Schaft Creek Project -

Geochemical Shake-Flask Testing of Overburden in the Proposed Pit Area

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P.Geo. and A.Sc.T. Notice

This study is based on detailed technical information interpreted through standard and advanced chemical and geoscientific techniques available at this time. As with all geoscientific investigations, the findings are based on data collected at discrete points in time and location. In portions of this report, it has been necessary to infer information between and beyond the measured data points using established techniques and scientific judgement. In our opinion, this report contains the appropriate level of geoscientific information to reach the conclusions stated herein.

This study has been conducted in accordance with British Columbia provincial legislation as stated in the Engineers and Geoscientists Act and in the Applied Science Technologists and Technicians Act.

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Report Summary

This report is a continuation of studies related to metal leaching and acid rock drainage (ML-ARD) from pit-area overburden at the Schaft Creek Project. Previous work on pit-area overburden at the Schaft Creek Project showed that some samples were already acidic, probably due to natural organic carbon and natural soil processes. This report focussed more closely on already-acidic overburden, conducting leaching tests known as “shake flasks”. Shake-flask testing showed some unusual results due to colloids. Nevertheless, solid-phase contents and correlations were apparent, and predictions for full-scale drainage chemistry from overburden were compiled for acidic and near-neutral overburden.

Acidic Overburden Samples

For this ML-ARD study, twelve of the original 175 overburden samples were analyzed further using “shake flasks”. Two splits of one sample (LJ-9) were analyzed, for a total of 13 new analyses. These samples were chosen to reflect the more acidic overburden (paste pH <~6) with ranges of solid-phase concentrations, which was found near the surface in the southern portion of the pit area. The two splits of LJ-9 showed that the freshly pulverized sample was more reactive than the older pulverized sample, so freshly pulverized samples were used for this study.

Colloids in Overburden Drainage

To understand the results of this shake-flask testing, it is important to note that filtration through 0.45 µm filters arbitrarily separates finer “dissolved” aqueous species and particles from coarser “suspended” particles. The combination of the two is called “total”. In reality, the dissolved species includes hydrated ions (~10^{-4} to 10^{-3} µm), aqueous complexes and ion pairs, polymers, nanoparticles, finer colloids, and finer mineral particles. In contrast, the suspended species include coarser colloids and coarser mineral particles. After filtration of the dissolved sample, the dissolved and total samples are stabilized by acid addition.

Finer reactive colloids can sometimes coagulate after filtration and analysis to form visible precipitants within stabilized dissolved samples. This can affect total and dissolved concentrations through time. This occurred with the Schaft Creek overburden shake flasks.

These reactive, coagulating colloids were primarily composed of iron, aluminum, magnesium, and silicon, with lesser amounts of other elements. As a result, drainage waters from Schaft Creek overburden may display trends of decreasing dissolved concentrations through time with increasing suspended concentrations. This will affect aqueous total concentrations if the coagulated colloids settle from the drainage.

Correlations with Solid-Phase Organic Carbon

Correlations of solid-phase and aqueous parameters with solid-phase organic carbon included solid-phase paste pH, aqueous shake-flask-leached pH, and aqueous-leached dissolved organic carbon. As a result, these four parameters were cross-correlated, with higher organic carbon generally associated with more acidic pH. In turn, aqueous leached parameters increasing with decreasing pH will also generally increase with increasing organic carbon.

The inverse correlation of solid-phase aluminum and silicon showed that 4-6% solid-phase organic carbon meant the sample was predominantly composed of inorganic aluminosilicate minerals. Conversely, 43-44% organic carbon was virtually pure organic soil.

Other trends of solid-phase elements with organic carbon provided some evidence of whether a particular element was mostly associated with inorganic minerals or with organic material. For example:

- silica and aluminum represented inorganic minerals,
- some elements displayed anomalous trends suggesting an element was concentrated in the organic material at intermediate levels but not at low and high levels, and
- some elements showed a clearer association with organic carbon like mercury and selenium.

Prediction of Full-Scale Drainage Chemistry from Acidic and Near-Neutral Pit-Area Overburden

Due to the inverse correlation of organic carbon and pH in Schaft Creek overburden, predominantly inorganic overburden has near-neutral pH and predominantly organic overburden has acidic pH. Thus, predictions of full-scale drainage chemistry from near-neutral inorganic overburden are the same as those for full-scale mined rock.

For full-scale predictions of acidic overburden drainage, aqueous shake-flask concentrations were compared to full-scale near-neutral predictions, and several concentrations were similar. Therefore, the shake-flask concentrations were considered full-scale predictions for acidic overburden.

Differences between the acidic-overburden and near-neutral mined-rock predictions could be mostly attributed to:

- acidic pH leading to higher predicted concentrations for acidic overburden;
- higher organic carbon leading to higher predicted concentrations for acidic overburden; and
- colloids leading to higher predicted concentrations for acidic overburden.

The full-scale predictions for acidic overburden and for near-neutral overburden (using mined rock as the analogue) are compiled in Table A.

Table A. Predicted full-scale drainage chemistry for overburden at Schaft Creek based on shake-flask testing of acidic overburden and on near-neutral mined rock

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5] Minimum	Maximum	Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
pH (units)	7.72	8.35	Range: 6.2-6.7 when Organic Carbon < 4%C; 5.3-6.1 when Organic Carbon > 4%C
Conductivity (µS/cm)	2250	3390	1000 (or 330 when Organic Carbon < 6%C; 1000 when Organic Carbon > 6%C)
Acidity	4.5	6.2	110 (or 110 when paste pH 4.7-5.0; 30 when paste pH 5.0-6.0)
Alkalinity	158	204	140 (or 52 when paste pH 4.7-5.0; 140 when paste pH 5.0-6.0)
Sulphate	1410	2030	400 (or 30 when Organic Carbon < 6%C; 400 when Organic Carbon > 6%C)
Hardness	1100	1850	NA
Bromide	<0.5	<1	<2.5
Chloride	26	49	<25
Fluoride	0.5	1.0	<1
Nitrate[2]	0.21	0.45	0.4
Nitrite[2]	0.024	0.066	0.027
Ammonia[2]	0.013	0.15	NA
Phosphate (P)	0.036	0.16	NA
Al	0.0066	0.78	25[4] (or 25 when Organic Carbon < 6%C; 7 when Organic Carbon > 6%C[4])
Sb	0.0049	0.20	0.0048 (or 0.0005 when paste pH 4.7-5.0; 0.0048 when paste pH 5.0-6.0)
As	0.0025	0.0098	0.013 (or 0.013 when Organic Carbon < 6%C; 0.0072 when Organic Carbon > 6%C)
Ba	0.064	0.22	0.29[4]
Be	<0.0025	<0.005	0.0021

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5]		Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
	Minimum	Maximum	
Bi	<0.0025	<0.005	0.0021 (or 0.0021 when Organic Carbon < 6%C; <0.001 when Organic Carbon > 6%C)
B	0.062	0.16	0.12
Cd	<0.002	<0.006	0.0037 (or 0.00082 when paste pH 4.7-5.0; 0.0037 when paste pH 5.0-6.0)
Ca	407	719	120[4] (or 26 when Organic Carbon < 6%C; 120 when Organic Carbon > 6%C[4])
Cr	<0.0025	<0.005	0.074[4]
Co	0.0023	0.0080	0.043
Cu	0.11	0.48	0.68[4]
Fe	<0.03	0.34	25[4] (or 25 when Organic Carbon < 6%C; 8.0 when Organic Carbon > 6%C[4])
Pb	0.0005	0.0025	0.051 (or 0.051 when Organic Carbon < 6%C; 0.0026 when Organic Carbon > 6%C)
Li	0.05	0.08	0.012
Mg	24	43	24[4]
Mn	0.23	0.46	3.0[4]
Hg	<0.00001	0.000028	0.00014
Mo	2.0	7.2	3.0 (or 0.0057 when paste pH 4.7-5.0; 3.0 when paste pH 5.0-6.0)
Ni	<0.0025	0.010	0.092
P	<0.3	<0.3	3.2[4] (or 1.7 when Organic Carbon < 6%C; 3.2 when Organic Carbon > 6%C[4])
K	13	32	23.1
Se	0.016	0.14	0.011 (or 0.0020 when Organic Carbon < 6%C; 0.011 when Organic Carbon > 6%C)
Si	2.1	4.7	71[4] (or 71 when paste pH 4.7-5.0; 33 when paste pH 5.0-6.0[4])

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5] Minimum	Maximum	Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
Ag	0.00005	0.00029	0.0032 (or 0.0032 when paste pH 4.7-5.0; 0.0025 when paste pH 5.0-6.0)
Na[3]	170	350	73
Sr	3.7	11	0.90[4] (or 0.084 when Organic Carbon < 6%C; 0.90 when Organic Carbon > 6%C[4])
Tl	<0.0005	<0.001	0.00015
Sn	<0.0005	0.00087	0.0022
Ti	<0.01	0.016	1.2[4] (or 1.2 when paste pH 4.7-5.0; 0.41 when paste pH 5.0-6.0[4])
U[3]	0.007	0.074	0.0024 (or 0.0024 when paste pH 4.7-5.0; 0.00078 when paste pH 5.0-6.0)
V	<0.005	0.081	0.10 (or 0.10 when Organic Carbon < 6%C; 0.018 when Organic Carbon > 6%C)
Zn	2.0	2.6	0.10 (or 0.10 when Organic Carbon < 6%C; 0.018 when Organic Carbon > 6%C[4])
Aqueous Organic Carbon (C)	NA	NA	560 (or 560 when paste pH 4.7-5.0; 200 when paste pH 5.0-6.0)

[1] Concentrations of metals and other elements are dissolved (filtered).

[2] Concentrations of nitrogen species predicted here are not necessarily representative of those that will be derived from blasting residues upon mining.

[3] It is not clear if these elements were limited by or close to equilibrium, so increasing scale may increase their near-neutral concentrations.

[4] These elevated concentrations include colloids that can convert between dissolved (<0.45 µm) and suspended (>0.45 µm) forms.

[5] The full-scale mined-rock predictions (left columns) can be taken as predictions for overburden that is above pH 7 and predominantly rock; the right column is for overburden below pH 7 and with varying amounts of organic carbon.

1. INTRODUCTION

Whenever mined rock is exposed to air and moisture, the rates of weathering, oxidation, and leaching can accelerate. If sulphide minerals like pyrite are exposed, the oxidation will release acidity, some metals, sulphate, and heat. If the acidity is not neutralized by minerals like calcite or feldspar in the rock, the resulting acidic water is called "acid rock drainage" (ARD) in British Columbia.

Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of carbonate minerals can release metals like manganese.

ML-ARD is often associated with minesites, where it is well documented (e.g., Morin and Hutt, 1997 and 2001). As a result, the accurate prediction and control of ML-ARD at minesites in British Columbia are high priorities of the provincial government, as explained in its formal Policy, Guidelines, and draft Prediction Manual (Price and Errington, 1998; Price, 1998; Price et al., 1997). The federal government also emphasizes the accurate prediction and control of minesite drainage and ML-ARD (Price, 2009). This report follows the recommendations of those documents.

Previous work on pit-area overburden at the Schaft Creek Project showed that some samples were already acidic, probably due to natural organic carbon and natural soil processes (Morin and Hutt, 2009; see also Chapter 2 of this report). This report focusses more closely on already-acidic overburden, conducting leaching tests known as "shake flasks" (Chapter 3 of this report). Shake-flask testing showed some unusual results due to colloids (Chapter 4). Nevertheless, solid-phase contents and correlations were apparent (Chapter 5), and predictions for full-scale drainage chemistry from overburden were compiled (Chapter 6). Relevant data are compiled in the appendices.

2. SUMMARY OF PREVIOUS ML-ARD STUDIES OF PIT-AREA OVERBURDEN

The following text is the Report Summary taken verbatim from *Schaft Creek Project - Prediction of Metal Leaching and Acid Rock Drainage for Overburden in the Proposed Pit Area* (Morin and Hutt, 2009).

Introduction

Whenever mined rock is exposed to air and moisture, the rates of weathering, oxidation, and leaching can accelerate. If sulphide minerals like pyrite are exposed, the oxidation will release acidity, some metals, sulphate, and heat. If the acidity is not neutralized by minerals like calcite or feldspar in the rock, the resulting acidic water is called "acid rock drainage" (ARD) in British Columbia.

Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of carbonate minerals can release metals like manganese.

This report compiles and interprets the existing information related to potential ML-ARD from overburden within the proposed pit area at the Schaft Creek Project. The overburden samples, and the static analyses applied to them, are described in Chapter 2. Based on interpolation among drillholes and test pits, the thickness of overburden is presented in Chapter 3. The ML-ARD assessment of the overburden, as a group regardless of location and depth, is presented in Chapter 4. The spatial variations in ML-ARD characteristics laterally and vertically are discussed in Chapters 5 and 6. Relevant data, information, and photographs are compiled in the appendices.

