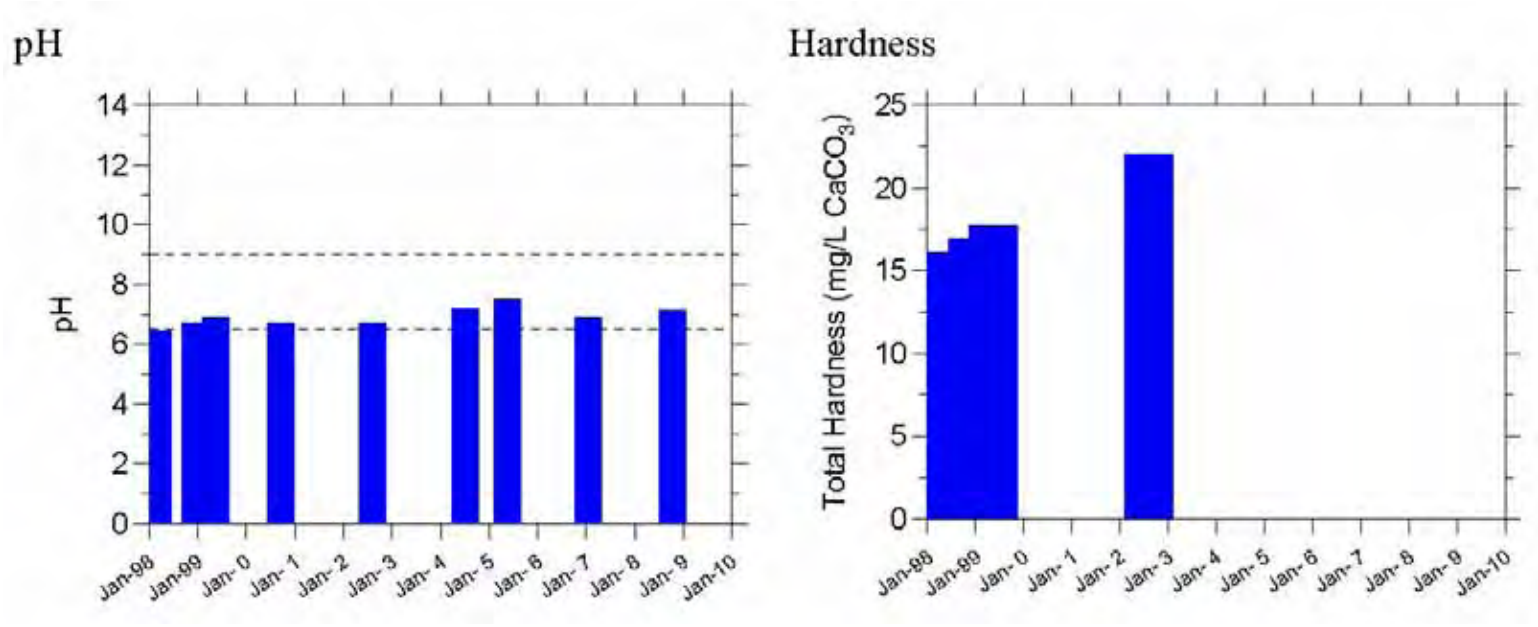

NOTES

1. Dashed lines represent CCME Guidelines for the Protection of Aquatic Life.

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YELLOWKNIFE GOLD PROJECT

Physical Parameters
Yellowknife River at Yellowknife

PROJECT NO.	DWN	CKD	REV
V23201097	KW	TP	0
OFFICE: EBA-VANC	DATE: April 14, 2011		

Figure 2.9-3

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2.9.5.2 Nutrients

Ammonia

Ammonia concentrations were low in all of the lakes sampled (Figure 2.9-4). Most natural surface fresh waters have an ammonia concentration of less than 0.1 mg/L (as nitrogen), which is consistent for all of the lakes tested (Puznicki 1996). The Yellowknife River sampling location did not include ammonia in the suite of parameters analyzed.

