CRITIQUE OF PEBBLE LIMITED PARTNERSHIP PRELIMINARY WATER QUALITY DATA FOR THE PEBBLE PROSPECT, ALASKA

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Executive Summary

The Pebble prospect in the Bristol Bay, Alaska area contains a world-class deposit of copper, gold, and molybdenum in two conjoined sections, Pebble East and Pebble West. Exploratory drilling has occurred since 1988, and advanced exploration began in 2004.

Baseline studies are critical to understanding mineralization and water quality in the Bristol Bay region. While numerous studies have been conducted by the mine proponent, Pebble Limited Partnership (PLP), only preliminary data have been released. This critique examines the preliminary PLP water quality data to determine whether it adequately reflects the water quality of the natural environment.

Although a full data validation could not be conducted due to lack of data, evaluation of the preliminary water quality data available suggests that some of the results might be compromised or in error. At several groundwater wells, analyte concentrations trend up or down, indicating a chemically unstable aqueous environment. Both surface and groundwater had ammonia sporadically in much higher concentrations than reported for rivers at nearby Lake Clark, or for streams with high salmon carcass density. Occasionally analyte concentrations at a site along a stream reach appeared to be much higher or lower than the trend in concentrations moving from upstream to downstream would suggest. Most surface water and groundwater data reviewed included potential outliers – data outside the historic range, usually as high concentrations – and several sites had suspended sediment that did not appear representative of natural waters.

Analytes that traditionally correlate include: turbidity and suspended sediment, total dissolved solids and conductivity, total and dissolved concentrations of major cations, alkalinity and hardness. The PLP data set included poor correlation of these relationships at some sites. Poor correlations between total dissolved solids and conductivity were found at several sites on the South Fork Koktuli and Upper Talarik. Poor correlation of total and dissolve concentrations of major cations occurred primarily in groundwater samples. Poor correlation of alkalinity and hardness occurred occasionally due to a single measurement of a concentration far above or below the historic range. Turbidity information was only available for groundwater and only in qualified terms (“low”, “high”, etc.). High sediment concentrations, with associated metals, were included in data at sites for which turbidity was “low” or “none”. Sediment can be elevated after initial well development, but should not be presented as representative of natural waters. In surface water, high sediment concentrations that do not correlate with discharge may be an artifact of sampling, particularly in 2004 when the DH-48 sampler was utilized. A final database should provide turbidity for both surface water and groundwater in nephelometric turbidity units, as per PLP’s field sampling protocol.

Analytes for which dissolved concentrations are more than 20% of total, or for which several analytes on a single date have dissolved concentrations more than 10% over total concentrations, should be reviewed; this occurred with much greater frequency in the PLP data set than in USGS data collected in the Pebble area. The PLP data set also included major cations for which dissolved and total concentrations did not correlate.

In addition to specific data points that should be reviewed, critical historical and spatial information relevant to characterizing the natural environment is missing, data are not placed in context, and much could be done to present the data in a manner that would lend itself to review and interpretation by regulators and the public.

- Spatial coverage. Sampling of ponds and lakes in the mine area, and seeps on the ore body, were very limited. Groundwater sampling outside potential mine facility siting was limited although downgradient water quality and quantity could be affected. There is limited monitoring well coverage for the North Fork Koktuli River and Upper Talarik Creek, and no monitoring wells in the Chulitna drainage, on Lower Talarik Creek, or at Kaskanak Creek.
- Sampling over time. No water quality data prior to 2004 is presented, although exploration has been conducted since 1988, making it difficult to distinguish natural baseline from potential exploration impacts. Additionally sampling frequency of seeps, ponds, and lakes was not adequate to discern seasonal signals and changes in water quality over time.
- Organics analysis. There was very limited analysis of petroleum hydrocarbons and other organic compounds related to exploration drilling, and no analysis of fuel range organics along the transportation corridor. Water from only three stream sites was analyzed, with no analysis of organic compounds in ponds, lakes, headwater streams, tributaries, or wetlands. Dissolved organic carbon was not measured in surface water until 2007, and there has been no analysis of groundwater or surface water total organic carbon. The sediment sampling for organic compounds was inadequate to determine the natural variability in concentrations across different habitat types, including wetlands, sloughs, fast-running streams, ponds, and lakes.
- Data interpretation. Sample results for water quality were only presented in pdf tables without laboratory data sheets, statistics, or explanation. No interpretive or technical reports were submitted. No field notes or driller's logs were provided. No information was provided on whether sampling locations – groundwater or surface water – were mineralized or un-mineralized, or on the proximity to exploration activities

Data needs to be placed in context in order for the best interpretation to be made and for a full data validation. It would also clarify how analytes detected at very low concentrations are presented. A systemic issue in the data set is the presentation of different values as representing ½ the method detection limit, when they actually represent the method reporting limit, ½ the method reporting limit, or the practical quantitation limit; in some cases up to four different values are given as representing ½ the method detection limit of a single analyte at a single sample site.

In summary, although significant effort has been expended to collect and analyze water quality samples, the preliminary database almost certainly contains data not representative of the natural surface water or groundwater environment. Additionally, the database is missing certain data that would be useful in understanding the baseline environmental conditions and the possible effects of exploration activities. Reviewers of the preliminary water quality database should be aware of possible inadequacies and errors in the data and the lack of associated data validation.

CHAPTER1: SAMPLING SCOPE, DESIGN, AND CONTEXT

1.1 Introduction

The world-class Pebble prospect in Southwest Alaska contains copper, gold, and molybdenum in primarily sulfide ore. Located on a plateau at an elevation of about 1000 feet, unconsolidated glacial till and outwash are prevalent[1] resulting in permeable soils over much of the area. A layer of overburden up to 150 feet thick covers the area, but mineralization at Pebble West is closer to the surface, while at Pebble East the mineralized rock is beneath a wedge of volcanic and sedimentary rocks 1000-3000 feet below the glacial till (Figure 1).[2] Permafrost is discontinuous. Precipitation is moderate (35-40 inches per year),[3] and feeds lakes, rivers, dozens of ponds, and hundreds of tributaries. There is significant exchange of surface water with groundwater as evidenced by over 4,500 mapped groundwater seeps[4] and by piezometer data.[5] The mining claims lie within the headwaters of some of the most productive wild salmon returns on earth. Mining a metal sulfide ore body poses significant risks to the fishery, in part due to the potential for mining to change the surface water and ground water quality. Baseline studies must accurately portray the water chemistry for assessment of the risk and for use in future monitoring.

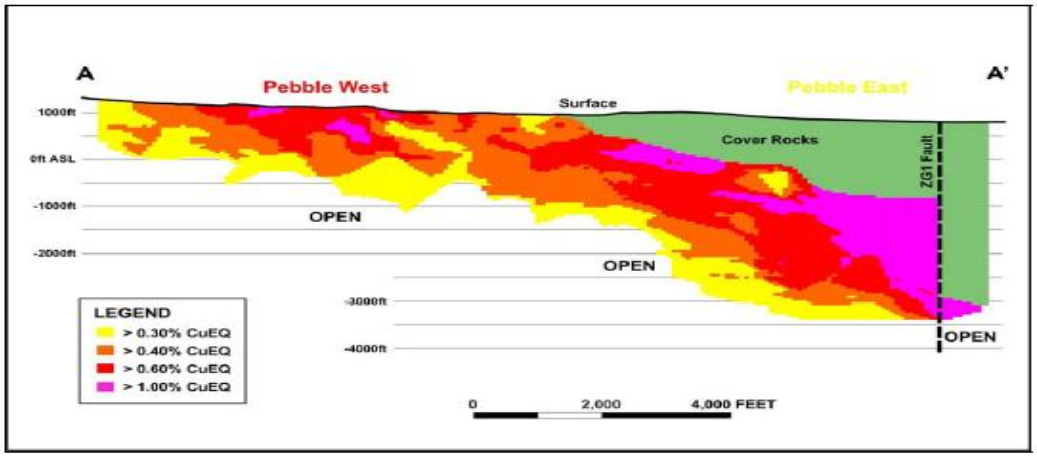

Figure 1. Cross-section of Pebble ore deposit. Illustration of mineralization. Rebagliati et al 2009

This review examines whether the available (as of April 2011) water quality information provided by the Pebble Limited Partnership (PLP) accurately reflects the pre-mining environment and how well it lends itself to third party review.

- Was the scope of the studies appropriate?
- Was the sampling design adequate?
- Do studies provide the context necessary for interpreting the data?
- Are data consistent or do some data points need to be re-examined or removed from the datasets?

1 PLP Pre-Permit Report C; Kelley 2010
2 Kelley 2010
3 Knight-Piesold, 2006, mentions this range, apparently based on a streamflow and a back-calculation as mentioned in the deposition of Jaimee Cathcart in the trial Nunamta Aulukestaii vs State of Alaska . The only meteorology data published by Pebble consultants was collected in 2007, reporting 34.5 inches of precipitation at one of six meteorological stations (PLP Pre-Permit Report A, 2008). From 2004-2007, the weather station at the Iliamna airport (which is at a lower elevation than the proposed Pebble mine site) reported 15-30 inches per year.
4 PLP Report D-6 Data June 2008; Map of seeps available in PLP, 2007. Pre-Permit Report F-3.
5 Wobus, 2009 provides a review of hydrologic response of groundwater to precipitation

1.2 Methods

Laboratory quality control data were not provided by PLP; therefore, a traditional quality assurance/quality control analysis could not be conducted. In Chapter 1, available data was collected and examined visually for data gaps that could be filled to better assess the natural environment.

The following documents were reviewed:

- Cominco data 1991-1993 (ADNR File 1033, date unknown)
- NDM draft baseline environmental studies posted on Alaska Department of Natural Resources (DNR) website http://dnr.alaska.gov/mlw/mining/largemine/pebble/index.htm
- PLP, 2008 "Pre-Permit Report F: Surface Water and Groundwater Quality", posted on the PLP website.[6]
- A document[7] produced from a PLP consultant (SLR) through the discovery process in the lawsuit *Nunamta Aulukestaii v State of Alaska* (PLP intervening) in 2010.
- PLP "Quality Assurance Project Plans", 2004, 2005, 2006, 2007, 2008, available on CD from Alaska Department of Natural Resources.
- USGS sampling in the Pebble mining claims region (Fey 2008, Fey 2009, Kelley 2010)
- USGS sampling in the Lake Clark region (Brabets 2002; Brabets and Ourso 2006)
- Maps available from technical reports submitted by PLP to SEDAR (the Canadian Securities and Exchange Commission) (Rebagliati et al 2005, 2008, 2009)
- A map provided by DNR (DNR 2010)

In Chapter 2, a review was performed on the available PLP preliminary data to determine if single outliers or trends existed that could be un-representative of the natural environment and deserved closer scrutiny prior to inclusion in the final database. This was constrained by data limitations. Inter-parameter relationships were examined, as was the relative percent difference (RPD) in filtered and unfiltered concentrations of major cations and select metals. Additionally, graphs were created to visualize potential data points that were not consistent with the range of concentrations at the same site over time, and to visualize whether analyte concentrations were consistent across upstream and downstream sites when samples were collected on the same day or within three days.[8]

The intent of the review is to point out data that could potentially benefit from further investigation and information that could be of assistance to third party reviewers when the final database is submitted.

1.3 Results: scope and design of PLP water quality studies

PLP[9] conducted baseline sampling of surface water and groundwater chemistry. Laboratory analyses included total and suspended solids, total and dissolved metals, major cations (calcium, magnesium, potassium, sodium), major anions (sulfate, chloride, fluoride), alkalinity, acidity, hardness, specific

[6] http://www.pebblepartnership.com/pages/environment/environment-pre-permitting.php
[7] Bates stamp SLR 000856, no cover sheet
[8] The 3-day period was chosen because it appeared that it often took 3 days to collect surface water at all sites.
[9] Unless specifically noted otherwise, the term "PLP" will be used to refer to both work that Northern Dynasty (NDM) conducted prior to the partnership with Anglo-American and to the later documents released.

conductance, and other analytes. PLP analyzed samples for nitrogen compounds associated with mining (cyanide, thiocyanate, nitrate/nitrite, and ammonia) and for phosphorous.

Surface water samples were collected at 41 stream and river sites and 19 ponds (Figure 2).[10] Streams were sampled monthly, with many sites sampled from April 2004-December 2008. Ponds and lakes were only sampled in 2006 and 2007, with most sites having only one to two samples. Groundwater studies included quarterly samples from 21 to 37 monitoring wells (depending on the year) and occasional samples from 125 groundwater seeps (Figures.3-4). Most monitoring wells were installed in 2004 and were usually sampled quarterly.

1.3.1 Scope – spatial and temporal issues

1.3.1.1 Historical data

Although exploration has been ongoing since 1988, there are essentially no historical water quality data prior to 2004, approximately 16 years after exploratory drilling commenced (Figure 5). It is important to measure chemical components of the natural environment prior to advanced exploration to ensure that the "true" or baseline chemistry is characterized, given that exploration activities have the potential to accelerate or change natural chemistry.[11] Analytes such as pH, oxidation-reduction potential (ORP), and dissolved oxygen can easily be measured from the start of exploration, with the addition of hydrocarbons/organics, cations, anions, and metals as exploration advances.

Surface water

A single "historical" document on surface water quality in the Pebble region has been released.[12] Summarizing water chemistry from 1991-1993, the report was made available to the public by the State of Alaska in an electronic format for a single day. It did not include a legible map of sample site locations, nor were any location coordinates provided (Figure 6). Analysis was limited to total metals in surface water. Dissolved concentrations of metals, anions, field parameters, nutrients and groundwater analysis, if conducted, have not been made available.[13] Although apparently 20 surface water sampling stations were established, there were minimal data for five sites and no data for 11 stations. The data were presented as raw data and chain of custody forms, with some graphs, but a full interpretive report was not provided. Analytical detection limits were generally higher than those in more recent studies, and the two datasets are therefore difficult to compare.

Groundwater

There are no groundwater data from the ore body area prior to the expansion of drilling in 2004. This data is important because drilling can accelerate natural weathering processes. Without data from early in exploration, it is very difficult to know whether the water collected as representative of natural groundwater has in fact been impacted by the depth and high density of exploratory holes on the ore body.

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[10] Information and maps mentioned in this paragraph are from PLP Pre-Permit Report F

[11] Zamzow 2010

[12] ADNR, file report 1033, date unknown

[13] Analysis for cyanide was conducted, occasional fluoride analysis, and samples from a single date in 1993 had nitrogen and phosphorous analysis.

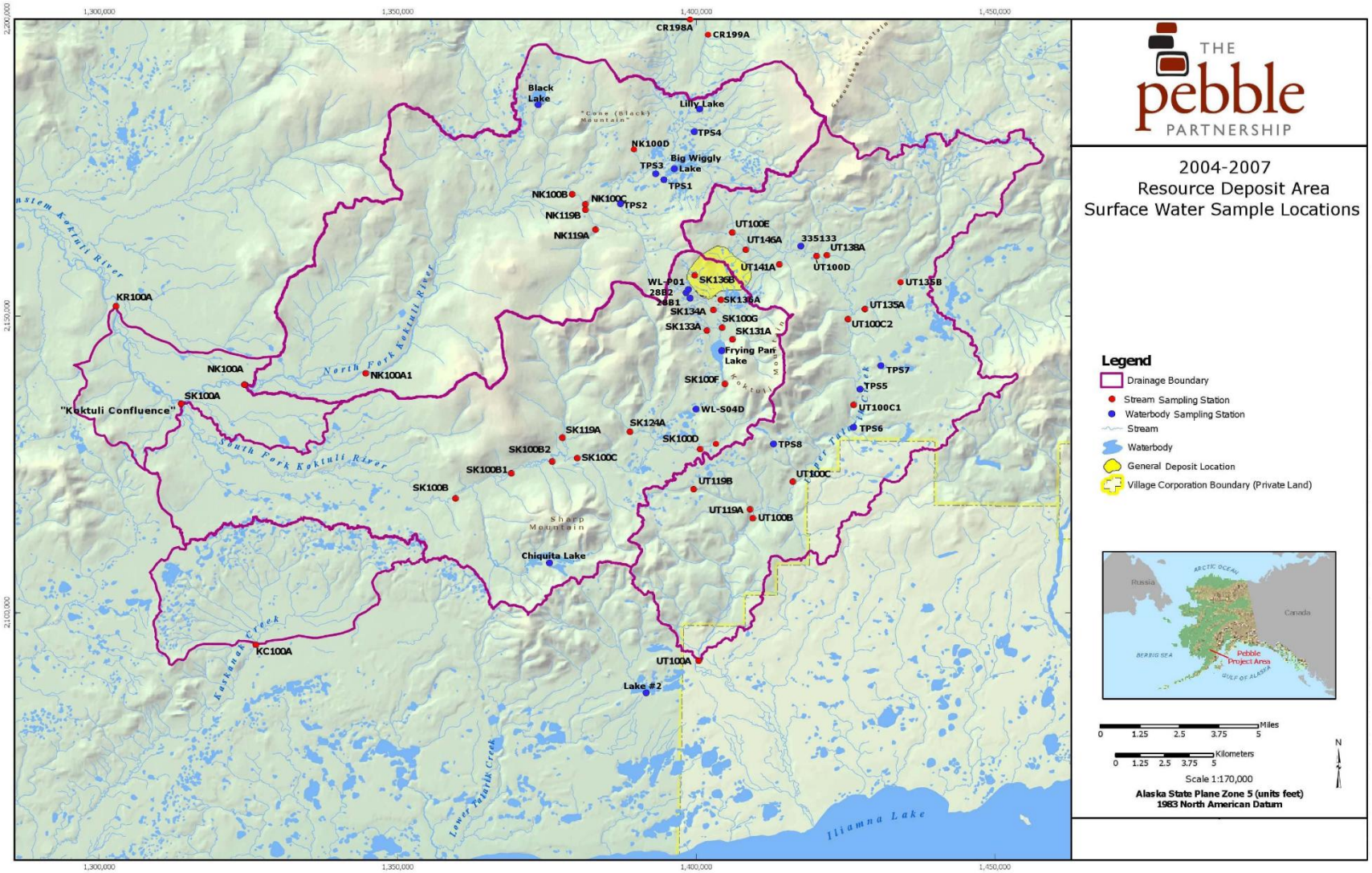

Figure 2. PLP surface water sampling sites. PLP 2008 Pre-Permit Report F; all PLP data are preliminary and subject to change.

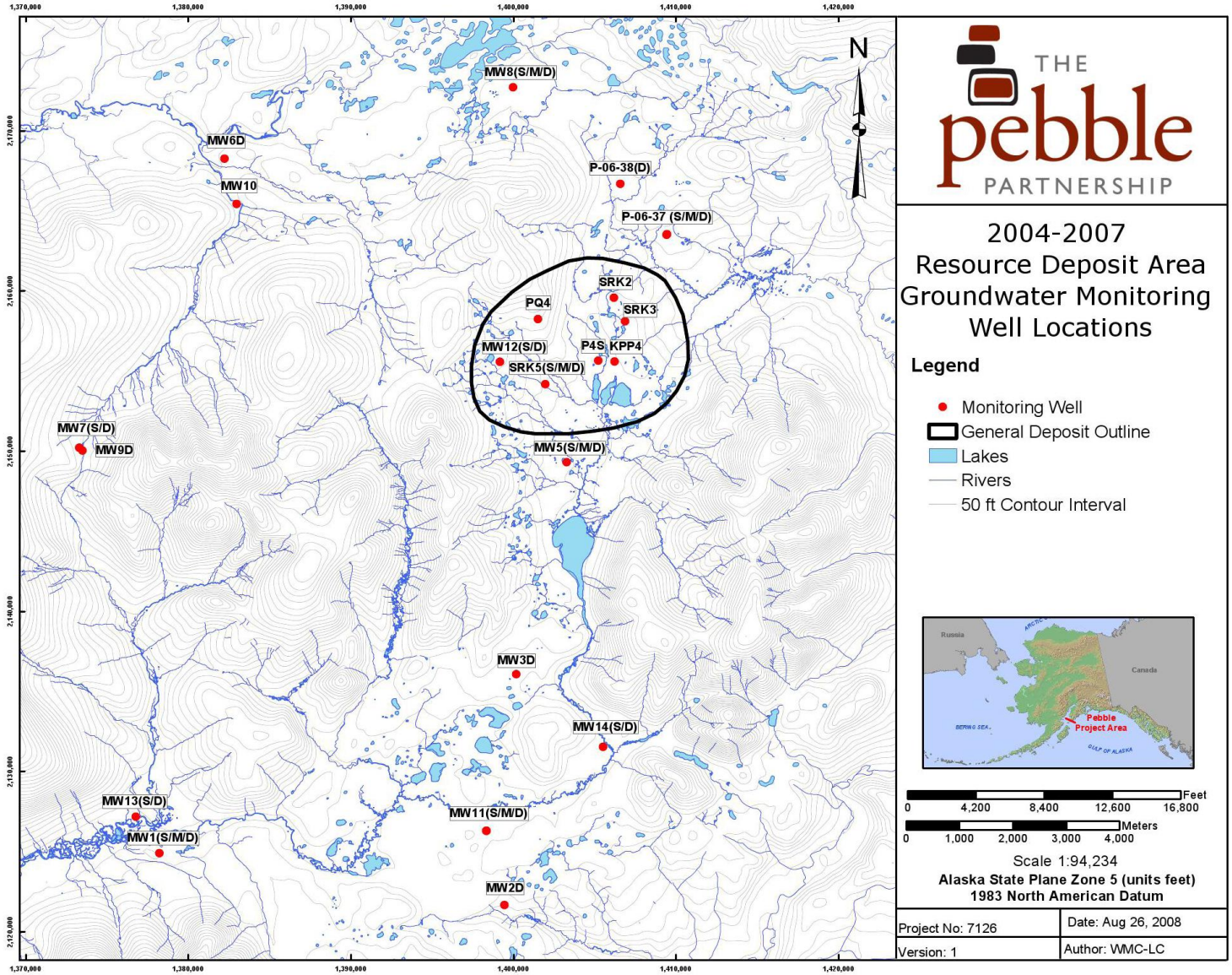

Figure 3. PLP groundwater monitoring well sites. PLP 2008 Pre-Permit Report F; all PLP data are preliminary and subject to change.

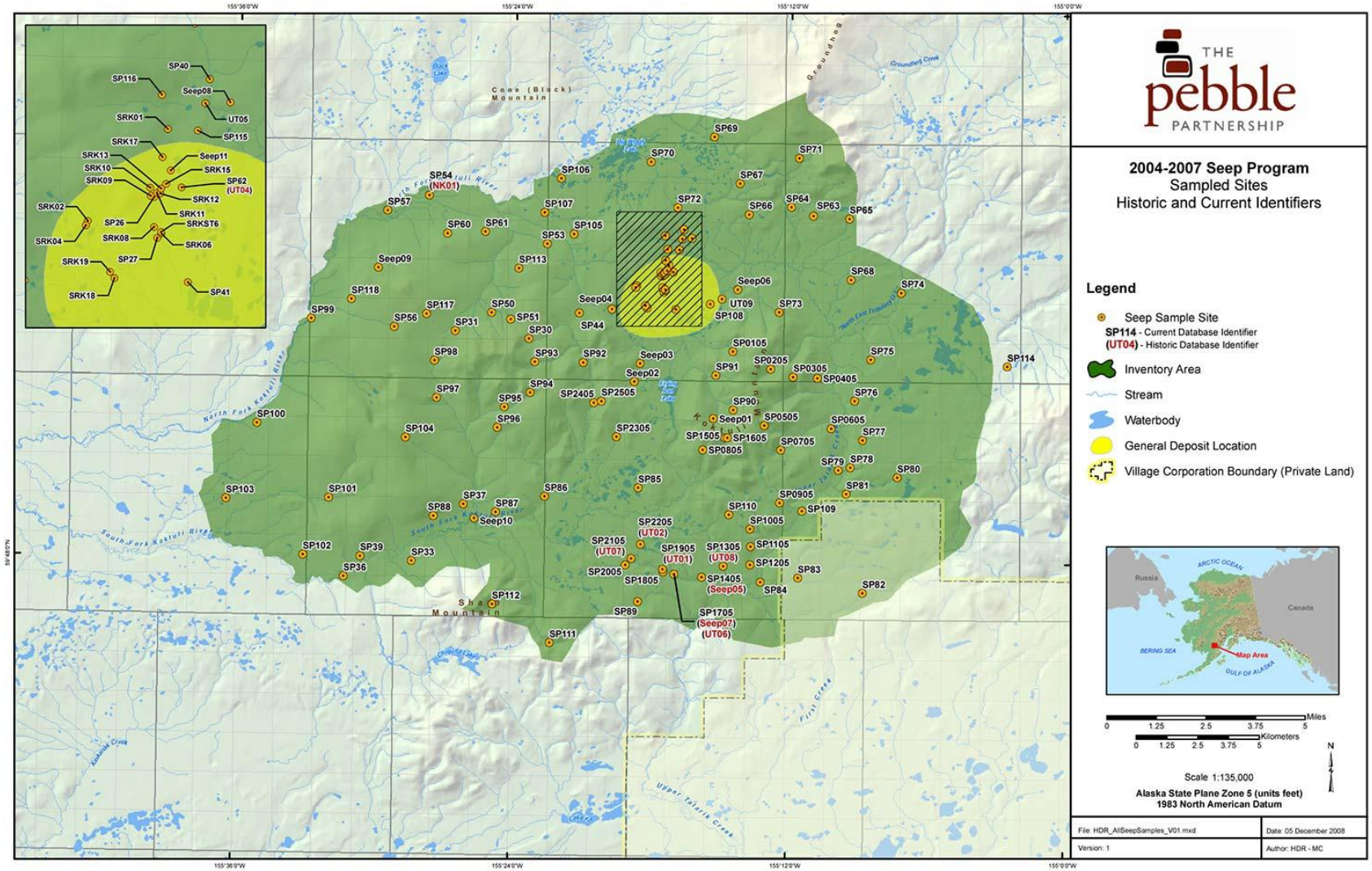

Figure 4. PLP seep sampling sites. PLP 2008 Pre-Permit Report F; all PLP data are preliminary and subject to change.

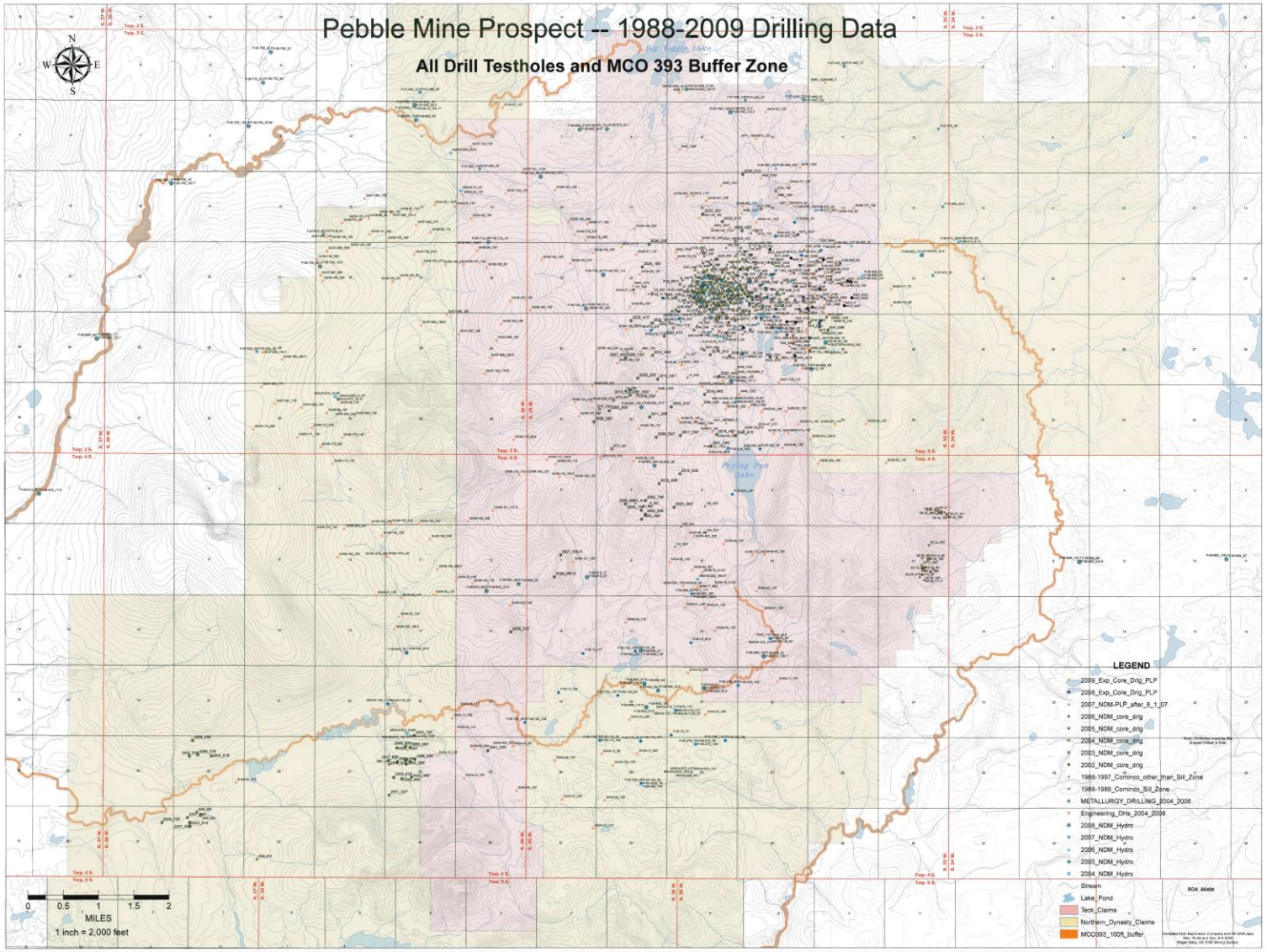

Figure 5. ADNR drill hole map

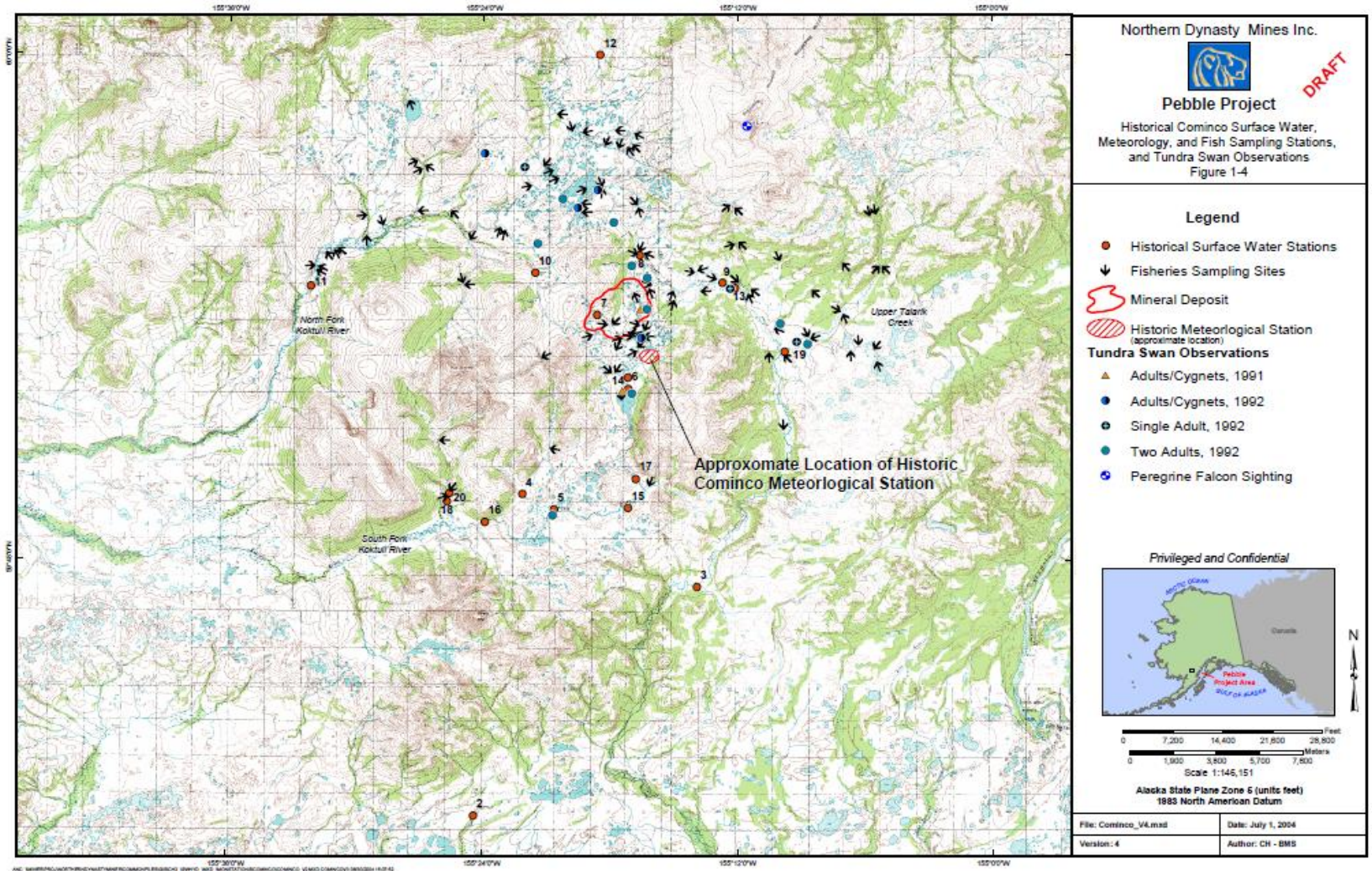

Figure 6. Historical Cominco surface water sampling sites. This is the only map that could be found of Cominco sample sites. It is located in NDM 2005. Cominco surface water sampling sites are noted as red dots. Data has not been made publicly available from all Cominco sites.

For example, no seep data were collected from the ore body prior to 2004, and then only a single sample was collected at a single site (Seep 11, September 2004).[14] Seep samples were collected in 2006 and later, but for seeps located on the ore body, there are only one to three samples at each seep rather than a consistent sample history. This is in contrast to the region between the South Fork Koktuli River and Upper Talarik Creek, where seeps were sampled multiple times. A cluster of 9 seeps sampled by PLP in the Pebble West area have classic acid mine chemistry: low pH (medians 2.7-4), high sulfate concentrations (medians 31-193 mg/L), high ORP (medians 248-510), and extremely high concentrations of copper and aluminum (medians 10-2990 ug/L copper and 1030-6700 ug/L aluminum).[15]

Similarly, seeps were rarely sampled on a quarterly basis the way monitoring wells were. Seep water quality may change over a very short period of time, and quarterly or even monthly sampling, particularly during periods when hydrology is changing, such as ice breakup (April, May) and the traditionally rainy months (August, September) would provide information on the effect of these short-term events on seep water quality. For example, seep SRK17 (collected by PLP), located at Pebble West just north of the acid seep cluster, had water chemistry that was dramatically different in May than in the fall (Table 1). A slug of acid drainage – high acidity, sulfate, and dissolved metals came through in May, a time when snow is rapidly melting and the groundwater table may rise. Although the pH did not decline, the increase in dissolved metals was significant: copper is considered toxic to aquatic life by State of Alaska standards at near 2.7 ug/L[16] and aluminum at 87 ug/L; these levels were exceeded by up to 24 times (copper) or 68 times (aluminum).[17]

Table 1. Water chemistry for PLP seep SRK17. Data is from PLP Pre-Permit Report F. All data are preliminary

Date	**Alkalinity** (mg/L as CaCO3)	**Acidity** (mg/L)	**Dissolve Oxygen** (mg/L)	**pH (SU)**	**ORP (mV)**	**Conductivity** (µmhos/cm)	**Sulfate** (mg/L)
Oct 2006	nd	2	8	5.3	282	80	30
May 2007	nd	45	7	5.6	125	220	83
Oct 2007	nd	1	6	6.1	146	123	44
	Dissolved copper (µg/L)	**Dissolved iron** (µg/L)	**Dissolved aluminum** (µg/L)	**Dissolved molybdenum** (µg/L)	**Barium** (µg/L)	**Calcium** (µg/L)	**Sodium** (µg/L)
Oct 2006	1	86	49	<0.3	9	10	3980
May 2007	65	444	5910	<0.3	16	6	3310
Oct 2007	1	25	35	<0.3	13	13	4800

nd = not determined?

ORP = oxidation-reduction potential

[14] PLP 2008 Pre-Permit Report F-3

[15] ibid

[16] The State of Alaska recognizes that copper toxicity changes with the hardness of the water; the regulatory standard (chronic criteria for aquatic life) for dissolved copper at a hardness of 25 mg/L is 2.7 ug/L of copper.

[17] ADEC 2008

1.3.1.2 Spatial coverage

Surface water sites where samples were collected for inorganic analysis were on the three main rivers – the South Fork Koktuli, North Fork Koktuli, and Upper Talarik Creek –some of their tributaries, a single site on the Koktuli River (main stem), and a single site in the upper reaches of Kaskanak Creek, near the southern border of the mining lease. Most surface water sites were sampled monthly from April 2004-December 2008.[18]

- Streams that did not directly border the mining lease – such as Lower Talarik Creek, Chulitna River, and Stuyahok River – had no surface water sampling, although there is the potential that they could be affected through groundwater drawdown during mining or from potential discharge, leakage, or accidents depending on siting of mine facilities.
- Small headwater streams do not appear to have been sampled.
- No ponds or lakes near the ore deposit were sampled by PLP. The USGS sampled ponds on the ore body in 2007 and 2008.[19]
- There was only minimal sampling of lakes and ponds outside the ore body-- each of the 19 sites had only one or two samples each. No ponds were sampled within the Kaskanak Creek drainage, despite numerous kettle ponds and lakes dotting the headwaters of that region.

Ponds and lakes are likely to have less ability to flush contaminants, may contain fish, and could potentially represent fish rearing habitat if they are groundwater fed.[20] Had monthly sampling occurred, water chemistry and observations of water depth and temperature could inform whether the water bodies were fed by surface water or groundwater.

Pertaining to groundwater, ten monitoring wells (five single wells and two nested pairs) were installed by PLP near the ore deposit. The sampled wells in the vicinity of the ore bodies included:

- Pebble East wells – SRK2, SRK3, KP-P4, P-04S
- Pebble West well – PQ4, MW-05-12 D/S, SRK5 D/M/S.

No monitoring wells were installed along the Upper Talarik Creek, a system that appears to be primarily groundwater-fed,[21] outside headwaters adjacent the ore deposit. No monitoring wells were installed in Lower Talarik Creek, a stream awarded special use status by the Alaska Department of Fish and Game.[22]

[18] Data from April 2004-December 2007 is available in PLP's Pre-Permit Report F; data for January-December 2008 was obtained from SLR consulting during the discovery process in the *Nunamta* lawsuit; other than charge balance errors and cation and anion concentrations, the 2008 data has not been reviewed and included in this report.
[19] Fey et al 2008, Fey et al 2009
[20] Woody 2010
[21] During winter over-flights, stretches of the Upper Talarik were observed to remain open. Additionally, analysis of water chemistry at some Upper Talarik sites sampled by the Nature Conservancy or PLP indicated little seasonal variation of cations. Lastly, PLP identified water that flowed from the South Fork Koktuli underground, emerging in an Upper Talarik tributary. Together, the information tentatively identifies the Upper Talarik as having significant groundwater input.
[22] Dye et al, 2006

1.3.2 Scope – analytical issues

Baseline sampling at the Pebble prospect was conducted by several different consulting firms during 2004-2007.[23]

- Surface water at streams and lakes in the mine area collected by HDR, Alaska, Inc. (HDR)
- Surface water from ponds in the mine area collected by HDR and 3 Parameters Plus (3PP)
- Groundwater from pools in the mine area collected by 3PP
- Groundwater wells in the mine area sampled by SLR International (SLR)
- Groundwater seeps sampled by HDR
- Soil in the mine area sampled by SLR
- Sediment in the mine area sampled by SLR and HDR
- Surface water, groundwater, soil, and sediment along the proposed transportation corridor collected by Bristol Environmental and Engineering Services Corporation (BEESC)

Surface water and groundwater were analyzed extensively for the analytes listed in Table 2.

1.3.2.1 Quality control samples

Primary surface and groundwater samples, and field duplicate (quality control) samples were analyzed by SGS labs in Anchorage, AK; field triplicate (quality assurance) samples were analyzed by Columbia Analytical Services (CAS) in Kelso, WA.[24] No information was provided on field quality control samples (replicates, equipment blanks, trip blanks) or laboratory quality control samples (lab duplicates, matrix spikes). The USGS data from sampling in the Pebble region provided information on field replicates.

1.3.2.2 Field chemistry

Basic field parameter measurements (pH, dissolved oxygen, water temperature, specific conductivity, ORP) have been made available for groundwater samples, but field measurements are only available for the 2004 surface water samples. The 2005 NDM report also provided surface water discharge information for each site, with the field parameters, as did the USGS for samples from the Pebble region. Field parameter measurements should have been provided for later surface water samples in PLP reports.[25]

Drilling logs and driller's field notes have not been made publicly available, nor has chemistry or drilling logs from exploration holes been made available. These could represent some of the earliest groundwater data, if available for early exploration wells, and allow reviewers to determine whether water chemistry changed during the weeks the well was being developed, particularly when wells encountered reactive rock and aquifers that could feed into surface waters. Driller logs would also provide information on the aquifers from which the groundwater samples were collected.

[23] Pebble Partnership Quality Assurance Project Plan documents 2007, 2008
[24] Pebble Partnership. 2008. Environmental baseline studies 2008 Quality Assurance Project Plan. Table 1-1
[25] Field pH values were obtained for a limited number of surface water sites through the discovery process in the *Nunamta v State of Alaska* lawsuit, but the results were not reviewed for this report.

Table 2. Analytes and media. From PLP Quality Assurance Protocol Plans 2004 and 2005 (Table 1-6) and Quality Assurance Protocol Plans 2006, 2007, and 2008 (Table 1-5).

	Analyte	Surface Water	Groundwater	Seeps	Soil	Sediment
Basic Chemistry	**pH**	x	x	x		
	Specific conductance	x	x	x		
	Acidity	x	x	x		
	Alkalinity	x	x	x		
	Hardness	x	x	x		
	TDS	x	x	x		
	TSS	x	x	x		
Nitrogen species	**Ammonia as N**	x	x	x	x	x
	Nitrate + Nitrite	x	x	x		
	Cyanide, total	x	x	x	x	x
	Cyanide, WAD	x	x			
	Thiocyanate	x	x	x		
Phosphate species	**Phosphorous, total**	x	x	x		
	Orthophosphate	x		x		
Other anions	**Chloride**	x	x	x	x	x
	Fluoride	x	x	x	x	x
	Sulfate	x	x	x	x	x
Metals	**Metals**[a]	x	x	x	x	x
	Low-level mercury	x	x[b,c]	x		
	Mercury		x[d]		x	x
Organics	**TOC**	x[f]	x[f]		x[b,c,d,e]	
	DOC	x[c, f]	x[f]	x[c]		
	DRO,RRO	x[c, f]		x[c]	x[b,d,e]	
	PCBs	x[c, d, f]	x[d]	x[c,d]	x[d]	x[d]
	Pesticides	x[d, e]	x[d, e]		x[d]	x[d]
	VOCs	x[c, d, e,f]	x[d, e]	x[c]		
	SVOCs	x[c, d, e,f]	x[d, e]	x[c]		

[a] Total and dissolved analysis of Al, Sb, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Si (dissolved only), Ag, Na, Tl, Sn, V, Zn
[b] 2006
[c] 2007
[d] 2005
[e] 2004
[f] 2008

1.3.2.3 Organics parameters

Analysis of inorganics was conducted consistently every year (2004-2008) and over all matrices, while analysis of organics was inconsistent (Table 2). Limited surface water samples were analyzed for dissolved organic carbon (DOC) in 2007, and DOC was not determined in groundwater. TOC was not determined in stream sediment, surface water, or groundwater.

Sediment chemistry sampling at pond and lake sites in the mine area was minimal, with no information on sediment character (silt, sand, organic content) that affects transport and sequestration, and minimal analysis for fuel hydrocarbons. A single site (BUL) had a single set of organic compound analyses in sediment; this site could not be located on the map provided.[26]

Analysis of organics associated with anthropogenic activity[27] (diesel range organics (DRO), gasoline range organics (GRO), residual range organics (RRO), PCBs, pesticides, volatile organic compounds (VOC), and semi-volatile organic compounds (SVOC)) was not conducted consistently over time, space, or media types. For surface water, determination of these categories of organics in the mine area was limited to six surface water sites: one upstream and one downstream site each on the main stems of the South Fork Koktuli, North Fork Koktuli, and Upper Talarik. Each was sampled for pesticides, PCBs, VOCs, and SVOCs in August and October 2004 (Northern Dynasty) and in July 2007 (PLP). These six sites, and only these, were sampled for petroleum hydrocarbons (GRO, DRO, RRO) once in June 2007.[28]

- No pond water or stream tributaries were sampled for these organic compounds.
- No lake water, other than in Iliamna Lake, was sampled for these organic compounds. Iliamna Lake water was sampled at five locations for PCBs, pesticides, VOCs, and SVOCs in June and September 2005 and 2007; petroleum hydrocarbons (DRO, GRO, RRO) were determined in June and September 2007.
- The transportation corridor had only 3 sites sampled, and only for organic compounds not related to petroleum, once in October 2004.
- No analyses were conducted for potential organic contamination from drilling fluid constituents – e.g., polyacrylamide, acrylamide, ethanol –in surface water or groundwater samples.

Although a document states that groundwater was sampled for petroleum hydrocarbons ("*Groundwater samples are collected and analyzed for major anions, total and dissolved metals, nutrients, and petroleum hydrocarbons"*),[29] no data have been made public.

Along the road corridor, where fuel will be transported and releases will likely occur, only two soil samples were analyzed for RRO and DRO (no GRO or BTEX[30] testing); and although 97 samples of sediment from the road corridor were submitted for trace element analyses, none were analyzed for organic compounds. This is in stark contrast to samples from the port site and Lake Iliamna, where all samples collected for trace element analysis were also analyzed for full or partial fuel organics analysis. [31] Because naturally occurring organic compounds can register as total petroleum hydrocarbons, it is important to have an adequate baseline sampling of soil and sediment for total petroleum hydrocarbons.

[26] PLP 2007 Pre-permit Report E
[27] RROs, VOCs and SVOCs can be produced naturally
[28] PLP 2008 Pre-Permit Report F, section "Organic Constituents"
[29] PLP 2008 "Environmental Baseline Studies – Preliminary summary studies, SLR Alaska", section 2.2
[30] BTEX = benzene, toluene, ethylene, xylene
[31] Zamzow and Moran 2008

1.4. Results: Data interpretation

Although a great deal of data has been collected to date, the data has not been put into context in a way that would allow for interpretation of the data. For example, important contextual information could include: whether samples were collected from a mineralized area, changes in precipitation or air temperature in the days prior to sample collection; and other factors that could affect water chemistry. Therefore, when measured concentrations differ from the general pattern (i.e. possible outliers) it is not possible to determine whether natural events (precipitation, etc.) or anthropogenic events (sampling error, drilling impacts, etc.) are the root cause. Additionally, maps need to be designed to facilitate interpretation and review.

1.4.1 Natural variation patterns

Surface water chemistry reflects the chemistry of rocks and soil through which waters flow and may also reflect the biological conditions, e.g., microbial populations, nutrients released by spawning salmon, nitrogen and ammonia released as salmon carcasses degrade, and animal fecal material.

In the Pebble region, there is a temporal pattern to surface water analyte concentrations. In late summer and fall, rains increase flow and total sediment and there is an increase in iron, aluminum, manganese and trace metals, and a decrease in solute concentrations. In winter, solute concentrations tend to increase and metals decrease due to the lack of surface runoff. Spring snowmelt is accompanied by a decrease in solutes and an increase in total and dissolved metals, including trace metals – often this is the period when the highest concentrations of metals are measured in surface water. In summer, trace metal concentrations decrease and major solute concentrations increase as groundwater makes up more of the stream flow.

Groundwater chemistry typically reflects the nature of the aquifer material and soils it encounters. Groundwater commonly contains dissolved anions (sulfate, chloride, fluoride), cations (calcium, magnesium, potassium, sodium) and metals, but low concentrations of particulate metals. Groundwater tends to be most concentrated in cations and anions during periods where there is little contribution from surface water (which dilutes groundwater), such as mid-winter. Groundwater is generally less susceptible to the seasonal concentration fluctuations observed in surface water, although there may be some seasonal effect if surface water readily infiltrates into and mixes with groundwater.

The Pebble region contains both mineralized and un-mineralized regions. Water sample results should be placed in context of whether the sample site lies within a mineralized region or not, and what type of mineralization is evident on the surface and, if there is drilling nearby, in the subsurface.

1.4.2 Anthropogenic influences

Natural surface water chemistry is susceptible to rapid changes related to storm events and snowmelt. Sampling errors, such as delayed sample filtration, the presence of headspace in alkalinity sample bottles, dust contamination, sediment disturbed by human activity upstream of the sample collection location, may also contribute to observed water chemistry. Exploration activities such as seismic blasting, drilling waste pits, and drilling could also affect water quality. Field notes, information on field and laboratory

quality controls, and details of any nearby exploration activity should be made available with water chemistry results.

Groundwater samples may be affected by "in-well" reactions, such as contamination of well water with grout or sediment. If water is pumped too quickly, chemistry may change as water encounters different pressure or air infiltrates into hydrologic pathways. Field notes and driller's logs should be provided with monitoring well data for determining which samples represent the true character of natural groundwater.

Exploration activities have the potential to influence surface and groundwater results through seismic blasting, introduction of petroleum to the groundwater or surface water environment, changing the pathways of water through rock, and by drilling waste disposal. Drilling material is discharged to sumps dug into the tundra, or to natural "dry depressions" likely located on highly permeable material.[32] Dissolved constituents may become tied up in organic complexes in sump walls or depression soils/sediment, but could potentially infiltrate into the shallow groundwater system. Similarly, precipitation and snowmelt are transport mechanisms that mobilize surface material, and have the potential to transport drilling material such as cuttings and solid fractions to surface water bodies.

In order to evaluate the possible influence of anthropogenic influences on water quality, baseline sampling efforts should specify

- the proximity of the sampling location to drilling and drilling discharge sites (spatial relationship),
- whether exploratory or geotechnical holes have been recently installed and the dates they remained open (temporal relationship),
- dates and locations of seismic blasting (spatial and temporal relationship)

Exploration activities may also change nearby hydrogeologic and geochemical conditions because of the presence of the boring/well. Particular care should be exercised when collecting and interpreting samples from wells located in the vicinity of exploration activities, where there may be potential for groundwater to move through newly opened fractures, undergo redox reactions, or pick up petroleum, sodium, and other exploration-related materials.[33]
Samples from monitoring wells need to be scrutinized. Sediment may contaminate samples and provide falsely elevated metal concentration results. If hydrocarbons enter the well, such as from drilling discharge or fuel spills, they may stimulate microbial growth that can then change the speciation and mobility of some metals. Aerobic microbes will use up oxygen as they consume hydrocarbons. As oxygen decreases, nitrogen- iron- and manganese-reducing microbes may become dominant, converting Fe^{3+} and Mn^{4+} to Fe^{2+} and Mn^{2+}, the mobile, dissolved forms of the metal. Therefore, indications of microbial activity include a decrease in dissolved oxygen accompanied by a decrease in redox and an increase in dissolved (but not total) iron and manganese. Aluminum concentrations do not change.

If the monitoring well is located near reactive sulfide rock, drilling the well or nearby exploration drilling has the potential to open fractures in reactive rock that may result in acid rock reactions along the fracture

[32] Hydraulic conductivity may be as high as 259 ft/day, and median values in overburden and bedrock combined is near 52 ft/day (Wobus 2009)
[33] A full discussion of the potential for exploration to impact water quality is found in Zamzow 2010.

zones and an increase in dissolved metals above the background of what was naturally present – in contrast to erosional events that increase total metal concentrations. Similarly, introduction of alkaline drilling material can mobilize metalloids such as arsenic and selenium.

Maps of surface and ground water sampling sites should include sites and coordinates for exploration drilling with clearly indicate topographical features, including elevations, wetlands, and water bodies. Additionally, maps should be generated that include geologic and soil trace elements information with water sampling sites overlaid to clearly locate mineralized areas.

1.4.3 Combined natural and anthropogenic influences

Interpretation of constituents like barium, ammonia, and sodium can be difficult, as they are products of both exploration drilling and of the natural environment.

Natural geologic material may contain barium and sodium. Sodium bentonite is present in drilling muds used in developing drill holes and wells at Pebble, as is barite (barium sulfate). Bentonite, a type of clay, has a high "cation exchange capacity" (CEC) compared to sand or gravel, and sodium atoms can "exchange" for other ions with a positive charge, such as dissolved metals (e.g. Cu^{2+}, Cd^{2+}, Fe^{3+}) or major cations (Ca^{2+}), resulting in increased concentrations of sodium in groundwater. When drilling muds are disposed of on the land surface, elevated sodium and conductivity can result in surface and groundwater. Drilling muds can change the alkalinity and pH of natural waters as well, because bentonite is mixed at high pH for use in drilling.

Decomposition of biological material, such as salmon carcasses, can produce ammonia. Blasting agents (e.g., ammonium nitrate-fuel oil, or ANFO) can also increase ammonia and nitrate/nitrite concentrations in groundwater or surface water. The streams at Pebble have high levels of oxygen, and oxygen converts ammonia to nitrate and nitrite (NO_3^-, NO_2^-), oxidized forms of nitrogen. Despite the oxygenated nature of surface water, and some groundwater, PLP occasionally did measure ammonia in groundwater and surface water that was considerably higher than concentrations measured in the Lake Clark area by the USGS (Table 3).[34] Ammonia in surface water and groundwater in the mine claims area has been detected up to 1,500 μg/L, while the USGS detected ammonia in rivers of Lake Clark near 20 μg/L and others have detected concentrations in streams with spawned out salmon up to 60 μg/L.[35] Possibly the elevated ammonia levels are due to influences of humic material and salmon carcasses. However, the sporadic very high concentrations do raise questions about whether seismic lines or other activities may have been conducted in a manner that influenced the reported ammonia concentrations.

[34] Brabets 2002; Brabets and Ourso 2006
[35] Mitchell and Lamberti 2005

Table 3. Ammonia in surface and groundwater. Only concentrations greater than 0.2 mg/L are listed; several instances of concentrations near 0.1 mg/L have also been reported. Reported ammonia is presumed to be total ammonia, and un-ionized ammonia (NH_3) is calculated based on a theoretical pH and temperature. The Alaska DEC standard for total ammonia is about 0.18 mg/L, based on pH and temperature; EPA uses a standard of 0.02 mg/L of un-ionized ammonia. Source: PLP 2008. Pre-Permit Report F (all PLP data are preliminary).

Date	Total Ammonia (mg/L)	TSS (mg/L)	NH_3 if pH=7-7.5, temp=5-10 ^{0}C (mg/L)	Site	Location
Surface Water					
2004					
July 23	0.45	32	0.003	GS14B	along the proposed road system
Aug 17	0.41	2	0.002	GS12A	
Aug 17	0.23	4	0.001	GS14A	
Aug 17	0.45	2	0.003	GS14B	
Aug 19	0.18	1	0.001	GS3A	
Sep 25	0.25	1	0.001	GS3A	
2005					
Aug 15	0.20	0.6	0.001	SK131A	Tributary southeast of pit
Aug 16	0.26	9.0	0.002	SK133A	Tributary, southwest of pit
Aug 17	0.27	0.8	0.002	UT135A	Tributary of Upper Talarik
Aug 17	1.03	2.7	0.006	UT138A	Tributary downstream of pit
Sep 16	0.34	1.8	0.002	SK100A	Confluence of North and South Fork Koktuli
2006					
Dec 12	0.22	<0.4	0.001	UT100E	Upper Talarik upstream of pit
2007					
April 24	0.50	16	0.003	UT100A	Upper Talarik, far downstream
Aug 15	0.40	69	0.002	SK133A	Near SK131A
Groundwater					
2005					
Mar 18	0.30	3.8	0.001	MW5S	south of pit
Nov 10	0.28	1.2	0.001	MW14D	South Fork Koktuli below Frying Pan Lake
2006					
Mar 23	0.29	5.7	0.001	MW14D	South Fork Koktuli below Frying Pan Lake
May 21	0.21	0.8	0.001	MW14D	South Fork Koktuli below Frying Pan Lake
Aug 21	0.22	1.0	0.001	MW9D	North Fork Koktuli tributary
Aug 30	0.21	<0.075	0.001	SWQ2	transportation corridor
Nov 2	0.70	2.7	0.003	MW3D	South Fork Koktuli below Frying Pan Lake
Nov 3	1.11	<0.076	0.004	P06-37S	North of pit
Nov 4	0.73	1.1	0.003	P06-37D	North of pit
2007					
Aug 23	0.18	1.0	0.001	P06-38D	North of pit
Sep 7	1.51	<2.5	0.002	SP57	spring on North Fork Koktuli

1.5. Summary of Sampling Scope, Design, and Context

The Pebble claims area has a single large mineral deposit, with smaller mineralization pockets. The primary controls on surface water chemistry are snowmelt, rain events, and geology. There is exchange of surface water and groundwater due to overburden and bedrock with high hydraulic conductivity. Water chemistry information should be placed in context of these natural controls and in context of any anthropogenic activities that might affect characterization of the natural environment.

W**ater quality information was not adequate temporally.**

- Historic data are limited.
    - No surface water chemistry data are available prior to 1991.
    - No surface water chemistry data are available between 1993 and 2004, although drilling was conducted by both Cominco and NDM during that period.
    - No historical groundwater chemistry is available prior to 2004, including critical information on seeps and springs on the ore body.
    - No field chemistry is available from Cominco drilling 1988-1997.
    - The only historic data available (1991-1993) had elevated (less sensitive) analyte detection limits and a limited analyte suite relative to more recent data.
    - Cominco data could not be obtained for all sites.[36]
- Temporal sampling was extremely limited at some sites, and is insufficient to capture changes in short term responses to hydrologic changes, or to show seasonal patterns and long term trends.
    - Only 1-2 samples were taken at lakes and ponds.
    - Seeps on the ore body had only 1-2 samples total collected from 1988 – 2008.
- No historical samples (prior to 2004) were analyzed for ammonia. Ammonia was sporadically elevated in stream samples compared to Lake Clark tributaries despite generally oxygenated surface water. Due to lack of information, these changes could not be linked directly to exploration or natural events.

Water quality information was not adequate spatially

- No ponds on the ore body were sampled.
- No groundwater monitoring wells on the Upper Talarik, except near the ore deposit.
- No groundwater monitoring wells on the North Fork Koktuli, except near the ore deposit.
- No groundwater monitoring wells at Lower Talarik Creek.
- Only two surface water monitoring sites are located in the mineral deposit area.

The sampling design is not sufficient.

- Petroleum hydrocarbon determination was minimal
    - none was conducted in pond and lake water or sediment, in headwater streams or tributaries
    - only minimal sampling occurred in the main stems of the three main streams

[36] Data are missing for Cominco sites 1, 2, 3, 4, 5, 7, 10, 15, 16, 18, 19 and 20. Sites 1-10 should have data on 19 metals but will not have organics, nitrates, or ammonia (see footnote 3).

    - only very minimal sampling occurred along the proposed road system, and it did not include organics related to petroleum
- No data on seismic lines or other blasting activity is provided. Maps, dates, depths, distances from water bodies, and types of explosives utilized should be provided, particularly with reference to locations of water sampling locations.
- Total organic carbon and dissolved organic carbon were not analyzed in sediment, ponds, or groundwater.

Baseline studies are not placed in context.

- All sample sites, including ponds and seeps, should be placed in context relative to mineralization.
- Discharge calculations need to be placed with surface water chemistry data for context.
- On-site precipitation data are needed.
- Surface water sampling needs to include field notes and notes on relevant events such as recent rains, rapid snowmelt, localized erosion, recent fires and volcanic eruptions, and other natural events that may influence water quality.
- Maps need to clearly indicate topographical features and natural water features.
- The potential for anthropogenic influence on sampling is not discussed. Maps and text need to clearly indicate spatial and temporal relationships of exploration activity that could influence water chemistry.
- Cyanide results for soil and vegetation need to be clearly placed in context relative to potential natural formation of cyanide, such as whether the plants have vacuoles or are known cyanide-forming plants, whether soil is collected from locations in which these plants are growing, and whether there have been recent fires or other events that may transport cyanide to a location.

The presentation of material did not lend itself to review.

- Data are presented as pdf tables without discussion, context, statistical analyses, or graphical analyses.
- Data are not available from the mining companies in a format that can be manipulated (Excel, Access, etc).
- No QC data (blanks, matrix spikes, replicates etc.) are provide to facilitate third party review.
- Field notes are not available.
- Groundwater drilling logs are not available.
- There is no single map or data set that juxtaposes water sampling sites and dates with exploration activities. Drill hole maps are unreadable.

In conclusion, while numerous studies have been conducted, critical data relevant to characterizing the natural environment is missing, and much could be done to present data in a manner that would lend itself to review and interpretation by regulators and the public.

CHAPTER 2: POTENTIALLY PROBLEMATIC DATA

2.1 Introduction

Quality control was deemed an important focus of the PLP sampling program. Laboratory data were reviewed using the EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review,[37] EPA Contract Laboratory Program National Functional Guidelines for Low Concentration Organic Data Review,[38]and EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.[39]

Quality control (QC) field duplicates were collected by PLP at a frequency of 10% for both water and soil samples; a single laboratory analyzed primary and field duplicate samples. Quality assurance (QA) field triplicates were also collected at a frequency of 10% and analyzed by a separate laboratory.[40] Deionized water blanks were analyzed for total metals at a frequency of one per sampling event; equipment blanks were analyzed for dissolved metals at a frequency of 5%. Trip blanks were analyzed for low level mercury and VOCs at a frequency of one per cooler.[41]

PLP conducted a data validation review of the raw data prior to publication in Pre-permit Report F: Surface Water and Groundwater Quality. The data reviewed in this section had undergone, at a minimum, laboratory QA/QC and further quality control evaluation:

> *A total of 78,358 individual dissolved metal and cation results were produced from baseline program samples from 2004-2007. Of these, 4310 results or approximately 5.5% of the dissolved metal and cation results were rejected from the dataset due to suspected contamination of the samples that is apparent when the dissolved result is significantly higher than the associated total metals result. Note that this data release contains only the validated primary sample results, the QA/QC sample results and any rejected primary results are not presented or included in the statistical summaries for each location.*[42]

However, a cursory review of the preliminary database found problematic data (e.g. groundwater with pH 10, single dates with multiple analytes at very high or very low concentrations outside the range of other measurements). Because laboratory data and field notes were not available, a full third-party data validation could not be conducted. Instead, the following were applied to highlight potentially problematic data:

- Calculation of relative percent difference of unfiltered and filtered concentrations of major cations and select metals/metalloids
- Graphical representation of TSS relationship to stream discharge
- Review of TSS in groundwater
- Graphical representation of the relationship of TDS and specific conductance

[37] US EPA 1999; referenced in Pebble Partnership QAPP 2008
[38] US EPA 2001; referenced in Pebble Partnership QAPP 2008
[39] US EPA 2002; referenced in Pebble Partnership QAPP 2008
[40] Pebble Partnership QAPPs 2004, 2005, 2006, 2007, 2008, Table 1-4.
[41] Pebble Partnership QAPPs, 2004-2007; the protocol was changed in 2008 to have equipment blanks analyzed for total metals, dissolved metals, and DOC, the water blank analyzed for total metals and TOC, and the trip blank only analyzed for low-level mercury (Pebble Partnership QAPP 2008, Table 1-7).
[42] PLP 2008 Pre-Permit Report F, Quality Control overview

- Graphical representation of the relationship of alkalinity and hardness
- Graphical representation of specific analyte concentrations at several consecutive stations (upstream and downstream) to look for outliers
- Graphical representation of analyte data when measurements appeared to be outside the historic range at a specific site (outliers)

2.2 Methods

Formulas utilized in calculations are presented below. Graphs were created from templates placed in the Excel spreadsheets that PLP data was transferred to (from original pdf's in PLP Pre-Permit Report F). The types of graphs included analyte concentrations over time, plots of total versus dissolved concentrations, analyte concentrations versus discharge, TSS over time, TSS versus discharge, alkalinity versus hardness, and TDS versus specific conductance. Data points presented as potential outliers are identified through visualization on graphs. Presentation of all graphs would be onerous, but a subset is provided in appendices to illustrate specific potentially problematic data. All graphs are available upon request. There were too few pond and lake samples to analyze.

2.2.1 Relative percent difference

The relative percent difference (RPD) values of unfiltered and filtered analyte concentrations were examined to determine the quality of analytical results (Equation 1). The EPA (2010) uses an RPD based on the Contract Required Quantitation Limit (CRQL) for "… control limits for duplicate samples, which would include, for example, two samples collected at the same location at the same time and handled the same way (e.g., filtered or unfiltered) …". PLP and EPA (2005) uses the Method Reporting Limit (MRL) in the same manner.[43]

The formula for calculating RPD from duplicate measurements is:[44]

$$RPD = [(C_1 - C_2) \times 100] \div [(C_1 + C_2) / 2]$$

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

RPD's greater than 20% (when sample concentrations are both above 5 * MRL) are highlighted as data of concern, consistent with PLP's 2008 data verification and validation methods.[45] For comparison, tables of the RPD values for total and dissolved concentrations of major cations in streams, ponds, and groundwater, collected by the USGS in the Pebble region in 2007-2008, are also provided.

2.2.2 TDS and specific conductance

Natural water contains particulates, colloids, undissociated compounds, and dissolved ions. The "total dissolved solids" (TDS, in mg/L) is a sum of the major anions and cations: sodium, potassium, calcium,

[43] PLP 2008 QAPP Section 1.6.2, 4.2.2

[44] PLP 2008 QAPP Section 4.2.2; this is essentially the same as the EPA 2010 formula of RPD =(|S-D|*100)/((S+D)/2) for S= sample and D= duplicate

[45] PLP 2008 QAPP Section 4.2.2; similarly EPA 2010 uses control limits of 20% for the RPD of "original and duplicate samples ≥ five times the Contract Required Quantitation Limit (CRQL)."

magnesium, chloride, sulfate, silicate, nitrate, fluoride and alkalinity.[46] The ability of water to conduct an electrical current (EC) is related to TDS, and when plotted TDS:EC should fall along a straight line.

2.2.3 TSS and discharge

The initial flush of discharge during snowmelt or precipitation is expected to increase the concentration of total suspended solids (TSS) in stream water. The relationship between TSS and discharge was graphed to determine if elevated TSS occurred without a concurrent increase in discharge. Turbidity data was not available for surface water, and was only available in qualified terms ("low", "high") for groundwater, although PLP protocol specifies measuring turbidity in nephelometric turbidity units (NTU).[47]

2.2.4 Temporal and spatial range checks

A subset of data was graphed to determine if

- Data over time at a single site fell within a clearly defined range
- Concentrations of a single analyte fell within a clearly defined range across several sites along a stream.

Where data appeared to be outside the normal pattern, graphs are presented. Such data is highlighted in that it could warrant further investigation to determine if natural events are the source (e.g. sudden winter warming trend, rains) or whether there were field or laboratory errors.

2.2.5 Groundwater

Groundwater samples were analyzed for QA/QC elements utilizing the same methods as for surface water. Due to time constraints, results are only provided for 11 of the 38 monitoring wells; these data will continue to be developed as time allows and as new data are released. Data on 125 seeps, many of which had only two or three samples, were not reviewed. However, a review of seep data, particularly on the ore body, is encouraged to examine whether water quality may have changed since the beginning of exploration.[48]

2.3 Results: surface water analysis

Below, a brief synopsis of potentially questionable data at each sampling site is noted, with details in attached appendices. Illustrative graphs and tables are available in Appendix A; the original Excel sheets and more graphs are available upon request.

The most common problems included: dissolved analyte concentrations higher than total concentrations, TDS that did not correlate with specific conductance (particularly at South Fork Koktuli sites), and TSS and associated total metals that did not correlate with discharge, and presenting multiple concentrations to indicate concentrations below the detection limit.

[46] ibid
[47] PLP 2008 Field Sampling Plan, Groundwater Hydrology and Water Quality, Mine Study Area Section 6.5.2.2
[48] Zamzow 2010

Regarding RPDs for dissolved and total fractions, virtually all sites had dates for which at least three of the four major cations had dissolved concentrations exceeding 10% of the total concentration. For the North Fork Koktuli, every site had at least one date with 3 of 4 major cations with RPD greater than 10%, for the South Fork Koktuli, 14 of 15 sites, and for the Upper Talarik 10 of 13 sites. Specific dates – February 2007, November 2007, December 2007 – appeared to most commonly have cation RPDs greater than 10%. With regards to RPD values of 20% or higher, when concentrations of major cations and six metals were examined, the total number of sampling events with RPDs of these analytes at over 20% was low, but some instance occurred at half of the North Fork Koktuli sites, one third of South Fork Koktuli sites, and at two-thirds of Upper Talarik Creek sites.

At some sites, specific dates had multiple instances of questionable data:

At NK100A, April 2004 – elevated TSS and metals
At NK119A, February 2006 – TSS, cations, and sulfate
At NK119B, March 2005 – cations and sulfate
At SK100B1, March 2007 – cations, anions, some metals
At UT119B, February 2007 – cations, sulfate, some metals
At UT135A, August 2006 – cations, several metals

Regarding the presentation of multiple numbers as the method detection limit,

> *"(when) the parameter is undetected by the test, the value shown (in bold font) is ½ the method detection limit (MDL) or ½ the practical quantitation limit (PQL). If the result was not detected at the lab MDL, the value shown is ½ MDL; if flagged U or UJ, the value shown is ½ PQL."*

However, the preliminary results that were provided to the public do not show the flagged data, nor are the lab MDLs provided. Complicating matters, some analytes at some sites have up to four different concentrations in bold font to represent "undetected" analytes. This method of recording can skew the data set when used in interpreting data across the site.

2.3.1 South Fork Koktuli main stem sites

SK100A

Questionable data includes poor correlation between TDS and conductivity, between alkalinity and hardness, and dates for which at least three major cations have RPDs greater than 10%. Several elements are reported as below MDL but concentrations indicate they are at or above the MRL. There are potential outliers in alkalinity, copper, iron, lead and zinc.

SK100B

Data includes poor correlation between TDS and conductivity, between alkalinity and hardness, and dates for which at least three major cations have RPDs greater than 10% and molybdenum RPD is greater than 20%. Several elements are reported as below MDL but concentrations indicate they are at or above the MRL. There are potential outliers in alkalinity, anions, copper, aluminum, lead, molybdenum and zinc.

SK100B1

In March 2007, major cations, chloride, and sulfate did not appear to be representative, potentially affecting hardness values. TSS concentrations appear to be elevated in May 2006. In September 2005,

arsenic, copper, and sodium concentrations were not consistent with concentrations upstream and downstream. Although there was a steady pattern of decreasing concentrations at sampling sites from upstream to downstream, site SK100B1 had much higher concentrations of arsenic and sodium, outside the pattern, and copper was lower than the trend (see Appendix A).

SK100B2

Data includes poor correlation between TDS and conductivity, between alkalinity and hardness, and dates for which at least three major cations have RPDs greater than 10%. Lead is the only potential outlier, with high concentrations February and May 2006. Aluminum (February 2006) and sodium (May 2006) concentrations were not consistent with concentrations upstream and downstream, having higher concentrations than would be expected from the spatial trend (see Appendix A).

SK100C

Data includes poor correlation between TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. The relationships of total and dissolved sodium correlate poorly, as does molybdenum, for a single date each. In July 2007, suspended sediment is elevated, potentially affecting the reported concentration of total metals. Aluminum and tin data reported as below MDL are either typographical errors or the MDL changed on different dates and was different for total and dissolved fractions. Copper, aluminum, antimony, tin, arsenic, iron, lead, manganese, and zinc have potential outliers, particularly in July 2007.

SK100D

Data includes poor correlation between TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. Aluminum, cadmium and tin data reported as below MDL although concentrations indicate they are near or above the MRL. Antimony and lead have potential outliers. Iron concentrations in November 2007 do not correlate with the trend of decreasing concentrations downstream, measuring higher concentration at SK100D than any other sites (see Appendix A).

SK100F

Aluminum, antimony, lead and zinc have dates for which measured concentrations are above the historic range, and copper has one measurement below the historic range; molybdenum has one high and one low. In February of 2007, alkalinity, copper and iron have very low concentrations relative to the spatial trend of upstream and downstream sites. Aluminum, molybdenum, sodium, and zinc have dates for which concentrations are high relative to the upstream-downstream trend. Aluminum and tin concentrations were reported as below MDL, although concentrations indicate they are near or above the MRL.

SK100G

Data includes dates for which at least three major cations have RPDs greater than 10%. In April 2007, suspended sediment does not correlate with discharge, potentially affecting reported concentrations of aluminum. Aluminum, iron, molybdenum, sodium, tin, and zinc have dates with high concentrations relative to the historic range. Dissolved copper does not correlate with concentrations upstream and downstream on two occasions, where concentrations are lower than the upstream-downstream trend would suggest. Aluminum, cadmium, and tin data reported as below MDL are either typographical errors or the MDL changed on different dates and was different for total and dissolved fractions.

2.3.2 South Fork Koktuli tributaries

SK119A

Data includes dates for which at least three major cations have RPDs greater than 10% and elevated concentrations of cations that may affect the reported hardness value. In May 2006, suspended sediment is elevated above historic range, potentially affecting reported concentrations of aluminum, iron, and manganese. In December 2006, cations and several metals were measured in concentrations above the historic range. TDS concentrations are very low in May 2007, while sulfate, aluminum, antimony, arsenic, copper, iron, lead, manganese, molybdenum, and zinc have at least a single date with concentrations above the historic range. Aluminum, antimony, arsenic, cadmium, selenium, silver and tin data reported as below MDL are either typographical errors or the MDL changed on different dates and was different for total and dissolved fractions.

SK124A

Data includes dates for which at least three major cations have RPDs greater than 10%, and alkalinity that correlated poorly with hardness. Sulfate, aluminum, copper, lead, and zinc have dates with concentrations higher than the historic range. Arsenic data reported as above MRL although concentrations appeared to be below MDL.

SK131A

Data includes dates for which at least three major cations have RPDs greater than 10%, and alkalinity that correlated poorly with hardness. Calcium appears elevated in May 2005, potentially affecting hardness values. Chloride, iron, sulfate, antimony, arsenic, copper, and lead have potential outliers, with concentrations above the historic range, although there is no consistent date for which concentrations were high. Aluminum, lead, manganese, molybdenum data reported as above MRL although concentrations appeared to be below MDL; iron MRL appeared to be different for total and dissolved concentrations.

SK133A

Data includes dates for which at least three major cations have RPDs greater than 10%, and alkalinity that correlated poorly with hardness in November 2007. Elevated TSS may affect reported concentrations of aluminum, iron, manganese, and zinc in May 2006 and of aluminum in August 2007. Antimony, arsenic, lead, molybdenum and tin also have dates for which concentrations are above the historic range. Aluminum and arsenic are reported below MDL but concentrations appear to be above MRL, while selenium and vanadium were reported as above MRL when concentrations appeared to be below MDL.

SK134A

Data includes dates for which at least three major cations have RPDs greater than 10%, and iron with and RPD greater than 20%. In May 2006, elevated TSS may affect reported concentrations of aluminum, iron, manganese, copper, and vanadium. Aluminum and antimony are reported below MDL but concentrations appear to be above MRL, while arsenic, selenium and vanadium were reported as above MRL when concentrations appeared to be below MDL. Aluminum, antimony, copper, vanadium, iron, and manganese have potential outliers.

SK136A
Data includes dates for which at least three major cations have RPDs greater than 10%, aluminum and antimony reported below MDL but concentrations appear to be above MRL, while arsenic, selenium and vanadium were reported as above MRL when concentrations appeared to be below MDL. Antimony, selenium, tin, and zinc have dates for which concentrations are higher than the historic range.

SK136B
Data includes dates for which at least three major cations have RPDs greater than 10%, manganese with an RPD greater than 20%, and aluminum and antimony reported below MDL but concentrations appear to be above MRL, while arsenics and vanadium were reported as above MRL when concentrations appeared to be below MDL. Aluminum, antimony, copper, lead, and zinc have dates for which concentrations are higher than the historic range.

2.3.3 North Fork Koktuli main stem sites

NK100A
Data includes dates for which at least three major cations have RPDs greater than 10% and molybdenum with an RPD greater than 20%. In April 2004, TSS is elevated and concentrations of aluminum, copper, iron, manganese, and zinc are above the historic range. Aluminum, antimony, cadmium, tin, and vanadium are reported below MDL but concentrations appear to be above MRL.

NK100A1
For three the 11 dates this site was sampled, the RPD for most major cations is over 10%. In May 2007 sulfate and copper are measured in concentrations above the historic range (although TSS is not elevated) and alkalinity is measured in concentrations below the historic range.

NK100B (sampled only in 2007)
Data includes poor correlation between TDS and conductivity and dates for which at least three major cations have RPDs greater than 10%. In May 2007, sulfate and copper concentrations are high relative to the historic range. On other dates, copper, sulfate, and zinc are high.

NK100C
Data includes poor correlation between TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. In May 2006, alkalinity correlated poorly with hardness. Sulfate, copper, iron, lead, and manganese have potential outliers, particularly in February 2006. In February 2007, TSS and aluminum concentrations are high for that time of year. Aluminum, antimony, and tin are reported as below MDL but appear to be in concentrations above MRL.

*NK100D (*Sampled only in April 2004 and May 2004)
No questionable data

2.3.4 North Fork Koktuli tributary sites

NK119A

Data includes poor correlation between TDS and conductivity, poor correlation between TSS and discharge, dates for which at least three major cations have RPDs greater than 10%, and dates for which sodium, magnesium, and potassium RPDs are over 20%. In February 2006, alkalinity correlated poorly with hardness, and TSS and TDS appear elevated and potentially affected reported concentrations of total metals, cations, and sulfate. In addition to cations and total metals elevated in February 2006, sulfate, aluminum, antimony and tin had potential outliers in other months. Aluminum, copper, molybdenum, and tin were reported as below MDL but concentrations appeared to be greater than MRL.

NK119B

Data includes poor correlation between TDS and conductivity, poor correlation between alkalinity and hardness, dates for which at least three major cations have RPDs greater than 10%, and dates for which manganese RPD is over 20%. The outliers observed at NK119A in February 2006 were not observed at NK119B (downstream). In March 2005, alkalinity did not correlate with hardness, and major cations appeared to be elevated, potentially affecting the reported hardness value. Antimony, arsenic, copper, and lead had dates for which concentrations were above the historic average. Several metals were reported as below MDL although concentrations appeared to be above MRL.

2.3.5 Upper Talarik Creek main stem sites

UT100A

Conductivity, aluminum, copper, potassium, and vanadium had dates for which concentrations were higher than the historic range. In June 2005, alkalinity was low relative to hardness. Aluminum, antimony, and molybdenum are reported as below MDL although concentrations appeared to be above MRL.

UT100B

Data includes dates for which at least three major cations have RPDs greater than 10%, potassium with an RPD over 20%, and several dates with zinc RPD greater than 20%. Copper, iron, lead, manganese, and zinc had dates with concentrations above the historic range, particularly in August 2006 or April 2004. Arsenic had dates for which the relationship between total and dissolved was outside the normal pattern. Aluminum, antimony, and molybdenum were reported as below MDL although concentrations appeared to be above MRL, and dissolved selenium and tin were reported as greater than the total fractions although both were noted as below MDL.

UT100C

Like UT100B, data includes aluminum, antimony, and molybdenum reported as below MDL in May 2004 although concentrations appeared to be above MRL, and dissolved selenium and tin were reported as greater than the total fractions although both were noted as below MDL. However, the potential outliers were thiocyanate, copper, and manganese, and none were in August 2006. In March 2007, iron concentrations were elevated relative to the trend of upstream-downstream concentrations. The RPD for copper was greater than 20% in May 2004.

UT100C1 (2007 only)
No questionable data, except TDS appeared elevated in March 2007; the concentration may fall within a normal range pattern when more data is collected.

UT100C2 (2007 only)
Data includes poor correlation of TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. Copper, manganese, vanadium, and zinc appeared to have elevated concentrations relative to the other data points, particularly in February 2007 and September 2007, but may fall within a normal range pattern when more data is collected. Total iron concentrations in September 2007 were about twice as high as iron at all other UT sites upstream or downstream (see Appendix A).

UT100D
Data includes poor correlation of TDS and conductivity, dates for which at least three major cations have RPDs greater than 10%, and calcium RPD greater than 20%. Suspended sediment appeared to be elevated in April 2007, potentially affecting the reported concentrations of aluminum, iron, manganese, and vanadium, which only had potential outliers on this date. Aluminum, antimony, and tin were reported as below MDL but concentrations appeared to be above MRL. Antimony and zinc had dates (not April 2007) with concentrations above the historic range.
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UT100E
Data includes poor correlation of TDS and conductivity, dates for which at least three major cations have RPDs greater than 10%, and manganese RPD greater than 20%. Arsenic, copper, lead, and zinc had dates with concentrations above the historic range, all on different dates. Aluminum and antimony were reported as below MDL but concentrations appeared to be above MRL.

2.3.6 Upper Talarik Creek tributary sites

UT119A
Data includes poor correlation of TDS and conductivity, dates for which at least three major cations have RPDs greater than 10%, and manganese and molybdenum RPDs greater than 20%. Aluminum, antimony, and molybdenum were reported as below MDL but concentrations appeared to be above MRL. In October 2004, TDS, arsenic and major cations appeared to be at levels below the historic range (hardness value potentially affected). Aluminum and antimony had concentrations above the historic range in August 2005.

UT119B
Data includes arsenic with a declining trend over time, to below MDL. There is poor correlation of TDS and conductivity, dates for which at least three major cations have RPDs greater than 10%, and potassium RPD greater than 20%. Major anions, major cations, and copper, iron, and lead had potential outliers, particularly in February 2007, while alkalinity was poorly correlated with hardness and conductivity that month; elevated calcium and magnesium potentially affect reported hardness value. Aluminum, antimony, molybdenum, and tin were reported as below MDL but concentrations appeared to be above MRL.

UT135A
Data includes poor correlation of TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. Aluminum, antimony, copper, and tin were reported as below MDL but concentrations appeared to be above MRL. Many constituents sampled in August 2006 were reported in elevated concentrations, including sulfate, major cations, and arsenic, copper, selenium, tin, cadmium, molybdenum, vanadium, and zinc; reported hardness value is potentially affected. In the same month, the relationship of total and dissolved zinc was different from the normal pattern.

UT138A
Data includes poor correlation of TDS and conductivity, and dates for which at least three major cations have RPDs greater than 10%. In February 2006, the relationship of total to dissolved potassium was outside the normal pattern. Aluminum and antimony were reported as below MDL but concentrations appeared to be above MRL. Arsenic, copper, iron, lead, molybdenum, potassium, and zinc had high concentrations relative to the historic range, although not on a common date.

UT141A
Data includes dates for which at least three major cations have RPDs greater than 10%, and calcium, magnesium, and manganese have RPDs greater than 20%. Antimony, lead, and zinc had dates for which concentrations were above the historic range. Alkalinity appeared to be lower than the historic range in May 2006. Aluminum, antimony, and molybdenum were reported as below MDL but concentrations appeared to be above MRL.

UT146A
Like UT141A, at least three major cations had RPDs greater than 10%, and calcium and magnesium have RPDs greater than 20% all in September 2004. Aluminum has an unusual bell-shaped curve relationship between total and dissolved data; data should be reviewed. In February 2006, sulfate was elevated relative to the sulfate-TDS relationship, and copper was low relative to the historic range. The relationship of potassium total and dissolved concentrations was outside the normal pattern in January 2007. Lead and zinc had dates for which concentrations were above the historic range. Aluminum, antimony, and molybdenum were reported as below MDL but concentrations appeared to be above MRL.

2.3.7 Kaskanak Creek

Questionable data included TSS points that did not correlate with discharge. TDS, aluminum, antimony, copper, iron, lead, and zinc have potential outliers, particularly in August 2005. In August 2005, the relationship of total to dissolved concentrations for arsenic and manganese is outside the normal pattern.

2.3.8 Ponds and Lakes

The data analysis methods utilized when reviewing stream chemistry could not be performed for ponds and lakes due to the paucity of data: only one or two samples were collected for each. Several samples were collected at Frying Pan Lake, but represented samples collected at different stations rather than several samples collected at one station across time.[49] Analyte concentrations could be quite variable

[49] Nine samples were collected July 26, 2006, one sample July 27, 2006, and one sample August 13, 2007.

across Frying Pan Lake sites, and with only one sample at each it is not possible to determine if the variability is natural or due to sampling problems. Common problems throughout the pond and lake data set include concentrations of dissolved cations more than 5% greater than concentrations of total (despite concentrations greater than 5 MRL) and the issue of multiple numbers provided to indicate undetected concentrations and/or utilization of ½ the MRL as the "undetected" concentration rather than ½ MDL.[50]

Regarding RPD's of total and dissolved major cation concentrations, PLP data was compared to USGS data at the Pebble site (Appendix B). Of six lakes sampled by PLP,[51] four of the lakes had at least one of the major cations with dissolved concentrations more than 5% greater than total concentrations in the 2 dates sampled; there were multiple examples of dissolved analytes with concentrations more than 10% greater than total, including calcium. Of thirteen ponds sampled by PLP once in 2006 and once in 2007, all but two had the dissolved concentration of at least one major cation more than 5% greater than the total concentration, and most had multiple cations with these conditions. There were several examples of sites with dissolved cation concentrations more than 10% greater than total, and two instances 20-50% higher. In contrast, of 65 ponds sampled by the USGS in 2008 (one sample per site), only 15 had dissolved cations with concentrations more than 5% greater than total, and only one instance where the dissolved concentration exceeded total by more than 10%; calcium never exceeded 5% RPD.

2.4. Results: groundwater analysis

Groundwater studies included quarterly samples from 21 to 38 monitoring wells (depending on the year) and occasional samples from 125 groundwater seeps. Most monitoring wells were installed in 2004 and were usually sampled quarterly. Data from seeps was not reviewed.

Analysis of groundwater samples indicate that the samples suffer from similar issues as surface water. There is also ample evidence of sediment contaminating water samples, and some samples expressed indicators of acid, alkaline, or microbial influences that may not have been representative of natural groundwater. However, only preliminary data are available for review, and does not include driller's logs, field notes, and other material that could clarify the chemistry reported. Details are provided when chemistry appears to be out of the normal pattern based on comparison with other monitoring wells in the nest (if nested), on trends over time, or on sporadic incidents. Illustrative graphs and tables are available in Appendix III; the original Excel sheets and more graphs are available upon request.

2.4.1 Monitoring wells on the ore body

2.4.1.1 PQ-4

PQ4, the only monitoring well within the dense drilling of Pebble West, is screened 1100' deep in bedrock. Over time, pH, sulfate, iron, arsenic and lead decline while acidity and copper increase. Iron is primarily in the ferrous (mobile) form. The first sample (November 2005) has high concentrations of TSS, alkalinity, aluminum and iron; there was no turbidity. Conductivity has a data point elevated above the historic range in August 2006, and in May 2007 all data should be reviewed due to low concentrations

[50] Multiple numbers in bold font – designating ½ MDL or ½ PQL – were noted for antimony, cadmium, chromium, iron, lead, mercury, vanadium

[51] Most sites were sampled once in 2006 and once in 2007 for a total of 12 site-samples for lakes

in all analytes. TDS and conductivity correlate poorly, and on some dates major cations have at least three of four major cations with RPD greater than 10%.

Sediment likely contaminated the first sample (November 2005). Declining pH and an increase in copper and acidity could indicate that the well is experiencing acid rock drainage, but sulfate and several metals decline over time. The data could reflect reactions occurring in other locations and affecting water received by the PQ4 well, or the first measurement of copper concentration may have been uncharacteristically low, as it has remained relatively steady since the second sample.

2.4.1.2 KPP4

TDS and conductivity correlate poorly, total and dissolved calcium correlate poorly, and major cations have at least three of four major cations with RPD greater than 10%. In March 2007 TSS, copper, aluminum, iron, manganese, zinc, and lead were elevated above the historic range; turbidity was listed as "high/none". Regarding copper, in March 2007, total copper increased from the 0.3 ug/L concentrations it had maintained for the previous 1.5 years to 5 ug/L and continued to have elevated total and dissolved concentrations in later samples.

2.4.1.3 MW12

Monitoring well MW12 had two nested wells, 12S and 12D, with very different chemistry. The deeper well, MW12D is located in bedrock while the shallow well MW12S is screened in sand and gravel.[52]

MW12D

Some metal concentrations are quite low and may complicate interpretation. Major cations correlate with TDS, but conductivity does not. TDS and some metals show indication of seasonal flux therefore the well may be subject to rapid recharge. Manganese, sulfate, sodium, and the sodium absorption ratio (SAR) decline with time, while iron concentrations increase after 2006. Aluminum and iron have dates on which concentrations are higher than the historical range. Different values and/or ½ MRL were utilized to denote concentrations below detection for aluminum, iron, zinc, and lead.

