183   -0.0174  0.0022  14:10:39     Yes
     2             [0.05]   0.0059    0.0075  0.0169   -0.0159  0.0029  14:13:39     Yes
     3             [0.05]   0.0070    0.0086  0.0186   -0.0207  0.0019  14:16:42     Yes
    Mean:             [0.05]   0.0062
    SD:              0.00     0.0007
    %RSD:              0.00     10.59
    Standard number 2 applied. [0.05]
    Correlation Coef.: 1.000000   Slope: 0.12457    Intercept: 0.00000

    Sequence No.: 3                          Autosampler Location: 142
    Sample ID: Calib Std 3                     Date Collected: 06.05.2010 14:18:51
    Analyst:                             Data Type: Original
    uL dispensed: 18 from 143, 3 from 139, 2 from 142
    Replicate Data: Calib Std 3
    Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
     #    ug/L       ug/L     Signal    Area   Height  Area   Height          Stored
     1             [0.1]    0.0113    0.0128  0.0301   -0.0179  0.0044  14:19:45     Yes
     2             [0.1]    0.0106    0.0121  0.0279   -0.0187  0.0037  14:22:47     Yes
     3             [0.1]    0.0111    0.0127  0.0273   -0.0179  0.0016  14:26:12     Yes
```

```
Mean:          [0.1]    0.0110
SD:              0.0      0.0004
%RSD:             0.0      3.37
Standard number 3 applied. [0.1]
Correlation Coef.: 1.000000   Slope: 0.14392    Intercept: 0.00000

Sequence No.: 4                          Autosampler Location: 142
Sample ID: Calib Std 4                     Date Collected: 06.05.2010 14:28:21
Analyst:                              Data Type: Original
uL dispensed: 14 from 143, 3 from 139, 6 from 142
Replicate Data: Calib Std 4
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height          Stored
 1            [0.3]    0.0306    0.0322  0.0695   -0.0143  0.0063  14:29:15     Yes
 2            [0.3]    0.0306    0.0322  0.0687   -0.0149  0.0068  14:32:24     Yes
 3            [0.3]    0.0305    0.0321  0.0673   -0.0161  0.0076  14:35:24     Yes
Mean:          [0.3]    0.0306
SD:              0.0      0.0001
%RSD:             0.0      0.25
Standard number 4 applied. [0.3]
Correlation Coef.: 0.999268   Slope: 0.12502    Intercept: 0.00000
  S-shaped calibration curve detected. Two-coefficient equation used.

Sequence No.: 5                          Autosampler Location: 142
Sample ID: Calib Std 5                     Date Collected: 06.05.2010 14:37:33
Analyst:                              Data Type: Original
uL dispensed: 8 from 143, 3 from 139, 12 from 142
Replicate Data: Calib Std 5
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height          Stored
 1            [0.6]    0.0563    0.0579  0.1211   -0.0112  0.0124  14:38:27     Yes
 2            [0.6]    0.0523    0.0539  0.1131   -0.0099  0.0151  14:41:29     Yes
 3            [0.6]    0.0544    0.0560  0.1134   -0.0108  0.0118  14:44:32     Yes
Mean:          [0.6]    0.0543
SD:              0.0      0.0020
%RSD:             0.0      3.65
Standard number 5 applied. [0.6]
Correlation Coef.: 0.999914   Slope: 0.12747    Intercept: 0.00000

Sequence No.: 6                          Autosampler Location: 142
Sample ID: Calib Std 6                     Date Collected: 06.05.2010 14:46:41
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 142
Replicate Data: Calib Std 6
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L       ug/L      Signal    Area   Height  Area    Height          Stored
 1            [1]      0.0835    0.0851  0.1846   -0.0046  0.0223  14:47:31     Yes
 2            [1]      0.0858    0.0874  0.1956   -0.0030  0.0254  14:50:30     Yes
 3            [1]      0.0842    0.0857  0.1936   -0.0037  0.0255  14:53:30     Yes
Mean:          [1]      0.0845
```

```
SD:              0        0.0012
%RSD:             0        1.43
Standard number 6 applied. [1]
Correlation Coef.: 0.999952   Slope: 0.12925    Intercept: 0.00000
Calibration data for Cadmium 228.8                  Equation: Nonlinear Through Zero
                           Entered  Calculated
                 Mean Signal    Conc.     Conc.    Standard
      ID            (Abs)       ug/L      ug/L     Deviation    %RSD
  Calib Blank 1        0.0000       0       0.00       0.00       15.5
   Calib Std 2        0.0062      0.05      0.05       0.00       10.6
   Calib Std 3        0.0110      0.1      0.10       0.00       3.4
   Calib Std 4        0.0306      0.3      0.30       0.00       0.3
   Calib Std 5        0.0543      0.6      0.60       0.00       3.6
   Calib Std 6        0.0845      1.0      1.00       0.00       1.4
Correlation Coef.: 0.999952   Slope: 0.12925    Intercept: 0.00000