2.9.5.3 Metals

Aluminum

Aluminum concentrations in fresh surface waters are pH dependent. The majority of lakes located between Great Slave Lake and the Beaufort Sea that were tested for aluminum displayed values below 100 µg/L (ppb) and a pH of greater than 6.5 (Figure 2.9-5 and 2.9-2, respectively), indicating they did not exceed the CCME guideline for the protection of aquatic life for aluminum (set at 100 µg/L at pH ≥6.5). Certain lakes with slightly lower pH levels (e.g., 5.5-6.5, Figure 2.9-2) had corresponding aluminum levels that would be considered in excess of the lower CCME guideline of 5 µg/L at these lower pH levels (e.g., <6.5).

Lakes within the watersheds of the Yellowknife River displayed even lower aluminum concentrations than many of the lakes tested in other areas. Natural fresh surface waters often have aluminum concentrations below 1,000 µg/L (Puznicki 1996).

Aluminum concentrations measured at the Yellowknife River sampling station outside of Yellowknife occasionally exceeded the upper CCME guidelines for the protection of aquatic life (Figure 2.9-6). Corresponding pH levels were above 6.5 in all cases except for the sampling event in early 1998.

Arsenic

Natural concentrations of arsenic in surface fresh waters have been found to range between 0.5-50 µg/L (Puznicki 1996). Arsenic levels assessed in several arctic lakes were generally low, ranging between 0-1 µg/L (Figure 2.9-5). All of the lakes sampled displayed arsenic levels that were well below the CCME guidelines for the protection of aquatic life (i.e., 5 µg/L).

With the exception of samples collected in 1998 and 1999, arsenic levels at the Yellowknife River sampling location were also very low (Figure 2.9-6). The samples collected in the late 90s are still within the expected range of natural variability for fresh surface waters.

Cadmium

Cadmium levels were generally below 0.1 µg/L in surface lakes tested between Great Slave Lake and the Beaufort Sea (Figure 2.9-7). These values are at the lower end of natural cadmium levels for surface fresh waters, which range from 0.1-10 µg/L (Puznicki 1996) but are above the CCME guideline of 0.017 µg/L for the protection of aquatic life. Cadmium concentrations greater than 10 µg/L are usually attributed to anthropogenic sources.