MW12S

TDS and conductivity correlate poorly and major cations have at least three of four major cations with RPD greater than 10%. There was a one-time decrease in alkalinity in March 2006 (from 180 mg/L to 34 mg/L) and a one-time increase in chloride. In November 2005, TSS and several metals (aluminum, iron, arsenic, lead, and copper) appear to have elevated concentrations although turbidity is reported as "low"; this is followed by a general decline in all over time. TDS, conductivity, sulfate, sodium, molybdenum, manganese and zinc also decline with time, with sulfate strongly correlated with TDS, sodium, manganese and molybdenum. Different values and/or ½ MRL were utilized to denote concentrations below detection for aluminum, zinc, and lead.

Hardness, conductivity, dissolved and suspended solids, and several cations, sulfate and metals (aluminum, arsenic, chromium, copper, iron, manganese, nickel, vanadium, and zinc) are significantly

[52] PLP 2007 Pre-Permit Report B; the lithology of SRK2 and SRK3 were not provided.

higher in MW12S relative to MW12D. For example, calcium at MW12D is higher than most mine area sites at 15,000 ug/L, but is 80,000 ug/L at MW12S.

It is reasonable to expect that MW12S, screened in sand and gravel, required a casing to prevent the walls of the well from caving in. The elevated TDS and sodium suggest the well has been contaminated by grout, possibly used in installing the casing, and sample water quality was influenced for at least a year.

2.4.2 Monitoring wells north of the ore body

2.4.2.1 P-06-38D

Monitoring well P-06-38D only had one sample reported, but there are indications the sample may have been influenced by alkaline contamination. It had a relatively high pH (7.65) and high hardness, conductivity, TDS, alkalinity, and dissolved arsenic, barium, manganese, potassium, and sodium. Further sampling will determine whether trends develop.

2.4.3 Monitoring wells on the South Fork Koktuli

2.4.3.1 MW3D

TDS and conductivity, alkalinity and hardness, total and dissolved magnesium, and total and dissolved sodium correlate poorly. The total concentrations of calcium, magnesium and sodium decrease over time while total copper increases over time (although the dissolved concentration does not). In May 2005, TSS and several metals (copper, aluminum, iron, arsenic, manganese, zinc and lead) are elevated above the historic range; once the outlier is removed, zinc appears to increase with time. Turbidity was listed as "none" for all dates. There was a one-time increase in alkalinity and silicon in March 2006. Multiple values are utilized to denote concentrations below the limit of detection for TSS, iron, zinc, lead; for some elements the "undetected" concentration is near or above the MRL.

2.4.3.2 MW5

This well has three screens (MW5D=107', MW5M=63', MW5S=40') with silt at the shallow screen and gravel in the deeper ones. MW5M had different chemistry from MW5S and -5D. Hydrographs suggests that -5D may be connected to the surface, while -5M and -5S are not.[53] TSS for MW5D appears to be seasonally influenced, indicating rapid recharge from the surface. Analysis of MW5M and MW5D data are provided below.

MW5D

Sodium is very high in the first samples, and pH, sodium, chloride and molybdenum decrease over time. Iron, manganese, (dissolved) zinc, magnesium and hardness increase over time. Aluminum is much higher in the first sample than in following samples. In May 2006, major cations, iron, manganese, arsenic and molybdenum have dissolved concentrations greater than 10% of the total.

The data for MW5D indicates potential contamination of the well samples. Drilling muds have been known to stimulate bacterial growth, with a consequent change in redox.[54] As microbes consume

[53] Wobus 2009
[54] Shanahan 2004; Gilkeson 2004; Longmire 2002

hydrocarbons they may cause decreases in dissolved oxygen, increases in dissolved iron and manganese (as observed at this well), and increases in hydrogen sulfide.

At MW5, the pH started very alkaline then decreased, and metals and cations fluctuated. Manganese, iron, and cations (calcium, magnesium, potassium) were found in concentrations much higher than most of the other wells outside the mineral deposit site. In particular, the disequlibrium was observed in MW5D, indicating introduction of sodium bentonite slurry into the well followed by the growth of reducing bacteria, impacting at least a year of water chemistry samples.

- The pH of MW5D was 10 when the first water sample was taken in Sept 2004, dropping to 9 by May 2005 and stabilizing at a neutral pH after that.[55] No other monitoring wells at the Pebble prospect had pH over 8, except MW2D on the Upper Talarik, which is relatively stable near pH 8.5 (the Upper Talarik drainage has noticeably more alkaline water than water in the South Fork Koktuli drainage).
- Sodium was twice the concentration in the first two samples (20-30 mg/L) compared to later samples (near 12 mg/L). During the same period, magnesium decreased, indicating possible cation exchange mechanisms.
- The oxidation-reduction potential indicates a change from a reducing environment (-360 mV) to an oxidizing one (near 130 mV) at the same time that pH is changing from pH 10 to pH 7. Although other wells in mineralized areas show fluctuations of redox around zero, from -120 to +150 mV, none have made such a dramatic shift from a clearly reducing environment to a clearly oxidizing one, with a corresponding change in pH.
- As the pH changed from alkaline to neutral, the smell of hydrogen sulfide (H_2S) is noted. At very high pH, sulfide exists as S^{2-} and does not have the classic smell of H_2S, which forms as pH becomes near neutral. Hydrogen sulfide is a waste product of sulfate reducing bacteria, and indicates the presence of a low oxygen, reducing atmosphere environment with a carbon source.
- Elevated concentrations of the metalloids molybdenum and vanadium decreased over time, indicating there was early mobilization in the alkaline environment with a decrease in mobilization as the environment became more neutral.
- After the change to the more oxidizing environment, manganese increased from near 500 ug/L (already highly elevated above criteria of 50 ug/L) to near 900 ug/L and remained steady at that concentration. Dissolved iron increased from ~700 ug/L to ~1400 ug/L, primarily in the ferrous iron form. Nitrate + nitrite was 4.2 mg/L at MW5D with the first water sample; this is significantly more elevated than in any other wells, although still below benchmark criteria of 10 mg/L. The increase in dissolved (ferrous) iron, nitrogen, and manganese may indicate activity of reducing bacteria.

MW5M

TDS correlated poorly with conductivity, and major cations, manganese, and molybdenum have dissolved fractions in higher concentration than total. Major cations and manganese increase over time, while sulfate and arsenic decrease over the first year. Total and dissolved sodium were not correlated. In March

[55] MW 5M pH has been 7-8.5, with possibly a slight trend to decreasing pH; MW 5S has been 5.3-7, again with a trend to decreasing pH.

2005, TSS, copper, aluminum, iron, and lead are measured in concentrations above the historic range; turbidity is listed as “none” for all dates.

2.4.3.3 MW11D

TDS correlated poorly with conductivity. The sodium absorption ratio increases over time while chloride decreases. There are one-time concentrations of copper, iron, manganese, and zinc above the historic range but these fell on different dates, indicating there was no specific incident in common. Multiple numbers were utilized to denote "undetected" concentrations for aluminum, iron, zinc, and lead; in 2004 concentrations for aluminum and molybdenum denoted as below MDL appear to be much higher than MRL.

2.4.3.4 MW14

Monitoring well MW14D and well MW14S (about 2 miles south of Frying Pan Lake) have quite different chemistry. This could be due to different rock material or aquifers encountered, or might indicate samples that differ from natural groundwater chemistry; driller's logs and information on lithology and aquifers would be helpful in interpreting the chemistry.

MW14D

Potassium, copper, molybdenum, and zinc decrease with time while other major cations, iron, manganese, sulfate and chloride increase; aluminum has a bell-shaped curve of concentrations over time. Total iron was not stable, but did not show a specific up or down trend, while dissolved iron increased sharply and correlated with sulfate. Concentrations varied from the historic range for conductivity and hardness (low) and iron, zinc, lead, potassium, and aluminum (high) on single dates. At least three of four major cations had RPD over 10% in August 2007. The value for ½ MRL was used for zinc concentrations below the detection limit.

MW14D has chemistry that indicates an unstable environment. Possible microbial or redox reactions may be the source of dissolved iron and manganese. For two months (March and May 2007) there is a sudden change from an oxidizing to a reducing environment (-200 mV) with a slight increase in pH; this data should be reviewed. Sulfur compounds are unstable, as hydrogen sulfide develops while sulfate concentrations increase. Clay or bentonite may have been introduced into the well, with consequential cation exchange activity.

MW14S

TDS correlated poorly with conductivity. Unlike MW14D, there are very few occasions where dissolved concentrations exceed total by more than 5%, and no occasions where the cation RPD is greater than 10% or where trace metal RPD exceeded 5%. However, the unfiltered concentrations of major cations do not correlate well with the filtered concentrations.

Acidity and nitrate were much higher in MW14S than in MW14D. Copper was also higher in MW14S, although it followed the same pattern as in MW14D – the first sample was elevated, the second sample even higher in concentration, with later samples declining in concentration, becoming stable after the first year. Total iron and manganese appear to reflect erosional events, but dissolved iron correlated with

sulfate. Aluminum and manganese were elevated above historic range each on a single occasion. Values at or greater than ½ MRL were utilized to denote zinc concentrations below the detection limit.

2.4.4 Monitoring wells on the North Fork Koktuli

2.4.4.1 MW10

TDS correlated poorly with conductivity, and in October 2006 major cations had dissolved fractions in higher concentration than total. In August 2005, manganese, copper, and lead were measured in concentrations above the historic range. In 2004, aluminum and manganese concentrations are noted as below the detection limit but appear to be higher than MRL. For iron and lead, multiple numbers denote concentrations below limit of detection, including concentrations that appear to be ½ MRL.

2.4.5 Monitoring wells on the Upper Talarik Creek

2.4.5.1 MW2D

It is not clear from the map provided in PLP "Preliminary Report F-4: Mine area groundwater" whether monitoring well MW2D is located within the South Fork Koktuli drainage or the Upper Talarik Creek drainage, but it is most likely in the Upper Talarik Creek drainage, relatively close to the surface water monitoring station UT119B. Time constraints did not allow for a full analysis of the data. There was an apparent error in either sampling or analysis on October 29, 2004 and the sample was either collected again or re-analyzed on October 30, 2004. While several analytes from October 29 were rejected and not placed in the preliminary database released (conductivity, TDS, TSS, acidity, alkalinity, nitrate, nitrite, total phosphorous, orthophosphate, chloride, fluoride, sulfate, cyanide species, ammonia, dissolved metals, dissolved fraction of major cations), all total fractions of metals and major cations (and hardness) were accepted and placed in the database. There is no explanation as to why the total fractions of metals and cations were accepted while the dissolved fractions were not. Data on October 29 was anomalously elevated (e.g. 222 mg/L hardness vs median of 24 mg/L; 44 ug/L total copper vs median of 0.2 ug/L), while data on October 30 was within the normal range observed at the site (e.g. 22 mg/L hardness; 0.3 ug/L total copper). Field chemistry is listed for October 20, 2004 but not for October 29 or 30.

2.4.6 Sediment

The presence of sediment in water samples is reflected by the elevated TSS concentration. This will often be accompanied by an increase in total (unfiltered) metals but by only a small increase, if any, in dissolved metals. Increase in "total" metals, particularly iron, aluminum, and manganese, may originate from natural sources or disturbances from exploratory activity. It also may originate from the monitoring well itself: gravel packing may be utilized to prevent sediment from entering the screen where water is sampled, but sediment can enter the screen on occasion and cause samples to contain high sediment-related metals.

There are several monitoring wells with water samples that appear to have had sediment contamination and were anomalous compared with other samples from the same well. These often had elevated concentrations of numerous metals, and very high concentrations of the primary erosional material (aluminum, iron, manganese). Outliers should be defined and either explained or removed prior to

inclusion in the full data set. Sites with high TSS and medium to high turbidity (as listed in the field sampling section of Pre-Permit Report F-4) are not listed below.

- MW1M Sediment in Oct 2004, with aluminum at 370 ug/L (median 3), iron 1170 ug/L (median 20 ug/L), and manganese 11 ug/L (median 1 ug/L). The following were also elevated: arsenic, barium, copper, lead, mercury, vanadium, zinc. Turbidity was "none".
- MW3D Sediment in first sample, May 2005, with aluminum 8650 ug/L (median 47 ug/L), iron 10,000 ug/L (median 80 ug/L), manganese 609 ug/L (median 3 ug/L) along with elevated arsenic, barium, cadmium, calcium, chromium, cobalt, copper, lead, magnesium, nickel, potassium, sodium, vanadium, and zinc. Turbidity was "none".
- MW5S All samples have TSS at 1-18 mg/L, with nine of 14 samples above 3 mg/L. Turbidity is listed as "none".
- MW11S Sediment in March 2006 sample had concentrations of total aluminum at 211 ug/L (median 9 ug/L), total iron 306 ug/L (median 14 ug/L), and manganese 24 ug/L (median 1 ug/L) in addition to elevated barium, chromium, copper, lead, molybdenum, nickel. Turbidity listed as "none".
- MW11SS Sediment in the first sample, Nov 2005 with aluminum 1000 ug/L, iron 894 ug/L, manganese 52 ug/L and elevated barium, boron, chromium, copper, lead, mercury, potassium, and zinc. Only four samples collected, and the high concentrations in the first sample skewed the median and mean. Turbidity listed as "none".
- MW12S High TSS in the second sample (Nov 2005) and samples from March 2006-March 2007 had TSS above historic range. Total aluminum, chromium, iron, and vanadium increased. Total copper increased (to 32 ug/L, from 4 ug/L) and returned to previous levels over a period of about a year. Turbidity for November 2005 and March 2006-March 2007 is "low".
- MW13D Sediment in the first sample Aug 2005 with total aluminum 26,700 ug/L (median 100 ug/L), total iron 7500 ug/L (median 40 ug/L), and total manganese 65 ug/L (median 4 ug/L) in addition to elevated antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, lead, magnesium, mercury, molybdenum, nickel, potassium, selenium, sodium, thallium, tin, vanadium, and zinc. Elevated concentrations in some constituents persisted for over a year. Turbidity in August 2005 was listed as "low/medium".
- KP-P4 Sediment in the March 2007 sample caused total aluminum concentrations to skyrocket to over 9,590 ug/L (median 50 ug/L), iron to 7360 ug/L (median 50 ug/L), and manganese to 173 ug/L (median 2 ug/L). Many other metals had concentrations much higher than the median, including total arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, vanadium, and zinc. Turbidity listed as "high/none".
- PQ-4 Sediment in first sample, Nov 2005, with aluminum 1370 ug/L, iron at 1670 ug/L and manganese 66 ug/L. Unclear whether water is at equilibrium and representative water quality. Turbidity listed as "none".
- SRK2 Total suspended solids greater than 3 mg/L in eight of twelve samples; TSS as high as 41 mg/L. Alkalinity, barium, sulfate, and major cations (calcium, magnesium, potassium, sodium) are all very high, but pH doesn't change much over time (6.4-8, median 7.6). In the first sample, dissolved and total aluminum were significantly higher than in other samples and may indicate dissolution of fine clay material. No turbidity was reported in the first sample, but was "low" or "medium/low" in later samples.

2.5. Summary of review of potentially questionable data

Samples at most sites indicate waters with very low alkalinity, conductivity, and trace metals, with many analyte concentrations below the method reporting limit. It can be challenging to apply quality controls to this type of water, but it is essential to do so in order to provide the best characterization of the natural waters.

Trends of the concentrations of analytes increasing or decreasing could be observed in many monitoring wells long after well development. Possible sediment contamination occurred at wells; whether this was due to well development or for some other reason, data should be reviewed to determine at what point groundwater chemistry is representative of natural waters. There are occasionally dates for which the entire sample set should be reviewed (e.g. PQ-4 May 2007, MW2D October 2004). Water quality across nested wells was not always similar (e.g. MW12, MW5); geologic, hydrologic and lithologic information that would assist in interpretation should be provided to reviewers.

No analyte trends were observed at surface water sites, but all but one of the stream sites sampled had data that should be reviewed. There are potential issues with elevated suspended sediment (and associated metals), primarily in 2004, possibly due to sampling methods. Most sites had analytes with apparent outlier data; occasionally specific dates would stand out (e.g. SK100B1 September 2005 and March 2007, SK100C July 2007, etc.) and/or the concentrations at the site did not correlate with concentrations upstream and downstream (e.g. SK100B2 aluminum and sodium, SK100D iron, etc.). RPD calculations indicate that dissolved concentrations for cations and some metals are often over 10%; while this is acceptable under the PLP QAPP, samples collected by the USGS in the Pebble area had much fewer instances of dissolved concentrations greater than total.

For both groundwater and surface water there was a systemic issue with either the MDL changing or typographical errors reporting concentrations as less than MDL when they were higher than MRL. This could potentially skew data when performing calculations of the data set.

In conclusion, the preliminary data reviewed has questionable data at most water sampling sites. Data needs to be placed in context in order for the best interpretation to be made, and lab QC sheets should be made available. Temperature and weather data, in addition to field notes, could be used in interpretation as well as information on whether groundwater contributes significantly to a surface water site (e.g. if snowmelt or rain increased the TSS, sites with significant groundwater input would be expected to have a depression in major cations and anions at the same time that total metals increased.

3.0 References

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Report Series B: Surface Water Hydrology. HDR Alaska and Knight-Piesold.
Report Series C: Surficial Geologic Map of the Pebble Limited Partnership's Pebble Project. Hamilton, Thomas D.
Report Series D. Section D-6. Water Management Consultants.
Report Series F: Surface Water and Groundwater Quality. HDR Alaska, SLR Alaska, Water Management Consultants, CH2M Hill, and Bristol Environmental & Engineering Services Corporation

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Please note that Pebble reports are drafts and have not been finalized. All Pebble Partnership reports are available on line at http://www.pebblepartnership.com/environment/data-releases

Online location may change. Previously documents were accessed at http://www.pebblepartnership.com/pages/environment/environment-pre-permitting.php

Locations of surface water, monitoring well, and seep sites sampled by the Pebble Limited Partnership (PLP) were taken primarily from Figure 6-5 of the 2005 Chapter 6 report. Locations of Cominco surface water sites were taken from Figure 1-4 of Northern Dynasty Minerals, Inc. 2004. Pebble Gold Copper Project Draft Environmental Baseline Studies Proposed 2004 Study Plan.

Appendix A:
Summary tables, graphs and RPD tables illustrating potentially questionable PLP stream data, 2004-2007

Summary Tables

A list of potentially questionable data is provided for each site.

Graphs

Graphs illustrating concentrations over time or property-property plots are presented. Only a subset of all the metals analyzed by PLP have been graphed or examined in RPD tables (aluminum, arsenic, cadmium, copper, iron, manganese, molybdenum, zinc). Where illustrative graphs for a site would take up more than 2 pages, graphs illustrating all potentially questionable data listed for the site may not be provided.

For RPD tables

The RPD for major cations and select metals (listed in boxes below) were calculated for each stream sampling event and are shown in tables after graphs. When concentrations of an analyte are less than 5MRL, data is not presented. Where either total or dissolved concentrations are less than 5 MRL, RPD is given but not color coded. Although all dates are presented, and many color-coded, only dates for which RPD is over 20%, or RPD for several elements is over 10%, are of potential concern. The MRL, acceptable percent of accuracy and precision as defined by PLP (2008 QAPP) are in the boxes below.

	Ca - Total	Ca - Diss.	Mg - total	Mg - Diss.	K - Total	K - Diss.	Na - Total	Na - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	50	50	20	20	50	50	100	100
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20	20	20

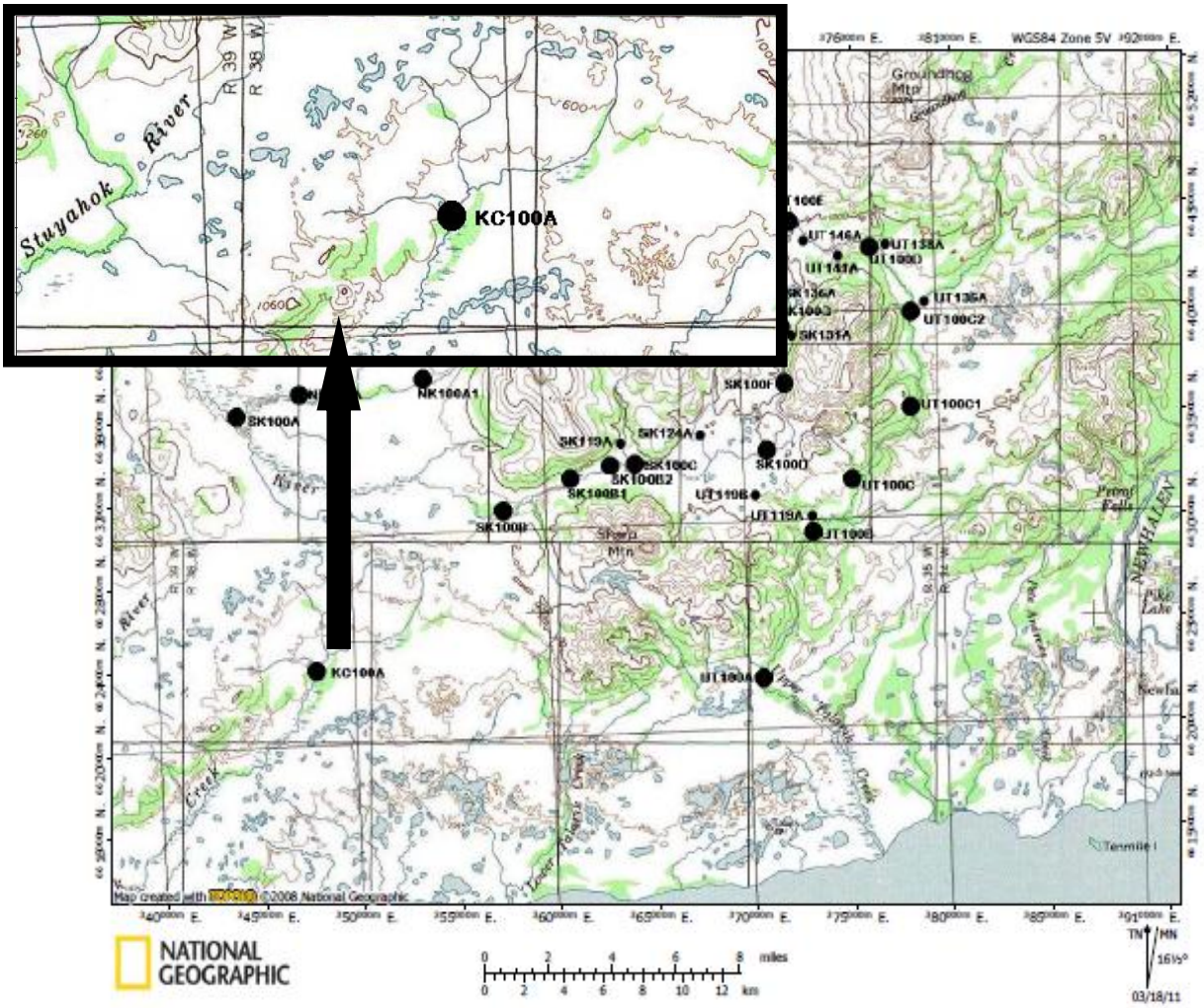
	Al - Total	Al - Diss.	As - Total	As - Diss.	Cd - Total	Cu - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	2	2	0.5	0.5	0.05	0.1
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20

	Fe - Total	Fe - Diss.	Mn - Total	Mn - Diss.	Mo - Total	Mo - Diss.	Zn - Total	Zn - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	20	20	0.05	0.05	0.05	0.05	1	1
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20	20	20

Color coding in this review is shown in the box below. Only data with an RPD greater than 20%, or for which the RPD for several analytes is greater than 10%, are considered to be of concern.

Diss.>Total with RPD 0-9%
Diss.>Total with RPD 10-19%
Diss.>Total with RPD > 20%
ndd - No dissolved data. Rejected by PLP?

Kaskanak Creek headwaters: Stream monitoring site KC-100A



KC100A

Property-property plots and RPD tables

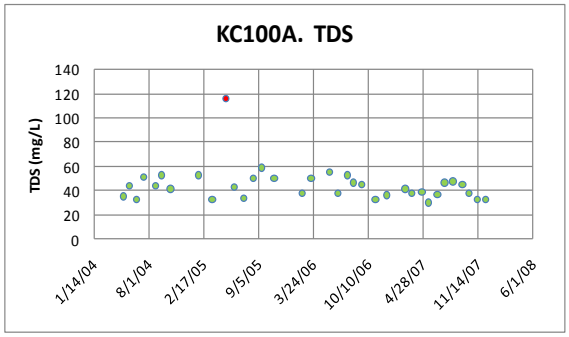
TSS appears elevated relative to discharge	April 2004, July 2005, August 2005
Major cation RPD dissolved consistently over total	October 2005, December 2006

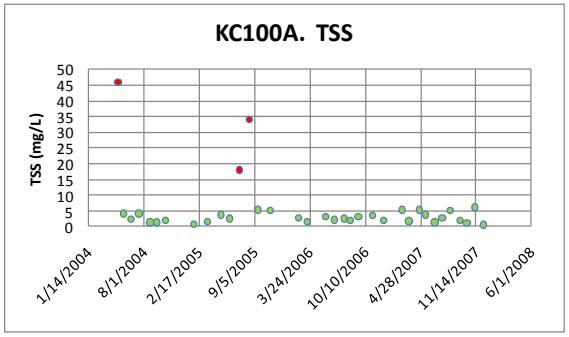
Potential outliers, outside pattern

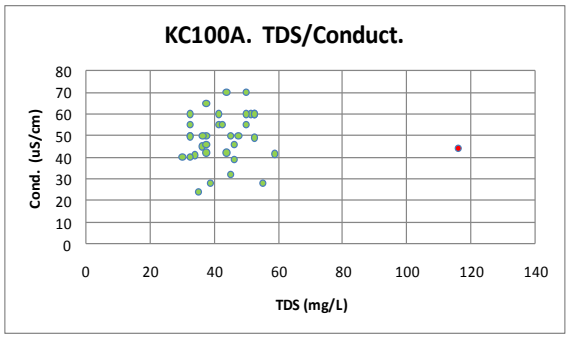
TDS	May 2005
TSS, aluminum, iron, manganese	April 2004, July 2005, August 2005
antimony	August 2005
arsenic	April 2004, July 2005, August 2005, March 2006
copper	April 2004, May 2004
lead	April 2004, February 2006, February 2007, March 2007
vanadium	April 2004
zinc	July 2005, August 2005

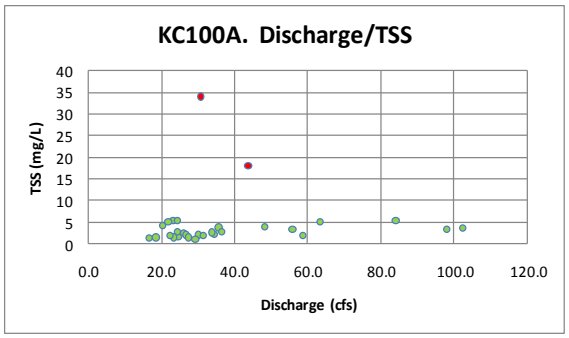
Elements reported as below MDL but appear to be near or above MRL

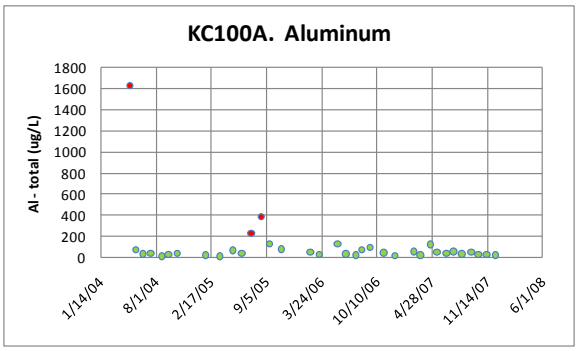
aluminum	June 2004, July 2004, Aug 2004, Sept 2004
antimony, cadmium, tin	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004

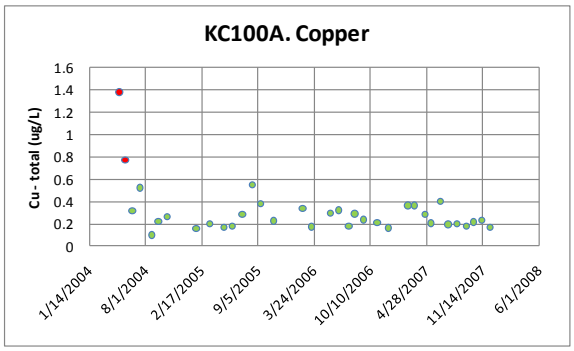

KC100A. TDS
TDS (mg/L)
140
120
100
80
60
40
20
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

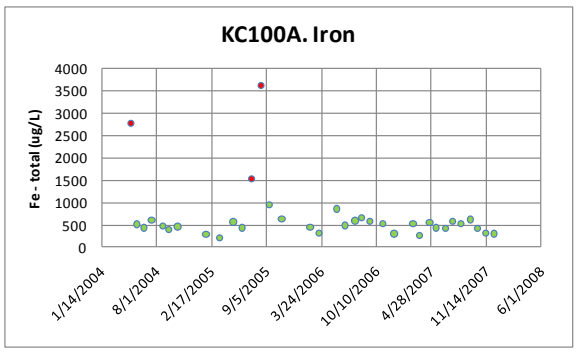

KC100A. TSS
TSS (mg/L)
50
45
40
35
30
25
20
15
10
5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

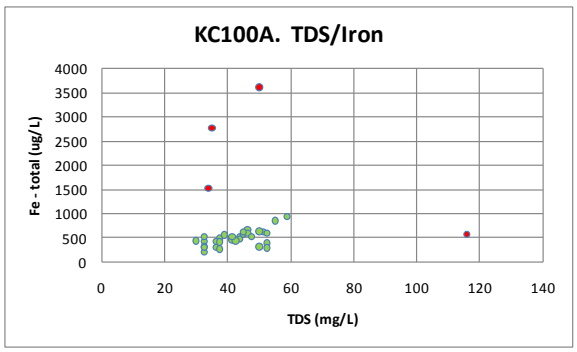

KC100A. TDS/Conduct.
Cond. (uS/cm)
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
TDS (mg/L)

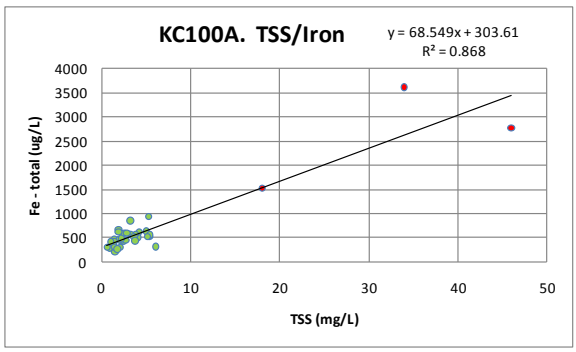

KC100A. Discharge/TSS
TSS (mg/L)
40
35
30
25
20
15
10
5
0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
Discharge (cfs)

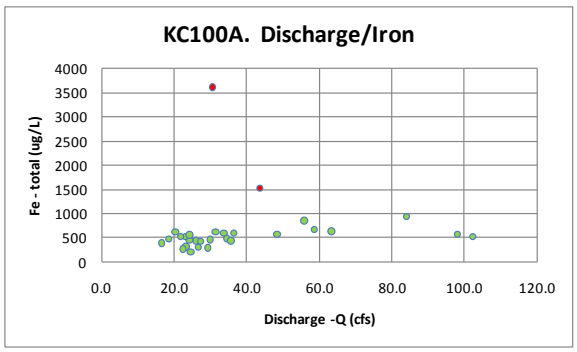

KC100A. Aluminum
Al - total (ug/L)
1800
1600
1400
1200
1000
800
600
400
200
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

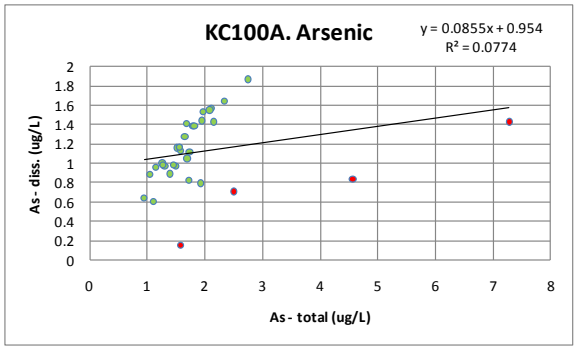

KC100A. Copper
Cu - total (ug/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

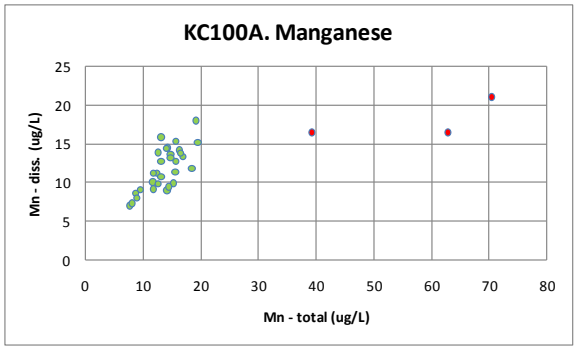

KC100A. Iron
Fe - total (ug/L)
4000
3500
3000
2500
2000
1500
1000
500
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

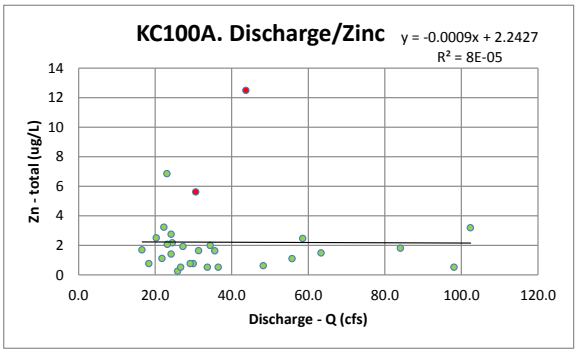

KC100A. TDS/Iron
Fe - total (ug/L)
4000
3500
3000
2500
2000
1500
1000
500
0
0
20
40
60
80
100
120
140
TDS (mg/L)

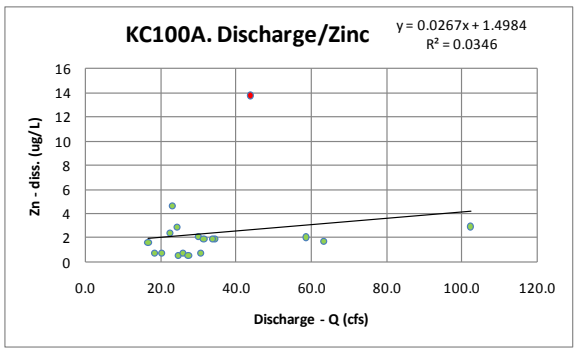

KC100A. TSS/Iron
y = 68.549x + 303.61
R² = 0.868
Fe - total (ug/L)
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
TSS (mg/L)


KC100A. Discharge/Iron
Fe - total (ug/L)
4000
3500
3000
2500
2000
1500
1000
500
0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
Discharge -Q (cfs)


KC100A. Arsenic
y = 0.0855x + 0.954
R² = 0.0774
As - diss. (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
7
8
As - total (ug/L)


KC100A. Manganese
Mn - diss. (ug/L)
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
Mn - total (ug/L)


KC100A. Discharge/Zinc
y = -0.0009x + 2.2427
R² = 8E-05
Zn - total (ug/L)
14
12
10
8
6
4
2
0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
Discharge - Q (cfs)


KC100A. Discharge/Zinc
y = 0.0267x + 1.4984
R² = 0.0346
Zn - diss. (ug/L)
16
14
12
10
8
6
4
2
0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
Discharge - Q (cfs)

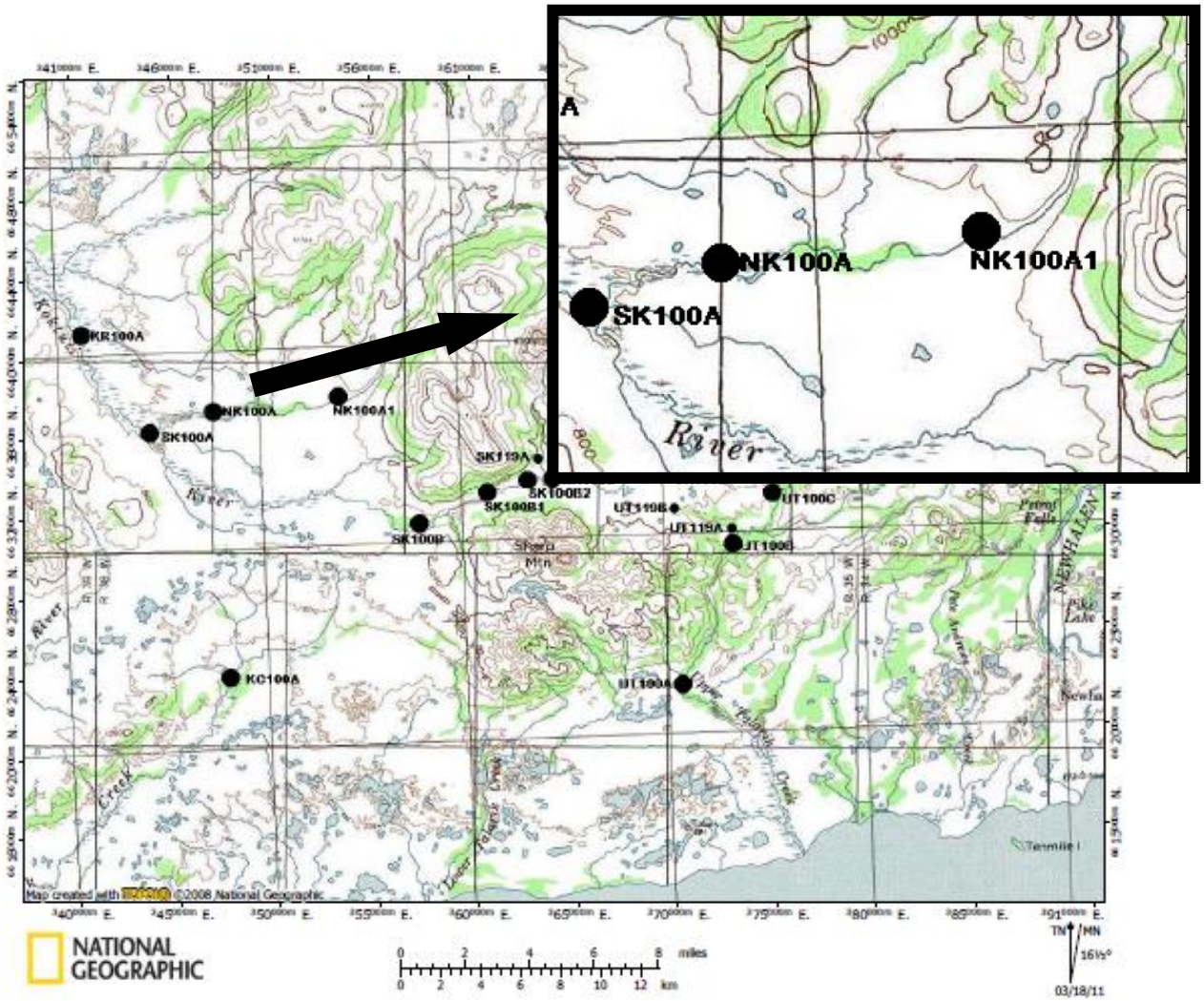
Major Cations

Date	Ca	Mg	K	Na
	RPD	RPD	RPD	RPD
4/29/2004				
5/20/2004	4%		3%	
6/5/2004				
6/15/2004				2%
7/13/2004		3%		3%
8/15/2004				
8/23/2004				
9/15/2004				
10/17/2004				
1/28/2005				
1/29/2005				
3/19/2005				
5/7/2005			3%	7%
6/7/2005	2%			
7/12/2005		1%	4%	4%
8/17/2005		2%		5%
9/15/2005		1%		7%
10/30/2005	12%	8%	12%	10%
2/11/2006	6%		7%	0%
3/14/2006	0%			
5/20/2006				6%
6/19/2006	4%	1%	6%	2%
7/25/2006				1%
8/16/2006				
9/15/2006				
11/4/2006		2%		1%
12/14/2006	13%	16%	15%	14%
2/21/2007	13%	8%	12%	
3/17/2007	11%			
4/22/2007				
5/15/2007		1%	3%	2%
6/18/2007				
7/14/2007			2%	
8/14/2007				
9/17/2007				
10/12/2007				
11/11/2007	1%	7%	6%	5%
12/12/2007	8%	9%	14%	4%

Trace Metals

Date	Al	Fe	As	Mn	Mo
	RPD	RPD	RPD	RPD	RPD
4/29/2004					
5/20/2004				19%	
6/5/2004					
6/15/2004				ndd	
7/13/2004					35%
8/15/2004					
8/23/2004					
9/15/2004					
10/17/2004				2%	4%
1/28/2005		ndd	ndd	ndd	ndd
1/29/2005					
3/19/2005		ndd	ndd	3%	19%
5/7/2005					
6/7/2005					ndd
7/12/2005					
8/17/2005					
9/15/2005					1%
10/30/2005					19%
2/11/2006					19%
3/14/2006					
5/20/2006					
6/19/2006					
7/25/2006					
8/16/2006					
9/15/2006					
11/4/2006					
12/14/2006					6%
2/21/2007					10%
3/17/2007					7%
4/22/2007					
5/15/2007				11%	1%
6/18/2007					
7/14/2007					
8/14/2007					
9/17/2007					
10/12/2007					
11/11/2007					
12/12/2007					6%

North Fork Koktuli main stem: Stream monitoring site NK-100A(furthest downstream)



NK100A

Property-property plots and RPD results

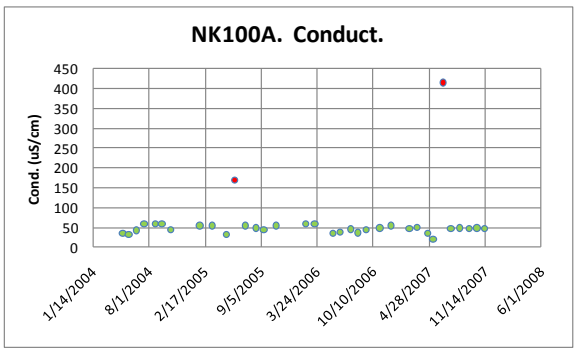
Major cation RPDs, dissolved consistently over total	Dec 2006, Dec 2007
Molybdenum RPD over 20%	March 2005

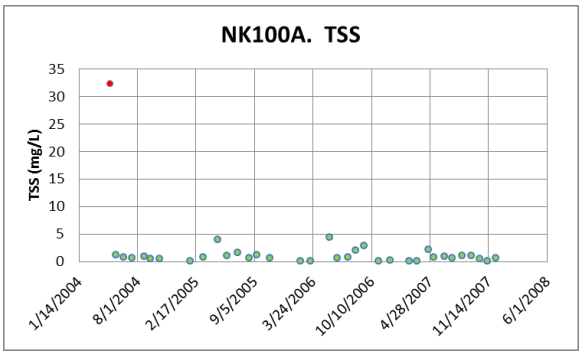
Potential outliers, outside pattern

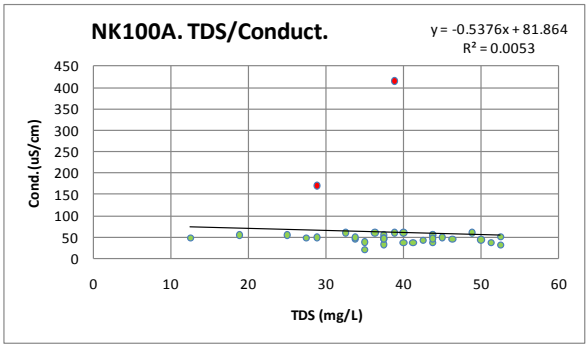
TSS, aluminum, copper, iron, manganese, zinc	April 2004
conductivity	June 2005, June 2007
aluminum	May 2007
copper	June 2007
zinc	Sept 2004

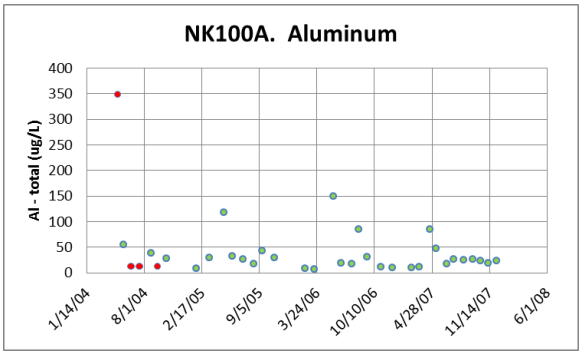
Elements reported as below MDL but appear to be above MRL

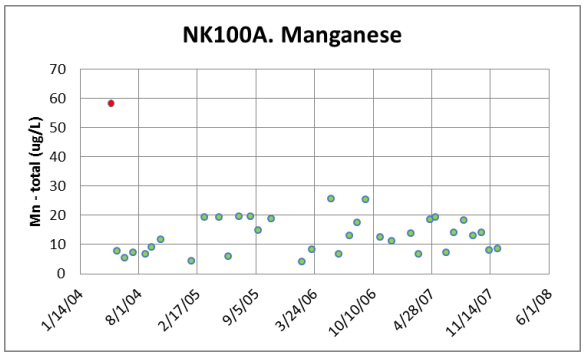
aluminum	June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	April 2004, May 2004, July 2004
cadmium	Sept 2004
tin (as MRL)	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
vanadium	March 2007

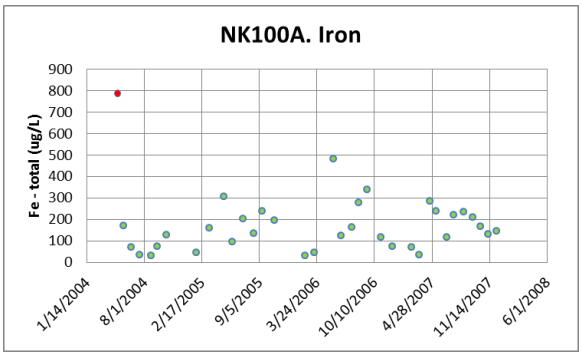

NK100A. Conduct.
Cond. (uS/cm)
450
400
350
300
250
200
150
100
50
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

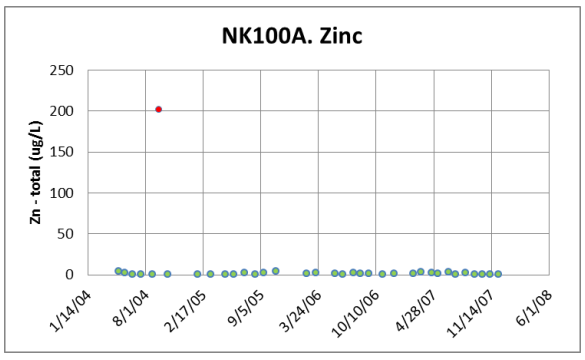

NK100A. TSS
TSS (mg/L)
35
30
25
20
15
10
5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

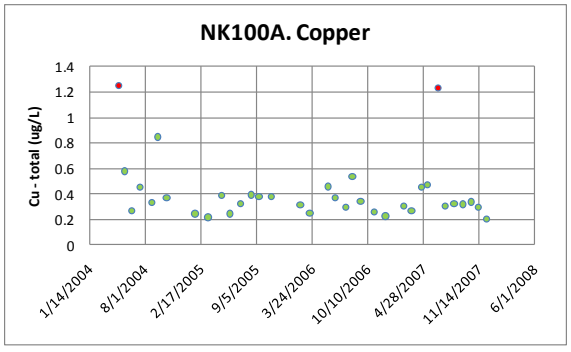

NK100A. TDS/Conduct.
y = -0.5376x + 81.864
R² = 0.0053
Cond. (uS/cm)
450
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
TDS (mg/L)


NK100A. Aluminum
Al - total (ug/L)
400
350
300
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100A. Manganese
Mn - total (ug/L)
70
60
50
40
30
20
10
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100A. Iron
Fe - total (ug/L)
900
800
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


NK100A. Zinc
Zn - total (ug/L)
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100A. Copper
Cu - total (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

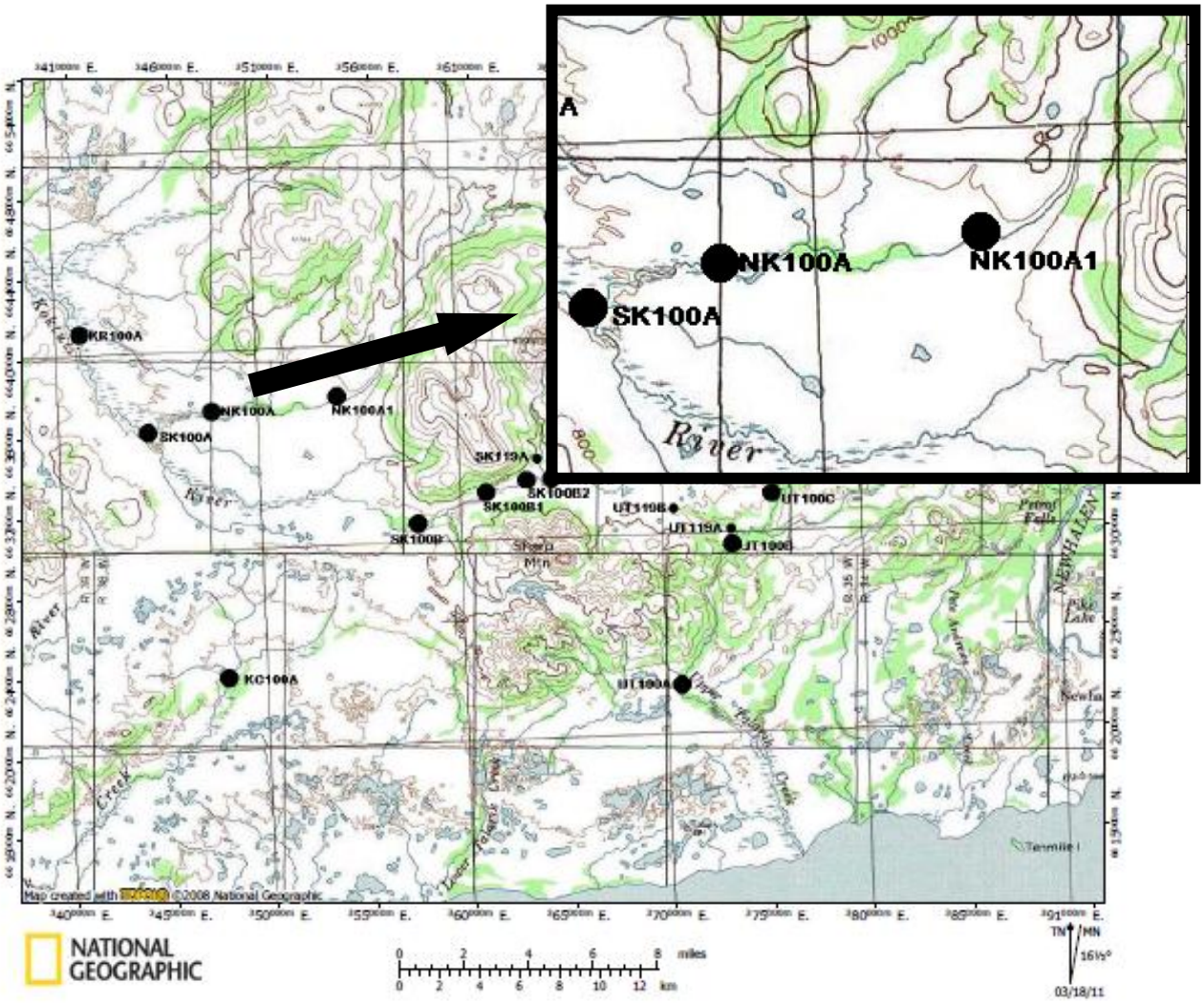
Major Cations

	Ca	Mg	K	Na
	RPD	RPD	RPD	RPD
4/29/2004				
5/19/2004				10%
6/2/2004				
6/15/2004				
7/14/2004	3%	3%	4%	3%
8/14/2004				
8/24/2004	0%		1%	
9/15/2004				
10/17/2004	4%	3%	2%	4%
1/28/2005	2%	4%	5%	3%
3/15/2005			5%	
5/4/2005				
6/3/2005	1%		1%	
7/9/2005				
8/17/2005				
9/14/2005	1%		4%	1%
10/28/2005		4%	2%	
2/10/2006			1%	
3/15/2006			1%	
5/20/2006			3%	3%
6/15/2006			2%	1%
7/23/2006	0%		3%	
8/16/2006				
9/14/2006				
11/3/2006	6%	3%	5%	4%
12/13/2006	18%	14%		12%
2/16/2007	5%	4%	5%	1%
3/16/2007		6%	6%	1%
4/22/2007	1%	1%	1%	1%
5/12/2007		11%	3%	
6/18/2007				
7/14/2007	4%	5%	7%	2%
8/16/2007	7%	6%	8%	7%
9/17/2007			5%	
10/15/2007	1%		3%	
11/11/2007	10%	4%	15%	2%
12/10/2007	17%	14%	16%	10%

Trace Metals

	Cu	Al	Fe	Mn	Zn	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/29/2004					24%	
5/19/2004						
6/2/2004						
6/15/2004	16%			ndd		
7/14/2004						23%
8/14/2004						
8/24/2004	19%					
9/15/2004						
10/17/2004	1%			3%	ndd	
1/28/2005	7%				69%	6%
3/15/2005	ndd				ndd	22%
5/4/2005	10%				54%	
6/3/2005	8%					
7/9/2005					ndd	13%
8/17/2005						
9/14/2005	ndd					
10/28/2005						15%
2/10/2006	18%				ndd	ndd
3/15/2006	15%				ndd	70%
5/20/2006					ndd	
6/15/2006					ndd	
7/23/2006	ndd					
8/16/2006	11%				35%	
9/14/2006	16%				4%	
11/3/2006	27%				98%	9%
12/13/2006	ndd				ndd	17%
2/16/2007	24%				ndd	0%
3/16/2007	ndd				5%	
4/22/2007	ndd			15%	ndd	
5/12/2007	ndd	12%			ndd	2%
6/18/2007						
7/14/2007	11%					4%
8/16/2007	15%				8%	6%
9/17/2007	27%				ndd	
10/15/2007	ndd				99%	3%
11/11/2007	ndd				ndd	9%
12/10/2007	ndd				99%	12%

North Fork Koktuli main stem: Stream monitoring site NK-100A1



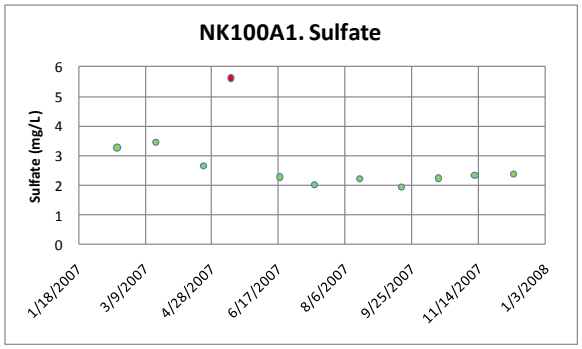
NK100A1

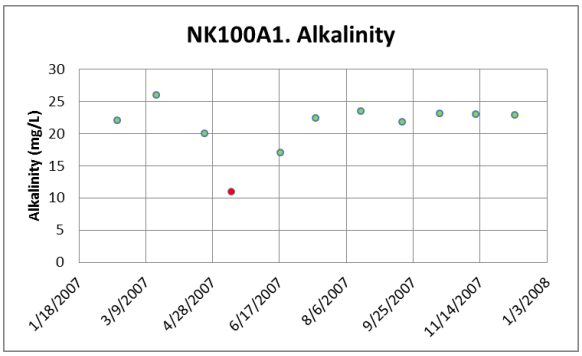
RPD results

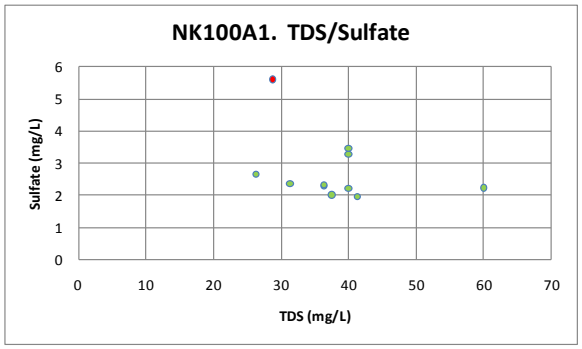
Major cation RPDs, dissolved consistently over total	Sept, Nov, Dec 2007

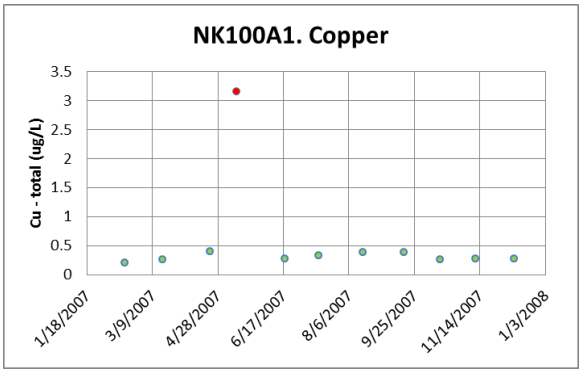
Potential outliers, outside pattern

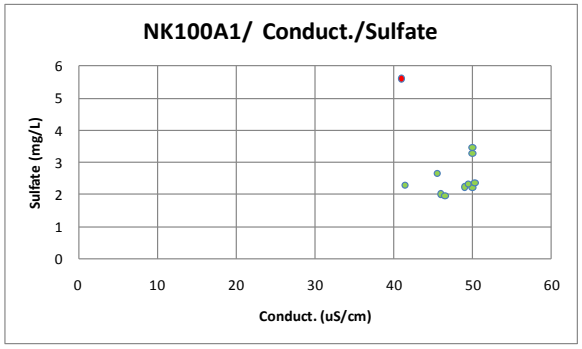
Sulfate, alkalinity, total and dissolved copper	May 2007

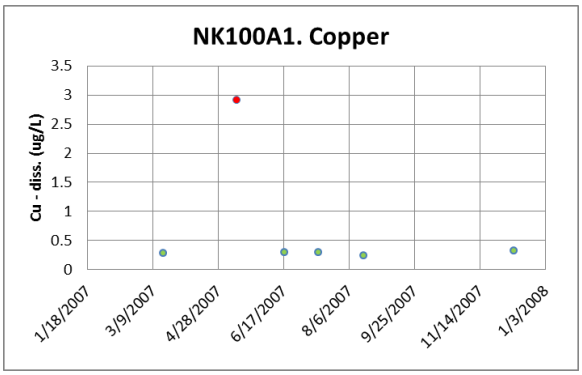

NK100A1. Sulfate
Sulfate (mg/L)
0
1
2
3
4
5
6
1/18/2007
3/9/2007
4/28/2007
6/17/2007
8/6/2007
9/25/2007
11/14/2007
1/3/2008

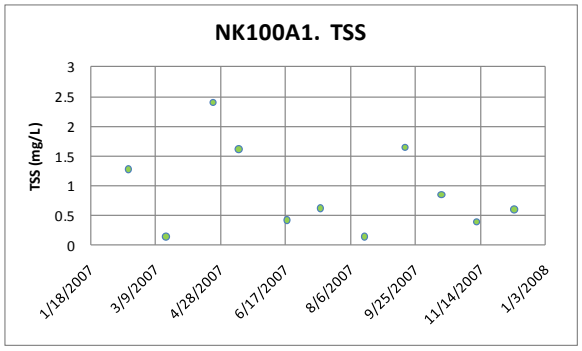

NK100A1. Alkalinity
Alkalinity (mg/L)
0
5
10
15
20
25
30
1/18/2007
3/9/2007
4/28/2007
6/17/2007
8/6/2007
9/25/2007
11/14/2007
1/3/2008


NK100A1. TDS/Sulfate
Sulfate (mg/L)
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
TDS (mg/L)


NK100A1. Copper
Cu - total (ug/L)
0
0.5
1
1.5
2
2.5
3
3.5
1/18/2007
3/9/2007
4/28/2007
6/17/2007
8/6/2007
9/25/2007
11/14/2007
1/3/2008


NK100A1/ Conduct./Sulfate
Sulfate (mg/L)
0
1
2
3
4
5
6
0
10
20
30
40
50
60
Conduct. (uS/cm)


NK100A1. Copper
Cu - diss. (ug/L)
0
0.5
1
1.5
2
2.5
3
3.5
1/18/2007
3/9/2007
4/28/2007
6/17/2007
8/6/2007
9/25/2007
11/14/2007
1/3/2008


NK100A1. TSS
TSS (mg/L)
0
0.5
1
1.5
2
2.5
3
1/18/2007
3/9/2007
4/28/2007
6/17/2007
8/6/2007
9/25/2007
11/14/2007
1/3/2008

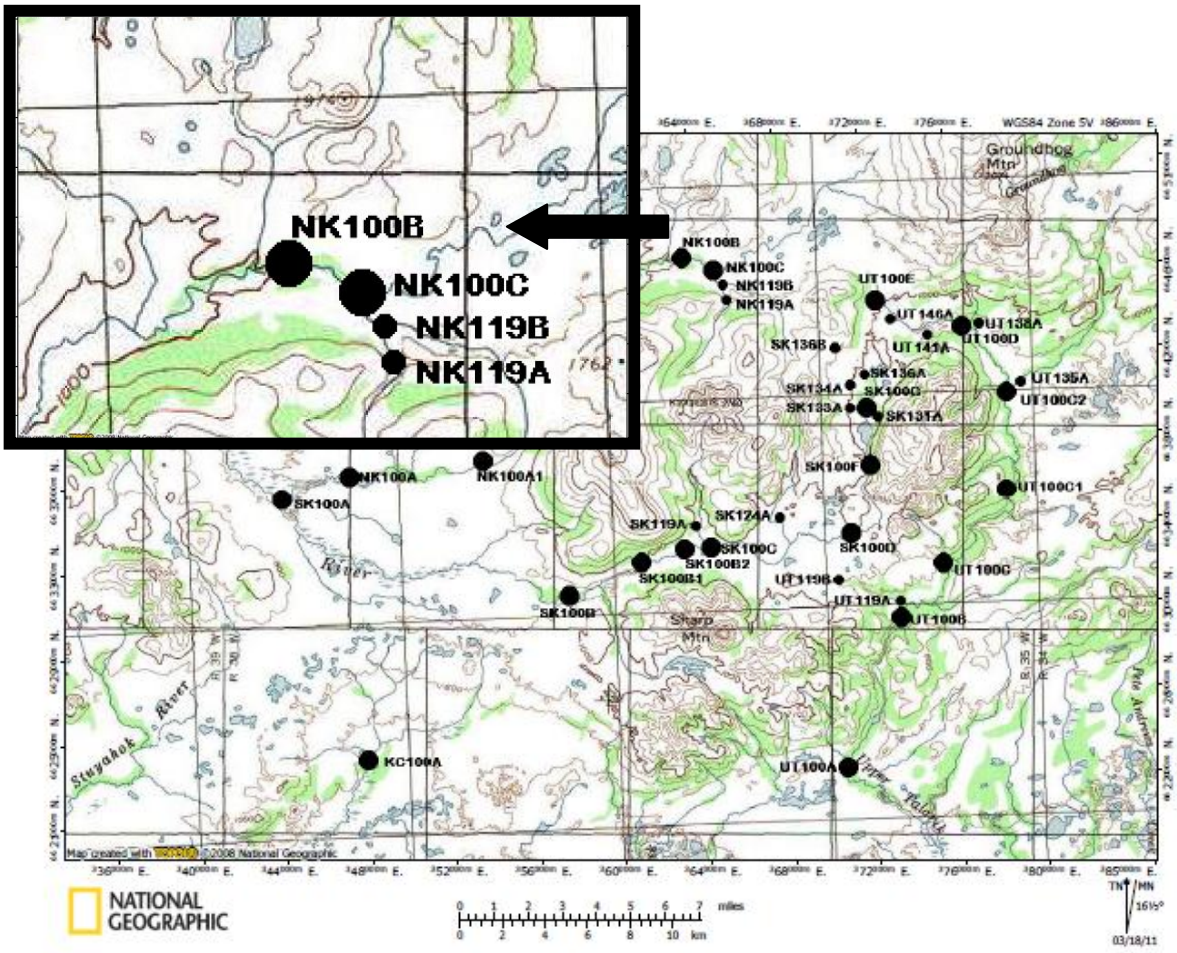
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
2/16/2007	15%	7%	15%	5%
3/17/2007	11%		14%	
4/22/2007				
5/12/2007				
6/18/2007				
7/14/2007			4%	
8/17/2007	5%	6%	6%	5%
9/17/2007	13%	12%	16%	11%
10/15/2007	1%	1%	4%	2%
11/11/2007	13%	12%	14%	0%
12/10/2007	14%	12%	16%	10%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Mo
Date	RPD	RPD	RPD	RPD		RPD	RPD
2/16/2007	ndd					ndd	14%
3/17/2007	5%					ndd	
4/22/2007	ndd				19%		
5/12/2007							
6/18/2007	8%					97%	
7/14/2007							1%
8/17/2007							5%
9/17/2007	ndd					10%	13%
10/15/2007	ndd						2%
11/11/2007	ndd					87%	9%
12/10/2007	20%					25%	18%

North Fork Koktuli main stem: Stream monitoring site NK-100B



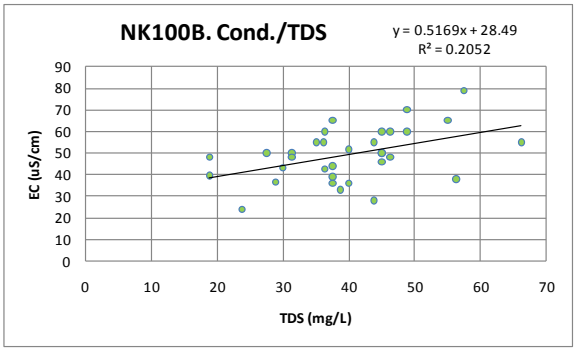
NK100B (sampled only in 2007)

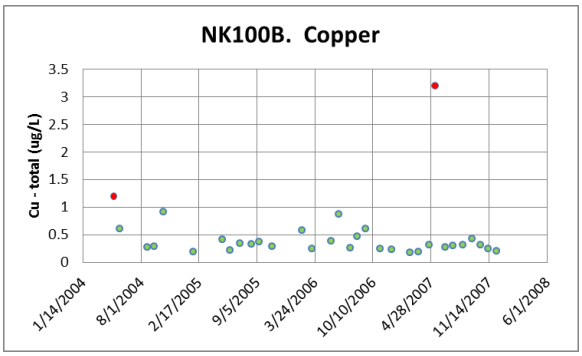
Property-property plots and RPD results

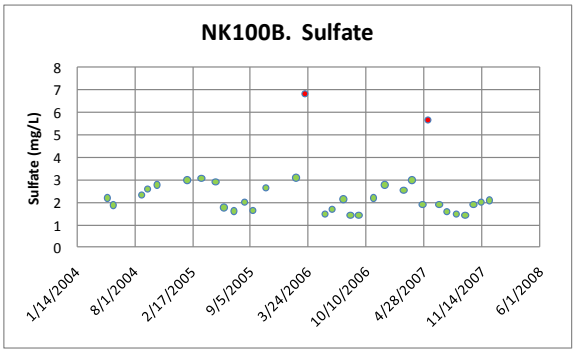
TDS correlates poorly with conductivity	
Major cation RPD's dissolved consistently over total	June 2005, Dec 2006, Feb 2007, Dec 2007

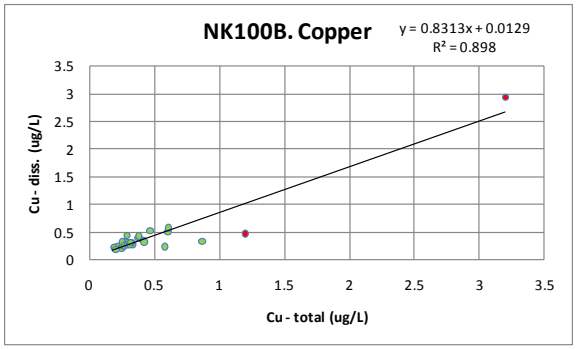
Potential outliers, outside pattern

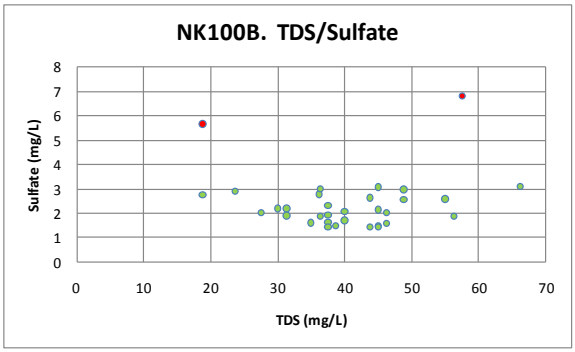
sulfate	Mar 2006, May 2007
copper	April 2007, May 2007
zinc	Oct 2007

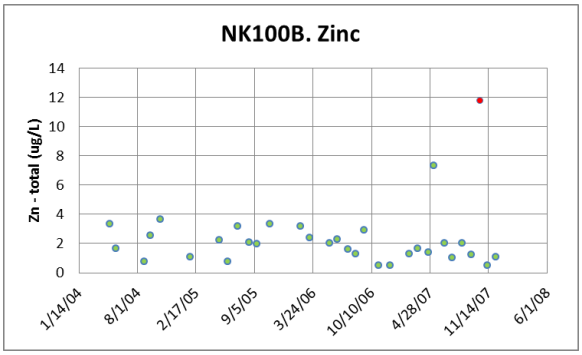

NK100B. Cond./TDS
y = 0.5169x + 28.49
R² = 0.2052
EC (uS/cm)
TDS (mg/L)


NK100B. Copper
Cu - total (ug/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


NK100B. Sulfate
Sulfate (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


NK100B. Copper
y = 0.8313x + 0.0129
R² = 0.898
Cu - diss. (ug/L)
Cu - total (ug/L)


NK100B. TDS/Sulfate
Sulfate (mg/L)
TDS (mg/L)


NK100B. Zinc
Zn - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

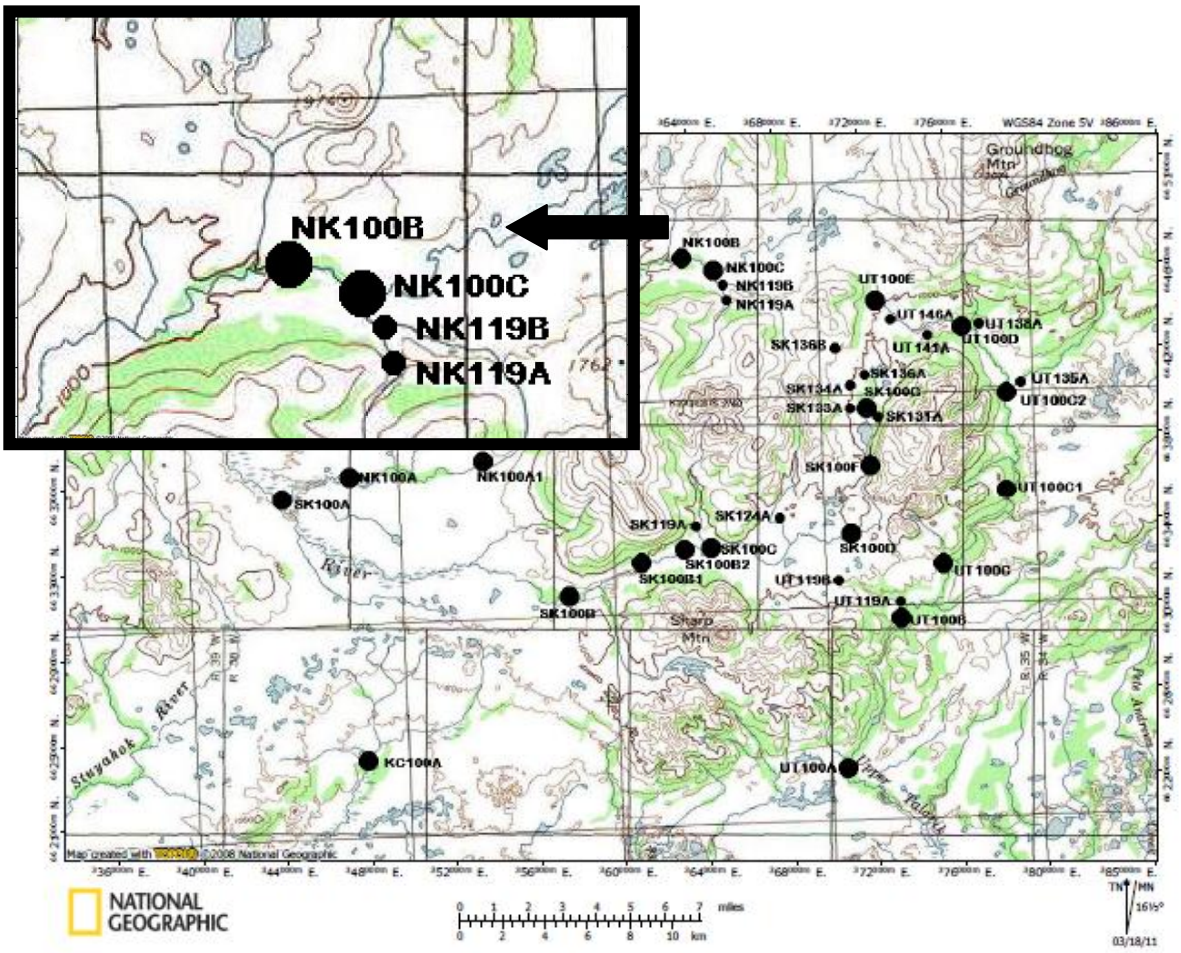
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/29/2004				
5/19/2004		9%		3%
6/2/2004				
7/14/2004				
8/24/2004	0%	1%	1%	
9/15/2004		1%		3%
10/18/2004			2%	3%
1/29/2005				2%
3/20/2005				
5/8/2005				
6/4/2005				
6/5/2005	13%	10%	18%	13%
7/9/2005	2%	1%	1%	2%
8/17/2005				
9/13/2005			1%	0%
10/28/2005		2%		
2/9/2006				2%
3/13/2006				
5/20/2006		9%	4%	9%
6/15/2006				
7/23/2006		2%	1%	5%
8/16/2006				
9/14/2006	9%	14%	8%	18%
11/3/2006	4%	2%	6%	3%
12/13/2006	12%	14%	16%	10%
2/16/2007	15%	10%	16%	11%
3/17/2007				1%
4/22/2007	5%	8%	6%	5%
5/12/2007	2%	1%	2%	1%
6/18/2007	3%	6%	7%	3%
7/14/2007				
8/16/2007	9%	9%	11%	11%
9/17/2007	9%	8%	11%	9%
10/15/2007	3%	3%	5%	2%
11/11/2007	14%	12%	19%	8%
12/10/2007	4%	1%	6%	0%

Trace Metals

	Cu	Al	Fe	Mn	Zn	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/29/2004						
5/19/2004				9%	25%	
6/2/2004						
7/14/2004						
8/24/2004	16%				75%	108%
9/15/2004	40%					
10/18/2004	ndd				ndd	
1/29/2005	13%				ndd	
3/20/2005						
5/8/2005						
6/4/2005						
6/5/2005	10%					ndd
7/9/2005					ndd	
8/17/2005						
9/13/2005	7%				1%	34%
10/28/2005	3%					ndd
2/9/2006					1%	ndd
3/13/2006					10%	ndd
5/20/2006	13%				ndd	
6/15/2006						5%
7/23/2006	0%					
8/16/2006	11%				5%	
9/14/2006						ndd
11/3/2006	24%				ndd	
12/13/2006	ndd				ndd	26%
2/16/2007	ndd				ndd	17%
3/17/2007	17%				35%	
4/22/2007	ndd			ndd	ndd	11%
5/12/2007						
6/18/2007						
7/14/2007						
8/16/2007					7%	10%
9/17/2007					33%	14%
10/15/2007						2%
11/11/2007	ndd				99%	19%
12/10/2007					59%	10%

North Fork Koktuli main stem: Stream monitoring site NK-100C



NK100C

Property-property graphs and RPD results

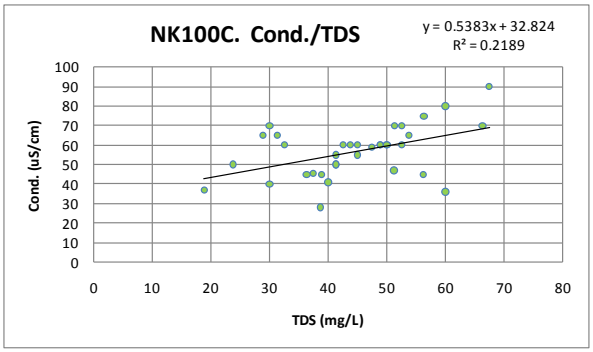
TDS and conductivity correlate poorly	
Alkalinity correlates poorly with hardness	May 2006
Major cation RPD's dissolved consistently over total	Sept 2007

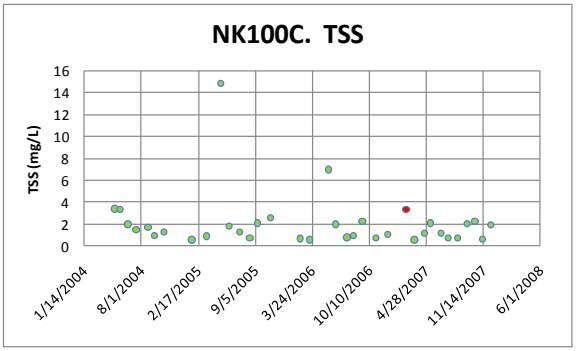
Potential outliers, outside pattern

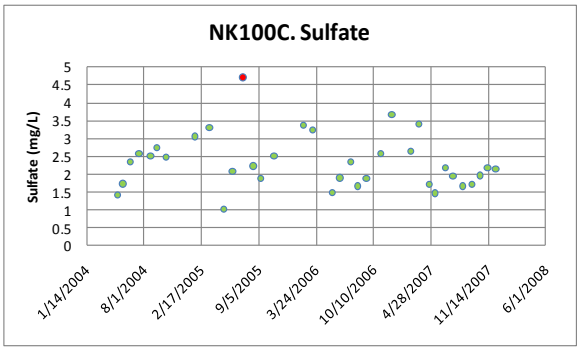
sulfate	July 2005
TSS, aluminum	Feb 2007
antimony, arsenic	Aug 2005
copper	May 2004, Feb 2006, Aug 2007
iron	May 2005, Feb 2006, March 2006, May 2006
lead	March 2006
manganese	Feb 2006

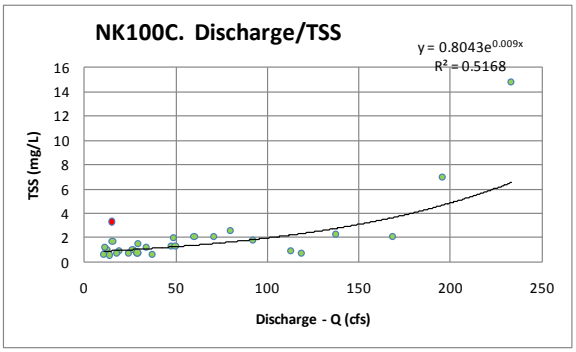
Elements reported as below MDL but appear to be at or above MRL

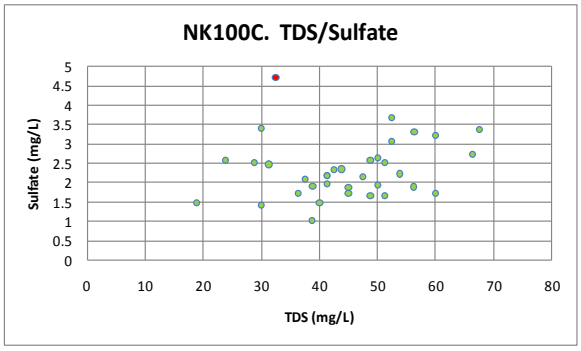
aluminum	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, Aug 2004
tin	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004

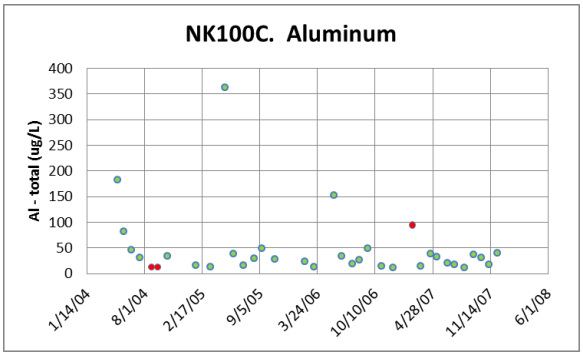

NK100C. Cond./TDS
y = 0.5383x + 32.824
R² = 0.2189
Cond. (uS/cm)
TDS (mg/L)

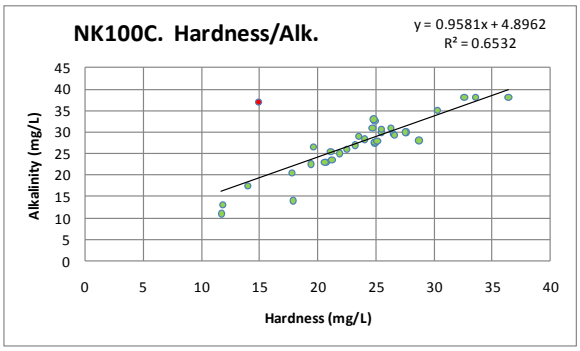

NK100C. TSS
TSS (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

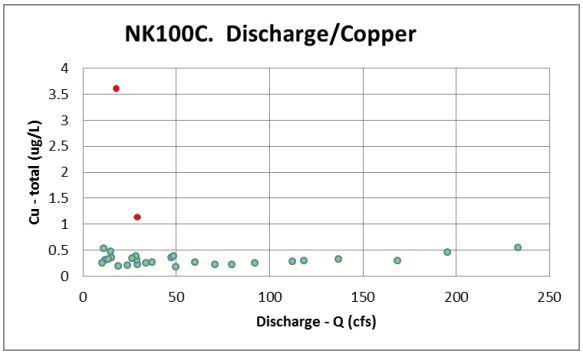

NK100C. Sulfate
Sulfate (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

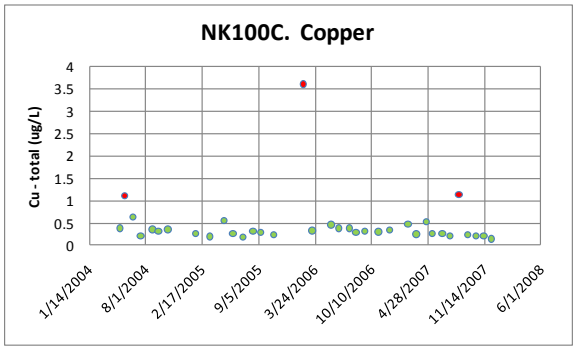

NK100C. Discharge/TSS
y = 0.8043e^0.009x
R² = 0.5168
TSS (mg/L)
Discharge - Q (cfs)

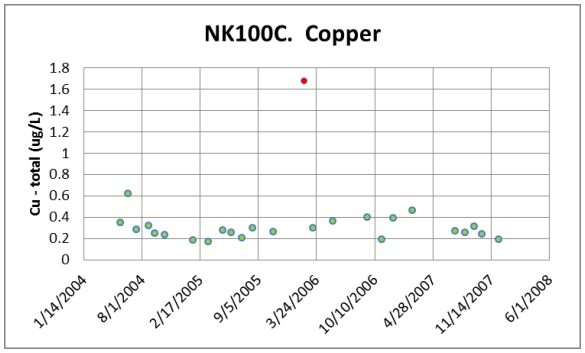

NK100C. TDS/Sulfate
Sulfate (mg/L)
TDS (mg/L)

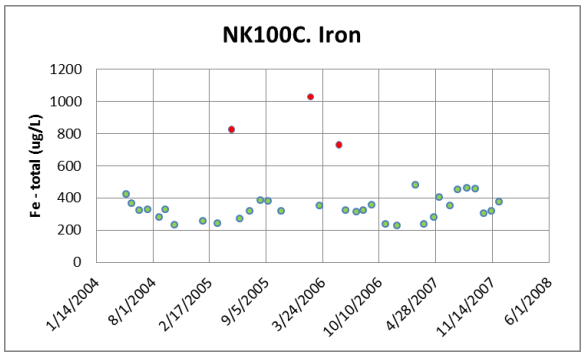

NK100C. Aluminum
Al - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

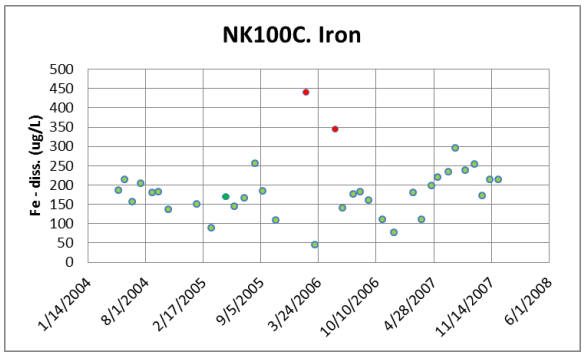

NK100C. Hardness/Alk.
y = 0.9581x + 4.8962
R² = 0.6532
Alkalinity (mg/L)
Hardness (mg/L)

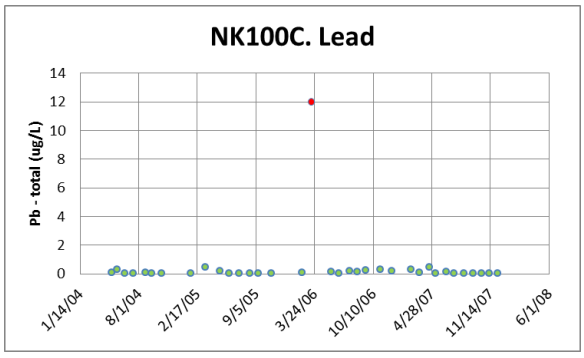

NK100C. Discharge/Copper
Cu - total (ug/L)
Discharge - Q (cfs)

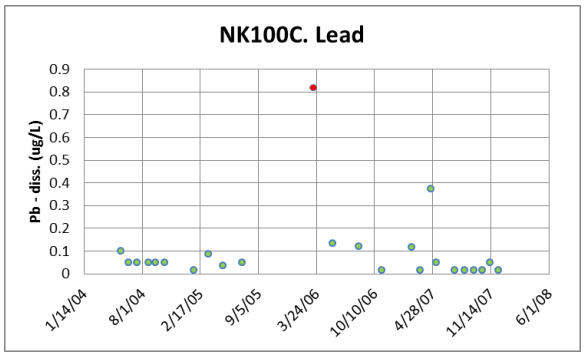

NK100C. Copper
Cu - total (ug/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

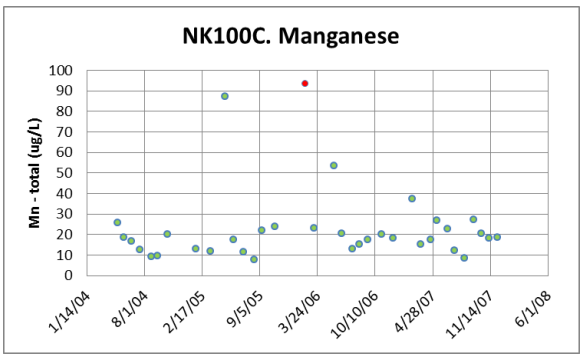

NK100C. Copper
Cu - total (ug/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

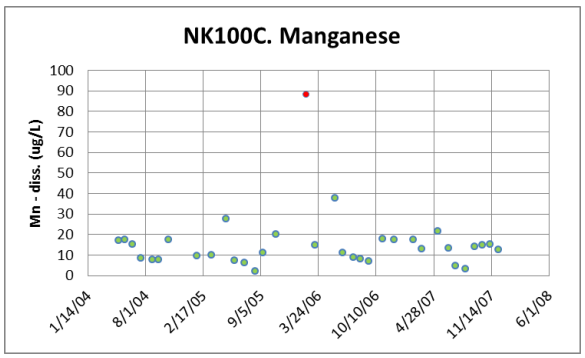

NK100C. Iron
Fe - total (ug/L)
1200
1000
800
600
400
200
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


NK100C. Iron
Fe - diss. (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


NK100C. Lead
Pb - total (ug/L)
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100C. Lead
Pb - diss. (ug/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100C. Manganese
Mn - total (ug/L)
100
90
80
70
60
50
40
30
20
10
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


NK100C. Manganese
Mn - diss. (ug/L)
100
90
80
70
60
50
40
30
20
10
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