Overburden Samples for the Schaft Creek Project

An important first step in this ML-ARD assessment is the recognition that overburden does not have a precise definition, but is ambiguous. Overburden is typically considered the broken and loose material above intact rock. This can include clay, silt, sand, gravel, cobbles, highly fractured rock, organic soils, and peat, which all apply to the Schaft Creek Project.

The primary sources of samples and data of pit-area overburden for this ML-ARD investigation were:

1) 94 hand-dug samples spanning depths of zero to an average of 0.2 m below surface, collected on a nominal 200 m grid spacing in September 2008 by the Schaft Creek geology team, representing surficial (shallowest) overburden;

2) 24 samples from existing core that still contained sufficient volumes for ML-ARD analyses; and,

3) 57 samples from test pits dug in September 2008, providing vertical profiles through the overburden and allowing more reliable visual examination and sampling of overburden without potential loss of finer particles.

These 175 overburden samples were analyzed for expanded acid-base accounting (ABA) and total-element contents based on four-acid-digested ICP-MS and whole-rock XRF analyses.

Thickness of Overburden in the Proposed Pit Area

To estimate the thickness of overburden in and around the proposed pit area, information on all recent and historical drillholes was reviewed to identify (1) the deepest reported overburden interval or (2), when no overburden was reported and sampled, the shallowest rock interval. This information was supplemented by the ML-ARD test pits.

The resulting lateral isopach map of overburden thickness showed much of the proposed pit area is covered with less than 15 m (Figure 3-1). However, two areas have more than 30 m of overburden, a larger one in the north and smaller one in the south. Overburden also tends to thicken towards the west. This is expected, because surface elevations are generally decreasing and thicker sediments of the Schaft Creek floodplain are being reached.

ML-ARD Characteristics of the Pit-Area Overburden as a Group

As a first step, the ML-ARD characteristics of the overburden samples were examined as one group, regardless of lateral location and depth.

Paste pH ranged from 4.7 to 9.0, with 16% (28 samples) having values more acidic than the water added to them. The lowest pH values were found in surficial samples.

Total sulphur ranged from less than the detection limit of 0.01%S (numerically set at 0.005%S) to 0.94 %S, although values below 0.05%S were relatively inaccurate and unreliable. Most of the total sulphur was potentially acid-generating sulphide, except for some surficial samples.

Samples contained up to 43%C total carbon. This was mostly natural organic carbon that correlated with paste pH and elevated levels of some elements like mercury and selenium.

Sobek (U.S. EPA 600 compliant) Neutralization Potential (NP) also correlated with paste pH, and showed that up to 10 kg/t could be unavailable for neutralization. This coincided with NP correlating with inorganic carbon only above 12 kg/t, suggesting carbonate accounted for most neutralization in the overburden samples.

Net balances of acid-generating and acid-neutralizing capacities were primarily based on Sobek NP, after some unavailable amount was subtracted, and on total sulphur. The alternative usage of sulphide did not change ARD predictions substantially. Total-sulphur-based Net Potential Ratios (TNPR) indicated that, in the best case with all measured NP reactive and available, only 6.3% (11 samples) were net acid generating. With an Unavailable NP of 10 kg/t, nearly half the samples (43%) were net acid generating, and thus unavailable NP is a critical parameter for predicting net acid generation from the overburden. At any unavailable NP value up to 10 kg/t, any sample with a measured NP above 25 kg/t was still consistently net neutralizing. These percentages apply only to the 175 overburden samples and not necessarily to actual overburden tonnages in the Schaft Creek pit area.

Total-element analyses showed that most samples were predominantly comprised of silica (SiO2) and alumina (Al2O3), sometimes with substantial amounts of calcium, iron, potassium, magnesium, sodium, and Loss on Ignition (LOI, correlating well with organic carbon). Compared with three times maximum crustal abundances, the 175 overburden samples often contained elevated levels of silver, bismuth, copper, and selenium, with fewer to rare elevated levels of arsenic, chromium, molybdenum, nickel, sulphur, antimony, uranium, and tungsten.

Lateral Variations of ML-ARD Characteristics in the Surficial Pit-Area Overburden

The surficial samples were primarily from the surficial-grid program, spanning a depth from 0 to an average of 0.2 m, and from the shallowest test-pit samples, spanning a depth from 0 to 0.3 m.

Laterally in the surficial overburden, paste pH generally increased from south to north. Because of the correlation of paste pH with Sobek Neutralization Potential, there was a similar spatial trend for NP. In contrast, total sulphur and sulphide showed a general trend of increasing levels from east to west.

Because surficial overburden in the southern area of the proposed pit tended to have the lowest NP levels, most of the limited number of net-acid-generating samples with TNPR < 2.0 were also found there. When an Unavailable NP of 10 kg/t was subtracted and the Adjusted TNPR calculated, many more samples in the southern area became net acid generating, as did some samples in the north.

Many elements showed distinct lateral patterns in their surficial solid-phase concentrations. For some there are overlaps, such as the southern portion of the proposed pit area containing an area of both elevated copper and net-acid-generating samples. Others showed unique lateral distributions. For example, arsenic varied from 0.8 to 95 ppm, but most arsenic values were between 5 and 11 ppm with the higher levels occurring in limited areas.

Vertical Trends in ML-ARD Characteristics for the Pit-Area Overburden

ML-ARD characteristics were evaluated with depth first as general trends regardless of location and then along three east-west vertical cross-sections containing ML-ARD test pits.

As explained above for surficial overburden, paste pH was generally lowest in the southern portion of the proposed pit area. Thus, the surficial samples on the southern cross-section showed the lowest values compared with the northern and central cross-sections. However, for all three cross-sections, paste pH generally increased in depth at each test pit, in agreement with the observed general trend.

No general trend of total sulphur was seen with depth. This was due to the variable and irregular trends of total sulphur with depth at specific locations on the three cross-sections.

For Neutralization Potential (NP), no clear trend was seen with depth, except for the highest values at depth. This general trend was also seen in many of the individual test pits on the three cross-sections.

In the best case with all NP reactive and available, only some surficial overburden was net acid generating (TNPR < 2.0), mostly in the southern portion of the pit area. When adjusted for Unavailable NP, larger amounts of net-acid-generating overburden appeared at depth (Adj TNPR < 2.0), mostly in the south but some also in the north. The north, central, and vertical cross-sections also showed the prevalence of net-acid-generating overburden from north to south and with depth.

Although copper displayed no general trend with depth, individual test pits showed generally steady (but variable) copper with increasing depth or generally increasing copper towards bedrock with depth. For other elements, mercury and selenium were generally higher near the surface, which was shown to be related to the proportion of organic carbon as discussed above.

Major ML-ARD Observations and Conclusions

Overburden in the proposed pit area of the Schaft Creek Project can be up to tens of meters thick. Some portions contain sufficient sulphide or organic carbon, and relatively little reactive Neutralization Potential (NP), so that acidic conditions can eventually arise.

In fact, 28 samples (16%) were already acidic at the time of analysis, although this was probably due to natural organic carbon processes rather than sulphide oxidation. Up to nearly half the samples may eventually generate net acidity through sulphide oxidation, and these samples are distributed laterally and through depth in the pit area. Perhaps more can generate acidity through natural organic processes.

Correlations of solid-phase elements indicated the sulphide minerals in the overburden do not contain most of many metals or other elements. This suggests metal leaching will not be dependent on the rate of sulphide oxidation.

If correct, then rates of metal leaching may depend on pH, which can be affected by any type of acid-generating and acid-neutralizing mechanism [note: this is confirmed for several elements in Chapters 5 and 6 of this 2010 report]. This would result in three major geochemical categories of overburden:

1) overburden that is already acidic by any process and can leach metals at elevated levels;
2) overburden that will become acidic if oxidized or combined with already-acidic overburden, resulting in increased metal leaching; and,
3) overburden that will remain near neutral, and may or may not have elevated metal leaching.

As a result, there would be options to the mine plan for jointly or individually removing, stockpiling, and/or eventually reusing the three geochemical categories of overburden as required.

Operationally, these categories can be distinguished through rapid on-site measurements of rinse pH and inorganic carbon. However, these categories should be confirmed by kinetic testing, or by assuming existing kinetic tests for rock and tailings apply to the overburden.

3. DESCRIPTION, SAMPLING, AND ANALYSIS OF PIT-AREA OVERBURDEN

3.1 Description

One of the most difficult and most important tasks in assessing the ML-ARD potential of overburden at a mining project is defining “overburden”. Wikipedia explains,

> “Overburden is the term used in mining to describe material that lies above the area of economic interest, e.g., the rock, soil and ecosystem that lies above the coal seam. Also known as 'waste'. Overburden is distinct from tailings, the material that remains after economically valuable components have been extracted from the generally finely milled ore. Overburden is removed during surface mining, but is typically not contaminated with toxic components and may be used to restore a mining site to a semblance of its appearance before mining began. Overburden may also be used as a term to describe all soil and ancillary material above the bedrock horizon in a given area. . . . By analogy, overburden is also used to describe the soil and other material that lies above a specific geologic feature, such as a buried astrobleme.” (http://en.wikipedia.org/wiki/Overburden, December 2009)

This definition shows some of the ambiguity involved, and suggests even waste rock lying above a coal seam can be labelled overburden.

From the perspective of diamond-drill coring, overburden is typically considered the broken, loose, and sometimes unrecoverable material above the intact, recoverable rock. This can include clay, silt, sand, gravel, cobbles, highly fractured rock, organic soils, and peat, which all apply to the Schaft Creek Project. When overburden is recovered during diamond-drill coring, finer particles can be lost and the material then incorrectly appears mostly as coarse particles and fractured rock.

From the perspective of remediation, useful overburden is the finer-grained material, particularly with natural organic-carbon content. This material can be spread by heavy equipment, fertilized if needed, and provides a growth medium for vegetation. This preference towards finer particles contrasts with the coarser particles often recovered during diamond-drill coring.

For the Schaft Creek Project, the relatively intact rock that forms ore and waste rock in the proposed pit area has been assessed separately for its ML-ARD potential (Morin and Hutt, 2010). Therefore, this ML-ARD report focusses on all geologic material above the relatively intact rock.

3.2 Sampling of Schaft Creek Pit-Area Overburden

At this time, there are no well-defined boundaries to the proposed pit area, because drilling, assaying, and geostatistical modelling are ongoing. Thus, some liberty was taken here to include samples that may lie outside the final pit area.

The primary sources of samples and data of pit-area overburden for the earlier ML-ARD investigation (Morin and Hutt, 2009) were:

1) 94 hand-dug samples spanning depths of zero to an average of 0.2 m below surface, collected on a nominal 200 m grid spacing in September 2008 by the Schaft Creek geology team,

representing surficial (shallowest) overburden (Figure 3-1);

2) 24 samples from existing core that still contained sufficient volumes for ML-ARD analyses (Figure 3-2); and,
3) 57 samples from test pits dug in September 2008, providing vertical profiles through the overburden and allowing more reliable visual examination and sampling of overburden without potential loss of finer particles (Figure 3-2).

For this ML-ARD study, twelve of the original 175 samples were analyzed further using “shake flasks”, as explained in Section 3.4. Two splits of one sample (LJ-9) were analyzed, for a total of 13 new analyses. These samples were chosen to reflect the more acidic overburden (paste pH <~6) with ranges of solid-phase concentrations, and thus were surficial samples from the southern portion of the pit area (Morin and Hutt, 2009). This is discussed further in the following chapters.

3.3 Original ML-ARD Analyses of Schaft Creek Pit-Area Overburden

In the original overburden study (Morin and Hutt, 2009), the 175 overburden samples (Section 3.2) were subjected to several geochemical ML-ARD “static” (one-time) analyses. Those samples were sent to ALS Chemex Labs in North Vancouver for:

1) Chemex Package ABA-PKG05A plus C-IR07, which is standard-Sobek (U.S. EPA 600 compliant; Sobek et al., 1978) expanded acid-base accounting (ABA), providing measured and/or calculated values of:
    - paste pH in a mixture of pulverized rock and water,
    - total sulphur,
    - measured sulphide,
    - leachable sulphate (both HCl and carbonate leach techniques),
    - calculated sulphide by subtracting sulphate from total sulphur,
    - barium-bound sulphate calculated from barium analyses,
    - calculation of acid potentials based on total-sulphur levels (Total-Sulphur Acid Potential, TAP),
    - calculation of acid potentials based on sulphide levels plus any unaccounted-for sulphur (Sulphide Acid Potential, SAP),
    - Sobek (U.S. EPA 600 compliant) neutralization potential (NP) by acid bath and base titration,
    - inorganic carbonate for mathematical conversion to Carbonate NP (Inorganic CaNP),
    - total carbon for mathematical conversion to Carbonate-equivalent NP (Total CaNP),
    - non-inorganic (“organic”) carbon calculated from the difference between total and inorganic carbon,
    - CaNP calculated from calcium (Ca CaNP),
    - CaNP calculated from Ca + Mg (Ca+Mg CaNP),
    - various Net Neutralization Potential (NNP) balances of acid neutralizing capacities minus various acid generating capacities, and
    - various Net Potential Ratio (NPR) balances of acid neutralizing capacities divided by various acid generating capacities.