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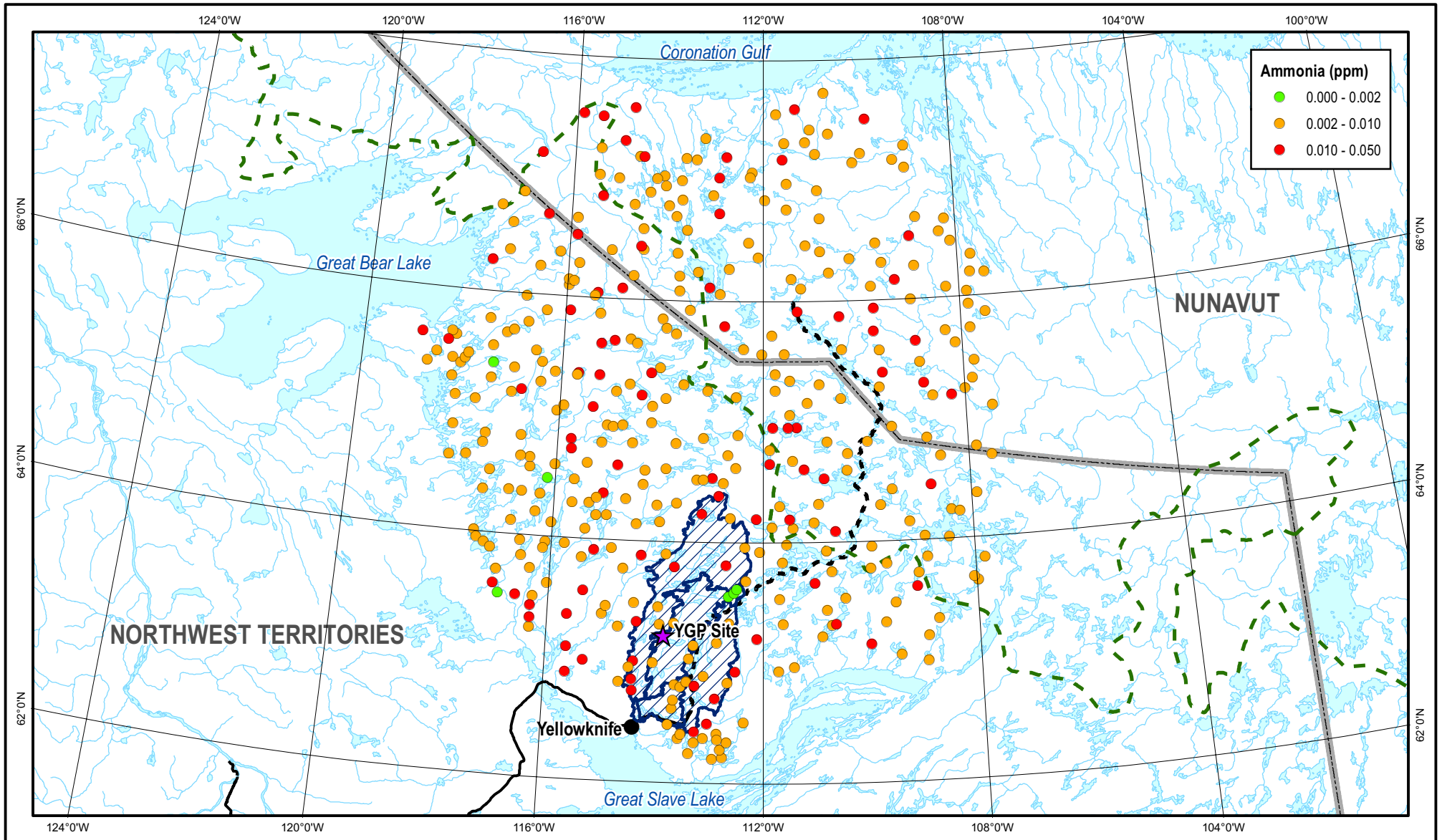

LEGEND

- Yellowknife Gold Project Site
- Yellowknife
- Treeline
- Yellowknife River Basin Watersheds
- NWT - Nunavut Border
- Winter Road
- Road
- River
- Waterbody

N / W / E / S

NOTES

1. Water quality data from Department of Indian and Northern Affairs (Puznicki, 1996).
2. Base data source: Atlas of Canada.

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Scale: 1:5,000,000

100 50 0 100

Kilometres

PROJECTION	DATUM
NWT Lambert	NAD83

FILE NO. V23201097-DAR-045.mxd

Tyhee NWT Corp

EBA Engineering Consultants Ltd.

