The Status of Metal Levels in Common Loons (Gavia immer) in the Northeast United States

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PREFACE

Information presented in this report is interim documentation of a 1994 environmental evaluation of livers from common loons collected throughout the Northeast United States (PACF Catalog Number 5030027). The evaluation was undertaken to correlate specific lead levels and lead object ingestion with loon mortality, and to measure levels of other potentially toxic metals. This evaluation represents a cooperative effort between Tufts University School of Veterinary Medicine (TUSVM) and the United States Fish and Wildlife Service (USFWS). The principal investigators are Andrew Major (USFWS) and Mark Pokras (TUSVM). This report was prepared jointly by the Fish and Wildlife Service and TUSVM.

Questions, comments, and suggestions related to this report are encouraged. Written inquires should refer to report number RY94-NEFO-1-EC and be directed to the following address:

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ABSTRACT

From 1989-1993, 178 common loons found dead or moribund throughout the northeastern United States were examined by personnel from Tufts University School of Veterinary Medicine. Major findings include 46 deaths involving trauma, 19 deaths involving infection, 36 deaths involving ingested lead, 14 deaths involving plastic entanglement, and 26 deaths involving aspergillosis.

This report contains toxicological data (liver and kidney tissue analysis) from a subset of 34 individuals found that lead, mercury, aluminum, selenium, iron, and cadmium concentrations were elevated in the northeastern United States loon population. In adults, liver lead concentrations ranged from <0.06 to 31.09 parts per million (ppm), and liver mercury levels ranged from 0.989 to 100.483 ppm. Ingested lead (mostly fishing sinkers and jigs) was found in 60.0 % of the adult loons from freshwater lakes. In most cases lead ingestion was accompanied by elevated liver lead levels. It is believed that the loons which ingested lead objects died from acute lead toxicosis. Results of this study confirm that much of summer loon mortality is closely linked to anthropogenic activities on and near breeding lakes.

INTRODUCTION

Populations of common loons (Gavia immer) are of special concern in much of North America due to increased encroachment by anthropogenic activities on and around their breeding lakes, and to a northward shifting of breeding boundaries and apparent overall decline in population size (McIntyre 1988). This migratory species has a summer breeding range on inland lakes located in the northern United States and Canada. Many of these birds winter off of the Atlantic coast or in the Gulf of Mexico. The common loon has been designated as either an endangered (VT) or threatened (NH) species, or as a species of special concern (MA and NY) in many northeastern states.

Loons are also of special interest because of their position within the food web. The loon is a top predator in the aquatic food chain and may serve as an indicator species for the aquatic environment. Only a few studies exist regarding contaminant-related loon mortality (Ream 1976, Haseltine et al. 1983, Belant and Anderson 1990) . Past studies (Pokras et al. 1992, Poppenga et. al 1992) has found mercury contamination and lead object ingestion to be particular threats to adult loons. This study further investigates contaminant-related loon morbidity and mortality in the northeast United States.

STUDY OBJECTIVES

The primary objectives of this cooperative study are to:

-Perform analysis on liver and kidney tissue for lead and other metals which are potential contaminants of concern.

-Investigate further the relationship between lead levels in the liver and lead sinker ingestion.

-Determine age-related accumulation of metals in the loon population.

-Determine whether high aluminum levels found in whole chicks are also found in loon chick livers.

-Determine the correlation between metal levels measured in liver tissue analysis and those measured in kidney tissue analysis.

METHODS

Collection

Loons found dead or moribund in New England were collected primarily by the U. S. Fish and Wildlife Service, the Maine Audubon Society, and the Loon Preservation Committee of New Hampshire. Private citizens, wildlife rehabilitators, and area veterinarians also contributed birds. Loons were collected from freshwater lakes in Maine, New Hampshire, Massachusetts, and Vermont, and from coastal shorelines in Connecticut, Maine, Massachusetts, and Rhode Island. Birds were packed on ice, sent by overnight delivery, and necropsied upon arrival at TUSVM Wildlife Clinic. Some birds were stored frozen (c.-200C) prior to shipping. From 1989-1993, 178 loons (93 adults, 34 immatures, 38 chicks, 5 embryos, and 8 of unknown age) were examined. Thirty-four of these individuals (19 adults and 15 chicks) were selected for metal analysis.

Necropsy, Radiography, and Histopathology

Each cadaver was weighed and a dorsoventral radiograph obtained. All specimens were necropsied. On those specimens not badly autolyzed a standard set of tissues was taken for histopathologic examination. When gross lesions were present they were processed and examined in addition to the standard set of tissues. Tissues were fixed in 10 % neutral buffered formalin, dehydrated, cleared, and embedded in paraffin. Embedded tissues were sectioned at 5 micrometers, stained with hematoxylin and eosin, and examined by the staff of the TUSVM Pathology Department.

Toxicology

Selected toxicologic testing was performed. Liver and kidney were removed at necropsy and stored at -70oC in chemically clean jars (I-Chem Research) prior to analysis. Chemical analysis of tissue were performed by the Research Triangle Institute, and quality assurance by the USFWS Patuxent Analytical Control Facility. Liver and kidney samples were analyzed for aluminum (Al), arsenic (As), boron (B), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), molybdenum (Mo), magnesium (Mg), nickel (Ni), lead (Pb), selenium (Se), strontium (Sr), vanadium (V), and zinc (Zn). Lead , arsenic, and selenium concentrations were determined by graphite furnace atomic absorption. The mean detection limit (mDL) for lead was 0.145 ppm, and for arsenic and selenium was 0.128 ppm. After digestion and purification steps, mercury concentrations were determined by atomic absorption spectrophotometry (Hatch and Ott 1968)(mDL = 0.026

ppm). The remaining elements were measured using an inductively coupled plasma quantometer; detection limits varied. All tissue values in this paper are expressed in ppm on a wet weight basis.

RESULTS

Major Pathological Findings

Of the 178 loons analyzed to date, major findings include 46 deaths involving trauma, 19 deaths involving infection, 36 deaths involving ingested lead, 14 deaths involving plastic entanglement, and 26 deaths involving aspergillosis. Of the 46 trauma-related deaths, 12 (26%) stemmed from interspecific fighting. Further causes of death include 4 birds with tumors, 4 birds with omphalitis (an umbilical infection), 7 birds shot, 2 birds oiled, and 4 birds with parasites. In some cases pathological findings clearly represented the cause of death, while in other cases birds were presented with multiple sublethal clinical findings, the sum of which may have resulted in death.

A disturbing finding in this study is the high incidence of lead ingestion in adult breeding loons. Lead ingestion was defined as the presence of a dense lead object in a bird's proventriculus or gizzard, other than a fish hook, leader, or swivel. Lead ingestion was the single most common pathologic finding for adult loons (36 of 93, 39%) especially those on freshwater breeding sites (34 of 57, 60%). There were proportionally more male loons (60%) than female loons (40%) with ingested lead. With the exception of one buckshot, all ingested lead was in the form of fishing objects. Only adult birds have thus far been found with ingested lead objects.

Entanglement in monofilament fishing line and fishing nets was another substantial cause of death in adult and immature loons (14 of 127, 11%). Ingested monofilament line and swivels, however, appeared to result in no pathology. Ingested fish hooks usually caused little pathology, but were clearly the cause of death in 3 individuals. Hooks were often associated with trauma to the esophagus, or with small granulomas in the proventricular or gizzard wall. In two cases, hooks penetrated the gastrointestinal tract and caused abdominal adhesions. In one case, a hook resulted in fatal peritonitis. The metal composition of hooks may be a major variable contributing to their persistence and traumatic effect.

Tissue Analyses

Liver tissues from 34 loons (19 adults and 15 chicks) and kidney tissues from 12 loons (7 adults and 5 chicks) were analyzed for metals and trace elements. Lead, mercury, aluminum, selenium, iron, and cadmium were found in elevated concentrations, and are discussed below.

Aluminum

Twenty of the 34 loons tested for liver aluminum concentrations had levels below the detection limit. For adults, aluminum levels ranged from <0.628 to 5.33 ppm ($\bar{x}$ = 1.12 ppm). For chicks, liver aluminum levels ranged from <0.588 to 5.08 ppm ($\bar{x}$ = 1.10 ppm). As for the 12 loons whose kidneys were tested for aluminum, 6 had levels below the detection limit.

Adults ranged from <0.998 to 7.743 ppm (x =1.582 ppm). Chicks ranged from <0.245 to 19.488 ppm (x = 2.876 ppm).

Liver and kidney aluminum levels showed no significant correlation with mercury, lead, selenium, iron, or cadmium levels. In addition, aluminum levels in the liver showed no correlation with aluminum levels in the kidney of the same bird (r=-0.346, n = 11, p = 0.307).

Cadmium

The liver cadmium concentrations in adults ranged from 0.135 to 4.447 ppm (x = 1.746 ppm), and in chicks from <0.012 to 0.109 ppm (x= 0.021 ppm). For kidney levels, adults ranged from 0.840 to 10.227 ppm (x = 4.069 ppm), and chicks ranged from <0.027 to 0.080 ppm (x = 0.043).

Liver cadmium level was significantly linked to liver mercury level (r=0.766, n =33) and liver iron level (r = 0.790, n = 33), but not linked to liver lead level (r=0.425, n = 33). In the kidney, cadmium and mercury were significantly, but not strongly, linked (r=0.556, n = 12), as were cadmium and lead (r=0.511, n = 12). Cadmium levels in the liver and kidney of each bird showed a significant positive correlation to each other (r=0.917, p < 0.0001, n = 11) and a generally linear relationship.

Iron

Liver iron levels ranged from 77.112 to 4104.0 ppm (x = 1380.758) in adults, and from 44.561 to 888.195 ppm (x = 114.906) in chicks. In general, female adults loons had higher liver iron levels (x = 2080.863 ppm) than did males (x = 870.414). In the kidney, iron levels ranged from 127.344 to 396.159 ppm (x = 224.484) in adults, and 49.455 to 159.742 ppm (x = 96.136) in chicks. Of the adults, females had, on average, higher kidney iron levels (x = 312.341 ppm) than did males (x = 175.227 ppm).

Iron levels in the liver were significantly correlated with liver lead (r=0.536, n = 33), selenium (r = 0.824, n = 33), mercury (r = 0.861, n = 33), and cadmium levels. In the kidney, iron levels were correlated with lead (r = 0.833, n = 12), selenium (r = 0.814, n =12), and mercury (r = 0.729, n = 12). The correlation between iron concentrations in the liver and kidney was 0.808 (n = 11, p<0.0015)(see Table 1).

Lead

In adults, liver lead concentrations ranged from <0.063 to 31.09 ppm (x = 1.721 ppm), and kidney lead concentrations ranged from <0.10 to 66.16 ppm (x = 8.581 ppm). Liver lead concentrations in chicks ranged from <0.11 to 1.36 ppm (x = 0.181 ppm), and kidney lead concentrations ranged from 0.20 to <0.81 ppm (x = 0.251 ppm).

Lead toxicosis in waterfowl is considered to exist when liver lead concentration is >6.00 ppm (Friend 1987; Longcore, et. al. 1974). One loon that ingested two lead objects had a liver lead concentration below 6 ppm (4.28 ppm , loon #91-0952). However, as this bird had a dialated and impacted proventriculus, a common sign of lead poisoning, and there is much interspecific variation in lead tolerance, we will assume for this analysis that toxicosis has occurred. In all other cases of lead ingestion, liver lead concentrations were above 6.00 ppm. Liver lead concentrations of birds known to have ingested metal (n=7) ranged from 4.28 to 31.09 ppm (x =12.55 ppm). In comparison, liver lead levels for adult birds not known to have ingested lead (n=10) ranged from <0.063 to 1.75 ppm (x=0.46 ppm). The average weights for loons with ingested lead was 4.2 kg (n = 4) for males and 4.27 kg (n = 3) for females. Of the 10 adults tested without lead toxicosis, the average weight of males was 4.45 kg (n = 4) and the average weight of females was 2.9 kg (n = 6).

Liver lead concentrations were correlated with liver iron levels, and kidney lead concentrations were correlated with kidney iron levels. Measured lead levels in the liver were closely correlated with those in the kidneys ($r = 0.986$, $n = 11$, $p < 0.0001$).

Mercury

Liver samples from 33 loons were analyzed for mercury content. Mercury liver concentrations in the adults ranged from 0.99 to 100.48 ppm, with an average of 17.67 ppm (Table 2). Liver mercury levels were characterized as being elevated when they exceeded 20.0 ppm. Eleven adult loons (58 %) had elevated mercury levels. Of these birds, 4 were male and 7 were female. The average liver concentration in adult males was 9.98 ppm (n=8) and in adult females 29.38 (n=9).

Mercury kidney concentrations in adults ranged from 4.10 to 72.55 ppm (x = 17.65 ppm). The average kidney concentration in adult males was 14.27 ppm, and in adult females 23.45 ppm. Mercury concentrations in chick livers ranged from 0.11 to 1.34 ppm(x = 0.38 ppm). In chick kidneys, mercury ranged from 0.24 to 0.46 ppm (x = 0.33 ppm).

Mercury levels showed a high correlation with selenium levels, both in the liver ($r= 0.940$, $n = 33$) and in the kidney ($r=0.966$, $n = 12$). Liver mercury also showed a positive correlation with liver cadmium levels. Liver mercury levels were not correlated with liver lead levels ($r= 0.231$, $n = 33$), nor were kidney mercury levels correlated with kidney lead levels ($r= 0.598$, $n = 12$). Liver mercury levels were correlated with kidney mercury levels ($r=0.921$, $n = 11$, $p<0.0001$).

Selenium

Liver selenium levels in adults ranged from 0.980 to 38.131 ppm (x =8.296), and in chicks from 0.552 to 1.634 ppm (x =1.091 ppm) (Table 2). A positive relationship between liver mercury and selenium was found in adult loons ($r = 0.906$, $n =17$). The adult with the selenium concentration of 38.131 ppm (#92-031L) also had the highest liver mercury concentration (100.483 ppm). Kidney selenium levels in adults ranged from 4.483 to 12.996 ppm (x = 8.638), and in chicks from 0.821 to 2.018 ppm (x = 1.458 ppm).

A positive correlation existed between selenium and mercury levels both in the kidney and the liver, as was mentioned above. In addition, there was a positive correlation between selenium liver and kidney values ($r=0.884$, $n = 11$, $p < 0.0001$)(see Table 1).