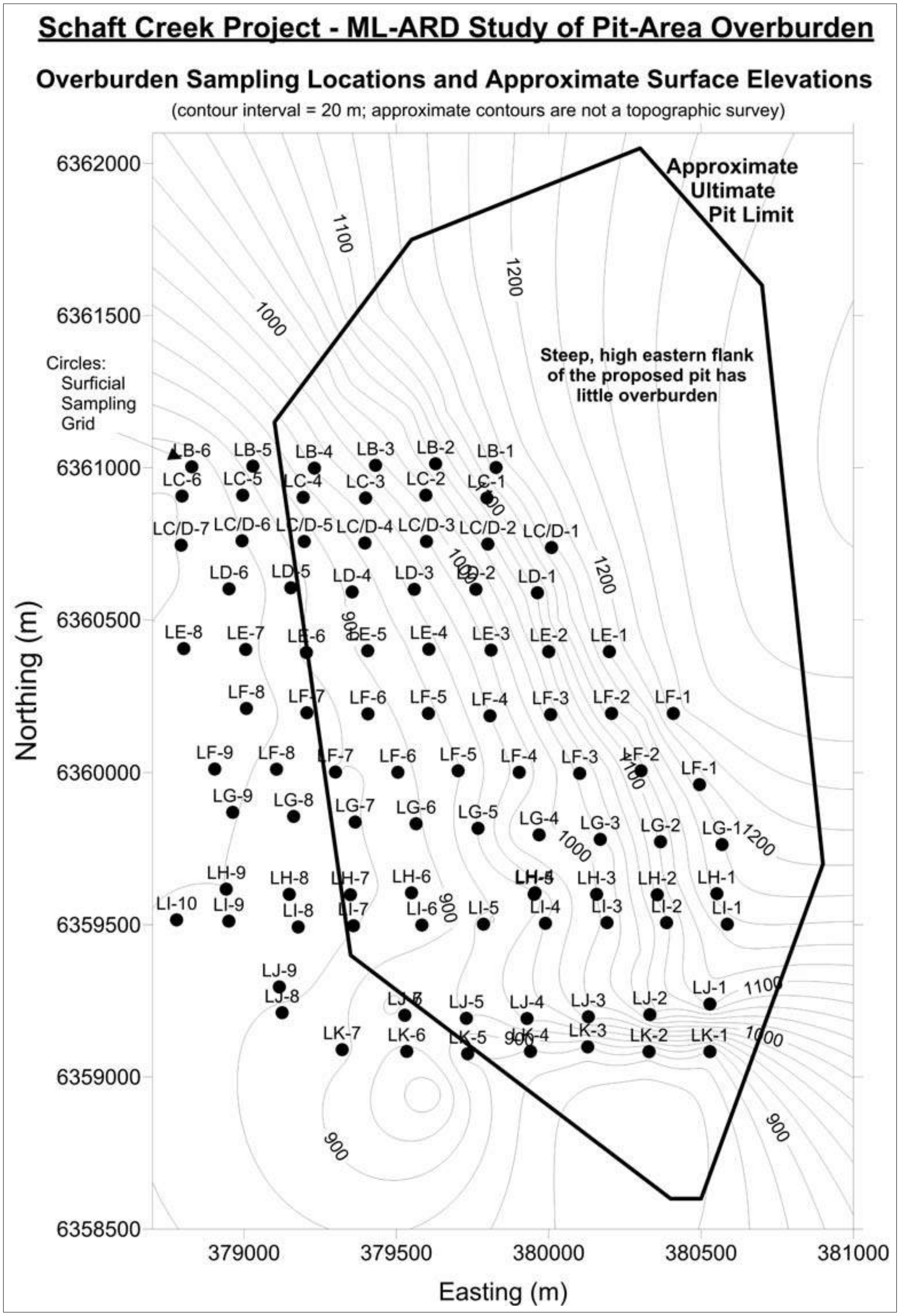

Figure 3-1. Overburden sampling locations in the surficial grid in the proposed pit area.

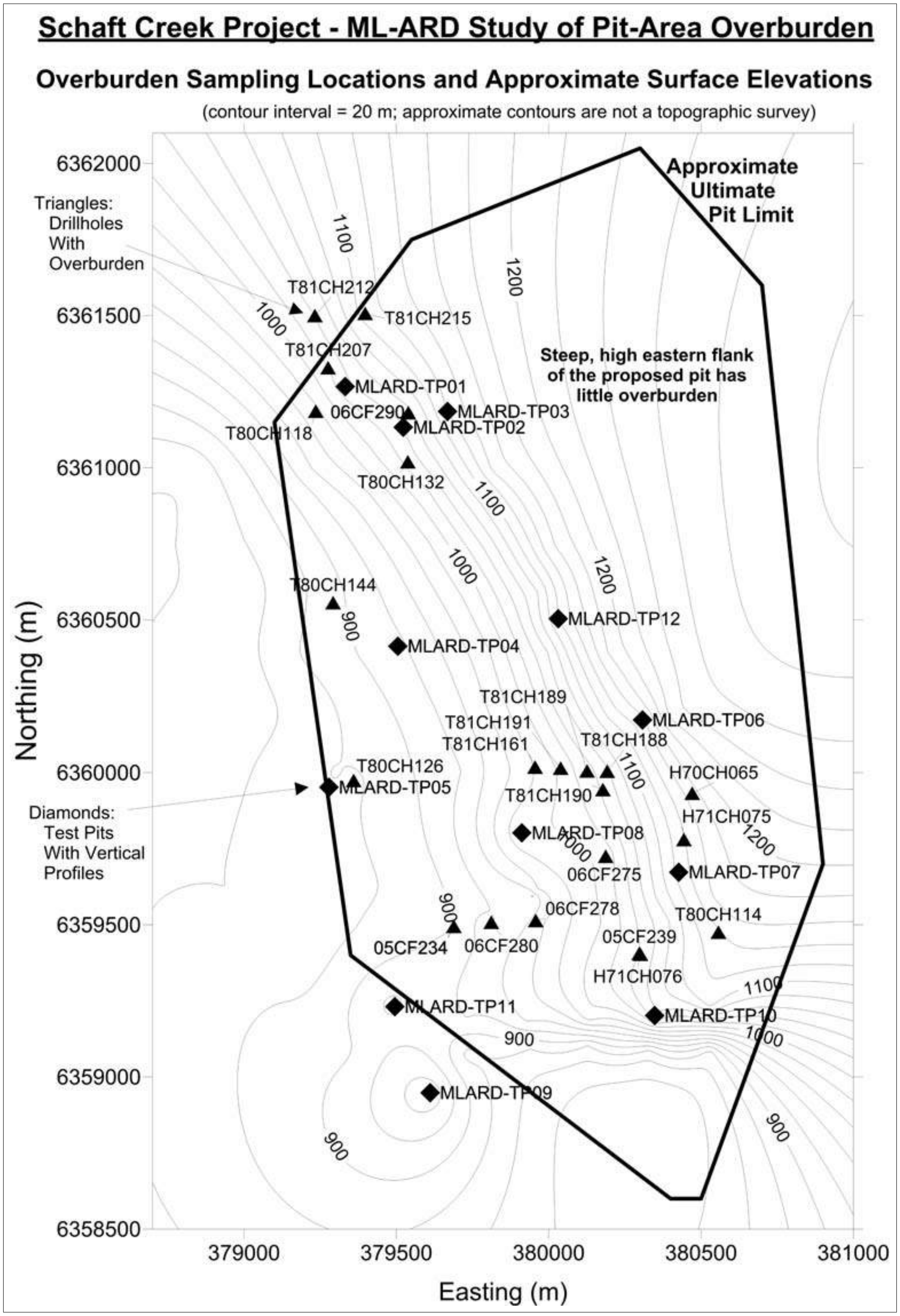

Figure 3-2. Overburden sampling locations at test pits and drillholes in the proposed pit area.

2) total-element contents by:

- Chemex Package ME-MS61m: 49-element analysis after strong four-acid digestion, and
- Chemex Package ME-XRF-06: XRF (x-ray-fluorescence) whole rock for 14 elements and parameters.

The results are compiled in Morin and Hutt (2009) and are discussed in the following chapters.

3.4 Additional ML-ARD Analyses of Schaft Creek Pit-Area Overburden

For this study, additional ML-ARD analyses were carried out by ALS Environmental in Vancouver, conducted on Schaft Creek overburden (Section 3.2) sent by ALS Chemex. Twelve of original 175 samples were selected. Portions of the original samples not previously pulverized were freshly crushed and pulverized for this testwork.

To determine if the freshly pulverized material ("Reject Pulp") was more reactive than the previously pulverized material, Sample LJ-9 had both "Original Pulp" and fresher "Reject Pulp" tested, resulting in a total of 13 samples (Appendix A). This showed that leached copper was about three times higher, and lead was about eight times higher, in the fresher Reject Pulp for LJ-9. This suggests these freshly pulverized samples may be more reactive than the previously pulverized samples. The freshly pulverized samples were used for leach testing.

The primary test conducted for this study was the "shake flask", where excess water is added to pulverized solids in a 3:1 ratio and the mixture is agitated for 24 hours (Section 7.4.1 of Price, 1997). Then the solution is filtered through 0.45 µm filters and analyzed for "dissolved" parameters.

The results for 13 shake flasks (including the older "Original Pulp" and fresher "Reject Pulp" for LJ-9) are compiled in Appendix A of this report. These samples were chosen to reflect ranges of solid-phase concentrations under acidic conditions (paste pH <~ 6) identified in the earlier study (Morin and Hutt, 2009), as explained in following chapters. All were surficial overburden mostly in the southern portion of the proposed pit where acidic samples were collected, with three taken from test pits (Figure 3-2) and ten from the surficial grid (Figure 3-1).

4. EFFECTS OF COLLOIDS ON SHAKE-FLASK TESTING OF SCHAFT CREEK PIT-AREA OVERBURDEN

To understand the results of this shake-flask testing (Section 3.4), it is important to note that filtration through 0.45 µm filters arbitrarily separates finer "dissolved" aqueous species and particles from coarser "suspended" particles. The combination of the two is called "total". In reality, the dissolved species includes hydrated ions (~10^{-4} to 10^{-3} µm), aqueous complexes and ion pairs, polymers, nanoparticles, finer colloids, and finer mineral particles. In contrast, the suspended species include coarser colloids and coarser mineral particles. After filtration of the dissolved sample, the dissolved and total samples are stabilized by acid addition.

Finer reactive colloids can sometimes coagulate after filtration and analysis to form visible precipitants within stabilized dissolved samples. This can affect total and dissolved concentrations through time. This occurred with the Schaft Creek overburden shake flasks.

Dissolved aqueous concentrations from the overburden shake-flask samples for aluminum, iron, and silicon were anomalously high (Appendix A) and likely above dissolved-ion solubilities for the corresponding oxide minerals. This suggested the presence of finer reactive colloids in the dissolved sample, supported by the later observation of precipitants in the preserved dissolved samples. ALS Environmental (2010a) reported,

> "The [shake-flask] extracts were filtered through a 0.45 micron membrane filter. The filtration was difficult but the solutions were clear. At this point all raw solutions show yellow precipitates in them. Similarly the nitric acid preserved cuts have presence of precipitates at this point, but only about 5 or 6 samples have more than 5 ml left in them. It might be a case that we seen before where there is presence of colloids in the solution (Aluminum+Iron colloids?)."

To examine this further, the laboratory was asked to analyze for dissolved organic carbon (DOC) and to determine the chemical composition of the precipitants. ALS Environmental (2010b) replied,

> "Yes, there is a fair amount of DOC in these samples. As written on the report comments, I logged in TOC rather than DOC to make sure that the lab analyst does not filter out the precipitates for the analysis. But yes, it is really a DOC result, since the water was filtered with a 0.45 micron membrane filter right after the extraction."
>
> "Also for 3 of the samples, we filtered the precipitates, digested and re-solubil[i]zed them within the same amount of deionized water. The results are expressed as Total metals. We can see that the 3 major components of these precipitates are Iron, Aluminum and Silica, with a presence of Calcium and Magnesium."

Results of DOC analyses for the shake-flask solutions are included in Appendix A of this report.