YELLOWKNIFE GOLD PROJECT

Water Quality in the Slave Province Ammonia

PROJECT NO.	DWN	CKD	REV
V23201097	SL	TP	0

OFFICE	DATE
EBA-VANC	March 14, 2011

Figure 2.9-4

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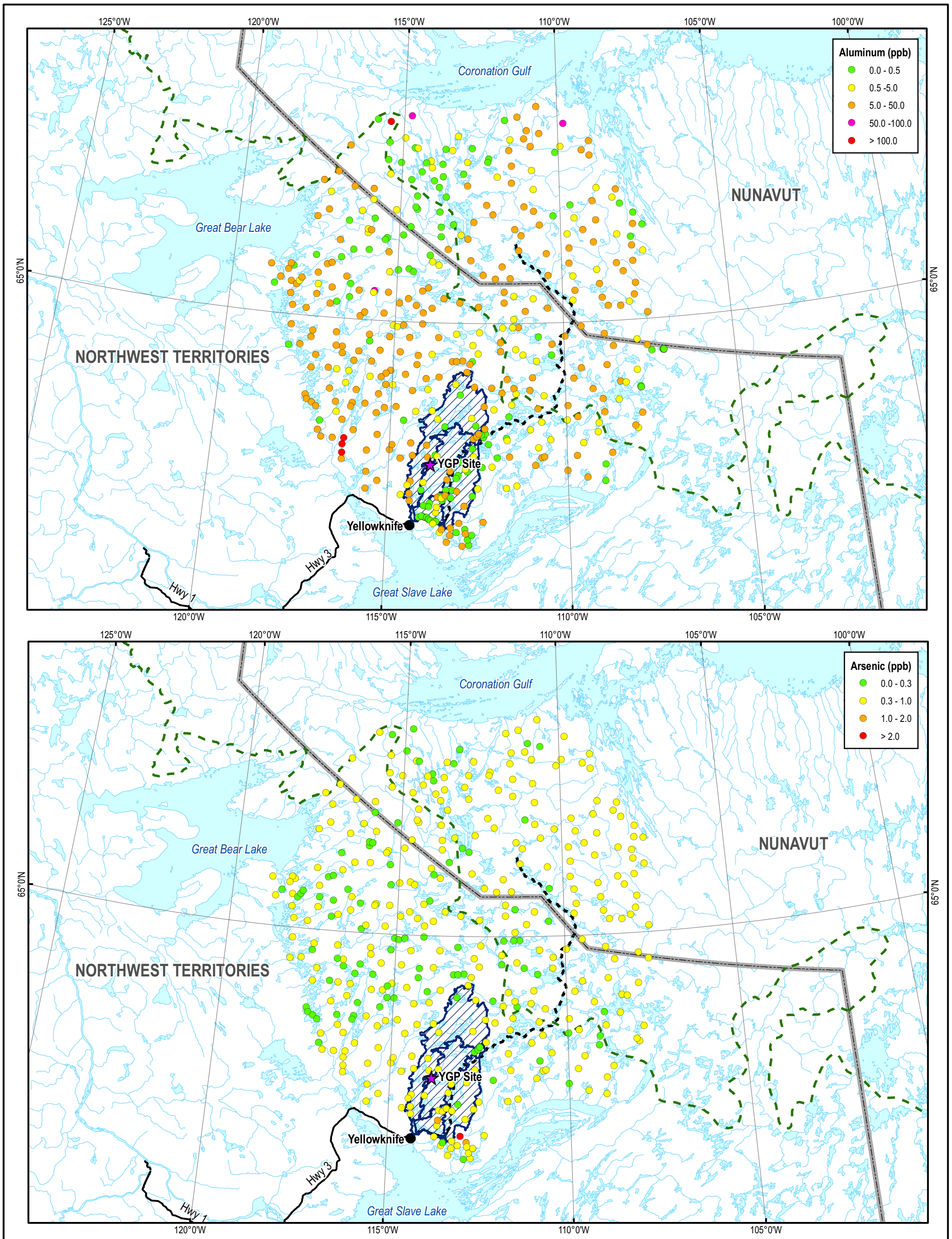

LEGEND

- Yellowknife Gold Project Site
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- River
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N W E S

NOTES

1. Water quality data from Department of Indian and Northern Affairs (Puznicki, 1996) and Ruhland et al. (2003).
2. Base data source: Atlas of Canada.