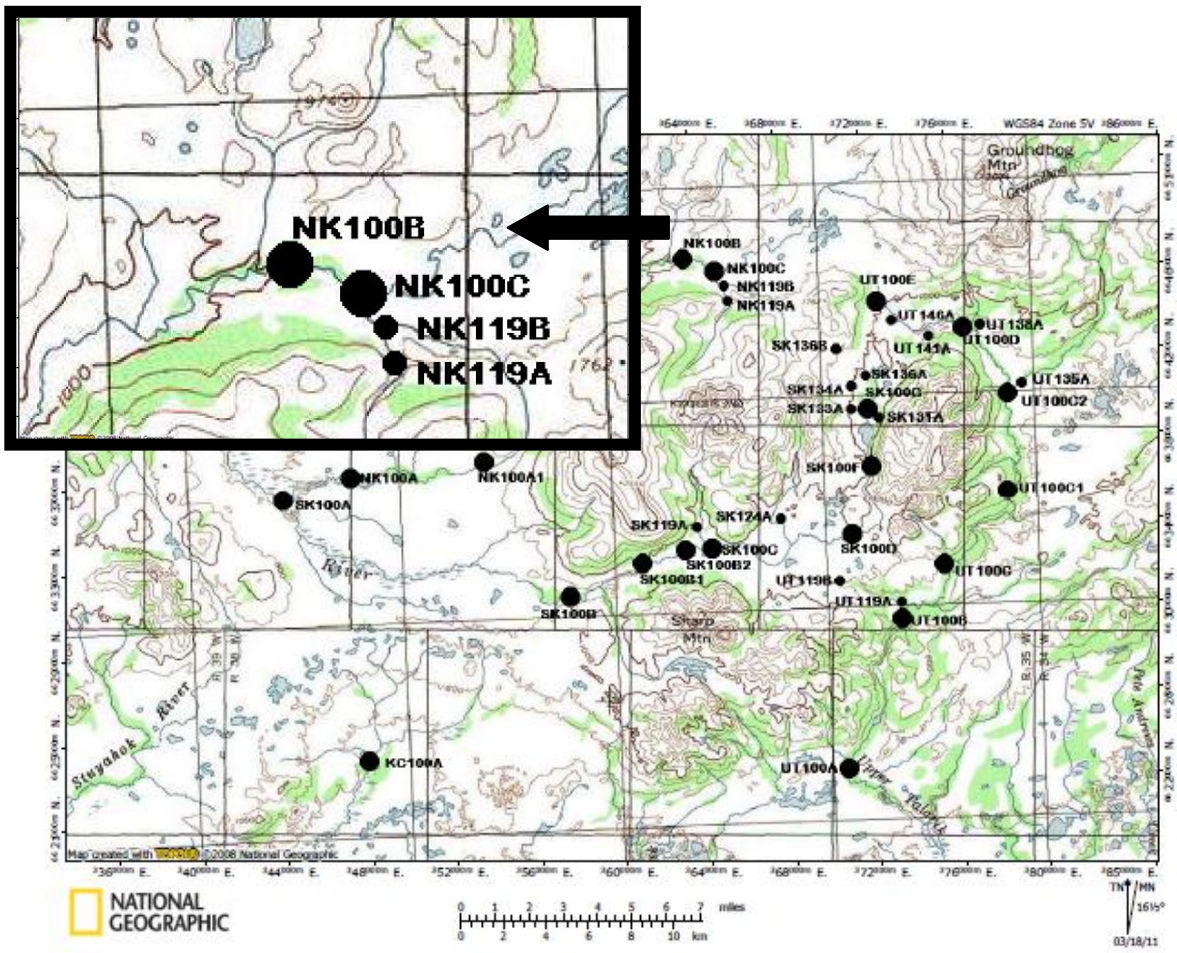
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	2%	3%		1%
5/19/2004				
6/2/2004				
6/15/2004				
7/14/2004	6%			
8/16/2004				
8/24/2004				
9/15/2004				
10/18/2004		1%		
1/25/2005			1%	2%
3/17/2005		15%	12%	
5/6/2005				
6/5/2005				3%
7/11/2005			1%	
8/16/2005	1%		5%	2%
9/13/2005	0%		0%	1%
10/28/2005				3%
2/9/2006				
3/13/2006		3%		2%
5/20/2006	4%	6%	4%	8%
6/15/2006				
7/23/2006	3%	3%	5%	7%
8/16/2006				
9/15/2006				
11/3/2006		0%		1%
12/13/2006				
2/16/2007	4%		5%	1%
3/17/2007	2%			
4/21/2007	2%	4%	3%	3%
5/12/2007				
6/18/2007	1%	2%	7%	2%
7/14/2007				
8/16/2007	1%		2%	1%
9/17/2007	10%	9%	12%	11%
10/15/2007	9%	8%	11%	8%
11/11/2007	12%	5%	12%	4%
12/10/2007	10%	6%	10%	6%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004	ndd					ndd	
5/19/2004							
6/2/2004							
6/15/2004						16%	
7/14/2004	26%					72%	28%
8/16/2004							
8/24/2004							
9/15/2004							
10/18/2004						68%	
1/25/2005						ndd	
3/17/2005						ndd	150%
5/6/2005						3%	
6/5/2005						69%	ndd
7/11/2005	12%			31%		ndd	ndd
8/16/2005				78%			ndd
9/13/2005	ndd					96%	
10/28/2005	13%			9%			ndd
2/9/2006						ndd	
3/13/2006						ndd	
5/20/2006							
6/15/2006	ndd						
7/23/2006	ndd					ndd	5%
8/16/2006	ndd						12%
9/15/2006	21%					15%	
11/3/2006							
12/13/2006	16%					ndd	ndd
2/16/2007							7%
3/17/2007	ndd						
4/21/2007	ndd			69%	ndd	ndd	9%
5/12/2007	ndd					16%	
6/18/2007	ndd					ndd	5%
7/14/2007	26%						5%
8/16/2007							1%
9/17/2007	30%						15%
10/15/2007	10%					86%	19%
11/11/2007	ndd			14%		91%	ndd
12/10/2007	26%					ndd	19%

North Fork Koktuli tributary: Stream monitoring site NK-119A



NK119A

Property-property graphs and RPD results

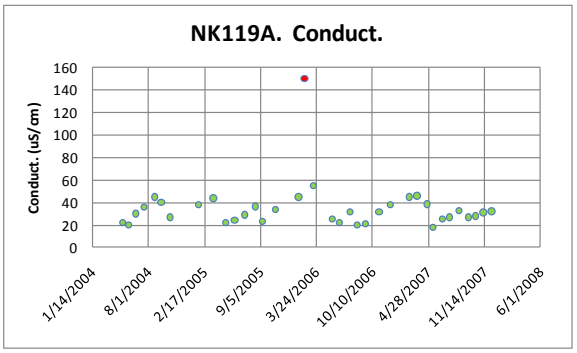
TDS correlates poorly conductivity	
TSS and discharge correlate poorly	
Alkalinity correlates poorly with hardness	Feb 2006
Major cation RPD's dissolved consistently over total	Jan 2006, Dec 2006, Feb 2007, Oct 2007, Nov 2007
Sodium RPD at 20%	Sept 2005
Magnesium RPD over 20%	Dec 2007
Potassium RPD over 20%	Oct 2007

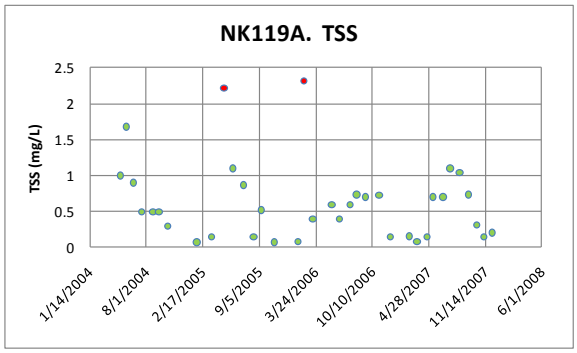
Potential outliers, outside pattern

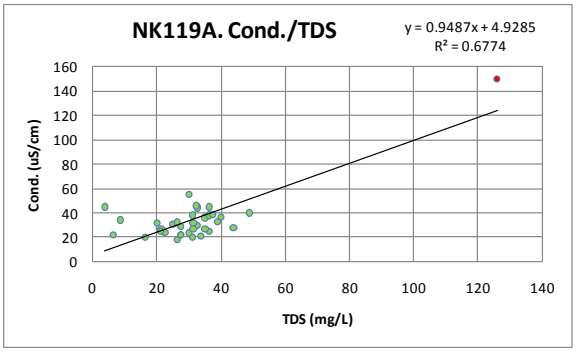
TSS, TDS, conductivity, calcium, magnesium, potassium, sodium, copper, iron, lead, manganese, zinc	Feb 2006
sulfate	June 2005, Feb 2006, June 2006
aluminum	May 2005, Aug 2005, Feb 2006
antimony, tin	Aug 2005

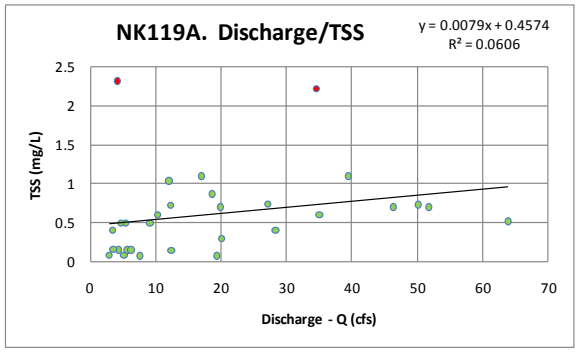
Elements reported as below MDL but appear to be above MRL

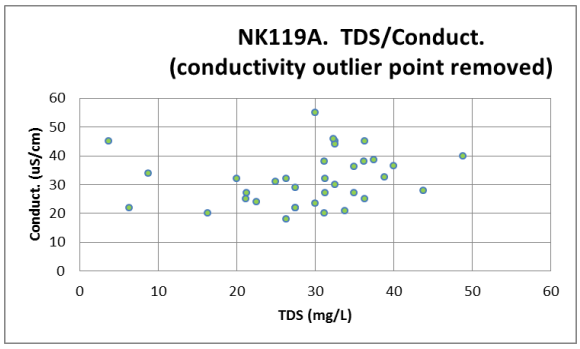
aluminum	June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
copper	March 2005
molybdenum	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
tin (as MRL)	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004, March 2005

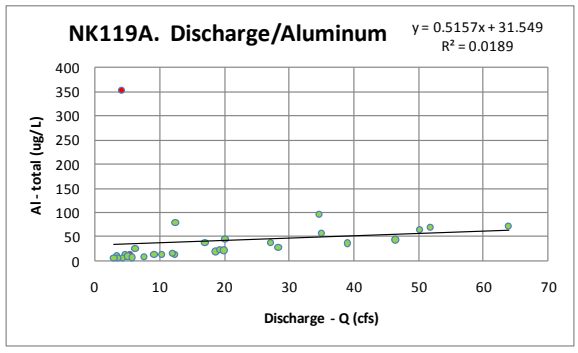

NK119A. Conduct.
Conduct. (uS/cm)
160
140
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

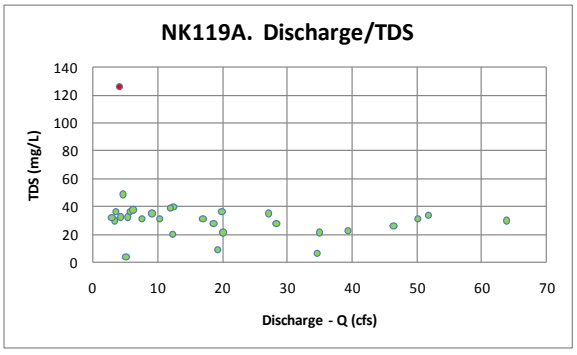

NK119A. TSS
TSS (mg/L)
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

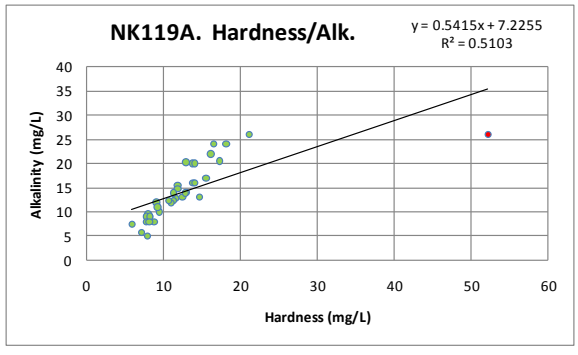

NK119A. Cond./TDS
y = 0.9487x + 4.9285
R² = 0.6774
Cond. (uS/cm)
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
TDS (mg/L)

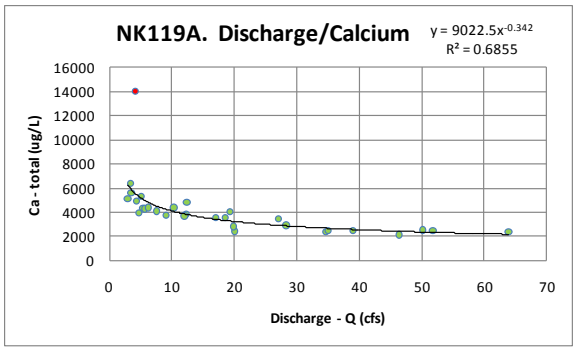

NK119A. Discharge/TSS
y = 0.0079x + 0.4574
R² = 0.0606
TSS (mg/L)
2.5
2
1.5
1
0.5
0
0
10
20
30
40
50
60
70
Discharge - Q (cfs)

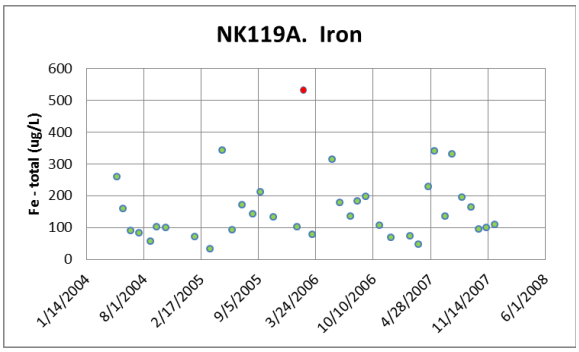

NK119A. TDS/Conduct.
(conductivity outlier point removed)
Conduct. (uS/cm)
60
50
40
30
20
10
0
0
10
20
30
40
50
60
TDS (mg/L)

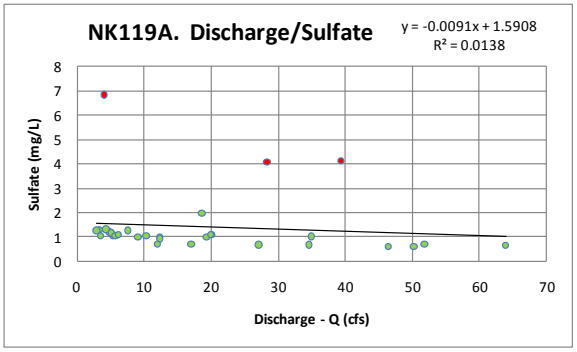

NK119A. Discharge/Aluminum
y = 0.5157x + 31.549
R² = 0.0189
Al - total (ug/L)
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
Discharge - Q (cfs)

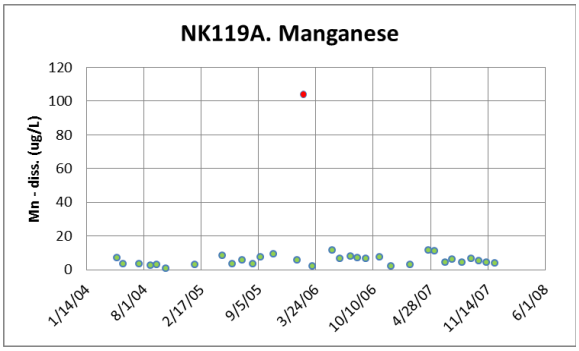

NK119A. Discharge/TDS
TDS (mg/L)
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
Discharge - Q (cfs)

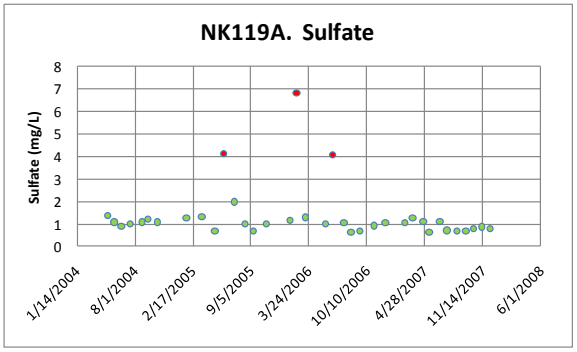

NK119A. Hardness/Alk.
y = 0.5415x + 7.2255
R² = 0.5103
Alkalinity (mg/L)
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Hardness (mg/L)

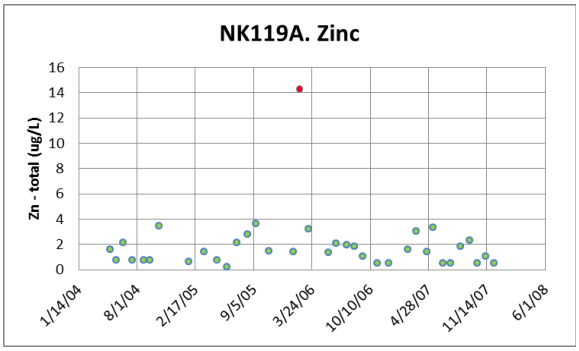

NK119A. Discharge/Calcium
y = 9022.5x-0.342
R² = 0.6855
Ca - total (ug/L)
Discharge - Q (cfs)

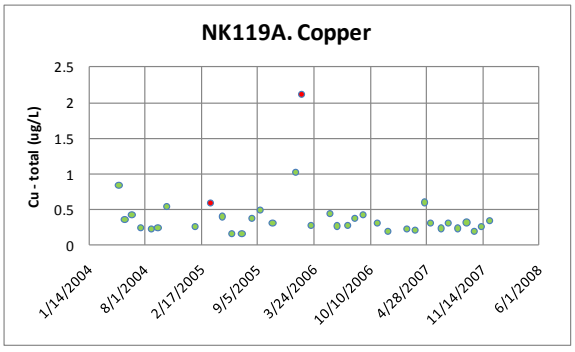

NK119A. Iron
Fe - total (ug/L)

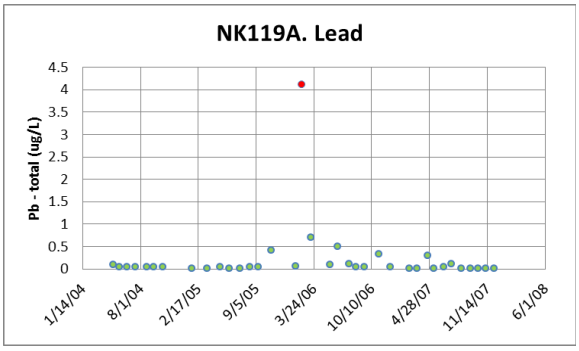

NK119A. Discharge/Sulfate
y = -0.0091x + 1.5908
R² = 0.0138
Sulfate (mg/L)
Discharge - Q (cfs)


NK119A. Manganese
Mn - diss. (ug/L)


NK119A. Sulfate
Sulfate (mg/L)


NK119A. Zinc
Zn - total (ug/L)


NK119A. Copper
Cu - total (ug/L)


NK119A. Lead
Pb - total (ug/L)

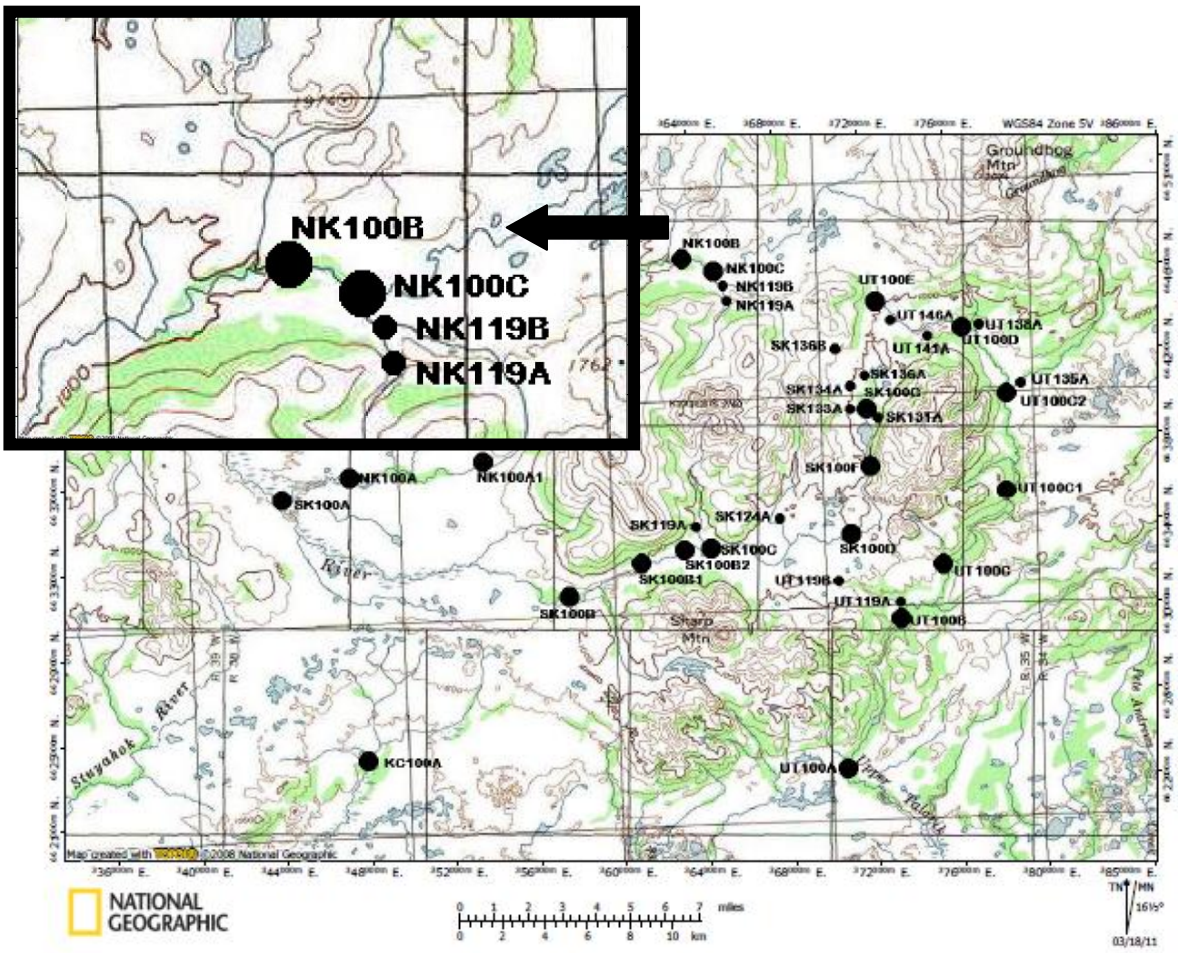
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	3%		7%	
5/21/2004			2%	2%
6/2/2004				
6/15/2004				
7/15/2004		11%		
8/16/2004				
8/24/2004	7%	7%	6%	3%
9/15/2004	14%	5%	10%	1%
10/17/2004				
1/26/2005	1%			
3/20/2005	11%			9%
5/3/2005	11%	4%	8%	2%
6/4/2005				
6/5/2005				
7/11/2005	1%	2%	9%	4%
8/16/2005			10%	2%
9/13/2005	1%	12%	14%	20%
10/28/2005		0%	7%	3%
1/19/2006	9%	13%	16%	19%
2/9/2006	11%	4%	4%	2%
3/13/2006			0%	
5/20/2006				
6/15/2006	2%	0%	10%	4%
7/23/2006	7%		7%	3%
8/16/2006			2%	1%
9/15/2006			4%	4%
11/3/2006	4%	13%	7%	7%
12/13/2006	14%	25%		16%
2/17/2007	12%	15%		10%
3/17/2007	1%	2%		3%
4/22/2007	2%	4%	4%	14%
5/13/2007	0%	4%	2%	5%
6/18/2007	1%	8%	13%	
7/13/2007		0%	2%	
8/16/2007	4%	4%	10%	6%
9/17/2007	5%	9%	12%	2%
10/14/2007	10%	12%	21%	5%
11/10/2007	19%	14%	19%	4%
12/9/2007	4%	9%	14%	3%

Trace Metals

	Cu	Al	Fe	As	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004							39%
5/21/2004							
6/2/2004							
6/15/2004					ndd		
7/15/2004							
8/16/2004							
8/24/2004							
9/15/2004	1%					103%	
10/17/2004				ndd			
1/26/2005						ndd	ndd
3/20/2005		14%	ndd	33%	ndd	ndd	ndd
5/3/2005	2%					99%	ndd
6/4/2005							
6/5/2005	30%			81%		15%	105%
7/11/2005	28%					3%	7%
8/16/2005						15%	
9/13/2005							
10/28/2005	8%					ndd	
1/19/2006						11%	ndd
2/9/2006							
3/13/2006						ndd	
5/20/2006	20%					7%	ndd
6/15/2006	20%						
7/23/2006	2%						ndd
8/16/2006	ndd					11%	9%
9/15/2006	ndd						ndd
11/3/2006							ndd
12/13/2006	29%					12%	ndd
2/17/2007	ndd					ndd	ndd
3/17/2007	7%				ndd	8%	
4/22/2007	ndd				17%	3%	ndd
5/13/2007	ndd				13%	12%	ndd
6/18/2007	2%					3%	
7/13/2007	ndd					ndd	68%
8/16/2007	ndd					4%	ndd
9/17/2007	11%					11%	
10/14/2007	ndd					7%	ndd
11/10/2007	ndd					10%	
12/9/2007						8%	95%

North Fork Koktuli tributary: Stream monitoring site NK-119B



NK119B

Property-property graphs and RPD tables

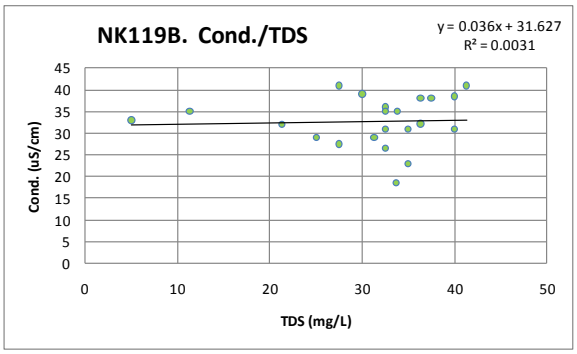
TDS and conductivity correlate poorly	
Alkalinity correlates poorly with hardness	July 2004, March 2005
Major cation RPD's dissolved consistently over total	June 2005, Nov 2007, Dec 2007
Manganese greater than 20% RPD	July 2004, Aug 2004, Oct 2004

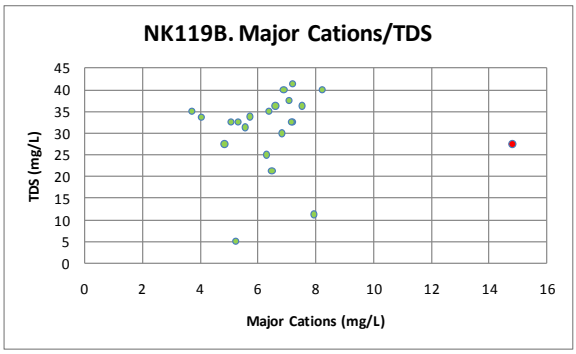
Potential outliers, outside pattern

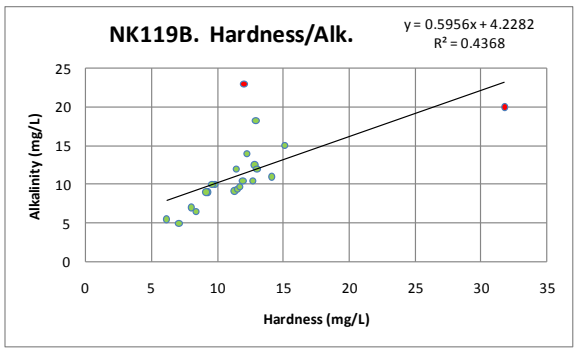
Calcium, magnesium, potassium, sulfate appear elevated; hardness may not be representative	March 2005
antimony, copper	April 2004
arsenic	Aug 2005
lead	March 2005, Sept 2005

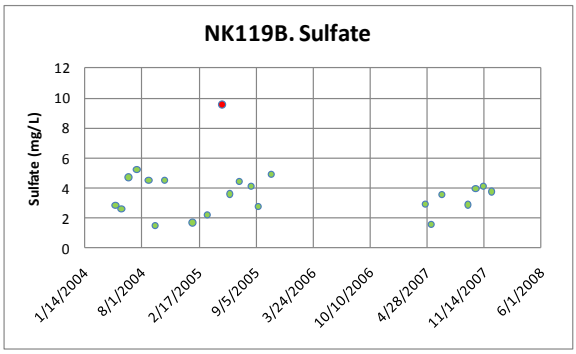
Elements reported as below MDL but appear to be above MRL

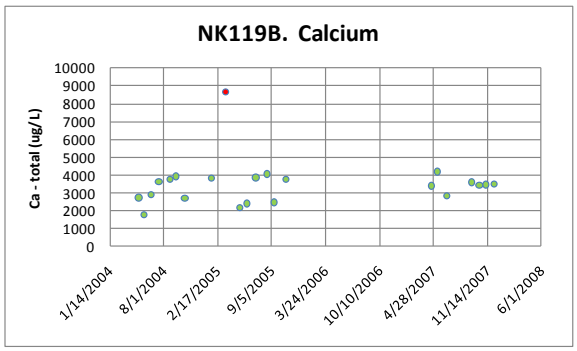
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004
antimony	April 2004, May 2004
copper, lead, selenium, tin	May 2004
molybdenum	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004

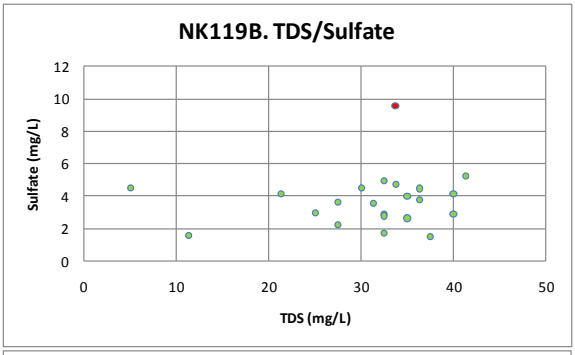

NK119B. Cond./TDS
y = 0.036x + 31.627
R² = 0.0031
Cond. (uS/cm)
TDS (mg/L)

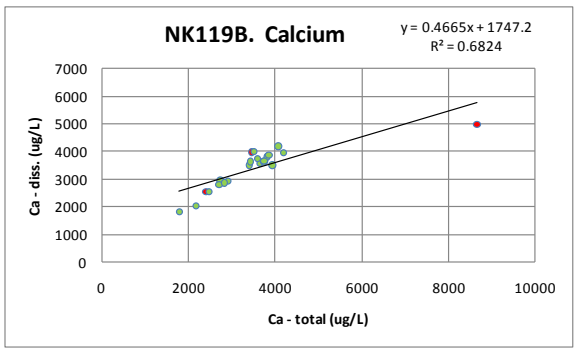

NK119B. Major Cations/TDS
TDS (mg/L)
Major Cations (mg/L)

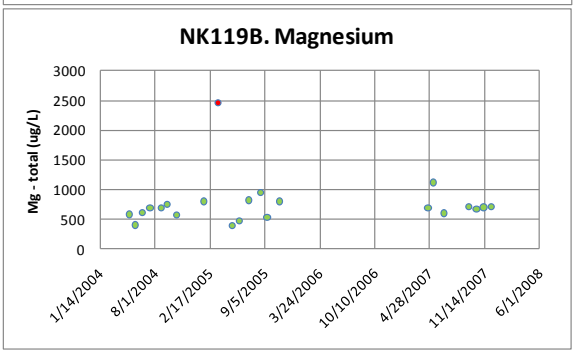

NK119B. Hardness/Alk.
y = 0.5956x + 4.2282
R² = 0.4368
Alkalinity (mg/L)
Hardness (mg/L)

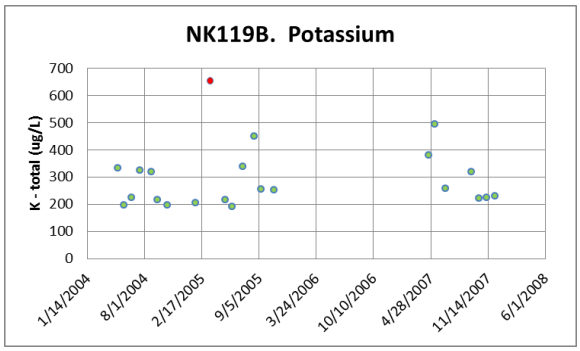

NK119B. Sulfate
Sulfate (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

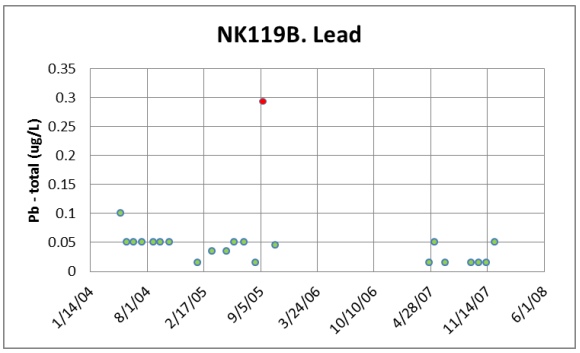

NK119B. Calcium
Ca - total (ug/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

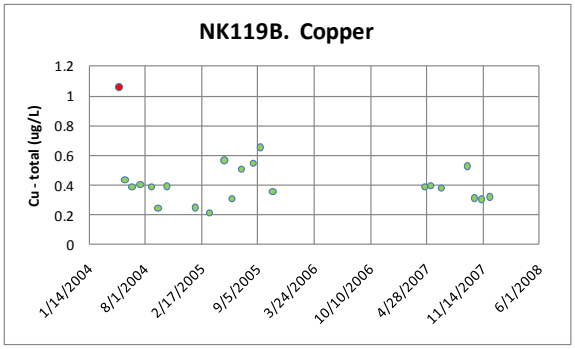

NK119B. TDS/Sulfate
Sulfate (mg/L)
TDS (mg/L)


NK119B. Calcium
y = 0.4665x + 1747.2
R² = 0.6824
Ca - diss. (ug/L)
Ca - total (ug/L)


NK119B. Magnesium
Mg - total (ug/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008







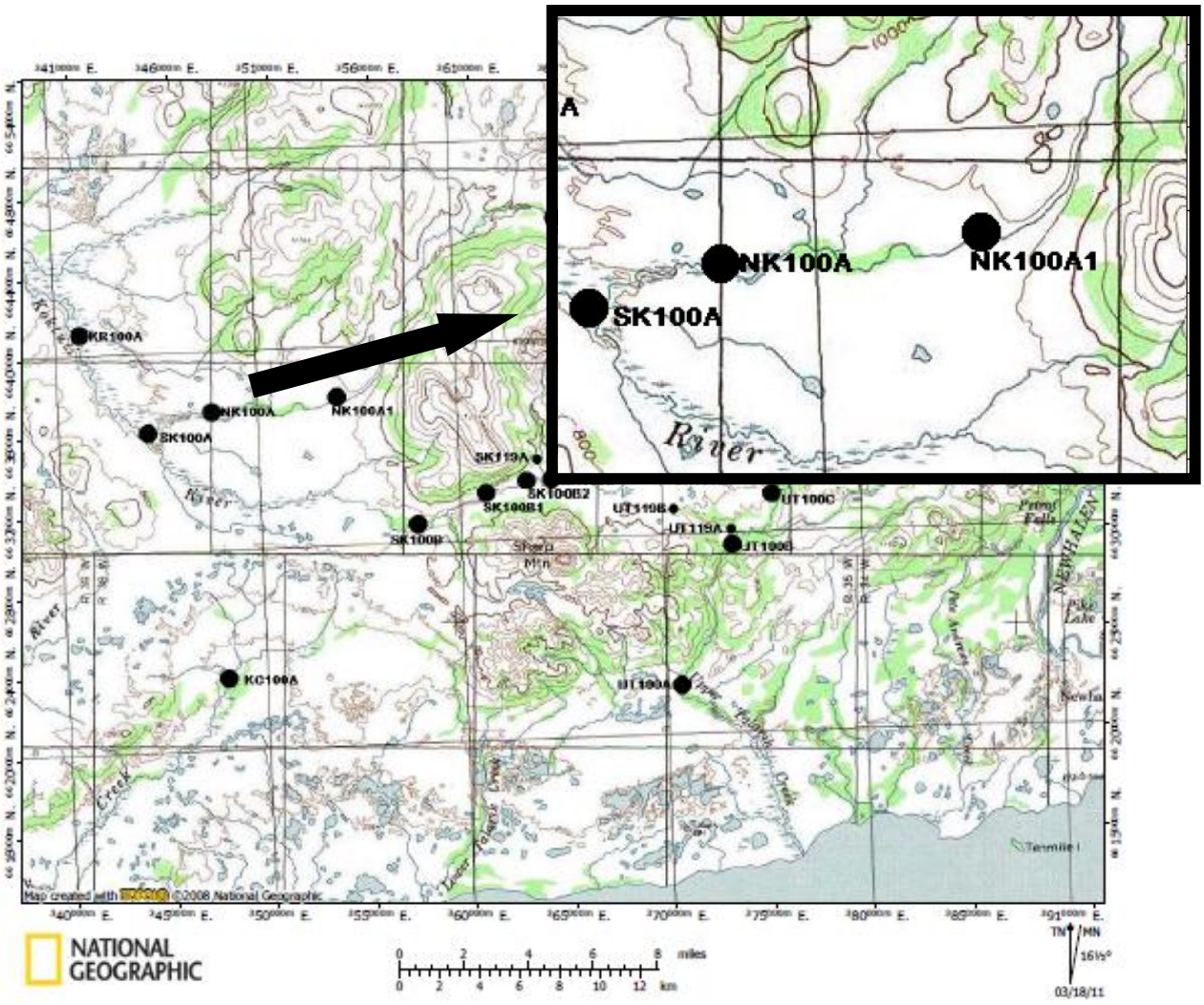
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	7%		2%	4%
5/21/2004	2%	1%	4%	12%
6/15/2004		1%		3%
7/14/2004				
8/24/2004		2%		1%
9/15/2004				3%
10/18/2004	3%	5%	5%	6%
1/25/2005			1%	
3/17/2005				
5/9/2005				
6/4/2005	5%	11%	16%	10%
7/9/2005	0%	1%		
8/19/2005	3%		1%	
9/13/2005	2%	3%		1%
10/28/2005				
4/22/2007	3%	7%	5%	6%
5/12/2007				
6/18/2007	1%	7%		
9/18/2007	4%	3%	5%	
10/15/2007	6%	6%	12%	1%
11/10/2007	14%	12%	19%	2%
12/9/2007	13%	14%	17%	5%

Trace Metals

	Cu	Al	Fe	As	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004							ndd
5/21/2004				86%	12%	86%	
6/15/2004					ndd		
7/14/2004					41%		
8/24/2004					68%		
9/15/2004	26%				16%		2%
10/18/2004					27%		
1/25/2005	12%					1%	94%
3/17/2005	ndd	ndd				ndd	32%
5/9/2005						119%	ndd
6/4/2005	9%					ndd	29%
7/9/2005							ndd
8/19/2005	10%	6%		120%			73%
9/13/2005		ndd	ndd		ndd		
10/28/2005						ndd	29%
4/22/2007	ndd				ndd	1%	ndd
5/12/2007	ndd						ndd
6/18/2007						9%	
9/18/2007	ndd					12%	ndd
10/15/2007	ndd					7%	ndd
11/10/2007	ndd					15%	
12/9/2007	16%					28%	ndd

South Fork Koktuli main stem: Stream monitoring site SK100A (furthest downstream)



SK100A

Property-property graphs and RPD tables

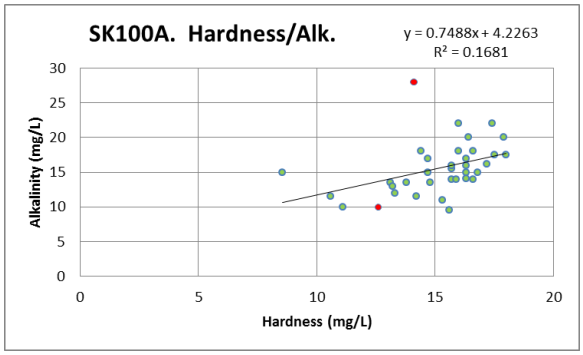
TDS and conductivity correlate poorly	
Alkalinity and hardness correlate poorly	June 2004, July 2006
TSS appears high relative to discharge	April 2007
Major cation RPD's dissolved consistently over total	Jan 2007, Oct 2007

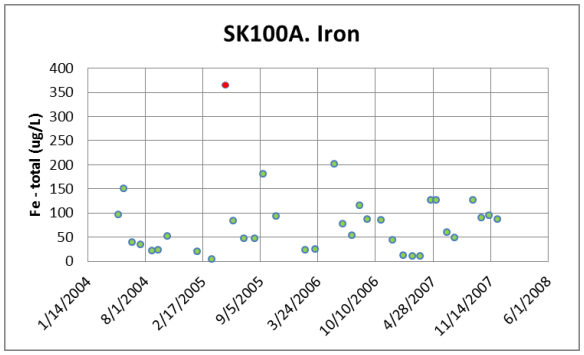
Potential outliers, outside pattern

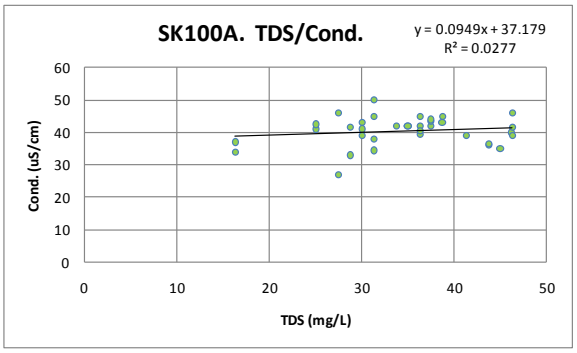
iron	May 2005
lead	April 2004, Feb 2006, May 2006
tin	May 2004
zinc	Feb 2006

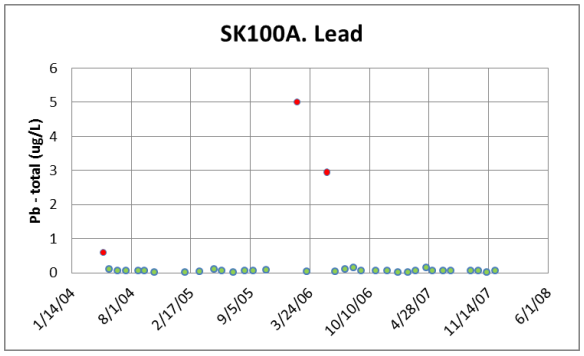
Elements reported as below MDL but appear to be at or above MRL

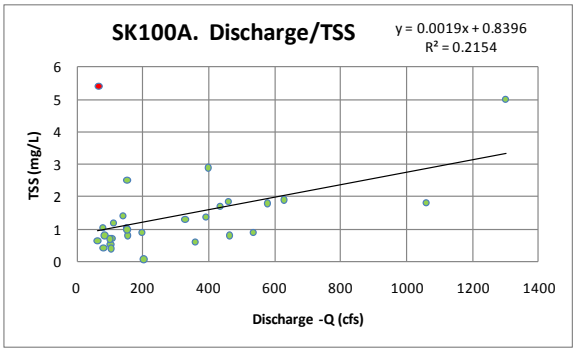
aluminum	April 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
antimony	Aug 2004
iron	July 2006
molybdenum	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
tin	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004

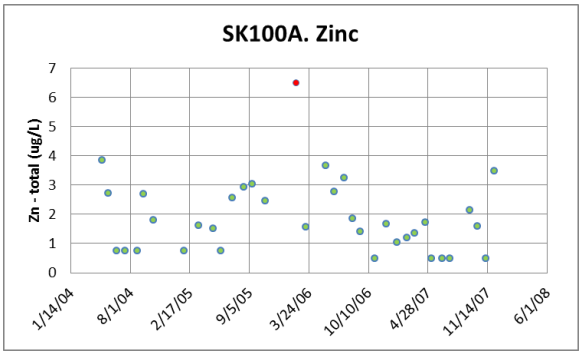

SK100A. Hardness/Alk.
y = 0.7488x + 4.2263
R² = 0.1681
Alkalinity (mg/L)
Hardness (mg/L)

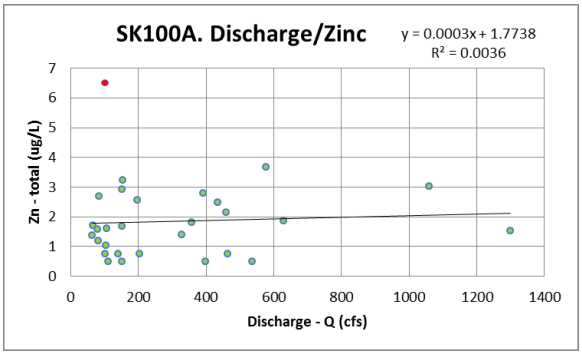

SK100A. Iron
Fe - total (ug/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK100A. TDS/Cond.
y = 0.0949x + 37.179
R² = 0.0277
Cond. (uS/cm)
TDS (mg/L)


SK100A. Lead
Pb - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK100A. Discharge/TSS
y = 0.0019x + 0.8396
R² = 0.2154
TSS (mg/L)
Discharge -Q (cfs)

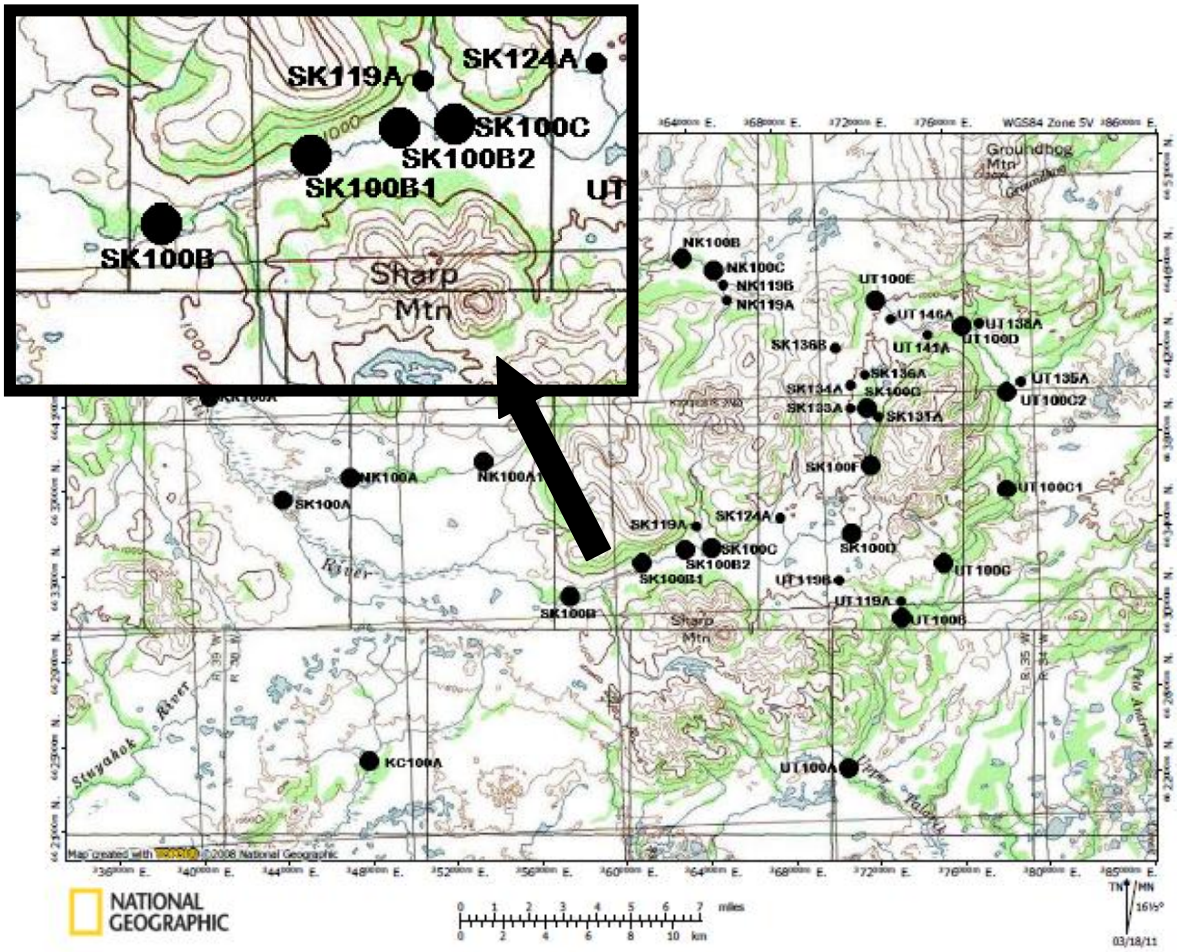

SK100A. Zinc
Zn - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK100A. Discharge/Zinc
y = 0.0003x + 1.7738
R² = 0.0036
Zn - total (ug/L)
Discharge - Q (cfs)

Major Cations				
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/28/2004			0%	
5/18/2004				2%
6/5/2004				
6/15/2004	1%	2%	2%	4%
7/14/2004				
8/14/2004				
8/24/2004	8%	10%	6%	8%
9/14/2004				1%
10/17/2004		0%		2%
1/28/2005				2%
3/19/2005	10%	5%		9%
5/6/2005				
6/2/2005	3%		11%	1%
7/9/2005				
8/17/2005				2%
9/16/2005	6%	7%	8%	11%
10/29/2005		3%		6%
2/8/2006	1%	4%		10%
3/14/2006				
5/20/2006				
6/18/2006				
7/22/2006	11%	6%	12%	8%
8/17/2006				
9/13/2006		4%	3%	4%
10/31/2006	7%	10%	9%	8%
12/10/2006				
1/15/2007	19%	13%		12%
2/17/2007	8%	7%	7%	10%
3/15/2007	6%	3%	7%	7%
4/20/2007	0%	1%		2%
5/11/2007	5%	7%	4%	8%
6/16/2007				
7/12/2007			1%	
9/15/2007	5%	4%	7%	3%
10/13/2007	10%	12%	15%	8%
11/9/2007	7%	9%	12%	6%
12/8/2007	3%	4%	11%	1%

Trace Metals					
	Cu	Al	Fe	Mn	Zn
Date	RPD	RPD	RPD	RPD	RPD
4/28/2004					
5/18/2004					
6/5/2004					
6/15/2004					
7/14/2004					
8/14/2004					
8/24/2004				ndd	76%
9/14/2004				7%	
10/17/2004				5%	4%
1/28/2005	ndd				89%
3/19/2005		ndd	ndd	ndd	
5/6/2005					42%
6/2/2005	ndd				70%
7/9/2005	3%				ndd
8/17/2005					
9/16/2005					17%
10/29/2005	1%				
2/8/2006	ndd				
3/14/2006	5%				ndd
5/20/2006					
6/18/2006	ndd				
7/22/2006					ndd
8/17/2006	ndd				
9/13/2006	16%				3%
10/31/2006					ndd
12/10/2006					30%
1/15/2007	28%				ndd
2/17/2007					ndd
3/15/2007	ndd			ndd	ndd
4/20/2007	ndd				ndd
5/11/2007	ndd				ndd
6/16/2007					ndd
7/12/2007	34%				83%
9/15/2007					28%
10/13/2007					28%
11/9/2007	ndd				ndd
12/8/2007					

South Fork Koktuli main stem: Stream monitoring site SK-100B



SK100B

Property-property graphs and RPD tables

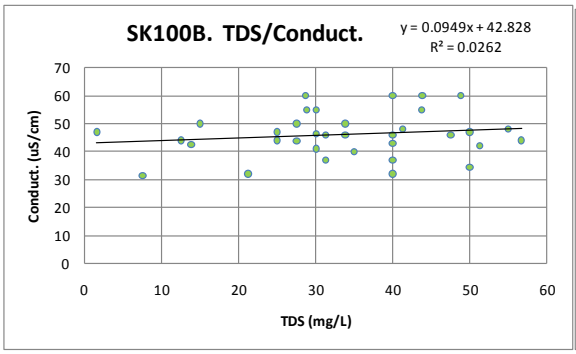
TDS and conductivity correlate poorly	
Alkalinity and hardness correlate poorly	July 2004
Major cation RPD's dissolved consistently over total	Feb 2007
Molybdenum RPD over 20%	Mar 2005

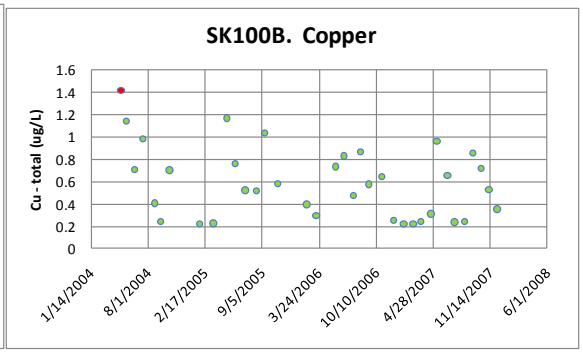
Potential outliers, outside pattern

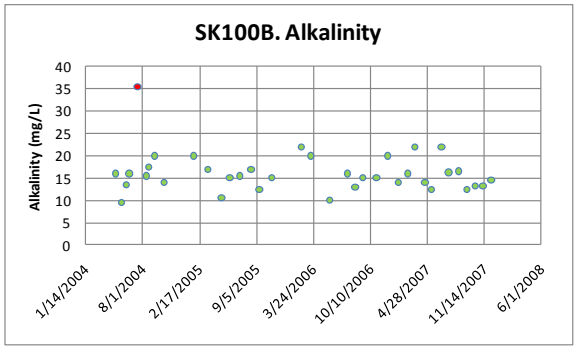
chloride, sulfate	April 2007
aluminum	May 2005
copper	April 2004
lead, molybdenum	Feb 2006
zinc	March 2005, July 2005, Feb 2006

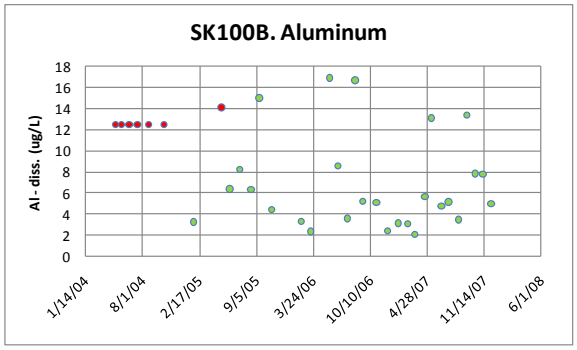
Elements reported as below MDL but appear to be at or above MRL

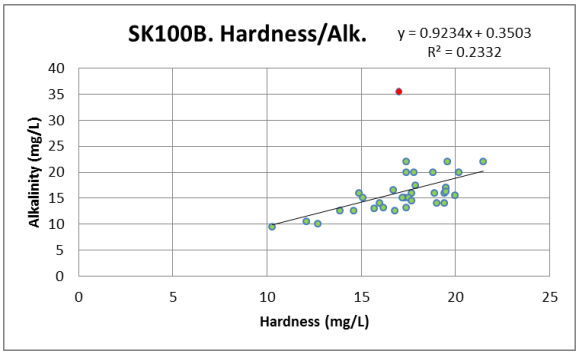
aluminum	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
tin	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004

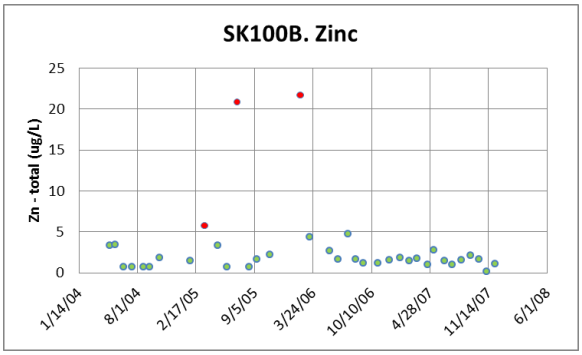

SK100B. TDS/Conduct.
y = 0.0949x + 42.828
R² = 0.0262
Conduct. (uS/cm)
TDS (mg/L)

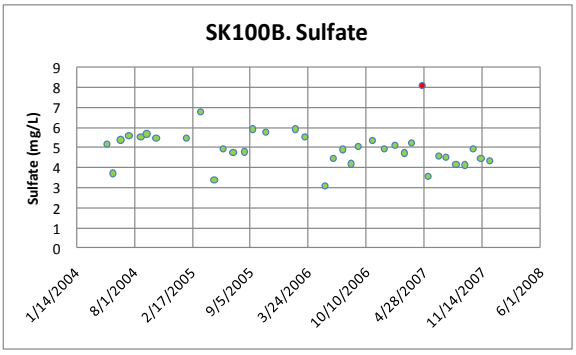

SK100B. Copper
Cu - total (ug/L)

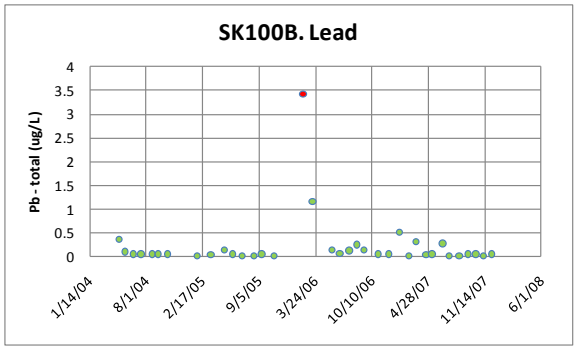

SK100B. Alkalinity
Alkalinity (mg/L)


SK100B. Aluminum
Al - diss. (ug/L)


SK100B. Hardness/Alk.
y = 0.9234x + 0.3503
R² = 0.2332
Alkalinity (mg/L)
Hardness (mg/L)


SK100B. Zinc
Zn - total (ug/L)


SK100B. Sulfate
Sulfate (mg/L)


SK100B. Lead
Pb - total (ug/L)

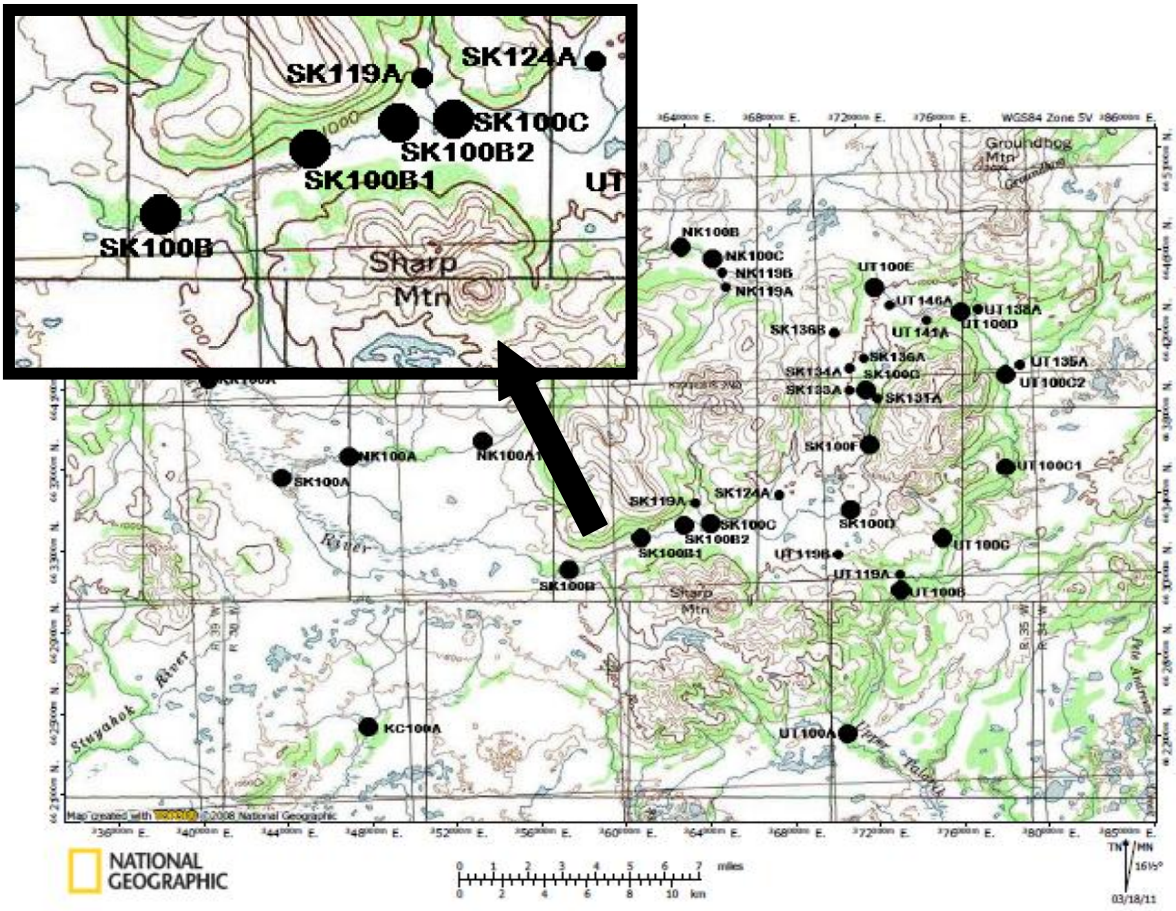
Major Cations

	Ca	Mg	K	Na
	RPD	RPD	RPD	RPD
04/28/04	1%	1%	1%	5%
05/18/04	3%		3%	
06/04/04				
06/15/04	6%	2%	5%	4%
07/14/04		9%		
08/15/04				
08/23/04				
09/13/04		3%	6%	7%
10/15/04				
01/28/05		2%	1%	4%
03/18/05	4%	3%	1%	14%
05/04/05				
06/03/05	2%	1%	5%	2%
07/08/05		2%		1%
07/09/05				
08/17/05				
09/14/05	2%	2%	5%	5%
10/29/05	2%	2%	1%	4%
02/08/06		2%		
03/13/06	5%		1%	
05/21/06				
06/18/06				
07/22/06	4%	4%	4%	7%
08/17/06				
09/13/06		1%		
10/31/06	8%	8%	12%	6%
12/10/06				
01/15/07				
02/17/07	16%	13%		12%
03/15/07		1%	6%	
04/20/07			4%	
05/11/07		1%		4%
06/17/07	3%	6%	5%	5%
07/12/07		2%	4%	
08/15/07	6%	5%	10%	5%
09/15/07	5%	6%	10%	4%
10/13/07	3%	5%	11%	3%
11/09/07		3%	9%	5%
12/08/07		1%	5%	3%

Trace Metals

	Cu	Al	Fe	Mn	Zn	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/28/2004						
5/18/2004					8%	
6/4/2004						
6/15/2004				ndd		
7/14/2004						
8/15/2004						
8/23/2004	39%					
9/13/2004	ndd	ndd			91%	
10/15/2004					11%	
1/28/2005	28%				43%	
3/18/2005	5%	ndd	ndd	ndd		21%
5/4/2005					24%	
6/3/2005					109%	
7/8/2005	ndd				11%	
7/9/2005						
8/17/2005						
9/14/2005					ndd	
10/29/2005						ndd
2/8/2006	ndd					
3/13/2006						ndd
5/21/2006						
6/18/2006					ndd	
7/22/2006					7%	9%
8/17/2006						
9/13/2006	6%				18%	
10/31/2006					ndd	8%
12/10/2006	23%				ndd	
1/15/2007	ndd				ndd	15%
2/17/2007	14%				ndd	11%
3/15/2007	ndd			ndd	ndd	
4/20/2007	ndd			16%	ndd	1%
5/11/2007	ndd				ndd	
6/17/2007					19%	5%
7/12/2007	1%					
8/15/2007	20%				46%	8%
9/15/2007					8%	
10/13/2007					19%	6%
11/9/2007	6%				ndd	1%
12/8/2007	ndd				56%	

South Fork Koktuli main stem: Stream monitoring site SK-100B1



SK100B1

Property-property graphs and RPD tables

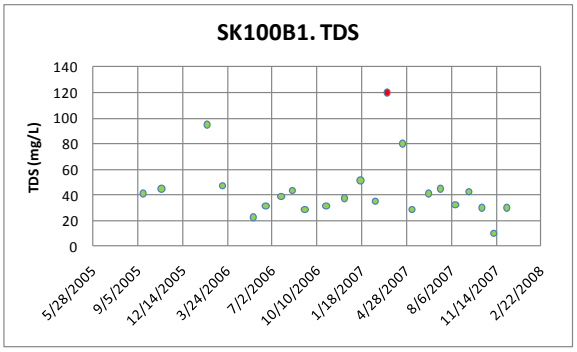
TSS elevated	May 2006

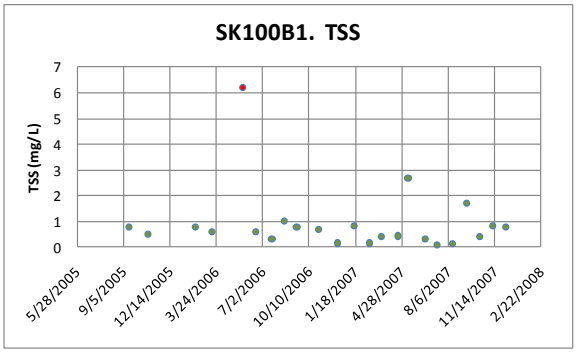
Potential outliers, outside pattern

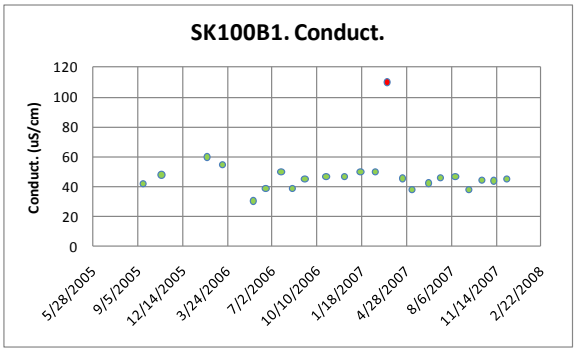
potassium	May 2006
TDS, conductivity, calcium, magnesium, potassium, alkalinity, hardness, chloride, sulfate, cadmium, lead	March 2007

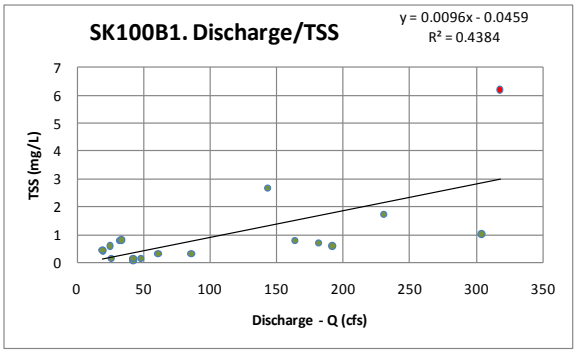
Potential outliers, do not correlate with concentrations upstream and downstream

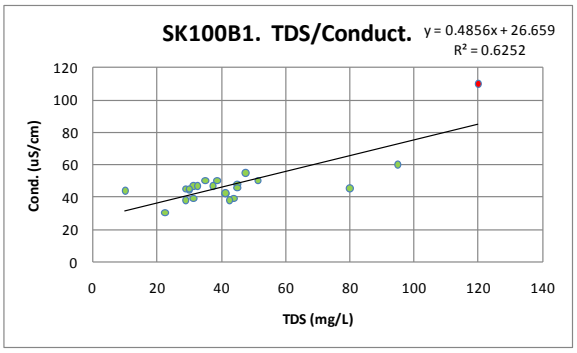
arsenic, copper, sodium	Sept 2005
sodium	March 2007

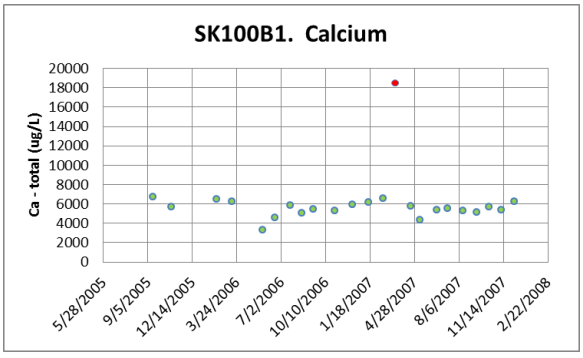

SK100B1. TDS
TDS (mg/L)
140
120
100
80
60
40
20
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

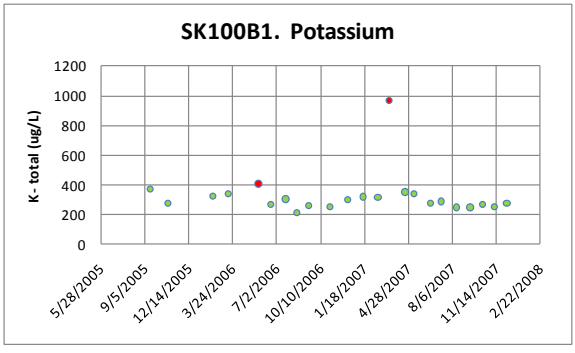

SK100B1. TSS
TSS (mg/L)
7
6
5
4
3
2
1
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

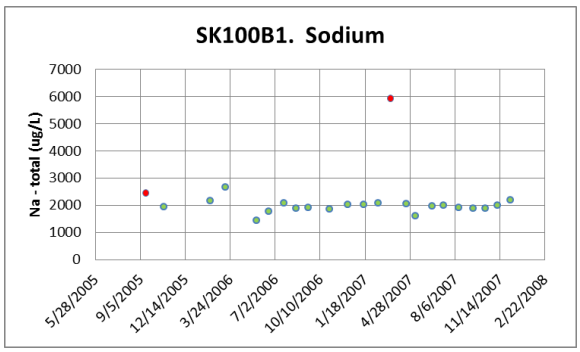

SK100B1. Conduct.
Conduct. (uS/cm)
120
100
80
60
40
20
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

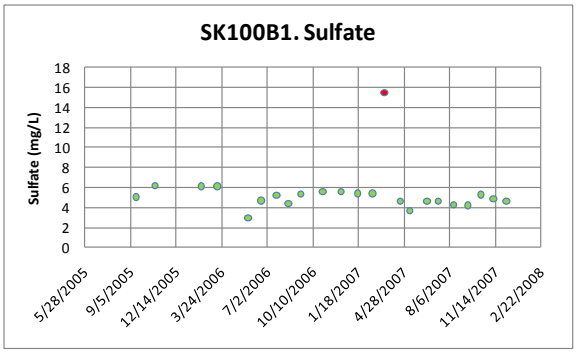

SK100B1. Discharge/TSS
y = 0.0096x - 0.0459
R² = 0.4384
TSS (mg/L)
7
6
5
4
3
2
1
0
0
50
100
150
200
250
300
350
Discharge - Q (cfs)

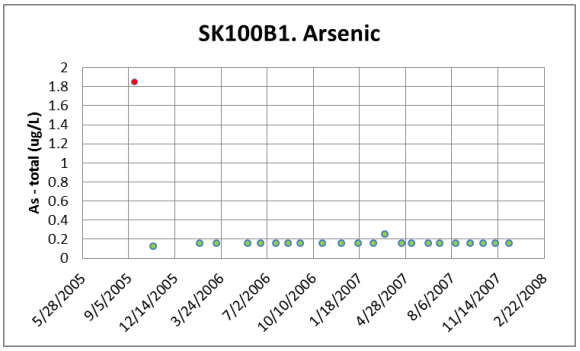

SK100B1. TDS/Conduct.
y = 0.4856x + 26.659
R² = 0.6252
Cond. (uS/cm)
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
TDS (mg/L)

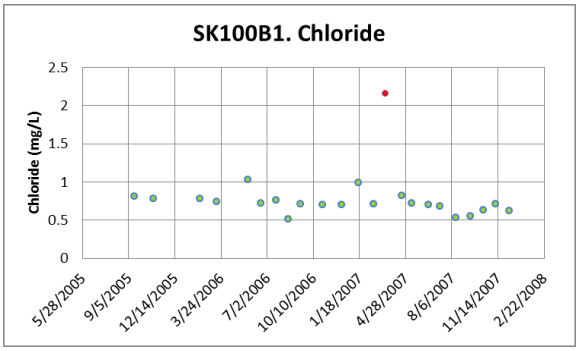

SK100B1. Calcium
Ca - total (ug/L)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

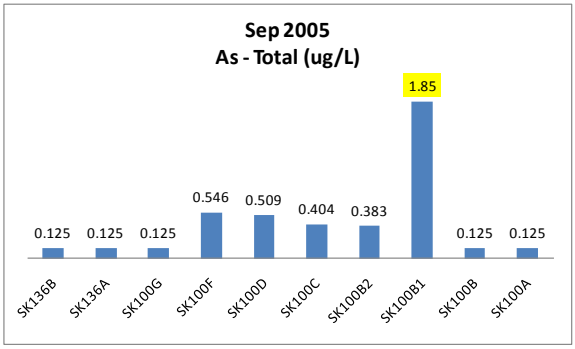

SK100B1. Potassium
K - total (ug/L)
1200
1000
800
600
400
200
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

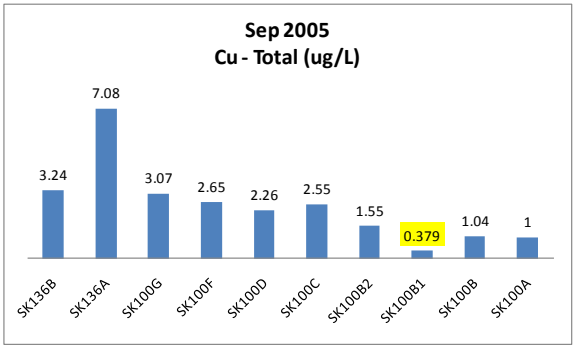


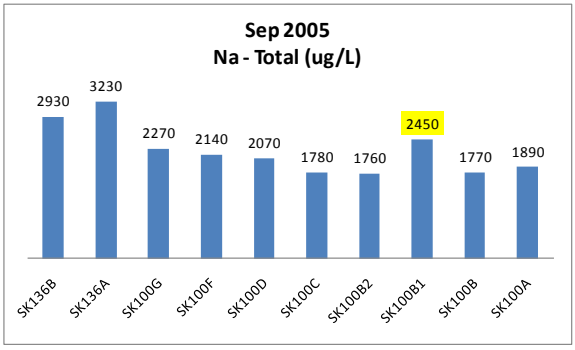


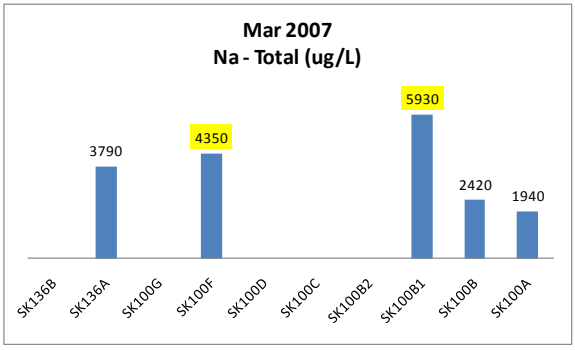












Sept 2005: SK100B1 sample collected Sept 17; SK100B2 and SK100B collected Sept 14 2007
March 2007: All samples collected March 15; data from SK100B2 not in data set (removed?)

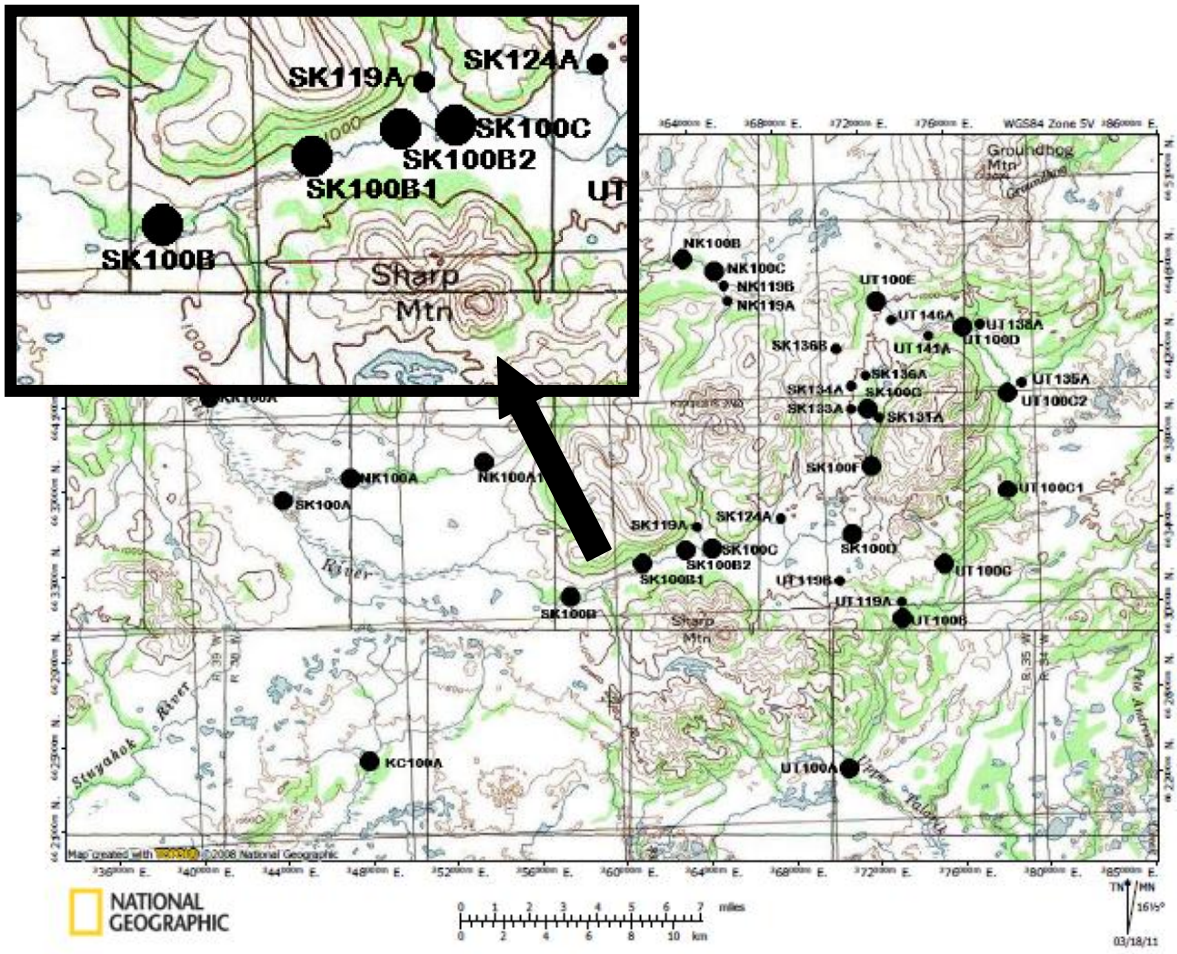
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
9/17/2005	7%	4%	8%	5%
10/28/2005				4%
2/7/2006	7%	2%	6%	3%
3/14/2006	8%	2%	4%	
5/21/2006	1%			3%
6/18/2006		2%	3%	6%
7/22/2006	3%	4%	4%	8%
8/17/2006				
9/13/2006			2%	1%
10/31/2006	7%	11%	9%	9%
12/10/2006	6%	9%	14%	5%
1/15/2007	3%	3%	1%	4%
2/17/2007	6%	4%	10%	5%
3/15/2007				
4/20/2007	7%	7%	7%	7%
5/11/2007	3%	2%	2%	2%
6/17/2007	4%	10%	18%	7%
7/12/2007	6%	12%	12%	9%
8/15/2007	4%	2%	11%	3%
9/15/2007	6%	7%	12%	4%
10/13/2007	3%	3%	1%	3%
11/9/2007				
12/8/2007				

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
9/17/2005					14%	
10/28/2005					ndd	
2/7/2006						ndd
3/14/2006	18%				2%	ndd
5/21/2006					ndd	
6/18/2006						
7/22/2006	ndd				8%	6%
8/17/2006	ndd					
9/13/2006	13%					36%
10/31/2006						ndd
12/10/2006						ndd
1/15/2007	8%				5%	ndd
2/17/2007	26%			2%	8%	ndd
3/15/2007	ndd			7%		12%
4/20/2007	ndd			9%	4%	ndd
5/11/2007	ndd				3%	14%
6/17/2007	ndd		15%		5%	ndd
7/12/2007	ndd				8%	
8/15/2007	ndd				6%	ndd
9/15/2007					3%	
10/13/2007	4%	ndd	ndd	ndd	11%	
11/9/2007	13%					107%
12/8/2007	ndd					ndd

South Fork Koktuli main stem: Stream monitoring site SK-100B2



SK100B2

Property-property graphs and RPD tables

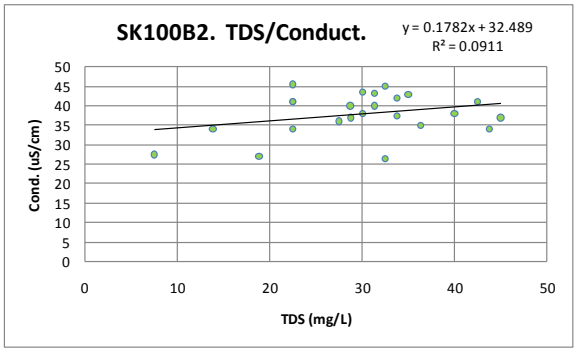
TDS and conductivity correlate poorly	
Alkalinity and hardness correlate poorly	Dec 2006, June 2007
Major cation RPD's dissolved consistently over total	Dec 2006, Feb 2007, May 2007, June 2007

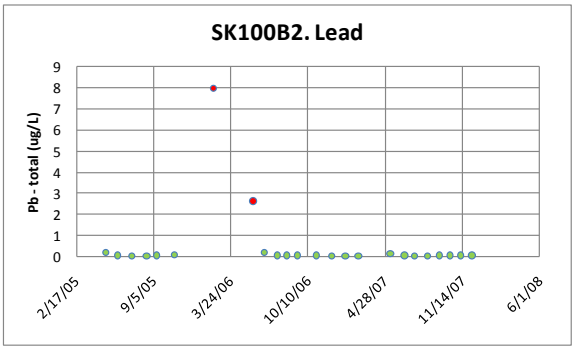
Potential outliers, outside pattern

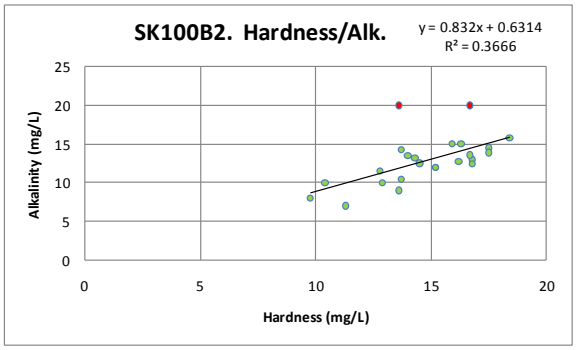
lead	Feb 2006, May 2006

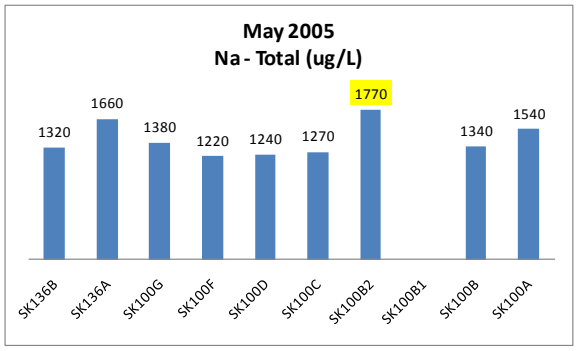
Potential outliers, do not correlate with concentrations upstream and downstream

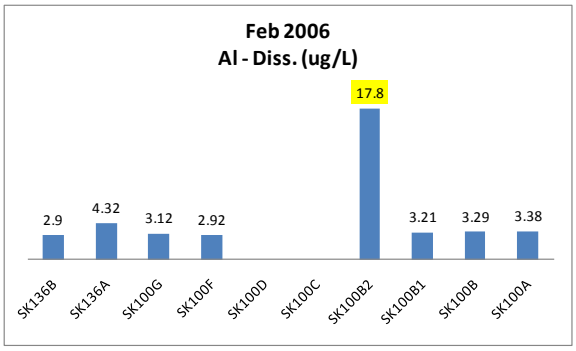
aluminum	Feb 2006
sodium	May 2005











For February 2006: samples collected at SK100B1 and SK100F on Feb 7, at SK100A, SK100B and SK100B2 on Feb 8; at SK100G on Feb 9. There were no samples that month for SK100C and SK100 D

For May 2005: samples collected at SK100B, SK100F, and SK100G on May 4; at SK100B2and SK100D on May 5; at SK100A on May 6; and at SK100C on May 8. There were no samples for SK100B.