DISCUSSION

Aluminum

Information on toxic tissue levels of aluminum are not currently available for wildlife species. In humans, most soft tissues contain between 0.2 and 0.6 ppm of aluminum (Underwood 1971). Sparling (1991) demonstrated that ducks fed diets with high aluminum levels may show clinical signs of lameness, decreased bone elasticity, bone fractures, and death. Of the five loons examined here with liver aluminum concentrations > 4 ppm, only one exhibited skeletal fractures.

Available forms of environmental aluminum are increased by acid rain. Aluminum does not appear to bioaccumulate; rather, aluminum levels in chicks were, on average, slightly higher than those in adults. This has been noted in previous studies (Pokras et al. 1992). However, aluminum levels in chick liver and kidney tissue measured in this study are substantially lower than those measured in whole chicks by Pokras (0.98 to 17.20 ppm, $\bar{x} = 8.05$ ppm). Aluminum levels in this sample population were not correlated with other metals of interest.

Cadmium

The mean liver cadmium values recorded for adult loons in this study were 1.746 ppm. This is higher than that found in the livers of Louisiana herons (Hydranassa tricolor) (Cheney 1981). Cheney reported mean cadmium levels of 0.078 ppm in heron adults. In addition, liver cadmium levels were significantly higher for adult loons than chicks ($p<0.0001$), which may imply that these metals bioaccumulate. The same was true of kidney cadmium levels ($p=0.0097$). Apparent cadmium bioaccumulation has been found previously in common loon livers (Pokras et al. 1992). Liver cadmium levels in this study were significantly linked to liver mercury levels and liver iron levels, but not linked to liver lead levels. Cadmium can adversely effect cardiovascular, renal, skeletal and systems.

Iron

Liver iron levels were significantly higher for adults than chicks ($p<0.0001$). This was less true for kidney liver levels ($p=0.115$). In addition, liver iron levels were significantly higher for female loons ($p=0.0064$). Liver iron concentration was significantly correlated with liver lead, selenium, mercury, and cadmium. Lead is known to inhibit the enzyme pyrimidine-5-nucleotidase, which ultimately affects red blood cell membrane stability by inhibiting sodium and potassium dependent ATPases (Paglia 1975).

Lead

Lead toxicosis may have a significant affect on loon populations in New England because it affects those birds of breeding age on their breeding grounds. Locke et. al. (1981) reported on three common loons from Maine, New Hampshire, and Wisconsin that died from ingestion on lead objects. Lead ingestion has been reported to be a problem in other avian species as well. A study of mute swans (Cygnus olor) in England (Sears et. al. 1989) reported 55% percent of swans found moribund or debilitated had ingested lead weights. This was the single greatest cause of illness observed in swans during a four year period. Once in the gizzard, lead objects are gradually eroded. Lead compounds are then available for absorption from the digestive tract into the blood and on to other organs (Humphreys 1991). Short term or acute lead poisoning is often detected in the blood. Long term or chronic lead poisoning is often observed from high levels in organs such as the liver and kidney, where lead can be stored for long periods of time. Despite medically sophisticated efforts, most live loons that are found with ingested lead die (Sears et. al. 1989). Chronic lead toxicosis in birds is associated with anemia, immunosuppression, decreased overall weight and muscle mass, central nervous system damage, and lowered reproductive success (Truscott 1970, Paglia 1975, Birkhead 1983, McIntosh 1989). It has been associated with altering red blood cell maturation in laboratory mammals, making them microcytic and hypochromic (Amdur, 1991).

Clemens et. al. (1975) reported lead levels of 2.0 ppm and 5.0 ppm in the liver and kidney, respectively, of healthy waterfowl. Liver lead levels of >6.0 ppm are thought to be toxic in waterfowl (Friend 1987; Longcore, et. al. 1974). One bald eagle diagnosed with lead poisoning had a liver lead level of 5 ppm (Langelier, et. al. 1991). Carnivorous birds may be more sensitive to lead poisoning, as their more acidic ventriculus results in a more rapid dissolution of lead (Langelier, et. al. 1991). Individual response to lead ingestion is quite variable. The interaction of various factors, including amount of lead ingested, time of retention, amount of lead eroded, and individual susceptibility apparently effect survival time (Hoffman, et. al. 1981).

It is difficult to determine why adult loons are ingesting lead objects. Lead weights are sometimes found in the gizzard along with fish hook, swivel, and monofilament line. The ingested weights are usually similar in size to the pebbles found in the gizzards of these birds. It is not known if loons are mistakenly ingesting lead objects along with the pebbles normally found in their gizzards, if they are selectively ingesting the objects based on appearance or taste, or if they are eating live bait fish with hooks and sinkers attached to them.

In the present study the average weight of adults with lead toxicosis ($x = 4.23$ kg, $n=7$) was slightly higher than those without ($x = 3.52$ kg, $n=10$). Most loons with lead toxicosis were presented in good body condition, which may imply that mortality is due to acute toxicosis. Previous studies have also found higher body weights among lead-poisoned loons (Pokras et al. 1992). This is contrary to Hohman (1990) who reported a 10 % body mass reduction in canvas back ducks (Aythya valisineria) that had ingested lead shot.

Mercury

Mercury was found to be the most frequently elevated contaminant in the tissues analyzed. The minimum level for acute toxicity in raptors has been reported to be between 20 and 45 ppm (Scheuhammer, 1987; Noble, 1990). Wobeser (1981) reported that mercury levels greater than 10.0 ppm in the liver may be high enough to cause clinical signs or even reproductive impairment in waterfowl. Frank (1983) reported liver mercury levels in healthy loons to range from 1.92 to 6.35 ppm (n=5) versus emaciated loons with mercury levels of 16.0-26.4 ppm (n=5). Mercury disrupts motor coordination, thereby affecting diving ability and thus feeding ability of loons.

Liver mercury levels were significantly higher in adult loons than in chicks (p=0.0003), as were kidney mercury levels (p=0.0080). Bioaccumulation of mercury has been noted previously in common loon populations (Pokras et al. 1992). One interesting finding in this study is the significant difference in liver mercury levels between male and female loons (p=0.0026). Poppenga (1992) hypothesized that sublethal effects of elevated mercury concentrations altered loon behavior such that affected birds are predisposed to lead ingestion. He reported a correlation coefficient (r) value of 0.76 ($p < 0.0006$) for liver and kidney lead and mercury levels. Our data show no such relationship for lead and mercury.

Selenium

Selenium, an essential dietary trace element, is considered toxic in waterfowl at liver concentrations >21.2 ppm wet weight (Ohlendorf et al. 1988). In waterfowl exhibiting toxic effects, Ohlendorf reported a mean liver selenium concentration of 94.4 ppm dry weight, or approximately 24 ppm wet weight. Control birds were reported to have values an order of magnitude less, with a range of 8.3 to 12.2 ppm dry weight. Our study included two adults, both females, with liver selenium values > 21.2 ppm (#92-011L, 23.783 ppm; 92-031L, 38.131 ppm). Two more adult females had liver selenium levels < 21.2 ppm but substantially higher than Ohlendorf's control birds (91-1334,18.515 ppm;#91-0805,18.545 ppm). Loon #92-031L, the adult with the highest liver selenium value of 38.131 ppm, also had the highest liver mercury level of 100.48 ppm. In Ohlendorf's study adult birds with elevated selenium concentrations were emaciated, had extensive hepatic lesions, and had fluid and fibrin in the peritoneal cavity. While all four birds mentioned above were emaciated, they did not exhibit the other symptoms described by Ohlendorf.

Selenium levels in livers and kidneys were higher for adults loons than for chicks (p=0.0001), which implies that selenium bioaccumulates with age. This relationship was also evident in the kidney (p=0.0005). Selenium bioaccumulation has been found in previous studies on loons (Pokras et al. 1992). The present study also found selenium concentration to be significantly linked to mercury concentration, and female loons to have a significantly higher liver selenium level than male loons (p=0.0011).

Kidney vs. Liver

One of the aims of this study is to compare metal concentrations in the kidney and liver tissue of loons. Published toxicological data on loon tissue has varied as to which of these organs was analyzed, and a concurrent lack of information has made it is difficult to compare one to the other. This study shows that there exists significant correlation between liver and kidney values for concentrations of cadmium, iron, lead, mercury, and selenium. In contrast, we found little correlation between liver and kidney aluminum levels (see Table 1).

CONCLUSIONS

This study provides an overview of environmental factors affecting the common loon in the northeast United States. While this survey may not give a complete representation of regional loon populations in the northeast, we believe it raises important issues and questions. Adult loons are being adversely effected by environmental contaminants, most notably lead. Loons are already susceptible to human disturbance (e.g., boating, recreational activities, and shoreline developments). In addition to these disturbances, the incidence of lead ingestion may have serious consequences for breeding loons.

This study also shows that several other metals should be considered as threats to breeding populations of loons, and perhaps other piscivorous species. Mercury and selenium concentrations have been found to be relatively high in this sample population. In the future we hope to expand the range of our study to include other avian piscivores and to further quantify environmental contaminants.

REFERENCES

Alexander, L. L. 1985. Trouble with loons. Living Birds Q. 4: 10-13.

Amdur, Mary O., Doull, John, and Curtis D. Klaassen (eds.). 1991. Casaret and Doull's Toxicology. Pergamon Press, New York.: 639-666.

Anderson, W. L., and S. P. Havera. (eds.) Feierabend, J. S., and A. B. Russell. 1986. Blood lead, protopotphyrin, and ingested shot for detecting lead poisoning in waterfowl. Proceed. of synposium held March 1984 on lead poisoning in wild waterfowl. Int. Assoc. of Fish and Wildlife Agencies, Washington D. C.: 10.

Barr, J. F. 1986. Population dynamics of the common loon (Gavia immer) associated with mercury-contaminated waters in northwestern Ontario. Canadian Wildlife Service Occasional Paper. 56

Braune, B. M., and D. D. Gaskin. 1987. Comparison of total mercury levels in relation to diet and molt for nine species of marine birds. Arch. Environ. Toxicol. Contam. 16: 217-224.

Burger, J. and M. Gochfeld. 1991. Lead, Mercury, and cadmium in feathers of tropical terns in Puerto Rico and Australia. Arch. Environ. Contam. Toxicol. 21: 311-315.

Campbell, R. C. 1974. Statistics for Biologists. Cambridge University Press.2nd ed: 366.

Cheney, M. A.; Hacker C. S.; and Schroder G. D. 1981. Bioaccumulation of lead and cadmium in the Louisiana heron (Hydranassa tricolor) and the cattle egret (Bubulcus ibis). Ecotox. and Environ. Safety. 5: 211-224.

Clemens, E. T., Krook, L., Aronson, A. L., and C. E. Stevens. 1975. Pathogenesis of lead shot poisoning in mallard duck. Cornell Vet. 65: 248.

Dahlquist, R. L., and J. W. Knoll. 1978. Inductively coupled plasma-atomic emission spectrometry: analysis of biological materials and soils for major, trace, and untra trace elements. Appl. Spectro. 32: 1-29.

Environmental Protection Agency. 1981. Interim methods for sampling and analyses of priority pollutants in sediments and fish tissues. US EPA, EPA 600/4-81-055. Cincinnati, Ohio.

Feierbend, J. S., and A. B. Russell (eds.). 1986. Lead poisoning in wild waterfowl. National Wildlife Federation, Washington, D. C.: 139.

Fisher, F. M. Jr., and S. L. Hall. (eds.) Feierabend, J. S., and A. B. Russell. 1986. Heavy metal concentrations of duck tissues in relation to ingestion of spent shot. Proceed. of synposium held March 1984 on lead poisoning in wild waterfowl. : 37-42.

Frank, R. 1983. Residues of organochlorine insecticides, industrial chemicals, and mercury in eggs and in tissues taken from healthy and emaciated common loons, Ontario, Canada, 1968-1980. Arch. Environ. Contam. Toxicol. 12: 641-654.

Friend, M. 1987. Lead poisoning. In : Friend, M. Field Guide to Wildlife Diseases. U.S. Fish & Wildlife Service Resource Publication. 167: 175-189.

Furness, R. W., Lewis, S. A., and J. A. Mills. 1990. Mercury levels in the plumage of red-billed gulls Larus novaehollandiae scopulinus of known sex and age. Environ. Pollut. 63: 33-39.

Hatch, W. R., and W. L. Ott. 1968. Determination of sub-microgram quantities of mercury by atomic absorption spectrophotometry. Anal. Chem. 40(14): 2085-2087.

Heinz, G. H., Hoffman, D. J., and L. G. Gold. 1989. Impaired reproduction of mallards fed an organic form of selenium. J. Wildl. Manage. 53(2): 418-428.

Hemphill, F. G., Kaeberle, M. L., and W. B. Buck. 1971. Lead suppression of mouse resistance toSalmonella typhimuriam . Scienc . 172: 1031-1032.

Hoffman, D. J., and G. H. Heinz. 1988. Embryonic and teratogenic effects of selenium in the diet of mallards. J. Toxicol. Environ. Health. 24: 477-490.

Hoffman, D.J., O.H. Pattee, S.N. Wiemeyer, and B. Mulhern. 1981. Effects of lead shot ingestion on d-aminolevulinic acid dehydratase activity, hemoglobin concentration, and serum chemistry in bald eagles. Journal of Wildlife Diseases. 17(3): 423-431.

Hohman, W. L.; Pritchert, R. D.; Pace, R. M. III; Woolington, D. W.; and Helm, R. 1990. Influence of ingested lead on body mass of wintering canvasbacks. J. Wildl. Man. 54(2): 211-215.

Humphreys, D. J. 1991. Effects of exposure to excessive quantities of lead on animals. Br. Vet. J. 147: 18 - 30.

Langelier, K.M., C.E. Andress, T.K. Grey, C. Wooldridge, R. Lewis, and R. Marchetti. 1991. Lead poisoning in bald eagles in British Columbia. Can Vet J. 32: February, 108-109.

Lewis, S. A., and R. W. Furness. 1991. Mercury accumulation and excretion in laboratory reared black-headed gull Larus ridibundus chick. Arch. Environ. Contam. Toxicol. 11: 99-102.

Lock, J. W., Thompson, D. R., Furness, R. W., and J. A. Bartle. 1992. Metal concentrations in seabirds of the New Aealand region. Environ. Pollut. 75(3): 289-300.

Locke, L. N., S. M. Kerr, and D. Zoromski. 1981. Lead poisoning in common loons (Gavia immer). Av. Dis. 26: 392-396.