The three aqueous analyses of the digested precipitants are provided in Appendix B. From these aqueous analyses, the solid-phase colloid concentrations were calculated by:

1) considering only detectable aqueous concentrations;
2) summing all detectable concentrations in each of the three solutions,
3) mathematically dividing each detectable concentration by the sum to obtain solid-phase concentrations as a percentage.

The resulting calculated solid-phase concentrations are illustrated in Figures 4-1 to 4-3. Due to the nature of the analyses, the oxide contents of the concentrations (e.g., SiO_2) are not included.

Figures 4-1 to 4-3 showed that the coagulated reactive colloids from the Schaft Creek overburden were generally composed primarily of iron and aluminum, with large amounts of silicon and magnesium, and significant amounts of calcium, titanium, and manganese. Also, one colloid contained 10% phosphorus, and metals like barium, copper, and zinc comprised at least a few tenths of one percent in some samples. Thus, overburden colloids were primarily composed of iron, aluminum, magnesium, and silicon.

As a result, drainage waters from Schaft Creek overburden may display trends of decreasing dissolved concentrations through time with increasing suspended concentrations. This will affect aqueous total concentrations if the coagulated colloids settle from the drainage.

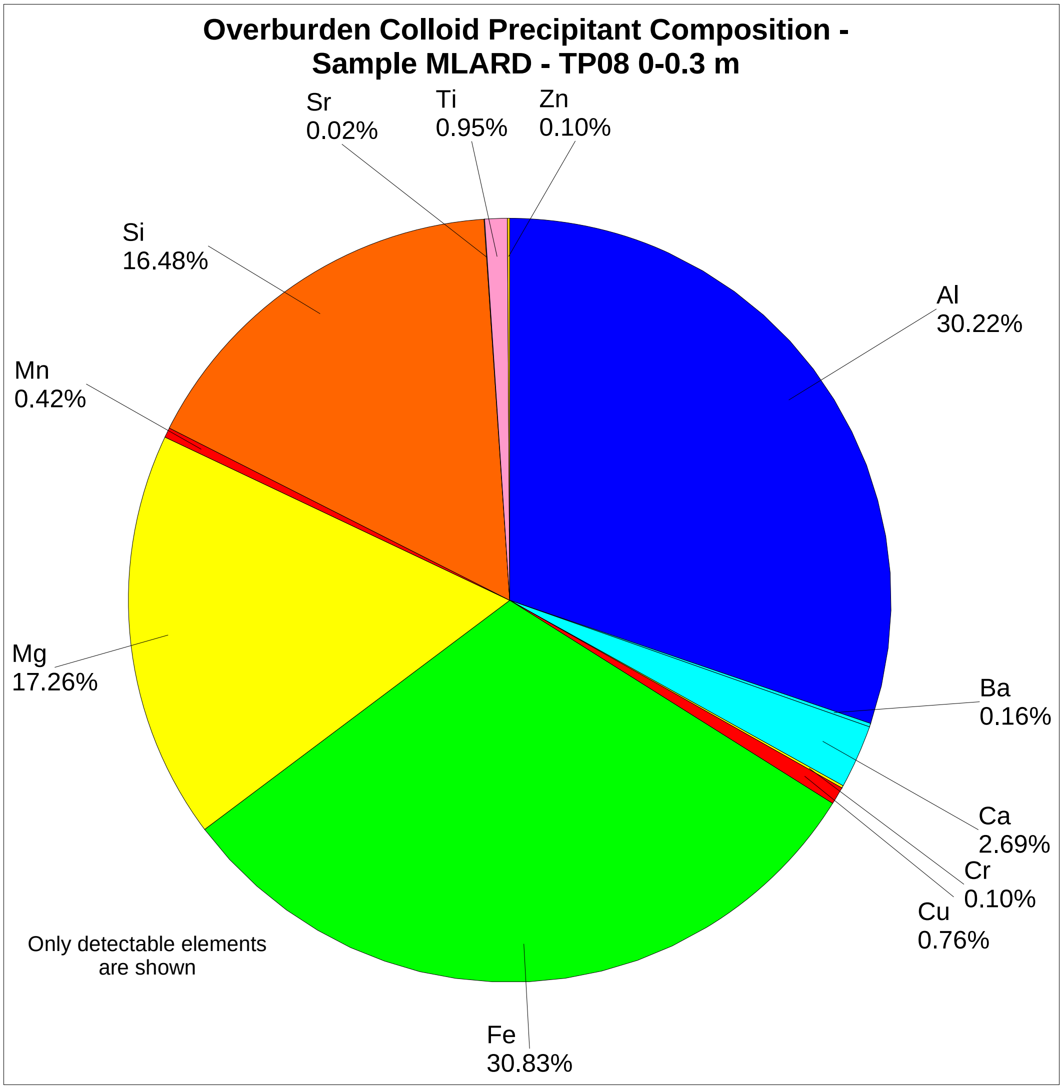

Figure 4-1. Calculated solid-phase concentrations of coagulated colloids in Sample MLARD - TP08 0-0.3 m, based on aqueous digestion and detectable elements.

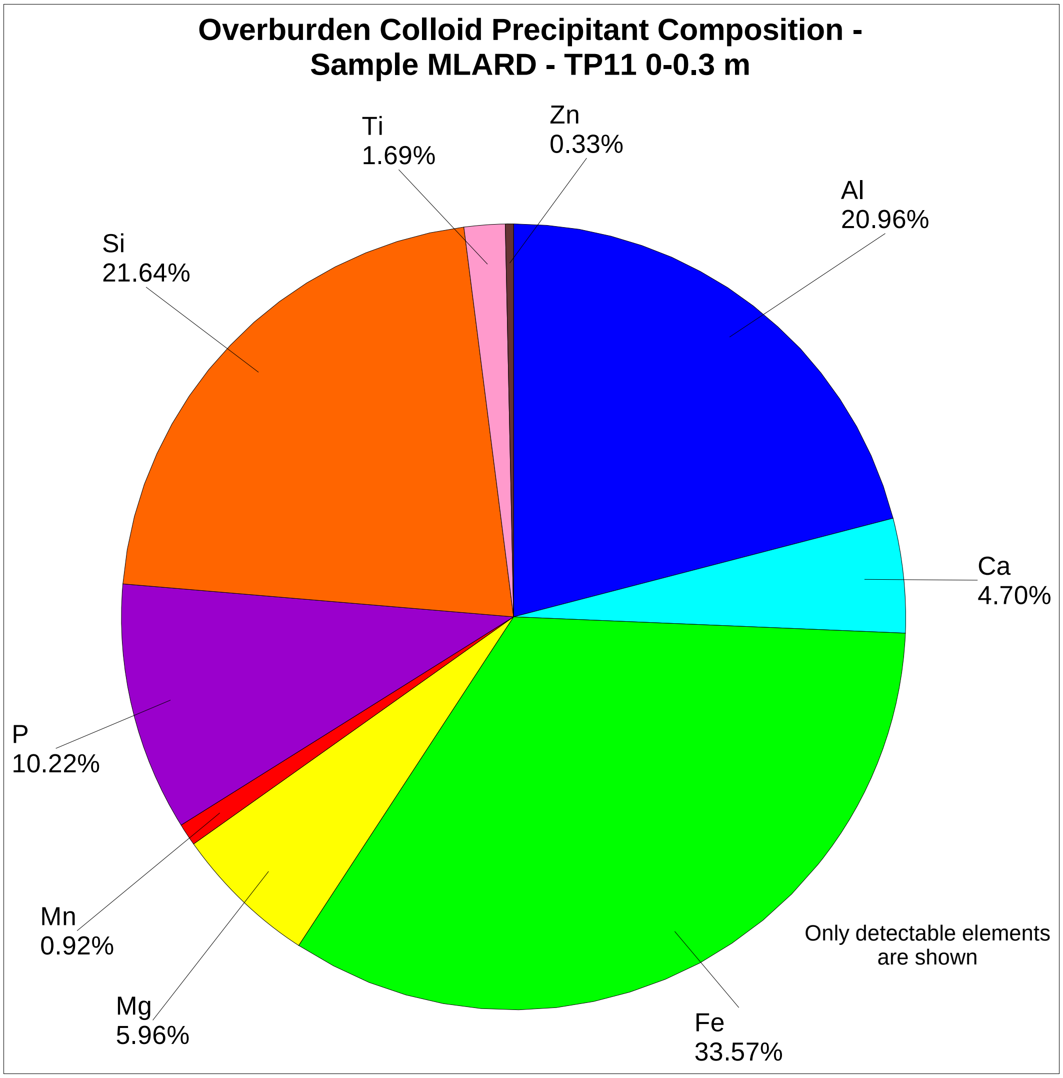

Figure 4-2. Calculated solid-phase concentrations of coagulated colloids in Sample MLARD - TP11 0-0.3 m, based on aqueous digestion and detectable elements.

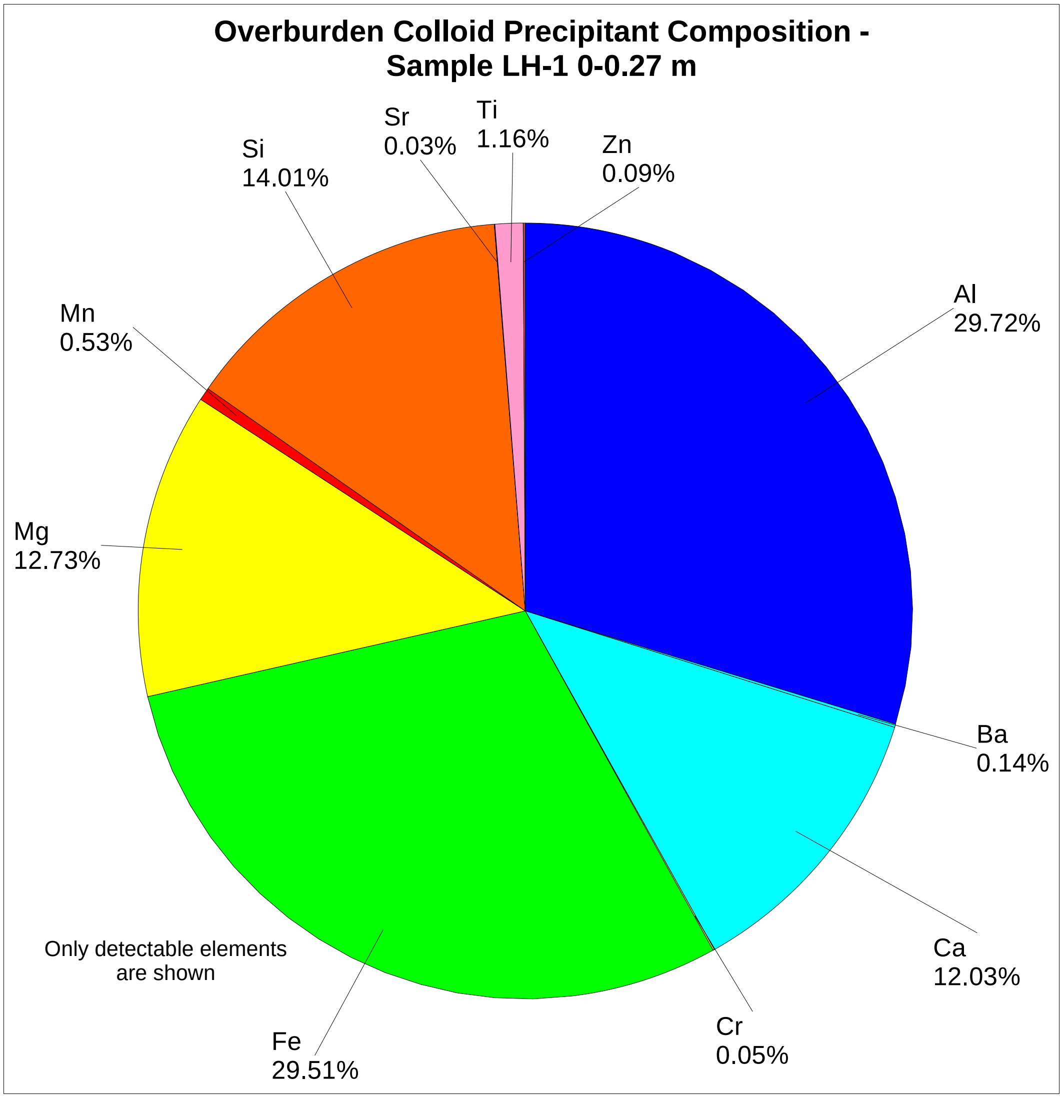

Figure 4-3. Calculated solid-phase concentrations of coagulated colloids in Sample LH-1 0-0.27 m, based on aqueous digestion and detectable elements.