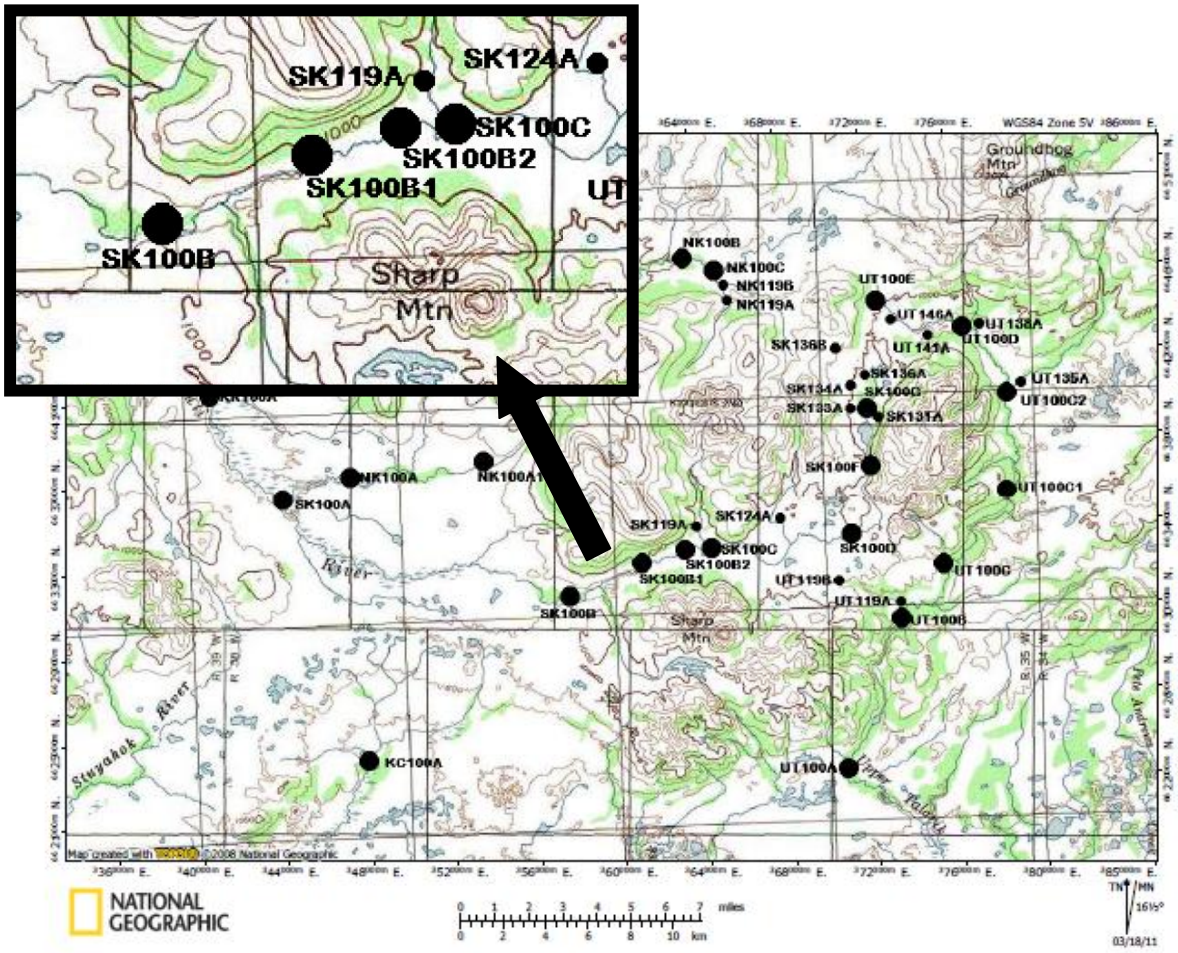
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/5/2005				
6/3/2005			1%	2%
7/10/2005				
8/18/2005	3%	1%	6%	1%
9/14/2005			3%	2%
10/29/2005				5%
2/8/2006				
5/21/2006				
6/18/2006	2%	3%	5%	6%
7/22/2006				0%
8/17/2006				
9/13/2006				1%
10/31/2006	6%	7%	6%	5%
12/10/2006	12%	16%	19%	11%
1/15/2007	4%	10%	16%	3%
2/17/2007	13%	15%	17%	2%
5/11/2007	13%	13%	10%	8%
6/17/2007	9%	16%	14%	11%
7/12/2007	3%	10%	11%	4%
8/15/2007	1%	4%	9%	
9/15/2007	7%	8%	7%	6%
10/13/2007	5%	7%	10%	5%
11/9/2007			5%	2%
12/8/2007	1%	8%	9%	10%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/5/2005						3%
6/3/2005						24%
7/10/2005						ndd
8/18/2005						
9/14/2005						
10/29/2005					ndd	
2/8/2006	9%					
5/21/2006					ndd	
6/18/2006						16%
7/22/2006						19%
8/17/2006						12%
9/13/2006	11%				3%	43%
10/31/2006						ndd
12/10/2006	10%				7%	ndd
1/15/2007						ndd
2/17/2007					26%	ndd
5/11/2007						29%
6/17/2007	10%				8%	90%
7/12/2007					2%	
8/15/2007	30%				3%	ndd
9/15/2007					4%	
10/13/2007					2%	19%
11/9/2007	ndd				1%	19%
12/8/2007	ndd				1%	36%

South Fork Koktuli main stem: Stream monitoring site SK-100C



SK100C

Property-property graphs and RPD tables

TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	July 2005, Dec 2006
Relationship of total and dissolved sodium correlates poorly	June 2006
Relationship of total and dissolved molybdenum correlates poorly	July 2004

Potential outliers, outside pattern

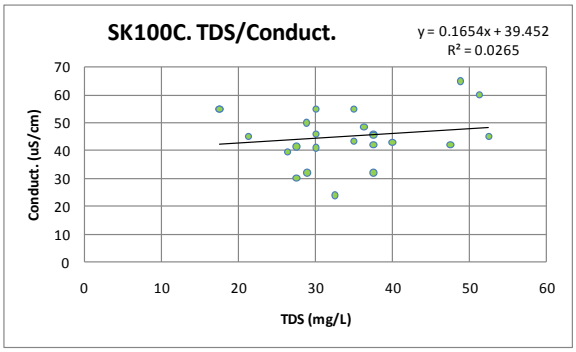
Sulfate, TSS, aluminum, arsenic, copper, iron, lead, manganese	July 2007
TSS	May 2007
antimony	May 2004, July 2004
manganese	Oct 2005
tin	June 2004
zinc	July 2006

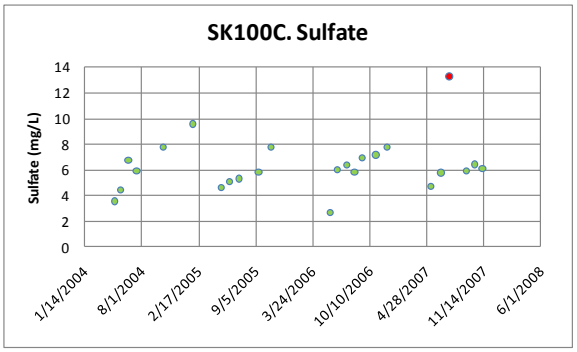
Elements reported as below MDL but appear to be above MRL

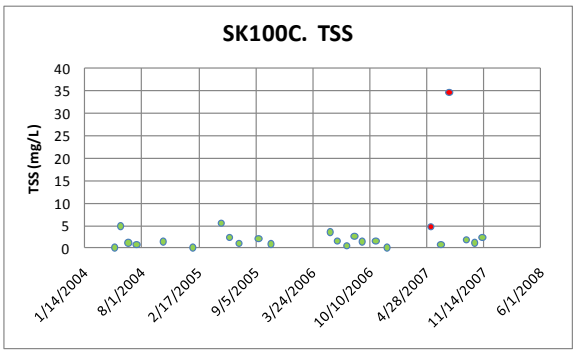
aluminum	April 2004, May 2004, June 2004, July 2004, Oct 2004

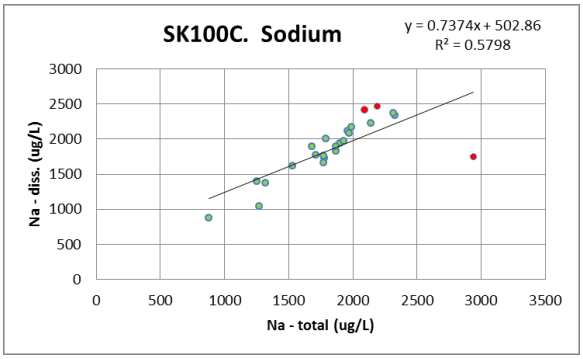
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

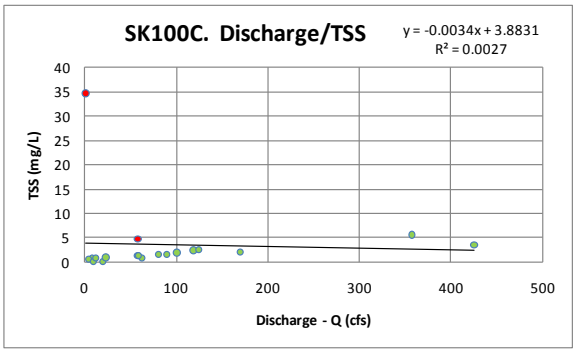
tin	May 2004

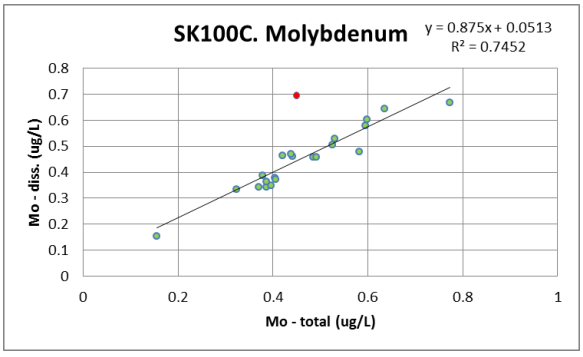

SK100C. TDS/Conduct.
y = 0.1654x + 39.452
R² = 0.0265
Conduct. (uS/cm)
TDS (mg/L)

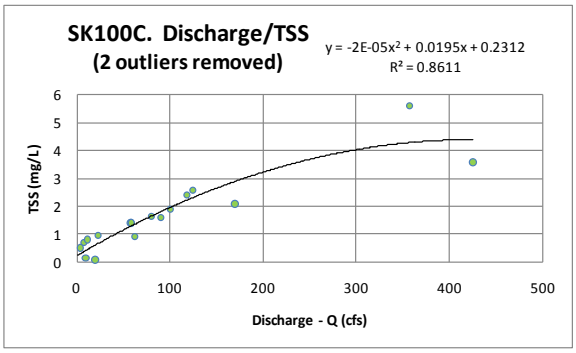

SK100C. Sulfate
Sulfate (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

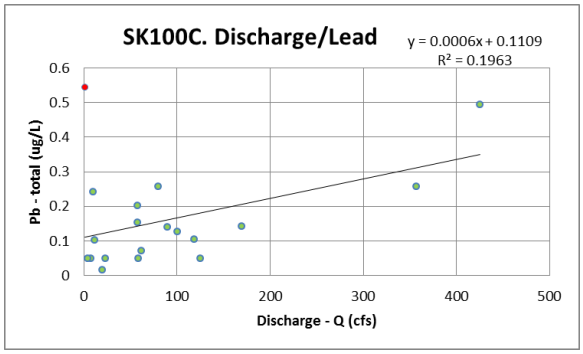

SK100C. TSS
TSS (mg/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

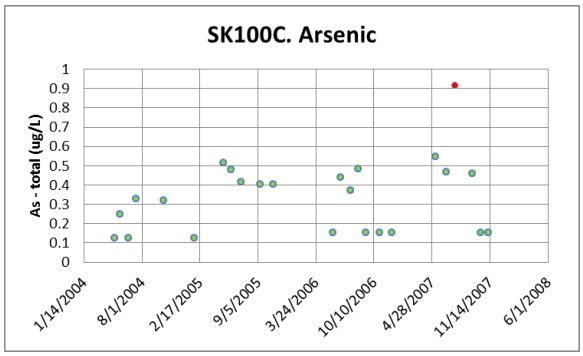

SK100C. Sodium
y = 0.7374x + 502.86
R² = 0.5798
Na - diss. (ug/L)
Na - total (ug/L)

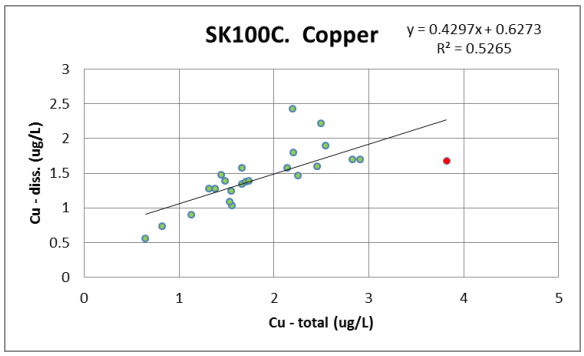

SK100C. Discharge/TSS
y = -0.0034x + 3.8831
R² = 0.0027
TSS (mg/L)
Discharge - Q (cfs)

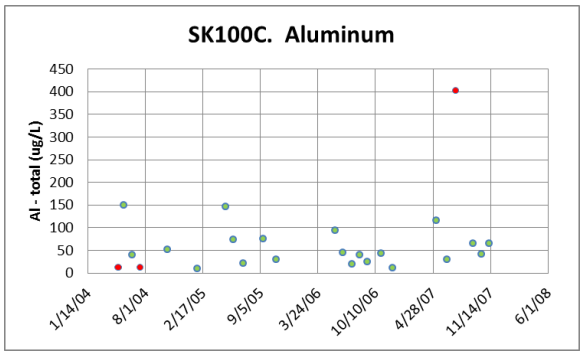

SK100C. Molybdenum
y = 0.875x + 0.0513
R² = 0.7452
Mo - diss. (ug/L)
Mo - total (ug/L)

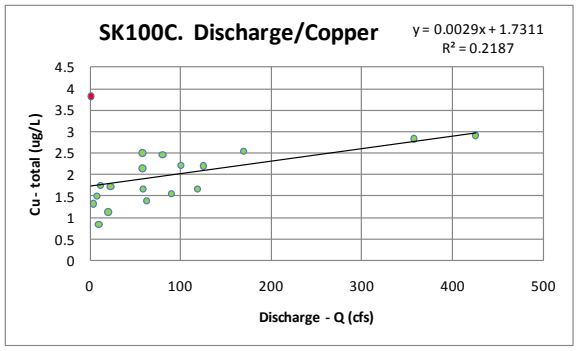

SK100C. Discharge/TSS
(2 outliers removed)
y = -2E-05x² + 0.0195x + 0.2312
R² = 0.8611
TSS (mg/L)
Discharge - Q (cfs)

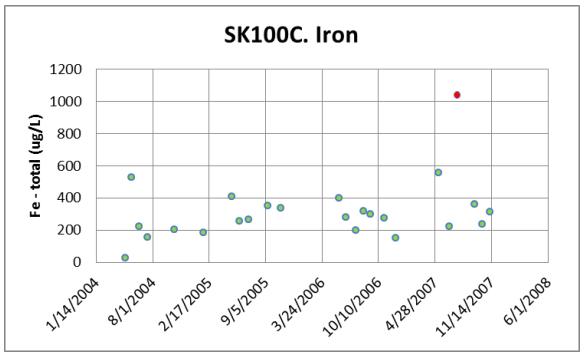

SK100C. Discharge/Lead
y = 0.0006x + 0.1109
R² = 0.1963
Pb - total (ug/L)
Discharge - Q (cfs)

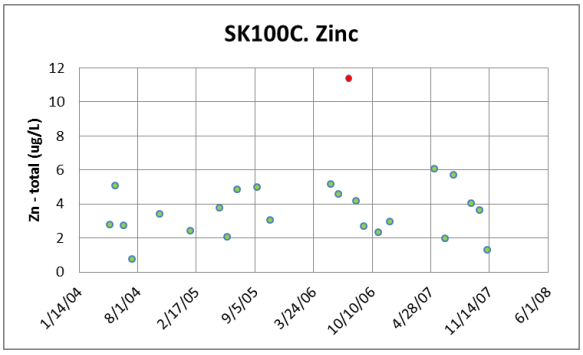

SK100C. Arsenic
As - total (ug/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

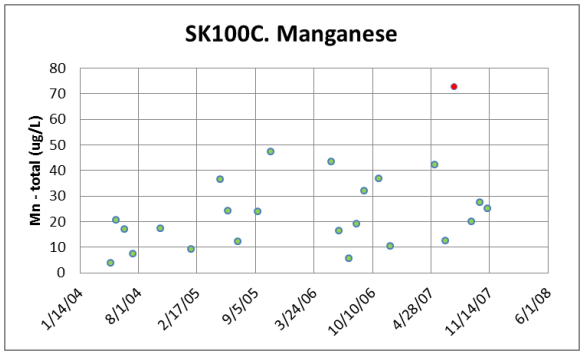

SK100C. Copper
y = 0.4297x + 0.6273
R² = 0.5265
Cu - diss. (ug/L)
3
2.5
2
1.5
1
0.5
0
0
1
2
3
4
5
Cu - total (ug/L)

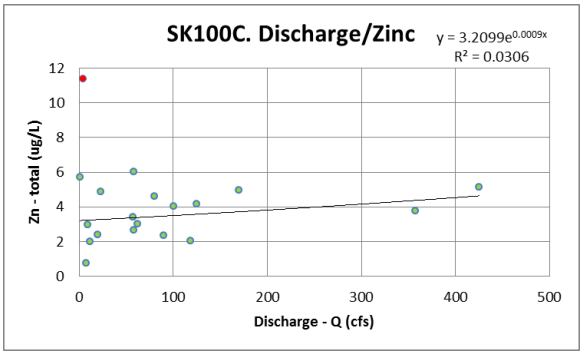

SK100C. Aluminum
Al - total (ug/L)
450
400
350
300
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK100C. Discharge/Copper
y = 0.0029x + 1.7311
R² = 0.2187
Cu - total (ug/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
100
200
300
400
500
Discharge - Q (cfs)


SK100C. Iron
Fe - total (ug/L)
1200
1000
800
600
400
200
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK100C. Zinc
Zn - total (ug/L)
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK100C. Manganese
Mn - total (ug/L)
80
70
60
50
40
30
20
10
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK100C. Discharge/Zinc
y = 3.2099e^0.0009x
R² = 0.0306
Zn - total (ug/L)
12
10
8
6
4
2
0
0
100
200
300
400
500
Discharge - Q (cfs)

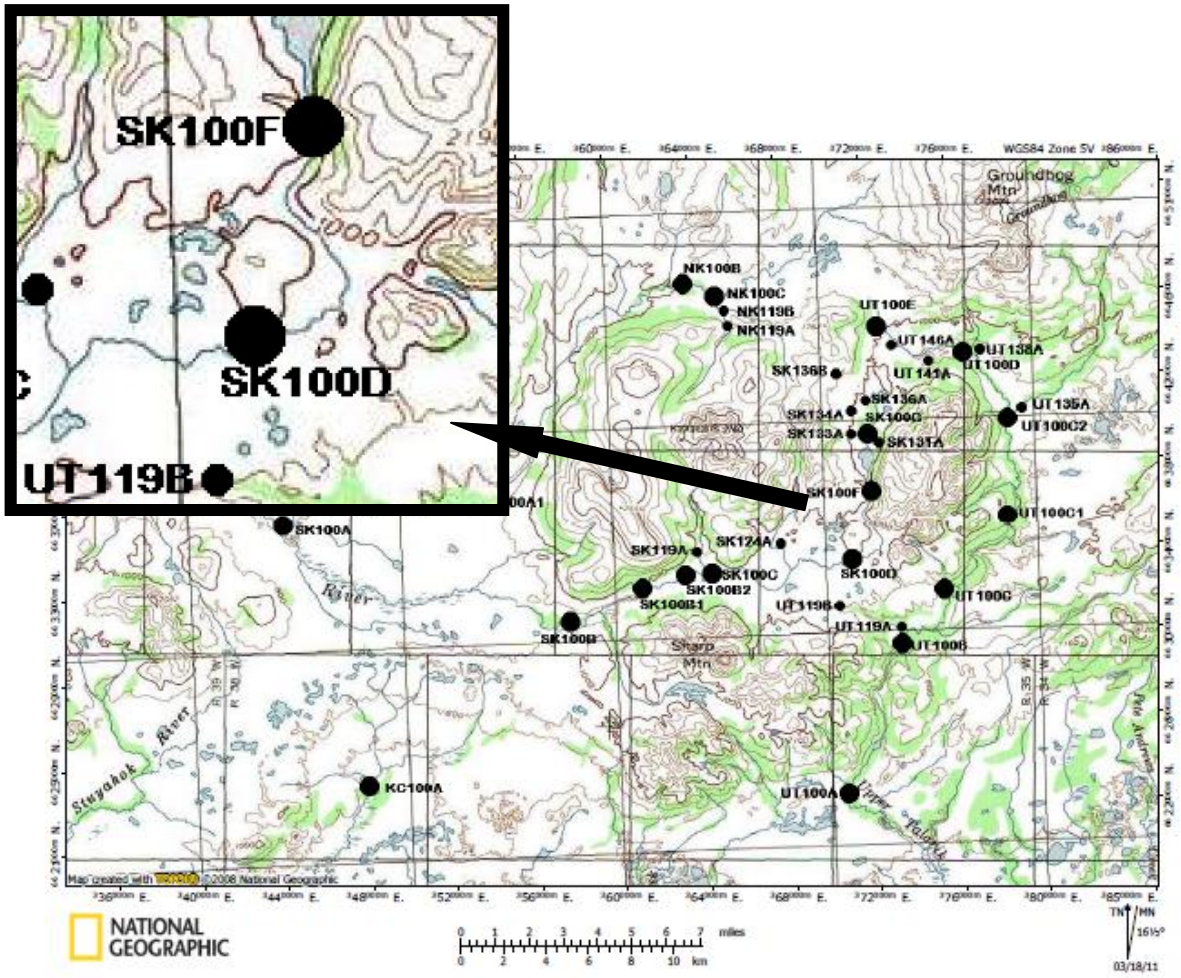
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/28/2004	1%	4%		6%
5/18/2004			4%	11%
6/3/2004				
6/15/2004	2%	1%	2%	2%
7/13/2004	3%		5%	7%
10/16/2004	8%	2%	4%	3%
1/28/2005				4%
5/8/2005				
6/4/2005	1%	0%	3%	12%
7/8/2005	7%	14%	10%	15%
9/14/2005				
10/29/2005		2%		5%
5/23/2006				0%
6/18/2006				
7/22/2006	7%		8%	0%
8/17/2006		1%		
9/13/2006				
10/31/2006	2%	8%	4%	9%
12/10/2006	10%	12%	18%	12%
5/11/2007		1%		4%
6/17/2007	1%	5%	4%	2%
7/16/2007	4%		4%	2%
9/15/2007	1%	2%	1%	1%
10/13/2007			3%	
11/9/2007	6%	6%	9%	12%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/28/2004				6%		
5/18/2004					2%	
6/3/2004						
6/15/2004				13%		6%
7/13/2004					43%	80%
10/16/2004					4%	8%
1/28/2005						ndd
5/8/2005						3%
6/4/2005					10%	
7/8/2005					1%	ndd
9/14/2005						
10/29/2005					ndd	3%
5/23/2006					ndd	
6/18/2006						
7/22/2006						
8/17/2006	10%				7%	
9/13/2006						
10/31/2006						35%
12/10/2006					4%	ndd
5/11/2007						
6/17/2007					1%	
7/16/2007						
9/15/2007						1%
10/13/2007	1%					11%
11/9/2007						45%

South Fork Koktuli main stem: Stream monitoring site SK-100D



SK100D

Property-property graphs and RPD tables

TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	Oct 2006, Feb 2007

Potential outliers

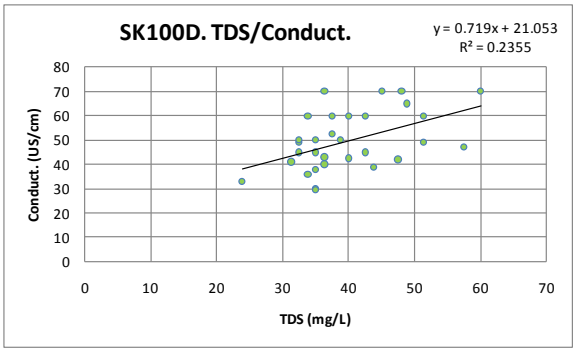
antimony	June 2004
lead	April 2007

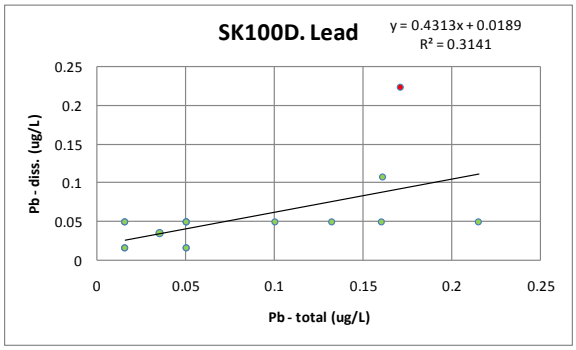
Potential outliers, do not correlate with concentrations upstream and downstream

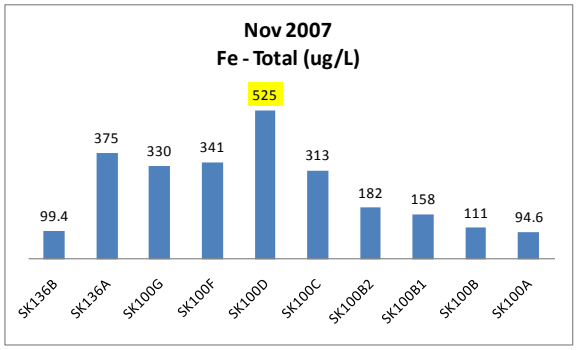
iron	Nov 2007

Elements reported as below MDL but appear to be at or above MRL

aluminum	April 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
cadmium	Jan 2005
tin	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
TSS	March 2005







All samples collected November 9, 2007

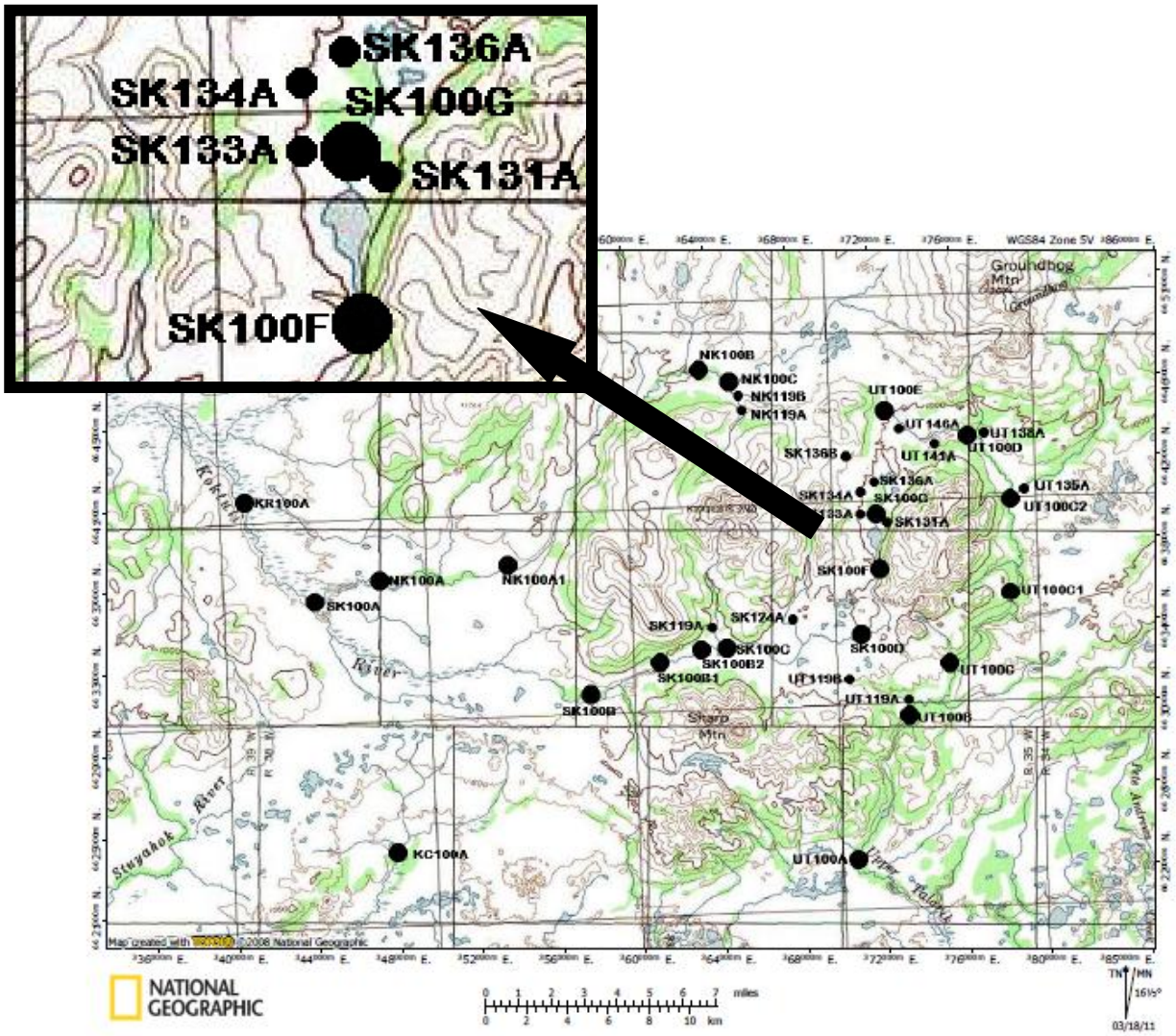
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/28/2004	2%			
5/18/2004				1%
6/16/2004	2%		2%	
7/14/2004				
8/23/2004				
9/14/2004	3%	8%	1%	8%
10/15/2004				
1/26/2005	4%			
3/18/2005				
5/5/2005			0%	
6/3/2005				
7/10/2005				
8/19/2005	11%			4%
9/15/2005			2%	2%
10/29/2005		2%		6%
6/18/2006			0%	1%
7/22/2006	1%	3%	1%	5%
8/17/2006				
9/13/2006				
10/31/2006	8%	10%	11%	12%
12/10/2006	16%	9%	18%	6%
2/17/2007	17%	10%	18%	15%
4/21/2007			1%	
5/11/2007	5%	4%	5%	7%
6/17/2007				
7/12/2007	3%	6%	7%	3%
8/15/2007				
9/16/2007	4%	4%	8%	3%
10/13/2007	4%	6%	8%	5%
11/9/2007	12%	6%	12%	5%
12/8/2007	8%	7%	12%	5%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RFP	RPD	RPD	RPD	RPD	RPD
4/28/2004						1%
5/18/2004						
6/16/2004	2%			1%	2%	44%
7/14/2004					12%	78%
8/23/2004				15%		105%
9/14/2004	6%				6%	
10/15/2004						28%
1/26/2005					2%	ndd
3/18/2005	10%		ndd	ndd		
5/5/2005						19%
6/3/2005						
7/10/2005					1%	ndd
8/19/2005	9%					ndd
9/15/2005						ndd
10/29/2005					ndd	
6/18/2006	ndd					ndd
7/22/2006					6%	28%
8/17/2006					2%	54%
9/13/2006						
10/31/2006					19%	ndd
12/10/2006						ndd
2/17/2007	5%			11%	ndd	ndd
4/21/2007						6%
5/11/2007						ndd
6/17/2007						
7/12/2007						7%
8/15/2007						
9/16/2007					4%	
10/13/2007					1%	21%
11/9/2007						
12/8/2007					3%	39%

South Fork Koktuli main stem: Stream Monitoring Site SK-100F



SK100F

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Dec 2007

Potential outliers, outside pattern

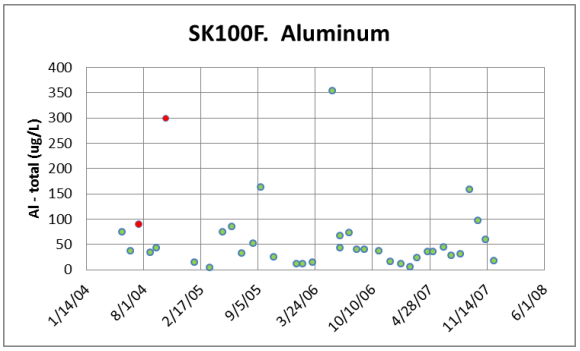
aluminum	Oct 2004
antimony	May 2004, June 2004, July 2004
copper	Feb 2007
lead	May 2006
molybdenum	July 2004
zinc	July 2005

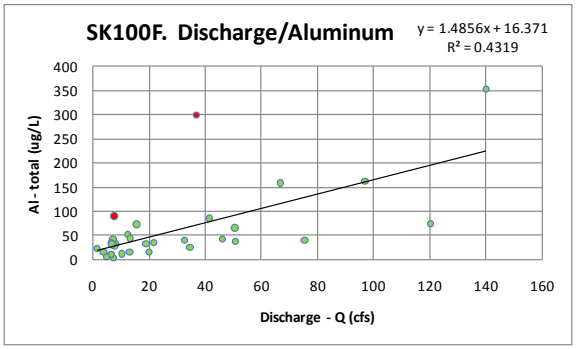
Potential outliers, do not correlate with concentrations upstream and downstream

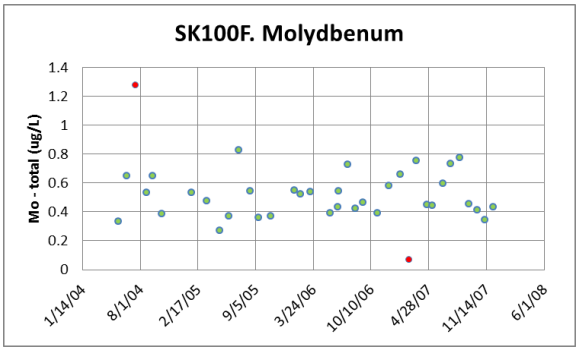
aluminum	July 2004
alkalinity, copper, iron, molybdenum	Feb 2007
sodium	Feb 2006
zinc	June 2006

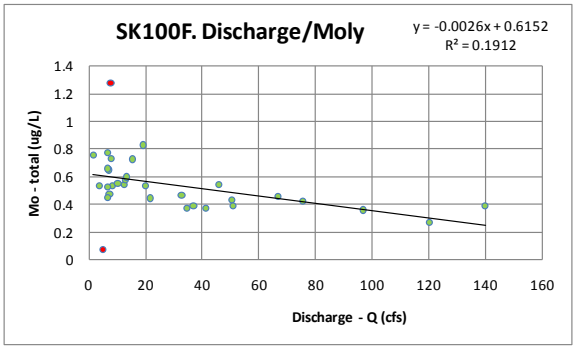
Elements reported as below MDL but appear to be at or above MRL

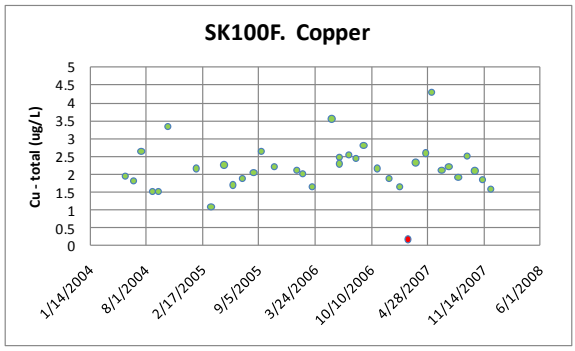
aluminum	May 2004, June 2004, Aug 2004, Oct 2004
tin	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004

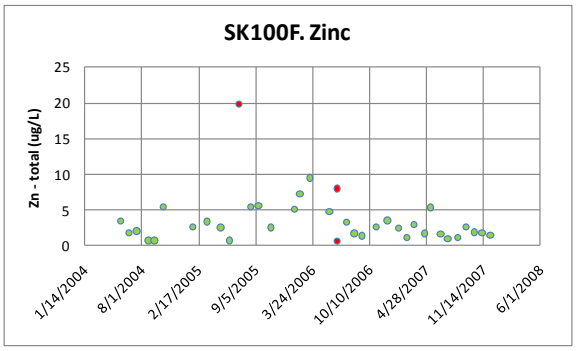

SK100F. Aluminum
Al - total (ug/L)
400
350
300
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

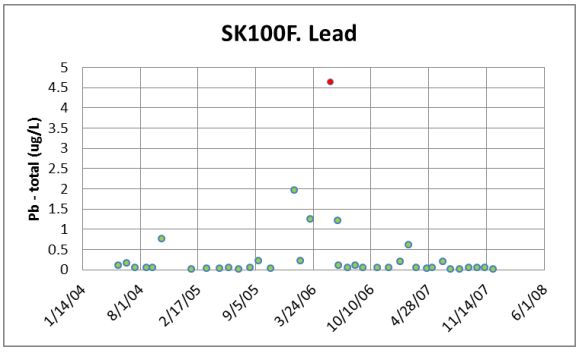

SK100F. Discharge/Aluminum
y = 1.4856x + 16.371
R² = 0.4319
Al - total (ug/L)
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
Discharge - Q (cfs)

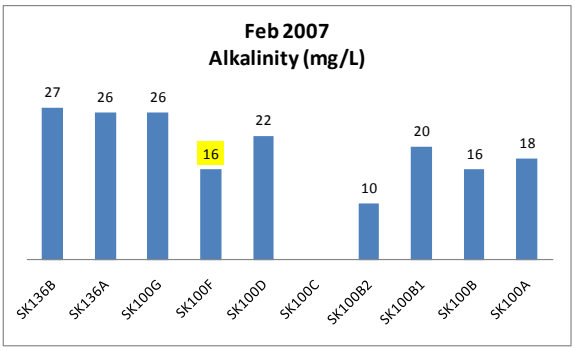

SK100F. Molydbenum
Mo - total (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

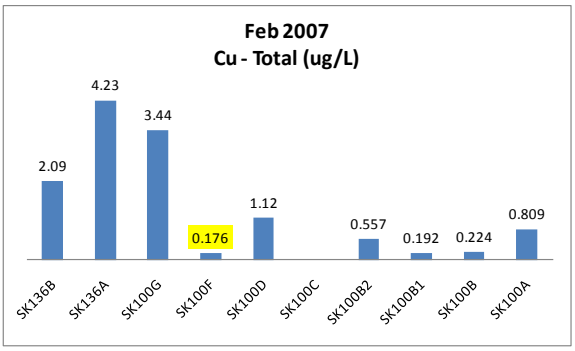

SK100F. Discharge/Moly
y = -0.0026x + 0.6152
R² = 0.1912
Mo - total (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
120
140
160
Discharge - Q (cfs)

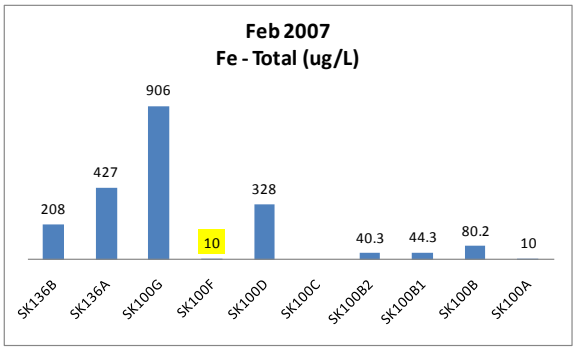

SK100F. Copper
Cu - total (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

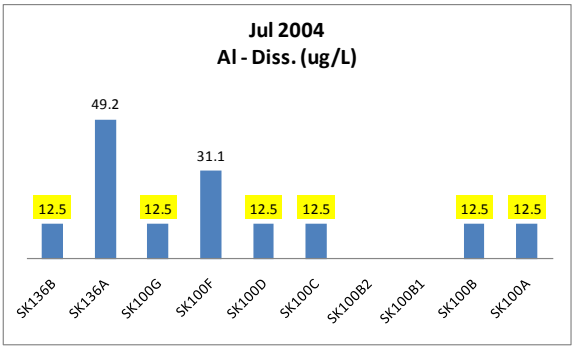

SK100F. Zinc
Zn - total (ug/L)
25
20
15
10
5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

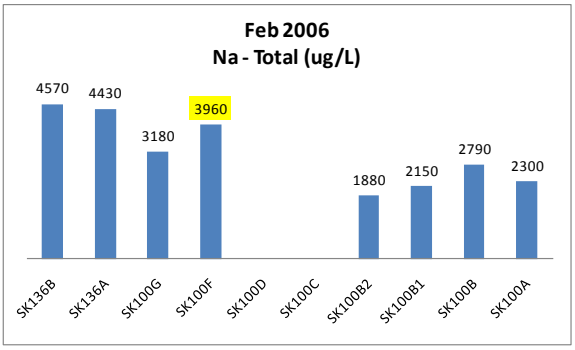

SK100F. Lead
Pb - total (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

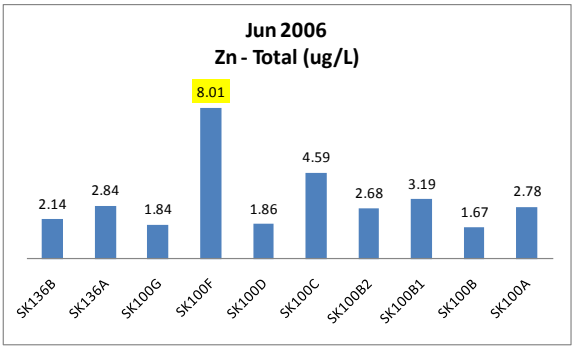












Samples collected
July 2004: All sites sampled July 14 except SK100C July 13 and SK100G July 15
Feb 2006: SK100F sampled Feb 7, SK100A and SK100B sampled Feb 8, SK100G sampled Feb 9
June 2006: All sites sampled June 18 except SK100F June 19
Feb 2007: SK100A, B, and D sampled Feb 17; SK100F and SK100G sampled Feb 18
Mar 2007: SK100A and SK100B sampled Mar 15, SK100F sampled Mar 16

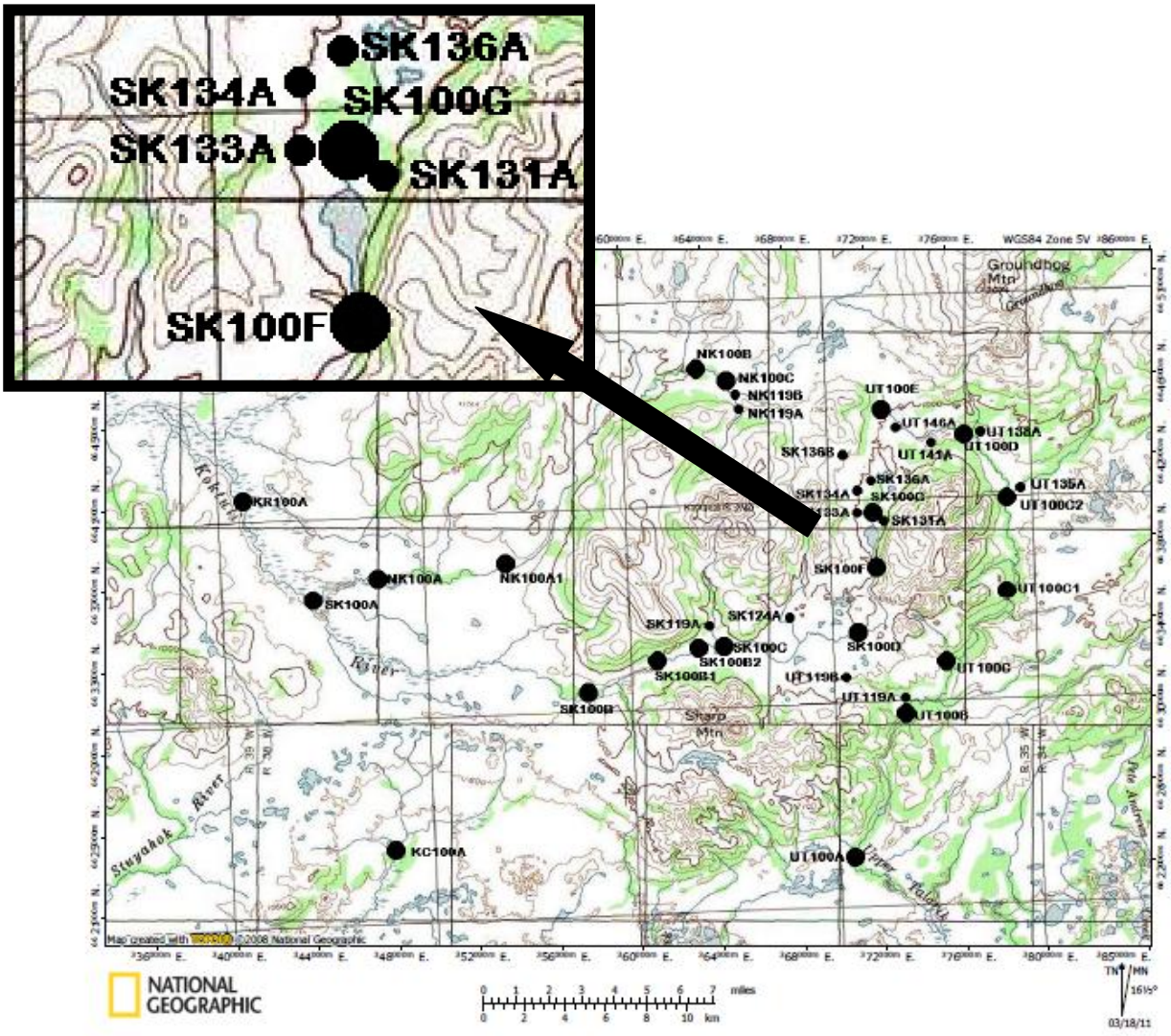
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/18/2004	4%	6%	5%	6%
6/1/2004				
6/16/2004				
7/14/2004	5%			
8/16/2004				
8/24/2004				
9/14/2004				
10/16/2004				
1/26/2005	5%		2%	
3/19/2005			13%	
5/4/2005			5%	
6/5/2005	2%		14%	4%
7/9/2005	0%	1%		3%
8/18/2005	2%	1%	1%	2%
9/15/2005				
10/29/2005	3%	6%	8%	11%
1/18/2006	7%	0%	7%	4%
2/7/2006	8%	9%	9%	9%
3/14/2006	2%	11%		12%
5/22/2006				1%
6/18/2006				
6/19/2006				
7/22/2006				
8/17/2006				
9/13/2006				
11/1/2006	1%	4%	5%	2%
12/11/2006		2%		2%
1/19/2007	9%			
2/18/2007	10%	8%	18%	1%
3/16/2007				
4/21/2007				1%
5/11/2007		2%	3%	1%
6/17/2007		2%	2%	1%
7/12/2007	6%	9%	17%	8%
8/15/2007			6%	
9/15/2007	7%	5%	5%	6%
10/13/2007				
11/9/2007	2%	4%	4%	5%
12/8/2007	11%	11%	16%	9%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/18/2004						28%
6/1/2004						
6/16/2004						
7/14/2004						5%
8/16/2004						
8/24/2004						
9/14/2004						
10/16/2004						
1/26/2005				0%	7%	ndd
3/19/2005	ndd	ndd	ndd	14%	1%	
5/4/2005						ndd
6/5/2005					12%	89%
7/9/2005					5%	
8/18/2005						ndd
9/15/2005					ndd	
10/29/2005					ndd	33%
1/18/2006				6%	7%	
2/7/2006				6%	ndd	
3/14/2006						
5/22/2006						
6/18/2006						ndd
6/19/2006						ndd
7/22/2006						ndd
8/17/2006						6%
9/13/2006						8%
11/1/2006						24%
12/11/2006						ndd
1/19/2007						ndd
2/18/2007	ndd				47%	ndd
3/16/2007						ndd
4/21/2007	ndd			3%	2%	ndd
5/11/2007						14%
6/17/2007						
7/12/2007					5%	20%
8/15/2007						4%
9/15/2007						
10/13/2007						17%
11/9/2007						17%
12/8/2007	15%				4%	ndd

South Fork Koktuli main stem: Stream monitoring site SK-100G



SK100G

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Oct 2005, Jan 2006
TSS does not correlate with discharge, potentially affecting concentrations of aluminum	April 2007
Total lead does not correlate with the usual lead-discharge relationship	Jan 2007

Potential outliers, outside pattern

aluminum	Jan 2005, March 2005, April 2007
iron	July 2004, Aug 2005
molybdenum	Aug 2005, Feb 2006
sodium and sodium absorption ratio (SAR)	Jan 2005
tin	June 2004
zinc	July 2005

Potential outliers, do not correlate with concentrations upstream and downstream

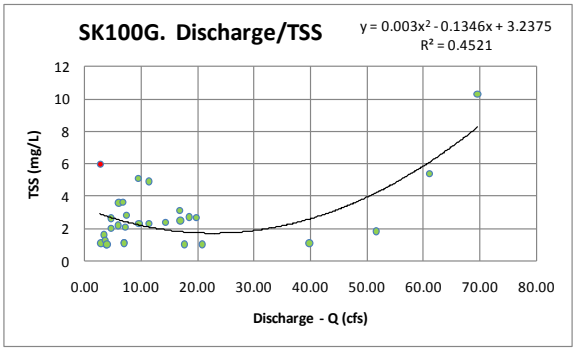
copper	Aug 2005, Feb 2006

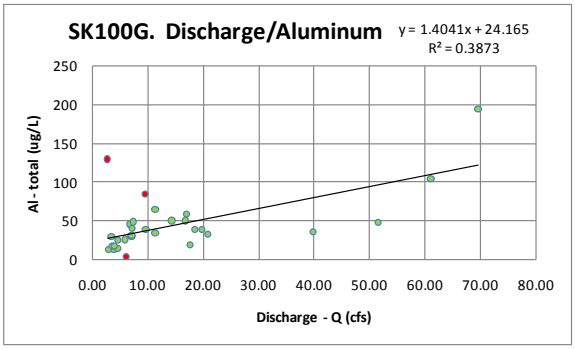
Elements reported as below MDL but appear to be above MRL

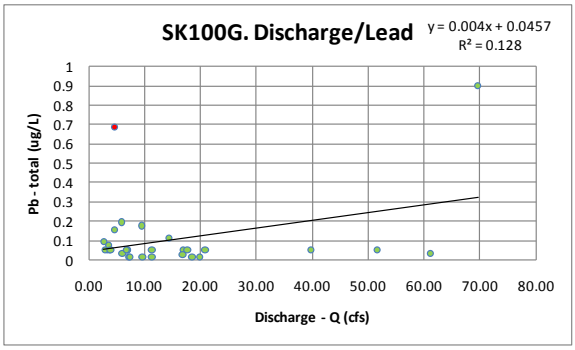
aluminum	April 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
cadmium (at MRL)	July 2004

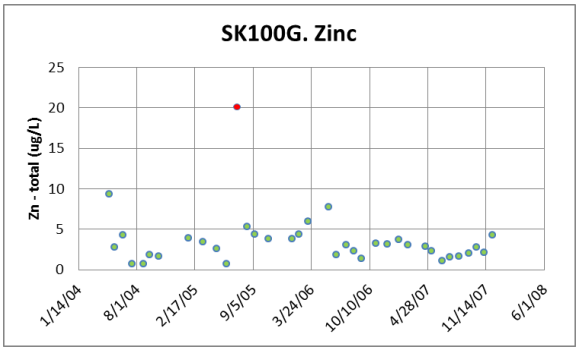
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

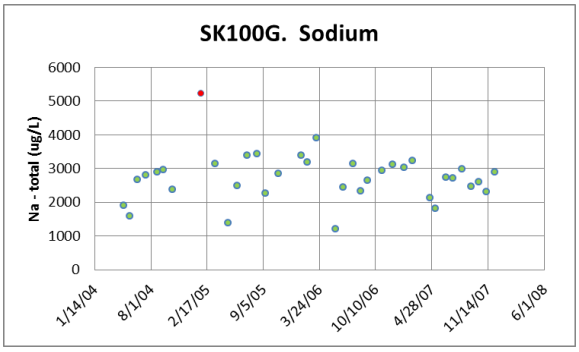
antimony	Aug 2004, Sept 2004

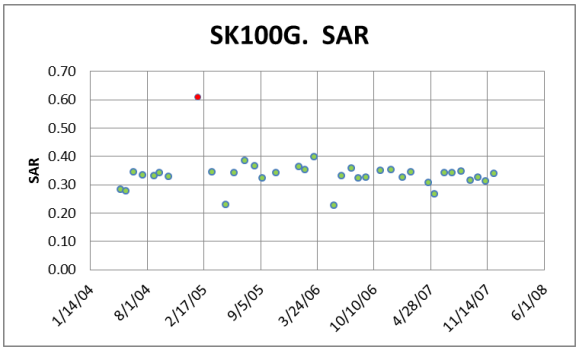


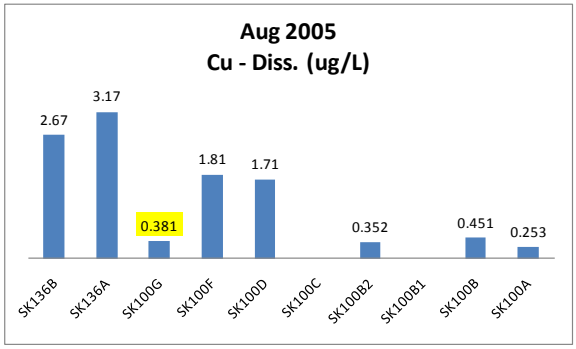


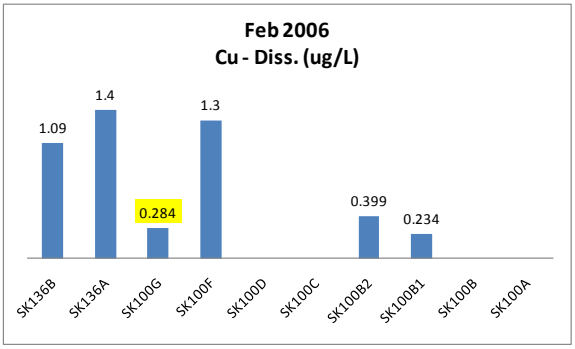












Samples collected

Aug 2005: SK100G was sampled Aug 15, SK136A and SK136B on Aug 16, SK100A and SK100B on Aug 17, SK100B2 and SK100F on Aug 18, and SK100D on Aug 19.

Feb 2006: SK100F sampled Feb 7, SK100A and SK100B sampled Feb 8, SK100G sampled Feb 9

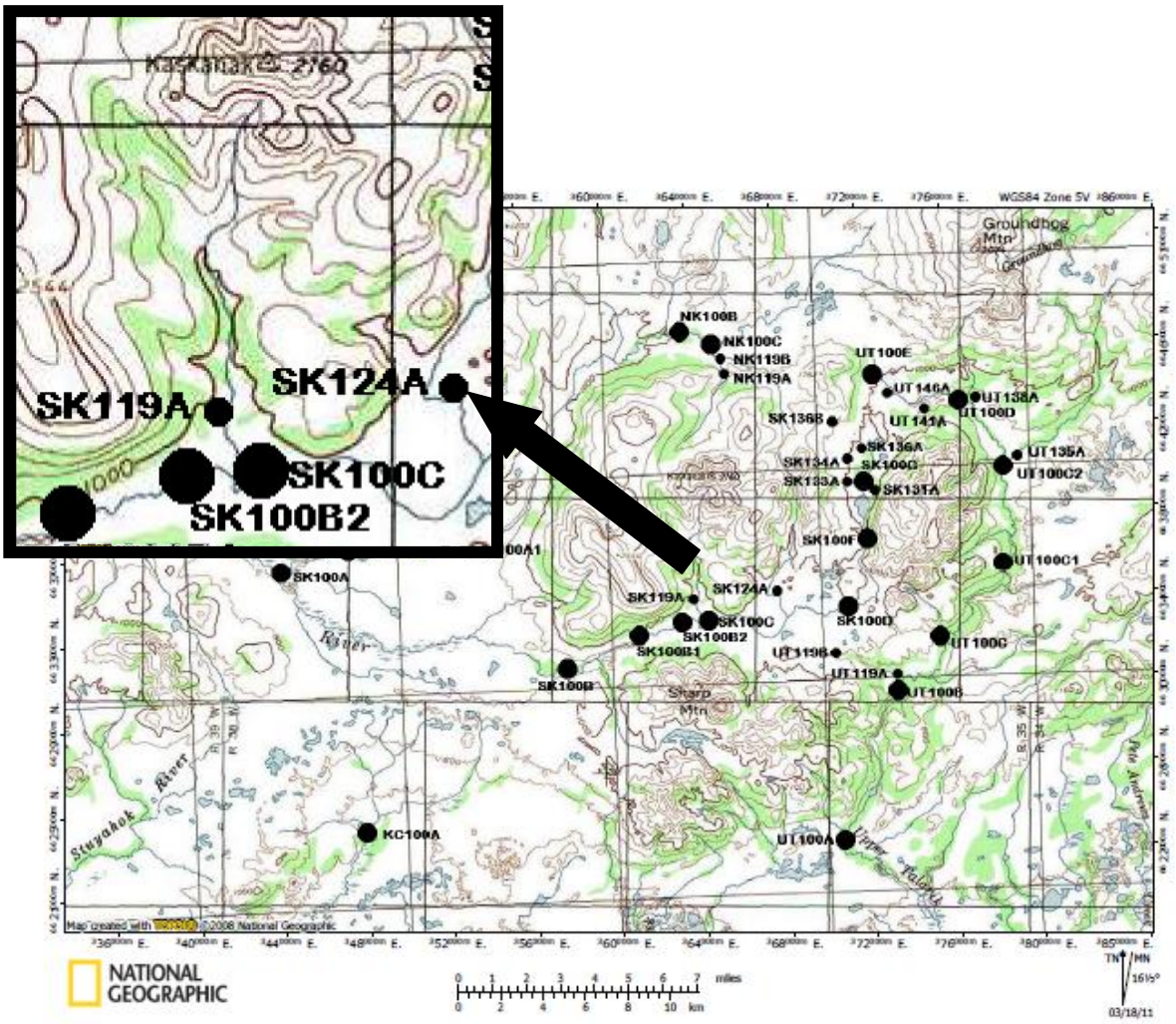
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/28/2004				
5/18/2004		5%		7%
6/1/2004				
6/15/2004				
6/16/2004				
7/15/2004	5%	6%	12%	9%
8/16/2004				
8/25/2004		1%	0%	4%
9/14/2004		3%	0%	6%
10/16/2004	2%	2%	1%	3%
1/26/2005				
3/17/2005	3%		14%	4%
5/4/2005				
6/5/2005				
7/11/2005				0%
8/15/2005			0%	
9/12/2005			1%	0%
10/29/2005	10%	14%	14%	15%
1/18/2006	19%	18%		19%
2/9/2006	4%	4%	7%	3%
3/13/2006	4%		5%	
5/22/2006				
6/18/2006				
7/22/2006				
8/17/2006				
9/13/2006				
11/1/2006		2%	4%	
12/10/2006	10%	7%	12%	8%
1/19/2007	6%	1%	11%	
2/18/2007	18%			
4/21/2007				
5/11/2007	6%	9%	8%	8%
6/17/2007			2%	
7/13/2007			2%	
8/15/2007	6%	4%	7%	4%
9/16/2007	3%	8%	10%	7%
10/13/2007			4%	
11/9/2007	10%	6%	12%	4%
12/8/2007		1%	1%	0%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/28/2004						
5/18/2004					30%	
6/1/2004						
6/15/2004	ndd	ndd	ndd	ndd	ndd	ndd
6/16/2004						
7/15/2004				12%	ndd	
8/16/2004						
8/25/2004					17%	
9/14/2004					2%	
10/16/2004					1%	49%
1/26/2005						ndd
3/17/2005	ndd	ndd	ndd	ndd	0%	
5/4/2005						30%
6/5/2005					4%	88%
7/11/2005						
8/15/2005						
9/12/2005					1%	
10/29/2005				1%	ndd	
1/18/2006				19%	ndd	ndd
2/9/2006	13%				18%	
3/13/2006		ndd		1%	14%	ndd
5/22/2006						
6/18/2006						14%
7/22/2006						
8/17/2006						21%
9/13/2006						29%
11/1/2006						22%
12/10/2006						ndd
1/19/2007					2%	ndd
2/18/2007				5%	6%	ndd
4/21/2007						ndd
5/11/2007					4%	34%
6/17/2007						39%
7/13/2007						
8/15/2007					4%	23%
9/16/2007					0%	29%
10/13/2007						
11/9/2007						
12/8/2007						

South Fork Koktuli tributary: Stream Monitoring SK-119A



SK119A

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Oct 2005, Feb 2007, Oct 2007, Dec 2007
Potassium RPD over 20%	Oct 2007, Nov 2007, Dec 2007
Manganese RPD over 20%	June 2004, Oct 2004
TSS does not correlate with discharge	May 2006

Potential outliers, outside pattern

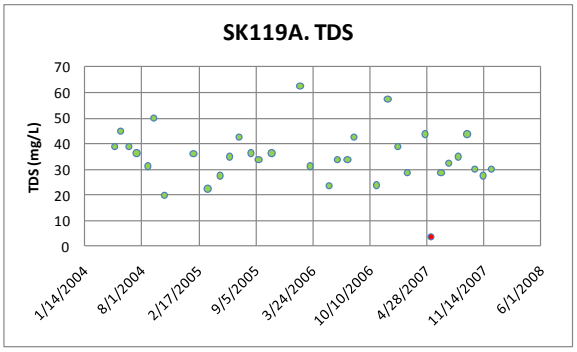
TDS	May 2007
sulfate	June 2005, Sept 2005
TSS, aluminum, iron, manganese	May 2006
antimony	April 2004, June 2004, July 2004
arsenic	Aug 2005
copper	Dec 2006
iron	April 2004, June 2005, Oct 2005
lead	Dec 2006, Jan 2007, Feb 2007
manganese	June 2004, June 2005, Dec 2006
molybdenum	Aug 2004, Dec 2006
zinc	July 2005, Dec 2006
Calcium, magnesium, potassium appear high; hardness may not be representative	Dec 2006
Alkalinity appears low	Sept 2005

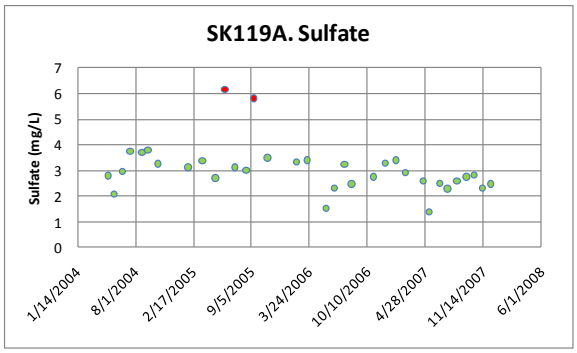
Reported as below MDL but appears to be above MRL

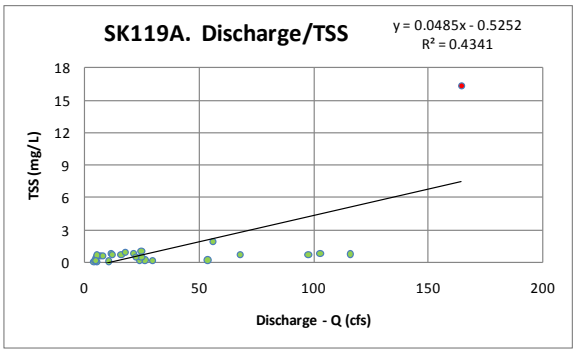
aluminum	April 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony (>1/2 MRL), arsenic, cadmium, selenium (>1/2 MRL), silver (1/2 MRL), tin	Dec 2006
iron (1/2 MRL)	Aug 2004

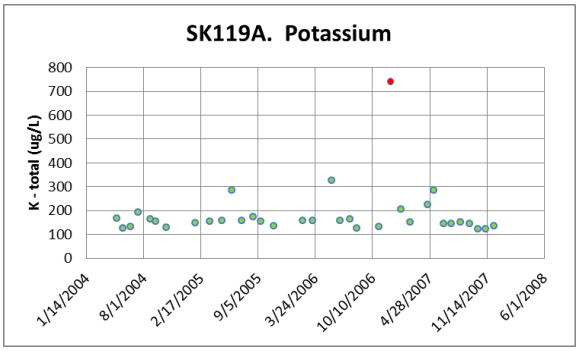
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

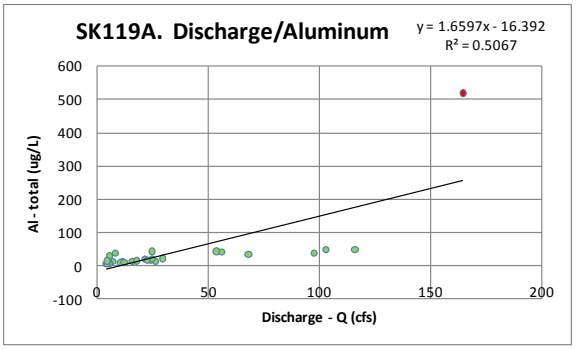
antimony	May 2004, Aug 2004, Dec 2006
selenium	June 2004

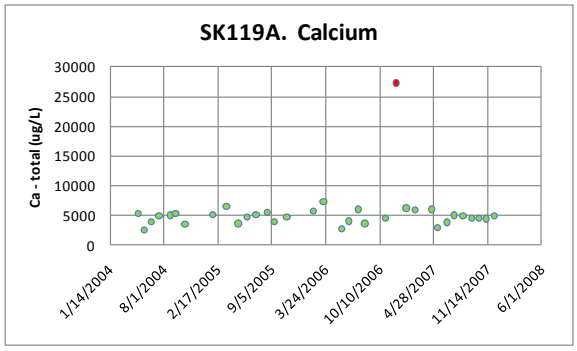

SK119A. TDS
TDS (mg/L)
70
60
50
40
30
20
10
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

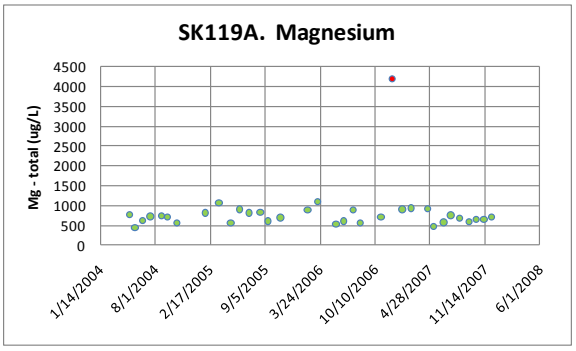

SK119A. Sulfate
Sulfate (mg/L)
7
6
5
4
3
2
1
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

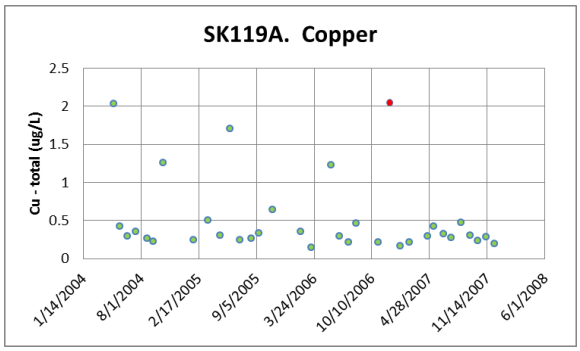

SK119A. Discharge/TSS
y = 0.0485x - 0.5252
R² = 0.4341
TSS (mg/L)
18
15
12
9
6
3
0
0
50
100
150
200
Discharge - Q (cfs)

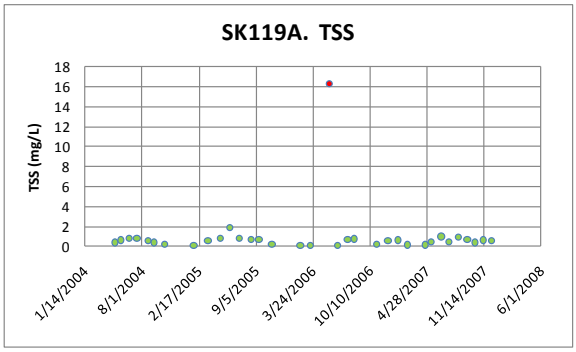

SK119A. Potassium
K - total (ug/L)
800
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

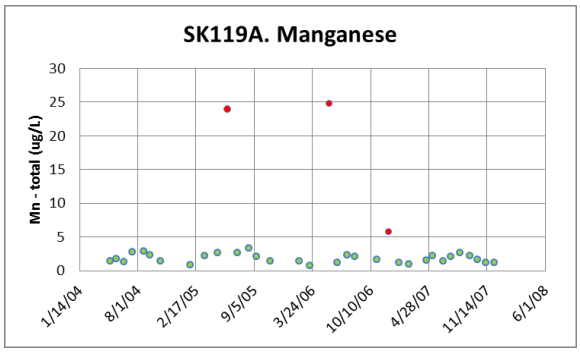

SK119A. Discharge/Aluminum
y = 1.6597x - 16.392
R² = 0.5067
Al - total (ug/L)
600
500
400
300
200
100
0
-100
0
50
100
150
200
Discharge - Q (cfs)

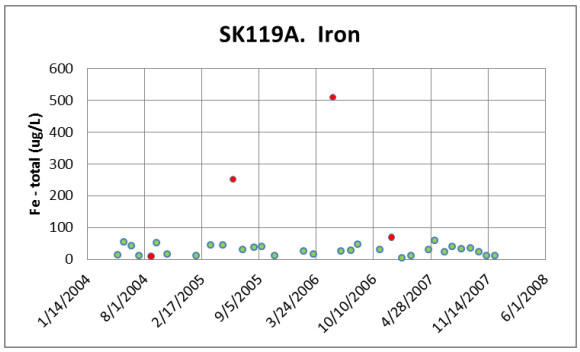

SK119A. Calcium
Ca - total (ug/L)
30000
25000
20000
15000
10000
5000
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

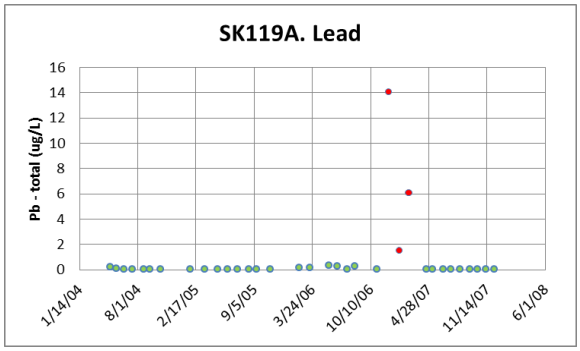

SK119A. Magnesium
Mg - total (ug/L)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

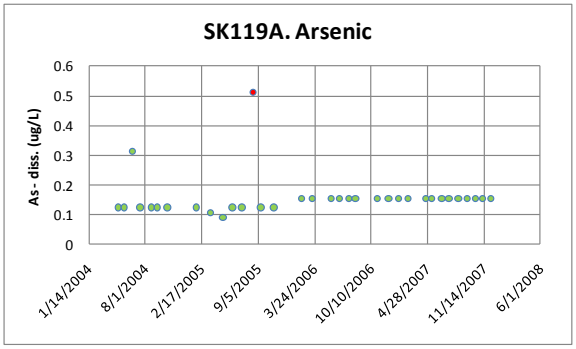

SK119A. Copper
Cu - total (ug/L)
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

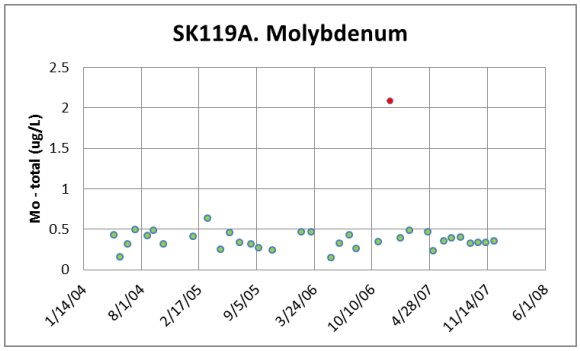

SK119A. TSS
TSS (mg/L)
18
16
14
12
10
8
6
4
2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

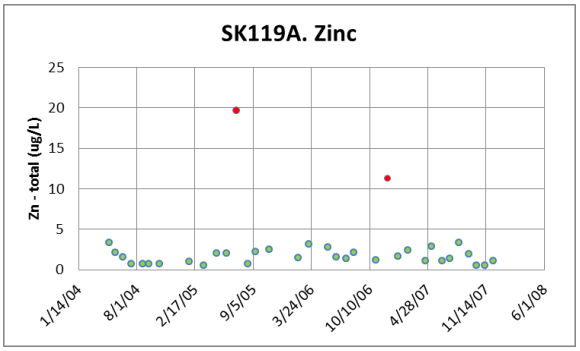

SK119A. Manganese
Mn - total (ug/L)
30
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK119A. Iron
Fe - total (ug/L)
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK119A. Lead
Pb - total (ug/L)
16
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK119A. Arsenic
As - diss. (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK119A. Molybdenum
Mo - total (ug/L)
2.5
2
1.5
1
0.5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK119A. Zinc
Zn - total (ug/L)
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

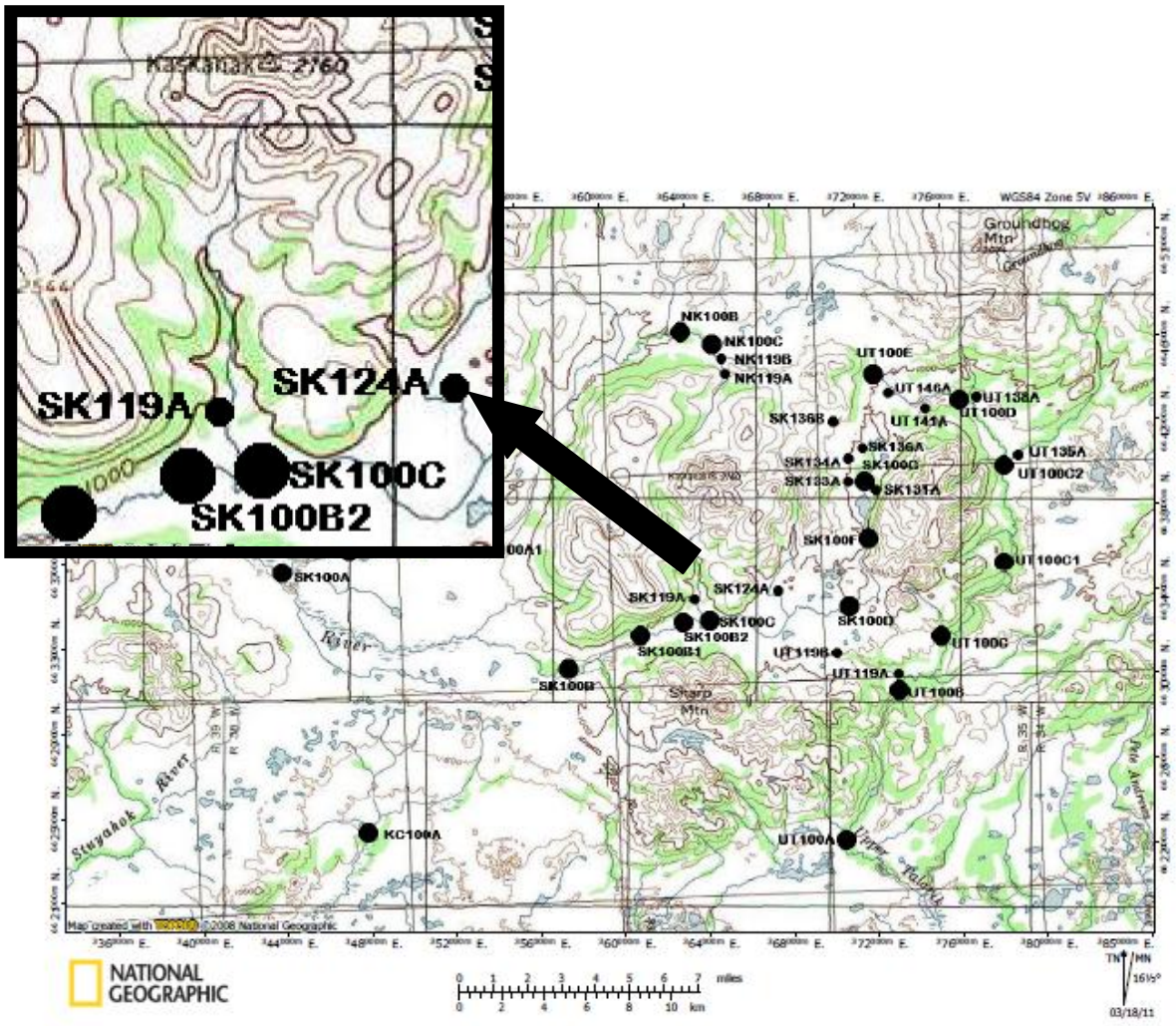
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/28/2004		1%		
5/19/2004	4%		11%	
6/16/2004	5%	0%	3%	10%
7/13/2004	3%	4%	2%	3%
8/15/2004				
8/23/2004				
9/13/2004		7%		3%
10/18/2004				
1/29/2005				
3/20/2005				
5/3/2005	12%	1%	4%	5%
6/5/2005			5%	
7/9/2005				
8/18/2005	3%	5%	5%	5%
9/14/2005	2%	1%	13%	4%
10/30/2005	7%	13%	16%	17%
2/7/2006	5%	6%	16%	8%
3/15/2006			1%	
5/21/2006				
6/19/2006			2%	
7/23/2006		0%	8%	2%
8/16/2006			5%	5%
11/1/2006	5%	11%	15%	7%
12/11/2006				
1/17/2007	5%	12%	18%	1%
2/18/2007	17%	12%		10%
4/21/2007		1%	4%	
5/12/2007				
6/17/2007	6%	13%	18%	4%
7/13/2007			7%	
8/15/2007		2%	4%	
9/16/2007	5%	8%	15%	4%
10/14/2007	10%	14%	23%	9%
11/10/2007	9%	8%	32%	2%
12/9/2007	15%	18%	25%	15%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/28/2004			93%	8%		
5/19/2004	30%			ndd		21%
6/16/2004				112%	21%	21%
7/13/2004				ndd		
8/15/2004						
8/23/2004	12%		71%		64%	
9/13/2004						
10/18/2004				31%	3%	69%
1/29/2005	15%					ndd
3/20/2005						99%
5/3/2005	4%					23%
6/5/2005					9%	21%
7/9/2005						12%
8/18/2005	22%				ndd	85%
9/14/2005	ndd				11%	ndd
10/30/2005	19%		37%		ndd	
2/7/2006	ndd				ndd	ndd
3/15/2006	50%				2%	
5/21/2006					ndd	
6/19/2006	6%					ndd
7/23/2006	37%					ndd
8/16/2006	10%				3%	
11/1/2006	ndd				4%	ndd
12/11/2006						
1/17/2007	ndd				4%	ndd
2/18/2007	ndd	5%		10%	10%	ndd
4/21/2007	ndd			ndd	1%	ndd
5/12/2007	ndd		ndd	4%		ndd
6/17/2007	4%				1%	6%
7/13/2007						
8/15/2007					1%	
9/16/2007	ndd				1%	12%
10/14/2007	26%				9%	109%
11/10/2007	ndd					90%
12/9/2007	ndd				ndd	ndd

South Fork Koktuli tributary: Stream monitoring site SK-124A



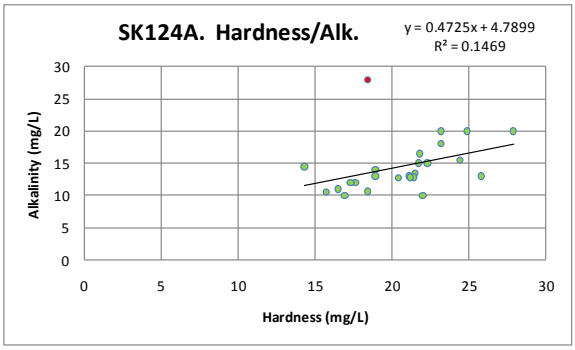
SK124A

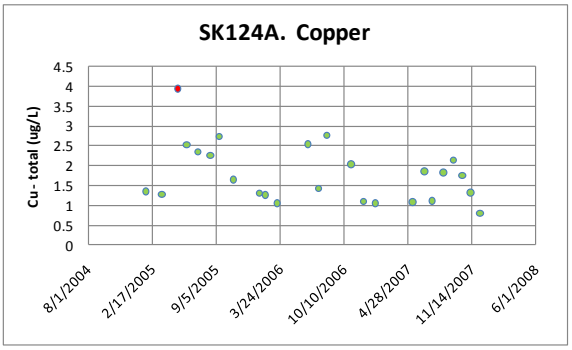
Property-property graphs and RPD tables

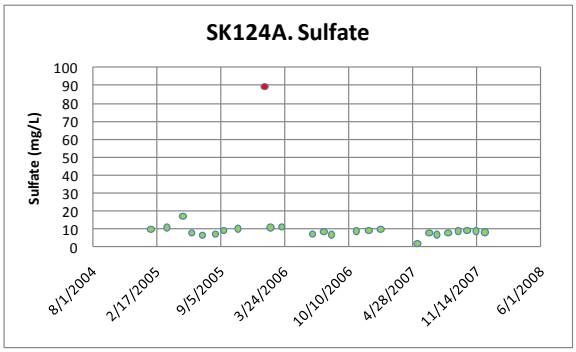
Major cation RPD's dissolved consistently over total	Sept 2005, Nov 2006, Jan 2007, Sept 2007
Sodium RPD greater than 20%	Dec 2007
Alkalinity correlates poorly with hardness	Aug 2006

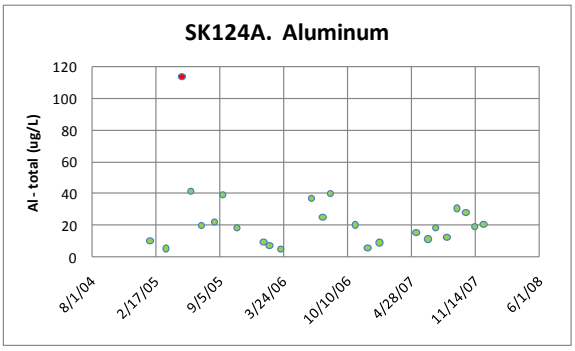
Potential outliers, outside pattern	
sulfate	Jan 2006
aluminum	May 2005
copper	May 2005
lead	Jan 2006, Feb 2006
zinc	July 2005, Feb 2006

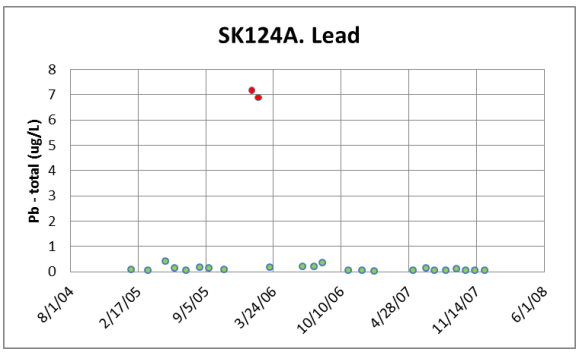
Reported as greater than MRL but appears to be below MDL	
arsenic	March 2005, May 2005

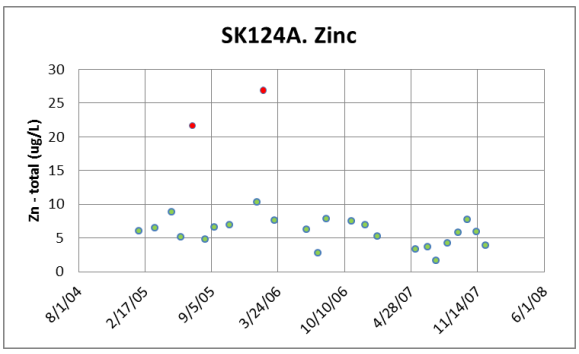

SK124A. Hardness/Alk.
y = 0.4725x + 4.7899
R² = 0.1469
Alkalinity (mg/L)
Hardness (mg/L)


SK124A. Copper
Cu - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK124A. Sulfate
Sulfate (mg/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK124A. Aluminum
Al - total (ug/L)
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK124A. Lead
Pb - total (ug/L)
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK124A. Zinc
Zn - total (ug/L)
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

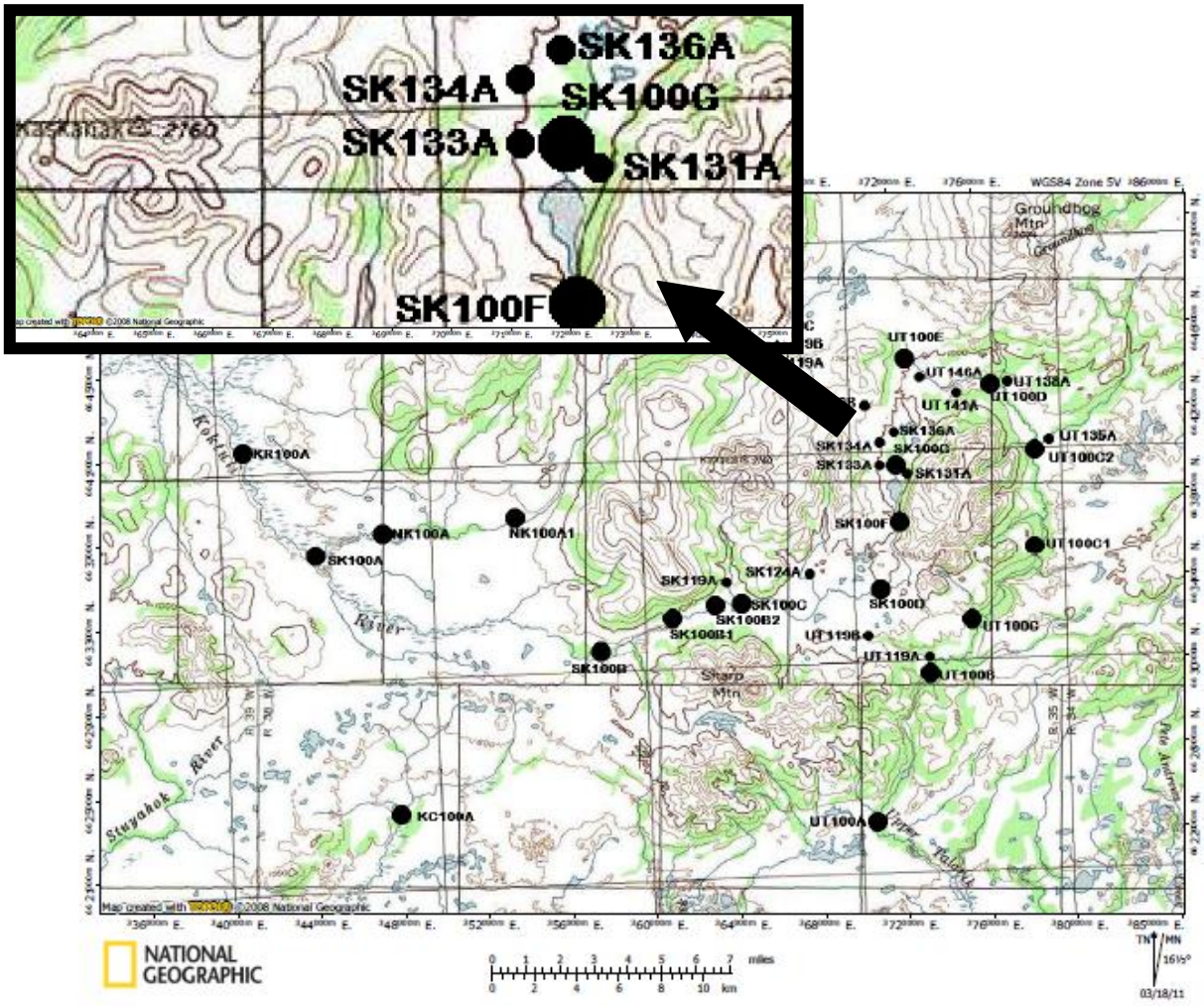
Major Cations

Date	Ca RPD	Mg RPD	K RPD	Na RPD
1/29/2005				
3/19/2005				
5/9/2005			0%	
6/5/2005		1%	7%	3%
7/9/2005				
8/18/2005	5%	3%	8%	6%
9/14/2005	18%	9%	17%	16%
10/29/2005	4%	9%	10%	16%
1/19/2006	9%	5%	8%	8%
2/7/2006	9%	6%	9%	7%
3/14/2006				
6/19/2006	4%	2%	7%	6%
7/23/2006			1%	1%
8/16/2006			1%	
11/1/2006	9%	13%	16%	10%
12/11/2006	7%	9%	11%	6%
1/17/2007	8%	12%	12%	15%
5/12/2007	7%	9%	7%	8%
6/18/2007		5%	5%	3%
7/13/2007		2%	2%	
8/16/2007	4%	8%	9%	6%
9/16/2007	11%	13%	13%	12%
10/14/2007				
11/10/2007	2%	4%	8%	3%
12/9/2007	1%	14%		20%

Trace Metals

Date	Cu RPD	Al RPD	Fe RPD	Mn RPD	Mo RPD	Zn RPD
1/29/2005						
3/19/2005						9%
5/9/2005					15%	
6/5/2005					12%	
7/9/2005						1%
8/18/2005						
9/14/2005					ndd	ndd
10/29/2005				1%	ndd	5%
1/19/2006				2%	12%	ndd
2/7/2006	6%			8%		
3/14/2006						
6/19/2006						
7/23/2006						ndd
8/16/2006						
11/1/2006					14%	5%
12/11/2006						19%
1/17/2007					8%	13%
5/12/2007		ndd	ndd	7%	3%	
6/18/2007						
7/13/2007						5%
8/16/2007					4%	
9/16/2007	7%				13%	4%
10/14/2007					0%	1%
11/10/2007	ndd				0%	16%
12/9/2007					5%	9%

South Fork Koktuli tributary: Stream monitoring site SK-131A



SK131A

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Nov 2006
Alkalinity correlates poorly with hardness	July 2004
Magnesium RPD greater than 20%	Nov 2006

Potential outliers, outside pattern

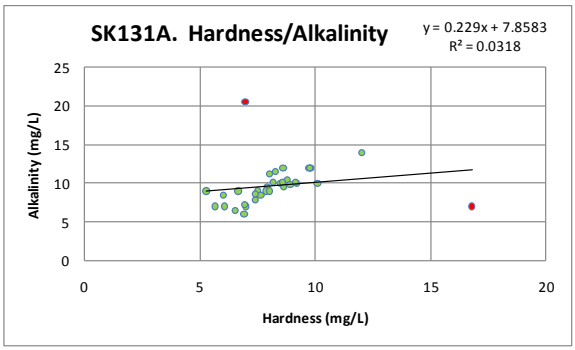
Calcium appears elevated; hardness may not be representative	May 2005
chloride, iron	May 2006
sulfate	Oct 2004, May 2005
antimony	Aug 2005
copper	July 2004, July 2005, Dec 2006, Nov 2007
lead	Feb 2006, March 2006

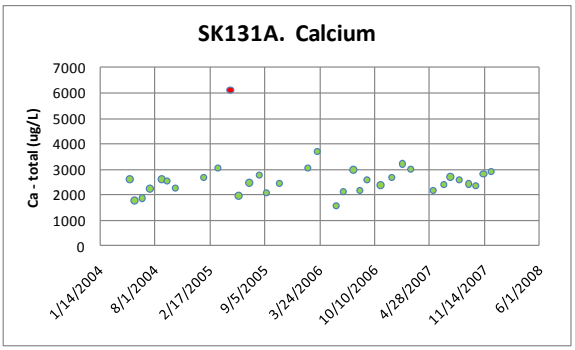
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

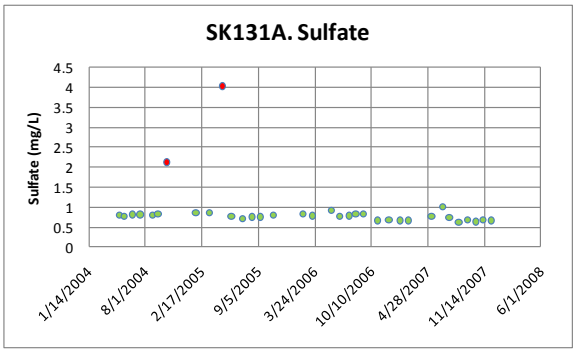
iron	March 2006

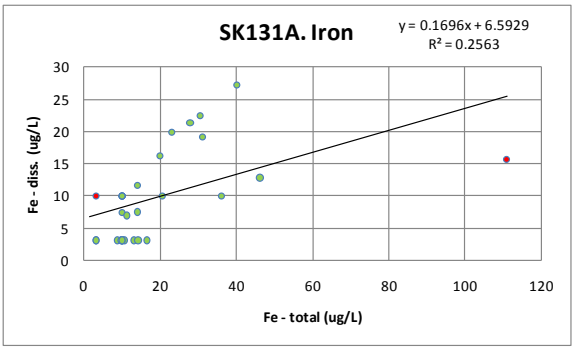
Elements reported as below MDL but appears to be above MRL