Longcore, J. R., L. N. Locke, G. E. Bagley, and R. Andrews. 1974. Significance of lead residues in mallard tissues. Special Science Report Wildlife . U.S. Fish and Wildlife Service, Washington, D.C. 182: 24 .

McIntyre, J. M. W. 1988. The common loon: spirit of the northern lakes. U. Minn. Press.

Noble, D. G.; and Elliott, J. E. 1990. Levels of contaminants in Canadian raptors, 1966 to 1988; effects and temporal trends. Canadian Field-Naturalist. 104(2): 222-243.

Ohlendorf, H. M., Kilness, A. W., Simmons, J. L., Stroud, R. K., Hoffman, D. J., and J. F. Moore. 1988. Selenium toxicosis in wild aquatic birds. J. Toxicol. Environ. Health. 24: 67-92.

Paglia, D. E.; Valintine, W. N.; and Dahlgren, J. G. 1975. Effects of low level lead exposure on pyrimidine-5'-nucleotidase and other erythrocyte enzymes. J. Clin. Invest. 56: 1164-1169.

Pain, D. J. 1989. Haematological parameters as predictors of blood lead and indicators of lead poisoning in the black duck (Anas rubripes). Environmental Pollution. 60: 67-81.

Pokras, M., Chafel, R., Rohrbach, S., Press, C., Perry, C., and J. Burger. 1992. Environmental pathology of 124 common loons from the northeastern United States, 1989-1992. The Loon and Its Ecosystem: Status, Management, and Environmental Concerns:20-53. American Loon Conference Proceedings, U. S. Fish and Wildlife Service.

Pokras, M., and Chafel, R. 1992. Lead toxicosis from ingesting fishing sinkers in adult common loons (Gavia immer) in New England. Journal of Zoo and Wildlife Medicine. 23(1): 92-97.

Poppenga, R. Cooley, T., Schmitt, S., O'Brien, D., Braselton, E., Sikarskie, J., Lloyd, J., Evers, D. 1992. Liver and kidney metal concentrations from a series of common loons determined by inductively coupled argon plasma emission spectroscopy. The Loon and Its Ecosystem: Status, Management, and Environmental Concerns. American Loon Conference Proceedings, U. S. Fish and Wildlife Service.

Redig, P T., Lawler, E. M., Schwartz, S., Dunnette, J. L., Stephenson, B., and G. E. Duke. 1991. Effects of Chronic Exposure to Sublethal Concentrations of Lead Acetate on Heme Synthesis and Immune Function in Red-Tailed Hawks. Arch Environ. Contam. 21: 72-77.

Scheuhammer, A. M. 1987. The chronic toxicity of aluminum, cadmuim, mercury, and lead in birds: a review. Environmental Pollution. 46: 263-295.

Scheuhammer, A. M. 1991. Effects of acidification on the availability of toxic metals and calcium to wild birds and mammals. Environmental Pollution. 71: 329-375.

Sears, J., S. W. Cooke, Z. R. Cooke, and T. J. Heron. 1989. A method for the treatment of lead poisoning in the mute swan (Cygnus olor) and its long-term success. Br. Vet. J. 145: 586-595.

Sheridan, R., Cocciasecca, B. Latteur, C., and B. Capel. 1989. Lead contamination of the skeleton of some seabirds. Aves. Spec. Issue. 26: 229-232.

Sparling, D. W. 1991. Acid precipitation and food quality: Effects of dietary aluminum, calcium, and phosphorus on bone and liver characteristics in American black ducks and mallards. Arch. Environ. Contamin. and Toxicol. 21(2): 281-288.

Strong, P.I.V. 1990. The suitability of the common loon as an indicator species. Wildl. Soc. Bull. 18:257-261.

Stroud, R. K. 1983. Information summary: Common loon die-off winter and spring of 1983. Report, Natl. Wildl. Health Lab. U. S. Fish and Wildlife Service, Madison, WI.

Truscott, R. B. 1970. Endotoxin in chicks: effect of lead acetate. Can. Jour. Comp. Med. 34: 134-137.

Trust, K. A. , M. W. Miller, J. K. Ringelman and I. M. Orme. 1990. Effect of ingested lead on antibody production in mallards (Anas platyrhynchos). J. Wildl. Dis. 26(3): 316-322.

Underwood, W.J. 1971. Trace Elements in Human and Animal Nutrition. Academic Press, Inc., New York.

Watkinson, J. H. 1966. Flourometric determination of selenium in biological material with 2,3 diaminonaphthalene. Anal. Chem. 38: 92-96.

Wobeser, G. A. 1981. Diseases of waterfowl. Plenum Publishing, New York, NY.

Appendix 1. Analytical results from the analysis of liver and kidney samples from 34 Common Loons collected in New England.

ECDMS ANALYTICAL REPORT (6)

04-Mar-94

Catalog: 5030027 Regional Study Id: 5f04 Purchase Order: 85830-3-3885

User Id: R5NEFO Submitter: Ken Carr - Concord, NH

Lab Name: Research Triangle Institute (RTI)

Report Includes the Following Sections:

- Weight, % Moisture, % Lipid, Total Suspended Solids
- Soil / Sediment Parameters
- Contaminant Concentrations
- Procedural Blanks
- Duplicates
- Reference Materials
- Spike Recoveries
- Comments (Result Modifers and QA/QC Comments)
- Analytical Methods

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS

Sample Number	Sample Matrix	Sample Weight (g)	Percent Moisture	Percent Lipid	Total Suspended Solids (%)
901142	Kidney	15.66	85.6		
910849K	Kidney	8.09	78.6		
910952K	Kidney	3.77	75.9		
911220K	Kidney	13.97	83.5		
920015LK	Kidney	14.03	77		
920018K	Kidney	20.88	79.8		
920018LK	Kidney	1.13	64.6		
920019LK	Kidney	6.46	83.1		
920021LK	Kidney	15.35	79.9		
920023LK	Kidney	.67	70.1		
920029LK	Kidney	14.46	75.1		
920030LK	Kidney	9.55	72.6		
93025L	Kidney	21.95	76.4		
890646	Liver	38.75	73.6		
900040	Liver	2.72	78.3		
900798	Liver	60.66	73.8		
910805	Liver	38.57	75.2		
910849L	Liver	54.61	76.6		
910952L	Liver	34.29	77		
911047	Liver	24.31	74.7		
911048	Liver	52.35	71		
911220L	Liver	33.38	78.5		
911243	Liver	61.98	75		
911334	Liver	41.45	77.5		
920011L	Liver	21.05	75.4		
920015LL	Liver	20.44	72.1		
920018L	Liver	46.79	75.5		
920018LL	Liver	5.03	90		
920019LL	Liver	18.81	77.7		
920020L	Liver	8.29	77.1		
920021LL	Liver	18.58	73		
920022L	Liver	2.92	75		
920023LL	Liver	3.13	74.4		
920025L	Liver	19.24	78.5		

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS (Cont.)

Sample Number	Sample Matrix	Sample Weight (g)	Percent Moisture	Percent Lipid	Total Suspended Solids (%)
920026L	Liver	19.72	75.6		
920027L	Liver	5.07	82.6		
920029LL	Liver	22.52	65.9		
920030LL	Liver	33.98	76.8		
920031L	Liver	19.45	71.2		
920033L	Liver	22.19	76.9		
93002L	Liver	23.3	65.9		
93007L	Liver	13.79	69.9		
93008L	Liver	14.55	87.4		
93009L	Liver	3.52	76.1		
93012L	Liver	24.62	67.3		
930145	Liver	20.96	78.3		

SOIL / SEDIMENT PARAMETERS

Sample Number	Percent TVS	Percent TOC	Particle Size %Sand	Particle Size %Silt	Particle Size %Clay

- NO DATA EXIST FOR THIS SECTION.

CONTAMINANT CONCENTRATIONS

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Al	901142	Kidney	< 11.2613	11.2613	< 1.6216272	1.6216272
	910849K	Kidney	< 11.4679	11.4679	< 2.4541306	2.4541306
	910952K	Kidney	32.13	6.5104	7.74333	1.5690064
	911220K	Kidney	< 6.7751	6.7751	< 1.1178915	1.1178915
	920015LK	Kidney	9.373	4.9603	2.15579	1.140869
	920018K	Kidney	< 4.9407	4.9407	< .9980214	.9980214
	920018LK	Kidney	55.05	22.7273	19.4877	8.0454642
	920019LK	Kidney	< 15.625	15.625	< 2.640625	2.640625
	920021LK	Kidney	18.67	4.8638	3.75267	.9776238
	920023LK	Kidney	< 25.7732	25.7732	< 7.7061868	7.7061868
	920029LK	Kidney	7.085	4.8638	1.764165	1.2110862
	920030LK	Kidney	5.898	4.902	1.616052	1.343148
	890646	Liver	9.383	4.9116	2.477112	1.2966624
	900040	Liver	23.41	6.4267	5.07997	1.3945939
	900798	Liver	5.017	4.9603	1.314454	1.2995986
	910805	Liver	5.657	4.9116	1.402936	1.2180768
	910849L	Liver	< 4.9801	4.9801	< 1.1653434	1.1653434
	910952L	Liver	7.905	4.9603	1.81815	1.140869
	911047	Liver	5.201	4.9702	1.315853	1.2574606
	911048	Liver	< 4.931	4.931	< 1.42999	1.42999
	911220L	Liver	6.452	4.9213	1.38718	1.0580795
	911243	Liver	< 4.9702	4.9702	< 1.24255	1.24255
	911334	Liver	< 4.9407	4.9407	< 1.1116575	1.1116575
	920011L	Liver	< 4.9702	4.9702	< 1.2226692	1.2226692
	920015LL	Liver	< 4.99	4.99	< 1.39221	1.39221
	920018L	Liver	21.76	9.7656	5.3312	2.392572
	920018LL	Liver	< 5.8824	5.8824	< .58824	.58824
	920019LL	Liver	20.36	4.9603	4.54028	1.1061469
	920020L	Liver	< 5	5	< 1.145	1.145
	920021LL	Liver	< 4.9702	4.9702	< 1.341954	1.341954
	920022L	Liver	< 16.7785	16.7785	< 4.194625	4.194625
	920023LL	Liver	< 5.1546	5.1546	< 1.3195776	1.3195776
	920025L	Liver	< 4.9213	4.9213	< 1.0580795	1.0580795
	920026L	Liver	20.73	4.9801	5.05812	1.2151444

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Al	920027L	Liver	< 6.2035	6.2035	< 1.079409	1.079409
	920029LL	Liver	12.98	4.9505	4.42618	1.6881205
	920030LL	Liver	< 4.9213	4.9213	< 1.1417416	1.1417416
	920031L	Liver	< 4.9407	4.9407	< 1.4229216	1.4229216
	920033L	Liver	8.139	4.9603	1.880109	1.1458293
	93002L	Liver	< 4.8544	4.8544	< 1.6553504	1.6553504
	93007L	Liver	6.779	4.845	2.040479	1.458345
	93008L	Liver	< 4.9801	4.9801	< .6274926	.6274926
	93009L	Liver	< 13.8889	13.8889	< 3.3194471	3.3194471
	93012L	Liver	< 4.902	4.902	< 1.602954	1.602954
	930145	Liver	< 4.9407	4.9407	< 1.0721319	1.0721319
As	901142	Kidney	< .496	.496	< .071424	.071424
	910849K	Kidney	< .9124	.9124	< .1952536	.1952536
	910952K	Kidney	< .6527	.6527	< .1573007	.1573007
	911220K	Kidney	< .4921	.4921	< .0811965	.0811965
	920015LK	Kidney	< .4912	.4912	< .112976	.112976
	920018K	Kidney	< .495	.495	< .09999	.09999
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< .4921	.4921	< .0831649	.0831649
	920021LK	Kidney	< .4836	.4836	< .0972036	.0972036
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	< .4902	.4902	< .1220598	.1220598
	920030LK	Kidney	< .498	.498	< .136452	.136452
	890646	Liver	< .496	.496	< .130944	.130944
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	< .499	.499	< .130738	.130738
	910805	Liver	.83	.499	.20584	.123752
	910849L	Liver	< .4941	.4941	< .1156194	.1156194
	910952L	Liver	< .4941	.4941	< .113643	.113643
	911047	Liver	< .497	.497	< .125741	.125741
	911048	Liver	< .4892	.4892	< .141868	.141868
	911220L	Liver	< .4941	.4941	< .1062315	.1062315
	911243	Liver	< .496	.496	< .124	.124
	911334	Liver	< .4921	.4921	< .1107225	.1107225

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
As	920011L	Liver	< .4941	.4941	< .1215486	.1215486
	920015LL	Liver	< .497	.497	< .138663	.138663
	920018L	Liver	< .4902	.4902	< .120099	.120099
	920018LL	Liver	< .5896	.5896	< .05896	.05896
	920019LL	Liver	< .4941	.4941	< .1101843	.1101843
	920020L	Liver	< .4883	.4883	< .1118207	.1118207
	920021LL	Liver	< .498	.498	< .13446	.13446
	920022L	Liver	< .4941	.4941	< .123525	.123525
	920023LL	Liver	< .5165	.5165	< .132224	.132224
	920025L	Liver	< .4883	.4883	< .1049845	.1049845
	920026L	Liver	< .4941	.4941	< .1205604	.1205604
	920027L	Liver	< .496	.496	< .086304	.086304
	920029LL	Liver	< .4864	.4864	< .1658624	.1658624
	920030LL	Liver	< .4873	.4873	< .1130536	.1130536
	920031L	Liver	1.39	.4941	.40032	.1423008
	920033L	Liver	< .4826	.4826	< .1114806	.1114806
	93002L	Liver	2.04	.498	.69564	.169818
	93007L	Liver	< .497	.497	< .149597	.149597
	93008L	Liver	.87	.4941	.10962	.0622566
	93009L	Liver	< .4931	.4931	< .1178509	.1178509
	93012L	Liver	< .4931	.4931	< .1612437	.1612437
	930145	Liver	1.76	.497	.38192	.107849
B	901142	Kidney	2.454	1.1261	.353376	.1621584
	910849K	Kidney	7.856	1.1468	1.681184	.2454152
	910952K	Kidney	9.83	.651	2.36903	.156891
	911220K	Kidney	6.135	.6775	1.012275	.1117875
	920015LK	Kidney	1.889	.496	.43447	.11408
	920018K	Kidney	10.3	.4941	2.0806	.0998082
	920018LK	Kidney	30.69	2.2727	10.86426	.8045358
	920019LK	Kidney	10.66	1.5625	1.80154	.2640625
	920021LK	Kidney	2.439	.4864	.490239	.0977664
	920023LK	Kidney	55.58	2.5773	16.61842	.7706127
	920029LK	Kidney	3.511	.4864	.874239	.1211136
	920030LK	Kidney	4.114	.4902	1.127236	.1343148