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YELLOWKNIFE GOLD PROJECT

Water Quality in the Slave Province Aluminum and Arsenic

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:5,000,000

100 50 0 100

Kilometres

FILE NO.			
V23201097-DAR-046.mxd			
PROJECT NO.	DWN	CKD	REV
V23201097	SL	TP	0
OFFICE	DATE		
EBA-VANC	March 14, 2011		

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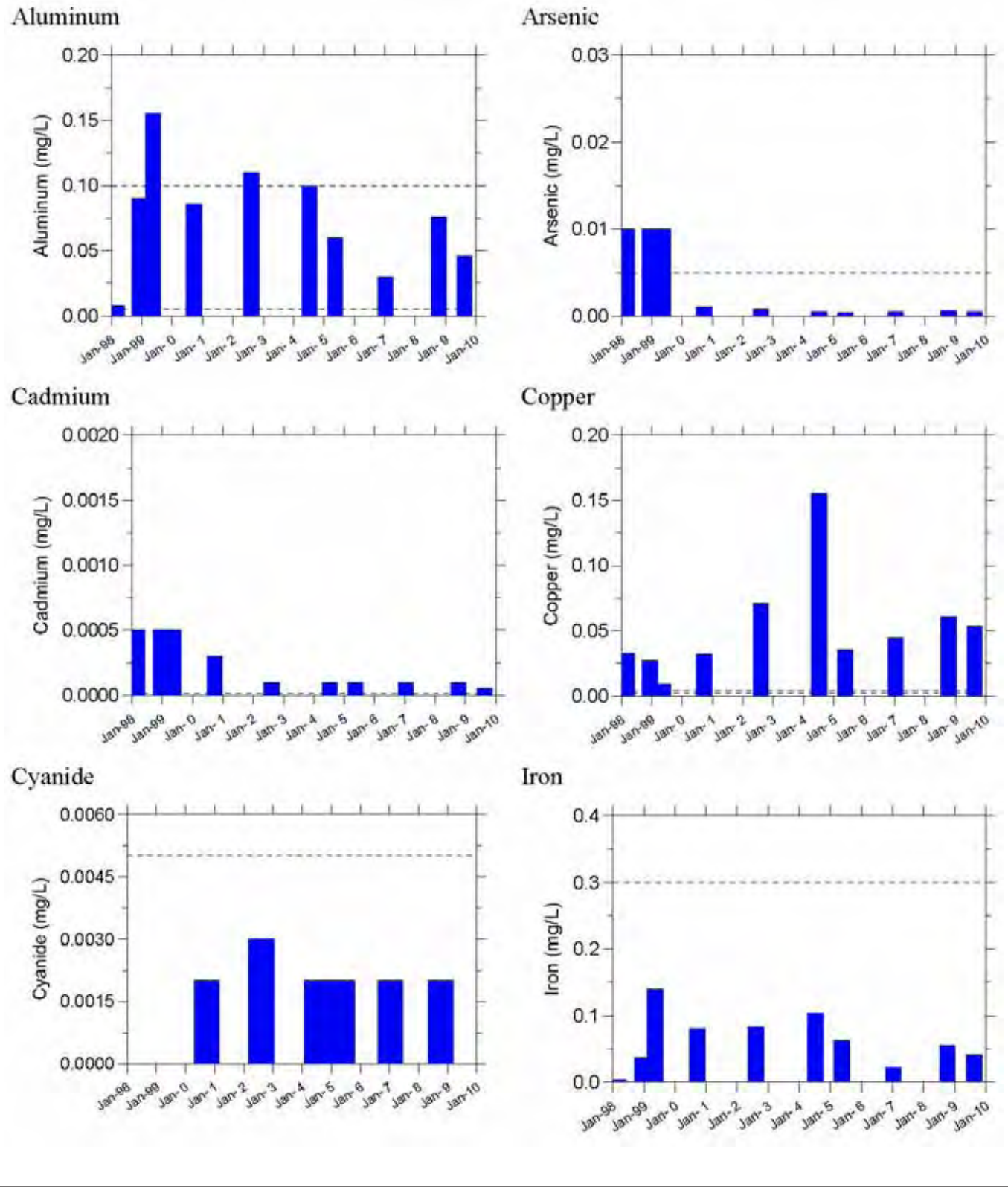
Figure 2.9-5



NOTES

1. Dashed lines represent CCME Guidelines for the Protection of Aquatic Life.
2. Al guidelines are pH dependent.
3. Cu guidelines are hardness dependent.
4. Results below detection limit report detection limit value.
5. Detection limits include (in mg/L): Al = 0.03; As = 0.0002; Cd = 0.0001; Cu = 0.0003; CN = 0.002; Fe = 0.05.