5. RESULTS OF SHAKE-FLASK TESTING OF SCHAFT CREEK PIT-AREA OVERBURDEN

5.1 Solid-Phase Correlations with Solid-Phase Organic Carbon

As noted in the earlier overburden study (Morin and Hutt, 2009; see Chapter 2 of this report), geochemical solid-phase correlations were seen with solid-phase organic carbon, calculated by the subtraction of inorganic carbon from total carbon. Correlations included paste pH, suggesting natural organic processes accounted for acidic pH values. No major correlations were seen with solid-phase sulphide, so organic carbon remained the major solid-phase parameter. This section shows and quantifies some of these correlations.

As explained in Chapter 2 and 3 of this report, overburden at Schaft Creek ranges from nearly pure inorganic material, comprised of inorganic minerals like quartz (SiO_2) and aluminosilicates (containing aluminum), to nearly pure natural organic material. This range can be seen in Figures 5-1 and 5-2, with inverse equations linking the inorganic elements to organic carbon. These show that samples with 43-44% organic carbon are purely organic with no substantial inorganic aluminosilicate minerals, whereas samples with less than 4-6% organic carbon are mostly inorganic.

Another solid-phase analysis is known as Loss on Ignition (LOI). LOI often reflects the weight loss from the samples of some or all sulphur, carbon, and tightly bound or crystalline water. In Schaft Creek overburden samples, LOI correlates well with organic carbon (Figure 5-3), providing an alternative method for measuring solid-phase organic-carbon content.

The 13 samples tested in shake flasks spanned most of the range of sulphide in pit-area overburden, from <0.01%S (numerically set to 0.005%S) to 0.56%S (Figure 5-4 and Appendix A). As mentioned above, there were no major correlations with solid-phase sulphide, and this includes organic carbon (Figure 5-4).

The primary objective of this study was to characterize leaching from acidic overburden (Chapter 1). Because paste pH inversely correlated with organic carbon (Figure 5-5), the 13 low-pH acidic samples contained detectable carbon at 1.16 to 21.7%C, with most elevated relative to the overall median of 0.82%C and mean of 3.7%C from the full overburden database. Nevertheless, the lower organic-carbon levels of a few percent still represented mostly inorganic samples (Figures 5-1 and 5-2), so that a range of mostly inorganic to mostly organic samples was tested.

Trends of solid-phase elements with organic carbon provided some evidence of whether a particular element was mostly associated with inorganic minerals or with organic material. For example:
- silica and aluminum represented inorganic minerals (Figures 5-1 and 5-2),
- some elements displayed anomalous trends suggesting an element was concentrated in the organic material at intermediate levels but not at low and high levels (e.g., Figure 5-6), and
- some elements showed a clearer association with organic carbon like mercury and selenium (Figures 5-7 and 5-8).

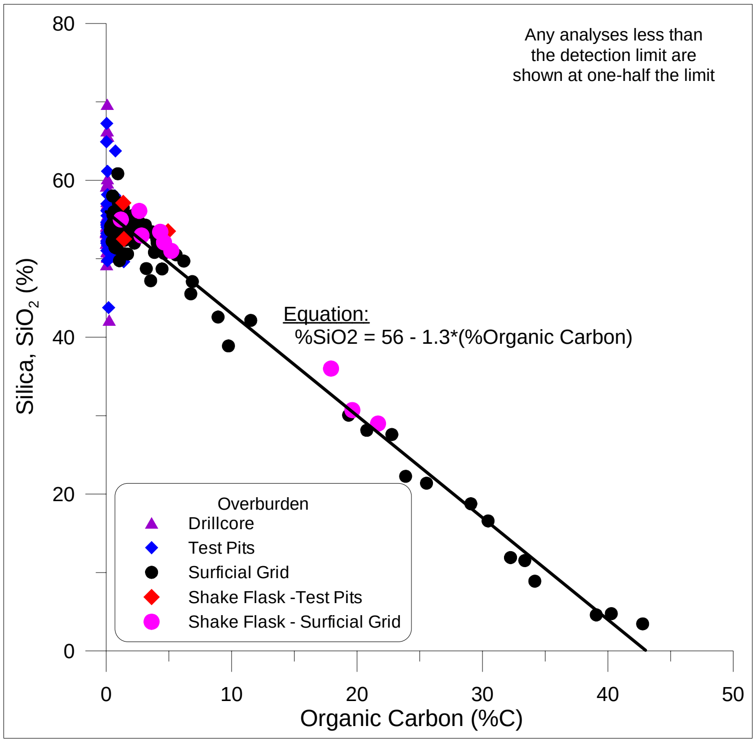

Figure 5-1. Solid-phase silica vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

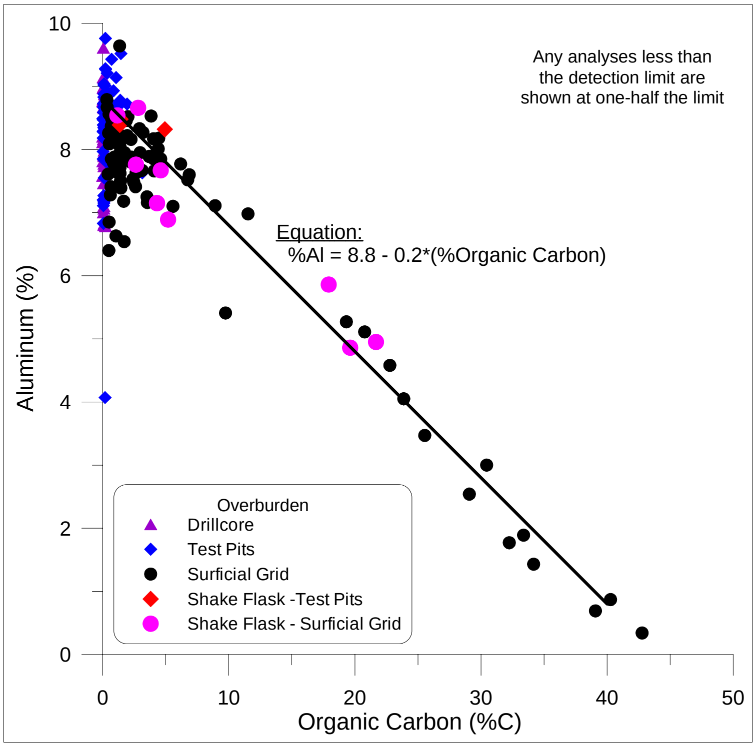

Figure 5-2. Solid-phase aluminum vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

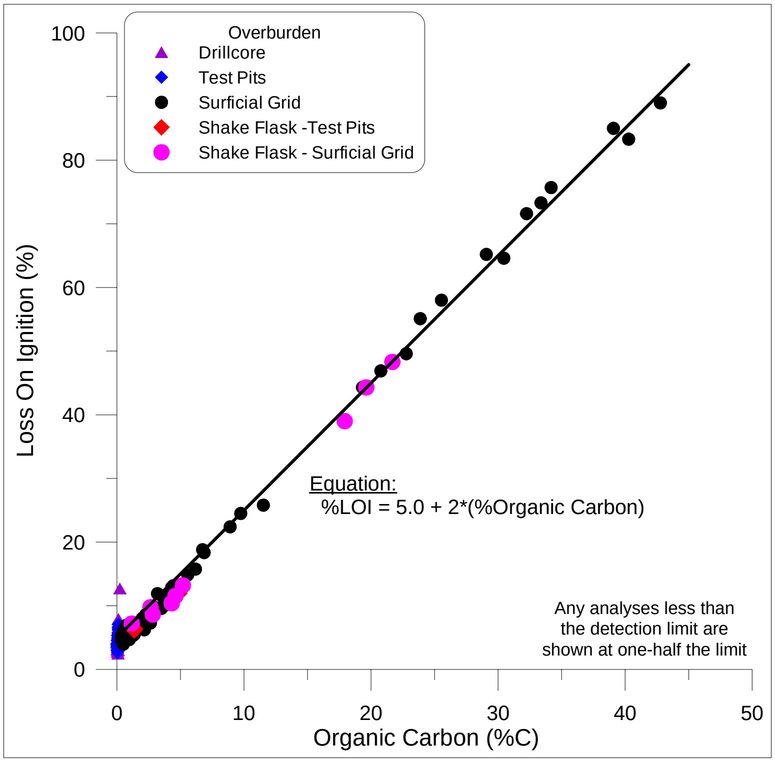

Figure 5-3. Solid-phase Loss on Ignition (LOI) vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

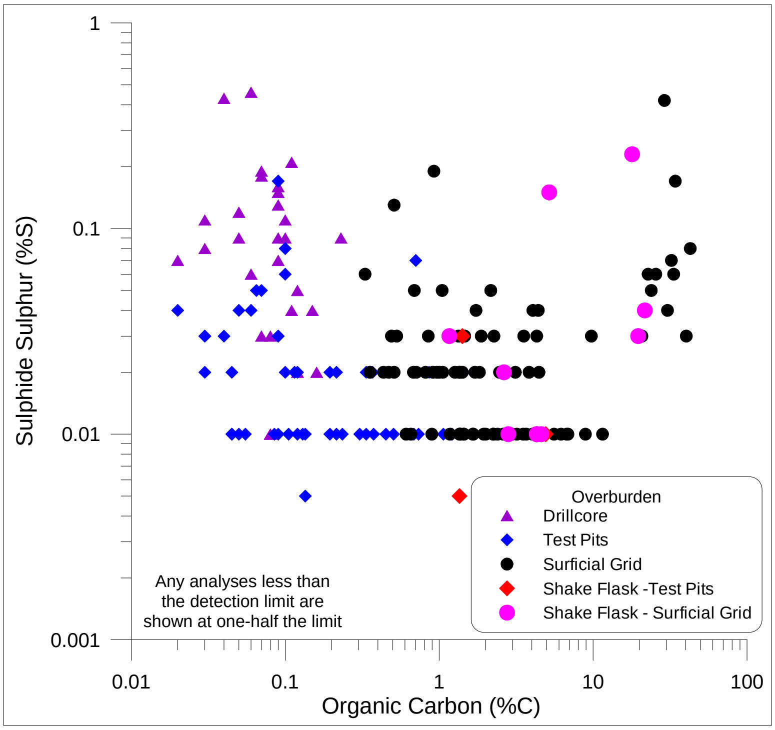

Figure 5-4. Solid-phase sulphide vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

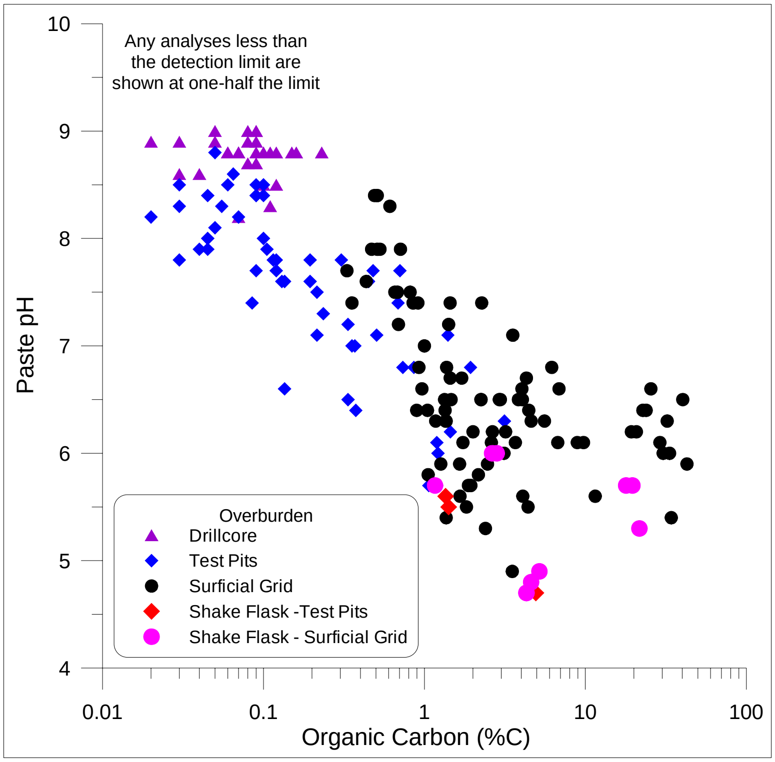

Figure 5-5. Solid-phase paste pH vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