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
B	890646	Liver	3.349	.4912	.884136	.1296768
	900040	Liver	22.34	.6427	4.84778	.1394659
	900798	Liver	1.635	.496	.42837	.129952
	910805	Liver	1.873	.4912	.464504	.1218176
	910849L	Liver	< .498	.498	< .116532	.116532
	910952L	Liver	.8006	.496	.184138	.11408
	911047	Liver	< .497	.497	< .125741	.125741
	911048	Liver	< .4931	.4931	< .142999	.142999
	911220L	Liver	2.803	.4921	.602645	.1058015
	911243	Liver	< .497	.497	< .12425	.12425
	911334	Liver	4.084	.4941	.9189	.1111725
	920011L	Liver	3.344	.497	.822624	.122262
	920015LL	Liver	2.258	.499	.629982	.139221
	920018L	Liver	9.811	.9766	2.403695	.239267
	920018LL	Liver	8.381	.5882	.8381	.05882
	920019LL	Liver	4.01	.496	.89423	.110608
	920020L	Liver	5.052	.5	1.156908	.1145
	920021LL	Liver	3.787	.497	1.02249	.13419
	920022L	Liver	11.84	1.6779	2.96	.419475
	920023LL	Liver	3.635	.5155	.93056	.131968
	920025L	Liver	.6891	.4921	.1481565	.1058015
	920026L	Liver	2.51	.498	.61244	.121512
	920027L	Liver	6.972	.6203	1.213128	.1079322
	920029LL	Liver	3.204	.495	1.092564	.168795
	920030LL	Liver	< .4921	.4921	< .1141672	.1141672
	920031L	Liver	8.132	.4941	2.342016	.1423008
	920033L	Liver	4.246	.496	.980826	.114576
	93002L	Liver	2.69	.4854	.91729	.1655214
	93007L	Liver	3.441	.4845	1.035741	.1458345
	93008L	Liver	6.366	.498	.802116	.062748
	93009L	Liver	7.794	1.3889	1.862766	.3319471
	93012L	Liver	2.892	.4902	.945684	.1602954
	930145	Liver	7.468	.4941	1.620556	.1072197
Ba	901142	Kidney	< 1.1261	1.1261	< .1621584	.1621584

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Ba	910849K	Kidney	1.611	1.1468	.344754	.2454152
	910952K	Kidney	2.994	.651	.721554	.156891
	911220K	Kidney	< .6775	.6775	< .1117875	.1117875
	920015LK	Kidney	< .496	.496	< .11408	.11408
	920018K	Kidney	< .4941	.4941	< .0998082	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< 1.5625	1.5625	< .2640625	.2640625
	920021LK	Kidney	< .4864	.4864	< .0977664	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	< .4864	.4864	< .1211136	.1211136
	920030LK	Kidney	< .4902	.4902	< .1343148	.1343148
	890646	Liver	.8734	.4912	.2305776	.1296768
	900040	Liver	.6582	.6427	.1428294	.1394659
	900798	Liver	< .496	.496	< .129952	.129952
	910805	Liver	< .4912	.4912	< .1218176	.1218176
	910849L	Liver	< .498	.498	< .116532	.116532
	910952L	Liver	< .496	.496	< .11408	.11408
	911047	Liver	< .497	.497	< .125741	.125741
	911048	Liver	< .4931	.4931	< .142999	.142999
	911220L	Liver	< .4921	.4921	< .1058015	.1058015
	911243	Liver	< .497	.497	< .12425	.12425
	911334	Liver	< .4941	.4941	< .1111725	.1111725
	920011L	Liver	< .497	.497	< .122262	.122262
	920015LL	Liver	< .499	.499	< .139221	.139221
	920018L	Liver	< .9766	.9766	< .239267	.239267
	920018LL	Liver	< .5882	.5882	< .05882	.05882
	920019LL	Liver	< .496	.496	< .110608	.110608
	920020L	Liver	< .5	.5	< .1145	.1145
	920021LL	Liver	< .497	.497	< .13419	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475
	920023LL	Liver	< .5155	.5155	< .131968	.131968
	920025L	Liver	< .4921	.4921	< .1058015	.1058015
	920026L	Liver	< .498	.498	< .121512	.121512
	920027L	Liver	< .6203	.6203	< .1079322	.1079322
	920029LL	Liver	< .495	.495	< .168795	.168795

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Ba	920030LL	Liver	< .4921	.4921	< .1141672	.1141672
	920031L	Liver	< .4941	.4941	< .1423008	.1423008
	920033L	Liver	< .496	.496	< .114576	.114576
	93002L	Liver	< .4854	.4854	< .1655214	.1655214
	93007L	Liver	< .4845	.4845	< .1458345	.1458345
	93008L	Liver	< .498	.498	< .062748	.062748
	93009L	Liver	< 1.3889	1.3889	< .3319471	.3319471
	93012L	Liver	< .4902	.4902	< .1602954	.1602954
	930145	Liver	< .4941	.4941	< .1072197	.1072197
Be	901142	Kidney	< .2252	.2252	< .0324288	.0324288
	910849K	Kidney	< .2294	.2294	< .0490916	.0490916
	910952K	Kidney	< .1302	.1302	< .0313782	.0313782
	911220K	Kidney	< .1355	.1355	< .0223575	.0223575
	920015LK	Kidney	< .0992	.0992	< .022816	.022816
	920018K	Kidney	< .0988	.0988	< .0199576	.0199576
	920018LK	Kidney	< .4545	.4545	< .160893	.160893
	920019LK	Kidney	< .3125	.3125	< .0528125	.0528125
	920021LK	Kidney	< .0973	.0973	< .0195573	.0195573
	920023LK	Kidney	< .5155	.5155	< .1541345	.1541345
	920029LK	Kidney	< .0973	.0973	< .0242277	.0242277
	920030LK	Kidney	< .098	.098	< .026852	.026852
	890646	Liver	< .0982	.0982	< .0259248	.0259248
	900040	Liver	< .1285	.1285	< .0278845	.0278845
	900798	Liver	< .0992	.0992	< .0259904	.0259904
	910805	Liver	< .0982	.0982	< .0243536	.0243536
	910849L	Liver	< .0996	.0996	< .0233064	.0233064
	910952L	Liver	< .0992	.0992	< .022816	.022816
	911047	Liver	< .0994	.0994	< .0251482	.0251482
	911048	Liver	< .0986	.0986	< .028594	.028594
	911220L	Liver	< .0984	.0984	< .021156	.021156
	911243	Liver	< .0994	.0994	< .02485	.02485
	911334	Liver	< .0988	.0988	< .02223	.02223
	920011L	Liver	< .0994	.0994	< .0244524	.0244524
	920015LL	Liver	< .0998	.0998	< .0278442	.0278442

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Be	920018L	Liver	< .1953	.1953	< .0478485	.0478485
	920018LL	Liver	< .1176	.1176	< .01176	.01176
	920019LL	Liver	< .0992	.0992	< .0221216	.0221216
	920020L	Liver	< .1	.1	< .0229	.0229
	920021LL	Liver	< .0994	.0994	< .026838	.026838
	920022L	Liver	< .3356	.3356	< .0839	.0839
	920023LL	Liver	< .1031	.1031	< .0263936	.0263936
	920025L	Liver	< .0984	.0984	< .021156	.021156
	920026L	Liver	< .0996	.0996	< .0243024	.0243024
	920027L	Liver	< .1241	.1241	< .0215934	.0215934
	920029LL	Liver	< .099	.099	< .033759	.033759
	920030LL	Liver	< .0984	.0984	< .0228288	.0228288
	920031L	Liver	< .0988	.0988	< .0284544	.0284544
	920033L	Liver	< .0992	.0992	< .0229152	.0229152
	93002L	Liver	< .0971	.0971	< .0331111	.0331111
	93007L	Liver	< .0969	.0969	< .0291669	.0291669
	93008L	Liver	< .0996	.0996	< .0125496	.0125496
	93009L	Liver	< .2778	.2778	< .0663942	.0663942
	93012L	Liver	< .098	.098	< .032046	.032046
	930145	Liver	< .0988	.0988	< .0214396	.0214396
Cd	901142	Kidney	14.55	.2252	2.0952	.0324288
	910849K	Kidney	.2964	.2294	.0634296	.0490916
	910952K	Kidney	15.66	.1302	3.77406	.0313782
	911220K	Kidney	61.98	.1355	10.2267	.0223575
	920015LK	Kidney	35.71	.0992	8.2133	.022816
	920018K	Kidney	4.16	.0988	.84032	.0199576
	920018LK	Kidney	< .4545	.4545	< .160893	.160893
	920019LK	Kidney	< .3125	.3125	< .0528125	.0528125
	920021LK	Kidney	45.41	.0973	9.12741	.0195573
	920023LK	Kidney	< .5155	.5155	< .1541345	.1541345
	920029LK	Kidney	14.56	.0973	3.62544	.0242277
	920030LK	Kidney	< .098	.098	< .026852	.026852
	890646	Liver	7.084	.0982	1.870176	.0259248
	900040	Liver	< .1285	.1285	< .0278845	.0278845

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cd	900798	Liver	3.305	.0992	.86591	.0259904
	910805	Liver	16.66	.0982	4.13168	.0243536
	910849L	Liver	.112	.0996	.026208	.0233064
	910952L	Liver	7.986	.0992	1.83678	.022816
	911047	Liver	.2073	.0994	.0524469	.0251482
	911048	Liver	< .0986	.0986	< .028594	.028594
	911220L	Liver	14.82	.0984	3.1863	.021156
	911243	Liver	.139	.0994	.03475	.02485
	911334	Liver	10.54	.0988	2.3715	.02223
	920011L	Liver	14.88	.0994	3.66048	.0244524
	920015LL	Liver	6.346	.0998	1.770534	.0278442
	920018L	Liver	2.01	.1953	.49245	.0478485
	920018LL	Liver	< .1176	.1176	< .01176	.01176
	920019LL	Liver	< .0992	.0992	< .0221216	.0221216
	920020L	Liver	< .1	.1	< .0229	.0229
	920021LL	Liver	16.47	.0994	4.4469	.026838
	920022L	Liver	< .3356	.3356	< .0839	.0839
	920023LL	Liver	.2605	.1031	.066688	.0263936
	920025L	Liver	< .0984	.0984	< .021156	.021156
	920026L	Liver	< .0996	.0996	< .0243024	.0243024
	920027L	Liver	< .1241	.1241	< .0215934	.0215934
	920029LL	Liver	6.062	.099	2.067142	.033759
	920030LL	Liver	< .0984	.0984	< .0228288	.0228288
	920031L	Liver	12.53	.0988	3.60864	.0284544
	920033L	Liver	.4714	.0992	.1088934	.0229152
	93002L	Liver	4.463	.0971	1.521883	.0331111
	93007L	Liver	4.648	.0969	1.399048	.0291669
	93008L	Liver	1.071	.0996	.134946	.0125496
	93009L	Liver	< .2778	.2778	< .0663942	.0663942
	93012L	Liver	5.511	.098	1.802097	.032046
	930145	Liver	12.05	.0988	2.61485	.0214396
Cr	901142	Kidney	< 1.1261	1.1261	< .1621584	.1621584
	910849K	Kidney	1.444	1.1468	.309016	.2454152
	910952K	Kidney	2.245	.651	.541045	.156891

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cr	911220K	Kidney	.7049	.6775	.1163085	.1117875
	920015LK	Kidney	1.075	.496	.24725	.11408
	920018K	Kidney	.6032	.4941	.1218464	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< 1.5625	1.5625	< .2640625	.2640625
	920021LK	Kidney	.9099	.4864	.1828899	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	1.182	.4864	.294318	.1211136
	920030LK	Kidney	1.062	.4902	.290988	.1343148
	890646	Liver	.8477	.4912	.2237928	.1296768
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	1.198	.496	.313876	.129952
	910805	Liver	< .4912	.4912	< .1218176	.1218176
	910849L	Liver	.7412	.498	.1734408	.116532
	910952L	Liver	1.662	.496	.38226	.11408
	911047	Liver	.6643	.497	.1680679	.125741
	911048	Liver	.5226	.4931	.151554	.142999
	911220L	Liver	.8243	.4921	.1772245	.1058015
	911243	Liver	.5022	.497	.12555	.12425
	911334	Liver	.7325	.4941	.1648125	.1111725
	920011L	Liver	.8918	.497	.2193828	.122262
	920015LL	Liver	< .499	.499	< .139221	.139221
	920018L	Liver	< .9766	.9766	< .239267	.239267
	920018LL	Liver	< .5882	.5882	< .05882	.05882
	920019LL	Liver	2.675	.496	.596525	.110608
	920020L	Liver	< .5	.5	< .1145	.1145
	920021LL	Liver	.5814	.497	.156978	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475
	920023LL	Liver	.6598	.5155	.1689088	.131968
	920025L	Liver	.6183	.4921	.1329345	.1058015
	920026L	Liver	3.998	.498	.975512	.121512
	920027L	Liver	< .6203	.6203	< .1079322	.1079322
	920029LL	Liver	1.034	.495	.352594	.168795
	920030LL	Liver	.8163	.4921	.1893816	.1141672
	920031L	Liver	.5456	.4941	.1571328	.1423008