Sequence No.: 7                          Autosampler Location: 31
Sample ID: 28d                           Date Collected: 06.05.2010 14:55:39
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 31
Replicate Data: 28d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     5.81        5.81      0.3991     0.4006  1.0335  0.1341   0.2657  14:56:26      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 8                          Autosampler Location: 31
Sample ID: 28d                           Date Collected: 06.05.2010 14:58:34
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 31

Replicate Data: 28d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     7.22        1.81      0.1401     0.1417  0.3662  0.0595   0.0691  14:59:28      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 9                          Autosampler Location: 31
Sample ID: 28d                           Date Collected: 06.05.2010 15:01:35
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 31
Replicate Data: 28d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height            Stored
 1     11.19       0.56      0.0515     0.0531  0.1516  -0.0011  0.0210  15:02:29      Yes
 2     8.07        0.40      0.0390     0.0406  0.1100  -0.0064  0.0136  15:05:30      Yes
 3     8.83        0.44      0.0421     0.0437  0.1247  -0.0059  0.0172  15:08:32      Yes
Mean:  9.36        0.47      0.0442
```

```
SD:    1.63       0.08      0.0065
%RSD:  17.38      17.38     14.72

Sequence No.: 10                         Autosampler Location: 32
Sample ID: 28                            Date Collected: 06.05.2010 15:10:39
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 32
Replicate Data: 28
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1     12.49       12.49     0.8202     0.8218  1.9021  1.2896   0.7813  15:11:27      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 11                         Autosampler Location: 32
Sample ID: 28                            Date Collected: 06.05.2010 15:13:35
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 32
Replicate Data: 28
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1     30.22       7.56      0.5098     0.5114  1.2123  0.3092   0.2515  15:14:29     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 12                         Autosampler Location: 32
Sample ID: 28                            Date Collected: 06.05.2010 15:16:38
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 32
Replicate Data: 28
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1     64.98       3.25      0.2352     0.2368  0.5921  0.1149   0.0990  15:17:30     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 13                         Autosampler Location: 33
Sample ID: 27d                            Date Collected: 06.05.2010 15:19:38
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 33
Replicate Data: 27d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L        ug/L      Signal     Area    Height  Area     Height           Stored
 1     13.76       13.76     0.9001     0.9016  2.1369  1.2964   0.6436  15:20:25      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 14                         Autosampler Location: 33
Sample ID: 27d                            Date Collected: 06.05.2010 15:22:33
Analyst:                              Data Type: Original
```

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uL dispensed: 15 from 143, 3 from 139, 5 from 33
Replicate Data: 27d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
 1    26.92       6.73      0.4575     0.4591  1.1002  0.2796  0.2126  15:23:27     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 15                          Autosampler Location: 33
Sample ID: 27d                            Date Collected: 06.05.2010 15:25:36
Analyst:                               Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 33
Replicate Data: 27d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
 1    37.76       1.89      0.1457     0.1472  0.3880  0.0700  0.0591  15:26:29     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 16                          Autosampler Location: 34
Sample ID: Ref N                          Date Collected: 06.05.2010 15:28:37
Analyst:                               Data Type: Original
uL dispensed: 3 from 139, 20 from 34
Replicate Data: Ref N
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
 1    3.38        3.38      0.2436     0.2452  0.6721  0.4765  0.4286  15:29:24     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 17                          Autosampler Location: 34
Sample ID: Ref N                          Date Collected: 06.05.2010 15:31:32
Analyst:                               Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 34
Replicate Data: Ref N
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
 #    ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
 1    3.25        0.81      0.0707     0.0723  0.1781  0.3478  0.1803  15:32:25     Yes