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YELLOWKNIFE GOLD PROJECT

Total Metals
Yellowknife River at Yellowknife

PROJECT NO.	DWN	CKD	REV
V23201097	KW	TP	0
OFFICE: EBA-VANC	DATE: April 14, 2011		

Figure 2.9-6

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Cadmium levels recorded at the Yellowknife River sampling station were routinely above the CCME guidelines for the protection of aquatic life; however, they are well below those concentrations commonly attributed to anthropogenic sources (Figure 2.9-6).

Copper

Copper concentrations in the environment are influenced by pH and hardness. Concentrations increase in waters with low hardness values and in environments that are generally acidic (Puznicki 1996). CCME guidelines for the protection of aquatic life range between 2 µg/L (with a corresponding water hardness of <120 mg/L $CaCO_3$) and 4 µg/L (at a water hardness >180 mg/L $CaCO_3$). Regionally, copper concentrations measured in various arctic lakes were mainly below 2 µg/L and less than 1.0 µg/L in the Yellowknife River Basin (Figure 2.9-7) upstream of the City of Yellowknife. Hardness in these same lakes (Figure 2.9-2) was largely below 120 mg/L $CaCO_3$, indicating that regionally, measured copper concentrations were within CCME guidelines. These copper concentrations also correspond with naturally occurring levels in fresh waters, which are commonly below 20 µg/L.

In contrast, copper concentrations measured in treated drinking water samples (<150 µg/L) taken at the pumphouse on the Yellowknife River at Yellowknife were found to be in excess of the CCME guidelines for the protection of aquatic life, irrespective of water hardness (Figure 2.9-6). These levels fall well within the Health Canada Drinking Water Standards for copper of ≤1000 µg/L[1].

Cyanide

Cyanide testing was conducted in lakes known to have a history of past mining activity (Puznicki 1996). The free cyanide ion (CN^-) was the cyanide species of interest. All of the lakes sampled reported cyanide values below the CCME guidelines for the protection of aquatic life (5 µg/L) (Figure 2.9-8).

Cyanide concentrations in the Yellowknife River were also well below CCME guidelines (Figure 2.9-6).

Iron

Iron is one of the more abundant elements on earth, the levels of which in fresh surface waters can be influenced by the abundance of phytoplankton and zooplankton (Puznicki 1996). Iron levels in lakes located between Great Slave Lake and the Beaufort Sea were generally less than 50 µg/L (Figure 2.9-8). The majority of the iron levels measured in sampled lakes are below the CCME guidelines for the protection of aquatic life (300 µg/L) and the levels characteristic of fresh surface waters (500 µg/L).

Iron levels measured in the Yellowknife River were well below CCME guidelines (Figure 2.9-6).

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[1] Health Canada: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2010-sum_guide-res_recom/index-eng.php#a13.