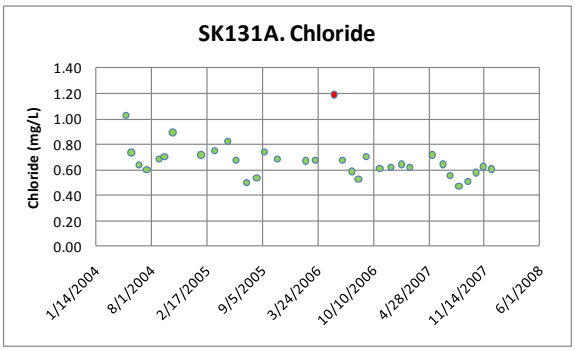
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
lead	Oct 2004
manganese	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
molybdenum	May 2004, June 2004, July 2004, Oct 2004

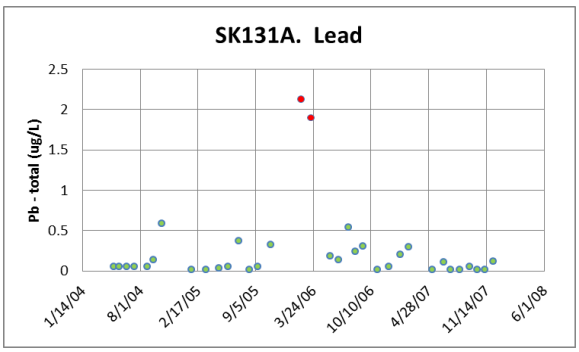

SK131A. Hardness/Alkalinity
y = 0.229x + 7.8583
R² = 0.0318
Alkalinity (mg/L)
Hardness (mg/L)

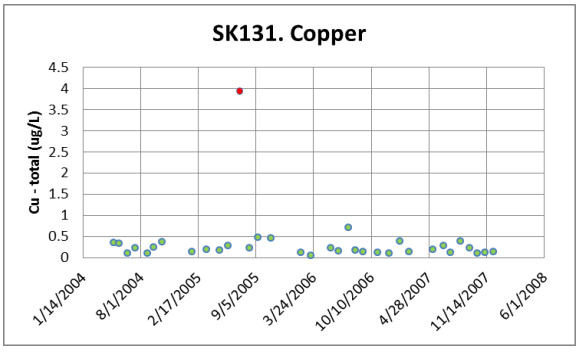

SK131A. Calcium
Ca - total (ug/L)


SK131A. Sulfate
Sulfate (mg/L)


SK131A. Iron
y = 0.1696x + 6.5929
R² = 0.2563
Fe - diss. (ug/L)
Fe - total (ug/L)


SK131A. Chloride
Chloride (mg/L)


SK131A. Lead
Pb - total (ug/L)


SK131. Copper
Cu - total (ug/L)

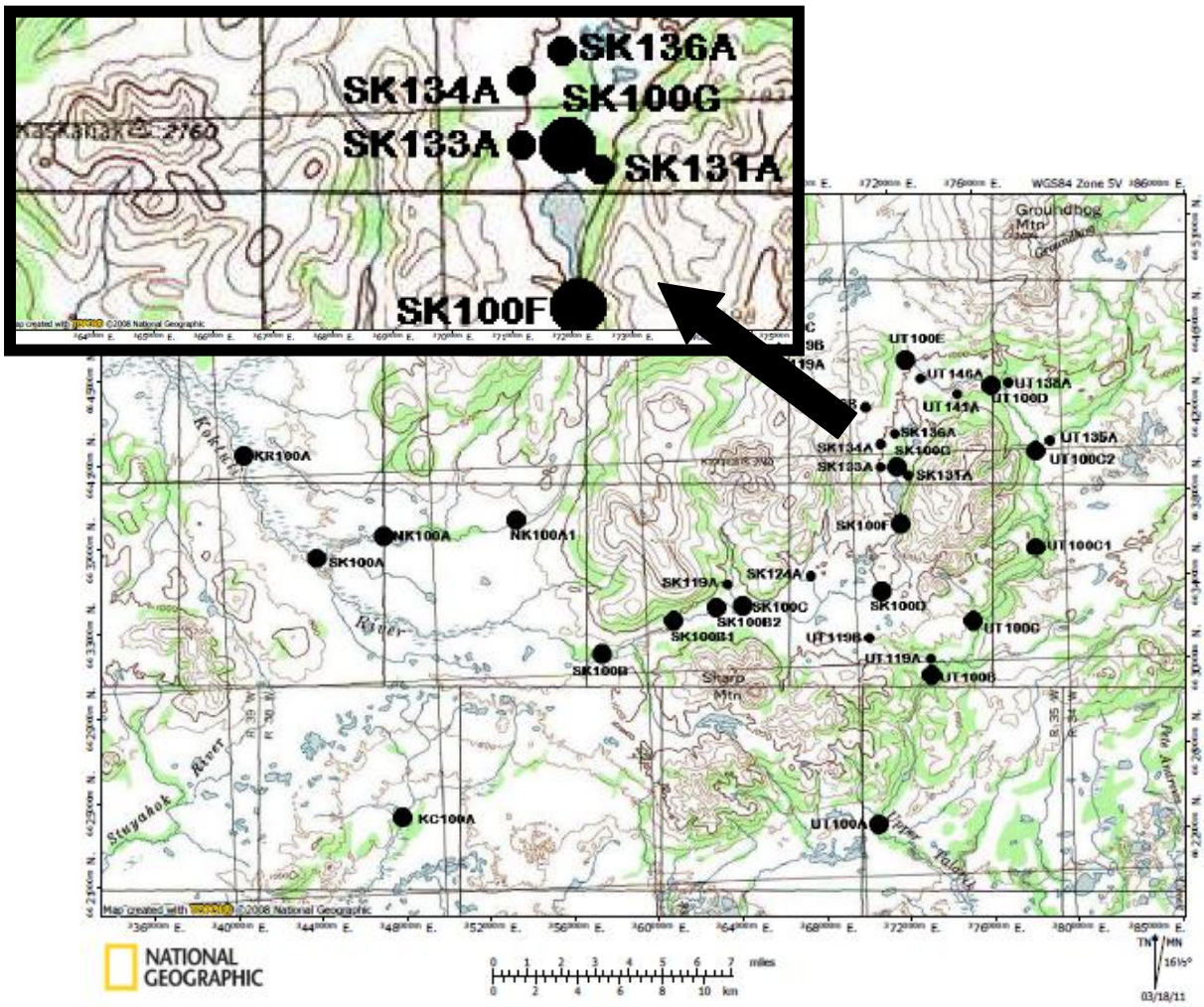
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004	6%	2%	9%	3%
5/19/2004				
6/16/2004	1%		3%	
7/13/2004	1%	10%		
8/26/2004		2%	7%	6%
9/15/2004		2%		2%
10/15/2004				
1/26/2005				
3/17/2005	12%	3%		10%
5/2/2005				
6/1/2005			4%	1%
7/9/2005				
7/10/2005	5%			
8/15/2005	3%	5%		4%
9/12/2005	0%		6%	
10/27/2005				
2/9/2006				
3/15/2006				
5/22/2006				
6/19/2006	1%	2%	8%	7%
7/24/2006		1%		2%
8/16/2006	1%	4%	5%	6%
9/13/2006				
11/1/2006	13%	20%	15%	8%
12/11/2006				14%
1/19/2007	9%	19%	11%	1%
2/18/2007				
5/11/2007	4%	7%	5%	5%
6/19/2007				
7/13/2007				
8/15/2007	4%	7%	5%	
9/16/2007	9%	19%	13%	7%
10/14/2007				
11/10/2007	3%	2%	11%	14%
12/9/2007	4%	5%		6%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004				33%		37%
5/19/2004				ndd		
6/16/2004				ndd		
7/13/2004	43%			ndd		67%
8/26/2004				123%		
9/15/2004				70%		ndd
10/15/2004				49%		
1/26/2005						ndd
3/17/2005		ndd			ndd	
5/2/2005	ndd				2%	35%
6/1/2005	8%				2%	31%
7/9/2005						
7/10/2005						
8/15/2005	ndd				1%	
9/12/2005					6%	
10/27/2005						ndd
2/9/2006	13%				13%	
3/15/2006	ndd		105%			
5/22/2006	ndd					
6/19/2006	ndd				2%	ndd
7/24/2006					3%	
8/16/2006	ndd				2%	
9/13/2006	ndd				3%	
11/1/2006	ndd					ndd
12/11/2006	60%				14%	ndd
1/19/2007						ndd
2/18/2007	ndd	12%		5%	10%	ndd
5/11/2007	ndd			ndd	6%	ndd
6/19/2007						
7/13/2007						
8/15/2007					7%	
9/16/2007	30%				6%	35%
10/14/2007	26%				2%	
11/10/2007	51%				5%	156%
12/9/2007	35%					

South Fork Koktuli tributary: Stream monitoring site SK-133A



SK133A

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Nov 2007, Dec 2007
Alkalinity correlates poorly with hardness	Nov 2007

Potential outliers, outside pattern,

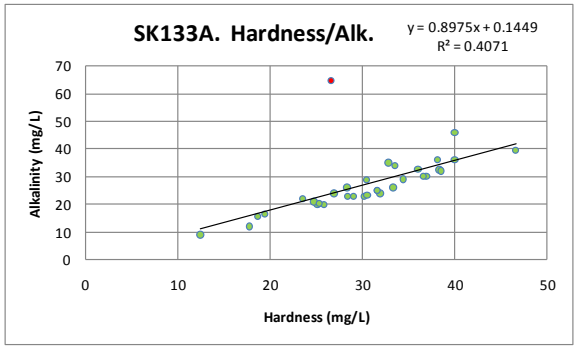
TSS, aluminum	May 2006, Aug 2007
antimony	May 2004, Aug 2005
arsenic	July 2004
copper, iron, manganese	May 2006
lead	June 2006
molybdenum	July 2004
tin	May 2004
zinc	Sept 2004, Oct 2004, July 2005, May 2006

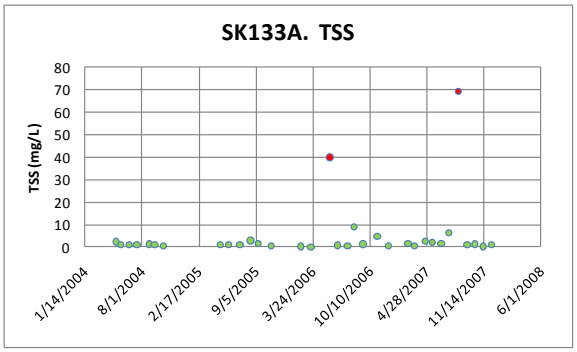
Elements reported as below MDL but appears to be above MRL

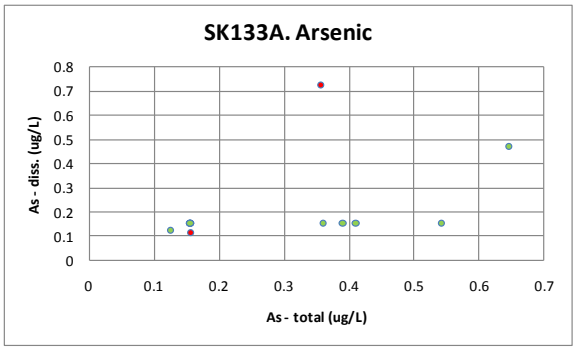
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
arsenic	May 2005

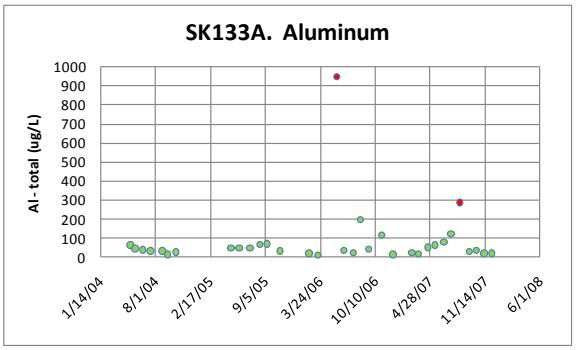
Elements reported as above MRL but appear to be below MDL

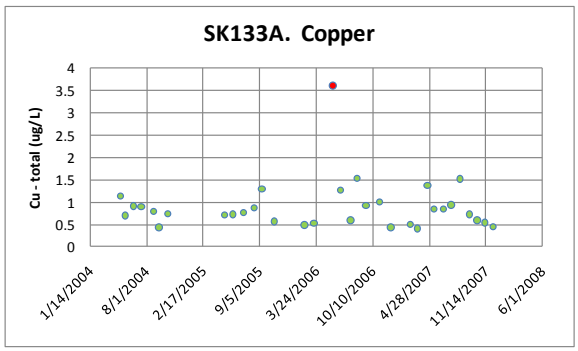
selenium, vanadium	May 2005

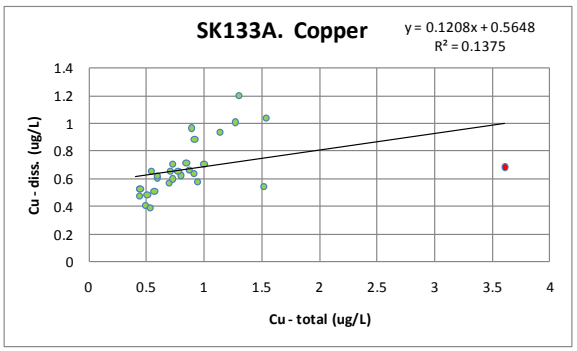

SK133A. Hardness/Alk.
y = 0.8975x + 0.1449
R² = 0.4071
Alkalinity (mg/L)
Hardness (mg/L)

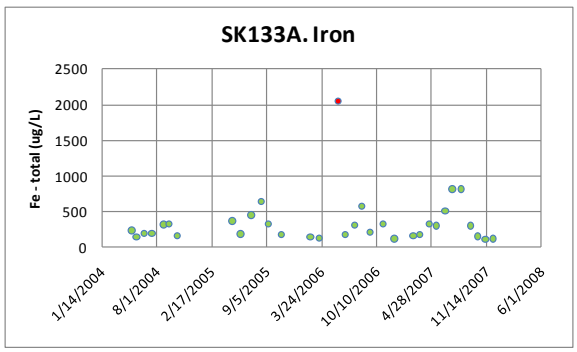

SK133A. TSS
TSS (mg/L)

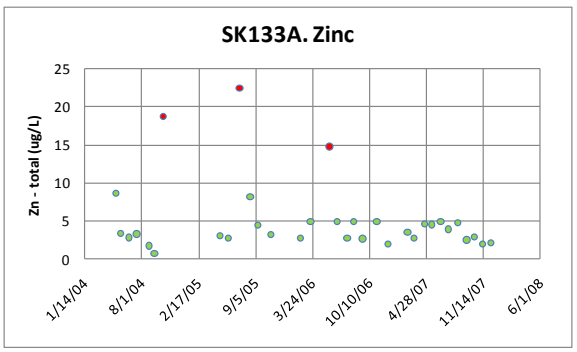

SK133A. Arsenic
As - diss. (ug/L)
As - total (ug/L)


SK133A. Aluminum
Al - total (ug/L)


SK133A. Copper
Cu - total (ug/L)


SK133A. Copper
y = 0.1208x + 0.5648
R² = 0.1375
Cu - diss. (ug/L)
Cu - total (ug/L)


SK133A. Iron
Fe - total (ug/L)


SK133A. Zinc
Zn - total (ug/L)

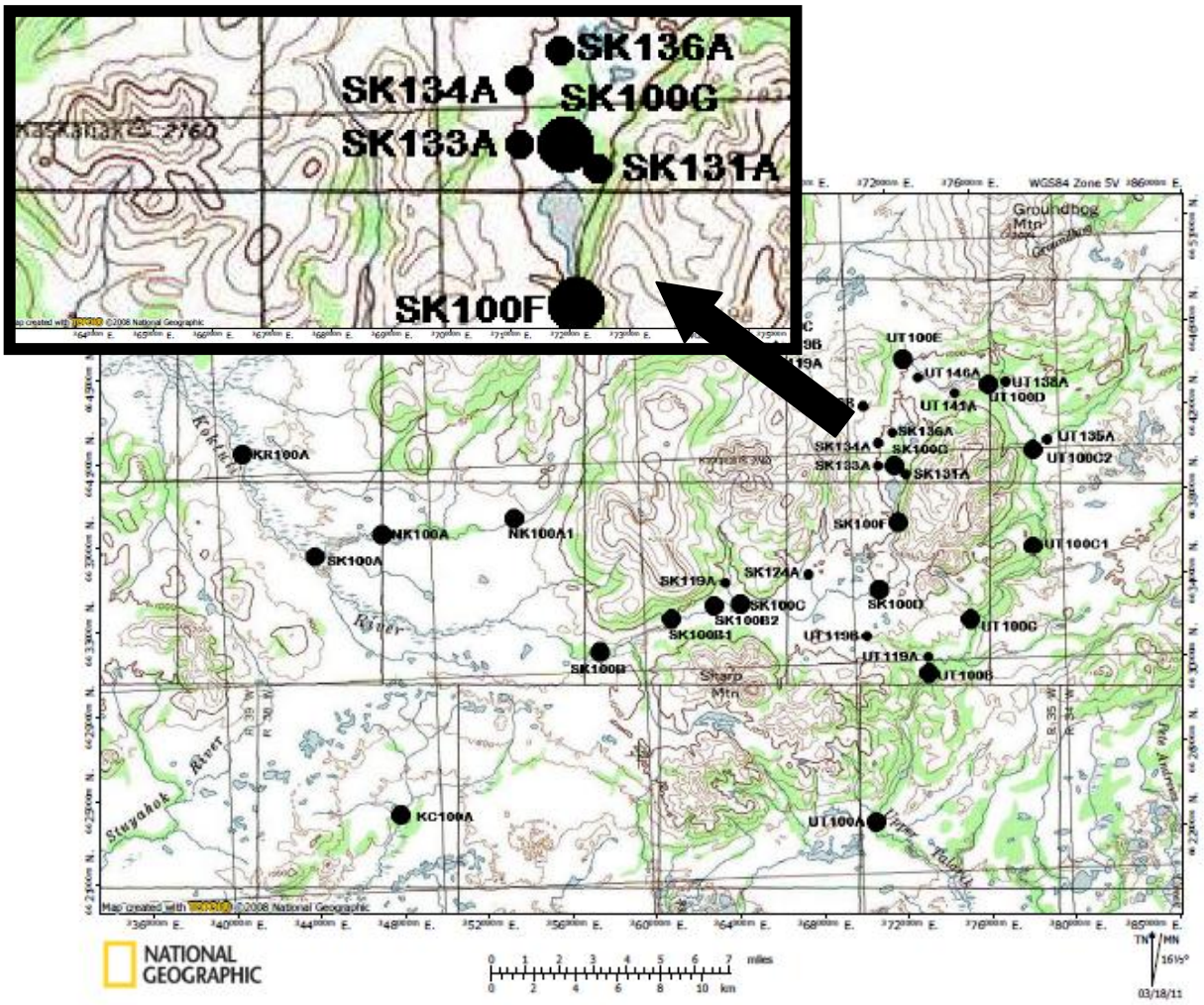
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				
5/19/2004				4%
6/16/2004	5%	4%	5%	4%
7/13/2004	1%	2%	1%	1%
8/26/2004				
9/14/2004		4%	7%	6%
10/15/2004				
5/3/2005	3%	4%	1%	8%
6/1/2005				3%
7/10/2005				
8/16/2005				
9/12/2005			1%	
10/27/2005	1%		2%	
2/10/2006				
3/16/2006				
5/22/2006				
6/19/2006	1%	2%	5%	3%
7/23/2006		1%		4%
8/16/2006				3%
9/15/2006				
11/4/2006		1%		5%
12/13/2006	16%			
2/20/2007		2%	4%	1%
3/16/2007		2%	14%	9%
4/21/2007		1%		
5/15/2007				
6/17/2007				
7/13/2007	4%	7%	6%	9%
8/15/2007				
9/16/2007		0%	5%	3%
10/14/2007	6%	7%	10%	8%
11/10/2007	15%	11%		13%
12/9/2007	7%	10%	14%	11%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004					33%	
5/19/2004						
6/16/2004				14%		8%
7/13/2004	8%				75%	ndd
8/26/2004						
9/14/2004	19%				23%	94%
10/15/2004	ndd					ndd
5/3/2005					6%	ndd
6/1/2005						13%
7/10/2005					16%	
8/16/2005						
9/12/2005						
10/27/2005						
2/10/2006					2%	6%
3/16/2006					3%	
5/22/2006						
6/19/2006					4%	
7/23/2006	2%					ndd
8/16/2006					3%	
9/15/2006						3%
11/4/2006						
12/13/2006	8%				ndd	ndd
2/20/2007						9%
3/16/2007	ndd					ndd
4/21/2007	ndd			12%		ndd
5/15/2007	ndd					
6/17/2007						
7/13/2007					1%	
8/15/2007						
9/16/2007					1%	4%
10/14/2007	4%				12%	
11/10/2007	19%				11%	
12/9/2007	17%				14%	

South Fork Koktuli tributary: Stream monitoring site SK-134A



SK134A

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	July 2006, April 2007, Nov 2007
Iron RPD greater than 20%	March 2005

Potential outliers, outside pattern

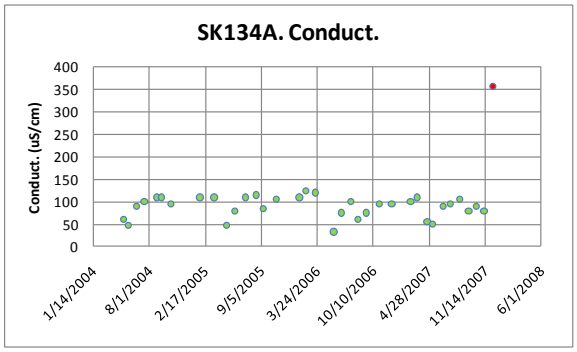
conductivity	Dec 2007
TSS, aluminum, iron, manganese, copper, vanadium	May 2006
iron	March 2005, July 2007
manganese	July 2007

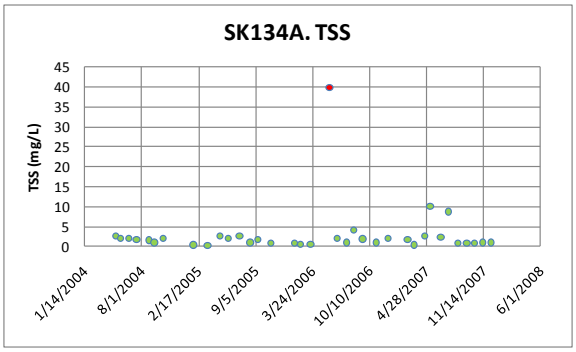
Elements reported as below MDL but appears to be above MRL

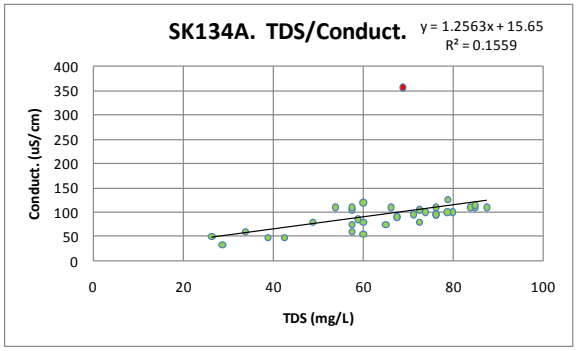
aluminum	June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, Aug 2004

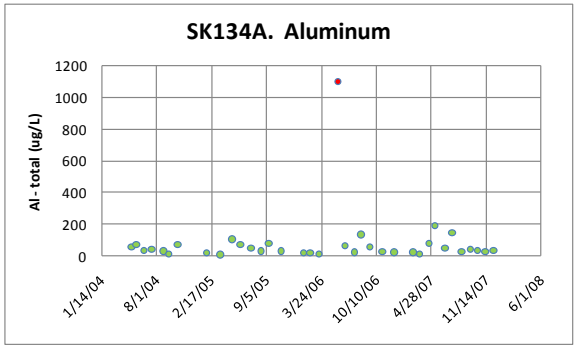
Elements reported as above MRL but appear to be below MDL

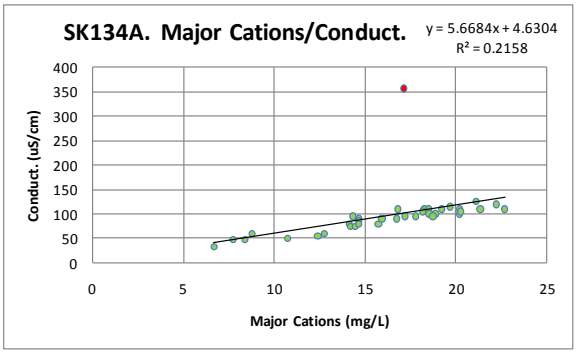
arsenic, vanadium	March 2005, May 2005
selenium	May 2005

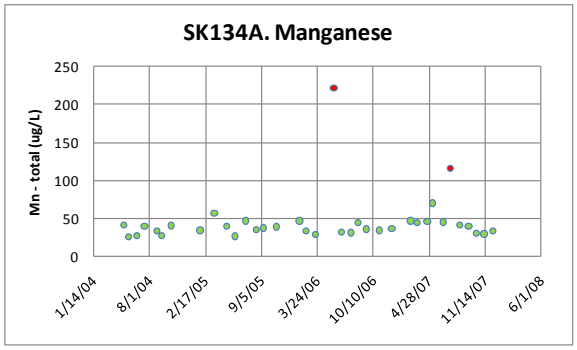

SK134A. Conduct.
Conduct. (uS/cm)
400
350
300
250
200
150
100
50
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

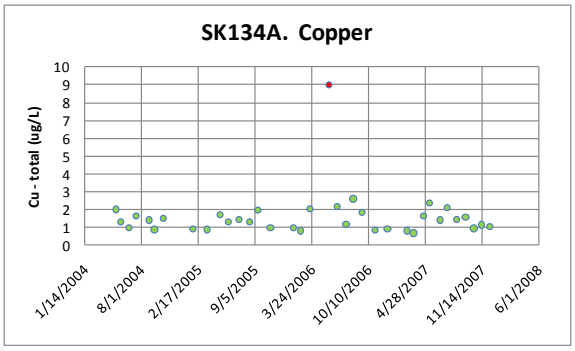

SK134A. TSS
TSS (mg/L)
45
40
35
30
25
20
15
10
5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

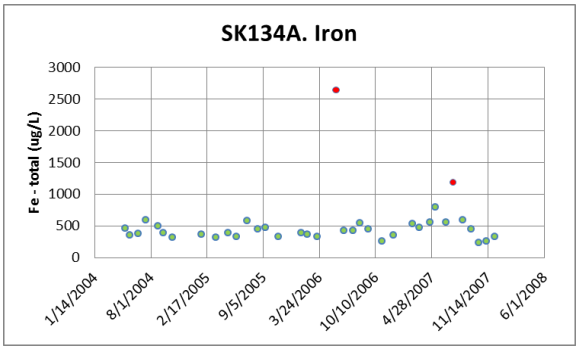

SK134A. TDS/Conduct.
y = 1.2563x + 15.65
R² = 0.1559
Conduct. (uS/cm)
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
TDS (mg/L)


SK134A. Aluminum
Al - total (ug/L)
1200
1000
800
600
400
200
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK134A. Major Cations/Conduct.
y = 5.6684x + 4.6304
R² = 0.2158
Conduct. (uS/cm)
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
Major Cations (mg/L)


SK134A. Manganese
Mn - total (ug/L)
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


SK134A. Copper
Cu - total (ug/L)
10
9
8
7
6
5
4
3
2
1
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


SK134A. Iron
Fe - total (ug/L)
3000
2500
2000
1500
1000
500
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

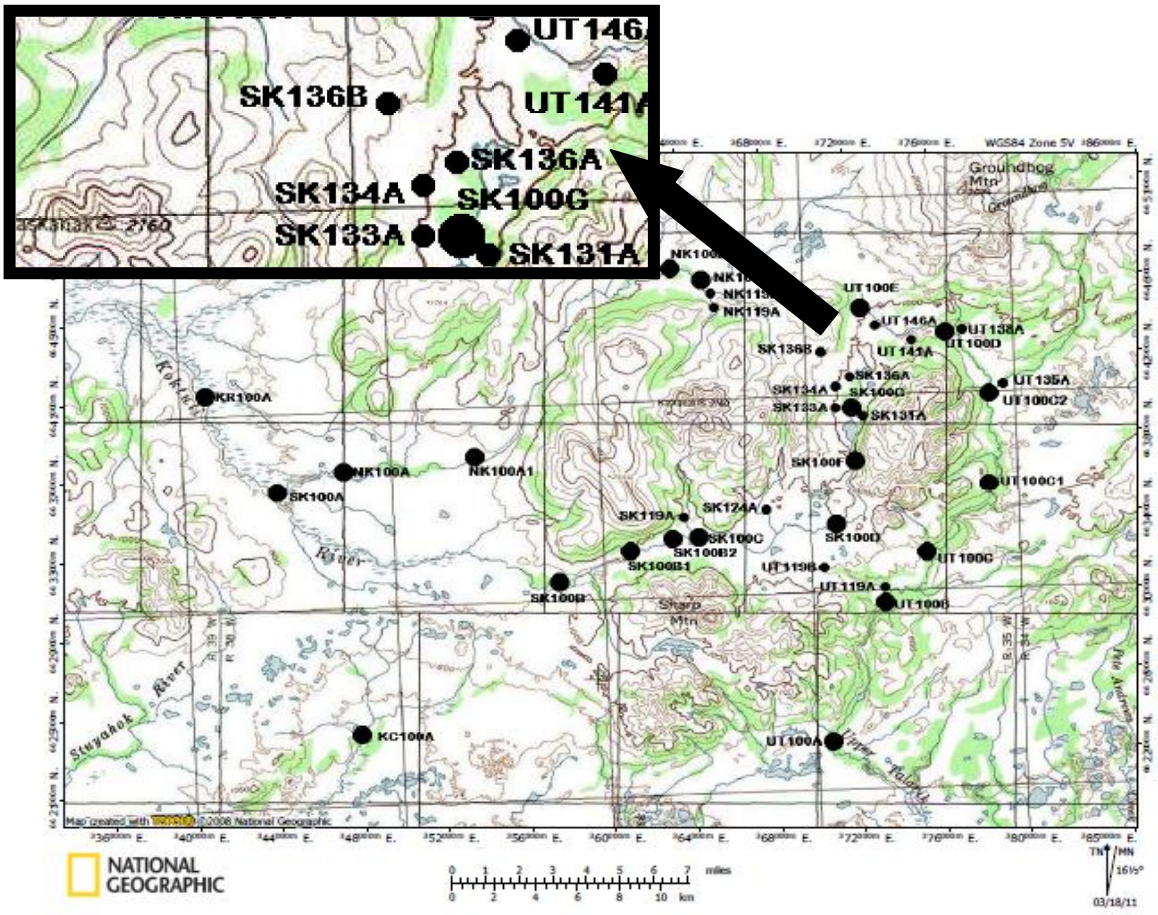
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004		5%	1%	5%
5/18/2004	9%	9%	8%	11%
6/16/2004	3%	4%	4%	4%
7/13/2004			1%	
8/26/2004		0%		
9/14/2004	16%	4%	6%	5%
10/16/2004		3%	4%	
1/29/2005			0%	
3/20/2005				
5/3/2005	3%	1%	2%	
6/1/2005				
7/10/2005	6%	10%	7%	11%
8/16/2005	2%	14%	6%	18%
9/13/2005	2%	4%	2%	5%
10/28/2005	5%	7%	8%	9%
1/18/2006				4%
2/10/2006				
3/16/2006		1%		4%
5/22/2006				
6/19/2006	3%	2%	3%	
7/22/2006	15%	10%	15%	11%
8/15/2006		4%		7%
9/15/2006				
11/1/2006			11%	
12/14/2006				
2/20/2007	7%	4%		9%
3/16/2007	6%	9%	10%	8%
4/21/2007	10%	11%	11%	10%
5/10/2007				
6/17/2007		0%	4%	0%
7/13/2007		3%	2%	3%
8/16/2007				
9/16/2007				
10/14/2007				
11/10/2007	12%	12%	17%	17%
12/10/2007	3%	3%	7%	2%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004						26%
5/18/2004					5%	15%
6/16/2004					11%	
7/13/2004					2%	
8/26/2004						
9/14/2004					12%	
10/16/2004					6%	
1/29/2005						
3/20/2005		ndd	35%		6%	
5/3/2005					1%	47%
6/1/2005						
7/10/2005					8%	
8/16/2005					ndd	40%
9/13/2005						ndd
10/28/2005					7%	65%
1/18/2006						ndd
2/10/2006						
3/16/2006					8%	
5/22/2006						
6/19/2006						
7/22/2006					13%	
8/15/2006						15%
9/15/2006						
11/1/2006	ndd					ndd
12/14/2006					19%	ndd
2/20/2007	ndd				3%	ndd
3/16/2007	ndd			2%	1%	27%
4/21/2007	ndd				9%	ndd
5/10/2007						ndd
6/17/2007						
7/13/2007						
8/16/2007						
9/16/2007						39%
10/14/2007						105%
11/10/2007	4%			3%	12%	102%
12/10/2007					1%	

South Fork Koktuli tributary: Stream monitoring site SK-136A



SK136A

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Jan 2006

Potential outliers, outside pattern

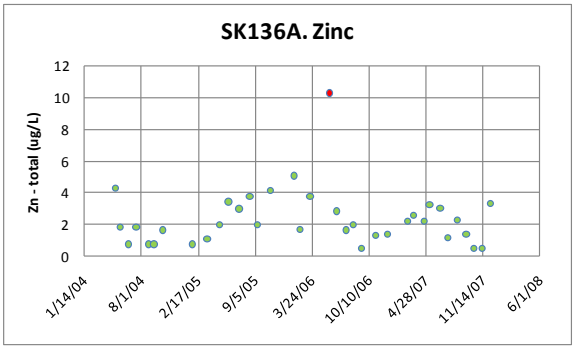
antimony	June 2004
selenium, tin	Dec 2006
zinc	May 2006

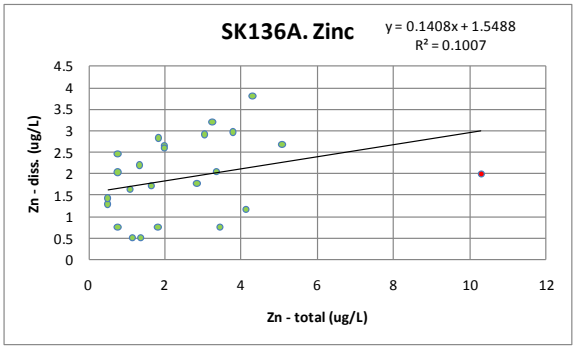
Elements reported as below MDL but appears to be above MRL

aluminum	June 2004, Sept 2004, Oct 2004
antimony	May 2004, June 2004, July 2004, May 2005

Elements reported as above MRL but appear to be below MDL

arsenic, selenium, vanadium	March 2005, May 2005





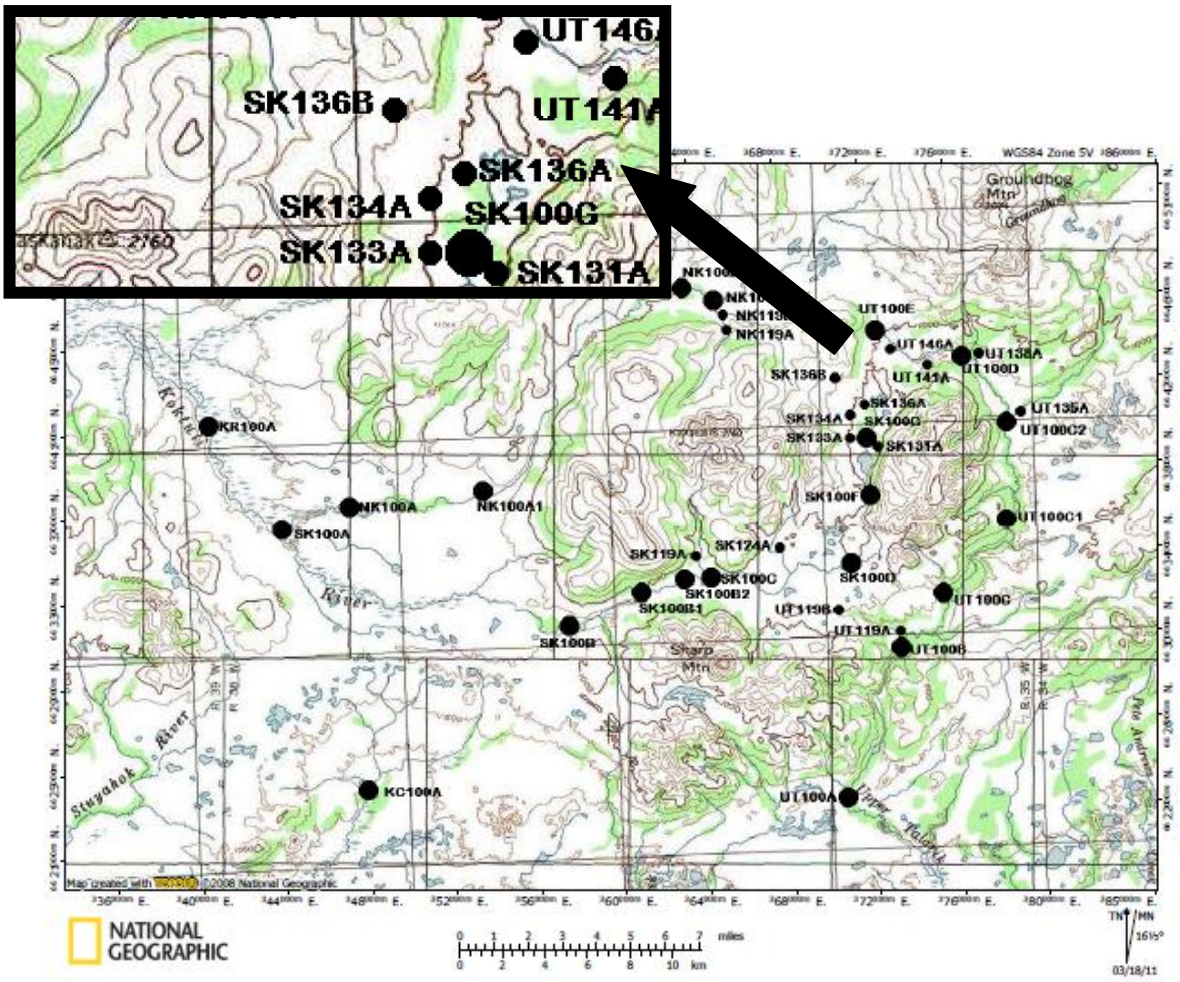
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				
5/18/2004	0%			
6/16/2004				
7/13/2004		2%		2%
8/25/2004		0%		
9/14/2004				
10/16/2004	2%	1%	1%	4%
1/27/2005		0%	2%	1%
3/20/2005				
5/3/2005	0%	1%		
6/2/2005				0%
7/10/2005	6%	7%	9%	9%
8/16/2005	1%		0%	2%
9/12/2005				
10/28/2005				
1/18/2006	10%	7%	14%	10%
2/10/2006	7%	1%	7%	2%
3/16/2006				
5/23/2006				1%
6/19/2006	1%	1%	3%	2%
7/22/2006	7%	7%	8%	11%
8/15/2006			1%	
9/13/2006				0%
11/3/2006	4%	4%	3%	3%
12/14/2006		1%		4%
2/21/2007	11%	6%	9%	7%
3/16/2007	6%	9%	7%	7%
4/21/2007	0%		2%	2%
5/10/2007		1%	2%	3%
6/17/2007				
7/13/2007				
8/16/2007			1%	
9/16/2007	2%		4%	
10/14/2007	6%	7%	7%	6%
11/10/2007	7%	7%	11%	6%
12/9/2007	2%	4%	8%	6%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004						
5/18/2004						43%
6/16/2004						107%
7/13/2004					9%	
8/25/2004						
9/14/2004						
10/16/2004						4%
1/27/2005					2%	92%
3/20/2005					10%	41%
5/3/2005						28%
6/2/2005						
7/10/2005					4%	ndd
8/16/2005						
9/12/2005						27%
10/28/2005					7%	
1/18/2006				6%	13%	
2/10/2006				4%	5%	ndd
3/16/2006					15%	ndd
5/23/2006						
6/19/2006						
7/22/2006					8%	ndd
8/15/2006						ndd
9/13/2006					3%	88%
11/3/2006						50%
12/14/2006						
2/21/2007					12%	ndd
3/16/2007					4%	ndd
4/21/2007						ndd
5/10/2007						
6/17/2007						
7/13/2007						
8/16/2007						ndd
9/16/2007						ndd
10/14/2007					7%	96%
11/10/2007						ndd
12/9/2007					1%	

South Fork Koktuli tributary: Stream monitoring site SK-136B



SK136B

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	Jan 2006, Feb 2007
Manganese RPD at 20%	March 2005

Potential outliers, outside pattern

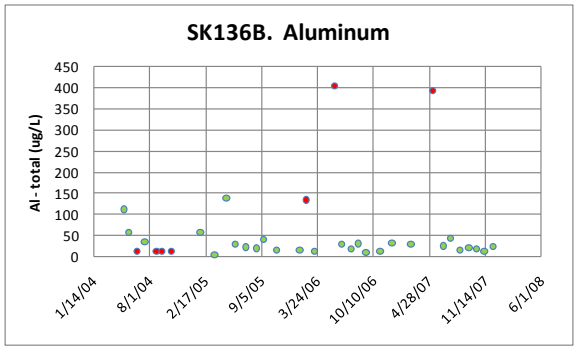
aluminum	Feb 2006, May 2006, May 2007
antimony	June 2004
copper	Jan 2005
lead	Aug 2006
zinc	July 2005, Dec 2007

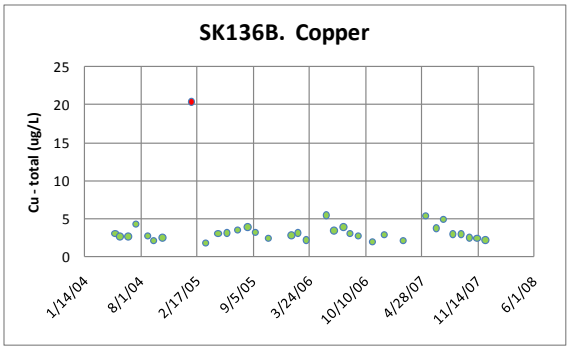
Elements reported as below MDL but appear to be above MRL

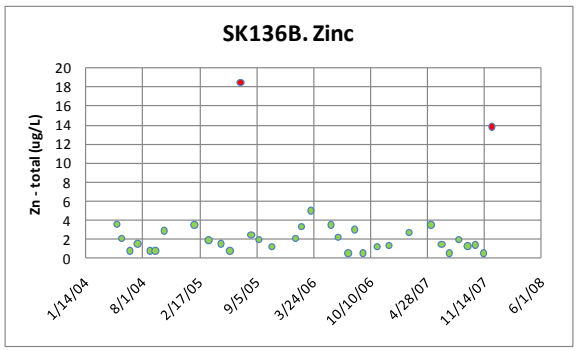
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, July 2004

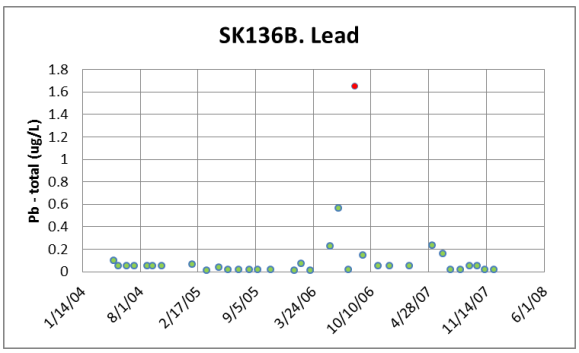
Elements reported as above MRL but appear to be below MDL

arsenic, vanadium	March 2005, May 2005





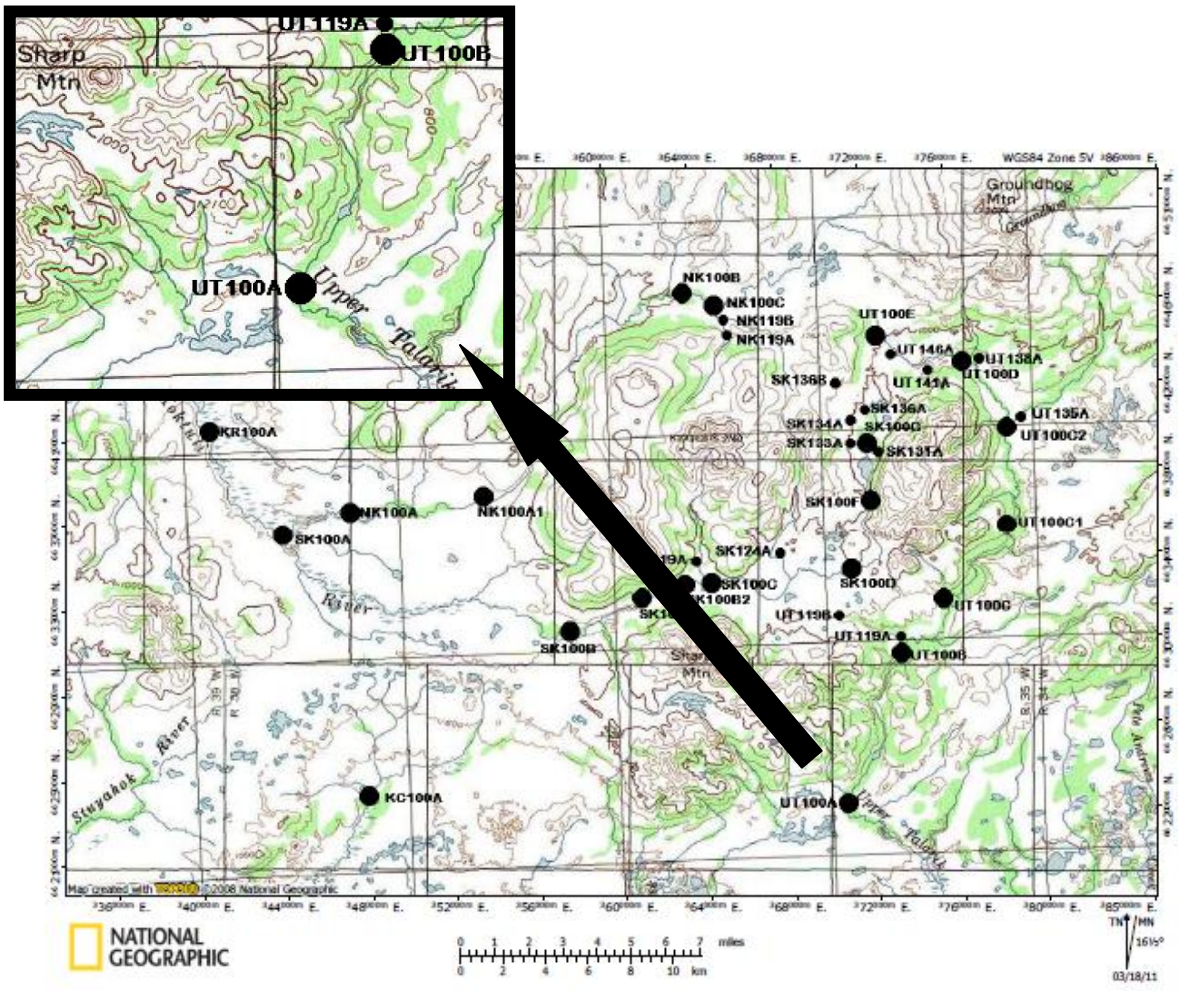




Major Cations				
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				
5/18/2004				2%
6/16/2004				
7/13/2004		2%		1%
8/25/2004	0%	1%	5%	
9/14/2004		1%	2%	3%
10/16/2004				
1/29/2005	3%	1%	2%	3%
3/20/2005	15%	3%	16%	2%
5/2/2005		3%		3%
6/2/2005		1%		1%
7/10/2005	1%	0%	1%	2%
8/16/2005			4%	2%
9/12/2005				
10/28/2005		2%		5%
1/18/2006	13%	10%	15%	12%
2/10/2006				
3/13/2006				
5/23/2006		2%		13%
6/19/2006				
7/23/2006				
8/15/2006				
9/13/2006				
11/3/2006	4%	9%	4%	8%
12/14/2006				
2/21/2007	15%	7%	19%	8%
5/10/2007				
6/17/2007	3%	3%	2%	3%
7/13/2007		1%	3%	
8/16/2007	1%	1%	3%	2%
9/16/2007	0%		3%	
10/14/2007				
11/10/2007	4%	4%	7%	1%
12/10/2007			5%	

Trace Metals						
	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004					20%	
5/18/2004	5%			6%		
6/16/2004				13%		94%
7/13/2004					23%	
8/25/2004						
9/14/2004					1%	
10/16/2004						
1/29/2005						29%
3/20/2005	ndd	ndd	ndd	20%	12%	
5/2/2005						37%
6/2/2005						
7/10/2005						8%
8/16/2005						38%
9/12/2005						33%
10/28/2005					ndd	ndd
1/18/2006					11%	ndd
2/10/2006						
3/13/2006					4%	1%
5/23/2006					ndd	ndd
6/19/2006	ndd					ndd
7/23/2006						ndd
8/15/2006						
9/13/2006						78%
11/3/2006						ndd
12/14/2006						ndd
2/21/2007				3%	13%	ndd
5/10/2007						
6/17/2007						23%
7/13/2007						
8/16/2007						ndd
9/16/2007						39%
10/14/2007						25%
11/10/2007						106%
12/10/2007						

Upper Talarik Creek main stem: Stream monitoring site UT-100A (furthest downstream)



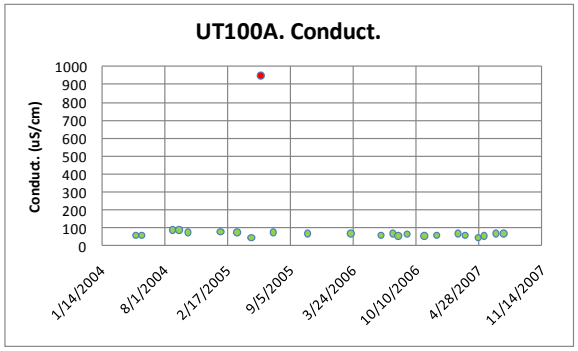
UT100A

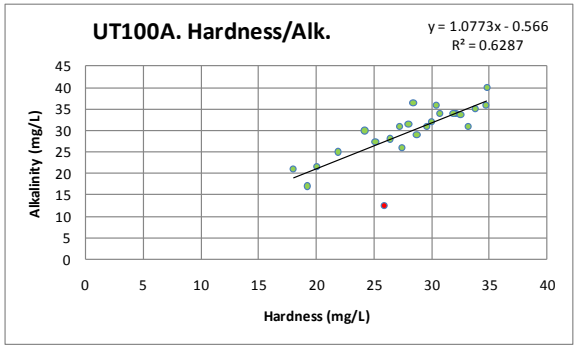
Potential outliers, outside pattern

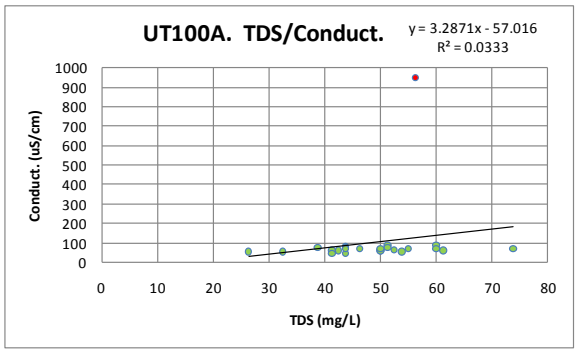
conductivity, alkalinity	June 2005
aluminum, copper	May 2004
potassium, vanadium	April 2007

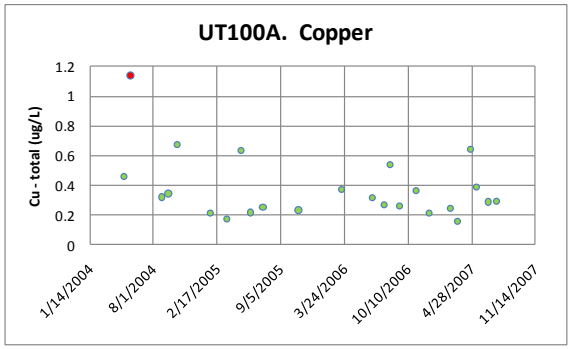
Elements reported as below MDL but appear to be above MRL

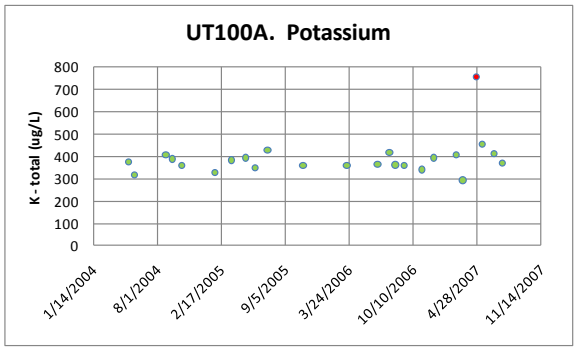
aluminum	May 2004, Aug 2004, Sept 2004, Oct 2004
antimony, molybdenum	May 2004, Aug 2004

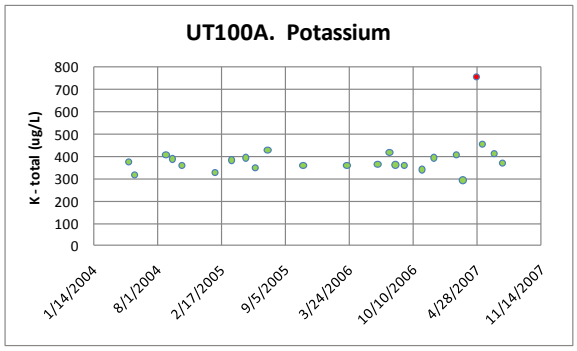

UT100A. Conduct.
Conduct. (uS/cm)
1000
900
800
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007

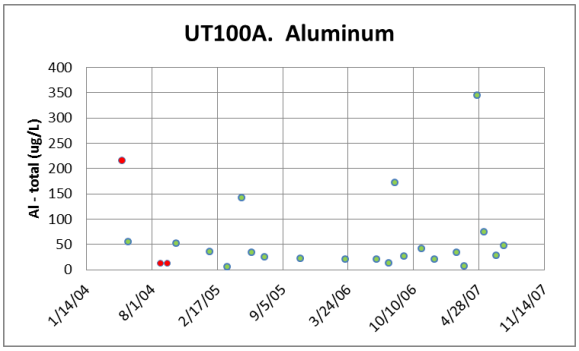

UT100A. Hardness/Alk.
y = 1.0773x - 0.566
R² = 0.6287
Alkalinity (mg/L)
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40
Hardness (mg/L)

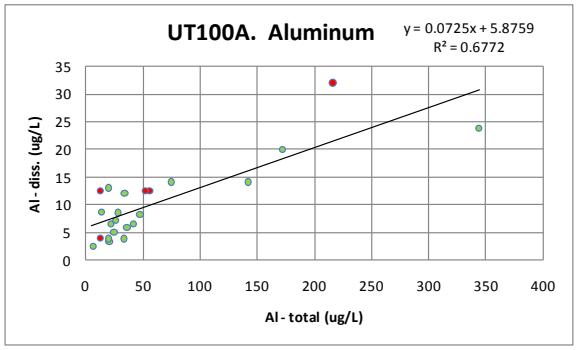

UT100A. TDS/Conduct.
y = 3.2871x - 57.016
R² = 0.0333
Conduct. (uS/cm)
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
TDS (mg/L)


UT100A. Copper
Cu - total (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007


UT100A. Potassium
K - total (ug/L)
800
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007


UT100A. Potassium
K - total (ug/L)
800
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007


UT100A. Aluminum
Al - total (ug/L)
400
350
300
250
200
150
100
50
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07


UT100A. Aluminum
y = 0.0725x + 5.8759
R² = 0.6772
Al - diss. (ug/L)
35
30
25
20
15
10
5
0
0
50
100
150
200
250
300
350
400
Al - total (ug/L)

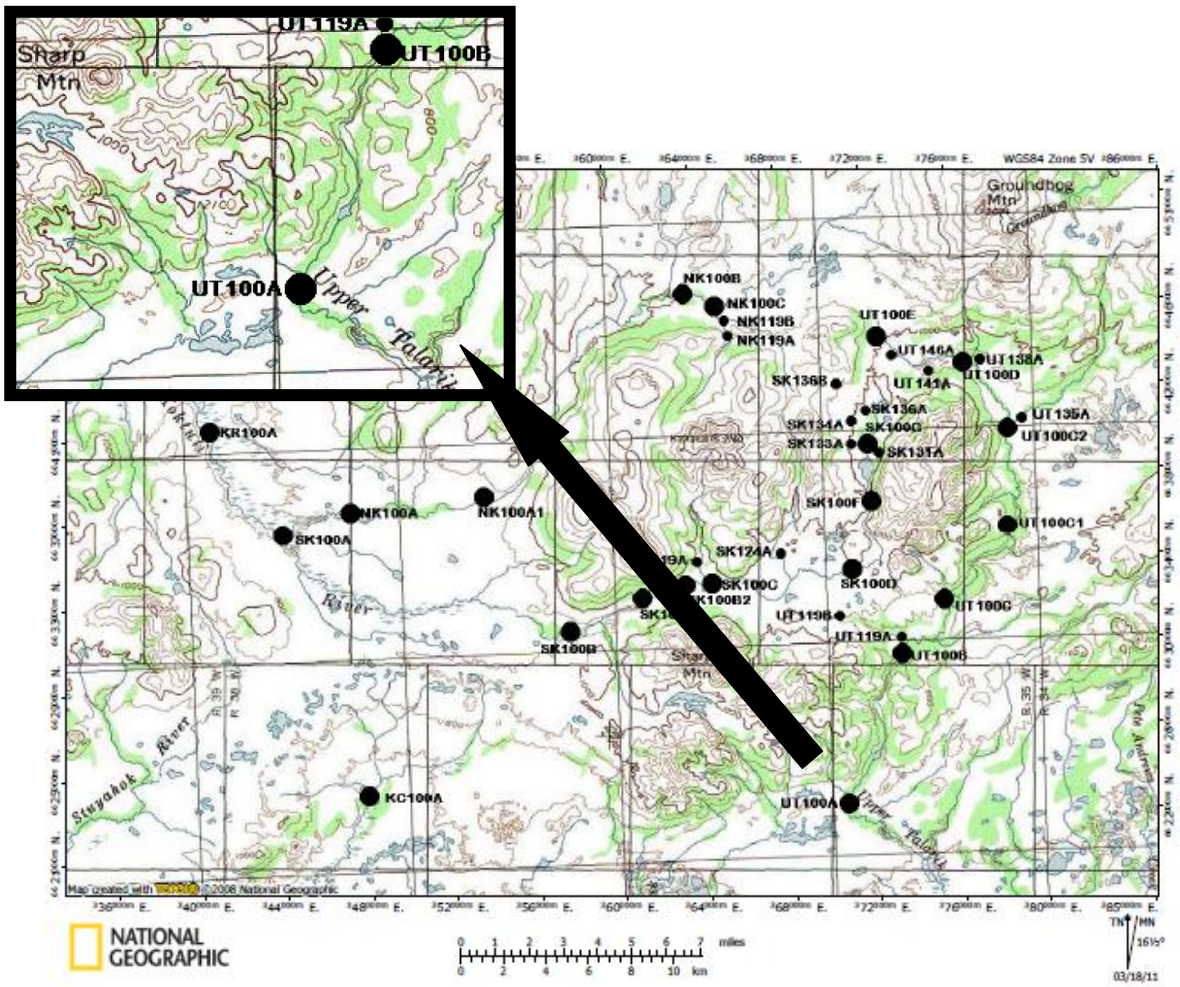
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				1%
5/20/2004				
8/26/2004	4%	2%	4%	
9/16/2004				1%
10/15/2004				
1/26/2005				
3/19/2005	5%			
5/4/2005				6%
6/3/2005	3%	5%	5%	4%
7/11/2005				
10/30/2005		2%		2%
3/16/2006				
6/20/2006				
7/27/2006		2%		3%
8/14/2006				
9/12/2006				
11/5/2006				
12/14/2006				
2/20/2007	4%	7%	11%	9%
3/14/2007	12%	2%	2%	0%
4/24/2007				
5/14/2007	1%		0%	
6/20/2007			0%	
7/15/2007			3%	

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004						
5/20/2004					79%	
8/26/2004						
9/16/2004				ndd		
10/15/2004						
1/26/2005						ndd
3/19/2005	ndd	ndd	ndd	ndd	8%	
5/4/2005						ndd
6/3/2005	24%					73%
7/11/2005						
10/30/2005						
3/16/2006						ndd
6/20/2006	6%					
7/27/2006	ndd				5%	ndd
8/14/2006	5%					
9/12/2006	29%					1%
11/5/2006						
12/14/2006	27%					ndd
2/20/2007	17%				6%	ndd
3/14/2007	ndd			ndd	16%	ndd
4/24/2007	ndd				19%	
5/14/2007	ndd				10%	
6/20/2007	ndd					94%
7/15/2007	ndd				5%	

Upper Talarik Creek main stem: Stream monitoring site UT-100B



UT100B

Property-property graphs and RPD tables

Major cation RPD's dissolved consistently over total	March 2006, Jan 2007, Oct 2007
Potassium RPD over 20%	Feb 2007
Zinc RPD over 20%	April 2004, July 2004, Oct 2004, March 2005, Sept 2005, Nov 2006, Feb 2007

Potential outliers, outside pattern

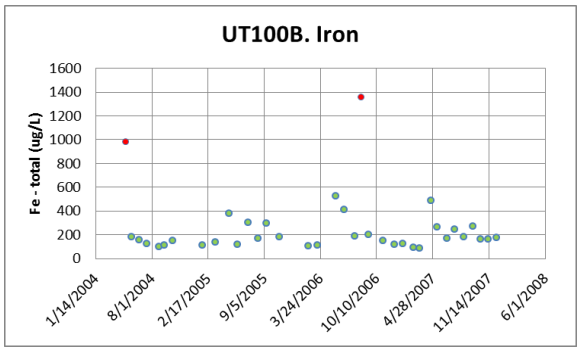
arsenic	Aug 2005, Aug 2006
copper	April 2004
iron	April 2004, Aug 2005, Aug 2006
lead	Feb 2007
manganese	April 2004, May 2005, Aug 2006
vanadium	Aug 2006
zinc	Feb 2006

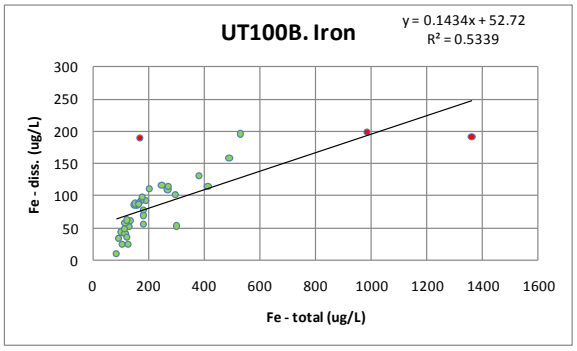
Elements reported as below MDL but appear to be above MRL

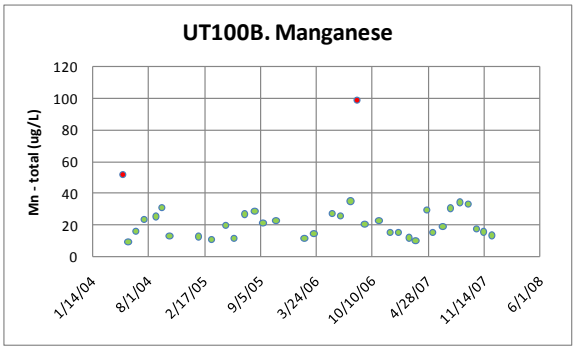
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	July 2004, Aug 2004
molybdenum	April 2004, May 2004, June 2004, July 2004, Aug 2004

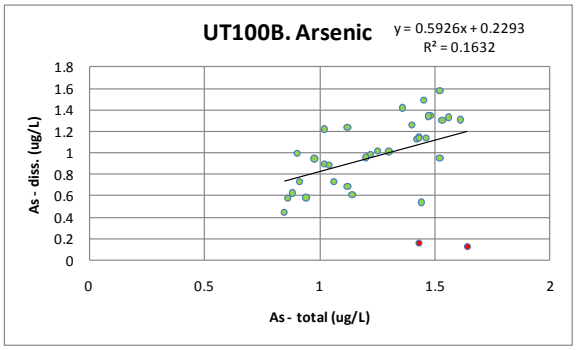
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

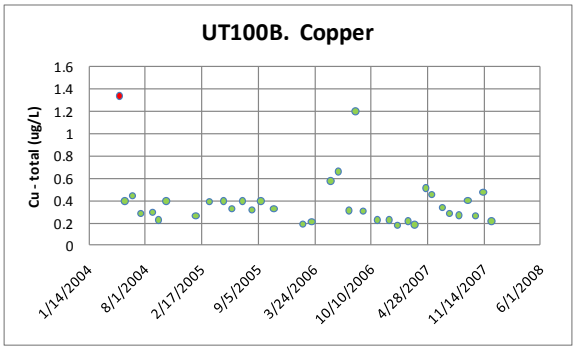
selenium, tin	May 2004

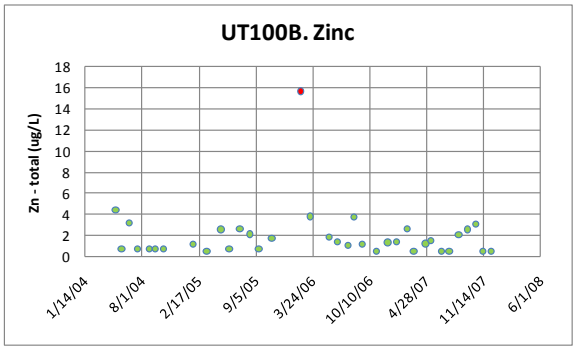

UT100B. Iron
Fe - total (ug/L)
1600
1400
1200
1000
800
600
400
200
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

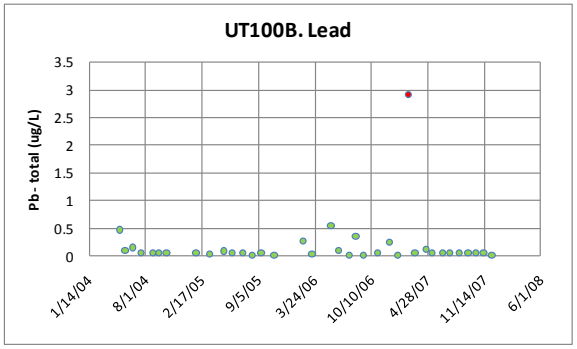

UT100B. Iron
y = 0.1434x + 52.72
R² = 0.5339
Fe - diss. (ug/L)
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400
1600
Fe - total (ug/L)


UT100B. Manganese
Mn - total (ug/L)
120
100
80
60
40
20
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100B. Arsenic
y = 0.5926x + 0.2293
R² = 0.1632
As - diss. (ug/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
As - total (ug/L)


UT100B. Copper
Cu - total (ug/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT100B. Zinc
Zn - total (ug/L)
18
16
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100B. Lead
Pb - total (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

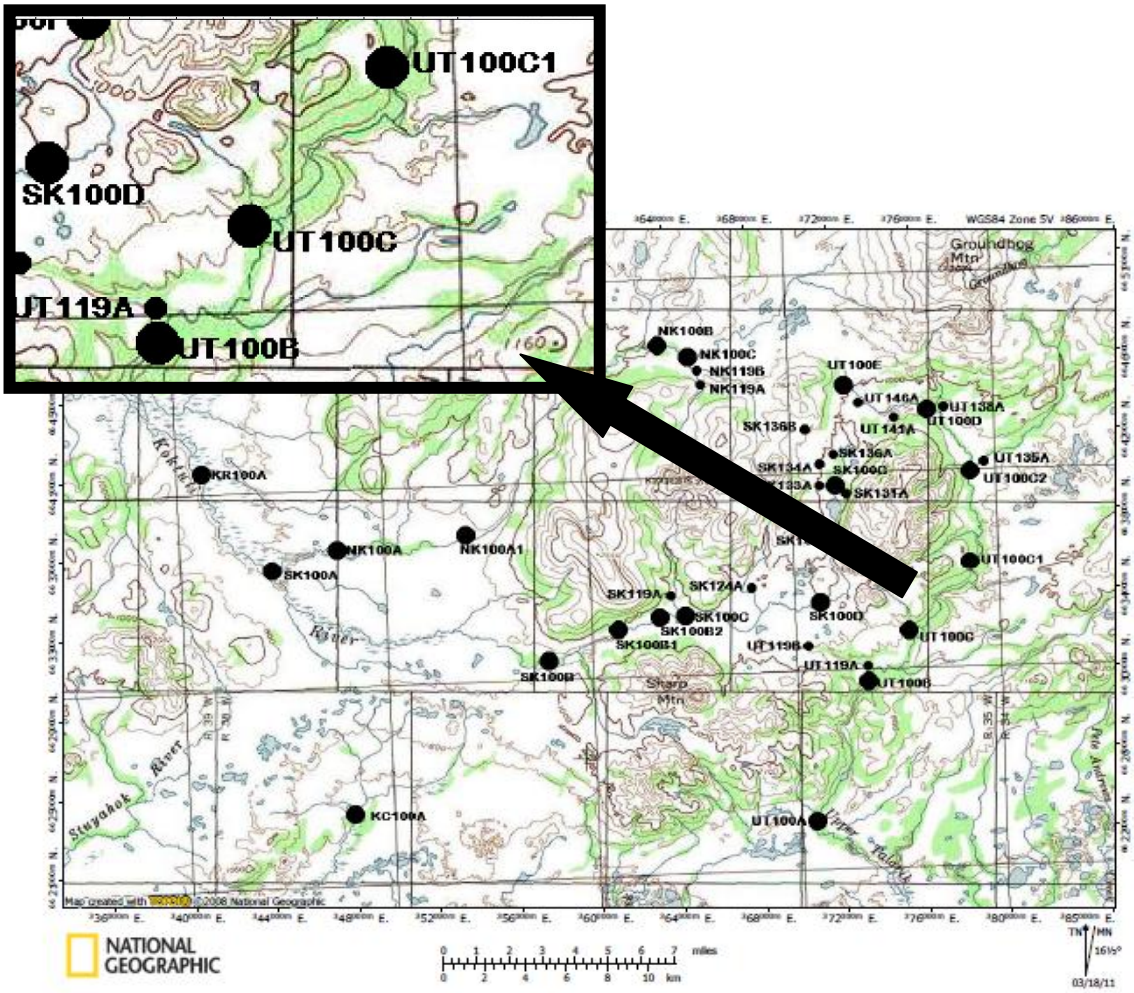
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	3%			
5/20/2004	7%	4%	16%	15%
6/3/2004				
6/17/2004				
7/15/2004		7%	4%	5%
8/15/2004				
8/26/2004	2%	4%	4%	1%
9/16/2004				0%
10/14/2004				
10/15/2004				
1/27/2005				
3/15/2005				
5/4/2005	6%	6%	2%	8%
6/3/2005	3%	5%	6%	3%
7/10/2005				
8/15/2005		10%		9%
9/14/2005				
10/30/2005		3%		4%
2/9/2006		2%		2%
3/14/2006	15%	14%	9%	17%
5/19/2006	5%		3%	9%
6/17/2006				
7/24/2006	7%	2%	10%	9%
8/15/2006				
9/12/2006				
11/2/2006	0%	3%	5%	2%
12/12/2006	4%	7%	6%	8%
1/12/2007	10%	12%	6%	12%
2/19/2007	10%	6%	23%	7%
3/13/2007				
4/23/2007			3%	1%
5/13/2007				
6/19/2007				
7/15/2007				
8/18/2007				
9/18/2007			3%	
10/16/2007	14%	13%		16%
11/11/2007	1%	2%	4%	4%
12/11/2007	2%	4%		5%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004						24%
5/20/2004					86%	
6/3/2004						
6/17/2004	17%			1%	77%	
7/15/2004					88%	77%
8/15/2004						
8/26/2004				8%		
9/16/2004	21%					
10/14/2004	8%				4%	87%
10/15/2004						
1/27/2005					2%	ndd
3/15/2005					ndd	111%
5/4/2005					7%	ndd
6/3/2005						
7/10/2005						ndd
8/15/2005	ndd		13%	ndd	ndd	
9/14/2005	21%					103%
10/30/2005	ndd				ndd	
2/9/2006	19%					
3/14/2006	28%					11%
5/19/2006						ndd
6/17/2006					2%	8%
7/24/2006						ndd
8/15/2006						
9/12/2006	6%				2%	9%
11/2/2006	36%				7%	110%
12/12/2006	23%				11%	ndd
1/12/2007	ndd				17%	ndd
2/19/2007	ndd				14%	31%
3/13/2007	ndd					ndd
4/23/2007	ndd				7%	ndd
5/13/2007	ndd				ndd	ndd
6/19/2007						
7/15/2007						
8/18/2007						
9/18/2007					6%	
10/16/2007	7%				11%	
11/11/2007	ndd				5%	ndd
12/11/2007					8%	ndd

Upper Talarik Creek main stem: Stream monitoring site UT-100C



UT100C

Property-property graphs and RPD tables

Copper RPD greater than 20%	May 2004

Potential outliers, outside pattern

thiocyanate	April 2007
copper	May 2004, Oct 2007
manganese	May 2004

Potential outliers, do not correlate with concentrations upstream and downstream

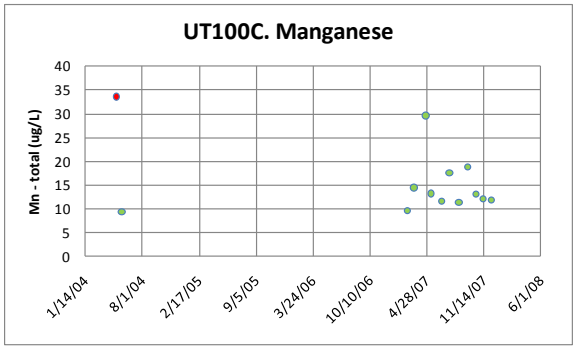
iron	March 2007

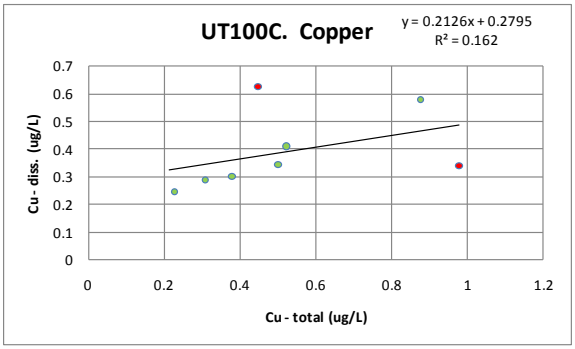
Elements reported as below MDL but appear to be above MRL

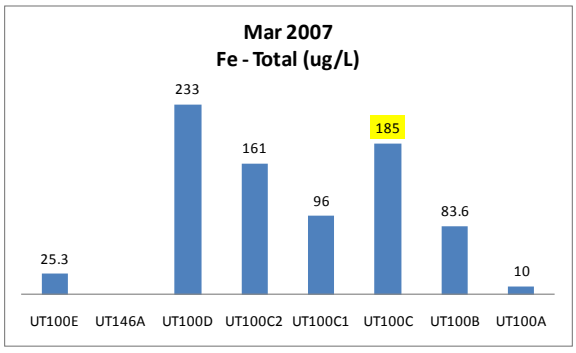
aluminum, antimony, molybdenum	May 2004

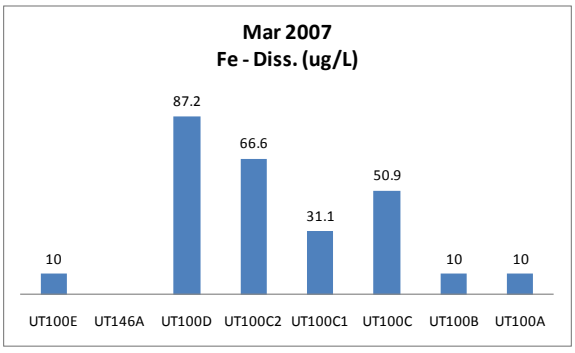
Dissolved fraction reported with different detection limit than total; both reported as below MDL but dissolved reported at higher concentration than total

selenium, tin, zinc	May 2004









March 2007:
Sampling at UT100B, UT00C, and UT100C1 occurred on March 13.
Sampling at UT100A, UT100C2, UT100D, and UT100E occurred on March 14.