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cr	920033L	Liver	.8592	.496	.1984752	.114576
	93002L	Liver	.5923	.4854	.2019743	.1655214
	93007L	Liver	1.644	.4845	.494844	.1458345
	93008L	Liver	.7824	.498	.0985824	.062748
	93009L	Liver	4.288	1.3889	1.024832	.3319471
	93012L	Liver	1.478	.4902	.483306	.1602954
	930145	Liver	.5882	.4941	.1276394	.1072197
Cu	901142	Kidney	71.85	1.1261	10.3464	.1621584
	910849K	Kidney	35.69	1.1468	7.63766	.2454152
	910952K	Kidney	59.53	.651	14.34673	.156891
	911220K	Kidney	51.3	.6775	8.4645	.1117875
	920015LK	Kidney	23.31	.496	5.3613	.11408
	920018K	Kidney	26.94	.4941	5.44188	.0998082
	920018LK	Kidney	19.56	2.2727	6.92424	.8045358
	920019LK	Kidney	43.79	1.5625	7.40051	.2640625
	920021LK	Kidney	87.65	.4864	17.61765	.0977664
	920023LK	Kidney	14.66	2.5773	4.38334	.7706127
	920029LK	Kidney	44.37	.4864	11.04813	.1211136
	920030LK	Kidney	24.8	.4902	6.7952	.1343148
	890646	Liver	93.43	.4912	24.66552	.1296768
	900040	Liver	10.26	.6427	2.22642	.1394659
	900798	Liver	18.15	.496	4.7553	.129952
	910805	Liver	84.51	.4912	20.95848	.1218176
	910849L	Liver	24.42	.498	5.71428	.116532
	910952L	Liver	88.67	.496	20.3941	.11408
	911047	Liver	197.1	.497	49.8663	.125741
	911048	Liver	20.8	.4931	6.032	.142999
	911220L	Liver	51.54	.4921	11.0811	.1058015
	911243	Liver	12.07	.497	3.0175	.12425
	911334	Liver	38.96	.4941	8.766	.1111725
	920011L	Liver	72.54	.497	17.84484	.122262
	920015LL	Liver	14.21	.499	3.96459	.139221
	920018L	Liver	95.75	.9766	23.45875	.239267
	920018LL	Liver	85.63	.5882	8.563	.05882

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cu	920019LL	Liver	65.7	.496	14.6511	.110608
	920020L	Liver	54.29	.5	12.43241	.1145
	920021LL	Liver	96.7	.497	26.109	.13419
	920022L	Liver	39.79	1.6779	9.9475	.419475
	920023LL	Liver	112.6	.5155	28.8256	.131968
	920025L	Liver	42.15	.4921	9.06225	.1058015
	920026L	Liver	95.54	.498	23.31176	.121512
	920027L	Liver	73.37	.6203	12.76638	.1079322
	920029LL	Liver	26.14	.495	8.91374	.168795
	920030LL	Liver	27.64	.4921	6.41248	.1141672
	920031L	Liver	67.85	.4941	19.5408	.1423008
	920033L	Liver	48.55	.496	11.21505	.114576
	93002L	Liver	206.7	.4854	70.4847	.1655214
	93007L	Liver	28.73	.4845	8.64773	.1458345
	93008L	Liver	21.42	.498	2.69892	.062748
	93009L	Liver	153.8	1.3889	36.7582	.3319471
	93012L	Liver	32.07	.4902	10.48689	.1602954
	930145	Liver	60.97	.4941	13.23049	.1072197
Fe	901142	Kidney	1349	22.5225	194.256	3.24324
	910849K	Kidney	539.2	22.9358	115.3888	4.9082612
	910952K	Kidney	528.4	13.0208	127.3444	3.1380128
	911220K	Kidney	1246	13.5501	205.59	2.2357665
	920015LK	Kidney	1345	9.9206	309.35	2.281738
	920018K	Kidney	913.3	9.8814	184.4866	1.9960428
	920018LK	Kidney	328.4	45.4545	116.2536	16.090893
	920019LK	Kidney	458.5	31.25	77.4865	5.28125
	920021LK	Kidney	1252	9.7276	251.652	1.9552476
	920023LK	Kidney	165.4	51.5464	49.4546	15.4123736
	920029LK	Kidney	1591	9.7276	396.159	2.4221724
	920030LK	Kidney	583	9.8039	159.742	2.6862686
	890646	Liver	12480	9.8232	3294.72	2.5933248
	900040	Liver	225.3	12.8535	48.8901	2.7892095
	900798	Liver	5404	9.9206	1415.848	2.5991972
	910805	Liver	7432	9.8232	1843.136	2.4361536

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Fe	910849L	Liver	601.3	9.9602	140.7042	2.3306868
	910952L	Liver	5108	9.9206	1174.84	2.281738
	911047	Liver	441.2	9.9404	111.6236	2.5149212
	911048	Liver	594	9.8619	172.26	2.859951
	911220L	Liver	10630	9.8425	2285.45	2.1161375
	911243	Liver	412.9	9.9404	103.225	2.4851
	911334	Liver	15720	9.8814	3537	2.223315
	920011L	Liver	7583	9.9404	1865.418	2.4453384
	920015LL	Liver	5280	9.98	1473.12	2.78442
	920018L	Liver	4495	19.5313	1101.275	4.7851685
	920018LL	Liver	487.6	11.7647	48.76	1.17647
	920019LL	Liver	740	9.9206	165.02	2.2122938
	920020L	Liver	385.3	10	88.2337	2.29
	920021LL	Liver	8436	9.9404	2277.72	2.683908
	920022L	Liver	602	33.557	150.5	8.38925
	920023LL	Liver	407.4	10.3093	104.2944	2.6391808
	920025L	Liver	614.6	9.8425	132.139	2.1161375
	920026L	Liver	569.5	9.9602	138.958	2.4302888
	920027L	Liver	256.1	12.4069	44.5614	2.1588006
	920029LL	Liver	7525	9.901	2566.025	3.376241
	920030LL	Liver	500.8	9.8425	116.1856	2.28346
	920031L	Liver	14250	9.8814	4104	2.8458432
	920033L	Liver	3845	9.9206	888.195	2.2916586
	93002L	Liver	3747	9.7087	1277.727	3.3106667
	93007L	Liver	4426	9.6899	1332.226	2.9166599
	93008L	Liver	612	9.9602	77.112	1.2549852
	93009L	Liver	297.5	27.7778	71.1025	6.6388942
	93012L	Liver	1098	9.8039	359.046	3.2058753
	930145	Liver	4019	9.8814	872.123	2.1442638
Hg	901142	Kidney	293.9	.0992	42.3216	.0142848
	910849K	Kidney	1.123	.1825	.240322	.039055
	910952K	Kidney	30.61	.1305	7.37701	.0314505
	911220K	Kidney	195.4	.0984	32.241	.016236
	920015LK	Kidney	94.02	.0982	21.6246	.022586

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Hg	920018K	Kidney	20.28	.099	4.09656	.019998
	920018LK	Kidney	1.292	.4545	.457368	.160893
	920019LK	Kidney	2.06	.0984	.34814	.0166296
	920021LK	Kidney	76.3	.0967	15.3363	.0194367
	920023LK	Kidney	1.526	.5155	.456274	.1541345
	920029LK	Kidney	157.3	.098	39.1677	.024402
	920030LK	Kidney	.8724	.0996	.2390376	.0272904
	890646	Liver	94.53	.0992	24.95592	.0261888
	900040	Liver	2.699	.1285	.585683	.0278845
	900798	Liver	78.15	.0998	20.4753	.0261476
	910805	Liver	222.2	.0998	55.1056	.0247504
	910849L	Liver	.932	.0988	.218088	.0231192
	910952L	Liver	37.14	.0988	8.5422	.022724
	911047	Liver	1.068	.0994	.270204	.0251482
	911048	Liver	.6098	.0978	.176842	.028362
	911220L	Liver	170.6	.0988	36.679	.021242
	911243	Liver	1.116	.0992	.279	.0248
	911334	Liver	419.1	.0984	94.2975	.02214
	920011L	Liver	236	.0988	58.056	.0243048
	920015LL	Liver	107.8	.0994	30.0762	.0277326
	920018L	Liver	23.26	.098	5.6987	.02401
	920018LL	Liver	3.304	.1179	.3304	.01179
	920019LL	Liver	2.855	.0988	.636665	.0220324
	920020L	Liver	2.243	.0977	.513647	.0223733
	920021LL	Liver	113.5	.0996	30.645	.026892
	920022L	Liver	3.318	.0988	.8295	.0247
	920023LL	Liver	5.24	.1033	1.34144	.0264448
	920025L	Liver	.6692	.0977	.143878	.0210055
	920026L	Liver	.4359	.0988	.1063596	.0241072
	920027L	Liver	3.888	.0992	.676512	.0172608
	920029LL	Liver	90.03	.0973	30.70023	.0331793
	920030LL	Liver	1.177	.0975	.273064	.02262
	920031L	Liver	348.9	.0988	100.4832	.0284544
	920033L	Liver	1.72	.0965	.39732	.0222915
	93002L	Liver	16.08	.0996	5.48328	.0339636

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Hg	93007L	Liver	11.53	.0994	3.47053	.0299194
	93008L	Liver	7.852	.0988	.989352	.0124488
	93009L	Liver	3.279	.0986	.783681	.0235654
	93012L	Liver	69.94	.0986	22.87038	.0322422
	930145	Liver	23.28	.0994	5.05176	.0215698
Mg	901142	Kidney	573.5	22.5225	82.584	3.24324
	910849K	Kidney	805.6	22.9358	172.3984	4.9082612
	910952K	Kidney	667.5	13.0208	160.8675	3.1380128
	911220K	Kidney	704.4	13.5501	116.226	2.2357665
	920015LK	Kidney	642.5	9.9206	147.775	2.281738
	920018K	Kidney	699.6	9.8814	141.3192	1.9960428
	920018LK	Kidney	707.4	45.4545	250.4196	16.090893
	920019LK	Kidney	764	31.25	129.116	5.28125
	920021LK	Kidney	726.4	9.7276	146.0064	1.9552476
	920023LK	Kidney	957.4	51.5464	286.2626	15.4123736
	920029LK	Kidney	458.3	9.7276	114.1167	2.4221724
	920030LK	Kidney	724.1	9.8039	198.4034	2.6862686
	890646	Liver	699.8	9.8232	184.7472	2.5933248
	900040	Liver	401.5	12.8535	87.1255	2.7892095
	900798	Liver	578.5	9.9206	151.567	2.5991972
	910805	Liver	722.9	9.8232	179.2792	2.4361536
	910849L	Liver	610.4	9.9602	142.8336	2.3306868
	910952L	Liver	621.8	9.9206	143.014	2.281738
	911047	Liver	624.1	9.9404	157.8973	2.5149212
	911048	Liver	507.3	9.8619	147.117	2.859951
	911220L	Liver	657.4	9.8425	141.341	2.1161375
	911243	Liver	800.7	9.9404	200.175	2.4851
	911334	Liver	677.1	9.8814	152.3475	2.223315
	920011L	Liver	712.8	9.9404	175.3488	2.4453384
	920015LL	Liver	539.1	9.98	150.4089	2.78442
	920018L	Liver	1061	19.5313	259.945	4.7851685
	920018LL	Liver	714	11.7647	71.4	1.17647
	920019LL	Liver	753.7	9.9206	168.0751	2.2122938
	920020L	Liver	597.9	10	136.9191	2.29

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mg	920021LL	Liver	619	9.9404	167.13	2.683908
	920022L	Liver	535.6	33.557	133.9	8.38925
	920023LL	Liver	558.2	10.3093	142.8992	2.6391808
	920025L	Liver	586.8	9.8425	126.162	2.1161375
	920026L	Liver	782.5	9.9602	190.93	2.4302888
	920027L	Liver	657.9	12.4069	114.4746	2.1588006
	920029LL	Liver	607.3	9.901	207.0893	3.376241
	920030LL	Liver	605.7	9.8425	140.5224	2.28346
	920031L	Liver	697	9.8814	200.736	2.8458432
	920033L	Liver	661.5	9.9206	152.8065	2.2916586
	93002L	Liver	704.9	9.7087	240.3709	3.3106667
	93007L	Liver	583.3	9.6899	175.5733	2.9166599
	93008L	Liver	643.9	9.9602	81.1314	1.2549852
	93009L	Liver	480.5	27.7778	114.8395	6.6388942
	93012L	Liver	605.1	9.8039	197.8677	3.2058753
	930145	Liver	548.5	9.8814	119.0245	2.1442638
Mn	901142	Kidney	3.981	.9009	.573264	.1297296
	910849K	Kidney	6.216	.9174	1.330224	.1963236
	910952K	Kidney	7.212	.5208	1.738092	.1255128
	911220K	Kidney	5.133	.542	.846945	.08943
	920015LK	Kidney	4.246	.3968	.97658	.091264
	920018K	Kidney	4.445	.3953	.89789	.0798506
	920018LK	Kidney	27.49	1.8182	9.73146	.6436428
	920019LK	Kidney	4.953	1.25	.837057	.21125
	920021LK	Kidney	6.193	.3891	1.244793	.0782091
	920023LK	Kidney	7.958	2.0619	2.379442	.6165081
	920029LK	Kidney	3.787	.3891	.942963	.0968859
	920030LK	Kidney	6.644	.3922	1.820456	.1074628
	890646	Liver	13.78	.3929	3.63792	.1037256
	900040	Liver	6.189	.5141	1.343013	.1115597
	900798	Liver	13.11	.3968	3.43482	.1039616
	910805	Liver	15.68	.3929	3.88864	.0974392
	910849L	Liver	16.47	.3984	3.85398	.0932256
	910952L	Liver	11.78	.3968	2.7094	.091264