 2    3.24        0.81      0.0706     0.0721  0.1780  0.3630  0.2078  15:35:25     Yes
 3    3.43        0.86      0.0740     0.0756  0.1850  0.3930  0.2306  15:38:25     Yes
Mean:  3.31       0.83      0.0718
SD:    0.11       0.03      0.0019
%RSD:  3.18       3.18      2.70

Sequence No.: 18                          Autosampler Location: 35
Sample ID: 21d                            Date Collected: 06.05.2010 15:40:33
Analyst:                               Data Type: Original
uL dispensed: 3 from 139, 20 from 35
Replicate Data: 21d
Repl  SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
```

```
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    6.74      6.74     0.4582    0.4598  1.2150  0.8066  0.4041  15:41:20     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 19                      Autosampler Location: 35
Sample ID: 21d                        Date Collected: 06.05.2010 15:43:28
Analyst:                          Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 35
Replicate Data: 21d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    8.46      2.11     0.1608    0.1624  0.3954  0.1346  0.0751  15:44:19     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 20                      Autosampler Location: 35
Sample ID: 21d                        Date Collected: 06.05.2010 15:46:27
Analyst:                          Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 35
Replicate Data: 21d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    5.43      0.27     0.0278    0.0294  0.0734  0.0028  0.0085  15:47:20     Yes
 2    7.47      0.37     0.0365    0.0381  0.0892  0.0054  0.0123  15:50:19     Yes
 3    10.03      0.50     0.0469    0.0485  0.1091  0.0138  0.0160  15:53:19     Yes
Mean:  7.64      0.38     0.0371
SD:    2.30      0.12     0.0096
%RSD:  30.15     30.15    25.88

Sequence No.: 21                      Autosampler Location: 36
Sample ID: 22d                        Date Collected: 06.05.2010 15:55:27
Analyst:                          Data Type: Original
uL dispensed: 3 from 139, 20 from 36
Replicate Data: 22d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    12.78      12.78     0.8384    0.8400  1.7021  0.8355  1.1626  15:56:15     Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 22                      Autosampler Location: 36
Sample ID: 22d                        Date Collected: 06.05.2010 15:58:22
Analyst:                          Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 36
Replicate Data: 22d
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak   Bkgnd   Bkgnd  Time      Peak
 #    ug/L      ug/L     Signal    Area   Height  Area    Height          Stored
 1    26.91      6.73     0.4574    0.4590  1.0603  0.5164  0.3485  15:59:15     Yes
   Sample concentration is greater than that of the highest standard.
```

```
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 23                          Autosampler Location: 36
Sample ID: 22d                            Date Collected: 06.05.2010 16:01:23
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 36
Replicate Data: 22d
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area     Height          Stored
 1    38.63       1.93      0.1486    0.1501  0.3562  0.1372   0.0789  16:02:15    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 24                          Autosampler Location: 37
Sample ID: 27                             Date Collected: 06.05.2010 16:04:23
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 37
Replicate Data: 27
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area     Height          Stored
 1    12.54       12.54     0.8234    0.8250  2.0522  0.8862   1.0720  16:05:10    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 25                          Autosampler Location: 37
Sample ID: 27                             Date Collected: 06.05.2010 16:07:18
Analyst:                              Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 37
Replicate Data: 27
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area     Height          Stored
 1    28.20       7.05      0.4778    0.4793  1.1891  0.5242   0.3988  16:08:11    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 26                          Autosampler Location: 37
Sample ID: 27                             Date Collected: 06.05.2010 16:10:18
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 37
Replicate Data: 27
Repl  SampleConc  StndConc  BlnkCorr  Peak    Peak    Bkgnd    Bkgnd   Time      Peak
 #    ug/L        ug/L      Signal    Area    Height  Area     Height          Stored
 1    37.53       1.88      0.1449    0.1464  0.4004  0.1035   0.0747  16:11:11    Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range.

Sequence No.: 27                          Autosampler Location: 141
Sample ID: Calib Blank 1                      Date Collected: 06.05.2010 16:13:19
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 141
```

```
        User canceled analysis.

        Analysis Begun