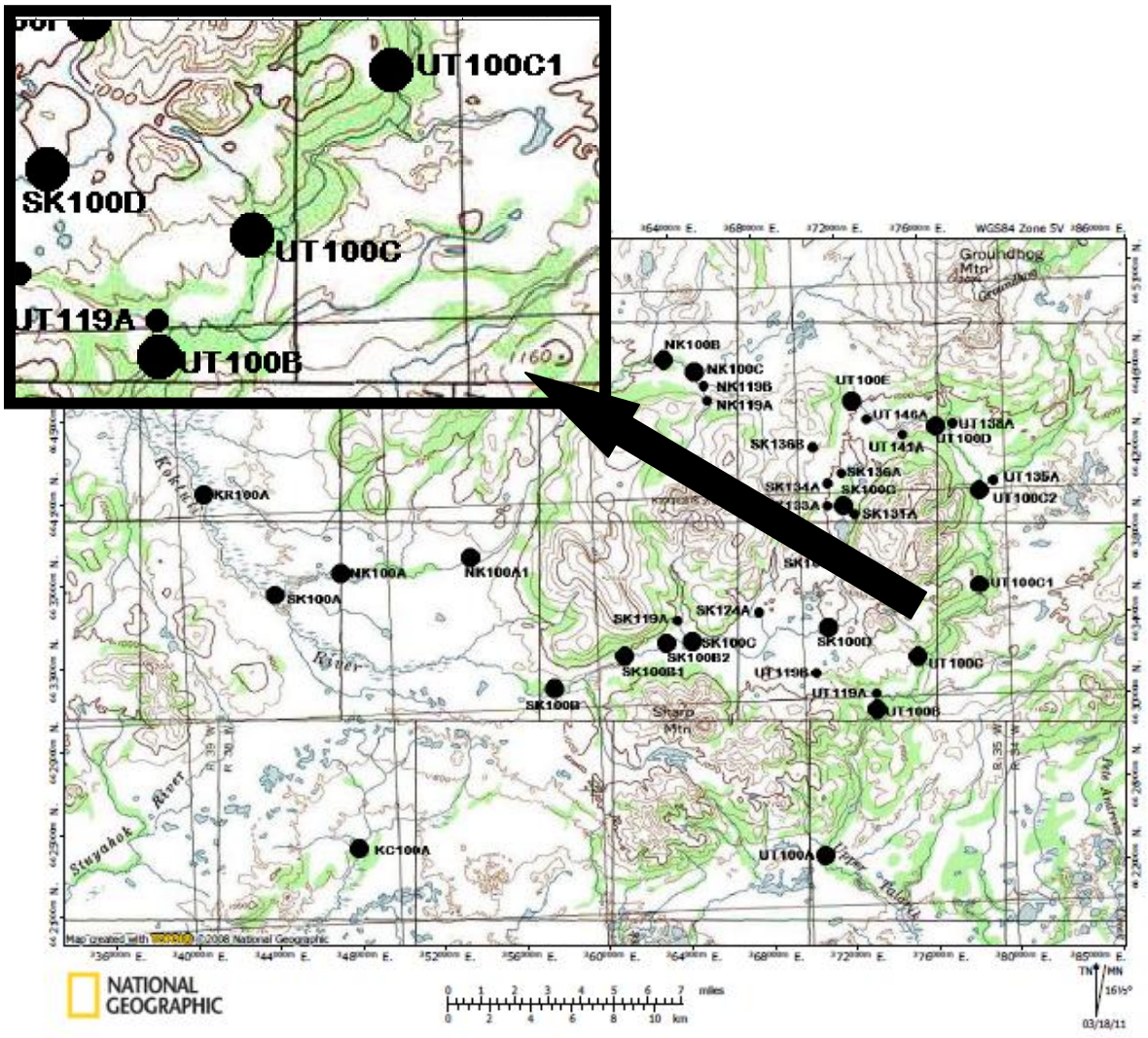
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/2/2004				5%
5/20/2004		1%	2%	11%
6/3/2004				
8/15/2004				
2/19/2007	2%	8%	10%	6%
3/13/2007				
4/23/2007	3%		3%	5%
5/13/2007				0%
6/19/2007				
7/15/2007				
8/18/2007		5%	2%	
9/18/2007	0%	1%	5%	0%
10/16/2007	5%	6%	14%	6%
11/11/2007	3%	6%	7%	8%
12/11/2007	7%	5%	13%	

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/2/2004						
5/20/2004	34%				86%	86%
6/3/2004						
8/15/2004						
2/19/2007	ndd					ndd
3/13/2007	ndd				3%	ndd
4/23/2007	ndd				6%	26%
5/13/2007	ndd				4%	ndd
6/19/2007						
7/15/2007						
8/18/2007	8%					
9/18/2007					4%	
10/16/2007					ndd	
11/11/2007	ndd				9%	54%
12/11/2007					11%	103%

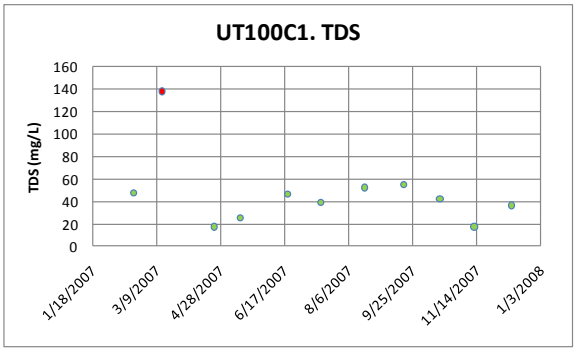
Upper Talarik Creek main stem: Stream monitoring site UT-100C1

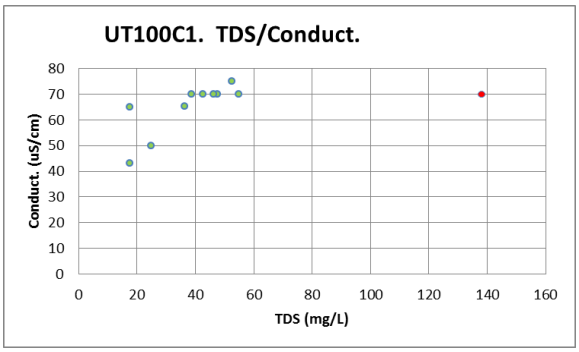


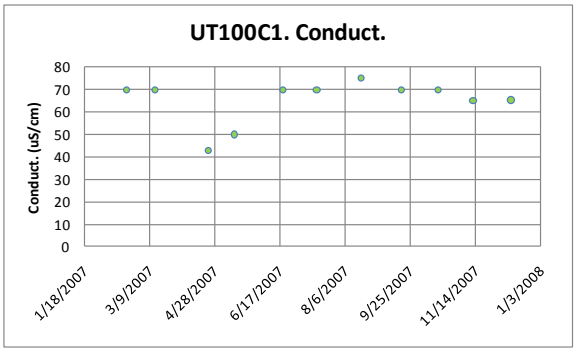
UT100C1 (2007 only)

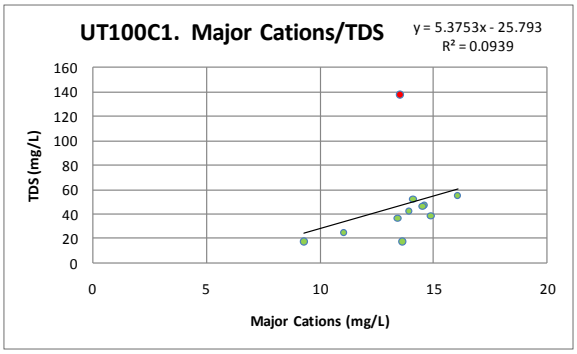
Potential outliers, outside pattern

TDS	March 2007









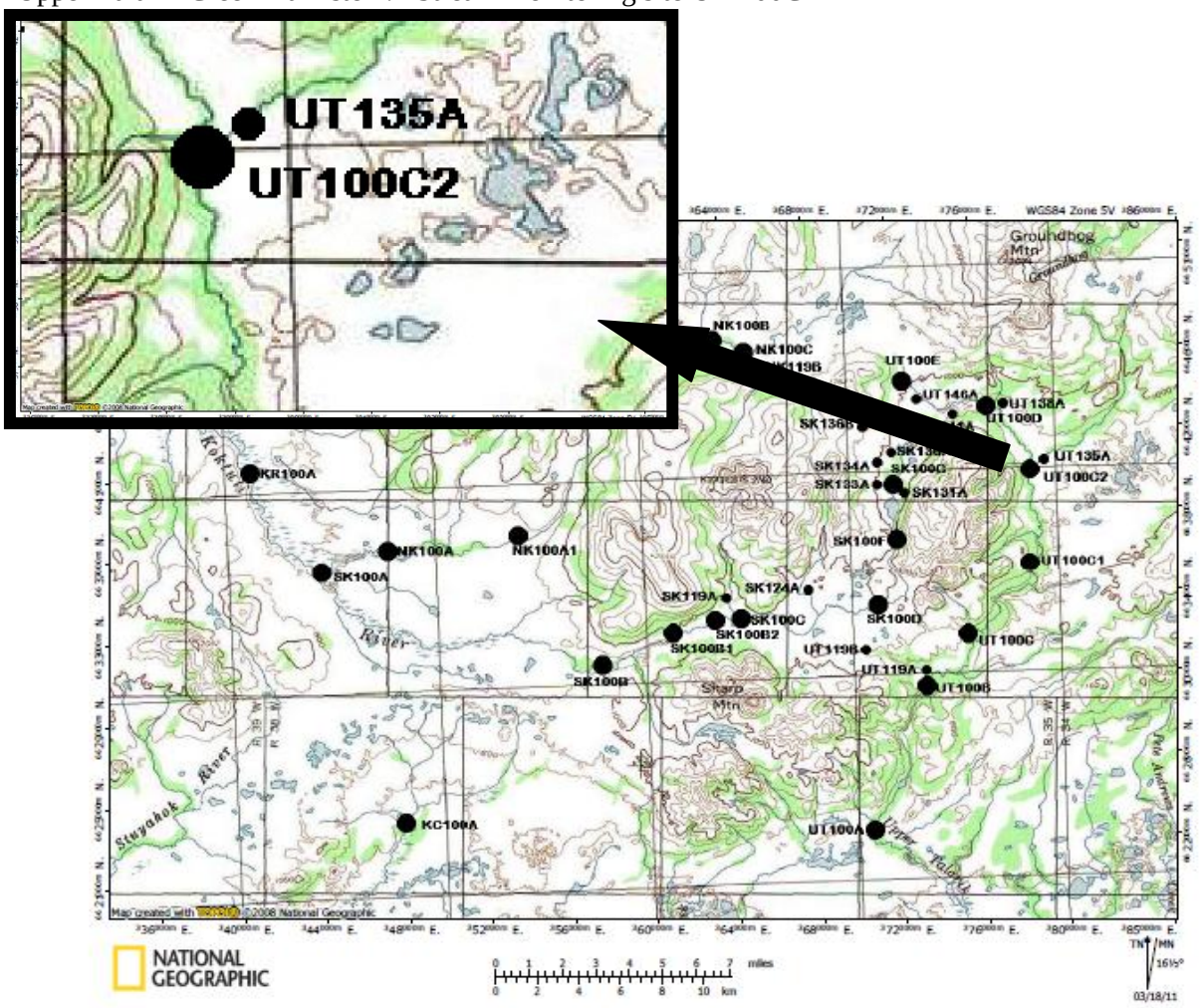
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
2/19/2007	9%	19%		19%
3/13/2007			2%	7%
4/23/2007				
5/13/2007	7%	6%	7%	7%
6/19/2007	3%	9%	11%	7%
7/15/2007			1%	
8/18/2007	6%	5%	11%	6%
9/18/2007				
10/16/2007	6%	4%	15%	6%
11/12/2007	2%	3%	3%	1%
12/11/2007	7%	12%	17%	9%

Trace Elements

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
2/19/2007	8%				7%	ndd
3/13/2007	ndd				1%	ndd
4/23/2007	ndd					ndd
5/13/2007	ndd				9%	ndd
6/19/2007					10%	19%
7/15/2007					2%	
8/18/2007					7%	72%
9/18/2007						
10/16/2007					8%	
11/12/2007					10%	102%
12/11/2007	11%				7%	

Upper Talarik Creek main stem: Stream monitoring site UT-100C2



UT100C2 (2007 only)

Property-property graphs and RPD tables

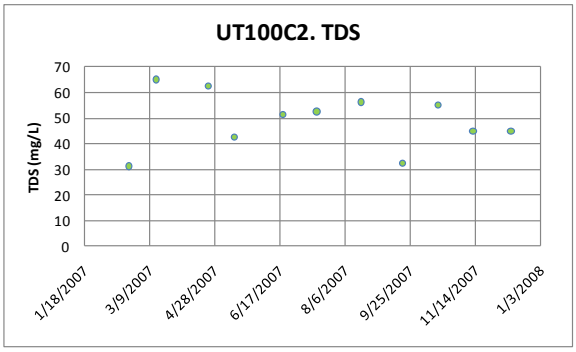
TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	May 2007

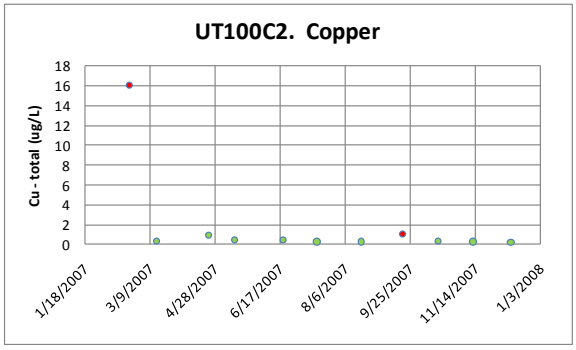
Potential outliers, outside pattern

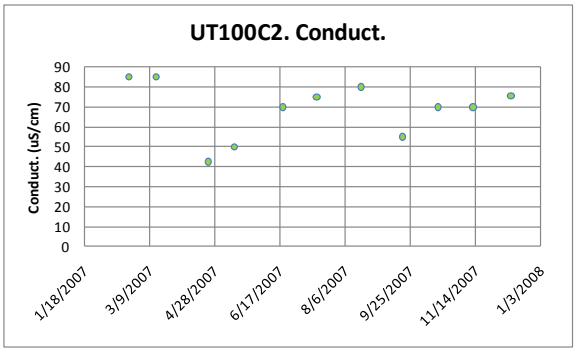
copper	Feb 2007, Sept 2007
zinc	Feb 2007
manganese	Sept 2007
vanadium	April 2007, Sept 2007

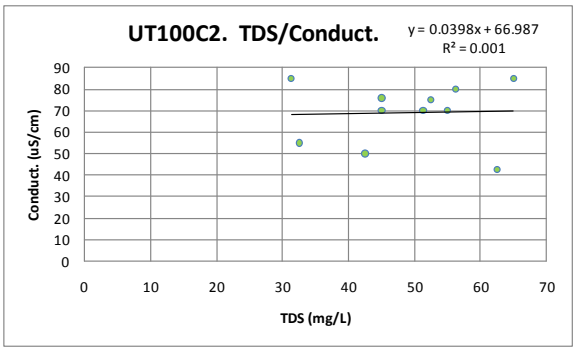
Potential outliers, do not correlate with concentrations upstream and downstream

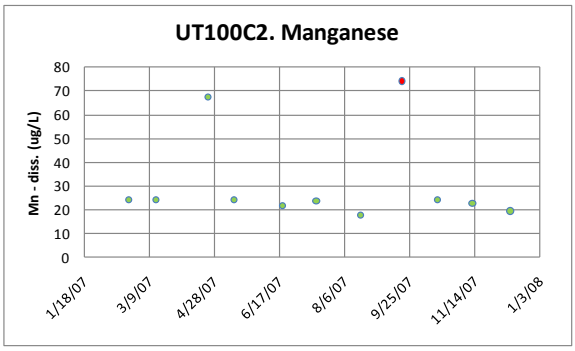
iron	Sept 2007

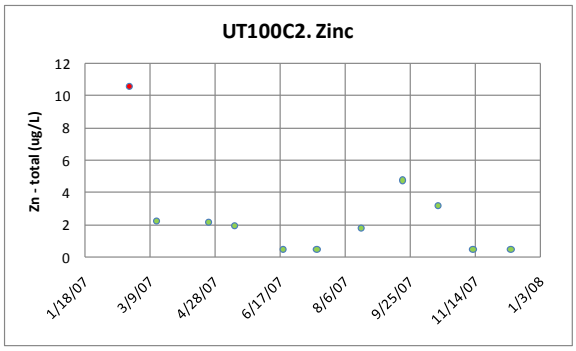


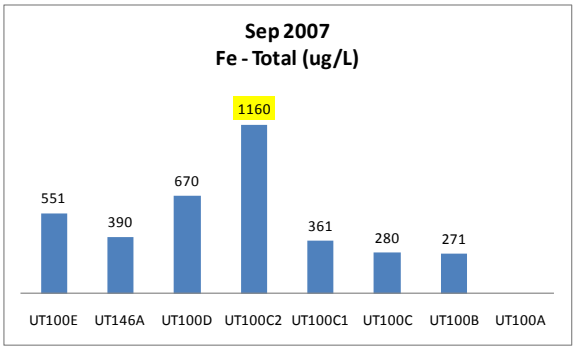


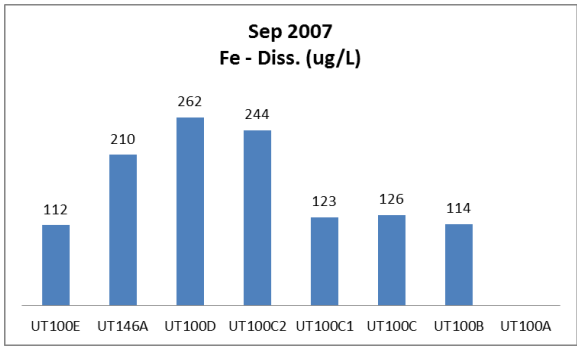












Sept 2007:
Sampling at UT100B, C, C1 and C2 occurred on Sept 18
Sampling at UT100D and UT100E occurred on Sept 19
Sampling at UT146A occurred on Sept 20

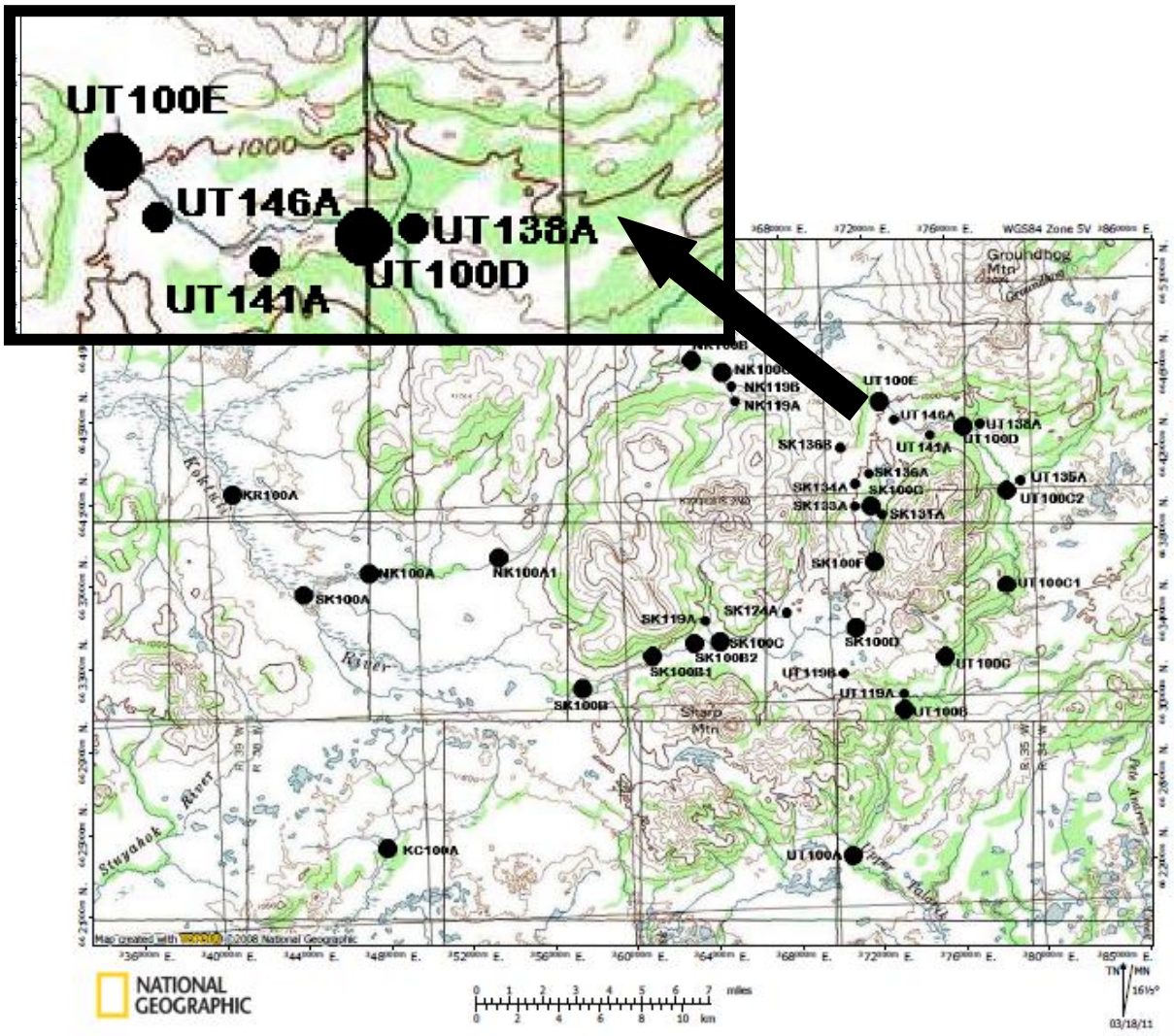
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
2/21/2007			1%	
3/14/2007	13%	3%	9%	
4/23/2007			1%	4%
5/13/2007	9%	11%	10%	13%
6/19/2007		3%	1%	1%
7/15/2007			3%	0%
8/18/2007		2%	1%	
9/19/2007	7%	5%	7%	10%
10/16/2007		3%	2%	3%
11/12/2007	3%			
12/11/2007	2%	4%	2%	4%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
2/21/2007						
3/14/2007	ndd			12%	5%	ndd
4/23/2007	ndd					ndd
5/13/2007	ndd				19%	12%
6/19/2007					5%	
7/15/2007	ndd					88%
8/18/2007	9%				1%	
9/19/2007					12%	
10/16/2007					5%	
11/12/2007	18%			1%	7%	96%
12/11/2007	ndd				6%	ndd

Upper Talarik Creek main stem: Stream monitoring site UT-100D



UT100D

Property-property graphs and RPD tables

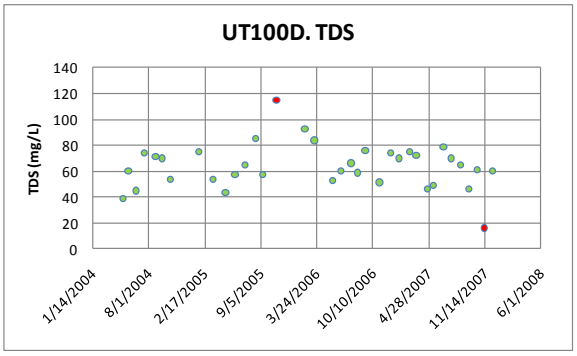
TDS correlates poorly with conductivity	Oct 2005, Nov 2007
Major cation RPD's dissolved consistently over total	Feb 2007
Calcium RPD greater than 20%	Sept 2004

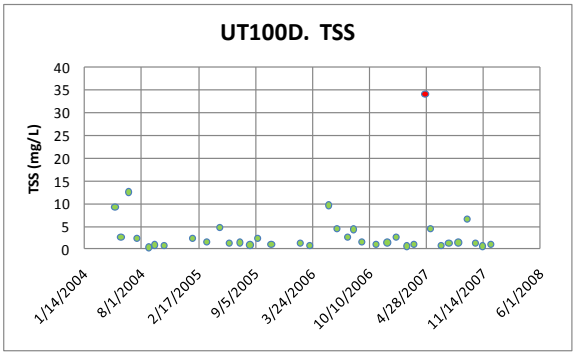
Potential outliers, outside pattern

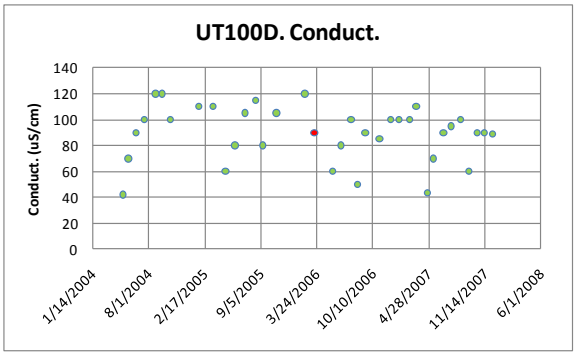
TSS, aluminum, iron, manganese, vanadium	April 2007
antimony	May 2004, June 2004
zinc	July 2005, Sept 2005

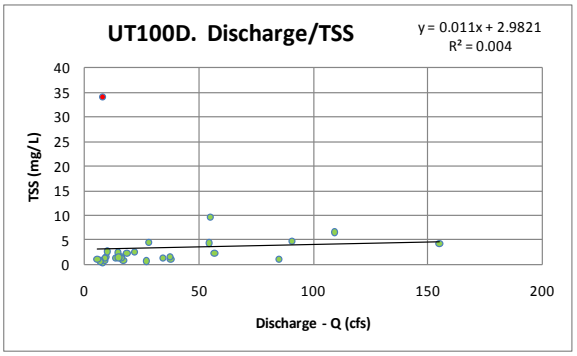
Elements reported as below MDL but appear to be above MRL

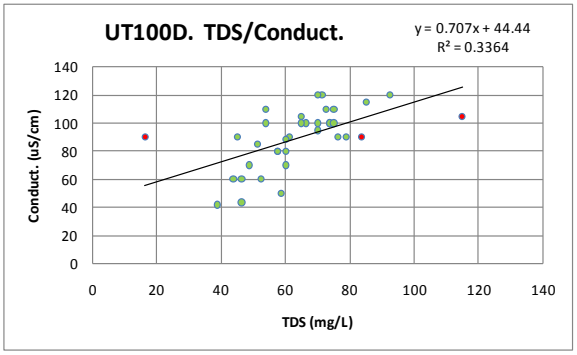
aluminum	June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
antimony	July 2004
tin	June 2004

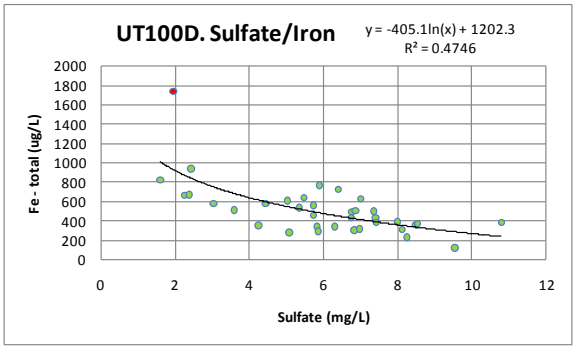

UT100D. TDS
TDS (mg/L)
140
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

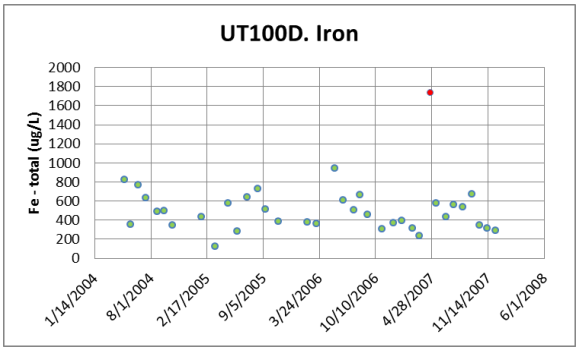

UT100D. TSS
TSS (mg/L)
40
35
30
25
20
15
10
5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

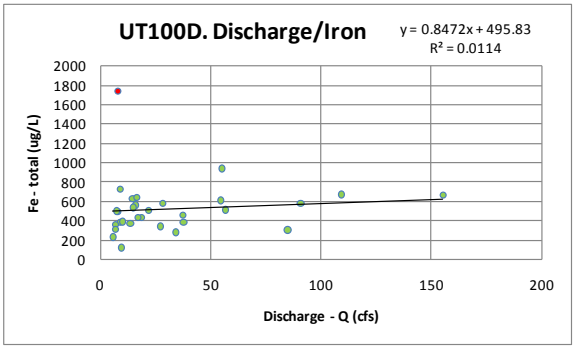

UT100D. Conduct.
Conduct. (uS/cm)
140
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

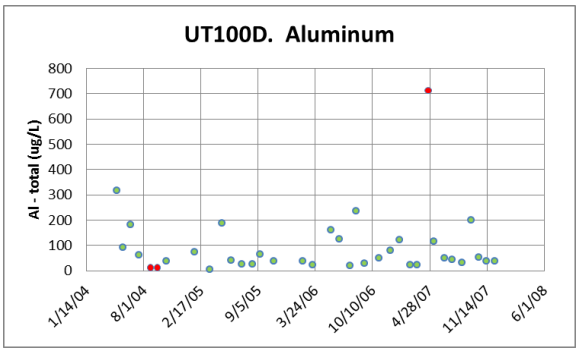

UT100D. Discharge/TSS
y = 0.011x + 2.9821
R² = 0.004
TSS (mg/L)
40
35
30
25
20
15
10
5
0
0
50
100
150
200
Discharge - Q (cfs)

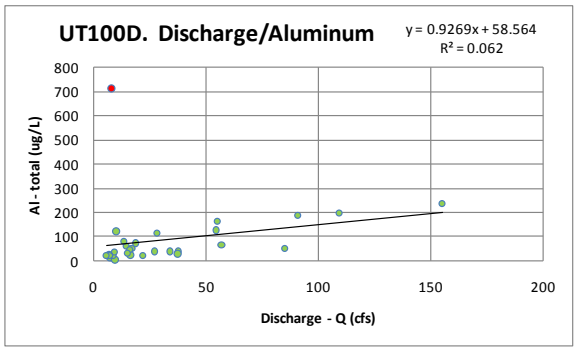

UT100D. TDS/Conduct.
y = 0.707x + 44.44
R² = 0.3364
Conduct. (uS/cm)
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
TDS (mg/L)

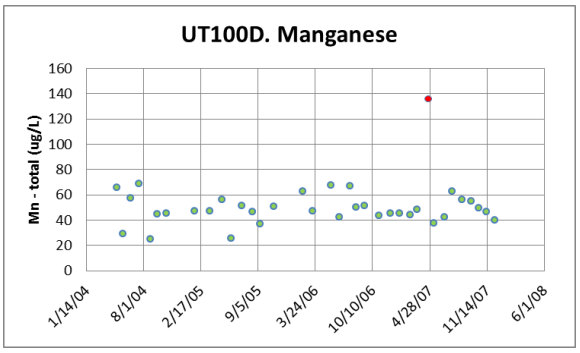

UT100D. Sulfate/Iron
y = -405.1ln(x) + 1202.3
R² = 0.4746
Fe - total (ug/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
2
4
6
8
10
12
Sulfate (mg/L)

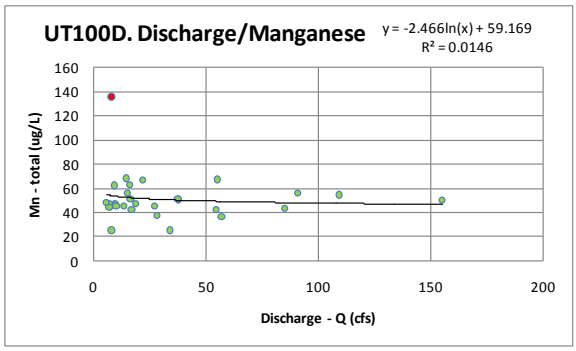

UT100D. Iron
Fe - total (ug/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

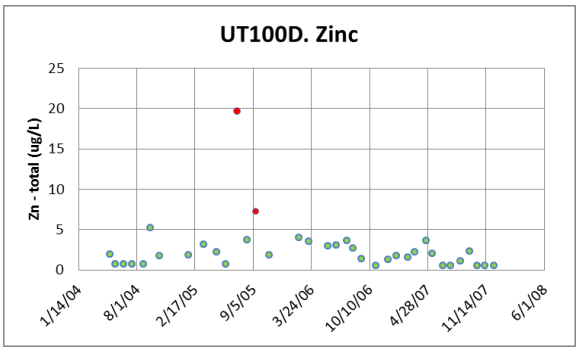

UT100D. Discharge/Iron
y = 0.8472x + 495.83
R² = 0.0114
Fe - total (ug/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
Discharge - Q (cfs)

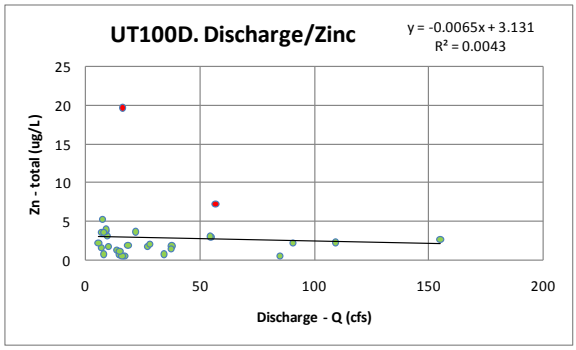

UT100D. Aluminum
Al - total (ug/L)
800
700
600
500
400
300
200
100
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100D. Discharge/Aluminum
y = 0.9269x + 58.564
R² = 0.062
Al - total (ug/L)
800
700
600
500
400
300
200
100
0
0
50
100
150
200
Discharge - Q (cfs)


UT100D. Manganese
Mn - total (ug/L)
160
140
120
100
80
60
40
20
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100D. Discharge/Manganese
y = -2.466ln(x) + 59.169
R² = 0.0146
Mn - total (ug/L)
160
140
120
100
80
60
40
20
0
0
50
100
150
200
Discharge - Q (cfs)


UT100D. Zinc
Zn - total (ug/L)
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100D. Discharge/Zinc
y = -0.0065x + 3.131
R² = 0.0043
Zn - total (ug/L)
25
20
15
10
5
0
0
50
100
150
200
Discharge - Q (cfs)

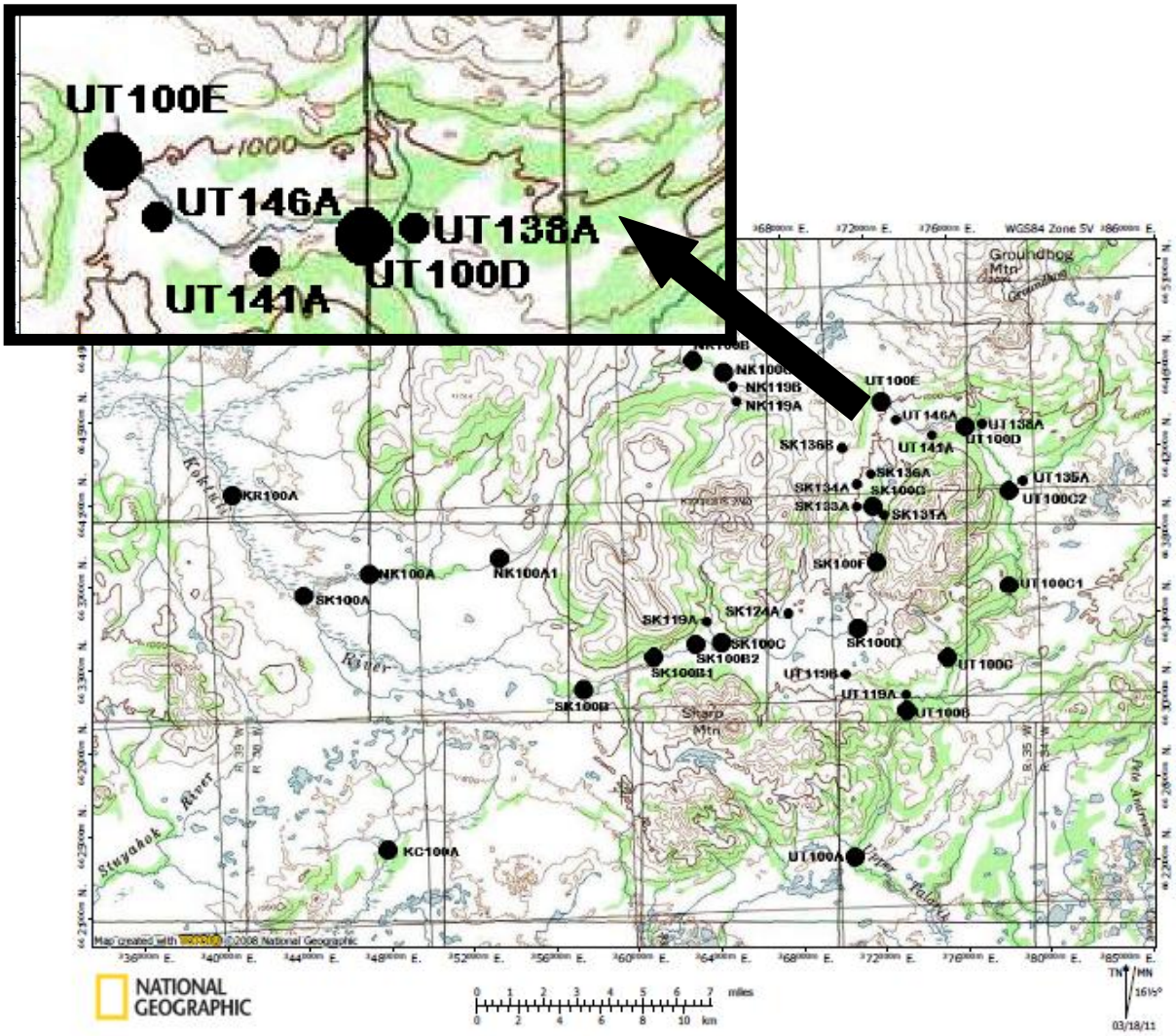
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	5%			5%
5/20/2004	4%	3%	4%	2%
6/3/2004				
6/17/2004				
7/15/2004				
8/16/2004				
8/25/2004		3%	6%	4%
9/17/2004	22%	16%	5%	9%
10/18/2004				
1/27/2005	2%			
3/19/2005			8%	
5/2/2005				
5/4/2005				
6/4/2005	2%	1%	4%	
7/11/2005				
8/16/2005				
9/13/2005				
10/30/2005		5%	6%	8%
2/9/2006		5%		
3/15/2006				
5/19/2006				
6/17/2006		1%		
7/24/2006	3%	2%	4%	7%
8/15/2006				
9/12/2006	8%	2%	11%	3%
11/2/2006	4%		1%	
12/12/2006	2%	2%	5%	4%
1/12/2007			6%	
2/19/2007	14%	13%		15%
3/14/2007	1%	1%	3%	2%
4/23/2007				
5/13/2007	5%	7%	6%	8%
6/19/2007	3%	3%	8%	3%
7/15/2007	3%	4%	7%	4%
8/18/2007	1%	1%	6%	2%
9/19/2007	7%	9%	10%	11%
10/16/2007			7%	
11/12/2007	2%	2%	10%	
12/11/2007			1%	

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004						22%
5/20/2004						68%
6/3/2004						
6/17/2004						
7/15/2004						
8/16/2004						
8/25/2004		ndd		1%		
9/17/2004	5%			4%		1%
10/18/2004						36%
1/27/2005	ndd				4%	ndd
3/19/2005	6%	ndd	ndd	16%	18%	
5/2/2005						9%
5/4/2005						
6/4/2005	12%					
7/11/2005	5%					
8/16/2005						
9/13/2005						
10/30/2005	ndd				ndd	
2/9/2006					ndd	ndd
3/15/2006					6%	ndd
5/19/2006						ndd
6/17/2006	10%				8%	
7/24/2006	15%				7%	
8/15/2006						
9/12/2006	20%			4%	4%	
11/2/2006					12%	ndd
12/12/2006					3%	ndd
1/12/2007						ndd
2/19/2007	ndd			4%	11%	ndd
3/14/2007					2%	ndd
4/23/2007	ndd					
5/13/2007	ndd				7%	35%
6/19/2007					6%	
7/15/2007	0%				6%	
8/18/2007					2%	
9/19/2007	14%				6%	
10/16/2007					4%	
11/12/2007	ndd				6%	ndd
12/11/2007						92%

Upper Talarik Creek main stem: Stream monitoring site UT-100E



UT100E

Property-property graphs and RPD tables

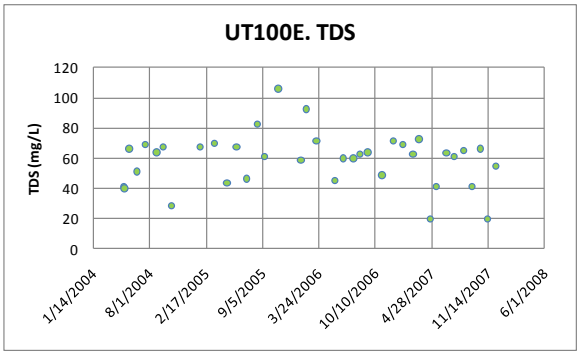
TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	Sept 2004
Manganese RPD over 20%	Sept 2004, March 2007

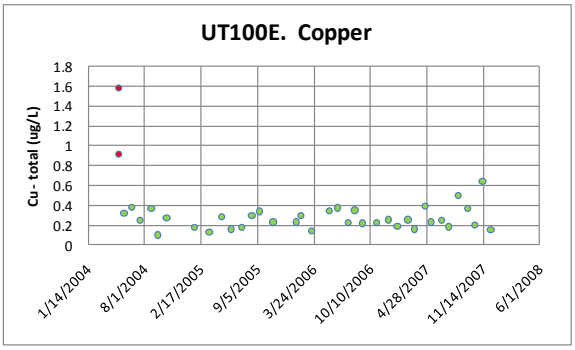
Potential outliers, outside pattern

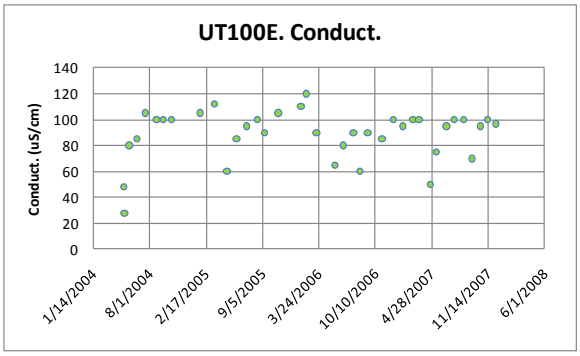
arsenic	Sept 2004
copper	April 2004, May 2004
lead	Jan 2006
zinc	July 2005, June 2006

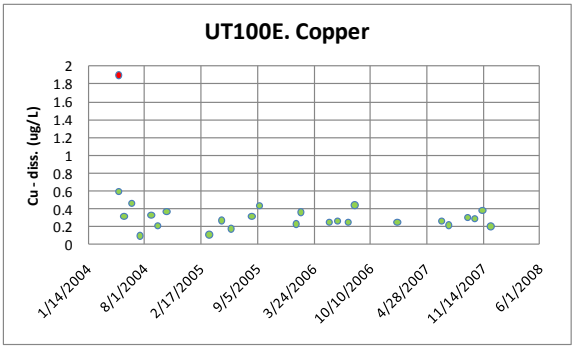
Elements reported as below MDL but appear to be above MRL

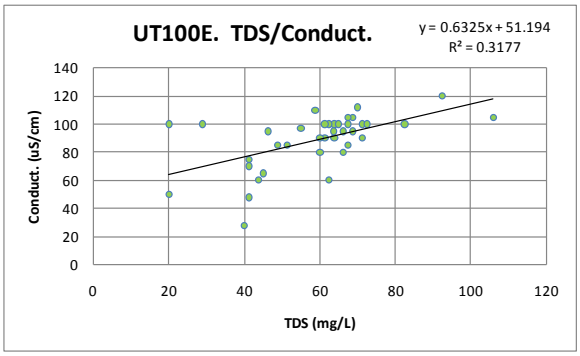
aluminum	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, June 2004

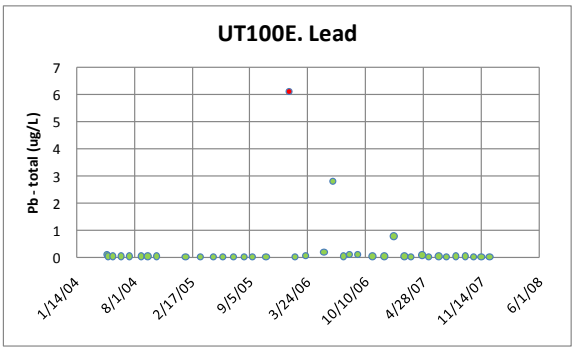

UT100E. TDS
TDS (mg/L)
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

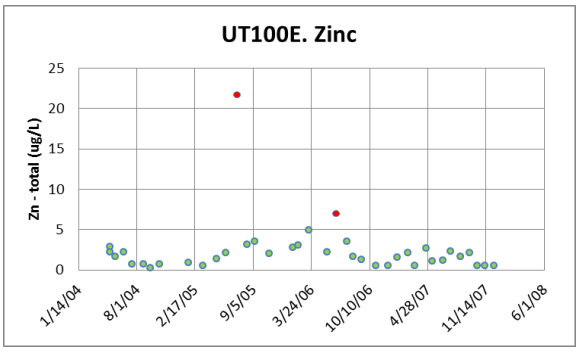

UT100E. Copper
Cu - total (ug/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

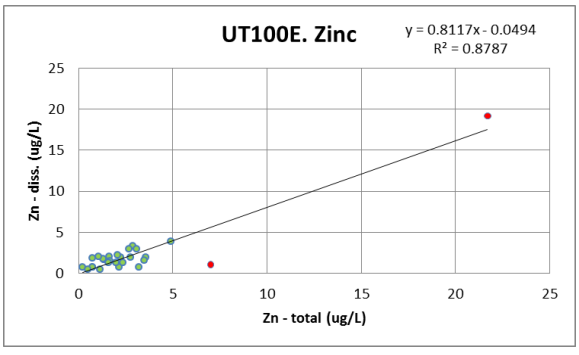

UT100E. Conduct.
Conduct. (uS/cm)
140
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT100E. Copper
Cu - diss. (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT100E. TDS/Conduct.
y = 0.6325x + 51.194
R² = 0.3177
Conduct. (uS/cm)
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
TDS (mg/L)


UT100E. Lead
Pb - total (ug/L)
7
6
5
4
3
2
1
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100E. Zinc
Zn - total (ug/L)
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT100E. Zinc
y = 0.8117x - 0.0494
R² = 0.8787
Zn - diss. (ug/L)
25
20
15
10
5
0
0
5
10
15
20
25
Zn - total (ug/L)

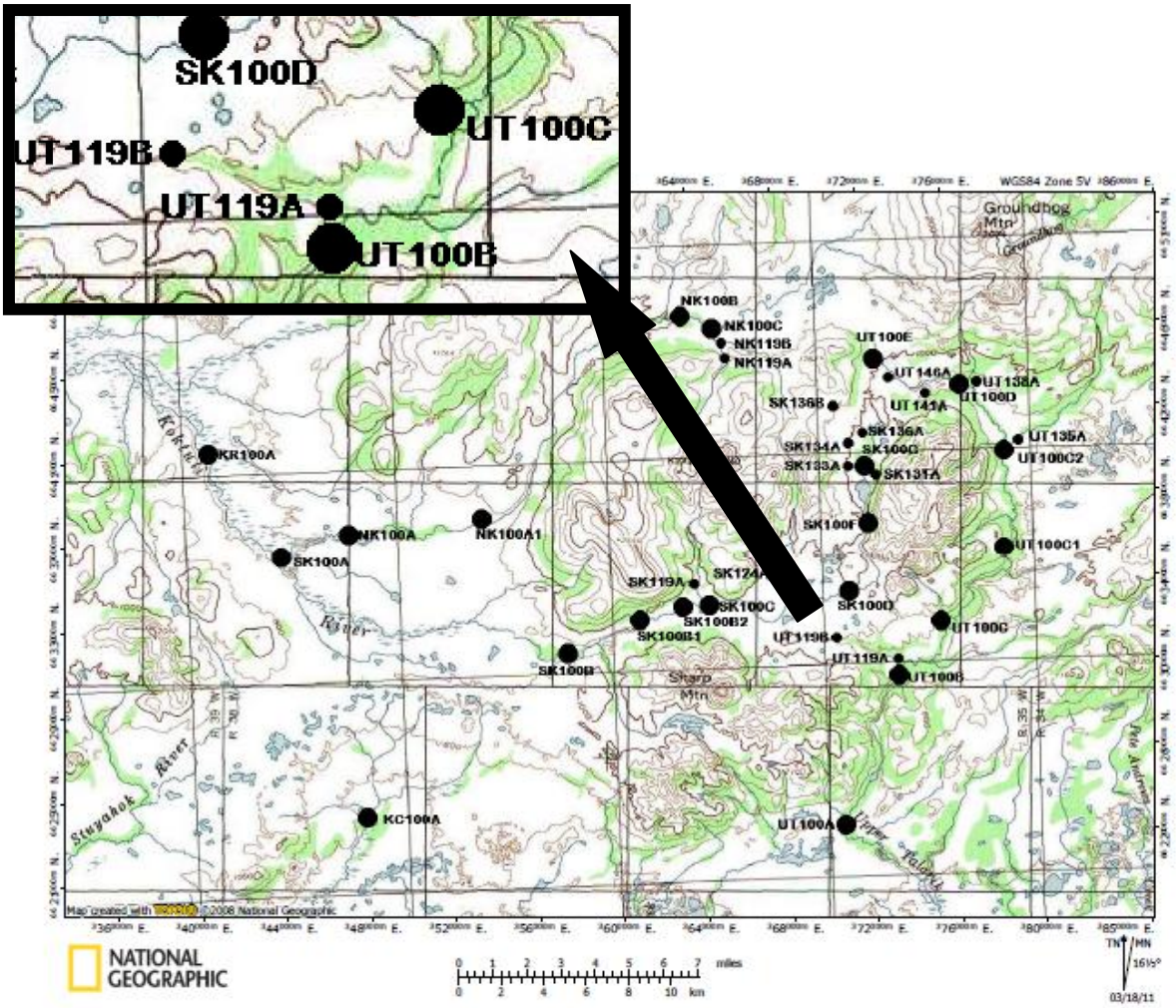
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	6%			
5/2/2004		5%	4%	
5/20/2004		7%	6%	4%
6/4/2004				
6/17/2004	1%		3%	
7/15/2004				
8/16/2004				
8/25/2004	1%	7%		4%
9/17/2004		16%	10%	14%
10/18/2004	2%	2%	2%	3%
1/25/2005	2%	2%		
3/18/2005			4%	
5/2/2005	3%			
6/4/2005	6%	7%	8%	9%
7/11/2005				
8/16/2005	3%	2%	4%	3%
9/12/2005	1%	0%	2%	2%
10/30/2005		5%		7%
1/19/2006	11%	6%	13%	9%
2/7/2006	1%	2%		4%
3/15/2006			4%	
5/18/2006	3%	1%		0%
6/17/2006				
7/24/2006				0%
8/15/2006	1%	1%		2%
9/12/2006				
11/2/2006	3%	4%	6%	2%
12/12/2006	4%	3%	7%	4%
1/14/2007	10%			3%
2/20/2007	6%	5%	15%	6%
3/14/2007	7%	3%	8%	3%
4/23/2007	1%	5%	3%	18%
5/14/2007				
6/19/2007		6%	6%	6%
7/15/2007			2%	
8/18/2007	5%	4%	5%	4%
9/19/2007	1%	3%	2%	3%
10/16/2007	2%	2%	10%	5%
11/12/2007			1%	
12/11/2007			4%	

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004						15%
5/2/2004	18%					ndd
5/20/2004						20%
6/4/2004						
6/17/2004	18%					
7/15/2004				ndd		
8/16/2004						
8/25/2004						
9/17/2004	70%			78%		105%
10/18/2004	29%					86%
1/25/2005	ndd				5%	ndd
3/18/2005					113%	ndd
5/2/2005						22%
6/4/2005	11%			ndd	ndd	
7/11/2005	ndd					
8/16/2005	6%					
9/12/2005	25%				ndd	
10/30/2005	ndd				ndd	
1/19/2006	1%				ndd	
2/7/2006	19%				11%	
3/15/2006	ndd				16%	
5/18/2006						ndd
6/17/2006						
7/24/2006	11%					
8/15/2006	24%					
9/12/2006	ndd					31%
11/2/2006	ndd				13%	ndd
12/12/2006	ndd				18%	ndd
1/14/2007	29%				16%	ndd
2/20/2007	ndd				5%	ndd
3/14/2007	ndd			24%	10%	ndd
4/23/2007	ndd					10%
5/14/2007	ndd				4%	63%
6/19/2007	4%				9%	
7/15/2007	18%				2%	
8/18/2007	ndd				8%	
9/19/2007					10%	8%
10/16/2007	35%				13%	
11/12/2007					9%	ndd
12/11/2007	26%				16%	ndd

Upper Talarik Creek tributary: Stream monitoring site UT-119A



UT119A

Property-property graphs and RPD tables

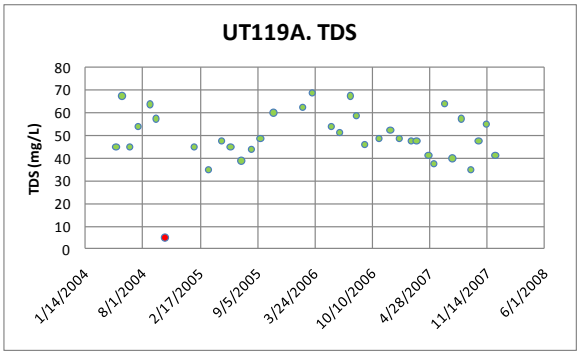
TDS and conductivity correlate poorly	
Alkalinity correlates poorly with hardness	Dec 2006
Major cation RPD's dissolved consistently over total	July 2004, Sept 2005
Manganese RPD over 20%	July 2004
Molybdenum RPD over 20%	June 2006

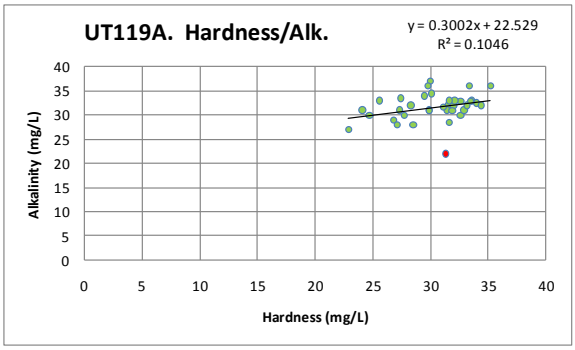
Potential outliers, outside pattern

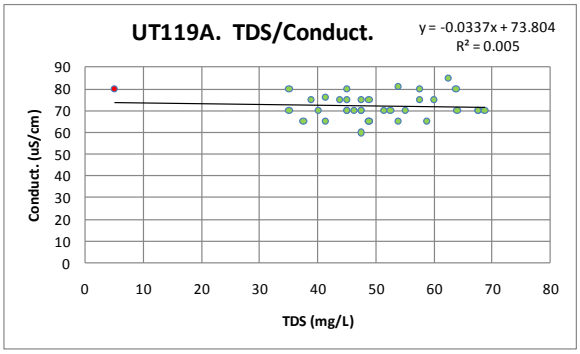
aluminum, antimony	Aug 2005
TDS, arsenic, calcium, magnesium, potassium, sodium	Oct 2004

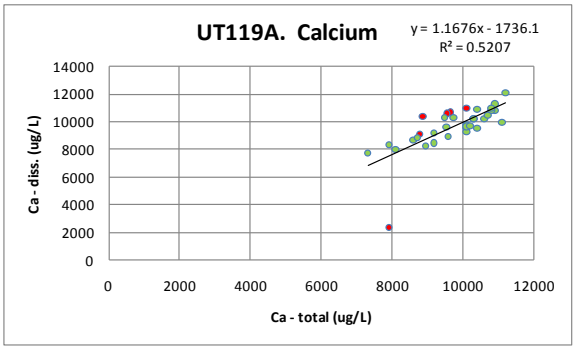
Elements reported as below MDL but appear to be above MRL

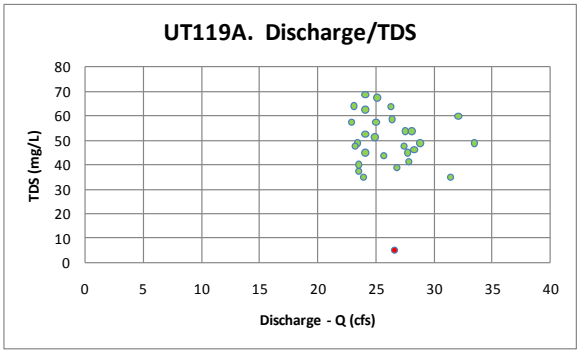
aluminum	April 2004, May 2004, June 2004, July 2004 Aug 2004, Sept 2004, Oct 2004
antimony	April 2004, May 2004, July 2004
molybdenum	April 2004, June 2004, August 2004, October 2004

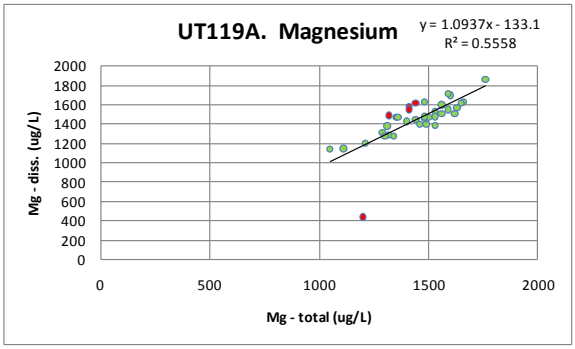

UT119A. TDS
TDS (mg/L)
80
70
60
50
40
30
20
10
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

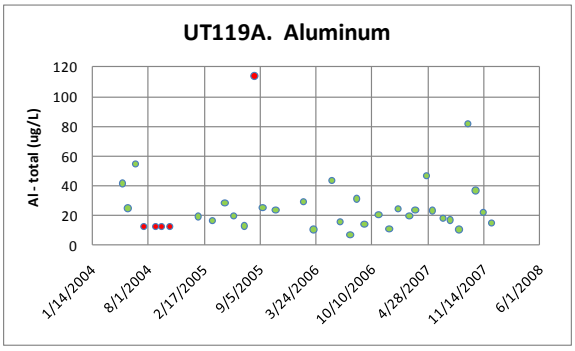

UT119A. Hardness/Alk.
y = 0.3002x + 22.529
R² = 0.1046
Alkalinity (mg/L)
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40
Hardness (mg/L)

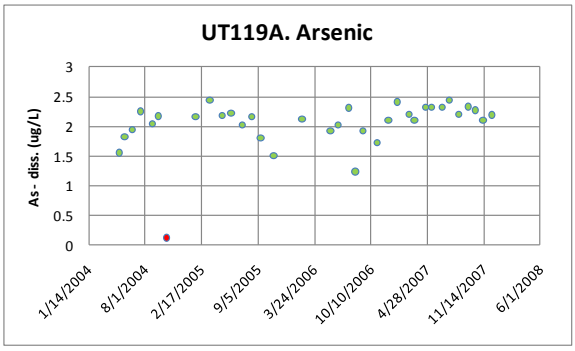

UT119A. TDS/Conduct.
y = -0.0337x + 73.804
R² = 0.005
Conduct. (uS/cm)
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
TDS (mg/L)


UT119A. Calcium
y = 1.1676x - 1736.1
R² = 0.5207
Ca - diss. (ug/L)
14000
12000
10000
8000
6000
4000
2000
0
0
2000
4000
6000
8000
10000
12000
Ca - total (ug/L)


UT119A. Discharge/TDS
TDS (mg/L)
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
Discharge - Q (cfs)


UT119A. Magnesium
y = 1.0937x - 133.1
R² = 0.5558
Mg - diss. (ug/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
Mg - total (ug/L)


UT119A. Aluminum
Al - total (ug/L)
120
100
80
60
40
20
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT119A. Arsenic
As - diss. (ug/L)
3
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

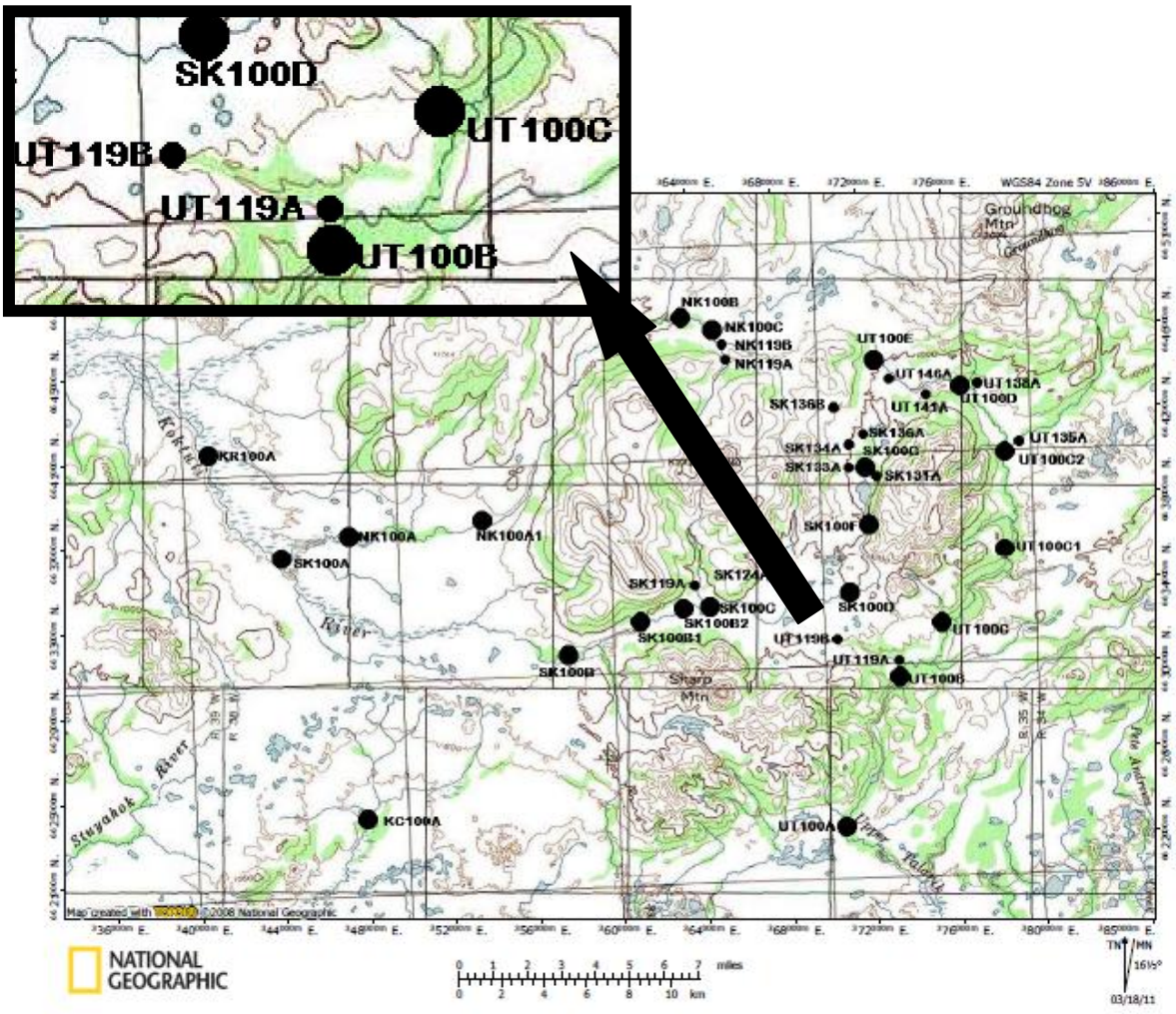
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	6%	4%	12%	6%
5/20/2004				2%
6/4/2004				
6/17/2004	5%	8%	2%	
7/15/2004	4%	12%	15%	12%
8/15/2004				
8/26/2004	0%	5%	3%	1%
9/16/2004				0%
10/15/2004				
10/17/2004				
1/26/2005				
3/18/2005			4%	
5/2/2005	1%	2%		
6/2/2005	1%		5%	
7/10/2005				3%
8/15/2005				
9/14/2005	16%	9%	16%	16%
10/30/2005				0%
2/8/2006		6%	3%	6%
3/14/2006	8%	6%	5%	7%
5/19/2006				
6/17/2006	10%	11%	9%	8%
7/24/2006	4%		7%	2%
8/15/2006				
9/12/2006				
11/2/2006	5%	10%	8%	9%
12/11/2006				
1/12/2007		3%	7%	6%
2/21/2007	10%	12%		9%
3/13/2007	8%	2%		2%
4/23/2007	2%		6%	2%
5/13/2007				
6/20/2007			1%	
7/16/2007	2%	8%		7%
8/17/2007				
9/19/2007		1%	6%	2%
10/15/2007	6%	8%	10%	7%
11/12/2007			1%	
12/12/2007	9%	9%	19%	8%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004						29%
5/20/2004				ndd		
6/4/2004						
6/17/2004	31%			19%		39%
7/15/2004				34%	15%	105%
8/15/2004						
8/26/2004						ndd
9/16/2004						
10/15/2004						
10/17/2004	109%	76%	ndd	ndd		88%
1/26/2005						ndd
3/18/2005	20%				ndd	ndd
5/2/2005					5%	65%
6/2/2005	119%					105%
7/10/2005			23%		8%	
8/15/2005					ndd	
9/14/2005	4%				ndd	91%
10/30/2005	34%					
2/8/2006	8%				ndd	5%
3/14/2006	ndd				7%	ndd
5/19/2006	30%					ndd
6/17/2006	ndd				20%	
7/24/2006	11%					23%
8/15/2006	ndd					
9/12/2006	ndd				4%	ndd
11/2/2006	47%				10%	ndd
12/11/2006	28%					ndd
1/12/2007	5%				1%	ndd
2/21/2007	38%				12%	ndd
3/13/2007	ndd				1%	
4/23/2007	ndd			ndd	3%	ndd
5/13/2007	ndd			ndd		28%
6/20/2007						
7/16/2007					3%	ndd
8/17/2007	ndd				1%	13%
9/19/2007	ndd					50%
10/15/2007	25%				9%	105%
11/12/2007	81%					ndd
12/12/2007	ndd				14%	105%

Upper Talarik Creek tributary: Stream monitoring site UT-119B



UT119B

Property-property graphs and RPD tables

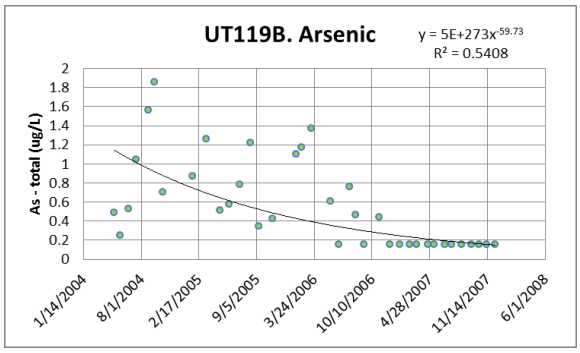
TDS and conductivity correlate poorly	
Alkalinity correlates poorly with hardness	Dec 2006, Jan 2007, Feb 2007
Arsenic total and dissolved concentrations appear to decline over time	
Major cation RPD's dissolved consistently over total	Aug 2004, Oct 2007, Nov 2007, Dec 2007
Potassium RPD over 20%	July 2007, Oct 2007, Nov 2007

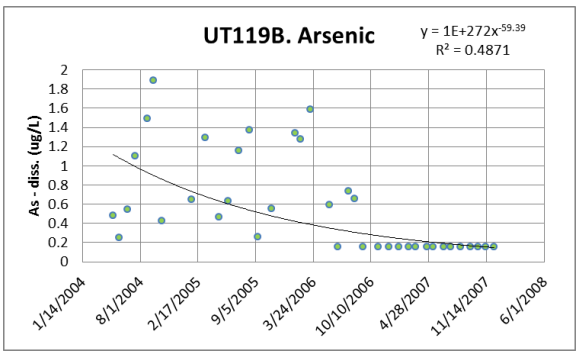
Potential outliers, outside pattern

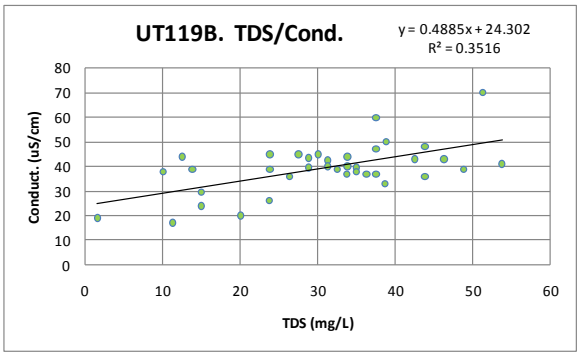
chloride	May 2006
sulfate	July 2004, Feb 2007
calcium, copper, magnesium, molybdenum, sodium	Feb 2007
potassium	Feb 2007, July 2007
iron	July 2005, Feb 2007
lead	Jan 2007, Feb 2007

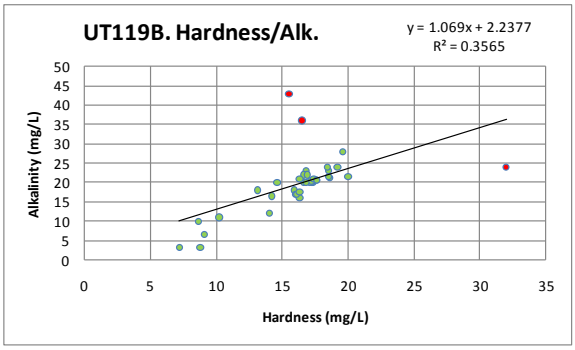
Elements reported as below MDL but appear to be above MRL

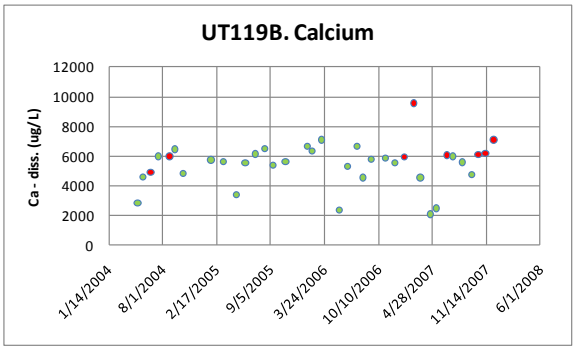
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, July 2004, Aug 2004
molybdenum	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
tin	March 2005

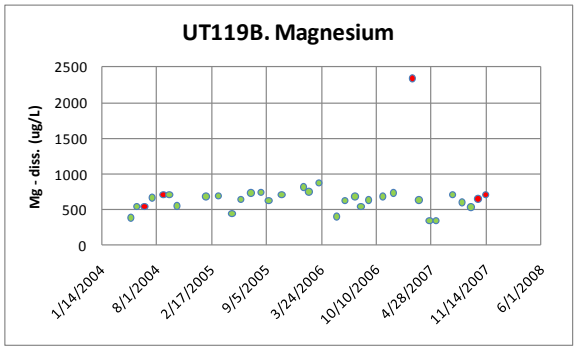

UT119B. Arsenic
y = 5E+273x-59.73
R² = 0.5408
As - total (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

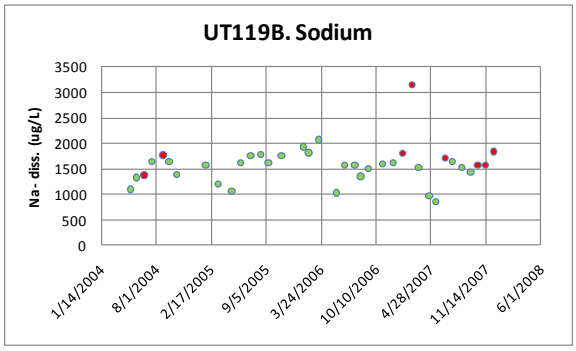

UT119B. Arsenic
y = 1E+272x-59.39
R² = 0.4871
As - diss. (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

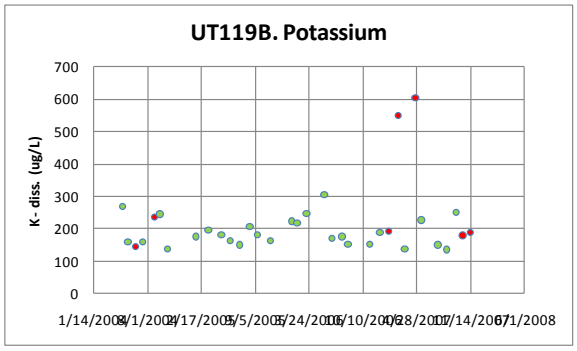

UT119B. TDS/Cond.
y = 0.4885x + 24.302
R² = 0.3516
Conduct. (uS/cm)
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
TDS (mg/L)

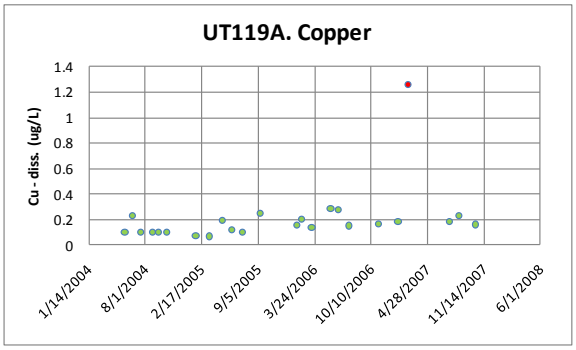

UT119B. Hardness/Alk.
y = 1.069x + 2.2377
R² = 0.3565
Alkalinity (mg/L)
50
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
Hardness (mg/L)

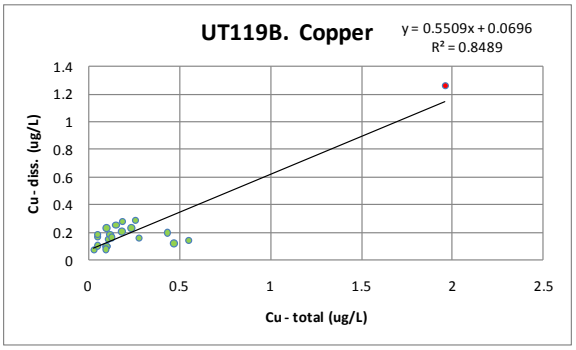

UT119B. Calcium
Ca - diss. (ug/L)
12000
10000
8000
6000
4000
2000
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

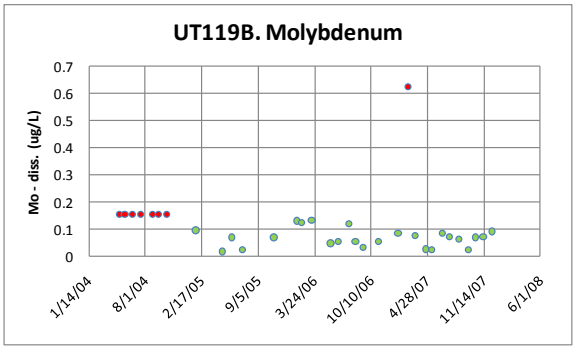

UT119B. Magnesium
Mg - diss. (ug/L)
2500
2000
1500
1000
500
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

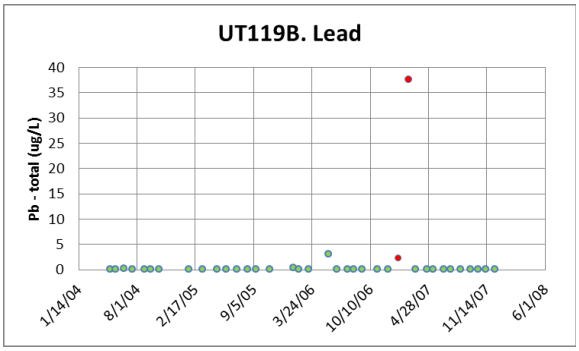

UT119B. Sodium
Na - diss. (ug/L)
3500
3000
2500
2000
1500
1000
500
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

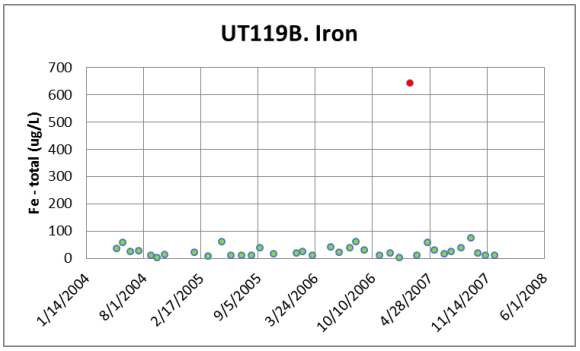

UT119B. Potassium
K - diss. (ug/L)
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

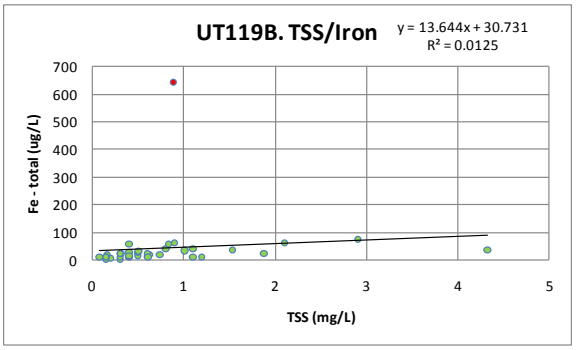

UT119A. Copper
Cu - diss. (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

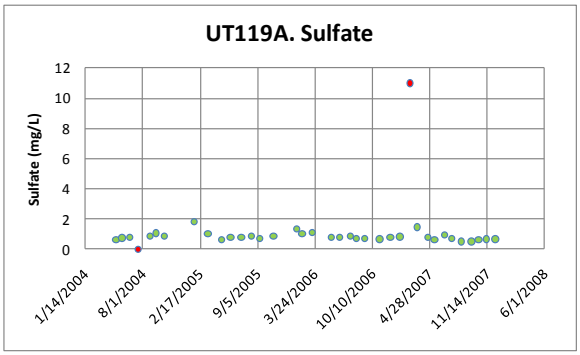

UT119B. Copper
y = 0.5509x + 0.0696
R² = 0.8489
Cu - diss. (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
Cu - total (ug/L)

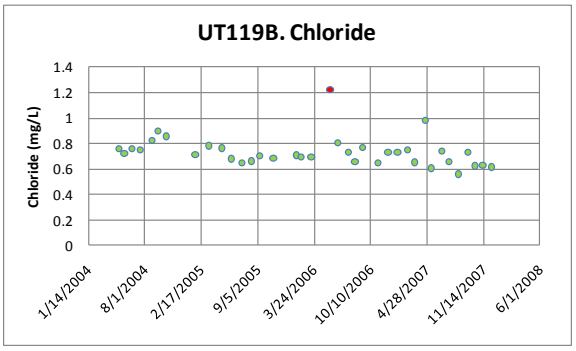

UT119B. Molybdenum
Mo - diss. (ug/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT119B. Lead
Pb - total (ug/L)
40
35
30
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT119B. Iron
Fe - total (ug/L)
700
600
500
400
300
200
100
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT119B. TSS/Iron
y = 13.644x + 30.731
R² = 0.0125
Fe - total (ug/L)
700
600
500
400
300
200
100
0
0
1
2
3
4
5
TSS (mg/L)


UT119A. Sulfate
Sulfate (mg/L)
12
10
8
6
4
2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT119B. Chloride
Chloride (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

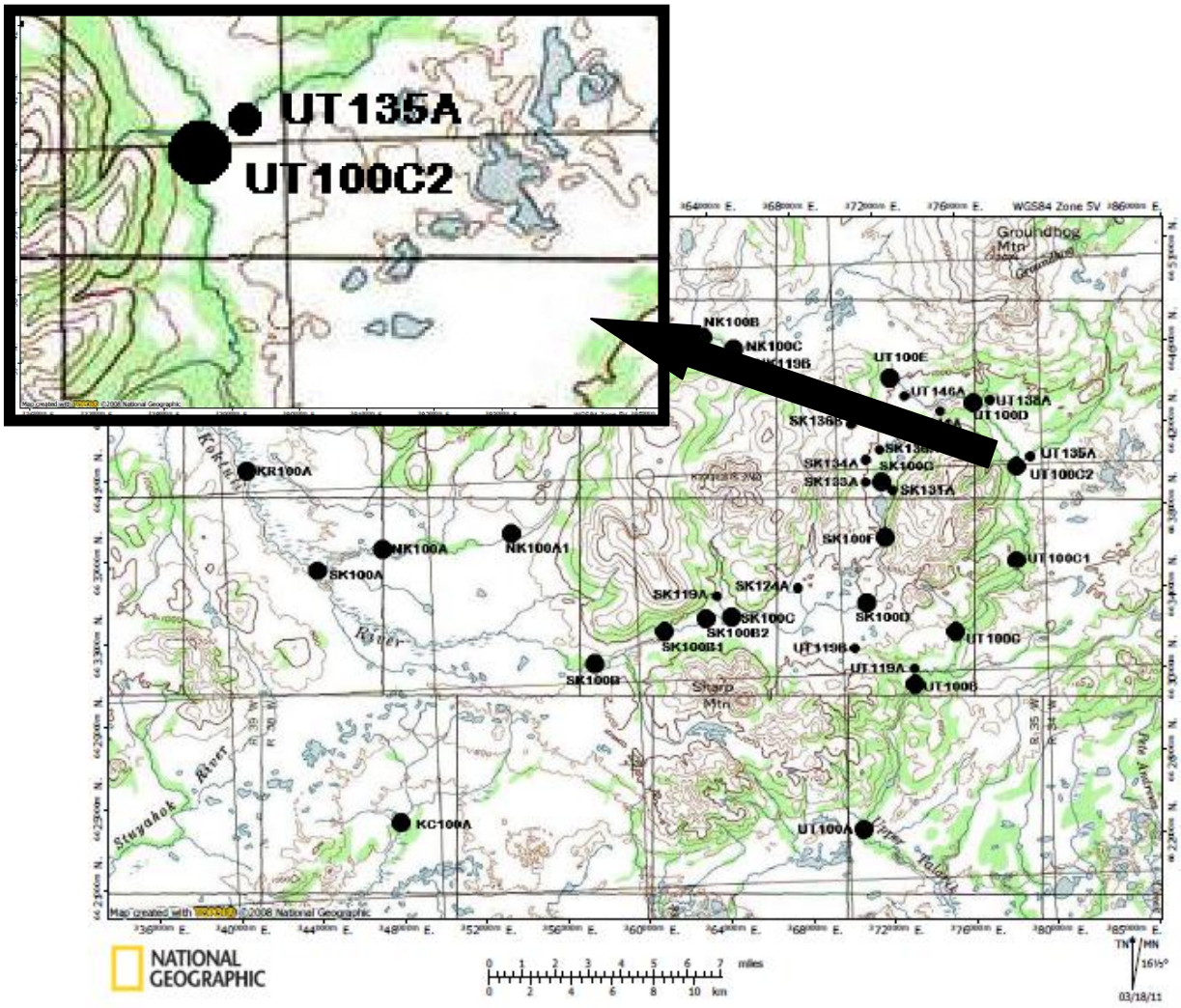
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	1%	3%	3%	6%
5/20/2004			3%	3%
6/17/2004	12%	7%	9%	11%
7/15/2004	7%		4%	1%
8/26/2004	7%	11%	14%	16%
9/16/2004	6%			
10/15/2004				
1/27/2005	2%			1%
3/15/2005			3%	
5/2/2005	1%	0%	6%	
6/3/2005		2%		3%
7/10/2005				
8/15/2005			1%	
9/13/2005	1%		5%	5%
10/30/2005		1%	4%	1%
1/19/2006	7%	8%	12%	10%
2/7/2006	3%	1%	4%	3%
3/14/2006	11%	6%	10%	10%
5/19/2006				1%
6/17/2006		4%		6%
7/24/2006	1%			
8/15/2006				
9/12/2006	4%	1%		
11/4/2006	3%	8%	10%	4%
12/11/2006	0%	12%	18%	4%
1/14/2007	15%		5%	19%
2/18/2007	7%		5%	
3/14/2007		3%		
4/22/2007				
5/14/2007				
6/20/2007	9%			11%
7/14/2007	1%	14%	26%	4%
8/17/2007			5%	
9/20/2007	0%	6%	6%	
10/15/2007	10%	15%	23%	10%
11/11/2007	11%	19%	29%	9%
12/12/2007	16%			19%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004	ndd					ndd
5/20/2004				ndd		
6/17/2004	78%			ndd		
7/15/2004				16%		105%
8/26/2004				ndd		72%
9/16/2004						
10/15/2004				25%		
1/27/2005						100%
3/15/2005	80%				ndd	72%
5/2/2005						ndd
6/3/2005						
7/10/2005	68%		75%		86%	22%
8/15/2005	ndd	16%			ndd	98%
9/13/2005	50%				ndd	105%
10/30/2005	ndd				9%	88%
1/19/2006					5%	ndd
2/7/2006	11%					
3/14/2006			31%			ndd
5/19/2006	10%					ndd
6/17/2006	37%				24%	
7/24/2006	32%					32%
8/15/2006	ndd					13%
9/12/2006	ndd			ndd	80%	11%
11/4/2006	108%					ndd
12/11/2006	ndd				ndd	ndd
1/14/2007	42%				25%	
2/18/2007					2%	
3/14/2007	ndd			ndd	4%	ndd
4/22/2007	ndd			ndd		ndd
5/14/2007	ndd			ndd		7%
6/20/2007	ndd		2%		40%	84%
7/14/2007	115%				26%	
8/17/2007					8%	3%
9/20/2007	ndd					
10/15/2007	23%				25%	
11/11/2007	ndd				28%	
12/12/2007	ndd				49%	94%

Upper Talarik Creek tributary: Stream monitoring site UT-135A



UT135A

Property-property graphs and RPD tables

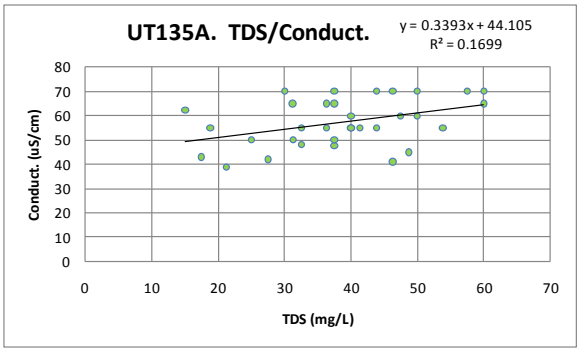
TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	Feb 2007
Total and dissolved zinc do not correlate with historical pattern	Aug 2006

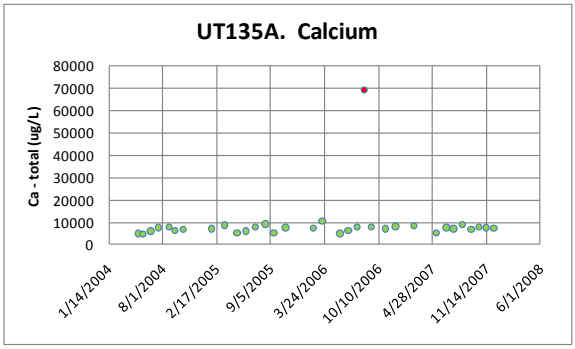
Potential outliers, outside pattern

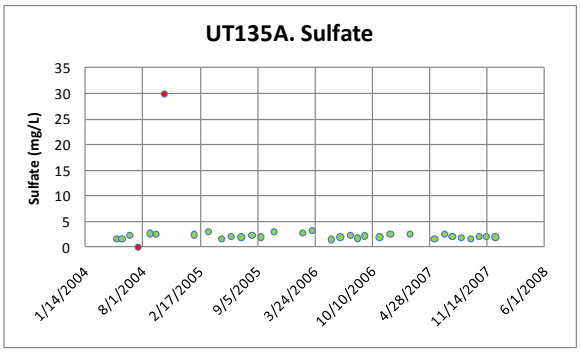
sulfate	July 2004, Oct 2004
antimony	May 2004, Oct 2005
arsenic, cadmium, calcium, magnesium, molybdenum, potassium, sodium, vanadium, zinc	Aug 2006
copper	Sept 2005, Aug 2006
lead	Oct 2005, Feb 2006, Feb 2007
manganese	Aug 2006, Aug 2007
selenium	May 2004, Aug 2006
tin	June 2004, Aug 2006

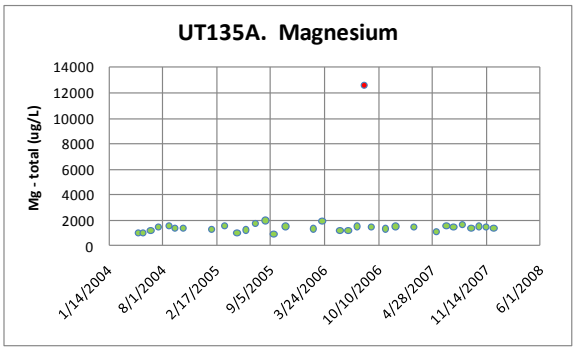
Elements reported as below MDL but appear to be above MRL

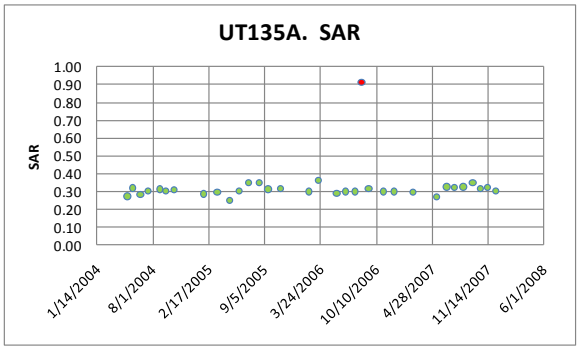
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, July 2004, Aug 2004
copper	May 2004, July 2004
tin	May 2004

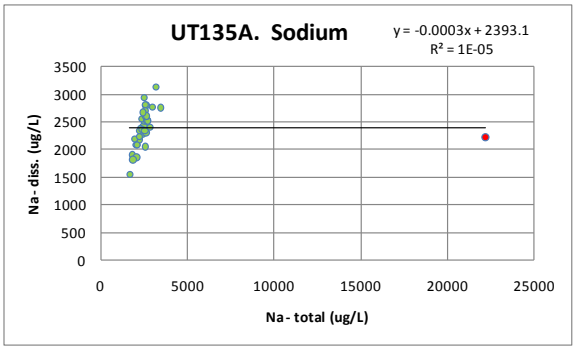

UT135A. TDS/Conduct.
y = 0.3393x + 44.105
R² = 0.1699
Conduct. (uS/cm)
TDS (mg/L)

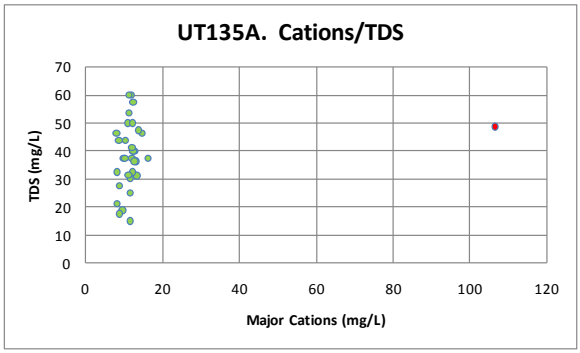

UT135A. Calcium
Ca - total (ug/L)

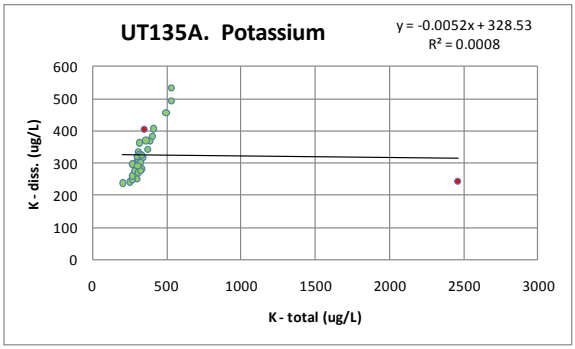

UT135A. Sulfate
Sulfate (mg/L)

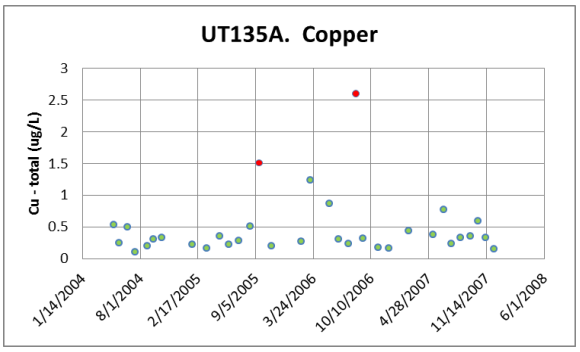

UT135A. Magnesium
Mg - total (ug/L)

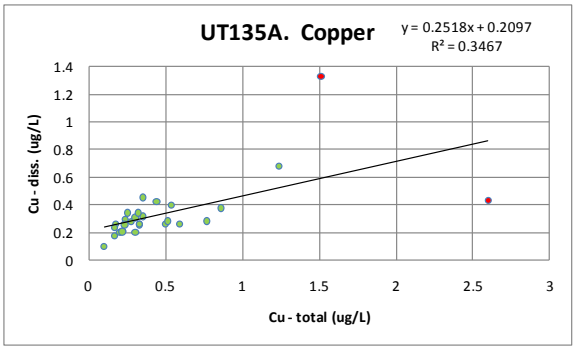

UT135A. SAR
SAR

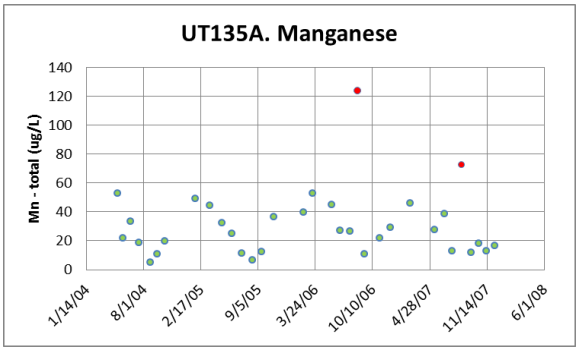

UT135A. Sodium
y = -0.0003x + 2393.1
R² = 1E-05
Na - diss. (ug/L)
Na - total (ug/L)

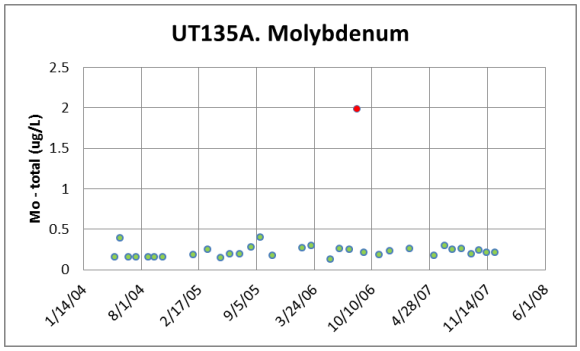

UT135A. Cations/TDS
TDS (mg/L)
Major Cations (mg/L)

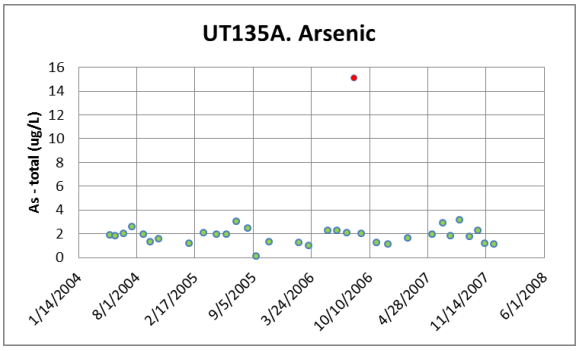

UT135A. Potassium
y = -0.0052x + 328.53
R² = 0.0008
K - diss. (ug/L)
K - total (ug/L)

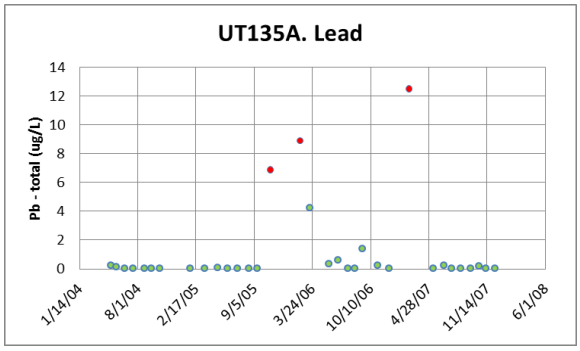

UT135A. Copper
Cu - total (ug/L)
3
2.5
2
1.5
1
0.5
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

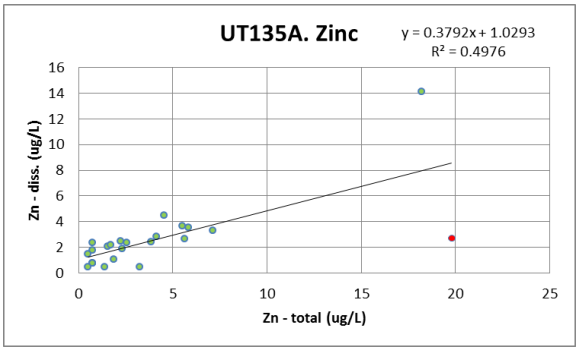

UT135A. Copper
y = 0.2518x + 0.2097
R² = 0.3467
Cu - diss. (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
3
Cu - total (ug/L)


UT135A. Manganese
Mn - total (ug/L)
140
120
100
80
60
40
20
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT135A. Molybdenum
Mo - total (ug/L)
2.5
2
1.5
1
0.5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT135A. Arsenic
As - total (ug/L)
16
14
12
10
8
6
4
2
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT135A. Lead
Pb - total (ug/L)
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT135A. Zinc
y = 0.3792x + 1.0293
R² = 0.4976
Zn - diss. (ug/L)
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
Zn - total (ug/L)