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mn	911047	Liver	14.5	.3976	3.6685	.1005928
	911048	Liver	8.48	.3945	2.4592	.114405
	911220L	Liver	15.13	.3937	3.25295	.0846455
	911243	Liver	16.93	.3976	4.2325	.0994
	911334	Liver	18.85	.3953	4.24125	.0889425
	920011L	Liver	15.23	.3976	3.74658	.0978096
	920015LL	Liver	11.53	.3992	3.21687	.1113768
	920018L	Liver	26.46	.7813	6.4827	.1914185
	920018LL	Liver	24.3	.4706	2.43	.04706
	920019LL	Liver	17.83	.3968	3.97609	.0884864
	920020L	Liver	16.91	.4	3.87239	.0916
	920021LL	Liver	12	.3976	3.24	.107352
	920022L	Liver	6.338	1.3423	1.5845	.335575
	920023LL	Liver	12.83	.4124	3.28448	.1055744
	920025L	Liver	15.39	.3937	3.30885	.0846455
	920026L	Liver	17.87	.3984	4.36028	.0972096
	920027L	Liver	10.78	.4963	1.87572	.0863562
	920029LL	Liver	22.14	.396	7.54974	.135036
	920030LL	Liver	20.95	.3937	4.8604	.0913384
	920031L	Liver	14.71	.3953	4.23648	.1138464
	920033L	Liver	16.71	.3968	3.86001	.0916608
	93002L	Liver	26.09	.3883	8.89669	.1324103
	93007L	Liver	18.3	.3876	5.5083	.1166676
	93008L	Liver	4.44	.3984	.55944	.0501984
	93009L	Liver	6.425	1.1111	1.535575	.2655529
	93012L	Liver	15.3	.3922	5.0031	.1282494
	930145	Liver	14.29	.3953	3.10093	.0857801
Mo	901142	Kidney	1.544	1.1261	.222336	.1621584
	910849K	Kidney	3.002	1.1468	.642428	.2454152
	910952K	Kidney	1.669	.651	.402229	.156891
	911220K	Kidney	3.239	.6775	.534435	.1117875
	920015LK	Kidney	1.964	.496	.45172	.11408
	920018K	Kidney	1.542	.4941	.311484	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mo	920019LK	Kidney	1.742	1.5625	.294398	.2640625
	920021LK	Kidney	1.505	.4864	.302505	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	1.142	.4864	.284358	.1211136
	920030LK	Kidney	3.047	.4902	.834878	.1343148
	890646	Liver	1.46	.4912	.38544	.1296768
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	1.103	.496	.288986	.129952
	910805	Liver	2.317	.4912	.574616	.1218176
	910849L	Liver	1.388	.498	.324792	.116532
	910952L	Liver	1.335	.496	.30705	.11408
	911047	Liver	1.336	.497	.338008	.125741
	911048	Liver	.9071	.4931	.263059	.142999
	911220L	Liver	1.145	.4921	.246175	.1058015
	911243	Liver	< .497	.497	< .12425	.12425
	911334	Liver	1.874	.4941	.42165	.1111725
	920011L	Liver	.5457	.497	.1342422	.122262
	920015LL	Liver	< .499	.499	< .139221	.139221
	920018L	Liver	3.501	.9766	.857745	.239267
	920018LL	Liver	1.741	.5882	.1741	.05882
	920019LL	Liver	1.72	.496	.38356	.110608
	920020L	Liver	.8325	.5	.1906425	.1145
	920021LL	Liver	.8409	.497	.227043	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475
	920023LL	Liver	< .5155	.5155	< .131968	.131968
	920025L	Liver	.5353	.4921	.1150895	.1058015
	920026L	Liver	1.354	.498	.330376	.121512
	920027L	Liver	1.001	.6203	.174174	.1079322
	920029LL	Liver	1.567	.495	.534347	.168795
	920030LL	Liver	.8005	.4921	.185716	.1141672
	920031L	Liver	1.128	.4941	.324864	.1423008
	920033L	Liver	.8607	.496	.1988217	.114576
	93002L	Liver	2.333	.4854	.795553	.1655214
	93007L	Liver	1.543	.4845	.464443	.1458345
	93008L	Liver	.588	.498	.074088	.062748

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mo	93009L	Liver	< 1.3889	1.3889	< .3319471	.3319471
	93012L	Liver	1.417	.4902	.463359	.1602954
	930145	Liver	1.088	.4941	.236096	.1072197
Ni	901142	Kidney	< 1.1261	1.1261	< .1621584	.1621584
	910849K	Kidney	< 1.1468	1.1468	< .2454152	.2454152
	910952K	Kidney	1.062	.651	.255942	.156891
	911220K	Kidney	< .6775	.6775	< .1117875	.1117875
	920015LK	Kidney	.5836	.496	.134228	.11408
	920018K	Kidney	< .4941	.4941	< .0998082	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< 1.5625	1.5625	< .2640625	.2640625
	920021LK	Kidney	< .4864	.4864	< .0977664	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	< .4864	.4864	< .1211136	.1211136
	920030LK	Kidney	< .4902	.4902	< .1343148	.1343148
	890646	Liver	.7565	.4912	.199716	.1296768
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	< .496	.496	< .129952	.129952
	910805	Liver	< .4912	.4912	< .1218176	.1218176
	910849L	Liver	< .498	.498	< .116532	.116532
	910952L	Liver	< .496	.496	< .11408	.11408
	911047	Liver	< .497	.497	< .125741	.125741
	911048	Liver	< .4931	.4931	< .142999	.142999
	911220L	Liver	.8737	.4921	.1878455	.1058015
	911243	Liver	< .497	.497	< .12425	.12425
	911334	Liver	.5145	.4941	.1157625	.1111725
	920011L	Liver	.5974	.497	.1469604	.122262
	920015LL	Liver	< .499	.499	< .139221	.139221
	920018L	Liver	< .9766	.9766	< .239267	.239267
	920018LL	Liver	< .5882	.5882	< .05882	.05882
	920019LL	Liver	.9777	.496	.2180271	.110608
	920020L	Liver	< .5	.5	< .1145	.1145
	920021LL	Liver	< .497	.497	< .13419	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Ni	920023LL	Liver	< .5155	.5155	< .131968	.131968
	920025L	Liver	< .4921	.4921	< .1058015	.1058015
	920026L	Liver	1.802	.498	.439688	.121512
	920027L	Liver	< .6203	.6203	< .1079322	.1079322
	920029LL	Liver	.7823	.495	.2667643	.168795
	920030LL	Liver	< .4921	.4921	< .1141672	.1141672
	920031L	Liver	.6867	.4941	.1977696	.1423008
	920033L	Liver	< .496	.496	< .114576	.114576
	93002L	Liver	< .4854	.4854	< .1655214	.1655214
	93007L	Liver	.5861	.4845	.1764161	.1458345
	93008L	Liver	< .498	.498	< .062748	.062748
	93009L	Liver	1.417	1.3889	.338663	.3319471
	93012L	Liver	< .4902	.4902	< .1602954	.1602954
	930145	Liver	< .4941	.4941	< .1072197	.1072197
Pb	901142	Kidney	99.59	1.1261	14.34096	.1621584
	910849K	Kidney	1.172	1.1468	.250808	.2454152
	910952K	Kidney	41.1	.651	9.9051	.156891
	911220K	Kidney	31.54	.6775	5.2041	.1117875
	920015LK	Kidney	107.6	.496	24.748	.11408
	920018K	Kidney	< .4941	.4941	< .0998082	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< 1.5625	1.5625	< .2640625	.2640625
	920021LK	Kidney	269	.4864	54.069	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	265.7	.4864	66.1593	.1211136
	920030LK	Kidney	.7151	.4902	.1959374	.1343148
	890646	Liver	69.26	.4912	18.28464	.1296768
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	36.5	.496	9.563	.129952
	910805	Liver	2.992	.4912	.742016	.1218176
	910849L	Liver	< .498	.498	< .116532	.116532
	910952L	Liver	18.6	.496	4.278	.11408
	911047	Liver	.9868	.497	.2496604	.125741
	911048	Liver	< .4931	.4931	< .142999	.142999

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Pb	911220L	Liver	35.77	.4921	7.69055	.1058015
	911243	Liver	< .497	.497	< .12425	.12425
	911334	Liver	4.766	.4941	1.07235	.1111725
	920011L	Liver	3.452	.497	.849192	.122262
	920015LL	Liver	43.09	.499	12.02211	.139221
	920018L	Liver	1.032	.9766	.25284	.239267
	920018LL	Liver	1.051	.5882	.1051	.05882
	920019LL	Liver	.9903	.496	.2208369	.110608
	920020L	Liver	< .5	.5	< .1145	.1145
	920021LL	Liver	81.39	.497	21.9753	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475
	920023LL	Liver	2.767	.5155	.708352	.131968
	920025L	Liver	< .4921	.4921	< .1058015	.1058015
	920026L	Liver	4.424	.498	1.079456	.121512
	920027L	Liver	.9532	.6203	.1658568	.1079322
	920029LL	Liver	91.18	.495	31.09238	.168795
	920030LL	Liver	< .4921	.4921	< .1141672	.1141672
	920031L	Liver	6.09	.4941	1.75392	.1423008
	920033L	Liver	3.254	.496	.751674	.114576
	93002L	Liver	2.21	.4854	.75361	.1655214
	93007L	Liver	2.353	.4845	.708253	.1458345
	93008L	Liver	< .498	.498	< .062748	.062748
	93009L	Liver	5.678	1.3889	1.357042	.3319471
	93012L	Liver	.6196	.4902	.2026092	.1602954
	930145	Liver	.9446	.4941	.2049782	.1072197
Se	901142	Kidney	89	.496	12.816	.071424
	910849K	Kidney	7.66	.9124	1.63924	.1952536
	910952K	Kidney	18.6	.6527	4.4826	.1573007
	911220K	Kidney	64.8	.4921	10.692	.0811965
	920015LK	Kidney	43.5	.4912	10.005	.112976
	920018K	Kidney	27.73	.495	5.60146	.09999
	920018LK	Kidney	5.7	2.2727	2.0178	.8045358
	920019LK	Kidney	4.86	.4921	.82134	.0831649
	920021LK	Kidney	40.4	.4836	8.1204	.0972036

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Se	920023LK	Kidney	5.6	2.5773	1.6744	.7706127
	920029LK	Kidney	51.3	.4902	12.7737	.1220598
	920030LK	Kidney	5.28	.498	1.44672	.136452
	890646	Liver	28.48	.496	7.51872	.130944
	900040	Liver	4.2	.6427	.9114	.1394659
	900798	Liver	28.72	.499	7.52464	.130738
	910805	Liver	74.77	.499	18.54296	.123752
	910849L	Liver	5.58	.4941	1.30572	.1156194
	910952L	Liver	17.35	.4941	3.9905	.113643
	911047	Liver	6.46	.497	1.63438	.125741
	911048	Liver	4.29	.4892	1.2441	.141868
	911220L	Liver	41.64	.4941	8.9526	.1062315
	911243	Liver	5.57	.496	1.3925	.124
	911334	Liver	82.29	.4921	18.51525	.1107225
	920011L	Liver	96.68	.4941	23.78328	.1215486
	920015LL	Liver	44.89	.497	12.52431	.138663
	920018L	Liver	27.8	.4902	6.811	.120099
	920018LL	Liver	5.52	.5896	.552	.05896
	920019LL	Liver	4.792	.4941	1.068616	.1101843
	920020L	Liver	5.69	.4883	1.30301	.1118207
	920021LL	Liver	44.97	.498	12.1419	.13446
	920022L	Liver	4.46	.4941	1.115	.123525
	920023LL	Liver	5.32	.5165	1.36192	.132224
	920025L	Liver	4.33	.4883	.93095	.1049845
	920026L	Liver	4.23	.4941	1.03212	.1205604
	920027L	Liver	4.8	.496	.8352	.086304
	920029LL	Liver	25.2	.4864	8.5932	.1658624
	920030LL	Liver	3.88	.4873	.90016	.1130536
	920031L	Liver	132.4	.4941	38.1312	.1423008
	920033L	Liver	5.4	.4826	1.2474	.1114806
	93002L	Liver	16.27	.498	5.54807	.169818
	93007L	Liver	16.92	.497	5.09292	.149597
	93008L	Liver	7.78	.4941	.98028	.0622566
	93009L	Liver	4.95	.4931	1.18305	.1178509
	93012L	Liver	19.98	.4931	6.53346	.1612437

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Se	930145	Liver	18.82	.497	4.08394	.107849
Sr	901142	Kidney	< .4505	.4505	< .064872	.064872
	910849K	Kidney	1.238	.4587	.264932	.0981618
	910952K	Kidney	4.354	.2604	1.049314	.0627564
	911220K	Kidney	1.459	.271	.240735	.044715
	920015LK	Kidney	.4939	.1984	.113597	.045632
	920018K	Kidney	1.393	.1976	.281386	.0399152
	920018LK	Kidney	4.499	.9091	1.592646	.3218214
	920019LK	Kidney	1.15	.625	.19435	.105625
	920021LK	Kidney	1.028	.1946	.206628	.0391146
	920023LK	Kidney	1.77	1.0309	.52923	.3082391
	920029LK	Kidney	.2363	.1946	.0588387	.0484554
	920030LK	Kidney	.3829	.1961	.1049146	.0537314
	890646	Liver	4.491	.1965	1.185624	.051876
	900040	Liver	3.502	.2571	.759934	.0557907
	900798	Liver	< .1984	.1984	< .0519808	.0519808
	910805	Liver	.329	.1965	.081592	.048732
	910849L	Liver	.5711	.1992	.1336374	.0466128
	910952L	Liver	.8587	.1984	.197501	.045632
	911047	Liver	.6821	.1988	.1725713	.0502964
	911048	Liver	.5778	.1972	.167562	.057188
	911220L	Liver	2.79	.1969	.59985	.0423335
	911243	Liver	.4215	.1988	.105375	.0497
	911334	Liver	.2203	.1976	.0495675	.04446
	920011L	Liver	1.448	.1988	.356208	.0489048
	920015LL	Liver	< .1996	.1996	< .0556884	.0556884
	920018L	Liver	1.059	.3906	.259455	.095697
	920018LL	Liver	1.468	.2353	.1468	.02353
	920019LL	Liver	.4108	.1984	.0916084	.0442432
	920020L	Liver	1.431	.2	.327699	.0458
	920021LL	Liver	< .1988	.1988	< .053676	.053676
	920022L	Liver	< .6711	.6711	< .167775	.167775
	920023LL	Liver	.4011	.2062	.1026816	.0527872
	920025L	Liver	.4707	.1969	.1012005	.0423335

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Sr	920026L	Liver	.4852	.1992	.1183888	.0486048
	920027L	Liver	2.12	.2481	.36888	.0431694
	920029LL	Liver	.3159	.198	.1077219	.067518
	920030LL	Liver	.2135	.1969	.049532	.0456808
	920031L	Liver	.5361	.1976	.1543968	.0569088
	920033L	Liver	.5083	.1984	.1174173	.0458304
	93002L	Liver	.7409	.1942	.2526469	.0662222
	93007L	Liver	.2356	.1938	.0709156	.0583338
	93008L	Liver	.4083	.1992	.0514458	.0250992
	93009L	Liver	< .5556	.5556	< .1327884	.1327884
	93012L	Liver	< .1961	.1961	< .0641247	.0641247
	930145	Liver	< .1976	.1976	< .0428792	.0428792
V	901142	Kidney	< 1.1261	1.1261	< .1621584	.1621584
	910849K	Kidney	< 1.1468	1.1468	< .2454152	.2454152
	910952K	Kidney	< .651	.651	< .156891	.156891
	911220K	Kidney	< .6775	.6775	< .1117875	.1117875
	920015LK	Kidney	< .496	.496	< .11408	.11408
	920018K	Kidney	< .4941	.4941	< .0998082	.0998082
	920018LK	Kidney	< 2.2727	2.2727	< .8045358	.8045358
	920019LK	Kidney	< 1.5625	1.5625	< .2640625	.2640625
	920021LK	Kidney	< .4864	.4864	< .0977664	.0977664
	920023LK	Kidney	< 2.5773	2.5773	< .7706127	.7706127
	920029LK	Kidney	< .4864	.4864	< .1211136	.1211136
	920030LK	Kidney	< .4902	.4902	< .1343148	.1343148
	890646	Liver	< .4912	.4912	< .1296768	.1296768
	900040	Liver	< .6427	.6427	< .1394659	.1394659
	900798	Liver	< .496	.496	< .129952	.129952
	910805	Liver	.9429	.4912	.2338392	.1218176
	910849L	Liver	< .498	.498	< .116532	.116532
	910952L	Liver	< .496	.496	< .11408	.11408
	911047	Liver	< .497	.497	< .125741	.125741
	911048	Liver	< .4931	.4931	< .142999	.142999
	911220L	Liver	< .4921	.4921	< .1058015	.1058015
	911243	Liver	< .497	.497	< .12425	.12425