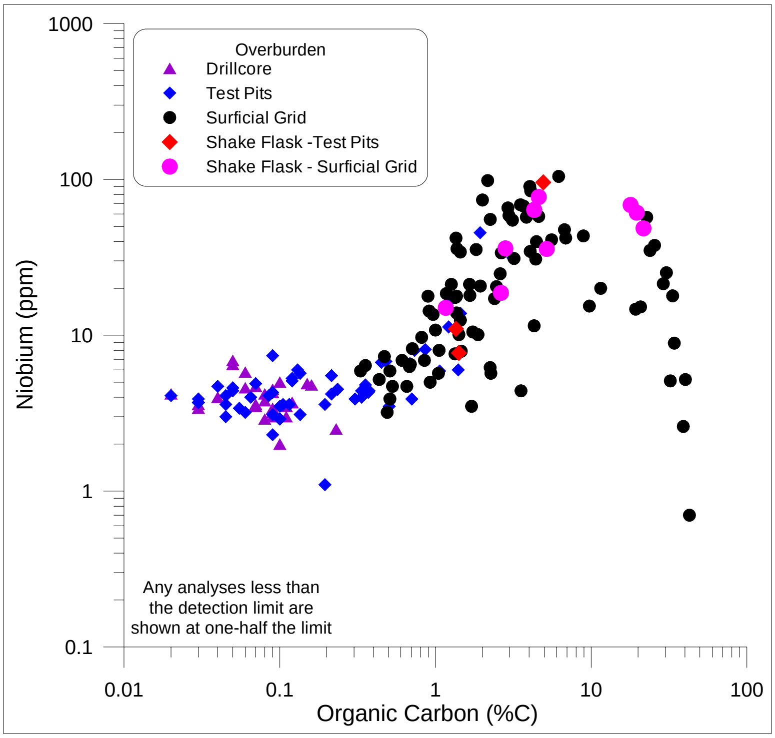

Figure 5-6. Solid-phase niobium vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

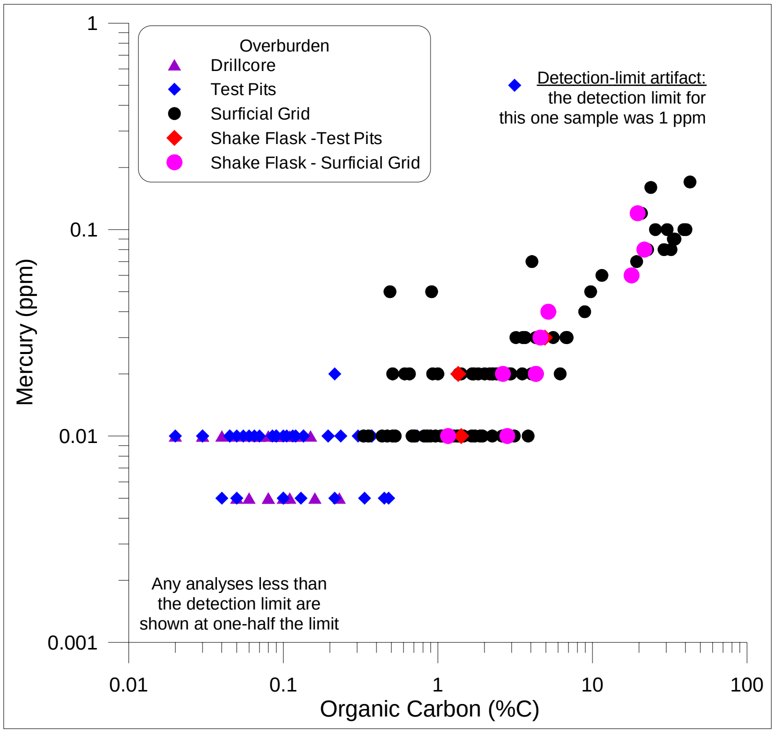

Figure 5-7. Solid-phase mercury vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

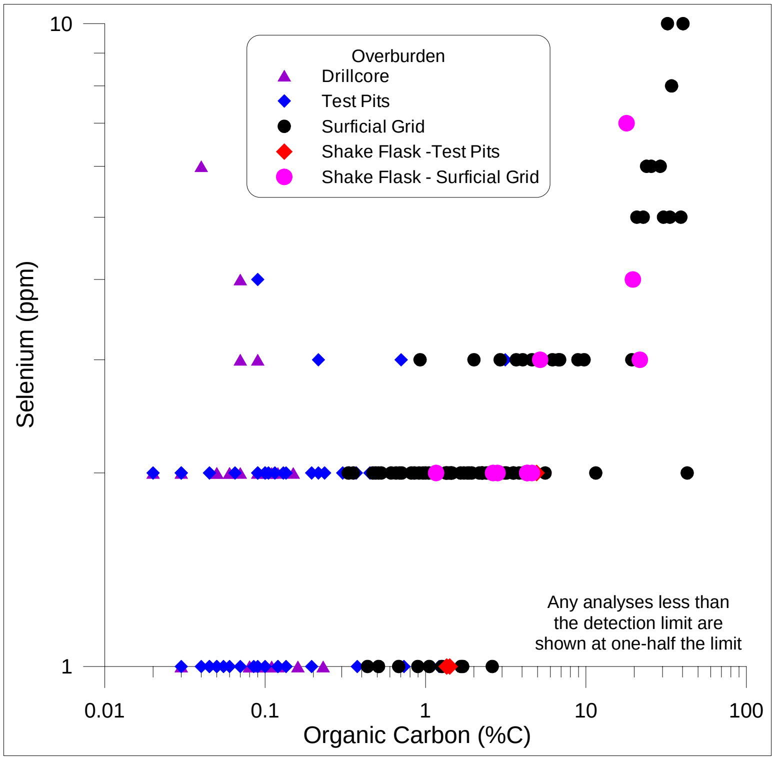

Figure 5-8. Solid-phase selenium vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

Solid-phase organic carbon also correlated with some aqueous parameters in the shake flasks. In particular, solid-phase organic carbon generally correlated with aqueous dissolved organic carbon from the shake flasks (Figure 5-9). This is discussed further in Section 5.2

5.2 Aqueous Shake-Flask-Leached Correlations with Solid-Phase Organic Carbon

Solid-phase organic carbon correlated with some aqueous leached parameters in the shake flasks. In particular, solid-phase organic carbon generally correlated with aqueous dissolved organic carbon (Figure 5-9) and aqueous pH (Figure 5-10). Because of these correlations and that with solid-phase paste pH (Figure 5-5), all four of these parameters (two solid phase and two aqueous) cross-correlate with each other (e.g., Figure 5-11).

For predictive purposes, scatterplots showing leached concentrations with solid-phase organic carbon and solid-phase paste pH are compiled in Appendices C and D. Because of the cross-correlations between organic carbon and pH, it is not possible to infer whether correlations in Appendices C and D are caused by variations in pH or in organic carbon within the aqueous and/or solid phase. Nevertheless, these can be used for refining full-scale predictions if needed (Chapter 6).

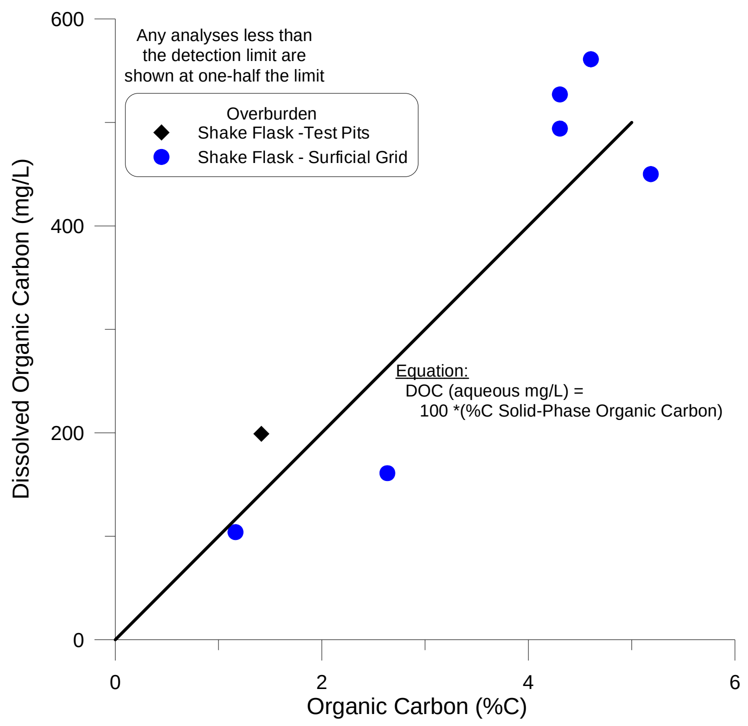

Figure 5-9. Aqueous shake-flask dissolved organic carbon vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

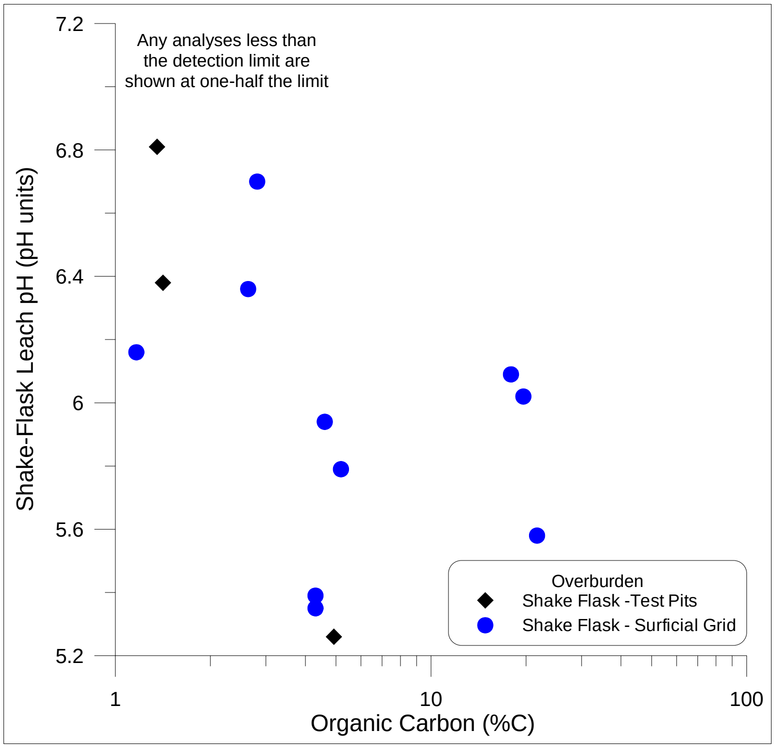

Figure 5-10. Aqueous shake-flask pH vs. solid-phase calculated organic carbon in Schaft Creek pit-area overburden.

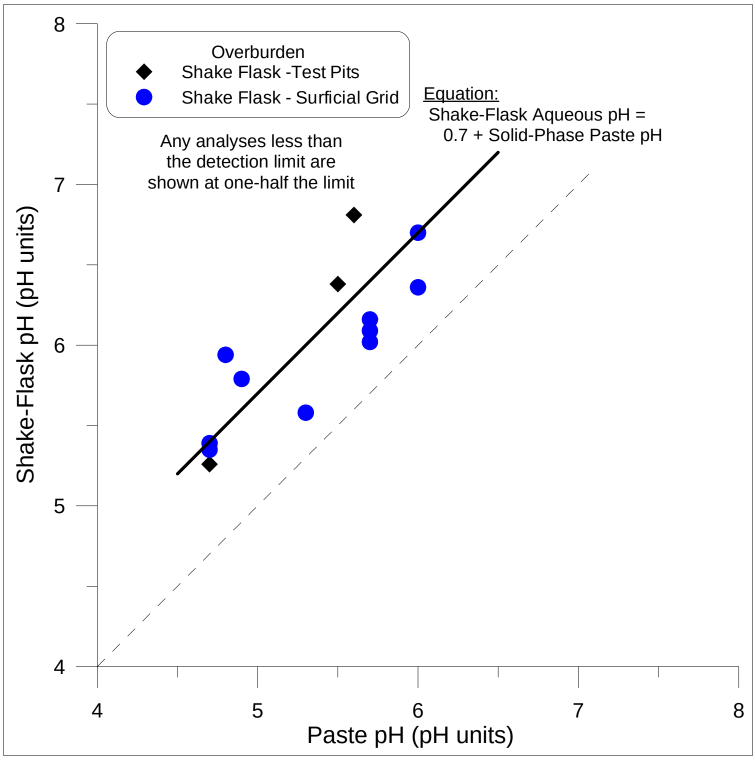

Figure 5-11. Aqueous shake-flask pH vs. solid-phase paste pH in Schaft Creek pit-area overburden.

6. PREDICTION OF FULL-SCALE DRAINAGE CONCENTRATIONS FROM SCHAFT CREEK PIT-AREA OVERBURDEN

The initial overburden report (Morin and Hutt, 2009) defined three categories of pit-area overburden at Schaft Creek:

1) overburden that is already acidic by any process and can leach metals at elevated levels;
2) overburden that will become acidic if oxidized or combined with already-acidic overburden, resulting in increased metal leaching; and,
3) overburden that will remain near neutral, and may or may not have elevated metal leaching.