        Logged In Analyst: c-drangeid                    Technique: AA Furnace
        Spectrometer Model: AA600, S/N 600S2110102       Autosampler Model: AS-800

        Sample Information File: C:\data-AA\Administrator\Sample Information\Cezar Cadmium
sample file reanalysis 4.si
        Batch ID: Somme bay 2010
        Results Data Set: Somme bay 2010 Cezar n3e
        Results Library: C:\data-AA\Administrator\Results\Results.mdb

        Method Loaded
        Method Name: Cezar Cadmium Method 3                  Method Last Saved: 06.05.2010
16:41:46
        Method Description: 0-10 ug/l marius and kjerand

        Sequence No.: 1                          Autosampler Location: 32
        Sample ID: 28                            Date Collected: 06.05.2010 16:47:13
        Analyst:                                 Data Type: Original
        uL dispensed: 3 from 139, 20 from 32
        Replicate Data: 28
        Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
         #     ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
         1     26.11       26.11     0.1761     0.1772  0.5062  0.0576  0.0819  16:47:55   Yes
          Sample concentration is greater than that of the highest standard.
        Sample beyond calibration range. It will be diluted and reanalyzed.

        Sequence No.: 2                          Autosampler Location: 32
        Sample ID: 28                            Date Collected: 06.05.2010 16:50:11
        Analyst:                                 Data Type: Original
        uL dispensed: 15 from 143, 3 from 139, 5 from 32
        Replicate Data: 28
        Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
         #     ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
         1     2.92        0.73      0.0656     0.0668  0.1678  0.0025  0.0220  16:51:05   Yes
         2     2.80        0.70      0.0639     0.0650  0.1768  0.0010  0.0259  16:54:08   Yes
         3     2.56        0.64      0.0602     0.0613  0.1666  0.0013  0.0242  16:57:09   Yes
        Mean:  2.76        0.69      0.0632
        SD:    0.18        0.05      0.0028
        %RSD:  6.63        6.63      4.40

        Sequence No.: 3                          Autosampler Location: 33
        Sample ID: 27d                           Date Collected: 06.05.2010 16:59:16
        Analyst:                                 Data Type: Original
        uL dispensed: 3 from 139, 20 from 33
        Replicate Data: 27d
        Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd   Bkgnd   Time       Peak
         #     ug/L        ug/L      Signal     Area    Height  Area    Height            Stored
```

```
 1    1.68       1.68      0.1035     0.1046  0.2770   0.0292   0.0419  17:00:04      Yes
   Sample concentration is greater than that of the highest standard.
Sample beyond calibration range. It will be diluted and reanalyzed.

Sequence No.: 4                        Autosampler Location: 33
Sample ID: 27d                         Date Collected: 06.05.2010 17:02:12
Analyst:                           Data Type: Original
uL dispensed: 15 from 143, 3 from 139, 5 from 33
Replicate Data: 27d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height   Area    Height            Stored
 1    1.28       0.32      0.0360     0.0372  0.1039   -0.0063  0.0125  17:03:06      Yes
 2    1.39       0.35      0.0384     0.0396  0.1030   0.0127   0.0125  17:06:09      Yes
 3    1.15       0.29      0.0329     0.0340  0.0914   -0.0068  0.0122  17:09:10      Yes
Mean:  1.27       0.32      0.0358
SD:    0.12       0.03      0.0028
%RSD:  9.64       9.64      7.80

Sequence No.: 5                        Autosampler Location: 36
Sample ID: 22d                         Date Collected: 06.05.2010 17:11:18
Analyst:                           Data Type: Original
uL dispensed: 3 from 139, 20 from 36
Replicate Data: 22d
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height   Area    Height            Stored
 1    1.13       1.13      0.0850     0.0861  0.2801   0.0031   0.0428  17:12:05      Yes
   Sample concentration is greater than that of the highest standard.
 2    1.15       1.15      0.0859     0.0871  0.2879   0.0048   0.0430  17:15:00      Yes
   Sample concentration is greater than that of the highest standard.
 3    1.07       1.07      0.0828     0.0839  0.2659   0.0032   0.0388  17:17:56      Yes
Mean:  1.12       1.12      0.0846
SD:    0.04       0.04      0.0016
%RSD:  3.50       3.50      1.91
   Sample concentration is greater than that of the highest standard.

Sequence No.: 6                        Autosampler Location: 37
Sample ID: 27                         Date Collected: 06.05.2010 17:20:03
Analyst:                           Data Type: Original
uL dispensed: 3 from 139, 20 from 37
Replicate Data: 27
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak    Bkgnd    Bkgnd   Time       Peak
 #     ug/L       ug/L      Signal     Area    Height   Area    Height            Stored
 1    0.58       0.58      0.0566     0.0577  0.1872   -0.0003  0.0271  17:20:51      Yes