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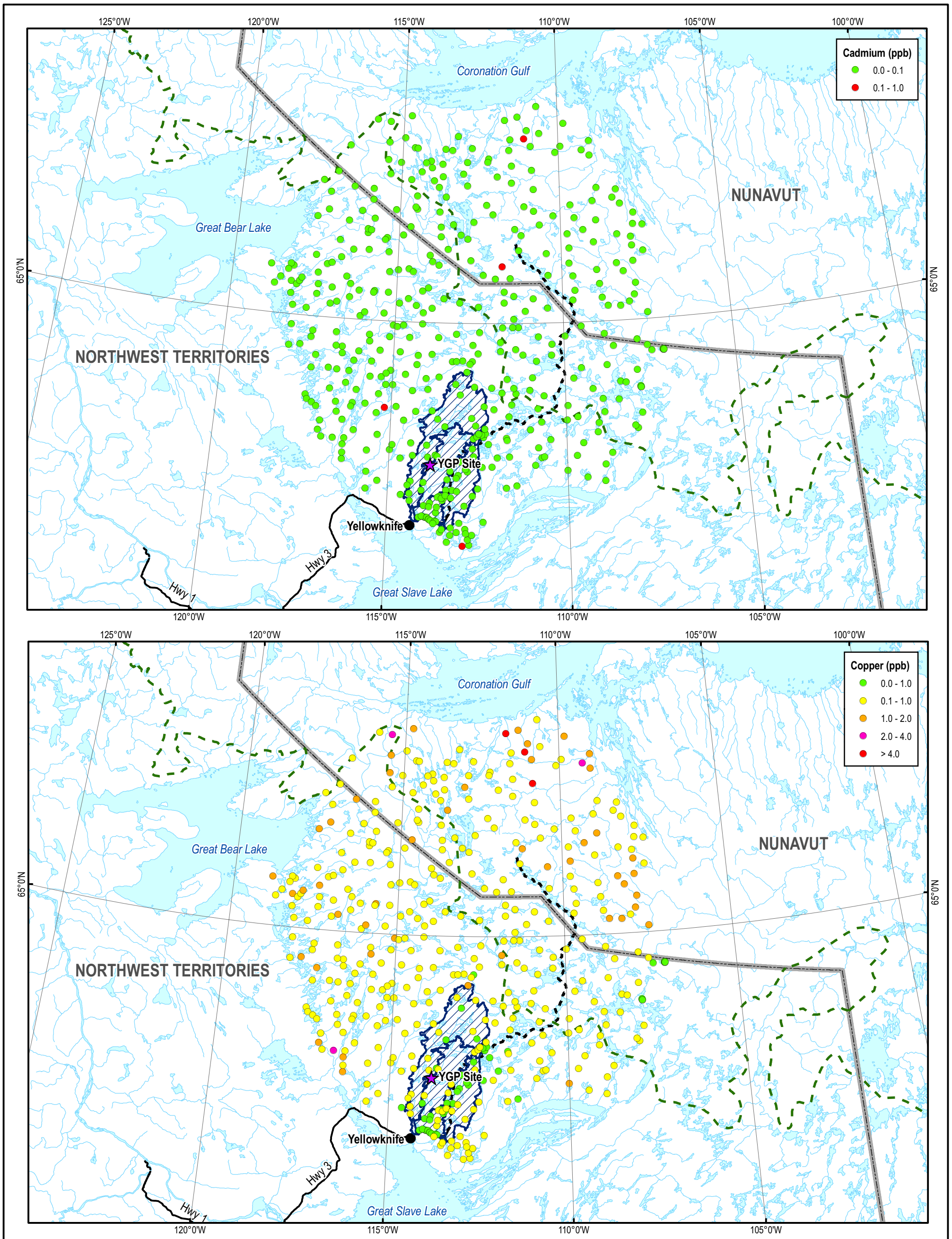

LEGEND

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N W E S

NOTES

1. Water quality data from Department of Indian and Northern Affairs (Puznicki, 1996) and Ruhland et al. (2003).
2. Base data source: Atlas of Canada.