Therefore, for predictions of full-scale drainage chemistry from overburden, predictions are needed for acidic and near-neutral drainages. Acidic conditions occur primarily in the surficial overburden in the southern portion of the pit area, whereas as northern surficial and all deeper overburden was near neutral (Morin and Hutt, 2009).

Solid-phase and aqueous pH in pit-area overburden inversely correlates with increasing organic carbon and decreasing inorganic mineral content (Chapter 5). Therefore, drainage-chemistry predictions for Schaft Creek mined rock can also be used for low-organic-carbon, near-neutral overburden (Table 6-1; see also Morin and Hutt, 2010).

On the other hand, for acidic overburden, the results of the shake flasks can be used for drainage-chemistry predictions. In this case, aqueous concentrations in mg/L from the acidic shake flasks were compared to full-scale predictions from mined rock (Table 6-1). This showed that several concentrations from the acidic shake flasks were within a factor of two of the minimum or maximum near-neutral full-scale values, and thus the shake flasks were yielding analogue values for full scale.

Differences between the acidic-overburden and near-neutral mined-rock predictions could be mostly attributed to:

- acidic pH leading to higher predicted concentrations for acidic overburden;
- higher organic carbon leading to higher predicted concentrations for acidic overburden; and
- colloids leading to higher predicted concentrations for acidic overburden.

Table 6-1. Predicted full-scale drainage chemistry for overburden at Schaft Creek based on shake-flask testing of acidic overburden and on near-neutral mined rock

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5] Minimum	Maximum	Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
pH (units)	7.72	8.35	Range: 6.2-6.7 when Organic Carbon < 4%C; 5.3-6.1 when Organic Carbon > 4%C
Conductivity (µS/cm)	2250	3390	1000 (or 330 when Organic Carbon < 6%C; 1000 when Organic Carbon > 6%C)
Acidity	4.5	6.2	110 (or 110 when paste pH 4.7-5.0; 30 when paste pH 5.0-6.0)
Alkalinity	158	204	140 (or 52 when paste pH 4.7-5.0; 140 when paste pH 5.0-6.0)
Sulphate	1410	2030	400 (or 30 when Organic Carbon < 6%C; 400 when Organic Carbon > 6%C)
Hardness	1100	1850	NA
Bromide	<0.5	<1	<2.5
Chloride	26	49	<25
Fluoride	0.5	1.0	<1
Nitrate[2]	0.21	0.45	0.4
Nitrite[2]	0.024	0.066	0.027
Ammonia[2]	0.013	0.15	NA
Phosphate (P)	0.036	0.16	NA
Al	0.0066	0.78	25[4] (or 25 when Organic Carbon < 6%C; 7 when Organic Carbon > 6%C[4])
Sb	0.0049	0.20	0.0048 (or 0.0005 when paste pH 4.7-5.0; 0.0048 when paste pH 5.0-6.0)
As	0.0025	0.0098	0.013 (or 0.013 when Organic Carbon < 6%C; 0.0072 when Organic Carbon > 6%C)
Ba	0.064	0.22	0.29[4]
Be	<0.0025	<0.005	0.0021

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5]		Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
	Minimum	Maximum	
Bi	<0.0025	<0.005	0.0021 (or 0.0021 when Organic Carbon < 6%C; <0.001 when Organic Carbon > 6%C)
B	0.062	0.16	0.12
Cd	<0.002	<0.006	0.0037 (or 0.00082 when paste pH 4.7-5.0; 0.0037 when paste pH 5.0-6.0)
Ca	407	719	120[4] (or 26 when Organic Carbon < 6%C; 120 when Organic Carbon > 6%C[4])
Cr	<0.0025	<0.005	0.074[4]
Co	0.0023	0.0080	0.043
Cu	0.11	0.48	0.68[4]
Fe	<0.03	0.34	25[4] (or 25 when Organic Carbon < 6%C; 8.0 when Organic Carbon > 6%C[4])
Pb	0.0005	0.0025	0.051 (or 0.051 when Organic Carbon < 6%C; 0.0026 when Organic Carbon > 6%C)
Li	0.05	0.08	0.012
Mg	24	43	24[4]
Mn	0.23	0.46	3.0[4]
Hg	<0.00001	0.000028	0.00014
Mo	2.0	7.2	3.0 (or 0.0057 when paste pH 4.7-5.0; 3.0 when paste pH 5.0-6.0)
Ni	<0.0025	0.010	0.092
P	<0.3	<0.3	3.2[4] (or 1.7 when Organic Carbon < 6%C; 3.2 when Organic Carbon > 6%C[4])
K	13	32	23.1
Se	0.016	0.14	0.011 (or 0.0020 when Organic Carbon < 6%C; 0.011 when Organic Carbon > 6%C)
Si	2.1	4.7	71[4] (or 71 when paste pH 4.7-5.0; 33 when paste pH 5.0-6.0[4])

Parameter[1] (mg/L unless noted)	Range of Full-Scale Near-Neutral Mined-Rock Predictions[5]		Maximum Full-Scale Acidic-Overburden Predictions (pH < 7)[5]
	Minimum	Maximum	
Ag	0.00005	0.00029	0.0032 (or 0.0032 when paste pH 4.7-5.0; 0.0025 when paste pH 5.0-6.0)
Na[3]	170	350	73
Sr	3.7	11	0.90[4] (or 0.084 when Organic Carbon < 6%C; 0.90 when Organic Carbon > 6%C[4])
Tl	<0.0005	<0.001	0.00015
Sn	<0.0005	0.00087	0.0022
Ti	<0.01	0.016	1.2[4] (or 1.2 when paste pH 4.7-5.0; 0.41 when paste pH 5.0-6.0[4])
U[3]	0.007	0.074	0.0024 (or 0.0024 when paste pH 4.7-5.0; 0.00078 when paste pH 5.0-6.0)
V	<0.005	0.081	0.10 (or 0.10 when Organic Carbon < 6%C; 0.018 when Organic Carbon > 6%C)
Zn	2.0	2.6	0.10 (or 0.10 when Organic Carbon < 6%C; 0.018 when Organic Carbon > 6%C[4])
Aqueous Organic Carbon (C)	NA	NA	560 (or 560 when paste pH 4.7-5.0; 200 when paste pH 5.0-6.0)

[1] Concentrations of metals and other elements are dissolved (filtered).

[2] Concentrations of nitrogen species predicted here are not necessarily representative of those that will be derived from blasting residues upon mining.

[3] It is not clear if these elements were limited by or close to equilibrium, so increasing scale may increase their near-neutral concentrations.

[4] These elevated concentrations include colloids that can convert between dissolved (<0.45 µm) and suspended (>0.45 µm) forms.

[5] The full-scale mined-rock predictions (left columns, from Morin and Hutt, 2010) can be taken as predictions for overburden that is above pH 7 and predominantly rock; the right column is for overburden below pH 7 and with varying amounts of organic carbon.

7. CONCLUSION

This report is a continuation of studies related to metal leaching and acid rock drainage (ML-ARD) from pit-area overburden at the Schaft Creek Project. Previous work on pit-area overburden at the Schaft Creek Project showed that some samples were already acidic, probably due to natural organic carbon and natural soil processes. This report focussed more closely on already-acidic overburden, conducting leaching tests known as “shake flasks”. Shake-flask testing showed some unusual results due to colloids. Nevertheless, solid-phase contents and correlations were apparent, and predictions for full-scale drainage chemistry from overburden were compiled for acidic and near-neutral overburden.

Acidic Overburden Samples

For this ML-ARD study, twelve of the original 175 overburden samples were analyzed further using “shake flasks”. Two splits of one sample (LJ-9) were analyzed, for a total of 13 new analyses. These samples were chosen to reflect the more acidic overburden (paste pH <~6) with ranges of solid-phase concentrations, which was found near the surface in the southern portion of the pit area. The two splits of LJ-9 showed that the freshly pulverized sample was more reactive than older pulverized sample, so freshly pulverized samples were used for this study.

Colloids in Overburden Drainage

The reactive, coagulating colloids from shake-flask testing of acidic overburden were primarily composed of iron, aluminum, magnesium, and silicon, with lesser amounts of other elements. As a result, drainage waters from Schaft Creek overburden may display trends of decreasing dissolved concentrations through time with increasing suspended concentrations. This will affect aqueous total concentrations if the coagulated colloids settle from the drainage.

Correlations with Solid-Phase Organic Carbon

Correlations of solid-phase and aqueous parameters with solid-phase organic carbon included solid-phase paste pH, aqueous shake-flask-leached pH, and aqueous-leached dissolved organic carbon. As a result, these four parameters were cross-correlated, with higher organic carbon generally associated with more acidic pH. In turn, aqueous leached parameters increasing with decreasing pH will also generally increase with increasing organic carbon.

The inverse correlation of solid-phase aluminum and silicon showed that 4-6% solid-phase organic carbon meant the sample was predominantly composed of inorganic aluminosilicate minerals. Conversely, 43-44% organic carbon was virtually pure organic soil.

Other trends of solid-phase elements with organic carbon provided some evidence of whether a particular element was mostly associated with inorganic minerals or with organic material. For

example:
- silica and aluminum represented inorganic minerals;
- some elements displayed anomalous trends suggesting an element was concentrated in the organic material at intermediate levels but not at low and high levels; and
- some elements showed a clearer association with organic carbon like mercury and selenium.

Prediction of Full-Scale Drainage Chemistry from Acidic and Near-Neutral Pit-Area Overburden

Due to the inverse correlation of organic carbon and pH in Schaft Creek overburden, predominantly inorganic overburden has near-neutral pH and predominantly organic overburden has acidic pH. Thus, predictions of full-scale drainage chemistry from near-neutral inorganic overburden are the same as those for full-scale mined rock.

For full-scale predictions of acidic overburden drainage, aqueous shake-flask concentrations were compared to full-scale near-neutral predictions, and several concentrations were similar. Therefore, the shake-flask concentrations were considered full-scale predictions for acidic overburden.

Differences between the acidic-overburden and near-neutral mined-rock predictions could be mostly attributed to:
- acidic pH leading to higher predicted concentrations for acidic overburden,
- higher organic carbon leading to higher predicted concentrations for acidic overburden, and
- colloids leading to higher predicted concentrations for acidic overburden.

The full-scale predictions for acidic overburden and for near-neutral overburden (using mined rock as the analogue) are compiled in Table 6-1.

8. REFERENCES

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APPENDIX A. Compiled Results of Shake-Flask Testing of Schaft Creek Pit-Area Overburden

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Sample Information**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Schaft Creek
Copper Fox Metals Inc.
Sample Information
Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

					UTM NAD 83 UTM Coordinates					Chemex Assay	
Testpit Drillhole Id	Material Type	From (m)	To (m)	Zone	X (Easting) (m)	Y (Northing) (m)	Z (Elevation) (m)	Interval (m)	Sample Type	Au (ppm)	Description
Vertical-Profile Overburden											
MLARD-TP08	Reject Pulp	0	0.3	9V	379912	6359802	999.2	0.30	Overburden	0.091	Light brown sandy silt with abundant roots
MLARD-TP09	Reject Pulp	0	0.3	9V	379611	6358948	956.9	0.30	Overburden	0.006	Orange-brown clayey silt with gravel and abundant wood fibers
MLARD-TP11	Reject Pulp	0	0.3	9V	379495	6359231	928	0.30	Overburden	*0.0025*	Dark brown silty sand with abundant roots
Shallow Overburden											
LE-5	Reject Pulp	0	0.11	9V	379406	6360399	905	0.11	Overburden	0.017	Lithology = fine sand to gravel; Grain size = 1/8 mm to 3 cm; Layers = No; Colour = orange-brown
LF-2	Reject Pulp	0	0.05	9V	380303	6360006	1113	0.05	Overburden	0.265	Lithology = medium soil to gravel; Grain size = 1/4 mm to 2 cm; Layers = No; Colour = orange-brown
LG-7	Reject Pulp	0	0.3	9V	379365	6359838		0.30	Overburden	0.006	Lithology = fine sand to gravel; Grain size = 1/8 mm to 1 cm; Layers = No; Colour = light brown
LG-9	Reject Pulp	0	0.23	9V	378963	6359870		0.23	Overburden	*0.0025*	Lithology = fine sand, organic soil; Grain size = 1/8 mm to 1 cm; Layers = No; Colour = dark brown
LH-1	Reject Pulp	0	0.27	9V	380552	6359602	1166	0.27	Overburden	*0.0025*	Lithology = sand to gravel; Grain size = 1/16 mm to 5 cm; Layers = No; Colour = orange-brown
LI-1	Reject Pulp	0	0.2	9V	380586	6359502	1153	0.20	Overburden	*0.0025*	Lithology = soil, medium sand to gravel; Grain size = 1/4 mm to 4 cm; Layers = No; Colour = brown-yellowish
LI-9	Reject Pulp	0	0.2	9V	378950	6359512	869	0.20	Overburden	0.025	Lithology = silt to angular gravel; Grain size = <1/16 mm to 4.5 cm; Layers = No; Colour = light-orange-tan
LJ-9	Original Pulp	0	0.21	9V	379116	6359296	865	0.21	Overburden	*0.0025*	Lithology = very fine grained sand to gravel; Grain size = 1/16 mm to 1/8 mm; Layers = No; Colour = light brown
LJ-9	Reject Pulp	0	0.21	9V	379116	6359296	865	0.21	Overburden	*0.0025*	Lithology = very fine grained sand to gravel; Grain size = 1/16 mm to 1/8 mm; Layers = No; Colour = light brown
LK-7	Reject Pulp	0	0.28	9V	379322	6359090	894	0.28	Overburden	0.008	Lithology = fine grained sand and soil; Grain size = 1/8 mm to 0.5 mm; Layers = No; Colour = dark brown, light brown

Project:	**Schaft Creek**	**Schaft Creek**
Client:	Copper Fox Metals Inc.	Copper Fox Metals Inc.
Data:	**Sample Information**	**ABA Data**
Comments:	Deeper overburden test pit samples were	Deeper overburden test pit samples were collected by MDAG personnel.
	Shallow overburden test pit samples were	Shallow overburden test pit samples were collected by Copper Fox personnel.
		pH of DI water used for paste pH read 6.0-6.1.
		Erratic S results found in some samples. Samples in question had been re-analyzed for S-IR08 and averages were reported.