 2    0.61       0.61      0.0584     0.0595  0.1953   -0.0010  0.0284  17:23:46      Yes
 3    0.57       0.57      0.0555     0.0567  0.1890   -0.0012  0.0279  17:26:41      Yes
Mean:  0.59       0.59      0.0568
SD:    0.02       0.02      0.0014
%RSD:  3.68       3.68      2.54

Sequence No.: 7                        Autosampler Location: 141
```

```
Sample ID: Calib Blank 1                    Date Collected: 06.05.2010 17:28:49
Analyst:                              Data Type: Original
uL dispensed: 3 from 139, 20 from 141
Replicate Data: Calib Blank 1
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height            Stored
 1    0.01        0.01      0.0011    0.0023  0.0044  -0.0126  0.0018  17:29:39     Yes
 2    0.01        0.01      0.0015    0.0026  0.0059  -0.0139  0.0013  17:32:38     Yes
 3    0.00        0.00      0.0005    0.0017  0.0048  -0.0122  0.0016  17:35:38     Yes
Mean:  0.01       0.01      0.0011
SD:    0.00       0.00      0.0005
%RSD:  46.80      46.80     46.61

Sequence No.: 8                             Autosampler Location: 142
Sample ID: Calib Std 2                        Date Collected: 06.05.2010 17:37:47
Analyst:                              Data Type: Original
uL dispensed: 19 from 143, 3 from 139, 1 from 142
Replicate Data: Calib Std 2
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height            Stored
 1    0.05        0.05      0.0071    0.0082  0.0229  -0.0139  0.0014  17:38:41     Yes
 2    0.06        0.06      0.0082    0.0093  0.0230  -0.0142  0.0021  17:41:42     Yes
 3    0.08        0.08      0.0105    0.0116  0.0258  -0.0151  0.0014  17:44:42     Yes
Mean:  0.06       0.06      0.0086
SD:    0.01       0.01      0.0017
%RSD:  21.21      21.21     20.19

Sequence No.: 9                             Autosampler Location: 142
Sample ID: Calib Std 3                        Date Collected: 06.05.2010 17:46:58
Analyst:                              Data Type: Original
uL dispensed: 18 from 143, 3 from 139, 2 from 142
Replicate Data: Calib Std 3
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height            Stored
 1    0.11        0.11      0.0139    0.0150  0.0342  -0.0130  0.0023  17:47:52     Yes
 2    0.07        0.07      0.0098    0.0110  0.0245  -0.0144  0.0014  17:50:55     Yes
 3    0.08        0.08      0.0099    0.0110  0.0255  -0.0131  0.0022  17:53:59     Yes
Mean:  0.09       0.09      0.0112
SD:    0.02       0.02      0.0023
%RSD:  22.17      22.17     20.70

Sequence No.: 10                            Autosampler Location: 142
Sample ID: Calib Std 4                        Date Collected: 06.05.2010 17:56:08
Analyst:                              Data Type: Original
uL dispensed: 14 from 143, 3 from 139, 6 from 142
Replicate Data: Calib Std 4
Repl  SampleConc  StndConc  BlnkCorr  Peak   Peak    Bkgnd   Bkgnd  Time       Peak
 #    ug/L        ug/L      Signal    Area   Height  Area    Height            Stored
 1    0.24        0.24      0.0286    0.0297  0.0635  -0.0118  0.0051  17:57:01     Yes
 2    0.25        0.25      0.0293    0.0304  0.0679  -0.0111  0.0077  18:00:11     Yes
```

```
 3    0.22       0.22     0.0266    0.0277  0.0640   -0.0116  0.0075  18:03:11      Yes
Mean:  0.24       0.24      0.0282
SD:    0.01       0.01      0.0014
%RSD:  5.86       5.86      4.99

Sequence No.: 11                          Autosampler Location: 142
Sample ID: Calib Std 5                      Date Collected: 06.05.2010 18:05:26
Analyst:                             Data Type: Original
uL dispensed: 8 from 143, 3 from 139, 12 from 142
Replicate Data: Calib Std 5
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak     Bkgnd    Bkgnd   Time        Peak
 #    ug/L       ug/L      Signal     Area    Height   Area     Height            Stored
 1    0.45       0.45     0.0472    0.0483  0.1085   -0.0094  0.0123  18:06:20      Yes
 2    0.47       0.47     0.0487    0.0498  0.1060   -0.0083  0.0128  18:09:29      Yes
 3    0.46       0.46     0.0473    0.0484  0.1046   -0.0087  0.0133  18:12:37      Yes
Mean:  0.46       0.46      0.0477
SD:    0.01       0.01      0.0008
%RSD:  2.37       2.37      1.75

Sequence No.: 12                          Autosampler Location: 142
Sample ID: Calib Std 6                      Date Collected: 06.05.2010 18:14:52
Analyst:                             Data Type: Original
uL dispensed: 3 from 139, 20 from 142
Replicate Data: Calib Std 6
Repl   SampleConc  StndConc  BlnkCorr   Peak    Peak     Bkgnd    Bkgnd   Time        Peak
 #    ug/L       ug/L      Signal     Area    Height   Area     Height            Stored
 1    0.93       0.93     0.0764    0.0775  0.1630   -0.0022  0.0236  18:15:42      Yes
 2    0.85       0.85     0.0723    0.0735  0.1599   -0.0016  0.0213  18:18:41      Yes
 3    0.90       0.90     0.0750    0.0762  0.1773   -0.0021  0.0240  18:21:41      Yes
Mean:  0.90       0.90      0.0746
SD:    0.04       0.04      0.0021
%RSD:  4.59       4.59      2.76
```