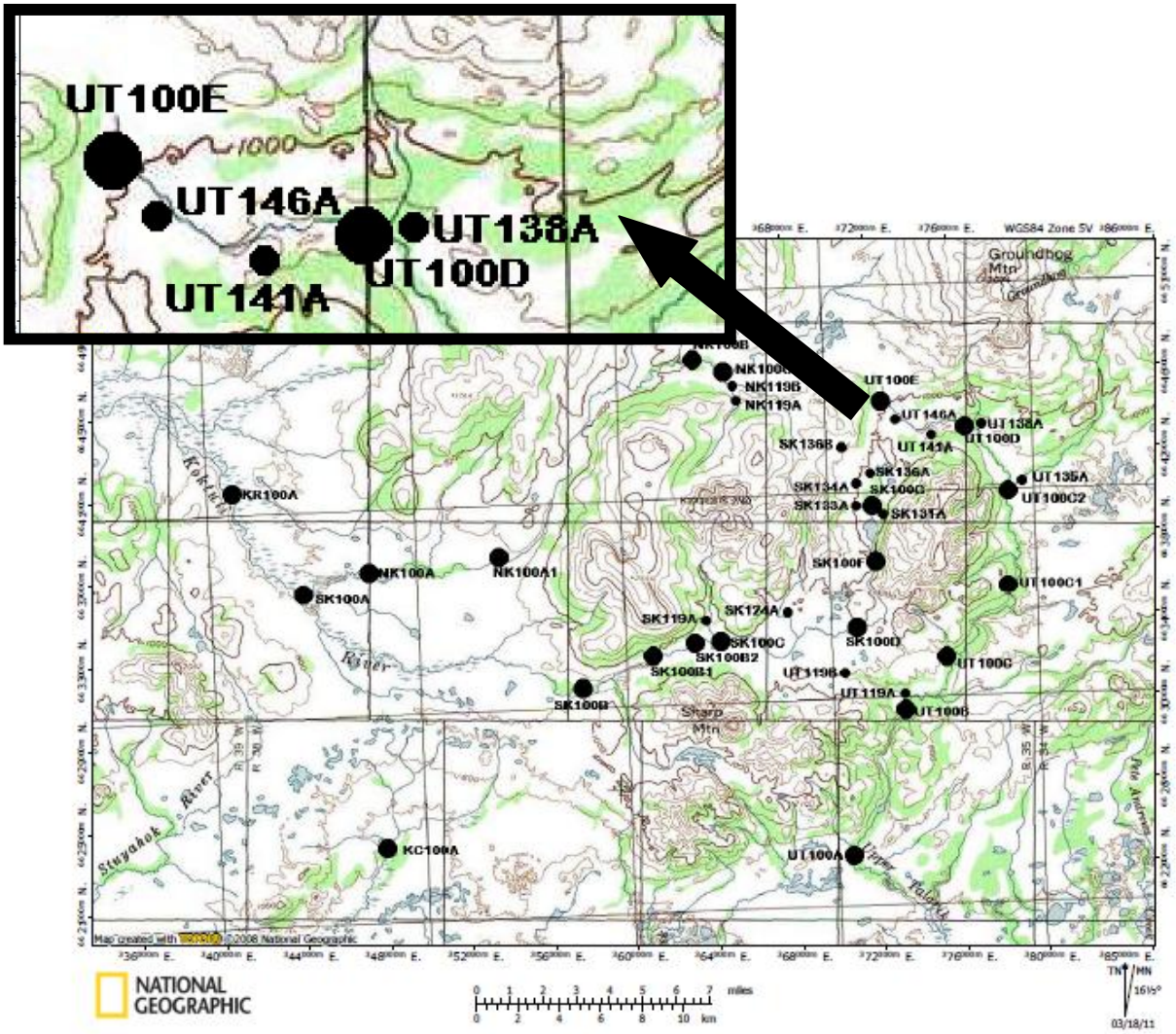
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				5%
5/20/2004	0%			
6/17/2004				1%
7/15/2004				
8/25/2004	0%	5%	9%	7%
9/16/2004	5%	2%	2%	3%
10/15/2004				
1/28/2005	2%	1%		4%
3/19/2005				
5/3/2005				
6/5/2005				
7/10/2005				
8/17/2005				
9/17/2005			3%	
10/31/2005	8%	6%	15%	8%
2/10/2006	4%		3%	
3/15/2006				
5/20/2006	4%		1%	11%
6/20/2006		1%		
7/24/2006	6%		7%	1%
8/18/2006				
9/12/2006				
11/4/2006	5%	11%	11%	8%
12/12/2006				
2/19/2007	4%	19%	15%	17%
5/14/2007				
6/19/2007				
7/15/2007	7%	8%	16%	6%
8/17/2007				
9/19/2007				
10/17/2007				
11/12/2007				
12/12/2007	9%	8%		9%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004						
5/20/2004	31%			6%		
6/17/2004						80%
7/15/2004				1%		
8/25/2004	0%	88%				
9/16/2004						
10/15/2004						104%
1/28/2005					4%	30%
3/19/2005	6%				ndd	ndd
5/3/2005						ndd
6/5/2005					11%	ndd
7/10/2005	ndd				3%	ndd
8/17/2005						
9/17/2005						
10/31/2005	ndd			19%	ndd	ndd
2/10/2006	2%					
3/15/2006						
5/20/2006						10%
6/20/2006	2%					
7/24/2006	21%					ndd
8/18/2006						
9/12/2006	6%					
11/4/2006	40%				4%	ndd
12/12/2006	34%					ndd
2/19/2007					8%	
5/14/2007	ndd			10%	8%	
6/19/2007						
7/15/2007	10%				6%	
8/17/2007						
9/19/2007	24%					24%
10/17/2007						
11/12/2007	ndd			5%		ndd
12/12/2007	ndd				4%	100%

Upper Talarik Creek tributary: Stream monitoring site UT-138A



UT138A

Property-property graphs and RPD tables

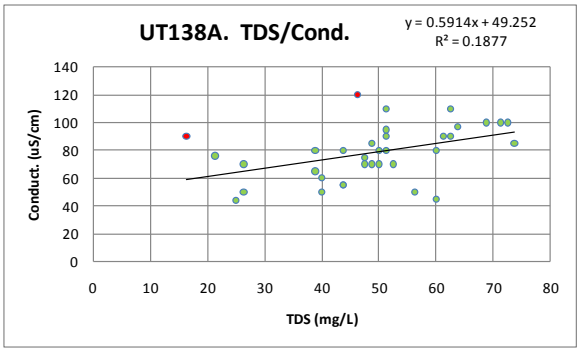
TDS and conductivity correlate poorly	
Ratio of total to dissolved potassium correlates poorly	Feb 2006
Major cation RPD's dissolved consistently over total	Sept 2004, Oct 2004, Jan 2007, March 2005

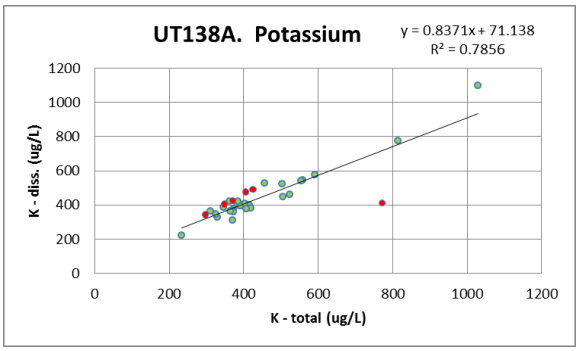
Potential outliers, outside pattern

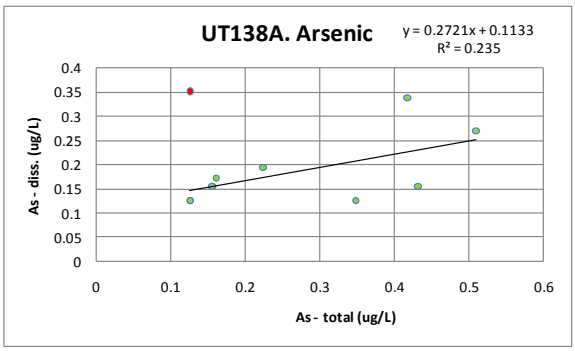
TDS	March 2006
antimony	June 2004
arsenic	Aug 2004
copper	May 2004, Aug 2004, Sept 2004, Feb 2006
lead	Oct 2005, Jan 2007
molybdenum	Feb 2007
zinc	May 2004, Sept 2004, July 2005

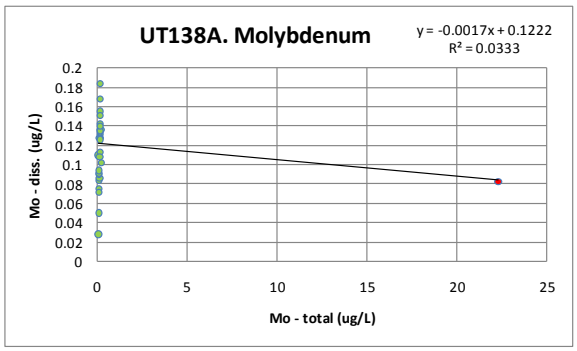
Elements reported as below MDL but appear to be above MRL

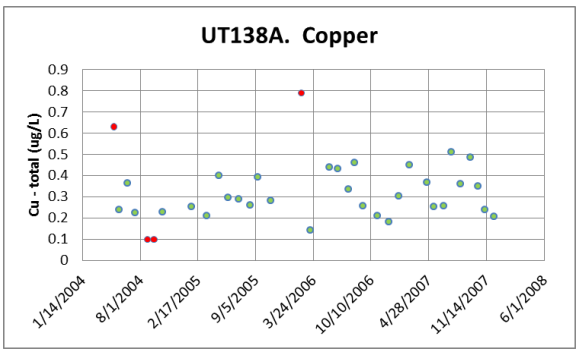
aluminum	May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	May 2004, Aug 2004

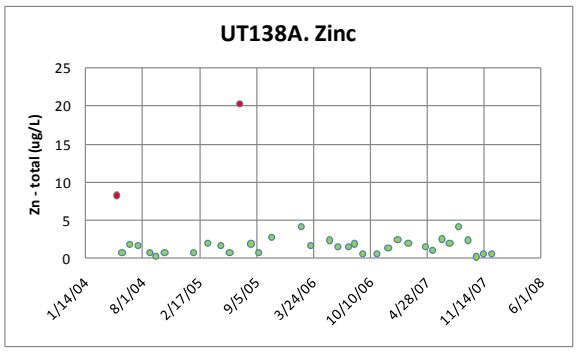

UT138A. TDS/Cond.
y = 0.5914x + 49.252
R² = 0.1877
Conduct. (uS/cm)
TDS (mg/L)

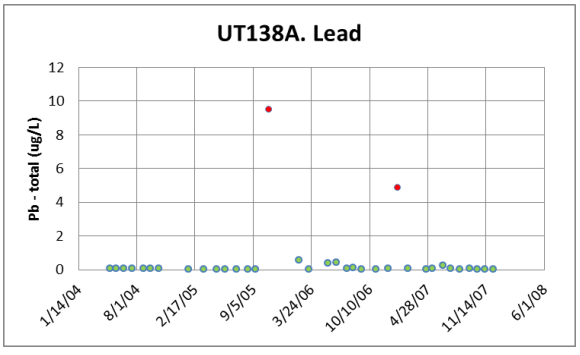

UT138A. Potassium
y = 0.8371x + 71.138
R² = 0.7856
K - diss. (ug/L)
K - total (ug/L)

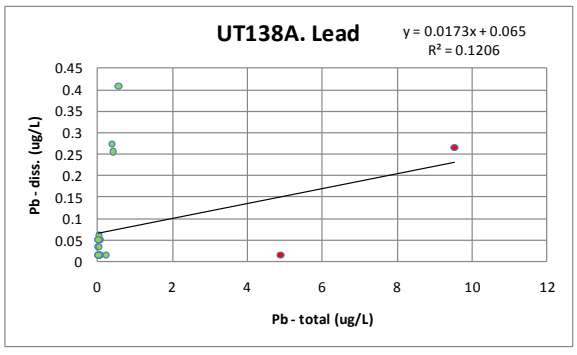

UT138A. Arsenic
y = 0.2721x + 0.1133
R² = 0.235
As - diss. (ug/L)
As - total (ug/L)


UT138A. Molybdenum
y = -0.0017x + 0.1222
R² = 0.0333
Mo - diss. (ug/L)
Mo - total (ug/L)


UT138A. Copper
Cu - total (ug/L)
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT138A. Zinc
Zn - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT138A. Lead
Pb - total (ug/L)
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT138A. Lead
y = 0.0173x + 0.065
R² = 0.1206
Pb - diss. (ug/L)
Pb - total (ug/L)

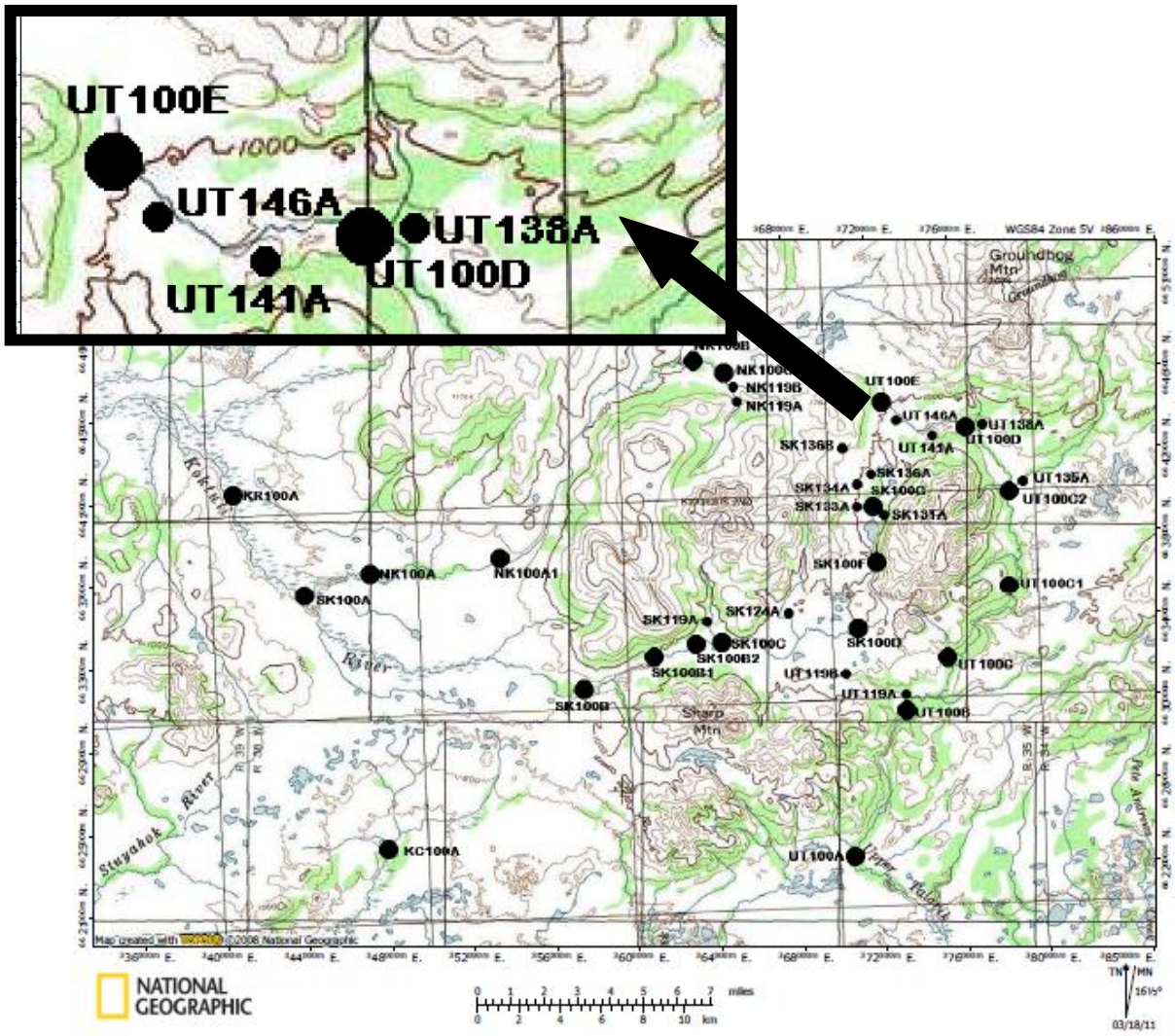
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/1/2004				
5/21/2004			1%	1%
6/17/2004				
7/15/2004				
8/18/2004				
8/25/2004			16%	
9/17/2004		15%	14%	15%
10/17/2004	15%	10%	15%	5%
1/27/2005	4%			0%
3/19/2005	16%	11%		12%
5/2/2005	4%	4%		2%
6/2/2005			1%	1%
7/9/2005		0%		
8/17/2005				
9/13/2005				
10/28/2005	5%	15%	15%	
2/10/2006		0%		
3/15/2006				
5/19/2006				
6/17/2006		4%		8%
7/24/2006		5%		7%
8/15/2006		2%	6%	6%
9/12/2006			1%	
11/2/2006	4%		6%	
12/12/2006		1%	1%	1%
1/14/2007	4%	19%	14%	16%
2/20/2007	11%	7%	14%	6%
4/22/2007	5%	6%	7%	7%
5/15/2007				
6/19/2007	2%	9%	9%	6%
7/16/2007	1%	1%		1%
8/17/2007				
9/19/2007	1%		4%	1%
10/16/2007	2%	3%	14%	4%
11/10/2007	7%	6%	16%	5%
12/10/2007	4%	3%	11%	3%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
5/1/2004						
5/21/2004	8%			2%		
6/17/2004						
7/15/2004						
8/18/2004						
8/25/2004	99%		ndd	19%		
9/17/2004	99%			13%		147%
10/17/2004	6%					
1/27/2005						
3/19/2005			ndd	7%	147%	
5/2/2005						27%
6/2/2005						
7/9/2005						ndd
8/17/2005	16%				2%	
9/13/2005						71%
10/28/2005	ndd				ndd	ndd
2/10/2006						
3/15/2006	47%					ndd
5/19/2006						8%
6/17/2006					26%	
7/24/2006					17%	
8/15/2006	ndd				9%	ndd
9/12/2006	30%					97%
11/2/2006	24%				21%	ndd
12/12/2006					5%	ndd
1/14/2007					17%	ndd
2/20/2007				1%	16%	ndd
4/22/2007	ndd			6%	8%	ndd
5/15/2007	ndd				1%	43%
6/19/2007	1%				8%	
7/16/2007					1%	
8/17/2007						
9/19/2007					13%	
10/16/2007					11%	
11/10/2007	ndd				18%	94%
12/10/2007	26%				19%	84%

Upper Talarik Creek tributary: Stream monitoring site UT-141A



UT141A

Property-property graphs and RPD tables

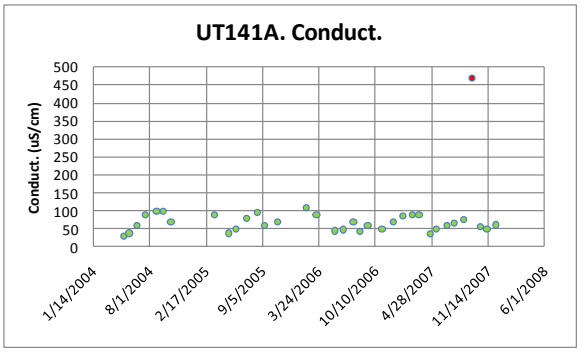
Major cation RPD's dissolved consistently over total	Nov 2006
Calcium RPD greater than 20%	Sept 2004
Potassium RPD greater than 20%	Nov 2007, Dec 2007
Manganese RPD greater than 20%	May 2004

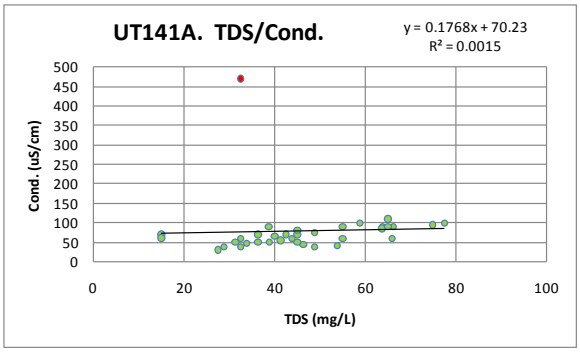
Potential outliers, outside pattern

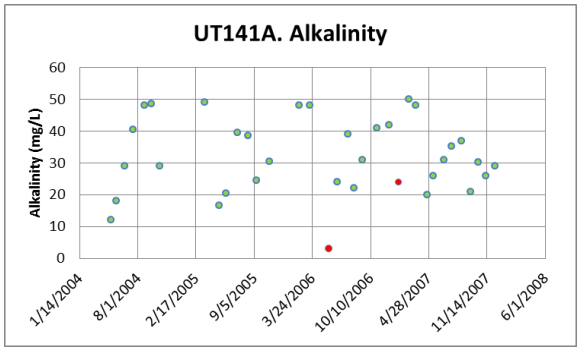
alkalinity	May 2006, Jan 2007
antimony	April 2004, May 2004, June 2004, Aug 2005
lead	Feb 2007
zinc	July 2005

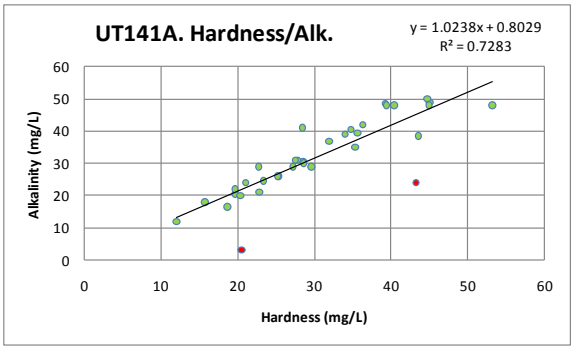
Elements reported as below MDL but appear to be above MRL

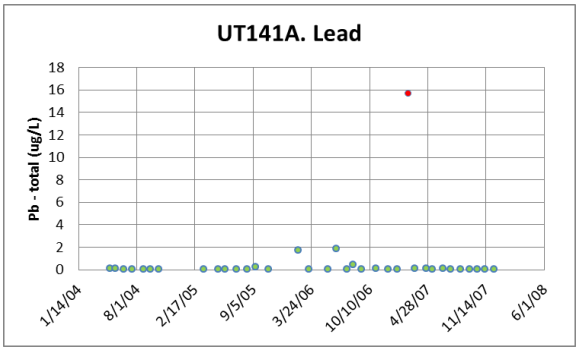
conductivity	Sept 2007
aluminum	May 2004, July 2004, Aug 2004, Sept 2004, Oct 2004
antimony	April 2004
molybdenum	April 2004, May 2004, June 2004, July 2004, Aug 2004, Sept 2004, Oct 2004

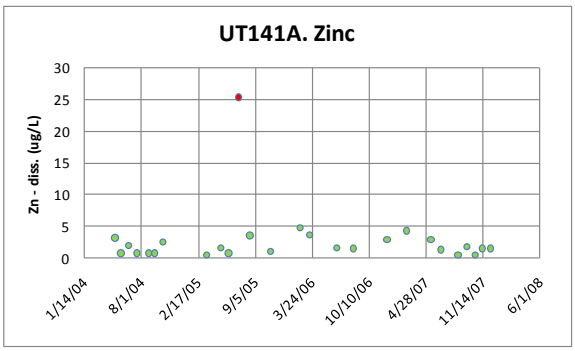

UT141A. Conduct.
Conduct. (uS/cm)
500
450
400
350
300
250
200
150
100
50
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT141A. TDS/Cond.
y = 0.1768x + 70.23
R² = 0.0015
Cond. (uS/cm)
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
TDS (mg/L)


UT141A. Alkalinity
Alkalinity (mg/L)
60
50
40
30
20
10
0
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


UT141A. Hardness/Alk.
y = 1.0238x + 0.8029
R² = 0.7283
Alkalinity (mg/L)
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Hardness (mg/L)


UT141A. Lead
Pb - total (ug/L)
18
16
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT141A. Zinc
Zn - diss. (ug/L)
30
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

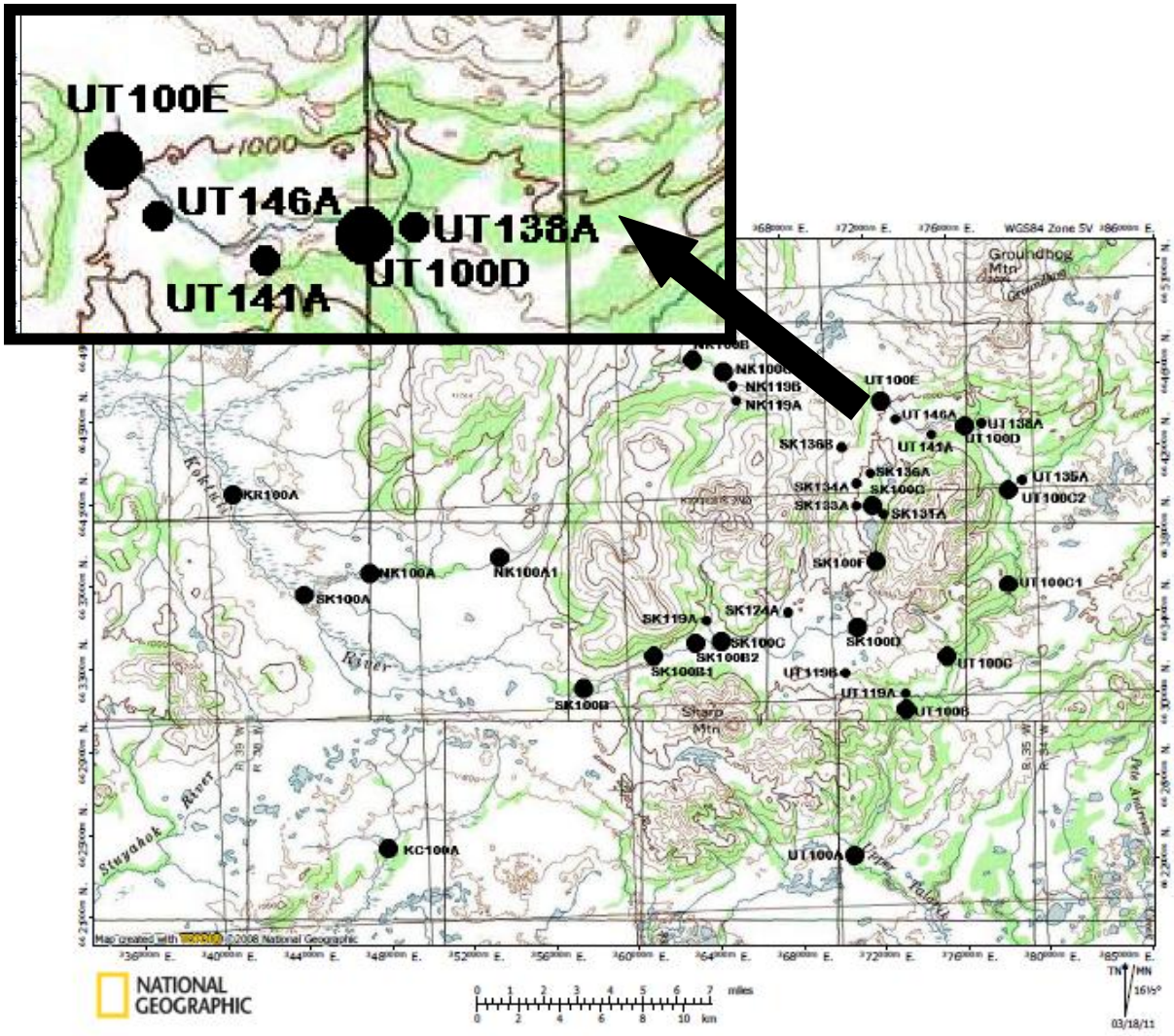
Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	7%		9%	6%
5/20/2004	0%		2%	
6/17/2004				
7/15/2004				
8/25/2004	1%		4%	
9/17/2004	20%	12%		4%
10/15/2004				
10/16/2004				
3/19/2005	4%		10%	
5/7/2005				
6/2/2005				1%
7/9/2005	5%	10%	6%	10%
8/16/2005				
9/13/2005	1%			
10/28/2005	5%	8%	10%	11%
2/8/2006				
3/15/2006				
5/19/2006		9%	1%	10%
6/17/2006	4%	5%	3%	7%
7/24/2006	3%	0%	1%	4%
8/15/2006				
9/12/2006				
11/2/2006	15%	13%		11%
12/12/2006			2%	
1/14/2007	13%			
2/19/2007	2%	2%	17%	10%
3/14/2007	4%		1%	
4/22/2007			0%	2%
5/14/2007				
6/20/2007	4%	9%		8%
7/16/2007			16%	
8/18/2007	6%	6%	19%	8%
9/19/2007			5%	
10/16/2007	2%	3%	16%	2%
11/10/2007	6%	3%	21%	0%
12/11/2007	1%	4%	20%	1%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004	16%					48%
5/20/2004	97%			25%		24%
6/17/2004	14%					88%
7/15/2004						
8/25/2004	ndd					105%
9/17/2004					69%	105%
10/15/2004	114%					107%
10/16/2004						
3/19/2005		ndd	ndd	11%	28%	
5/7/2005						78%
6/2/2005	26%					
7/9/2005	62%					18%
8/16/2005						
9/13/2005	0%	ndd	ndd	ndd		ndd
10/28/2005	0%			4%	ndd	
2/8/2006	26%					15%
3/15/2006	ndd					13%
5/19/2006	25%				3%	ndd
6/17/2006	21%				17%	
7/24/2006	4%				4%	ndd
8/15/2006	16%				17%	
9/12/2006	ndd					ndd
11/2/2006					12%	ndd
12/12/2006	21%				2%	39%
1/14/2007	ndd	ndd		ndd		ndd
2/19/2007	35%				2%	26%
3/14/2007	ndd			14%	1%	ndd
4/22/2007	ndd					ndd
5/14/2007	ndd			4%		5%
6/20/2007	ndd				13%	91%
7/16/2007	5%				10%	ndd
8/18/2007					10%	
9/19/2007						7%
10/16/2007					5%	
11/10/2007	ndd				7%	99%
12/11/2007					14%	100%

Upper Talarik Creek tributary: Stream monitoring site UT-146A



UT146A

Property-property graphs and RPD tables

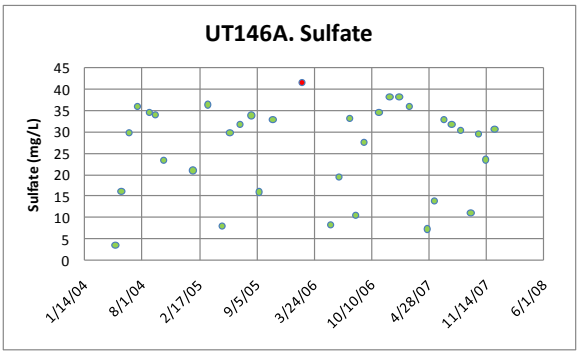
Aluminum has an unusual bell-shaped curve relationship between total and dissolved concentrations; data should be reviewed	
Relationship of TDS-sulfate outside pattern	February 2006
Relationship of total and dissolved potassium outside pattern	January 2007
Major cation RPD's dissolved consistently over total	Sept 2004
Calcium RPD greater than 20%	Sept 2004
Magnesium RPD greater than 20%	Sept 2004

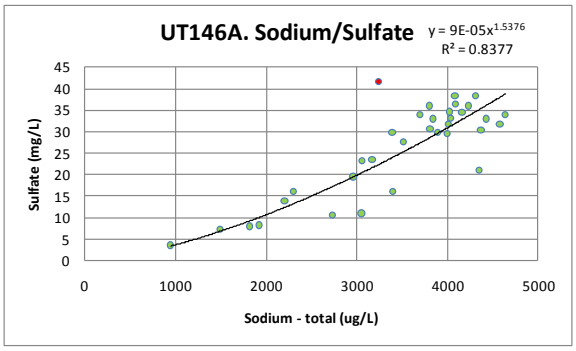
Potential outliers, outside pattern

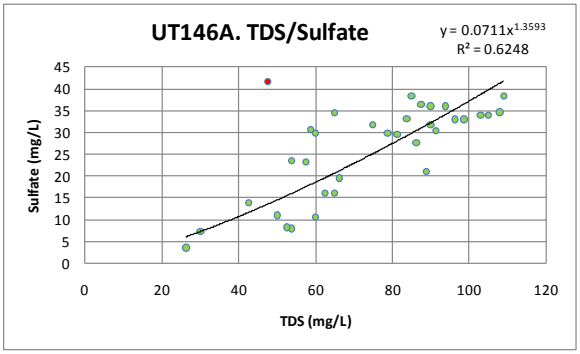
copper	Feb 2006
lead	June 2006, Feb 2007
zinc	Jan 2007

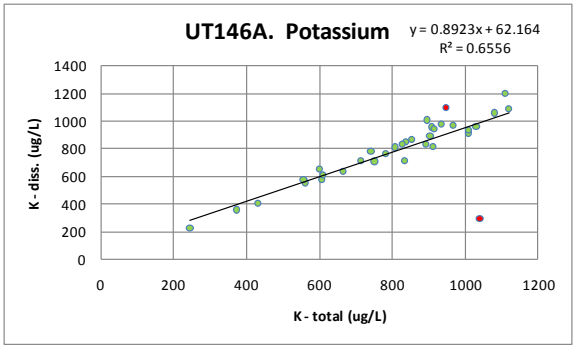
Elements reported as below MDL but appear to be above MRL

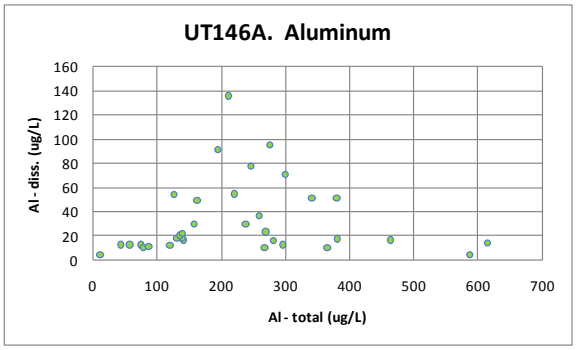
aluminum	June 2004, July 2004, Aug 2004, Sept 2004
antimony	May 2004, June 2004
molybdenum	

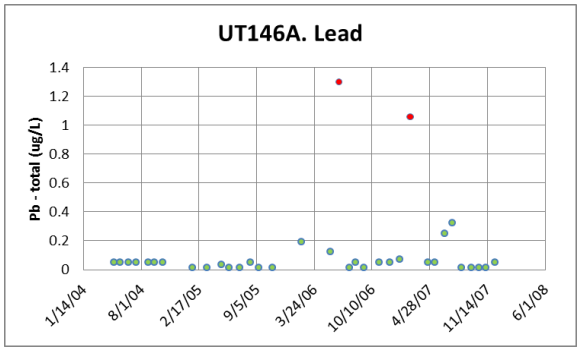

UT146A. Sulfate
Sulfate (mg/L)
45
40
35
30
25
20
15
10
5
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

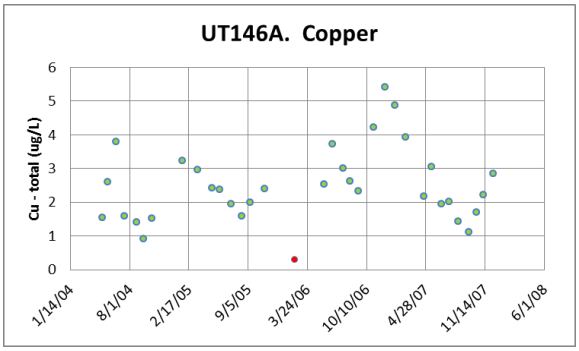

UT146A. Sodium/Sulfate
y = 9E-05x^1.5376
R² = 0.8377
Sulfate (mg/L)
45
40
35
30
25
20
15
10
5
0
0
1000
2000
3000
4000
5000
Sodium - total (ug/L)

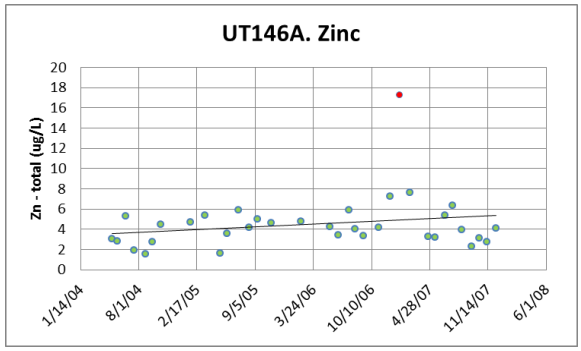

UT146A. TDS/Sulfate
y = 0.0711x^1.3593
R² = 0.6248
Sulfate (mg/L)
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
TDS (mg/L)


UT146A. Potassium
y = 0.8923x + 62.164
R² = 0.6556
K - diss. (ug/L)
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
K - total (ug/L)


UT146A. Aluminum
Al - diss. (ug/L)
160
140
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Al - total (ug/L)


UT146A. Lead
Pb - total (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT146A. Copper
Cu - total (ug/L)
6
5
4
3
2
1
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08


UT146A. Zinc
Zn - total (ug/L)
20
18
16
14
12
10
8
6
4
2
0
1/14/04
8/1/04
2/17/05
9/5/05
3/24/06
10/10/06
4/28/07
11/14/07
6/1/08

Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
4/30/2004	11%			8%
5/20/2004				3%
6/17/2004				
7/15/2004	4%	10%	12%	9%
8/25/2004				
9/17/2004	33%	30%	15%	19%
10/16/2004	2%		0%	1%
1/25/2005				18%
3/18/2005	5%	1%		
5/7/2005				
6/2/2005				
7/9/2005	3%	5%	5%	6%
8/16/2005				
9/13/2005				
10/30/2005	3%	1%	2%	1%
2/9/2006				
5/19/2006				
6/17/2006		3%		8%
7/24/2006	2%		3%	
8/15/2006				
9/12/2006			1%	3%
11/4/2006	3%	3%	1%	2%
12/12/2006				
1/14/2007				
2/19/2007	7%	6%	8%	8%
4/22/2007			0%	1%
5/17/2007		1%		2%
6/20/2007		9%	5%	8%
7/16/2007			2%	
8/17/2007				
9/20/2007	2%	0%	4%	0%
10/16/2007				
11/10/2007	6%	4%	8%	4%

Trace Metals

	Cu	Al	Fe	Mn	Mo	Zn
Date	RPD	RPD	RPD	RPD	RPD	RPD
4/30/2004						22%
5/20/2004						
6/17/2004					ndd	11%
7/15/2004				11%		
8/25/2004						
9/17/2004				1%		ndd
10/16/2004						
1/25/2005						ndd
3/18/2005				7%	100%	ndd
5/7/2005					139%	41%
6/2/2005						
7/9/2005						ndd
8/16/2005						
9/13/2005					22%	
10/30/2005					1%	1%
2/9/2006					6%	
5/19/2006						ndd
6/17/2006					20%	
7/24/2006					5%	
8/15/2006						ndd
9/12/2006				3%	3%	24%
11/4/2006						ndd
12/12/2006					10%	5%
1/14/2007					ndd	
2/19/2007				1%	6%	9%
4/22/2007	7%					ndd
5/17/2007						ndd
6/20/2007					14%	
7/16/2007					12%	
8/17/2007	3%					
9/20/2007					21%	21%
10/16/2007					6%	
11/10/2007					40%	
12/12/2007					14%	

Appendix B:

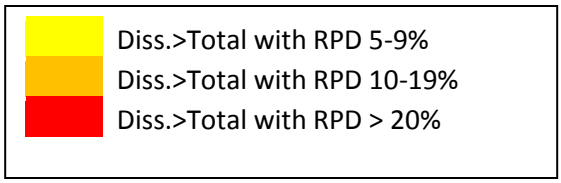
Cation RPD tables –

USGS Pebble stream, pond, and groundwater data, 2008

Legend

08	year sample collected
PB	region Pebble Beach
130	three digit number is a site specific label
RA	raw (unfiltered) water, acidified
FA	filtered water, acidified

Water samples were analyzed by high resolution ICP-MS



*A minus (-) sign indicates dissolved is greater than total; a positive % indicates total is greater than dissolved.

Streams

SampleNumber	Ca	RPD	K	RPD	Mg	RPD	Na	RPD
Streams								
08PB270RA	10.5	5%	0.419	8%	3.48	12%	3.81	13%
08PB270FA	9.97		0.388		3.1		3.36	
08PB271RA	9.42	8%	0.479	10%	3.34	13%	4.09	26%
08PB271FA	8.66		0.432		2.93		3.16	
08PB272RA	7.83	8%	0.336	4%	2.18	12%	3.24	22%
08PB272FA	7.21		0.323		1.94		2.59	
08PB273RA	7.76	7%	0.352	6%	2.28	22%	3.17	24%
08PB273FA	7.27		0.333		1.82		2.48	
08PB274RA	6.02	13%	0.207	0%	0.862	5%	1.93	6%
08PB274FA	5.26		0.208		0.818		1.82	
08PB275RA	7.67	8%	0.474	-9%	2.1	11%	3.21	21%
08PB275FA	7.1		0.519		1.89		2.59	
08PB276RA	7.52	14%	0.432	14%	1.96	12%	2.97	21%
08PB276FA	6.52		0.377		1.73		2.4	
08PB277RA	4.56	2%	0.273	-10%	1.31	10%	2.02	-3%
08PB277FA	4.48		0.302		1.19		2.08	
08PB278DRA	4.57	6%	0.278	-3%	1.16	-4%	2.03	-5%
08PB278DFA	4.29		0.287		1.21		2.14	
08PB278RA	5.54	16%	0.291	5%	1.35	14%	2.39	21%
08PB278FA	4.72		0.278		1.17		1.94	
08PB279RA	5.3	14%	0.315	2%	1.37	7%	2.34	8%
08PB279FA	4.62		0.308		1.28		2.17	

Ponds

SampleNumber	Ca	RPD	K	RPD	Mg	RPD	Na	RPD
08PB130RA	7.67	2%	1.69	-1%	3.18	20%	3.95	22%
08PB130FA	7.51		1.7		2.61		3.16	
08PB131DRA	7.17	3%	1.31	-2%	2.25	12%	3.15	12%
08PB131DFA	6.98		1.34		2		2.79	
08PB131RA	7.17	4%	1.3	1%	2.2	9%	3.11	11%
08PB131FA	6.91		1.29		2.02		2.78	
08PB132RA	0.228	4%	0.159	-6%	0.0994	7%	0.336	4%
08PB132FA	0.219		0.168		0.0929		0.323	
08PB133RA	0.292	2%	0.0817	-2%	0.0819	-6%	0.367	-6%
08PB133FA	0.285		0.0833		0.0871		0.39	
08PB134RA	1.45	6%	0.145	-6%	0.398	3%	0.787	3%
08PB134FA	1.37		0.154		0.387		0.764	
08PB135RA	0.29	3%	0.183	4%	0.163	23%	0.851	33%
08PB135FA	0.281		0.176		0.13		0.611	
08PB136RA	0.766	-2%	0.119	-5%	0.258	0%	0.483	-3%
08PB136FA	0.784		0.125		0.258		0.499	
08PB137RA	14.7	6%	1.42	-2%	4.18	12%	4.16	7%
08PB137FA	13.9		1.45		3.7		3.86	
08PB138RA	1.97	6%	0.188	3%	0.801	8%	1.16	3%
08PB138FA	1.86		0.182		0.738		1.13	
08PB139RA	0.369	-2%	0.196	1%	0.133	5%	0.49	1%
08PB139FA	0.377		0.195		0.126		0.486	
08PB140RA	1.07	3%	0.213	-2%	0.355	1%	0.776	-2%
08PB140FA	1.04		0.217		0.35		0.792	
08PB141RA	4.14	6%	0.166	4%	0.753	-3%	1.66	-7%
08PB141FA	3.9		0.16		0.775		1.78	
08PB142RA	2.59	2%	0.199	1%	0.489	1%	0.963	-3%
08PB142FA	2.55		0.198		0.482		0.991	
08PB143RA	5.33	2%	0.182	-3%	0.924	4%	1.45	-1%
08PB143FA	5.23		0.188		0.884		1.47	
08PB144RA	0.254	4%	0.251	3%	0.085	4%	0.587	11%
08PB144FA	0.244		0.244		0.0816		0.525	
08PB145RA	3.3	3%	0.271	-8%	0.539	3%	1.59	1%
08PB145FA	3.19		0.293		0.521		1.58	
08PB146RA	3.68	3%	0.108	2%	0.642	3%	1.66	-2%
08PB146FA	3.58		0.106		0.624		1.69	
08PB147RA	6.03	11%	0.28	1%	1.26	7%	2.04	2%
08PB147FA	5.39		0.276		1.17		2	
08PB149RA	3.63	4%	0.101	6%	0.59	14%	1.61	10%
08PB149FA	3.49		0.0953		0.515		1.46	
08PB150RA	8.54	7%	0.202	3%	1.91	13%	2.88	26%
08PB150FA	7.93		0.197		1.68		2.22	
08PB151RA	3.71	4%	0.108	-6%	0.642	10%	1.76	14%
08PB151FA	3.56		0.115		0.582		1.53	
08PB152RA	2.71	6%	0.192	-1%	0.518	5%	1.69	2%
08PB152FA	2.54		0.194		0.491		1.65	

Ponds, cont.

SampleNumber	Ca	RPD	K	RPD	Mg	RPD	Na	RPD
08PB153RA	0.774	6%	0.136	2%	0.316	8%	2.09	3%
08PB153FA	0.728		0.133		0.293		2.03	
08PB154RA	5.7	12%	0.264	2%	2.1	8%	2.28	14%
08PB154FA	5.07		0.26		1.94		1.98	
08PB155RA	1.64	9%	0.13	9%	0.484	10%	2.05	23%
08PB155FA	1.5		0.119		0.438		1.62	
08PB156RA	9.82	9%	0.606	3%	2.49	6%	4.16	21%
08PB156FA	8.95		0.587		2.35		3.36	
08PB157RA	1.62	4%	0.035	1%	0.539	4%	1.65	-2%
08PB157FA	1.56		0.0346		0.517		1.68	
08PB158RA	3.16	8%	0.311	3%	1.8	5%	2.6	-2%
08PB158FA	2.93		0.301		1.71		2.66	
08PB159RA	2.73	4%	0.269	0%	1.04	-5%	1.19	-13%
08PB159FA	2.63		0.268		1.09		1.35	
08PB160RA	2.09	2%	0.258	-3%	0.72	2%	1.04	-3%
08PB160FA	2.04		0.267		0.707		1.07	
08PB161RA	7.23	3%	0.358	5%	1.92	13%	2.4	7%
08PB161FA	7.05		0.342		1.69		2.24	
08PB162RA	3.74	8%	0.354	1%	1.16	-3%	2.38	-4%
08PB162FA	3.46		0.352		1.19		2.48	
08PB163DRA	4.3	2%	0.375	-7%	1.15	-2%	2.29	-6%
08PB163DFA	4.22		0.404		1.17		2.44	
08PB163RA	4.75	5%	0.37	-1%	1.32	16%	2.6	15%
08PB163FA	4.52		0.374		1.13		2.23	
08PB164RA	0.142	31%	0.156	13%	0.0491	1%	0.266	-9%
08PB164FA	0.104		0.137		0.0485		0.292	
08PB165RA	3.23	13%	0.0631	10%	0.942	7%	2.27	5%
08PB165FA	2.85		0.0573		0.875		2.17	
08PB166RA	7.52	4%	0.544	12%	2.31	14%	3.4	11%
08PB166FA	7.19		0.484		2.01		3.05	
08PB167RA	4.85	3%	0.235	1%	1.4	12%	2.28	17%
08PB167FA	4.72		0.233		1.24		1.93	
08PB168RA	3.41	10%	0.355	23%	1.05	3%	1.35	-5%
08PB168FA	3.09		0.283		1.02		1.42	
08PB169RA	13.1	3%	0.798	1%	3.26	6%	4.54	4%
08PB169FA	12.7		0.794		3.08		4.37	
08PB170RA	3.56	8%	0.303	0%	1.14	-1%	1.51	-3%
08PB170FA	3.3		0.303		1.15		1.56	
08PB171RA	21.1	5%	0.751	8%	7.14	15%	4.55	12%
08PB171FA	20		0.695		6.17		4.02	
08PB172RA	2.16	4%	0.185	-1%	0.701	5%	0.938	2%
08PB172FA	2.08		0.187		0.668		0.924	
08PB173RA	9.3	3%	0.382	-1%	2.58	5%	3.69	15%
08PB173FA	9.07		0.384		2.46		3.18	
08PB174RA	8.82	0%	0.614	0%	2.05	20%	4.12	24%
08PB174FA	8.84		0.612		1.67		3.24	

Ponds,cont.

SampleNumber	Ca	RPD	K	RPD	Mg	RPD	Na	RPD
08PB175RA	8.69	-2%	0.531	-6%	1.93	15%	3.48	8%
08PB175FA	8.88		0.566		1.66		3.21	
08PB176RA	0.365	14%	0.267	1%	0.139	8%	0.542	8%
08PB176FA	0.317		0.265		0.128		0.499	
08PB177RA	8.76	8%	0.453	21%	2.4	11%	3.47	7%
08PB177FA	8.1		0.367		2.15		3.25	
08PB181RA	0.275	11%	0.371	1%	0.111	7%	0.478	5%
08PB181FA	0.246		0.368		0.103		0.455	
08PB182RA	0.199	7%	0.303	5%	0.094	12%	0.339	3%
08PB182FA	0.185		0.287		0.083		0.328	
08PB183RA	4.7	4%	0.207	-3%	1.43	-1%	1.78	-7%
08PB183FA	4.51		0.213		1.45		1.9	
08PB184RA	7.16	6%	0.501	3%	1.99	12%	4.05	21%
08PB184FA	6.72		0.487		1.77		3.29	
08PB185RA	16.7	5%	0.636	9%	4.79	12%	4.43	1%
08PB185FA	15.9		0.582		4.23		4.4	
08PB186RA	6.02	4%	0.478	2%	3.05	21%	4.94	29%
08PB186FA	5.76		0.47		2.47		3.68	
08PB187RA	0.218	20%	0.0719	5%	0.0837	26%	0.361	18%
08PB187FA	0.178		0.0686		0.0645		0.302	
08PB188RA	12.1	1%	0.469	-7%	3.03	4%	3.01	10%
08PB188FA	12		0.505		2.9		2.72	
08PB189RA	1.25	5%	0.169	4%	0.373	-2%	1.07	-4%
08PB189FA	1.19		0.163		0.381		1.11	
08PB190DRA	0.574	2%	0.197	0%	0.204	8%	0.543	2%
08PB190DFA	0.564		0.197		0.189		0.533	
08PB190RA	0.563	2%	0.173	-5%	0.206	7%	0.574	7%
08PB190FA	0.554		0.182		0.192		0.534	
08PB202RA	6.83	10%	0.159	1%	2.29	22%	3.76	18%
08PB202FA	6.19		0.157		1.83		3.15	
08PB254RA	9.2	-3%	1.55	-10%	3.33	11%	3.71	17%
08PB254FA	9.44		1.72		2.97		3.13	
08PB255RA	9.76	0%	1.76	-1%	3.35	8%	3.59	14%
08PB255FA	9.74		1.77		3.08		3.13	
08PB256RA	7.01	3%	1.24	-4%	1.97	-1%	2.89	6%
08PB256FA	6.8		1.29		1.98		2.73	
08PB269RA	11	1%	0.479	-6%	3.88	11%	3.82	14%
08PB269FA	10.9		0.508		3.49		3.33	

Groundwater

SampleNumber	Ca	RPD	K	RPD	Mg	RPD	Na	RPD
water from drillholes								
08PB191RA	31.1	16%	1.28	19%	4.43	26%	23.7	14%
08PB191FA	26.5		1.06		3.41		20.6	
08PB203RA	31.9	10%	0.812	16%	3.84	28%	41.6	22%
08PB203FA	29		0.692		2.91		33.2	
08PB219RA	31.9	2%	0.722	-5%	9.73	16%	11.2	23%
08PB219FA	31.4		0.757		8.31		8.9	
Seeps and springs								
08PB282RA	1.01	0%	0.118	6%	0.131	18%	1.24	11%
08PB282FA	1.01		0.111		0.109		1.11	
08PB287RA	3.95	15%	0.199	9%	0.565	12%	2.01	26%
08PB287FA	3.39		0.181		0.499		1.55	

Appendix C:
Summary tables, graphs and RPD tables illustrating potentially questionable PLP groundwater data, 2004-2007

Summary Tables

A list of potentially questionable data is provided for each site.

Graphs

Graphs illustrating concentrations over time or property-property plots are presented. Only a subset of all the metals analyzed by PLP have been graphed or examined in RPD tables (aluminum, arsenic, cadmium, copper, iron, manganese, molybdenum, zinc). Where illustrative graphs for a site would take up more than 2 pages, graphs illustrating all potentially questionable data listed for the site may not be provided.

For RPD tables

The RPD for major cations and select metals (listed in boxes below) were calculated for each stream sampling event and are shown in tables after graphs. When concentrations of an analyte are less than 5MRL, data is not presented. Where either total or dissolved concentrations are less than 5 MRL, RPD is given but not color coded. Although all dates are presented, and many color-coded, only dates for which RPD is over 20%, or RPD for several elements is over 10%, are of potential concern. The MRL, acceptable percent of accuracy and precision as defined by PLP (2008 QAPP) are in the boxes below.

	Ca - Total	Ca - Diss.	Mg - total	Mg - Diss.	K - Total	K - Diss.	Na - Total	Na - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	50	50	20	20	50	50	100	100
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20	20	20

	Al - Total	Al - Diss.	As - Total	As - Diss.	Cd - Total	Cu - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	2	2	0.5	0.5	0.05	0.1
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20

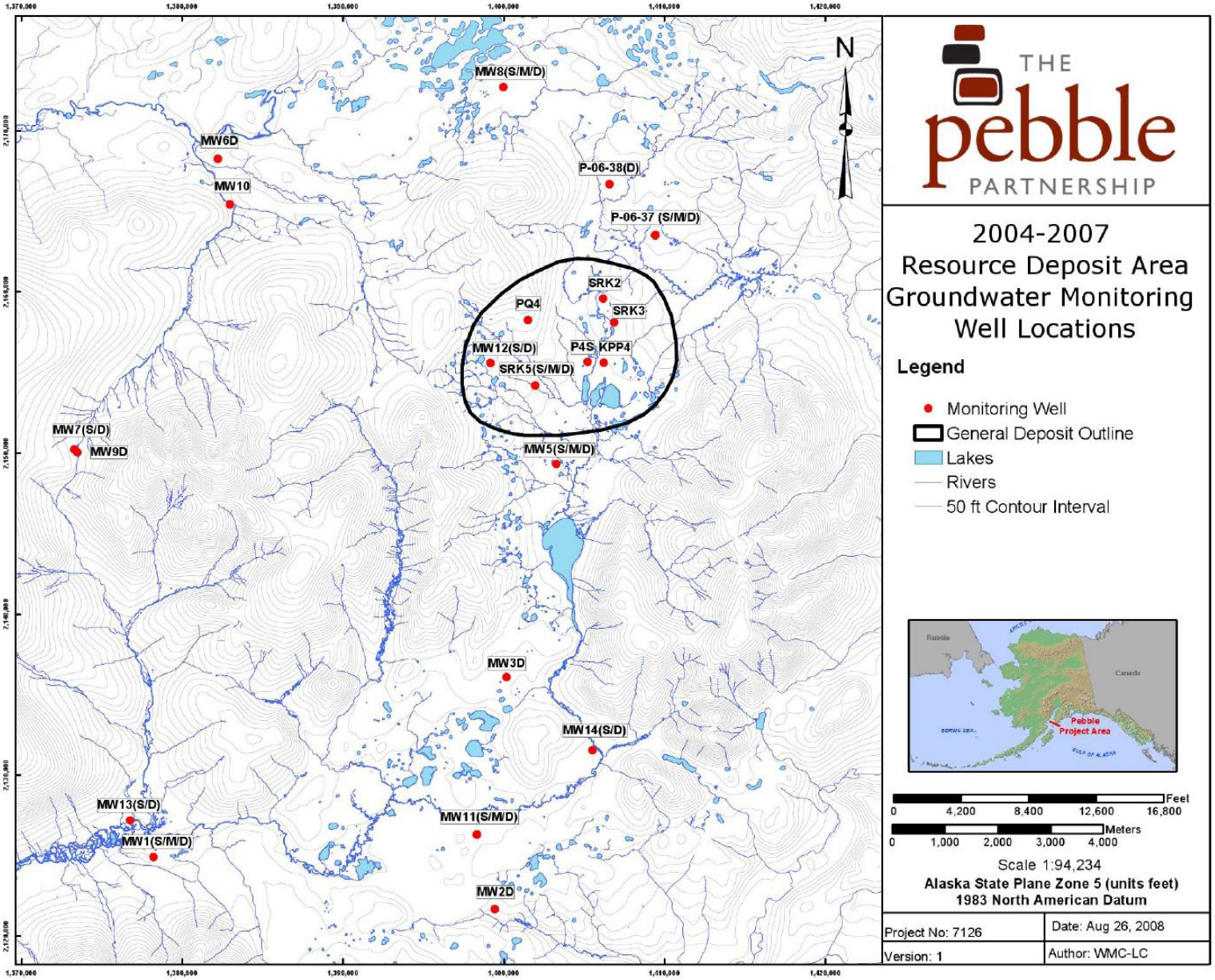
	Fe - Total	Fe - Diss.	Mn - Total	Mn - Diss.	Mo - Total	Mo - Diss.	Zn - Total	Zn - Diss.
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MRL	20	20	0.05	0.05	0.05	0.05	1	1
Accuracy %	85-115	85-115	85-115	85-115	85-115	85-115	85-115	85-115
Precision %	20	20	20	20	20	20	20	20

Color coding in this review is shown in the box below. Only data with an RPD greater than 20%, or for which the RPD for several analytes is greater than 10%, are considered to be of concern.

Diss.>Total with RPD 0-9%
Diss.>Total with RPD 10-19%
Diss.>Total with RPD > 20%
ndd - No dissolved data. Rejected by PLP?

*A minus (-) sign indicates dissolved greater than total; a positive % indicates total greater than dissolved

Location of PLP groundwater monitoring wells



Groundwater monitoring wells on the ore body

KPP4

Property-property graphs, trends and RPD tables

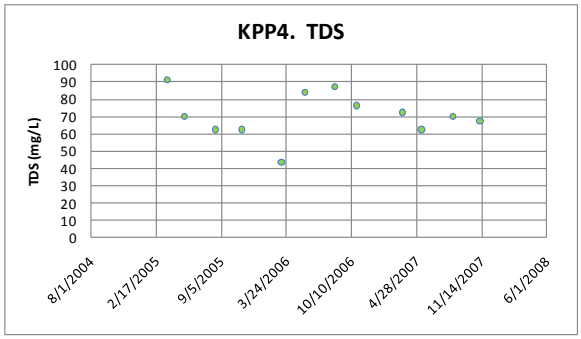
TDS and conductivity correlate poorly	
Total and dissolved calcium correlate poorly	
Major cation and molybdenum RPD's dissolved consistently over total	November 2005
Major cation RPD's dissolved consistently over total	May 2006

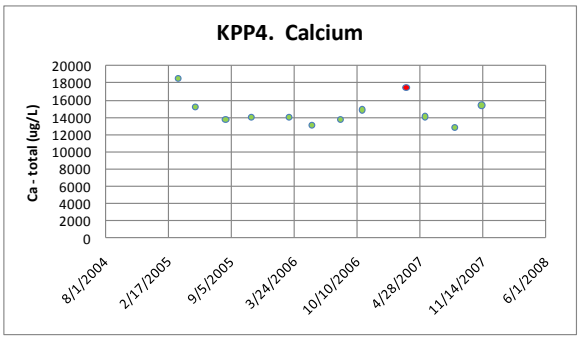
Potential outliers, outside pattern

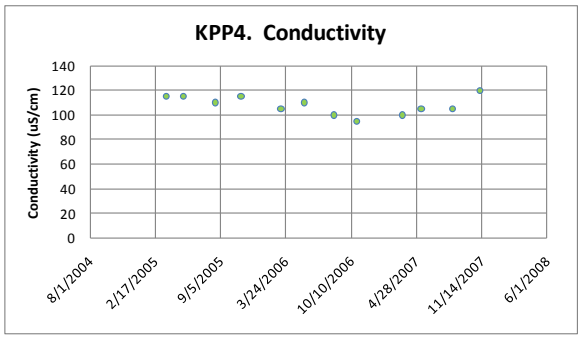
TSS, copper, aluminum, iron, manganese, zinc, lead	March 2007
copper	May 2007, August 2007, November 2007
aluminum	March 2005
manganese	March 2006, May 2007
lead	May 2005

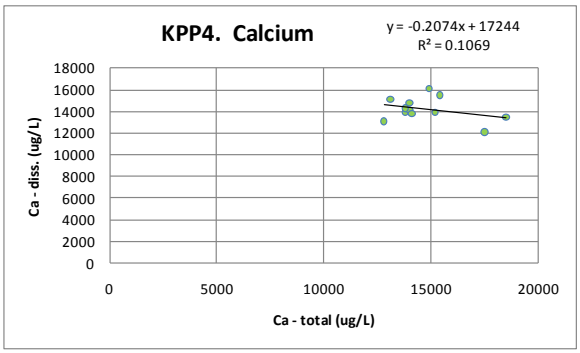
Elements reported as below MDL but appear to be above MRL

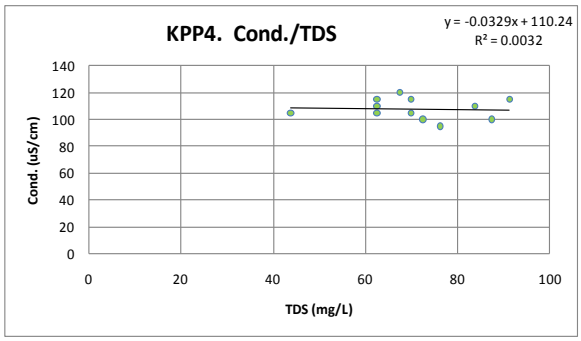
antimony	March 2007
mercury	March 2005, May 2005, August 2005, November 2005

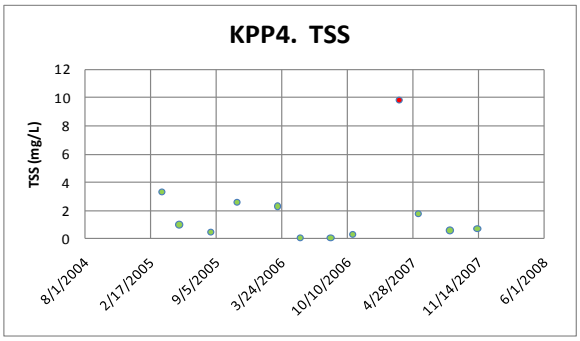

KPP4. TDS
TDS (mg/L)
100
90
80
70
60
50
40
30
20
10
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

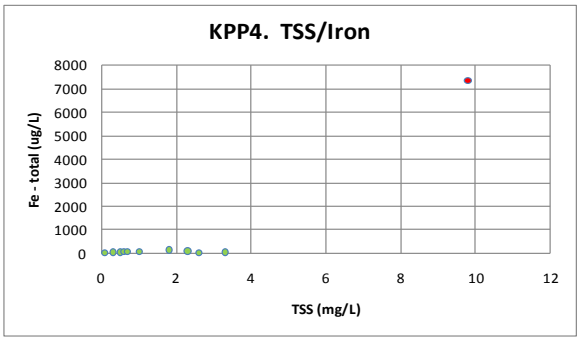

KPP4. Calcium
Ca - total (ug/L)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

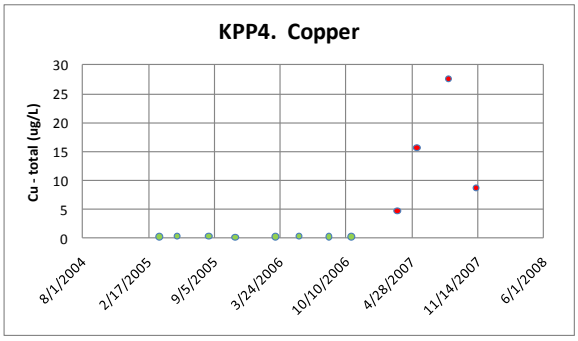

KPP4. Conductivity
Conductivity (uS/cm)
140
120
100
80
60
40
20
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

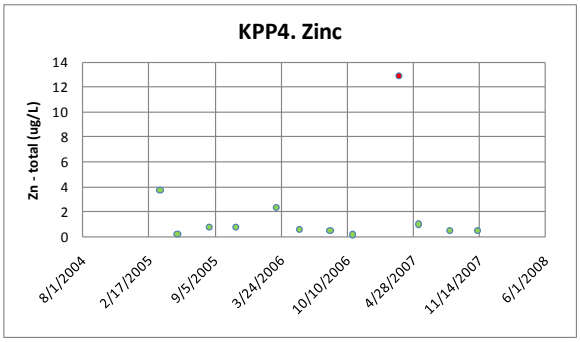

KPP4. Calcium
y = -0.2074x + 17244
R² = 0.1069
Ca - diss. (ug/L)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
5000
10000
15000
20000
Ca - total (ug/L)

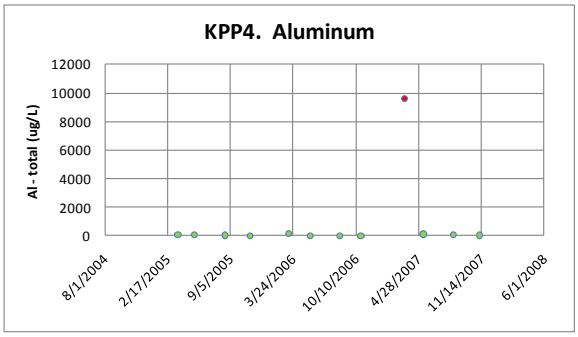

KPP4. Cond./TDS
y = -0.0329x + 110.24
R² = 0.0032
Cond. (uS/cm)
140
120
100
80
60
40
20
0
0
20
40
60
80
100
TDS (mg/L)

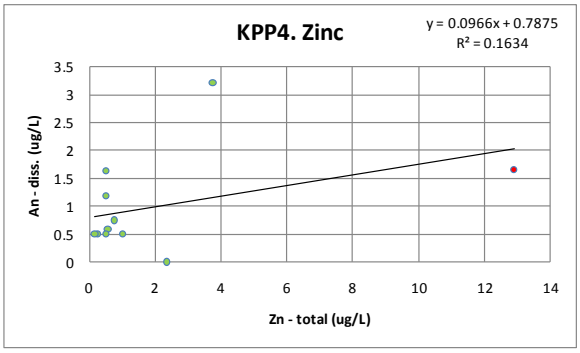

KPP4. TSS
TSS (mg/L)
12
10
8
6
4
2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

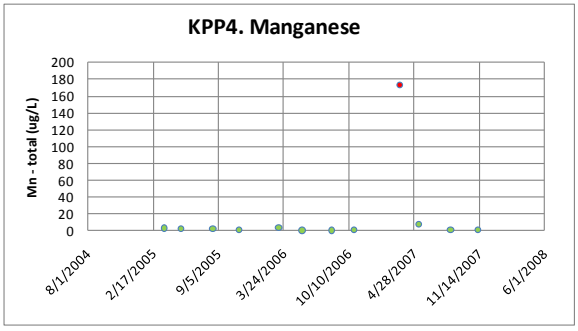

KPP4. TSS/Iron
Fe - total (ug/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
2
4
6
8
10
12
TSS (mg/L)

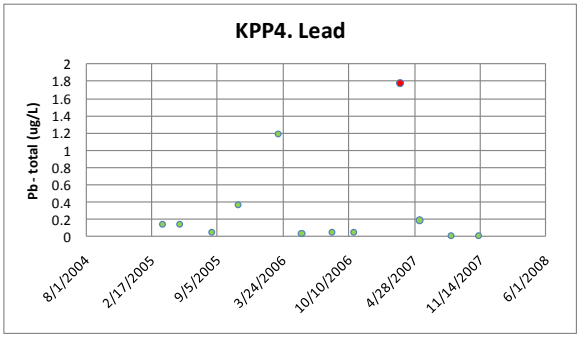

KPP4. Copper
Cu - total (ug/L)
30
25
20
15
10
5
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


KPP4. Zinc
Zn - total (ug/L)
14
12
10
8
6
4
2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


KPP4. Aluminum
Al - total (ug/L)
12000
10000
8000
6000
4000
2000
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


KPP4. Zinc
y = 0.0966x + 0.7875
R² = 0.1634
An - diss. (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
Zn - total (ug/L)


KPP4. Manganese
Mn - total (ug/L)
200
180
160
140
120
100
80
60
40
20
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


KPP4. Lead
Pb - total (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
3/22/2005	31%	20%	8%	20%
5/14/2005	9%	22%	-2%	19%
8/19/2005	-1%	1%	-2%	1%
11/7/2005	-1%	-12%	-10%	-13%
3/9/2006	-6%	-3%	-16%	1%
5/19/2006	-14%	-15%	-18%	-17%
8/19/2006	-4%	-1%	-3%	-2%
10/26/2006	-8%	-3%	-4%	4%
3/15/2007	36%	62%	72%	50%
5/13/2007	2%	4%	5%	2%
8/17/2007	-2%	-4%	-1%	-4%
11/9/2007	-1%	-3%	3%	-3%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
3/22/2005	103%	152%	171%	24%	53%	15%	126%	ndd
5/14/2005	93%	190%	136%	**-16%**	33%	**-72%**	0%	0%
8/19/2005	50%	172%	115%	0%	34%	0%	**-25%**	12%
11/7/2005	26%	150%	40%	**-54%**	17%	0%	184%	-12%
3/9/2006	54%	197%	162%	0%	136%	ndd	196%	42%
5/19/2006	69%	109%	58%	0%	31%	**-5%**	49%	**-16%**
8/19/2006	35%	138%	67%	111%	29%	**-81%**	0%	0%
10/26/2006	17%	138%	55%	0%	63%	**-105%**	0%	-7%
3/15/2007	170%	199%	197%	99%	197%	155%	ndd	ndd
5/13/2007	135%	191%	115%	0%	178%	68%	117%	-4%
8/17/2007	130%	192%	139%	**-79%**	130%	0%	ndd	-4%
11/9/2007	113%	189%	58%	0%	132%	**-106%**	ndd	-8%

Groundwater monitoring wells on the ore body

MW12D

Property-property graphs, trends and RPD tables

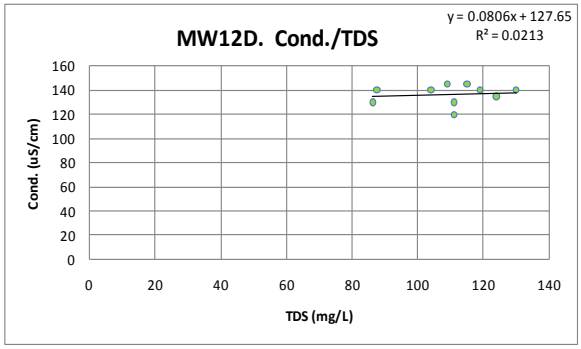
TDS does not correlate with conductivity	
Major cation RPD's dissolved consistently over total	November 2005, March 2006, November 2007
manganese, sulfate	Decrease with time
iron	trends up after 2006

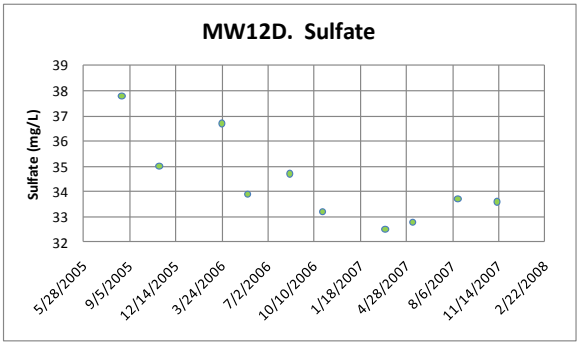
Potential outliers, outside pattern

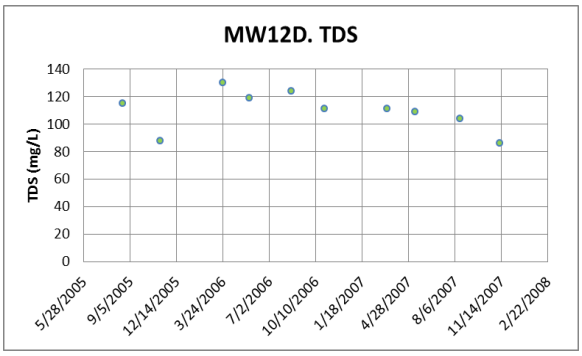
aluminum, iron	August 2005
aluminum	November 2007
molybdenum	March 2007

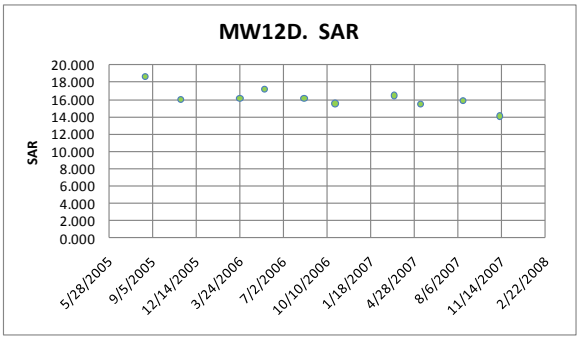
Elements reported as below MDL but appear to be above MRL

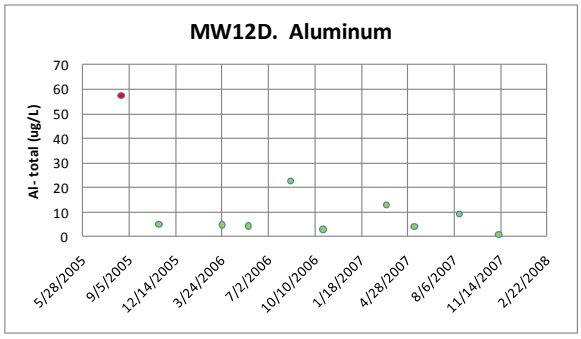
cyanide	March 2007, May 2007
mercury	August 2005, November 2005

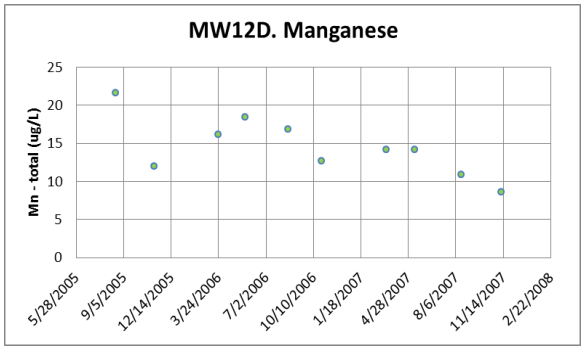

MW12D. Cond./TDS
y = 0.0806x + 127.65
R² = 0.0213
Cond. (uS/cm)
TDS (mg/L)

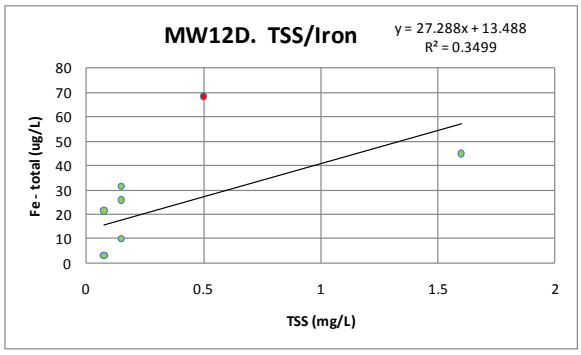

MW12D. Sulfate
Sulfate (mg/L)

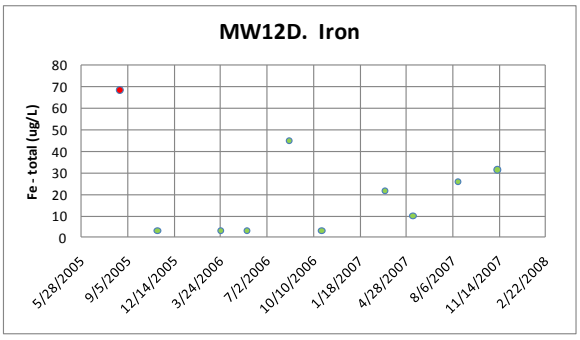

MW12D. TDS
TDS (mg/L)


MW12D. SAR
SAR


MW12D. Aluminum
Al - total (ug/L)


MW12D. Manganese
Mn - total (ug/L)


MW12D. TSS/Iron
y = 27.288x + 13.488
R² = 0.3499
Fe - total (ug/L)
TSS (mg/L)


MW12D. Iron
Fe - total (ug/L)

Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
8/19/2005	-4%	3%	1%	3%
11/8/2005	-18%	-18%		-16%
3/24/2006	-11%	-13%	-10%	-11%
5/19/2006	7%	-4%	4%	-3%
8/18/2006	-1%	0%	-2%	-1%
10/28/2006	-2%	11%	-1%	12%
3/13/2007	5%	1%	10%	2%
5/12/2007	0%	0%	-2%	0%
8/17/2007	2%	1%	1%	-1%
11/10/2007	-10%	-17%	-16%	-19%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
8/19/2005	37%	173%	82%	76%	1%	**-10%**	**-16%**	-1%
11/8/2005	4%	54%	**-97%**	3%	-13%	**-113%**	**-105%**	-16%
3/24/2006	-2%	0%	**-87%**	**-17%**	-8%	37%	0%	-15%
5/19/2006	13%	**-21%**	**-125%**	**-117%**	1%	0%	200%	-1%
8/18/2006	37%	139%	130%	-1%	2%	0%	76%	0%
10/28/2006	-5%	23%	**-105%**	42%	-2%	**-86%**	172%	1%
3/13/2007	41%	62%	150%	1%	10%	36%	99%	9%
5/12/2007	1%	17%	0%	-4%	-3%	9%	0%	-8%
8/17/2007	23%	105%	157%	27%	6%	139%	105%	-1%
11/10/2007	-16%	0%	86%	**-122%**	1%	**-98%**	0%	-6%

Groundwater monitoring wells on the ore body

MW12S

Property-property graphs, trends and RPD tables

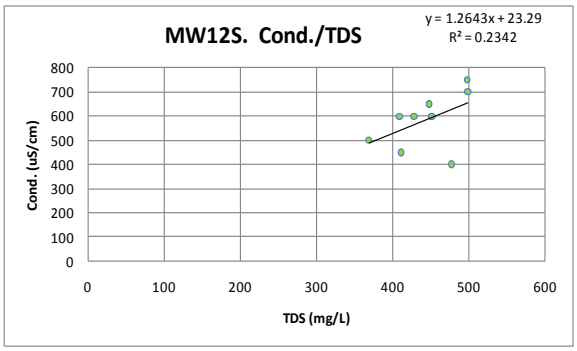
Major cation RPD's dissolved consistently over total	Nov 2005, Aug 2006
TDS and conductivity correlate poorly	
TSS, aluminum, iron, arsenic, lead, copper	high outlier Nov 2005 followed by declining concentrations
TDS, conductivity, sulfate, sodium (and SAR), manganese, molybdenum, zinc	decline over time

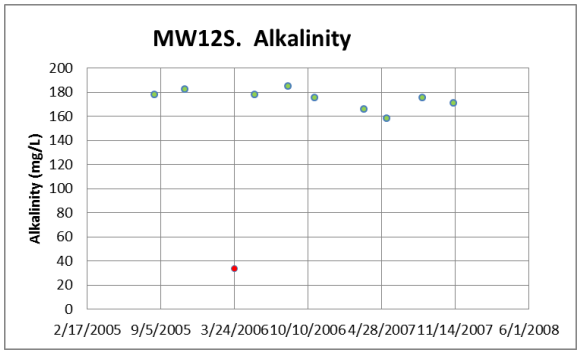
Elements reported as below MDL but appears to be at MRL

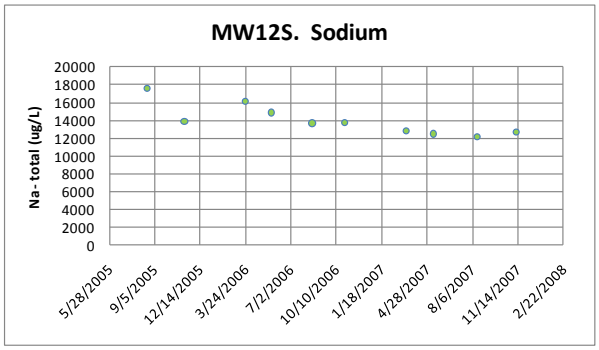
zinc	

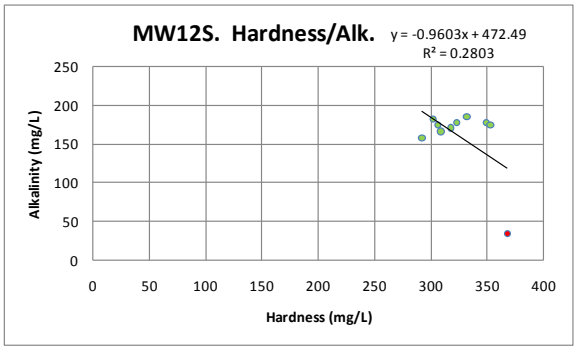
Potential outliers, outside pattern

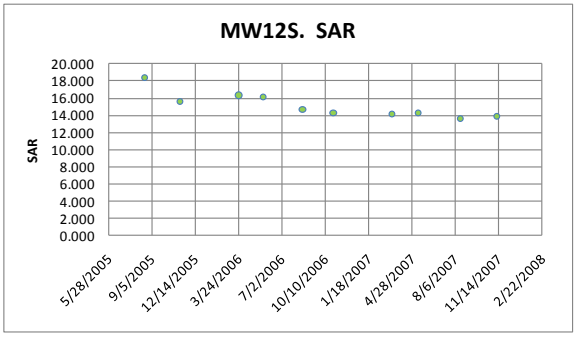
alkalinity	March 2006
chloride	October 2006
aluminum, arsenic, chromium, copper, iron, manganese, nickel, vanadium, zinc, TDS, TSS, hardness, sulfate	higher in MW12S relative to MW12D

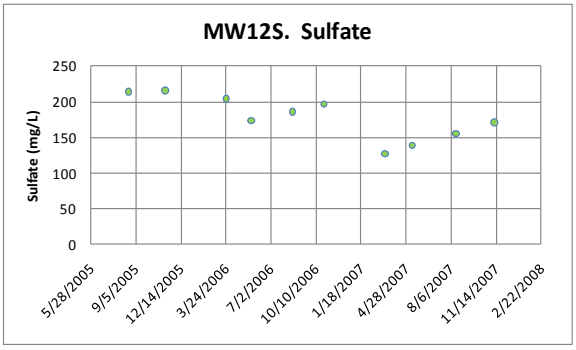

MW12S. Cond./TDS
y = 1.2643x + 23.29
R² = 0.2342
Cond. (uS/cm)
TDS (mg/L)

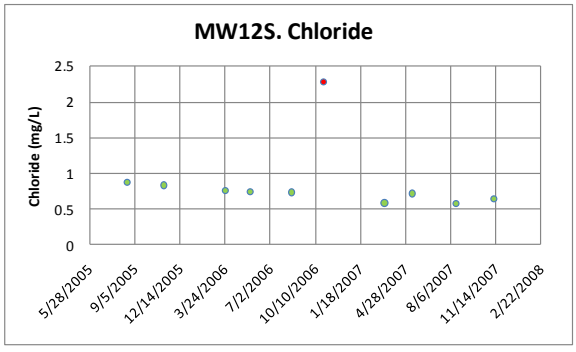

MW12S. Alkalinity
Alkalinity (mg/L)
2/17/2005 9/5/2005 3/24/2006 10/10/2006 4/28/2007 11/14/2007 6/1/2008

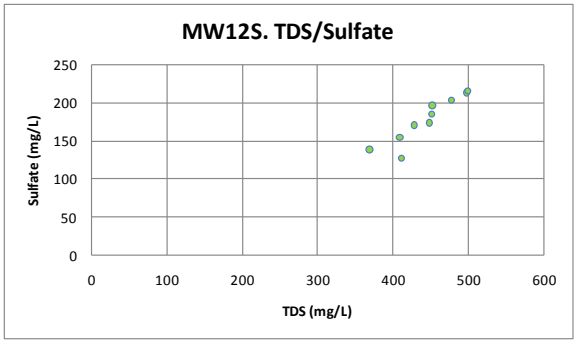

MW12S. Sodium
Na - total (ug/L)
5/28/2005 9/5/2005 12/14/2005 3/24/2006 7/2/2006 10/10/2006 1/18/2007 4/28/2007 8/6/2007 11/14/2007 2/22/2008

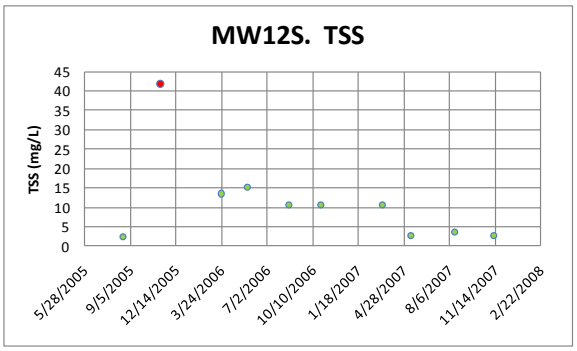

MW12S. Hardness/Alk.
y = -0.9603x + 472.49
R² = 0.2803
Alkalinity (mg/L)
Hardness (mg/L)

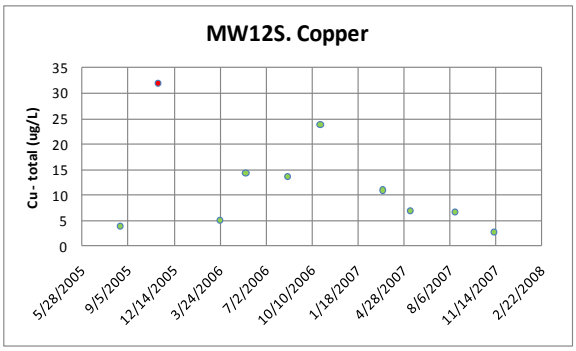

MW12S. SAR
SAR
5/28/2005 9/5/2005 12/14/2005 3/24/2006 7/2/2006 10/10/2006 1/18/2007 4/28/2007 8/6/2007 11/14/2007 2/22/2008

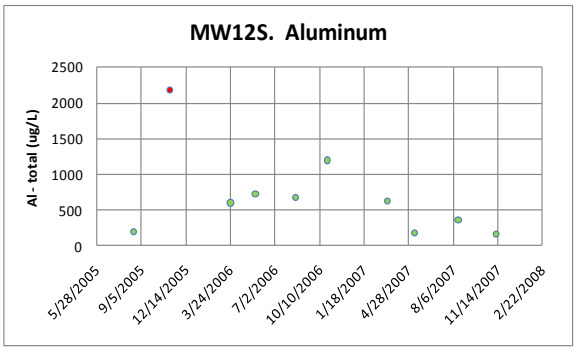

MW12S. Sulfate
Sulfate (mg/L)
5/28/2005 9/5/2005 12/14/2005 3/24/2006 7/2/2006 10/10/2006 1/18/2007 4/28/2007 8/6/2007 11/14/2007 2/22/2008

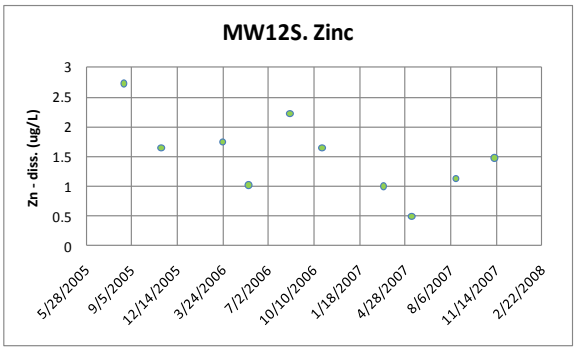

MW12S. Chloride
Chloride (mg/L)
5/28/2005 9/5/2005 12/14/2005 3/24/2006 7/2/2006 10/10/2006 1/18/2007 4/28/2007 8/6/2007 11/14/2007 2/22/2008

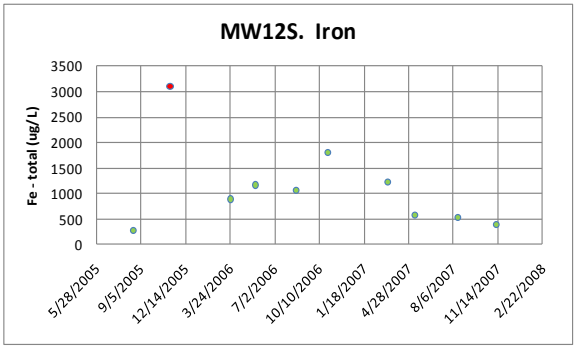

MW12S. TDS/Sulfate
Sulfate (mg/L)
TDS (mg/L)

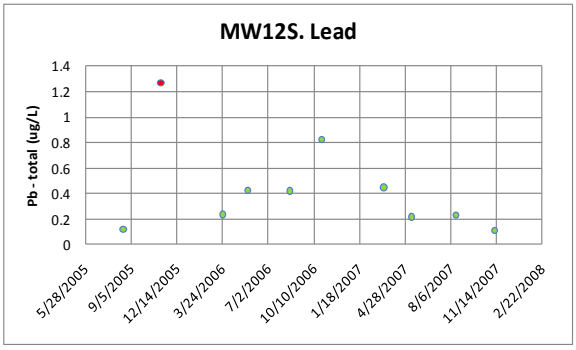

MW12S. TSS
TSS (mg/L)
45
40
35
30
25
20
15
10
5
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

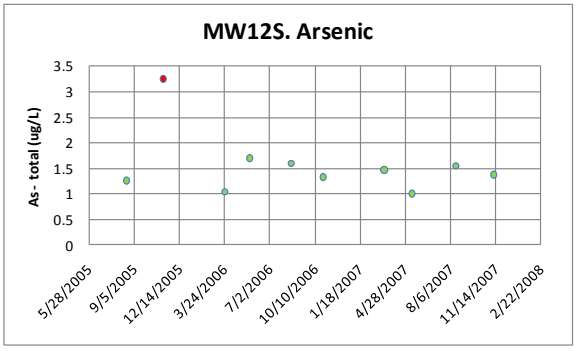

MW12S. Copper
Cu - total (ug/L)
35
30
25
20
15
10
5
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