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YELLOWKNIFE GOLD PROJECT

Water Quality in the Slave Province Cadmium and Copper

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:5,000,000

100 50 0 100

Kilometres

FILE NO.			
V23201097-DAR-047.mxd			
PROJECT NO.	DWN	CKD	REV
V23201097	SL	TP	0
OFFICE	DATE		
EBA-VANC	March 14, 2011		

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Figure 2.9-7

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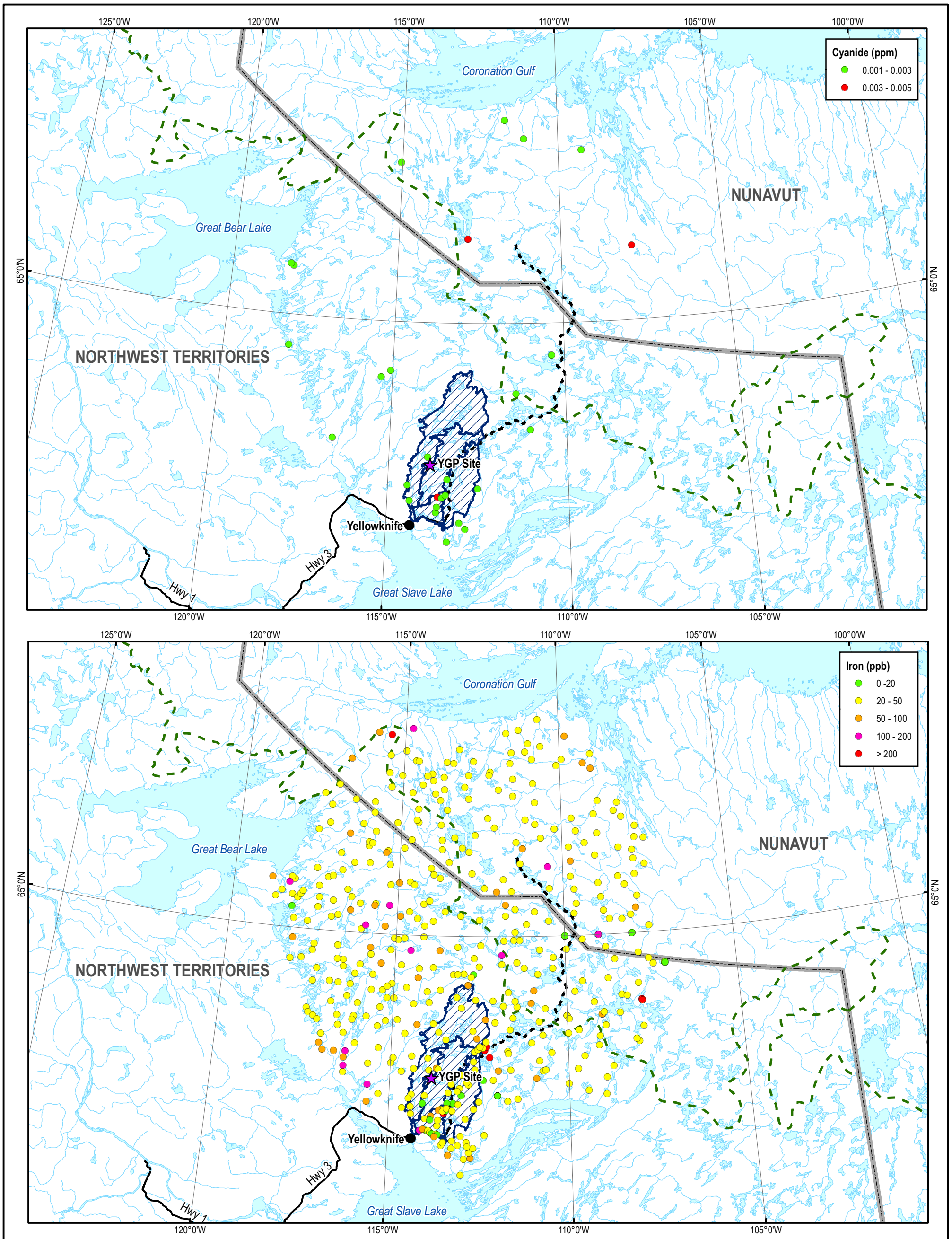

LEGEND

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N W E S

NOTES

1. Water quality data from Department of Indian and Northern Affairs (Puznicki, 1996), Ruhland et al. (2003), and Pienitz et al. (1997).
2. Base data source: Atlas of Canada.

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YELLOWKNIFE GOLD PROJECT

Water Quality in the Slave Province Cyanide and Iron

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:5,000,000

100 50 0 100

Kilometres

FILE NO.			
V23201097-DAR-048.mxd			
PROJECT NO.	DWN	CKD	REV
V23201097	SL	TP	0
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Figure 2.9-8