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
V	911334	Liver	< .4941	.4941	< .1111725	.1111725
	920011L	Liver	4.575	.497	1.12545	.122262
	920015LL	Liver	< .499	.499	< .139221	.139221
	920018L	Liver	< .9766	.9766	< .239267	.239267
	920018LL	Liver	< .5882	.5882	< .05882	.05882
	920019LL	Liver	< .496	.496	< .110608	.110608
	920020L	Liver	< .5	.5	< .1145	.1145
	920021LL	Liver	< .497	.497	< .13419	.13419
	920022L	Liver	< 1.6779	1.6779	< .419475	.419475
	920023LL	Liver	< .5155	.5155	< .131968	.131968
	920025L	Liver	< .4921	.4921	< .1058015	.1058015
	920026L	Liver	< .498	.498	< .121512	.121512
	920027L	Liver	< .6203	.6203	< .1079322	.1079322
	920029LL	Liver	< .495	.495	< .168795	.168795
	920030LL	Liver	< .4921	.4921	< .1141672	.1141672
	920031L	Liver	1.22	.4941	.35136	.1423008
	920033L	Liver	< .496	.496	< .114576	.114576
	93002L	Liver	< .4854	.4854	< .1655214	.1655214
	93007L	Liver	< .4845	.4845	< .1458345	.1458345
	93008L	Liver	< .498	.498	< .062748	.062748
	93009L	Liver	< 1.3889	1.3889	< .3319471	.3319471
	93012L	Liver	< .4902	.4902	< .1602954	.1602954
	930145	Liver	< .4941	.4941	< .1072197	.1072197
Zn	901142	Kidney	168.6	2.2523	24.2784	.3243312
	910849K	Kidney	106.5	2.2936	22.791	.4908304
	910952K	Kidney	144.6	1.3021	34.8486	.3138061
	911220K	Kidney	202.8	1.355	33.462	.223575
	920015LK	Kidney	122.9	.9921	28.267	.228183
	920018K	Kidney	118.7	.9881	23.9774	.1995962
	920018LK	Kidney	122.5	4.5455	43.365	1.609107
	920019LK	Kidney	95.09	3.125	16.07021	.528125
	920021LK	Kidney	228.1	.9728	45.8481	.1955328
	920023LK	Kidney	105.2	5.1546	31.4548	1.5412254
	920029LK	Kidney	131.5	.9728	32.7435	.2422272

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Zn	920030LK	Kidney	81.27	.9804	22.26798	.2686296
	890646	Liver	201.6	.9823	53.2224	.2593272
	900040	Liver	71.92	1.2853	15.60664	.2789101
	900798	Liver	130.4	.9921	34.1648	.2599302
	910805	Liver	204	.9823	50.592	.2436104
	910849L	Liver	96.85	.996	22.6629	.233064
	910952L	Liver	168	.9921	38.64	.228183
	911047	Liver	95.87	.994	24.25511	.251482
	911048	Liver	48.95	.9862	14.1955	.285998
	911220L	Liver	260.6	.9843	56.029	.2116245
	911243	Liver	73.89	.994	18.4725	.2485
	911334	Liver	186	.9881	41.85	.2223225
	920011L	Liver	120.8	.994	29.7168	.244524
	920015LL	Liver	101.4	.998	28.2906	.278442
	920018L	Liver	385.1	1.9531	94.3495	.4785095
	920018LL	Liver	189.1	1.1765	18.91	.11765
	920019LL	Liver	140.1	.9921	31.2423	.2212383
	920020L	Liver	90.3	1	20.6787	.229
	920021LL	Liver	241.4	.994	65.178	.26838
	920022L	Liver	64.28	3.3557	16.07	.838925
	920023LL	Liver	179.6	1.0309	45.9776	.2639104
	920025L	Liver	129.1	.9843	27.7565	.2116245
	920026L	Liver	156.3	.996	38.1372	.243024
	920027L	Liver	109.6	1.2407	19.0704	.2158818
	920029LL	Liver	212.4	.9901	72.4284	.3376241
	920030LL	Liver	87.4	.9843	20.2768	.2283576
	920031L	Liver	335.9	.9881	96.7392	.2845728
	920033L	Liver	261.7	.9921	60.4527	.2291751
	93002L	Liver	194.1	.9709	66.1881	.3310769
	93007L	Liver	200.9	.969	60.4709	.291669
	93008L	Liver	65.09	.996	8.20134	.125496
	93009L	Liver	150.7	2.7778	36.0173	.6638942
	93012L	Liver	77.87	.9804	25.46349	.3205908
	930145	Liver	289	.9881	62.713	.2144177

Appendix 2. Quality Assurance/Quality Control results

PROCEDURAL BLANKS

Analyte	Lab Sample Number	Result Total UG
Al	285471	.32
	285521	.13
	285601	.1
As	285461	0
	285511	0
	285591	0
B	285471	.03
	285521	0
	285601	.08
Ba	285471	0
	285521	.01
	285601	0
Be	285471	0
	285521	0
	285601	0
Cd	285471	0
	285521	.02
	285601	0
Cr	285471	.05
	285521	.07
	285601	.05
Cu	285471	.03
	285521	.01
	285601	0
Fe	285471	0
	285521	1.41
	285601	.65

PROCEDURAL BLANKS (Cont.)

Analyte	Lab Sample Number	Result Total UG
Hg	285461	0
	285511	0
	285591	.01
Mg	285471	0
	285521	.39
	285601	.01
Mn	285471	0
	285521	0
	285601	0
Mo	285471	.15
	285521	0
	285601	.07
Ni	285471	0
	285521	0
	285601	.01
Pb	285471	0
	285521	.24
	285601	.07
Se	285461	.03
	285511	.06
	285591	.02
Sr	285471	0
	285521	.01
	285601	0
V	285471	.01
	285521	0
	285601	0

PROCEDURAL BLANKS (Cont.)

Analyte	Lab Sample Number	Result Total UG
Zn	285471	.05
	285521	.01
	285601	.05

DUPLICATES

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)		Duplicate Result (ppm / %)		Average	Relative % Difference
Al	901142	Kidney	< 11.2613	Dry	< 11.0619	Dry	5.5808	1.79
	920021LK	Kidney	18.67	Dry	7.47	Dry	13.07	85.69
	890646	Liver	9.383	Dry	9.921	Dry	9.652	5.57
	920030LL	Liver	< 4.9213	Dry	< 4.9213	Dry	2.46065	0
As	901142	Kidney	< .496	Dry	< .495	Dry	0.24775	0.2
	920021LK	Kidney	< .4836	Dry	< .4873	Dry	0.242725	0.76
	890646	Liver	< .496	Dry	< .4912	Dry	0.2468	0.97
	920018L	Liver	< .4902	Dry	< .4883	Dry	0.244625	0.39
	920030LL	Liver	< .4873	Dry	< .4883	Dry	0.2439	0.21
B	901142	Kidney	2.454	Dry	1.943	Dry	2.1985	23.24
	920021LK	Kidney	2.439	Dry	2.203	Dry	2.321	10.17
	890646	Liver	3.349	Dry	3.231	Dry	3.29	3.59
	920030LL	Liver	< .4921	Dry	< .4921	Dry	0.24605	0
Ba	901142	Kidney	< 1.1261	Dry	< 1.1062	Dry	0.558075	1.78
	920021LK	Kidney	< .4864	Dry	< .4854	Dry	0.24295	0.21
	890646	Liver	.8734	Dry	1.034	Dry	0.9537	16.84
	920030LL	Liver	< .4921	Dry	< .4921	Dry	0.24605	0
Be	901142	Kidney	< .2252	Dry	< .2212	Dry	0.1116	1.79
	920021LK	Kidney	< .0973	Dry	< .0971	Dry	0.0486	0.21
	890646	Liver	< .0982	Dry	< .0973	Dry	0.048875	0.92
	920030LL	Liver	< .0984	Dry	< .0984	Dry	0.0492	0
Cd	901142	Kidney	14.55	Dry	14.88	Dry	14.715	2.24
	920021LK	Kidney	45.41	Dry	44.71	Dry	45.06	1.55
	890646	Liver	7.084	Dry	- 6.839	Dry	6.9615	3.52
	920030LL	Liver	< .0984	Dry	< .0984	Dry	0.0492	0
Cr	901142	Kidney	< 1.1261	Dry	< 1.1062	Dry	0.558075	1.78
	920021LK	Kidney	.9099	Dry	.7165	Dry	0.8132	23.78
	890646	Liver	.8477	Dry	.7358	Dry	0.79175	14.13

DUPLICATES (Cont.)

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)		Duplicate Result (ppm / %)		Average	Relative % Difference
Cr	920030LL	Liver	.8163	Dry	.7585	Dry	0.7874	7.34
Cu	901142	Kidney	71.85	Dry	79.53	Dry	75.69	10.15
	920021LK	Kidney	87.65	Dry	86.52	Dry	87.085	1.3
	890646	Liver	93.43	Dry	92.09	Dry	92.76	1.44
	920030LL	Liver	27.64	Dry	26.52	Dry	27.08	4.14
Fe	901142	Kidney	1349	Dry	1362	Dry	1355.5	0.96
	920021LK	Kidney	1252	Dry	1222	Dry	1237	2.43
	890646	Liver	12480	Dry	12210	Dry	12345	2.19
	920030LL	Liver	500.8	Dry	511.9	Dry	506.35	2.19
Hg	901142	Kidney	293.9	Dry	297	Dry	295.45	1.05
	920021LK	Kidney	76.3	Dry	75.13	Dry	75.715	1.55
	890646	Liver	94.53	Dry	91.31	Dry	92.92	3.47
	920018L	Liver	23.26	Dry	21.26	Dry	22.26	8.98
	920030LL	Liver	1.177	Dry	1.216	Dry	1.1965	3.26
Mg	901142	Kidney	573.5	Dry	597.1	Dry	585.3	4.03
	920021LK	Kidney	726.4	Dry	702.8	Dry	714.6	3.3
	890646	Liver	699.8	Dry	686.4	Dry	693.1	1.93
	920030LL	Liver	605.7	Dry	615.8	Dry	610.75	1.65
Mn	901142	Kidney	3.981	Dry	3.462	Dry	3.7215	13.95
	920021LK	Kidney	6.193	Dry	5.84	Dry	6.0165	5.87
	890646	Liver	13.78	Dry	13.67	Dry	13.725	0.8
	920030LL	Liver	20.95	Dry	21.47	Dry	21.21	2.45
Mo	901142	Kidney	1.544	Dry	1.197	Dry	1.3705	25.32
	920021LK	Kidney	1.505	Dry	1.291	Dry	1.398	15.31
	890646	Liver	1.46	Dry	1.568	Dry	1.514	7.13
	920030LL	Liver	.8005	Dry	.9032	Dry	0.85185	12.06
Ni	901142	Kidney	< 1.1261	Dry	< 1.1062	Dry	0.558075	1.78
	920021LK	Kidney	< .4864	Dry	< .4854	Dry	0.24295	0.21

DUPLICATES (Cont.)

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)		Duplicate Result (ppm / %)		Average	Relative % Difference
Ni	890646	Liver	.7565	Dry	< .4864	Dry	0.49985	102.69
	920030LL	Liver	< .4921	Dry	< .4921	Dry	0.24605	0
Pb	901142	Kidney	99.59	Dry	111	Dry	105.295	10.84
	920021LK	Kidney	269	Dry	264.8	Dry	266.9	1.57
	890646	Liver	69.26	Dry	74.07	Dry	71.665	6.71
	920030LL	Liver	< .4921	Dry	.7815	Dry	0.513775	104.22
Se	901142	Kidney	89	Dry	91.5	Dry	90.25	2.77
	920021LK	Kidney	40.4	Dry	39.7	Dry	40.05	1.75
	890646	Liver	28.48	Dry	28.07	Dry	28.275	1.45
	920018L	Liver	27.8	Dry	28.75	Dry	28.275	3.36
	920030LL	Liver	3.88	Dry	3.62	Dry	3.75	6.93
Sr	901142	Kidney	< .4505	Dry	.5206	Dry	0.372925	79.2
	920021LK	Kidney	1.028	Dry	.9417	Dry	0.98485	8.76
	890646	Liver	4.491	Dry	5.201	Dry	4.846	14.65
	920030LL	Liver	.2135	Dry	.212	Dry	0.21275	0.71
V	901142	Kidney	< 1.1261	Dry	< 1.1062	Dry	0.558075	1.78
	920021LK	Kidney	< .4864	Dry	< .4854	Dry	0.24295	0.21
	890646	Liver	< .4912	Dry	< .4864	Dry	0.2444	0.98
	920030LL	Liver	< .4921	Dry	< .4921	Dry	0.24605	0
Zn	901142	Kidney	168.6	Dry	179.6	Dry	174.1	6.32
	920021LK	Kidney	228.1	Dry	221.6	Dry	224.85	2.89
	890646	Liver	201.6	Dry	196.8	Dry	199.2	2.41
	920030LL	Liver	87.4	Dry	88.16	Dry	87.78	0.87