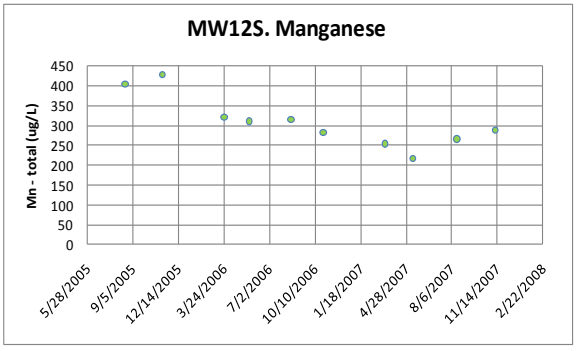

MW12S. Aluminum
Al - total (ug/L)
2500
2000
1500
1000
500
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW12S. Zinc
Zn - diss. (ug/L)
3
2.5
2
1.5
1
0.5
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW12S. Iron
Fe - total (ug/L)
3500
3000
2500
2000
1500
1000
500
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW12S. Lead
Pb - total (ug/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW12S. Arsenic
As - total (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW12S. Manganese
Mn - total (ug/L)
450
400
350
300
250
200
150
100
50
0
5/28/2005
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
8/19/2005	24%	28%	-1%	26%
11/9/2005	-13%	-15%	14%	-13%
3/24/2006	8%	-2%	8%	-1%
5/19/2006	1%	4%	1%	2%
8/18/2006	-11%	-11%	-5%	-12%
10/28/2006	-8%	-1%	8%	-1%
3/12/2007	-4%	-3%	-2%	-4%
5/12/2007	1%	9%	2%	8%
8/17/2007	2%	4%	11%	2%
11/10/2007	0%	-9%	-8%	-8%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
8/19/2005	93%	194%	131%	15%	-3%	10%	36%	0%
11/9/2005	182%	199%	193%	85%	11%	121%	185%	8%
3/24/2006	172%	198%	157%	46%	-4%	63%	179%	2%
5/19/2006	174%	198%	156%	103%	8%	91%	188%	4%
8/18/2006	170%	199%	144%	41%	-2%	36%	158%	-8%
10/28/2006	188%	200%	179%	158%	20%	106%	193%	1%
3/12/2007	174%	196%	162%	19%	-1%	95%	151%	-5%
5/12/2007	185%	198%	160%	13%	16%	133%	173%	4%
8/17/2007	187%	199%	159%	25%	8%	46%	175%	1%
11/10/2007	154%	195%	69%	20%	0%	22%	151%	-2%

Groundwater monitoring wells on the ore body

PQ4

Property-property graphs, trends and RPD tables

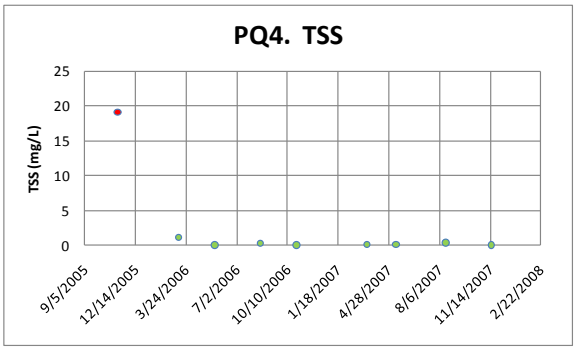
TDS and conductivity correlate poorly	
Major cation and arsenic, manganese and molybdenum RPD more than 10%	Aug 2006
Major cation RPD's dissolved consistently over total	May 2007
Major cation RPD and iron, manganese, and zinc RPD more than 10%	Aug 2007
iron	primarily in the ferrous form
pH, iron, arsenic, lead, sulfate	decline with time
acidity, copper	increase with time

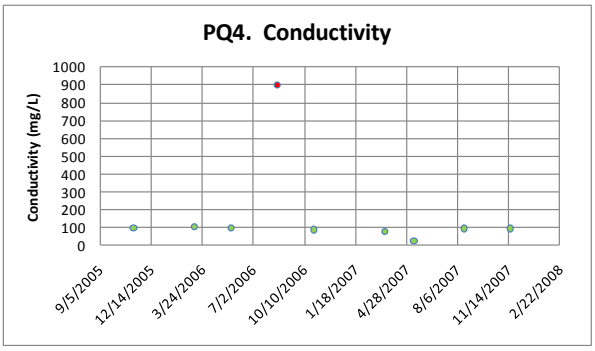
Potential outliers, outside pattern

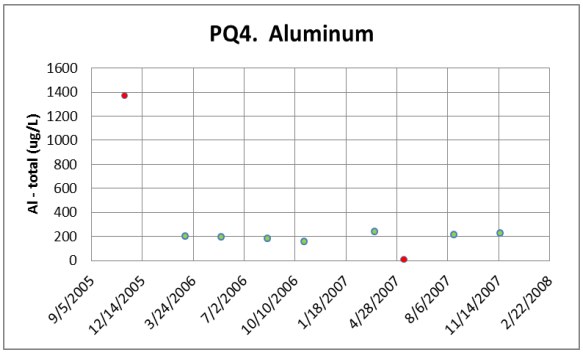
Low concentrations in all analytes, including cations	May 2007
TSS, alkalinity, aluminum, iron high	November 2005
conductivity	Aug 2006

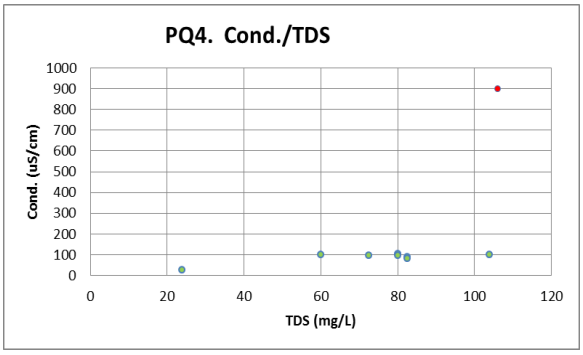
Elements reported as below MDL but appear to be above MRL

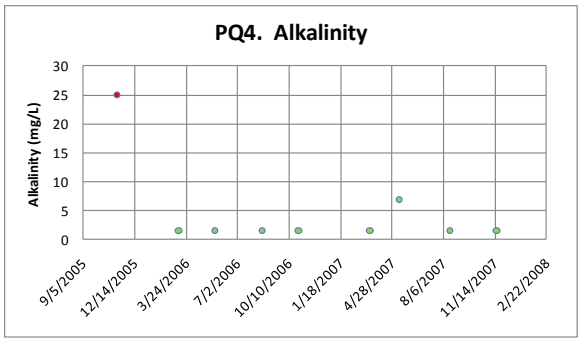
lead	March 2007
mercury	November 2005

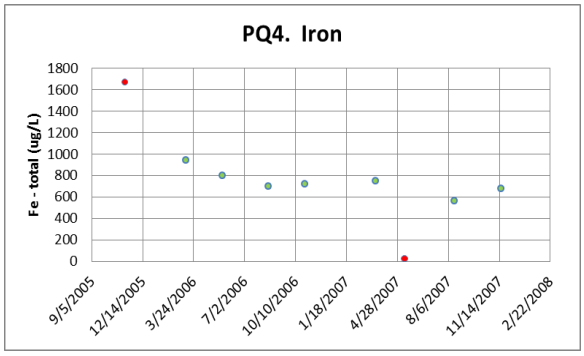

PQ4. TSS
TSS (mg/L)
25
20
15
10
5
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

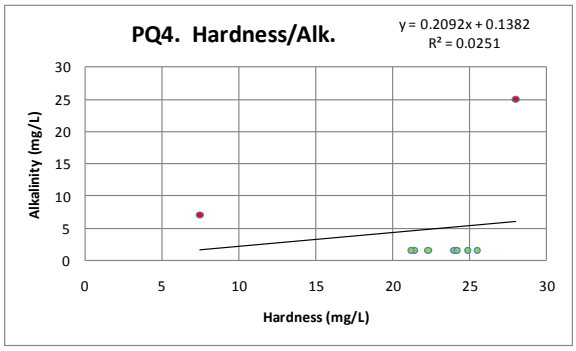

PQ4. Conductivity
Conductivity (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

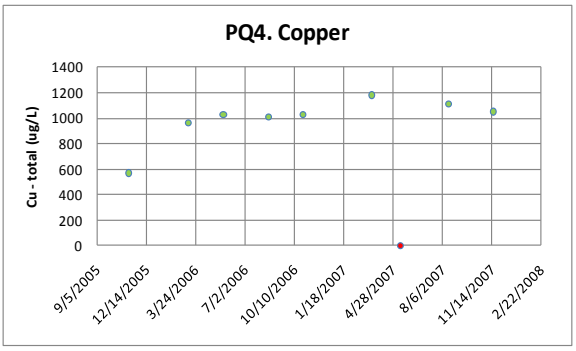

PQ4. Aluminum
Al - total (ug/L)
1600
1400
1200
1000
800
600
400
200
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

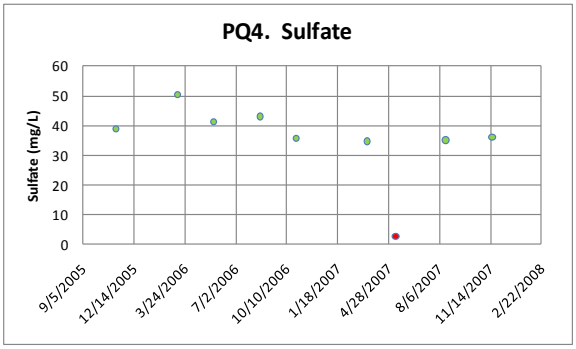

PQ4. Cond./TDS
Cond. (uS/cm)
1000
900
800
700
600
500
400
300
200
100
0
0
20
40
60
80
100
120
TDS (mg/L)

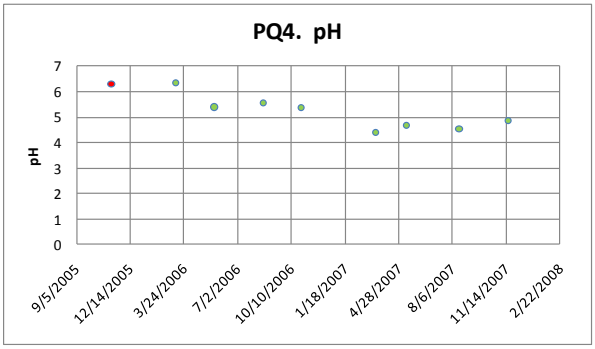

PQ4. Alkalinity
Alkalinity (mg/L)
30
25
20
15
10
5
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

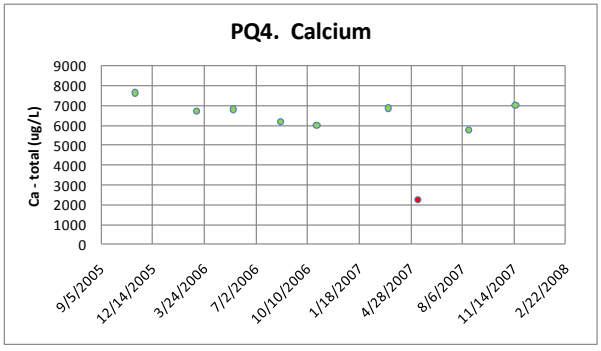

PQ4. Iron
Fe - total (ug/L)
1800
1600
1400
1200
1000
800
600
400
200
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

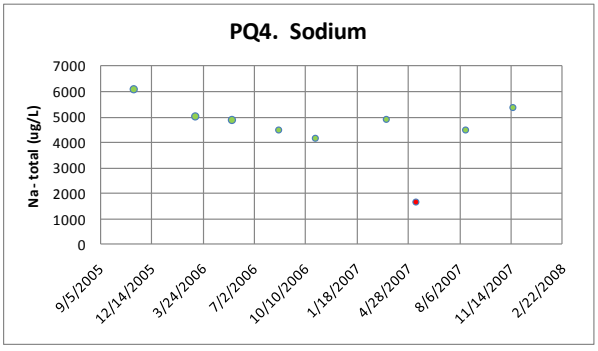

PQ4. Hardness/Alk.
y = 0.2092x + 0.1382
R² = 0.0251
Alkalinity (mg/L)
30
25
20
15
10
5
0
0
5
10
15
20
25
30
Hardness (mg/L)

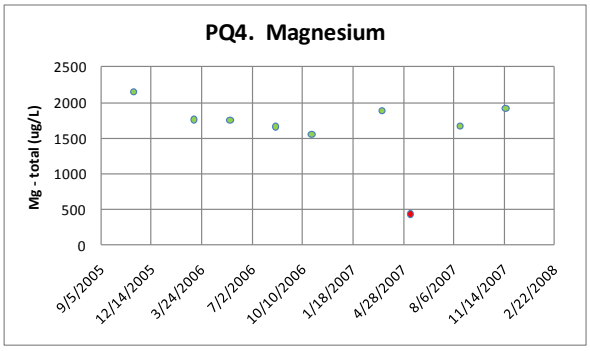

PQ4. Copper
Cu - total (ug/L)
1400
1200
1000
800
600
400
200
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

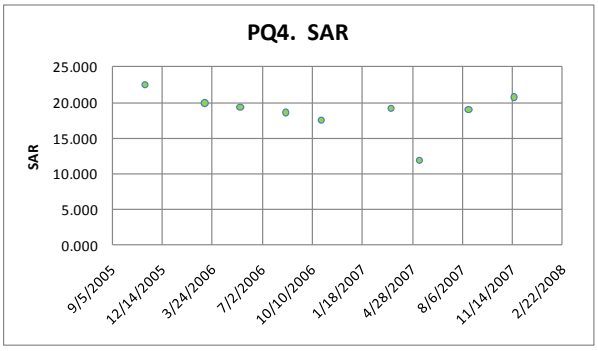

PQ4. Sulfate
Sulfate (mg/L)
60
50
40
30
20
10
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

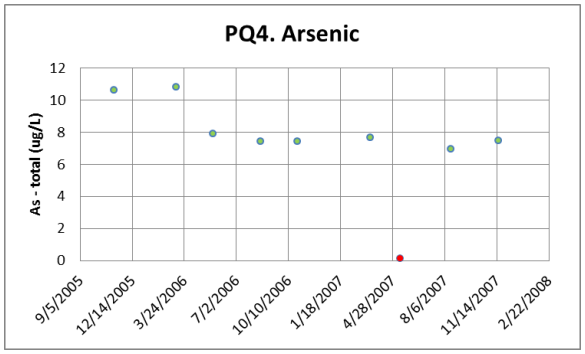

PQ4. pH
pH
7
6
5
4
3
2
1
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

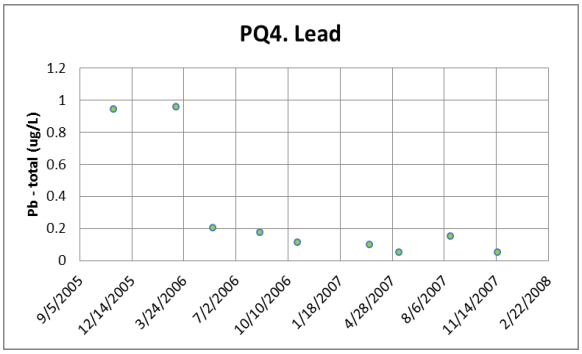

PQ4. Calcium
Ca - total (ug/L)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


PQ4. Sodium
Na - total (ug/L)
7000
6000
5000
4000
3000
2000
1000
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


PQ4. Magnesium
Mg - total (ug/L)
2500
2000
1500
1000
500
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


PQ4. SAR
SAR
25.000
20.000
15.000
10.000
5.000
0.000
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


PQ4. Arsenic
As - total (ug/L)
12
10
8
6
4
2
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


PQ4. Lead
Pb - total (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

Major Cations

	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
11/9/2005	5%	18%	7%	7%
3/9/2006	10%	-1%	7%	-1%
5/19/2006	10%	6%	3%	8%
8/18/2006	-11%	-12%	-13%	-12%
10/28/2006	-2%	3%	-2%	2%
3/16/2007	0%	-2%	1%	-2%
5/12/2007	-11%	-10%	-12%	-11%
8/18/2007	-13%	-8%	**-14%**	-11%
11/17/2007	5%	0%	6%	2%

Trace Metals

	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
11/9/2005	18%	175%	20%	7%	5%	6%	125%	8%
3/9/2006	7%	27%	17%	17%	11%	12%	ndd	17%
5/19/2006	9%	-11%	8%	-11%	1%	0%	24%	7%
8/18/2006	-8%	-3%	-9%	-17%	-10%	ndd	**-7%**	-10%
10/28/2006	-1%	3%	-5%	-4%	-6%	-2%	**-7%**	-6%
3/16/2007	11%	11%	11%	4%	9%	-2%	0%	7%
5/12/2007	27%	88%	83%	0%	4%	0%	0%	**-8%**
8/18/2007	-9%	0%	-17%	-9%	-16%	-17%	**-13%**	-8%
11/17/2007	-5%	6%	6%	6%	8%	6%	0%	5%

Monitoring wells on the South Fork Koktuli

MW3D

Property-property graphs, trends and RPD tables

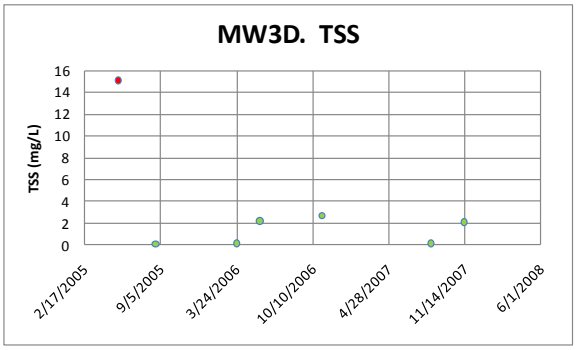
TDS and conductivity correlate poorly	
Alkalinity and hardness correlate poorly	
Magnesium and sodium total and dissolved concentrations correlate poorly	
Calcium, magnesium, sodium	Decrease over time
Calcium, potassium, molybdenum RPD over 10%	Nov 2006, Nov 2007
Copper, zinc	Increase over time

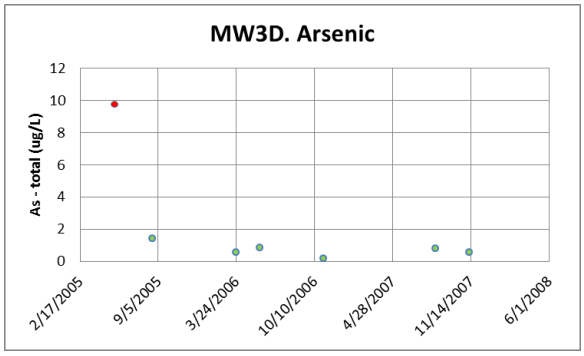
Potential outliers, outside pattern

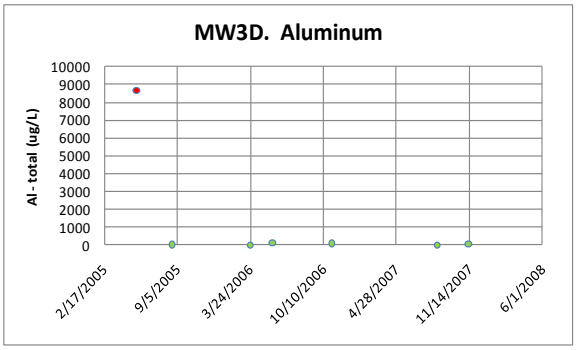
TSS, copper, aluminum, iron, arsenic, manganese, zinc, lead	May 2005
alkalinity, silicon	March 2006

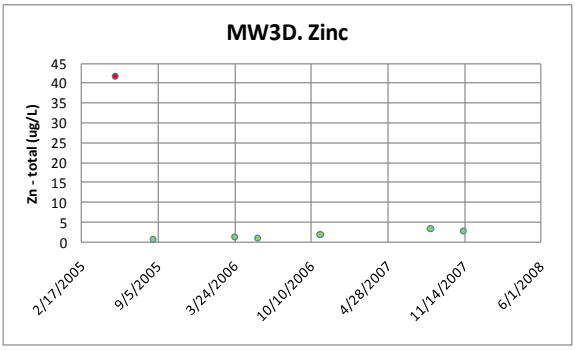
Elements reported as below MDL but appear to be above MRL

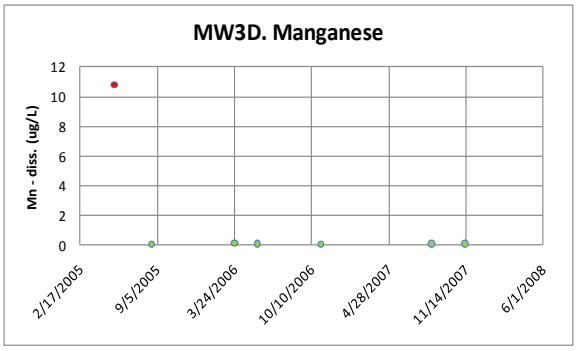
iron	March 2006
lead	March 2007

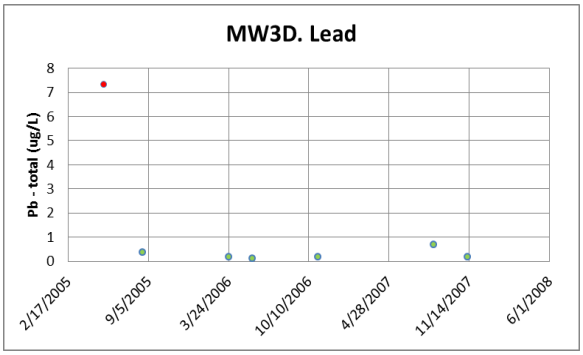

MW3D. TSS
TSS (mg/L)
16
14
12
10
8
6
4
2
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

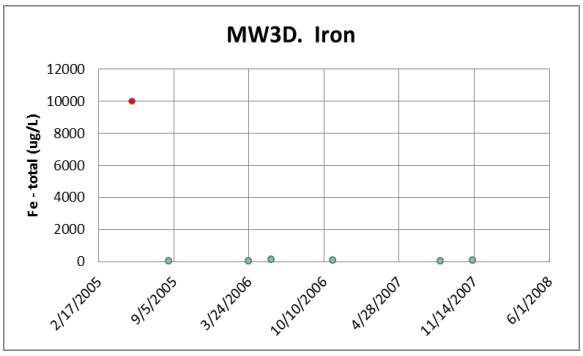

MW3D. Arsenic
As - total (ug/L)
12
10
8
6
4
2
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

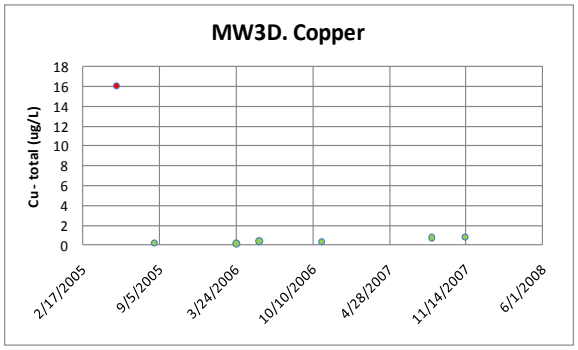

MW3D. Aluminum
Al - total (ug/L)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

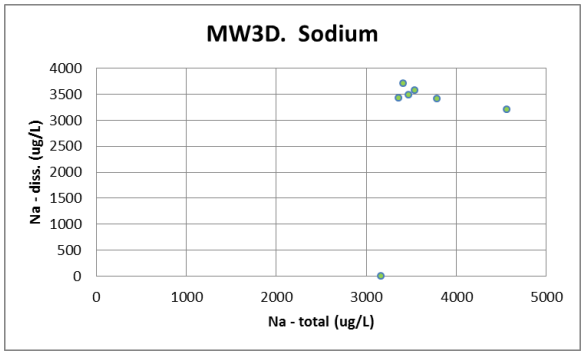

MW3D. Zinc
Zn - total (ug/L)
45
40
35
30
25
20
15
10
5
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

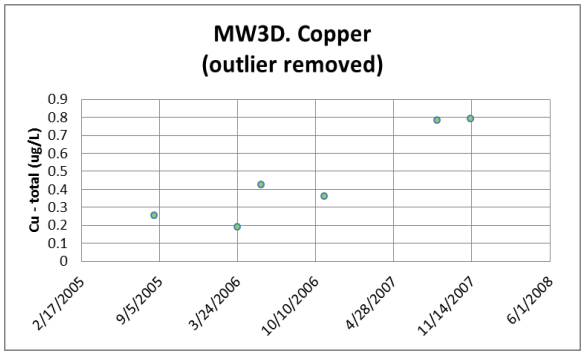

MW3D. Manganese
Mn - diss. (ug/L)
12
10
8
6
4
2
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

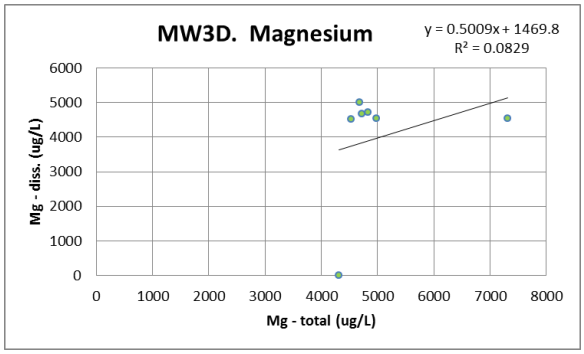

MW3D. Lead
Pb - total (ug/L)
8
7
6
5
4
3
2
1
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

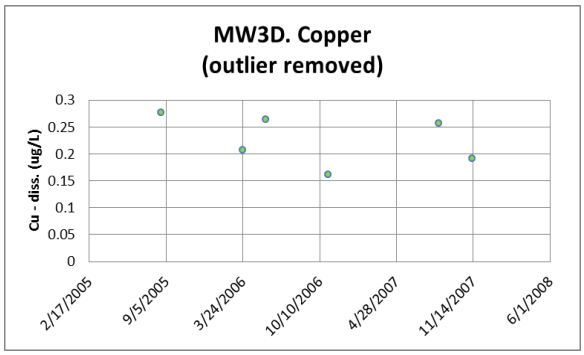

MW3D. Iron
Fe - total (ug/L)
12000
10000
8000
6000
4000
2000
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

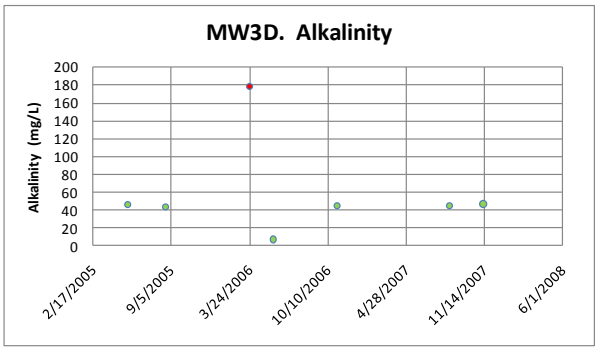

MW3D. Copper
Cu - total (ug/L)
18
16
14
12
10
8
6
4
2
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

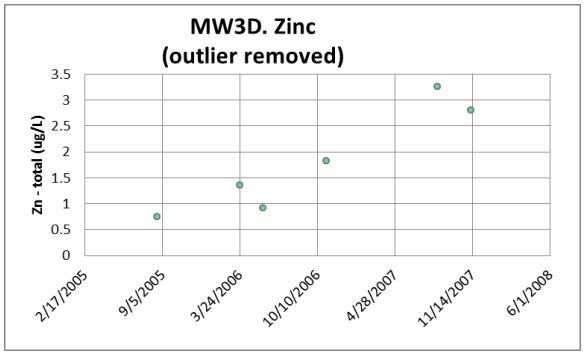

MW3D. Sodium
Na - diss. (ug/L)
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
Na - total (ug/L)

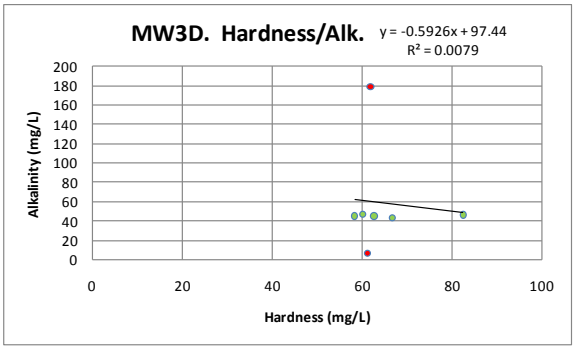

MW3D. Copper
(outlier removed)
Cu - total (ug/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW3D. Magnesium
y = 0.5009x + 1469.8
R² = 0.0829
Mg - diss. (ug/L)
6000
5000
4000
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
7000
8000
Mg - total (ug/L)


MW3D. Copper
(outlier removed)
Cu - diss. (ug/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW3D. Alkalinity
Alkalinity (mg/L)
200
180
160
140
120
100
80
60
40
20
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW3D. Zinc
(outlier removed)
Zn - total (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW3D. Hardness/Alk.
y = -0.5926x + 97.44
R² = 0.0079
Alkalinity (mg/L)
200
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
Hardness (mg/L)

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
5/16/2005	14%	47%	82%	35%
8/22/2005	14%	9%	10%	11%
3/24/2006	-2%	3%	0%	-1%
5/23/2006	-4%	1%	-3%	0%
11/2/2006	-12%	-7%	-11%	-8%
8/17/2007	-2%	0%	3%	-2%
11/11/2007	-14%	0%	-15%	0%

	Trace Metals							
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
5/16/2005	198%	200%	200%	164%	193%	188%	191%	0%
8/22/2005	-9%	165%	176%	30%	175%	0%	11%	10%
3/24/2006	-8%	0%	-31%	200%	175%	0%	0%	0%
5/23/2006	47%	196%	191%	15%	194%	0%	130%	-9%
11/2/2006	77%	195%	163%	-96%	194%	114%	169%	-13%
8/17/2007	101%	178%	105%	-8%	163%	101%	110%	-5%
11/11/2007	122%	182%	98%	-28%	179%	83%	168%	-11%

Monitoring wells on the South Fork Koktuli

MW5D

Property-property graphs, trends, and RPD tables

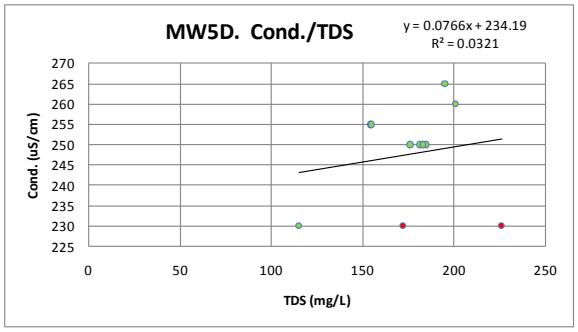
TDS, conductivity and major cations correlate poorly	
Major cations, iron, manganese, arsenic, molybdenum with RPD over 10%	May 2006
hardness, magnesium, iron, manganese, zinc	increase over time
pH, sodium, chloride, molybdenum	decrease over time
alkalinity	correlates negatively with hardness

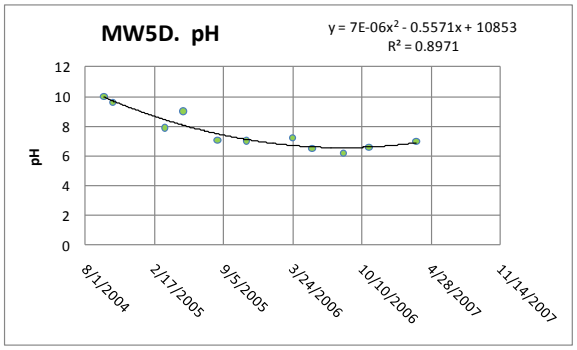
Potential outliers, outside pattern

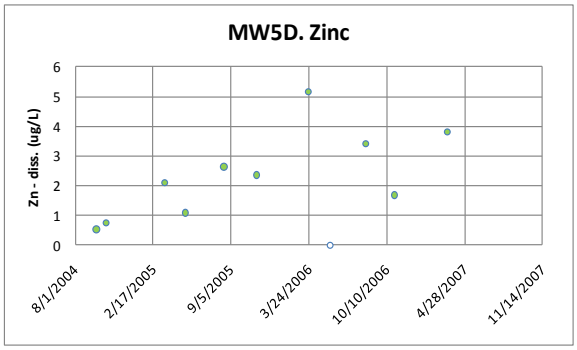
aluminum	September 2004

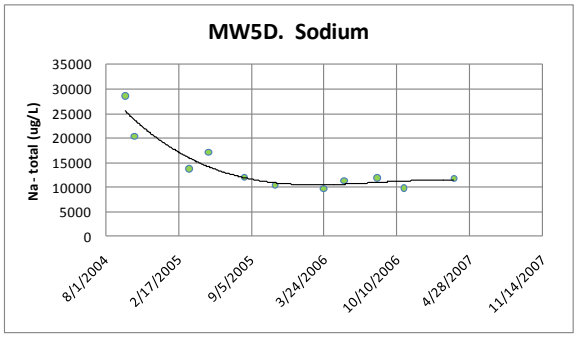
Elements reported as below MDL but appear to be above MRL

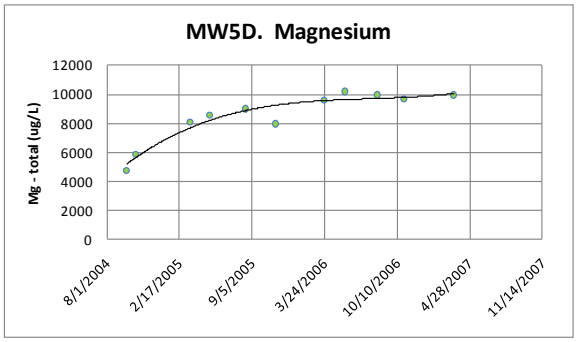
lead	November 2005, August 2006, October 2006
mercury	October 2004, March 2005

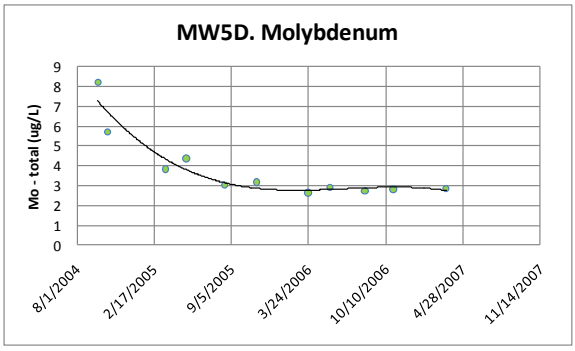

MW5D. Cond./TDS
y = 0.0766x + 234.19
R² = 0.0321
Cond. (uS/cm)
TDS (mg/L)

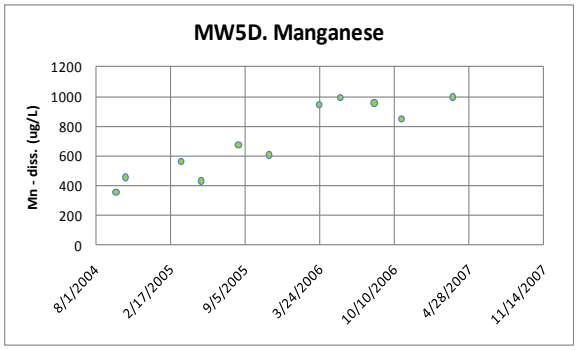

MW5D. pH
y = 7E-06x² - 0.5571x + 10853
R² = 0.8971
pH

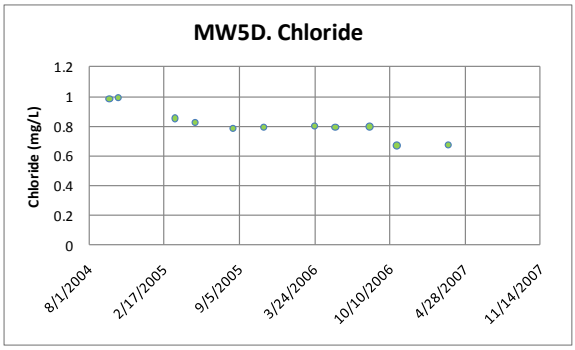

MW5D. Zinc
Zn - diss. (ug/L)


MW5D. Sodium
Na - total (ug/L)

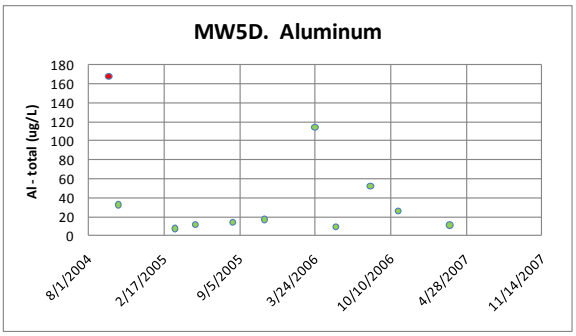

MW5D. Magnesium
Mg - total (ug/L)


MW5D. Molybdenum
Mo - total (ug/L)


MW5D. Manganese
Mn - diss. (ug/L)


MW5D. Chloride
Chloride (mg/L)

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
9/24/2004	7%	2%	2%	8%
10/19/2004	-4%	-4%	6%	-2%
3/18/2005	2%	4%	8%	3%
5/11/2005	18%	13%	12%	14%
8/18/2005	1%	2%	-2%	-1%
11/9/2005	0%	4%	7%	4%
3/23/2006	-7%	9%	1%	ndd
5/18/2006	-7%	-10%	-15%	-10%
8/17/2006	1%	3%	2%	2%
10/29/2006	8%	6%	4%	5%
3/15/2007	2%	1%	0%	1%



	Trace Metals							
Date	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
9/24/2004	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
10/19/2004	65%	141%	142%	11%	16%	147%	-29%	8%
3/18/2005	59%	89%	68%	14%	7%	128%	91%	4%
5/11/2005	162%	84%	26%	3%	-1%	25%	-38%	-5%
8/18/2005	131%	127%	20%	-5%	15%	49%	-104%	-14%
11/9/2005	57%	140%	35%	-2%	-1%	19%	121%	0%
3/23/2006	50%	154%	22%	13%	9%	22%	0%	10%
5/18/2006	113%	189%	28%	9%	-1%	6%	ndd	5%
8/17/2006	-15%	124%	-10%	-15%	-10%	ndd	0%	-11%
10/29/2006	17%	184%	27%	ndd	-5%	26%	96%	-3%
3/15/2007	12%	169%	4%	3%	3%	-11%	0%	1%
	-4%	139%	-1%	-12%	-1%	-117%	0%	5%

Monitoring wells on the South Fork Koktuli:

MW5M

Property-property graphs, trends, and RPD tables

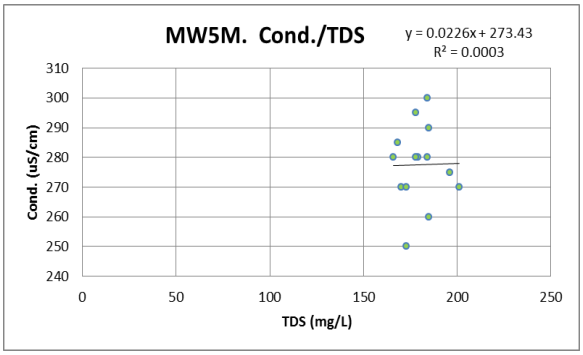
TDS, conductivity and major cations correlate poorly	
Total and dissolved sodium correlate poorly	
Major cation, manganese, molybdenum RPD's dissolved consistently over total	Aug 2007, Nov 2007
calcium, magnesium, potassium, sodium, manganese	increase over time
arsenic, sulfate	decline over time

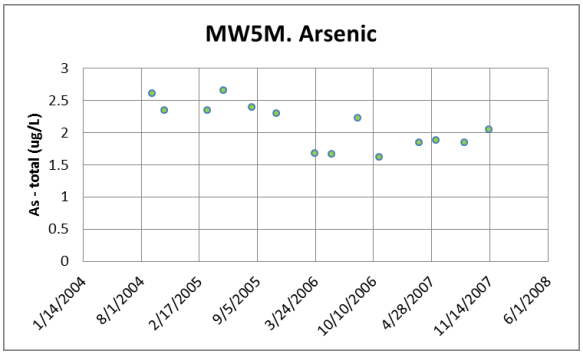
Potential outliers, outside pattern

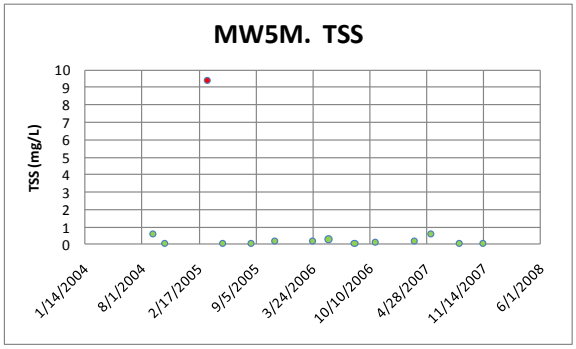
TSS, copper, aluminum, iron, lead	March 2005

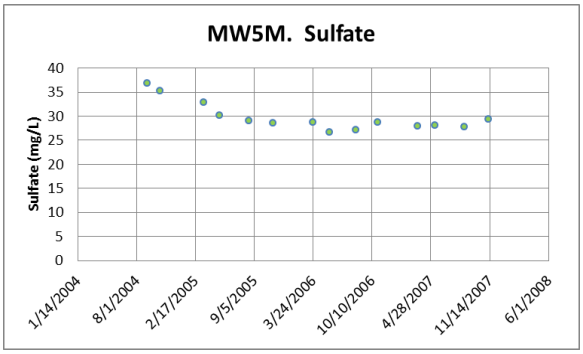
Elements reported as below MDL but appear to be above MRL

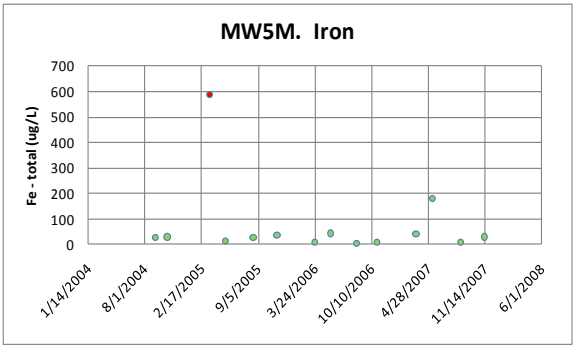
aluminum, antimony, lead, tin	September 2004, October 2004, March 2007
mercury	October 2004, March 2005, May 2005, August 2005, November 2005
zinc	September 2004, October 2004

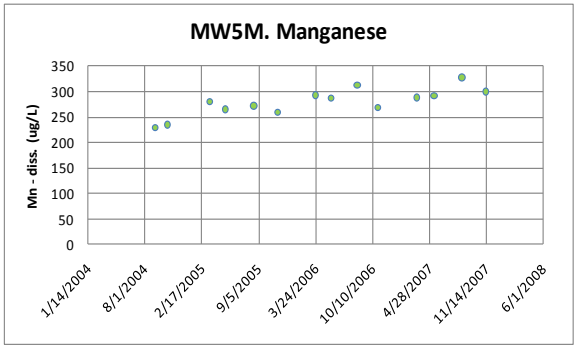

MW5M. Cond./TDS
y = 0.0226x + 273.43
R² = 0.0003
Cond. (uS/cm)
TDS (mg/L)

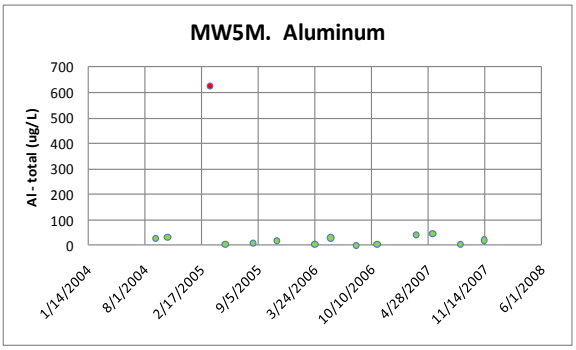

MW5M. Arsenic
As - total (ug/L)

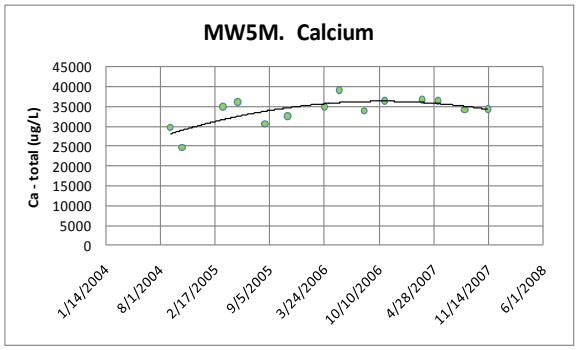

MW5M. TSS
TSS (mg/L)


MW5M. Sulfate
Sulfate (mg/L)

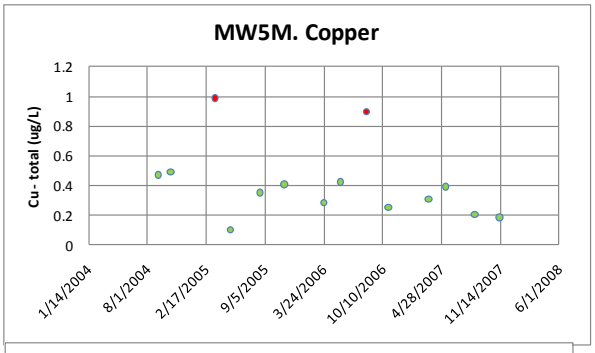

MW5M. Iron
Fe - total (ug/L)

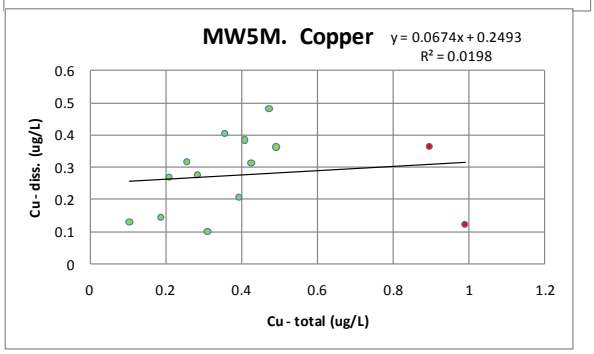

MW5M. Manganese
Mn - diss. (ug/L)

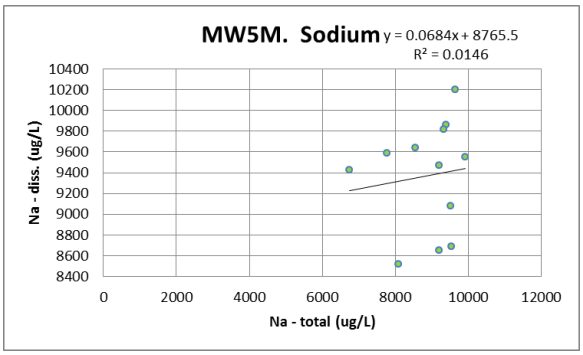

MW5M. Aluminum
Al - total (ug/L)


MW5M. Calcium
Ca - total (ug/L)

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
9/7/2004	-3%	-5%	-2%	-5%
10/19/2004	0%	0%	-14%	-33%
3/18/2005	16%	-18%	4%	-21%
5/11/2005	10%	9%	8%	9%
8/18/2005	-8%	-11%	6%	5%
11/9/2005	2%	2%	2%	6%
3/23/2006	-6%	-10%	0%	-3%
5/18/2006	4%	3%	0%	-5%
8/17/2006	-9%	-9%	-8%	-12%
10/29/2006	-5%	-4%	-10%	-5%
3/15/2007	-5%	-4%	-5%	-6%
5/13/2007	4%	4%	5%	4%
8/19/2007	-10%	-11%	-9%	-10%
11/11/2007	-11%	-13%	-7%	-11%







	Trace Metals							
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
9/7/2004	-2%	75%	90%	0%	-4%	0%	0%	-3%
10/19/2004	30%	90%	162%	-4%	3%	0%	0%	-9%
3/18/2005	156%	199%	198%	4%	-14%	77%	162%	5%
5/11/2005	-21%	68%	121%	-8%	5%	-8%	-152%	-10%
8/18/2005	-13%	97%	25%	19%	2%	-20%	-73%	0%
11/9/2005	6%	179%	-4%	4%	4%	3%	-105%	4%
3/23/2006	3%	37%	36%	-2%	4%	18%	0%	-3%
5/18/2006	30%	187%	173%	-1%	1%	-1%	-60%	5%
8/17/2006	84%	0%	0%	11%	-10%	40%	0%	-11%
10/29/2006	-21%	40%	0%	-3%	2%	-28%	-157%	-7%
3/15/2007	102%	182%	71%	-10%	-5%	0%	0%	-6%
5/13/2007	62%	192%	71%	-2%	5%	141%	164%	5%
8/19/2007	-26%	118%	0%	-12%	-13%	-15%	105%	-13%
11/11/2007	0%	73%	104%	-12%	-11%	2%	0%	-14%

Monitoring wells on the South Fork Koktuli

MW11D

Property-property graphs, trends, and RPD tables

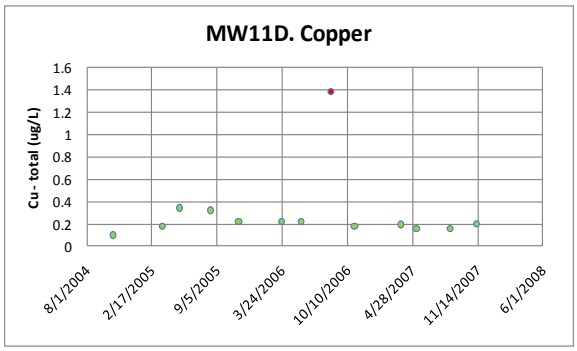
TDS and conductivity correlate poorly	
sodium absorption ratio	increases with time
chloride	decreases with time

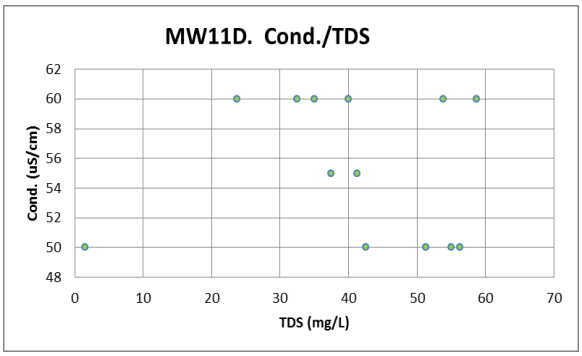
Potential outliers, outside pattern

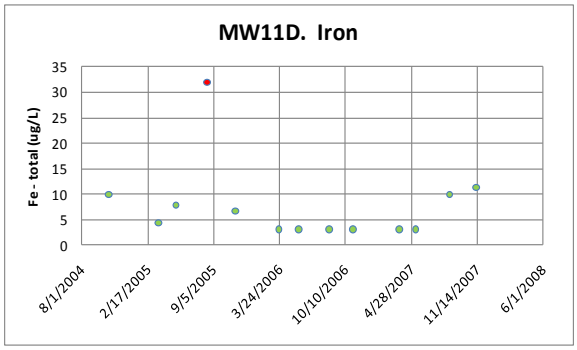
copper	August 2006
iron	August 2005
manganese	March 2006
zinc	August 2007

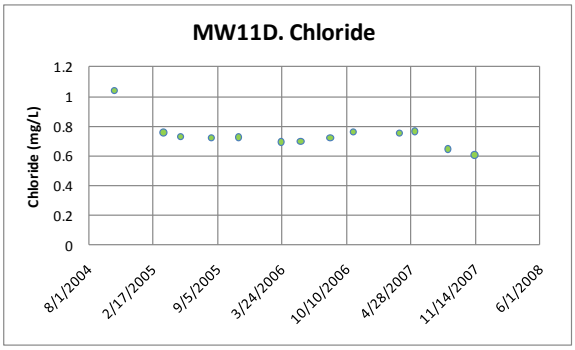
Elements reported as below MDL but appear to be above MRL

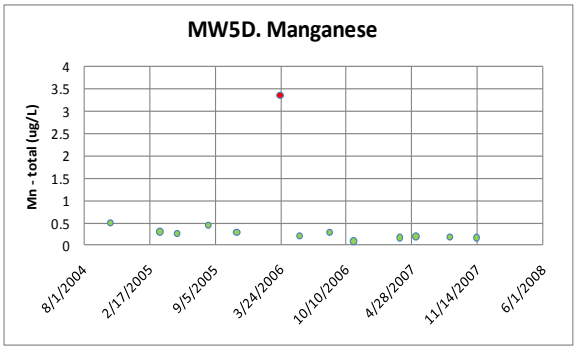
aluminum, antimony, copper, tin	October 2004
mercury	October 2004, March 2005, May 2005, August 2005, November 2005

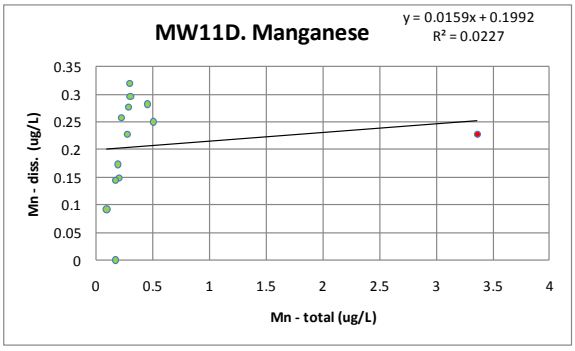

MW11D. Copper
Cu - total (ug/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

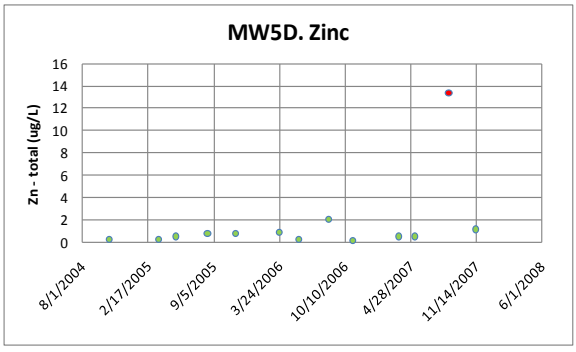

MW11D. Cond./TDS
Cond. (uS/cm)
62
60
58
56
54
52
50
48
0
10
20
30
40
50
60
70
TDS (mg/L)

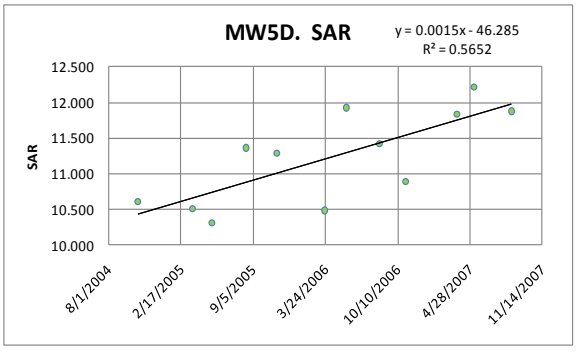

MW11D. Iron
Fe - total (ug/L)
35
30
25
20
15
10
5
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW11D. Chloride
Chloride (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW5D. Manganese
Mn - total (ug/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW11D. Manganese
y = 0.0159x + 0.1992
R² = 0.0227
Mn - diss. (ug/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.5
1
1.5
2
2.5
3
3.5
4
Mn - total (ug/L)


MW5D. Zinc
Zn - total (ug/L)
16
14
12
10
8
6
4
2
0
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW5D. SAR
y = 0.0015x - 46.285
R² = 0.5652
SAR
12.500
12.000
11.500
11.000
10.500
10.000
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
10/21/2004	2%	-1%	4%	-2%
3/21/2005	19%	21%	4%	21%
5/13/2005	27%	13%	1%	21%
8/16/2005	6%	1%	10%	4%
11/10/2005	1%	0%	-1%	-1%
3/22/2006	8%	7%	9%	10%
5/21/2006	-2%	-2%	-3%	-5%
8/21/2006	1%	1%	0%	0%
11/1/2006	1%	3%	0%	2%
3/22/2007	1%	2%	-2%	1%
5/10/2007	8%	8%	6%	7%
8/21/2007	-4%	-2%	-2%	-2%
11/11/2007	14%	14%	11%	18%

				Trace	Metals			
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
10/21/2004	0%	0%	105%	0%	67%	0%	0%	0%
3/21/2005	45%	77%	47%	4%	1%	**-85%**	**-69%**	2%
5/13/2005	122%	138%	85%	**-8%**	18%	72%	127%	**-25%**
8/16/2005	43%	73%	126%	67%	45%	0%	-60%	200%
11/10/2005	-1%	96%	ndd	0%	**-9%**	0%	0%	29%
3/22/2006	**-29%**	0%	0%	0%	175%	**-24%**	0%	14%
5/21/2006	14%	0%	0%	**-95%**	**-17%**	ndd	**-133%**	200%
8/21/2006	115%	39%	0%	79%	2%	ndd	ndd	12%
11/1/2006	9%	142%	0%	0%	-4%	0%	0%	**-9%**
3/22/2007	ndd	200%	**-105%**	0%	ndd	**-115%**	**-105%**	0%
5/10/2007	16%	0%	0%	**-9%**	28%	0%	0%	13%
8/21/2007	11%	83%	105%	**-75%**	9%	158%	105%	0%
11/11/2007	**-19%**	185%	41%	0%	15%	79%	105%	18%

Monitoring wells on the South Fork Koktuli

MW14D

Property-property graphs, trends, and RPD tables

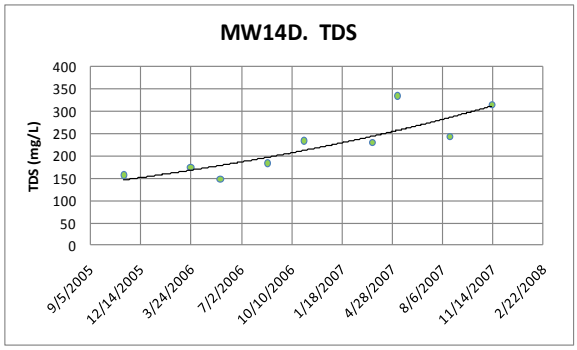
Major cation RPD's dissolved consistently over total	Aug 2007
potassium, copper, molybdenum, zinc	decrease with time
calcium, iron, manganese, sodium, chloride, sulfate, TDS, hardness	increase with time
aluminum	Bell-shaped curve of concentrations over time

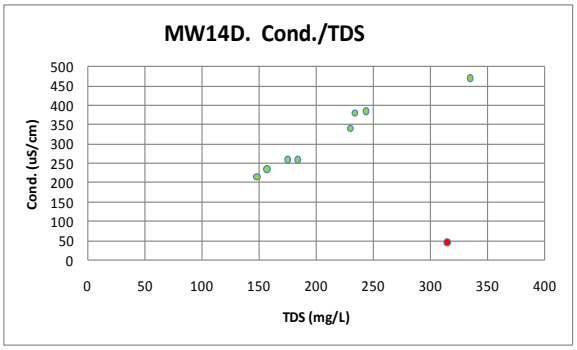
Potential outliers, outside pattern

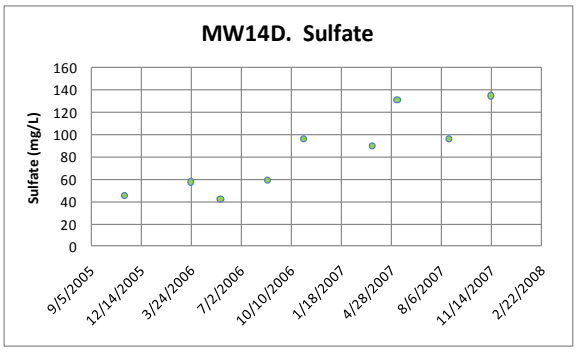
conductivity low	Nov 2007
hardness low	March 2007
iron, zinc high	August 2007
lead high	March 2006
potassium, aluminum high	Nov 2005

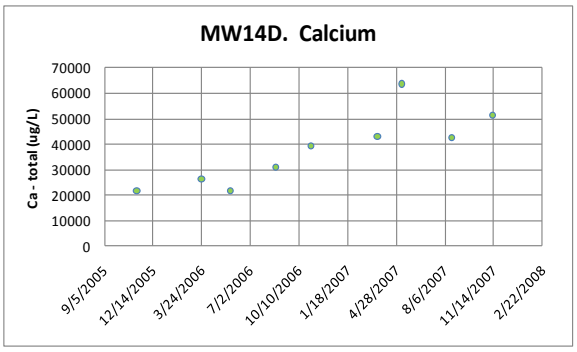
Elements reported as below MDL but appear to be above MRL

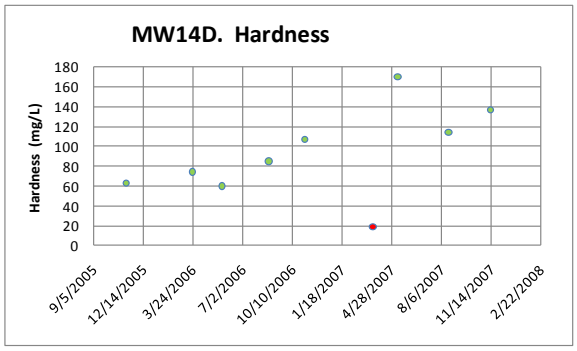
mercury	November 2005

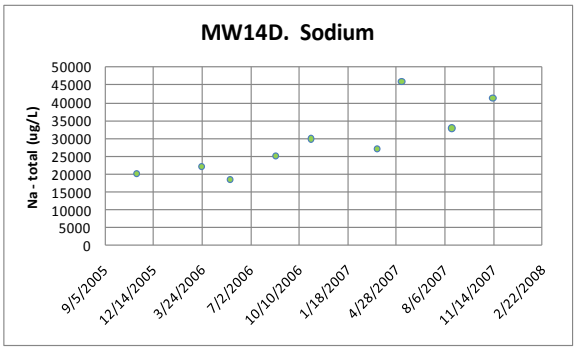

MW14D. TDS
TDS (mg/L)
400
350
300
250
200
150
100
50
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

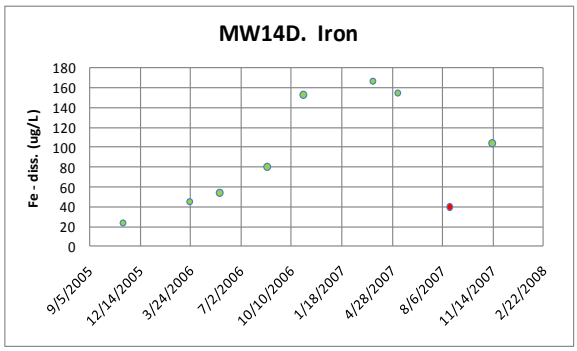

MW14D. Cond./TDS
Cond. (uS/cm)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
400
TDS (mg/L)

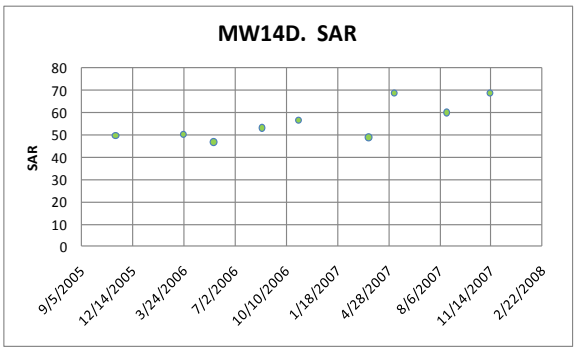

MW14D. Sulfate
Sulfate (mg/L)
160
140
120
100
80
60
40
20
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

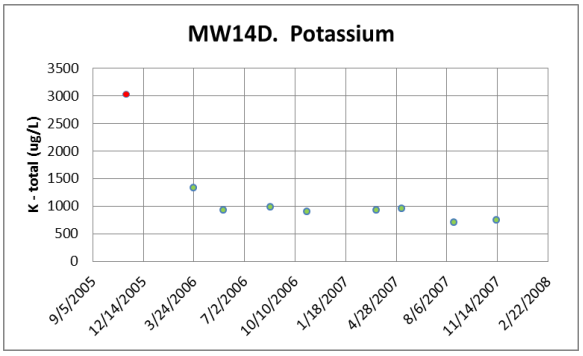

MW14D. Calcium
Ca - total (ug/L)
70000
60000
50000
40000
30000
20000
10000
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

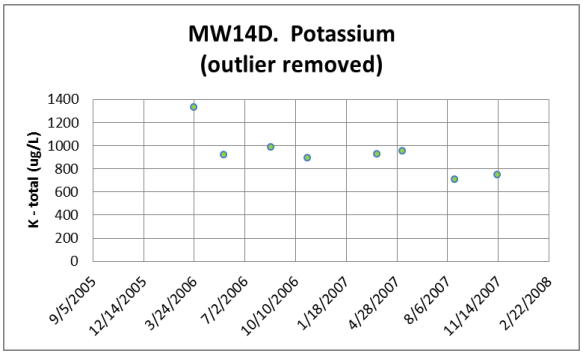

MW14D. Hardness
Hardness (mg/L)
180
160
140
120
100
80
60
40
20
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

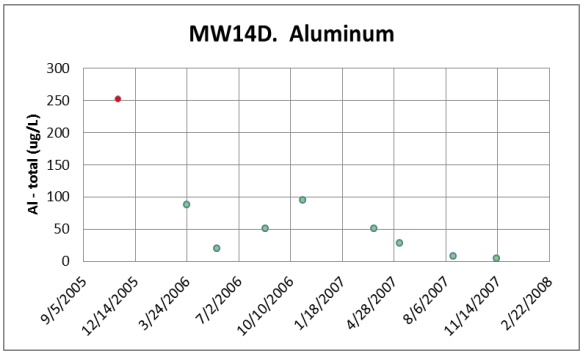

MW14D. Sodium
Na - total (ug/L)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

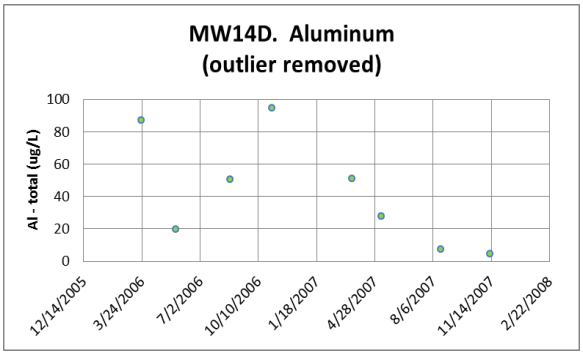

MW14D. Iron
Fe - diss. (ug/L)
180
160
140
120
100
80
60
40
20
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

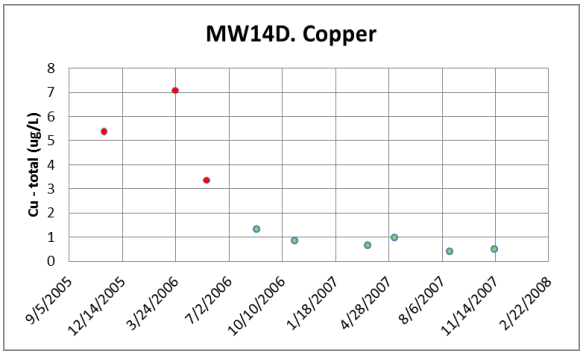

MW14D. SAR
SAR
80
70
60
50
40
30
20
10
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

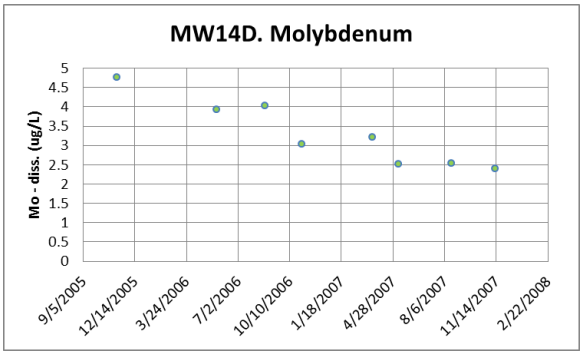

MW14D. Potassium
K - total (ug/L)
3500
3000
2500
2000
1500
1000
500
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

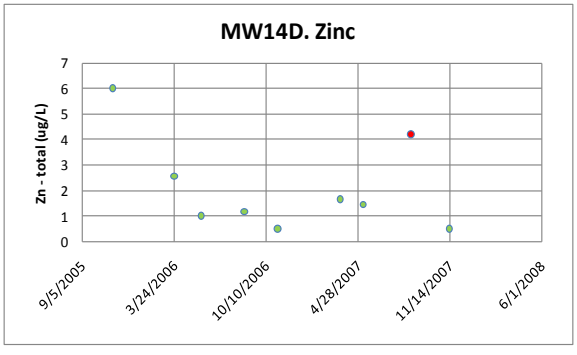

MW14D. Potassium
(outlier removed)
K - total (ug/L)
1400
1200
1000
800
600
400
200
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

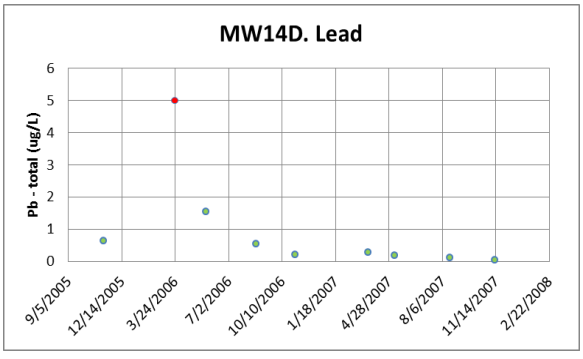

MW14D. Aluminum
Al - total (ug/L)
300
250
200
150
100
50
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14D. Aluminum
(outlier removed)
Al - total (ug/L)
100
80
60
40
20
0
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

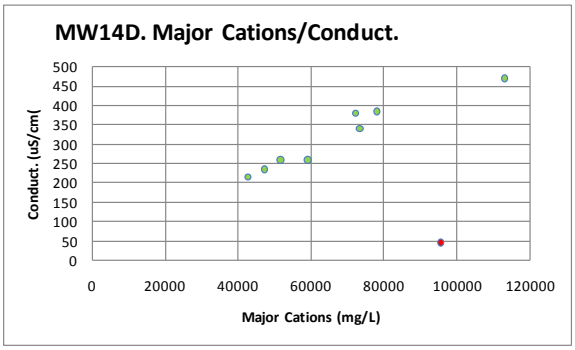

MW14D. Copper
Cu - total (ug/L)
8
7
6
5
4
3
2
1
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14D. Molybdenum
Mo - diss. (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14D. Zinc
Zn - total (ug/L)
7
6
5
4
3
2
1
0
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW14D. Lead
Pb - total (ug/L)
6
5
4
3
2
1
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
11/10/2005	4%	10%	4%	6%
3/23/2006	-20%	ndd	200%	0%
5/21/2006	-1%	-5%	1%	-2%
8/23/2006	-11%	8%	4%	2%
11/3/2006	-3%	-2%	2%	-5%
3/20/2007	-3%	-5%	0%	-13%
5/9/2007	29%	14%	17%	10%
8/20/2007	-8%	-10%	-10%	-10%
11/12/2007	4%	16%	3%	8%



	Trace Metals							
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
11/10/2005	140%	191%	157%	34%	12%	37%	170%	8%
3/23/2006	132%	175%	92%	-2%	ndd	10%	199%	200%
5/21/2006	145%	120%	80%	8%	9%	5%	188%	11%
8/23/2006	119%	167%	40%	0%	-13%	0%	166%	8%
11/3/2006	57%	182%	29%	6%	-10%	-75%	125%	2%
3/20/2007	65%	173%	36%	3%	-3%	33%	179%	-7%
5/9/2007	72%	156%	43%	27%	17%	98%	115%	19%
8/20/2007	13%	69%	89%	7%	-7%	49%	154%	-5%
11/12/2007	22%	42%	36%	24%	3%	-80%	105%	-3%

Monitoring wells on the South Fork Koktuli

MW14S

Property-property graphs, trends, and RPD tables

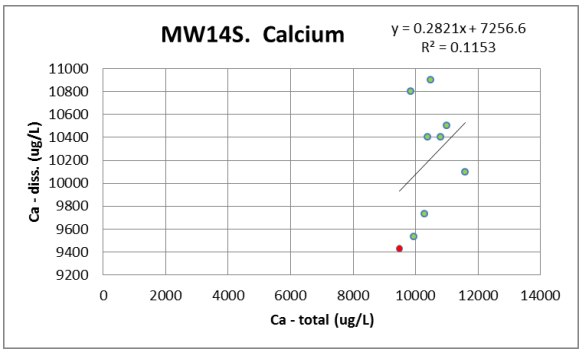
TDS and conductivity correlate poorly	
Calcium, magnesium, and potassium total concentrations do not correlate with dissolved concentrations	
copper	elevated then declines over time
TDS, calcium	decline over time

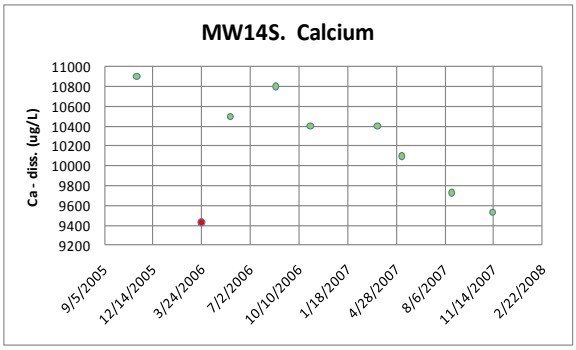
Potential outliers, outside pattern

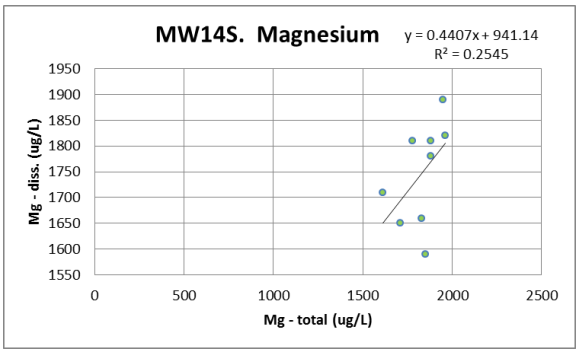
aluminum	August 2007
manganese	May 2006

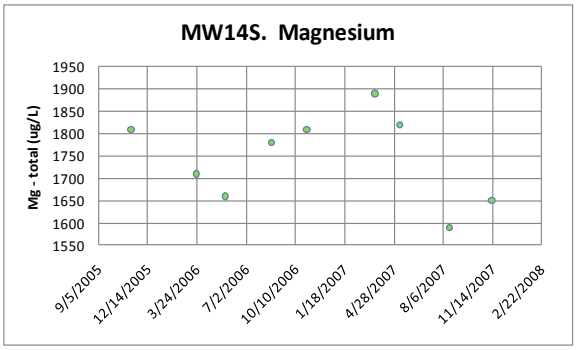
Elements reported as below MDL but appear to be above MRL

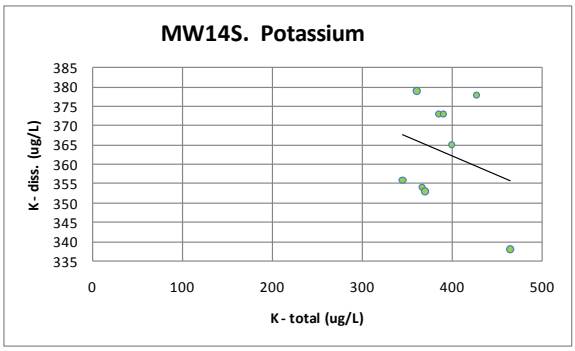
zinc	

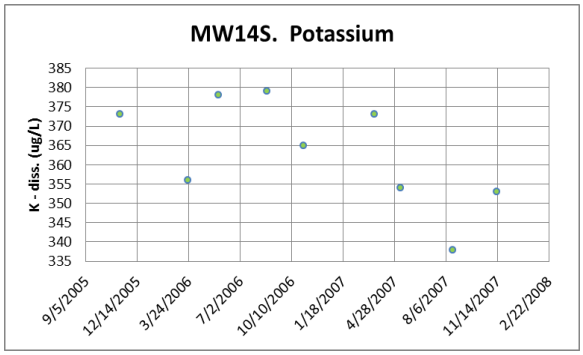

MW14S. Calcium
y = 0.2821x + 7256.6
R² = 0.1153
Ca - diss. (ug/L)
Ca - total (ug/L)

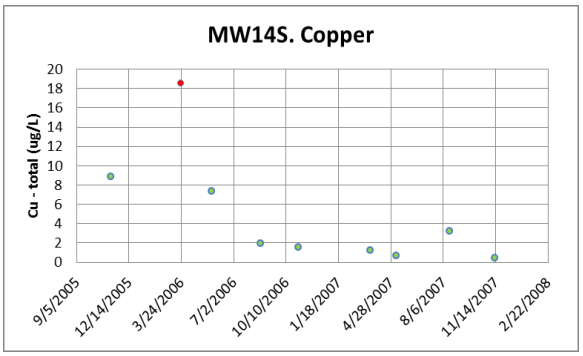

MW14S. Calcium
Ca - diss. (ug/L)

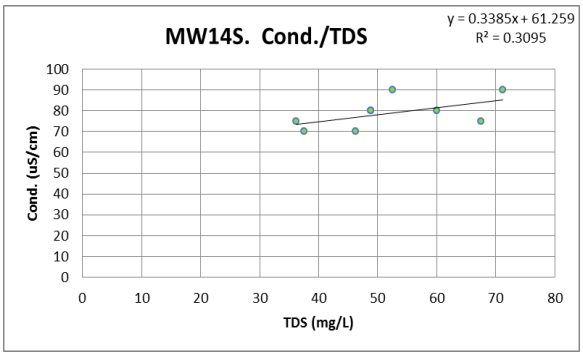

MW14S. Magnesium
y = 0.4407x + 941.14
R² = 0.2545
Mg - diss. (ug/L)
Mg - total (ug/L)

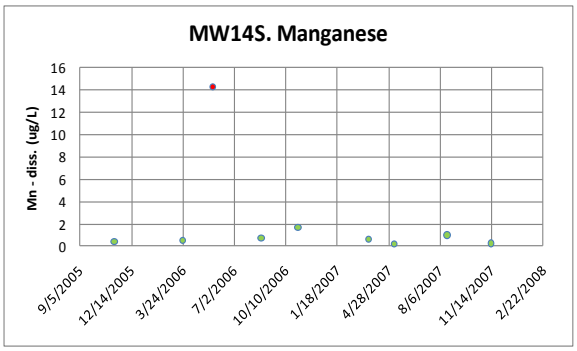

MW14S. Magnesium
Mg - total (ug/L)

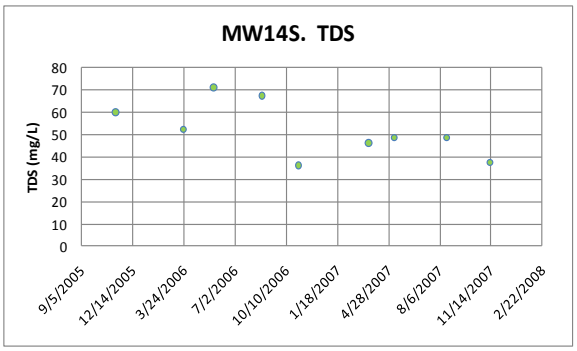

MW14S. Potassium
K - diss. (ug/L)
K - total (ug/L)

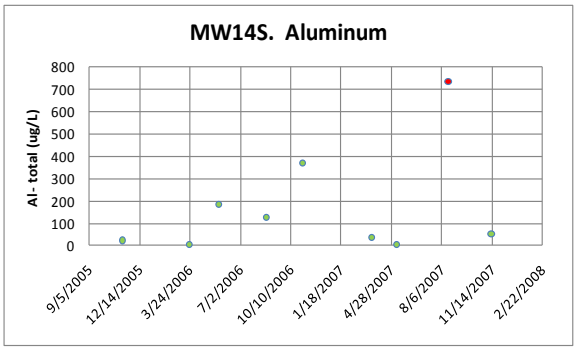

MW14S. Potassium
K - diss. (ug/L)


MW14S. Copper
Cu - total (ug/L)
20
18
16
14
12
10
8
6
4
2
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14S. Cond./TDS
y = 0.3385x + 61.259
R² = 0.3095
Cond. (uS/cm)
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
TDS (mg/L)


MW14S. Manganese
Mn - diss. (ug/L)
16
14
12
10
8
6
4
2
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14S. TDS
TDS (mg/L)
80
70
60
50
40
30
20
10
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008


MW14S. Aluminum
Al - total (ug/L)
800
700
600
500
400
300
200
100
0
9/5/2005
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
11/10/2005	-4%	-2%	3%	-2%
3/23/2006	1%	-6%	-3%	-6%
5/21/2006	5%	10%	12%	7%
8/23/2006	-9%	5%	-5%	5%
11/2/2006	0%	4%	9%	0%
3/20/2007	4%	3%	4%	3%
5/9/2007	14%	7%	4%	8%
8/19/2007	6%	15%	32%	7%
11/12/2007	4%	4%	5%	4%

	Trace Metals							
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
11/10/2005	-4%	161%	141%	**-12%**	134%	0%	105%	15%
3/23/2006	16%	92%	88%	0%	39%	0%	ndd	0%
5/21/2006	87%	198%	181%	120%	72%	38%	139%	-4%
8/23/2006	82%	197%	175%	0%	189%	107%	132%	0%
11/2/2006	114%	199%	193%	143%	183%	118%	183%	17%
3/20/2007	7%	189%	139%	0%	152%	**-32%**	**-99%**	0%
5/9/2007	36%	141%	154%	0%	97%	90%	105%	12%
8/19/2007	110%	199%	196%	167%	195%	119%	191%	37%
11/12/2007	53%	193%	148%	0%	177%	125%	105%	13%

Monitoring wells on the North Fork Koktuli

MW10

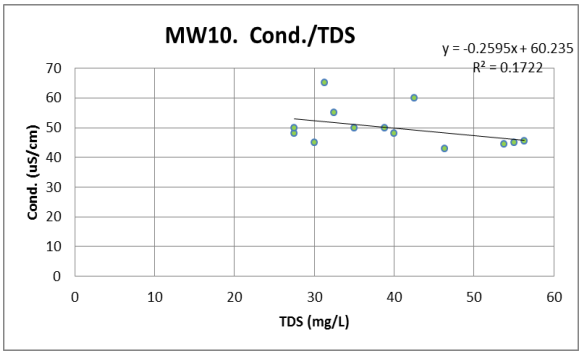
Property-property graphs, trends, and RPD tables

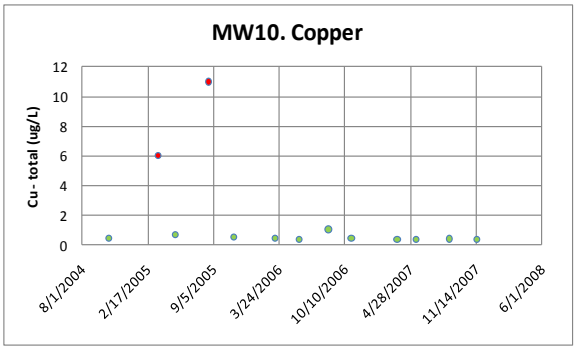
TDS and conductivity correlate poorly	
Major cation RPD's dissolved consistently over total	Oct 2006
Arsenic RPD greater than 20%	Aug 2006
Calcium total fraction does not correlate with dissolved fraction	

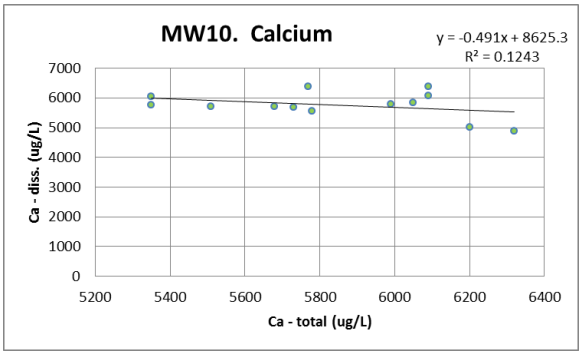
Potential outliers, outside pattern	
copper high	March 2005
aluminum high	May 2005
manganese, lead, copper high	August 2005

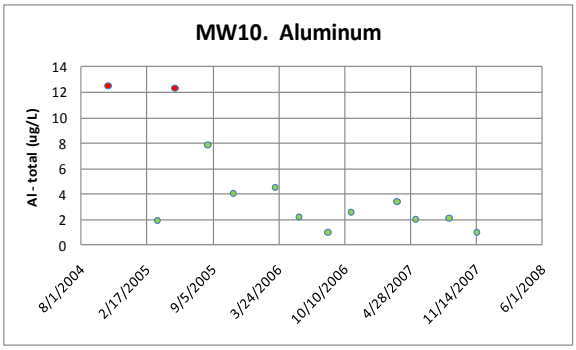
Elements reported as below MDL but appear to be above MRL

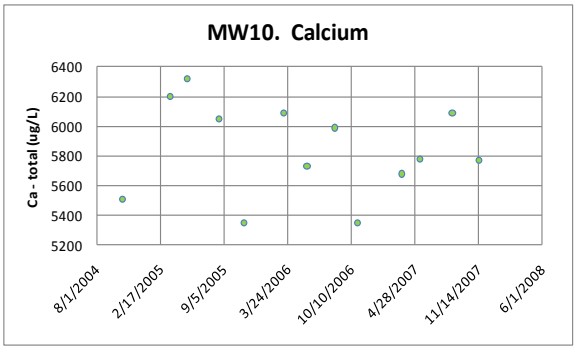
aluminum, manganese	October 2004

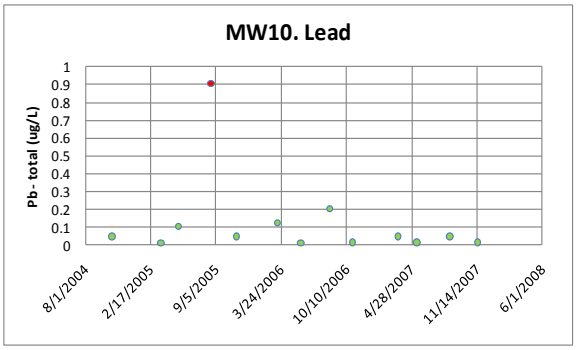

MW10. Cond./TDS
y = -0.2595x + 60.235
R² = 0.1722
Cond. (uS/cm)
TDS (mg/L)

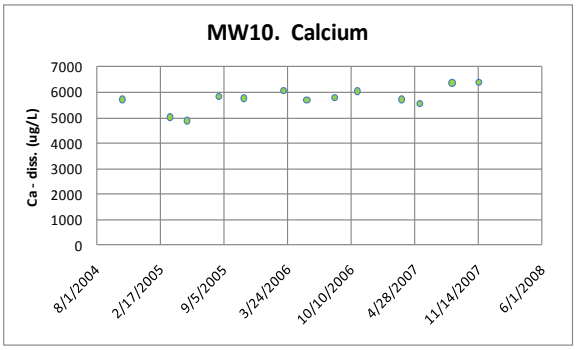

MW10. Copper
Cu - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

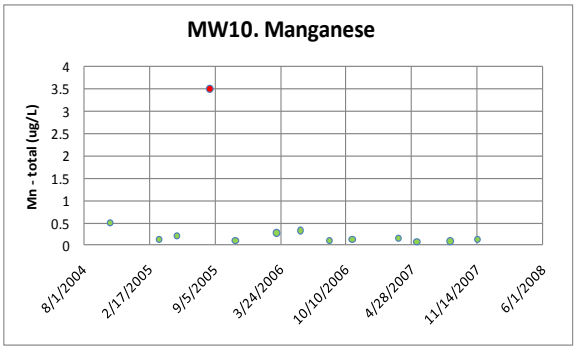

MW10. Calcium
y = -0.491x + 8625.3
R² = 0.1243
Ca - diss. (ug/L)
Ca - total (ug/L)


MW10. Aluminum
Al - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW10. Calcium
Ca - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW10. Lead
Pb - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW10. Calcium
Ca - diss. (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008


MW10. Manganese
Mn - total (ug/L)
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
6/1/2008

	Major Cations			
	Ca	Mg	K	Na
Date	RPD	RPD	RPD	RPD
10/21/2004	-4%	-11%	-7%	-7%
3/20/2005	21%	22%	5%	24%
5/12/2005	26%	-7%	-8%	22%
8/20/2005	4%	0%	21%	1%
11/6/2005	-7%	-6%	-8%	-9%
3/12/2006	0%	-4%	-3%	-4%
5/23/2006	1%	0%	1%	-3%
8/20/2006	3%	1%	-2%	1%
10/29/2006	-12%	-12%	-13%	-12%
3/18/2007	-1%	-1%	1%	0%
5/14/2007	4%	2%	6%	2%
8/23/2007	-4%	-3%	-5%	-9%
11/15/2007	-10%	-13%	-10%	ndd

	Trace Metals							
	Cu	Al	Fe	As	Mn	Zn	Pb	Mo
Date	RPD	RPD	RPD	RPD	RPD	RPD	RPD	RPD
10/21/2004	**-28%**	0%	0%	**-67%**	0%	**-156%**	**-93%**	0%
3/20/2005	178%	82%	0%	10%	16%	159%	**-103%**	82%
5/12/2005	84%	137%	141%	-17%	45%	0%	101%	-28%
8/20/2005	157%	155%	109%	35%	189%	142%	153%	118%
11/6/2005	18%	121%	0%	67%	0%	**-76%**	**-82%**	81%
3/12/2006	0%	128%	0%	22%	89%	**-15%**	ndd	135%
5/23/2006	0%	75%	0%	0%	106%	ndd	ndd	21%
8/20/2006	72%	0%	0%	-45%	8%	**-109%**	65%	-24%
10/29/2006	1%	88%	0%	-98%	60%	0%	**-105%**	12%
3/18/2007	4%	110%	0%	-8%	84%	28%	0%	-5%
5/14/2007	3%	68%	0%	0%	**-18%**	0%	**-105%**	13%
8/23/2007	**-15%**	71%	105%	0%	**-11%**	29%	0%	-13%
11/15/2007	**3%**	0%	81%	0%	138%	ndd	0%	-6%