REFERENCE MATERIALS

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Al	285501	NRCC TORT-1				23.56 Dry	
	285551	NRCC TORT-1				25.26 Dry	
	285581	NRCC TORT-1				27.05 Dry	
As	285491	NRCC DOLT-2	Dogfish Liver	16.6 Dry	1.1	13.91 Dry	83.8
	285541	NRCC DOLT-2	Dogfish Liver	16.6 Dry	1.1	13.45 Dry	81.02
	285571	NRCC DOLT-2	Dogfish Liver	16.6 Dry	1.1	11.25 Dry	67.77
	285481	NRCC DORM-1	Dogfish Muscle	17.7 Dry	2.1	18.47 Dry	104.35
	285531	NRCC DORM-1	Dogfish Muscle	17.7 Dry	2.1	19.06 Dry	107.68
	285561	NRCC DORM-1	Dogfish Muscle	17.7 Dry	2.1	15.81 Dry	89.32
B	285501	NRCC TORT-1				4.661 Dry	
	285551	NRCC TORT-1				4.319 Dry	
	285581	NRCC TORT-1				4.114 Dry	
Ba	285501	NRCC TORT-1				3.114 Dry	
	285551	NRCC TORT-1				2.964 Dry	
	285581	NRCC TORT-1				2.813 Dry	
Be	285501	NRCC TORT-1				< .0998 Dry	
	285551	NRCC TORT-1				< .0986 Dry	
	285581	NRCC TORT-1				< .0965 Dry	
Cd	285501	NRCC TORT-1	Lobster Hepatopancreas	26.3 Dry	2.1	22.72 Dry	86.39
	285551	NRCC TORT-1	Lobster Hepatopancreas	26.3 Dry	2.1	21.21 Dry	80.65
	285581	NRCC TORT-1	Lobster Hepatopancreas	26.3 Dry	2.1	18.42 Dry	70.04
Cr	285501	NRCC TORT-1	Lobster Hepatopancreas	2.4 Dry	.6	2.033 Dry	84.71
	285551	NRCC TORT-1	Lobster Hepatopancreas	2.4 Dry	.6	1.785 Dry	74.37
	285581	NRCC TORT-1	Lobster Hepatopancreas	2.4 Dry	.6	1.76 Dry	73.33

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Cu	285501	NRCC TORT-1	Lobster Hepatopancreas	439 Dry	22	353.3 Dry	80.48
	285551	NRCC TORT-1	Lobster Hepatopancreas	439 Dry	22	342.8 Dry	78.09
	285581	NRCC TORT-1	Lobster Hepatopancreas	439 Dry	22	351.5 Dry	80.07
Fe	285501	NRCC TORT-1	Lobster Hepatopancreas	186 Dry	11	126.6 Dry	68.06
	285551	NRCC TORT-1	Lobster Hepatopancreas	186 Dry	11	126.5 Dry	68.01
	285581	NRCC TORT-1	Lobster Hepatopancreas	186 Dry	11	136.1 Dry	73.17
Hg	285491	NRCC DOLT-2	Dogfish Liver	1.99 Dry	.1	1.88 Dry	94.47
	285541	NRCC DOLT-2	Dogfish Liver	1.99 Dry	.1	1.93 Dry	96.98
	285571	NRCC DOLT-2	Dogfish Liver	1.99 Dry	.1	1.97 Dry	98.99
	285481	NRCC DORM-1	Dogfish Muscle	.798 Dry	.074	.533 Dry	66.79
	285531	NRCC DORM-1	Dogfish Muscle	.798 Dry	.074	.772 Dry	96.74
	285561	NRCC DORM-1	Dogfish Muscle	.798 Dry	.074	.433 Dry	54.26
Mg	285501	NRCC TORT-1	Lobster Hepatopancreas	2550 Dry	250	2106 Dry	82.59
	285551	NRCC TORT-1	Lobster Hepatopancreas	2550 Dry	250	1955 Dry	76.67
	285581	NRCC TORT-1	Lobster Hepatopancreas	2550 Dry	250	1874 Dry	73.49
Mn	285501	NRCC TORT-1	Lobster Hepatopancreas	23.4 Dry	1	20.16 Dry	86.15
	285551	NRCC TORT-1	Lobster Hepatopancreas	23.4 Dry	1	19.05 Dry	81.41
	285581	NRCC TORT-1	Lobster Hepatopancreas	23.4 Dry	1	17.47 Dry	74.66
Mo	285501	NRCC TORT-1	Lobster Hepatopancreas	1.5 Dry	.3	1.767 Dry	117.8
	285551	NRCC TORT-1	Lobster Hepatopancreas	1.5 Dry	.3	1.088 Dry	72.53
	285581	NRCC TORT-1	Lobster Hepatopancreas	1.5 Dry	.3	1.19 Dry	79.33
Ni	285501	NRCC TORT-1	Lobster Hepatopancreas	2.3 Dry	.3	2.379 Dry	103.43
	285551	NRCC TORT-1	Lobster Hepatopancreas	2.3 Dry	.3	1.605 Dry	69.78
	285581	NRCC TORT-1	Lobster Hepatopancreas	2.3 Dry	.3	1.847 Dry	80.3

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Pb	285501	NRCC TORT-1	Lobster Hepatopancreas	10.4 Dry	2	8.866 Dry	85.25
	285551	NRCC TORT-1	Lobster Hepatopancreas	10.4 Dry	2	10.45 Dry	100.48
	285581	NRCC TORT-1	Lobster Hepatopancreas	10.4 Dry	2	9.346 Dry	89.87
Se	285491	NRCC DOLT-2	Dogfish Liver	6.06 Dry	.49	6.03 Dry	99.5
	285541	NRCC DOLT-2	Dogfish Liver	6.06 Dry	.49	6.15 Dry	101.49
	285571	NRCC DOLT-2	Dogfish Liver	6.06 Dry	.49	5.56 Dry	91.75
	285481	NRCC DORM-1	Dogfish Muscle	1.62 Dry	.12	1.43 Dry	88.27
	285531	NRCC DORM-1	Dogfish Muscle	1.62 Dry	.12	1.64 Dry	101.23
	285561	NRCC DORM-1	Dogfish Muscle	1.62 Dry	.12	1.75 Dry	108.02
Sr	285501	NRCC TORT-1	Lobster Hepatopancreas	113 Dry	5	89.53 Dry	79.23
	285551	NRCC TORT-1	Lobster Hepatopancreas	113 Dry	5	84.8 Dry	75.04
	285581	NRCC TORT-1	Lobster Hepatopancreas	113 Dry	5	87.73 Dry	77.64
V	285501	NRCC TORT-1	Lobster Hepatopancreas	1.4 Dry	.3	1.081 Dry	77.21
	285551	NRCC TORT-1	Lobster Hepatopancreas	1.4 Dry	.3	1.043 Dry	74.5
	285581	NRCC TORT-1	Lobster Hepatopancreas	1.4 Dry	.3	.9865 Dry	70.46
Zn	285501	NRCC TORT-1	Lobster Hepatopancreas	177 Dry	10	116.3 Dry	65.71
	285551	NRCC TORT-1	Lobster Hepatopancreas	177 Dry	10	108.7 Dry	61.41
	285581	NRCC TORT-1	Lobster Hepatopancreas	177 Dry	10	126.5 Dry	71.47

* Only certified analytes list a confidence interval - all others are considered reference values.

SPIKE RECOVERIES

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)		Amount Recovered (ppm / %)		* Spike / Background	Percent Recovery
Al	910849K	Kidney	901	Dry	881.3	Dry	80.01	97.81
	920029LK	Kidney	394	Dry	369.915	Dry	55.61	93.89
	900798	Liver	397	Dry	409.083	Dry	79.13	103.04
	920019LL	Liver	395	Dry	395.74	Dry	19.4	100.19
	920031L	Liver	395	Dry	441	Dry	79.95	111.65
As	920029LK	Kidney	10.1	Dry	10.57	Dry	20.24	104.65
	900798	Liver	10.1	Dry	11.39	Dry	20.24	112.77
	920019LL	Liver	9.98	Dry	9.15	Dry	20.16	91.68
	920031L	Liver	9.88	Dry	10.85	Dry	7.11	109.82
B	910849K	Kidney	90.6	Dry	83.094	Dry	11.53	91.72
	920029LK	Kidney	39.6	Dry	34.109	Dry	11.28	86.13
	900798	Liver	39.9	Dry	41.325	Dry	24.4	103.57
	920019LL	Liver	39.8	Dry	40.66	Dry	9.93	102.16
	920031L	Liver	39.8	Dry	43.488	Dry	4.89	109.27
Ba	910849K	Kidney	90.1	Dry	88.239	Dry	55.93	97.93
	920029LK	Kidney	39.4	Dry	36.75	Dry	80.07	93.27
	900798	Liver	39.7	Dry	42.6	Dry	80.04	107.3
	920019LL	Liver	39.5	Dry	42.06	Dry	79.94	106.48
	920031L	Liver	39.5	Dry	43.95	Dry	79.94	111.27
Be	910849K	Kidney	90.1	Dry	86.99	Dry	400.09	96.55
	920029LK	Kidney	39.4	Dry	37.34	Dry	400.41	94.77
	900798	Liver	39.7	Dry	43.29	Dry	400.2	109.04
	920019LL	Liver	39.5	Dry	42.58	Dry	399.8	107.8
	920031L	Liver	39.5	Dry	43.93	Dry	399.8	111.22
Cd	910849K	Kidney	90.5	Dry	82.9736	Dry	305.33	91.68
	920029LK	Kidney	39.5	Dry	39.53	Dry	2.71	100.08
	900798	Liver	39.8	Dry	45.215	Dry	12.04	113.61

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)	Amount Recovered (ppm / %)	* Spike / Background	Percent Recovery
Cd	920019LL	Liver	39.7 Dry	43.52 Dry	401.82	109.62
	920031L	Liver	39.7 Dry	48.23 Dry	3.17	121.49
Cr	910849K	Kidney	91.8 Dry	87.286 Dry	63.57	95.08
	920029LK	Kidney	40.1 Dry	38.108 Dry	33.93	95.03
	900798	Liver	40.4 Dry	44.852 Dry	33.72	111.02
	920019LL	Liver	40.3 Dry	43.065 Dry	15.07	106.86
	920031L	Liver	40.3 Dry	46.3144 Dry	73.86	114.92
Cu	910849K	Kidney	90.6 Dry	75.01 Dry	2.54	82.79
	920029LK	Kidney	39.6 Dry	60.93 Dry	0.89	153.86
	900798	Liver	39.9 Dry	42.94 Dry	2.2	107.62
	920019LL	Liver	39.8 Dry	44.7 Dry	0.61	112.31
	920031L	Liver	39.8 Dry	41.85 Dry	0.59	105.15
Fe	910849K	Kidney	902 Dry	825.8 Dry	1.67	91.55
	920029LK	Kidney	394 Dry	596 Dry	0.25	151.27
	900798	Liver	397 Dry	930 Dry	0.07	234.26
	920019LL	Liver	396 Dry	342 Dry	0.54	86.36
	920031L	Liver	396 Dry	1370 Dry	0.03	345.96
Hg	920029LK	Kidney	2 Dry	8.5 Dry	0.01	425
	920019LL	Liver	1.98 Dry	1.886 Dry	0.69	95.25
	920031L	Liver	1.96 Dry	-5.5 Dry	0.01	280.61
Mg	910849K	Kidney	902 Dry	789.4 Dry	1.12	87.52
	920029LK	Kidney	394 Dry	432.3 Dry	0.86	109.72
	900798	Liver	397 Dry	482.5 Dry	0.69	121.54
	920019LL	Liver	396 Dry	372.3 Dry	0.53	94.02
	920031L	Liver	396 Dry	494 Dry	0.57	124.75
Mn	910849K	Kidney	91.5 Dry	86.854 Dry	14.72	94.92
	920029LK	Kidney	40 Dry	37.593 Dry	10.56	93.98

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)		Amount Recovered (ppm / %)		* Spike / Background	Percent Recovery
Mn	900798	Liver	40.3	Dry	45.42	Dry	3.07	112.7
	920019LL	Liver	40.2	Dry	42.95	Dry	2.25	106.84
	920031L	Liver	40.2	Dry	46.8	Dry	2.73	116.42
Mo	910849K	Kidney	90.9	Dry	87.148	Dry	30.28	95.87
	920029LK	Kidney	39.7	Dry	38.618	Dry	34.76	97.27
	900798	Liver	40	Dry	44.187	Dry	36.26	110.47
	920019LL	Liver	39.9	Dry	41.19	Dry	23.2	103.23
	920031L	Liver	39.9	Dry	46.312	Dry	35.37	116.07
Ni	910849K	Kidney	451	Dry	423.3	Dry	400.5	93.86
	920029LK	Kidney	197	Dry	186.1	Dry	400.33	94.47
	900798	Liver	199	Dry	222.8	Dry	401.21	111.96
	920019LL	Liver	198	Dry	213.6223	Dry	202.52	107.89
	920031L	Liver	198	Dry	231.1133	Dry	288.34	116.72
Pb	910849K	Kidney	451	Dry	407.028	Dry	384.81	90.25
	920029LK	Kidney	197	Dry	231.7	Dry	0.74	117.61
	900798	Liver	199	Dry	228.1	Dry	5.45	114.62
	920019LL	Liver	198	Dry	218.2097	Dry	199.94	110.21
	920031L	Liver	198	Dry	237.91	Dry	32.51	120.16
Se	920029LK	Kidney	10.4	Dry	10.1	Dry	0.2	97.12
	900798	Liver	10.4	Dry	11.13	Dry	0.36	107.02
	920019LL	Liver	10.3	Dry	9.99	Dry	2.15	96.99
	920031L	Liver	10.2	Dry	10.6	Dry	0.08	103.92
Sr	910849K	Kidney	90.1	Dry	88.302	Dry	72.78	98
	920029LK	Kidney	39.4	Dry	36.8337	Dry	166.74	93.49
	900798	Liver	39.7	Dry	40.78	Dry	200.1	102.72
	920019LL	Liver	39.5	Dry	39.7892	Dry	96.15	100.73
	920031L	Liver	39.5	Dry	41.5439	Dry	73.68	105.17

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)		Amount Recovered (ppm / %)		* Spike / Background	Percent Recovery
V	910849K	Kidney	90.9	Dry	88.3	Dry	80.72	97.14
	920029LK	Kidney	39.7	Dry	37.48	Dry	80.67	94.41
	900798	Liver	40	Dry	43.79	Dry	80.65	109.47
	920019LL	Liver	39.9	Dry	43.03	Dry	80.75	107.84
	920031L	Liver	39.9	Dry	45.34	Dry	32.7	113.63
Zn	910849K	Kidney	90	Dry	70.9	Dry	0.85	78.78
	920029LK	Kidney	39.4	Dry	69.5	Dry	0.3	176.4
	900798	Liver	39.7	Dry	48.6	Dry	0.3	122.42
	920019LL	Liver	39.5	Dry	28.2	Dry	0.28	71.39
	920031L	Liver	39.5	Dry	64.1	Dry	0.12	162.28

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.