Testpit Drillhole Id	Material Type	Sampling Notes	Paste pH	S (Total)	S (Sulphide)	S (Sulphide)	Carbonate Leach S (Sulphate)	HCl Leachable S (Sulphate)	S ($BaSO_4$)	S (del_{actual})	S (del)	TAP	SAP	PAP
			Unity	(% Leco)	(% Leco)	(% Calc)	(%)	(%)	(%)	(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)
Method			OA-ELE07	S-IR08	S-IR07	S-CAL06	S-GRA06	S-GRA06a	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated
MDL			0.1	0.01	0.01	0.01	0.01	0.01						
Vertical-Profile Overburden														
MLARD-TP08	Reject Pulp	Centre of pit on steep slope	5.6	0.02	*0.005*	0.015	*0.005*	*0.005*	0.008	0.002	0.002	0.6	0.2	0.2
MLARD-TP09	Reject Pulp	South side of pit area	5.5	0.01	0.03	0.005	*0.005*	*0.005*	0.010	-0.035	0.000	0.3	0.9	0.5
MLARD-TP11	Reject Pulp	South side of pit, near 08CF324	4.7	0.02	0.01	0.015	*0.005*	*0.005*	0.006	-0.001	0.000	0.6	0.3	0.2
Shallow Overburden														
LE-5	Reject Pulp		5.7	0.01	0.03	0	*0.005*	0.01	0.010	-0.040	0.000	0.3	0.9	0.3
LF-2	Reject Pulp		6	0.03	0.02	0.02	0.01	0.01	0.006	-0.006	0.000	0.9	0.6	0.2
LG-7	Reject Pulp		5.7	0.6	0.23	0.56	0.09	0.04	0.006	0.324	0.324	18.8	17.3	15.2
LG-9	Reject Pulp		5.3	0.15	0.04	0.145	*0.005*	*0.005*	0.006	0.099	0.099	4.7	4.3	3.9
LH-1	Reject Pulp		6	0.02	0.01	0.015	*0.005*	*0.005*	0.004	0.001	0.001	0.6	0.3	0.2
LI-1	Reject Pulp		4.8	0.03	0.01	0.02	*0.005*	0.01	0.006	0.004	0.004	0.9	0.4	0.2
LI-9	Reject Pulp	Sampled at 230 m due to bad swamp	4.9	0.13	0.15	0.125	*0.005*	*0.005*	0.006	-0.031	0.000	4.1	4.7	0.2
LJ-9	Original Pulp		4.7	0.02	0.01	0.01	0.01	0.01	0.006	-0.006	0.000	0.6	0.3	0.2
LJ-9	Reject Pulp		4.7	0.02	0.01	0.01	0.01	0.01	0.006	-0.006	0.000	0.6	0.3	0.2
LK-7	Reject Pulp		5.7	0.05	0.03	0.04	0.03	0.01	0.008	0.002	0.002	1.6	1.0	0.2
Maximum			6	0.6	0.23	0.56	0.09	0.04	0.01	0.32	0.32	18.8	17.3	15.2
Minimum			4.7	0.01	0.005	0	0.005	0.005	0.0042	-0.04	0	0.31	0.21	0.16
Mean			5.33	0.085	0.045	0.075	0.015	0.01	0.0071	0.023	0.033	2.67	2.44	1.63
Standard Deviation			0.51	0.16	0.067	0.15	0.024	0.0094	0.0018	0.096	0.091	5.03	4.71	4.19
10 Percentile			4.7	0.012	0.01	0.006	0.005	0.005	0.0063	-0.035	0	0.38	0.31	0.16
25 Percentile			4.8	0.02	0.01	0.01	0.005	0.005	0.0063	-0.0063	0	0.62	0.31	0.16
Median			5.5	0.02	0.02	0.015	0.005	0.01	0.0063	-0.0013	0	0.62	0.62	0.16
75 Percentile			5.7	0.05	0.03	0.04	0.01	0.01	0.0084	0.0016	0.0016	1.56	0.99	0.32
90 Percentile			5.94	0.15	0.13	0.14	0.026	0.01	0.01	0.08	0.08	4.56	4.62	3.19
Interquartile Range (IQR) [1]			0.9	0.03	0.02	0.03	0.005	0.005	0.0021	0.0079	0.0016	0.94	0.68	0.17
Variance			0.26	0.026	0.0045	0.023	0.00056	0.000087	0.0000033	0.0093	0.0084	25.3	22.2	17.6
Skewness			-0.16	3.16	2.32	3.1	3.15	3.16	0.87	2.95	3.15	3.16	3.04	3.28
Coefficient of Variation (CoV) [2]			0.095	1.89	1.49	2.03	1.62	0.94	0.26	4.14	2.76	1.89	1.93	2.57
Count			13	13	13	13	13	13	13	13	13	13	13	13
NPR < 1.0 or NPR = 1.0														
1.0 < NPR < 2.0														
NPR > 2.0 or NPR =2.0														
% NPR < 1.0 or NPR = 1.0 of														
% 1.0 < NPR < 2.0 of Total														
% NPR > 2.0 or NPR =2.0 of														

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Data in blue indicates a calculated parameter.

Project:	**Schaft Creek**	**Schaft Creek**
Client:	Copper Fox Metals Inc.	Copper Fox Metals Inc.
Data:	**Sample Information**	**ABA Data**
Comments:	Deeper overburden test pit samples were	Deeper overburden test pit samples were collected by MDAG personnel.
	Shallow overburden test pit samples were	Shallow overburden test pit samples were collected by Copper Fox personnel.
		pH of DI water used for paste pH read 6.0-6.1.
		Erratic S results found in some samples. Samples in question had been re-analyzed for S-IR08 and averages were reported.

Testpit Drillhole Id	Material Type	Sampling Notes	Paste pH	S (Total)	S (Sulphide)	S (Sulphide)	Carbonate Leach S (Sulphate)	HCl Leachable S (Sulphate)	S ($BaSO_4$)	S (del_{actual})	S (del)	TAP	SAP	PAP
			Unity	(% Leco)	(% Leco)	(% Calc)	(%)	(%)	(%)	(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)
Method			OA-ELE07	S-IR08	S-IR07	S-CAL06	S-GRA06	S-GRA06a	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated
MDL			0.1	0.01	0.01	0.01	0.01	0.01						

% S (Sulphide) $_{(calc)}$ = % S (Total) - % S (Sulphate) $_{\text{Carbonate Leach}}$

%S($BaSO_4$) = Ba (ppm) * 0.0001 * 32.06 / 137.37

% S (del $_{actual}$) = %S(Total) - %S(Sulphide) $_{\text{Leco}}$ - %S(Sulphate) $_{\text{Carbonate Leach}}$ - %S($BaSO_4$)

% S (del) = % S (del $_{actual}$) unless < 0, then 0

TAP = % S (Total) * 31.25

SAP = % S (Sulphide + del) * 31.25

PAP = % Pyrite(Calculated) * 31.25

Note: If Calculated Pyrite is < 0.005 then calculated pyrite assumed to be 0.005

Unavailable NP (UNP) = 10

Available NP = NP - Unavailable NP

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ABA Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Testpit Drillhole Id	Material Type	NP	Available NP	Total C	Inorganic C	Inorganic CO_2	Organic C	Total CaNP	Inorganic CaNP	(Ca) CaNP	(Ca+Mg) CaNP	TNNP	Adjusted TNNP	SNNP	Adjusted SNNP	PNNP	Adjusted PNNP
		(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(% Leco)	(%)	(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)
Method		OA-VOL08	Calculated	C-IR07	C-GAS05	C-GAS05	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated
MDL		1		0.01	0.05	0.2											
Vertical-Profile Overburden																	
MLARD-TP08	Reject Pulp	7	-3	1.38	*0.025*	*0.1*	1.355	115.0	2.3	52.9	148.5	6.4	-3.6	6.8	-3.2	6.8	-3.2
MLARD-TP09	Reject Pulp	3	-7	1.44	*0.025*	*0.1*	1.415	120.0	2.3	79.9	184.9	2.7	-7.3	2.1	-7.9	2.5	-7.5
MLARD-TP11	Reject Pulp	-1	-11	4.95	*0.025*	*0.1*	4.925	412.5	2.3	41.5	72.3	-1.6	-11.6	-1.3	-11.3	-1.2	-11.2
Shallow Overburden																	
LE-5	Reject Pulp	5	-5	1.19	*0.025*	*0.1*	1.165	99.2	2.3	38.5	117.1	4.7	-5.3	4.1	-5.9	4.7	-5.3
LF-2	Reject Pulp	5	-5	2.66	*0.025*	*0.1*	2.635	221.7	2.3	18.2	80.4	4.1	-5.9	4.4	-5.6	4.8	-5.2
LG-7	Reject Pulp	6	-4	17.95	*0.025*	*0.1*	17.925	1495.9	2.3	48.4	64.9	-12.8	-22.8	-11.3	-21.3	-9.2	-19.2
LG-9	Reject Pulp	1	-9	21.7	*0.025*	*0.1*	21.675	1808.5	2.3	56.4	79.9	-3.7	-13.7	-3.3	-13.3	-2.9	-12.9
LH-1	Reject Pulp	7	-3	2.84	*0.025*	*0.1*	2.815	236.7	2.3	55.7	114.2	6.4	-3.6	6.7	-3.3	6.8	-3.2
LI-1	Reject Pulp	1	-9	4.63	*0.025*	*0.1*	4.605	385.9	2.3	47.2	92.1	0.1	-9.9	0.6	-9.4	0.8	-9.2
LI-9	Reject Pulp	2	-8	5.21	*0.025*	*0.1*	5.185	434.2	2.3	40.2	129.5	-2.1	-12.1	-2.7	-12.7	1.8	-8.2
LJ-9	Original Pulp	-1	-11	4.33	*0.025*	*0.1*	4.305	360.9	2.3	60.2	119.5	-1.6	-11.6	-1.3	-11.3	-1.2	-11.2
LJ-9	Reject Pulp	-1	-11	4.33	*0.025*	*0.1*	4.305	360.9	2.3	60.2	119.5	-1.6	-11.6	-1.3	-11.3	-1.2	-11.2
LK-7	Reject Pulp	10	0	19.65	*0.025*	*0.1*	19.625	1637.6	2.3	59.4	79.2	8.4	-1.6	9.0	-1.0	9.8	-0.2
Maximum		10	0	21.7	0.025	0.1	21.7	1808	2.27	79.9	185	8.44	-1.56	9.01	-0.99	9.84	-0.16
Minimum		-1	-11	1.19	0.025	0.1	1.16	99.2	2.27	18.2	64.9	-12.8	-22.8	-11.3	-21.3	-9.17	-19.2
Mean		3.38	-6.62	7.1	0.025	0.1	7.07	591	2.27	50.7	108	0.72	-9.28	0.94	-9.06	1.75	-8.25
Standard Deviation		3.57	3.57	7.39	0	0	7.39	616	0	14.7	34.4	5.63	5.63	5.41	5.41	5.02	5.02
10 Percentile		-1	-11	1.39	0.025	0.1	1.37	116	2.27	38.8	73.7	-3.36	-13.4	-3.21	-13.2	-2.53	-12.5
25 Percentile		1	-9	2.66	0.025	0.1	2.64	222	2.27	41.5	79.9	-1.62	-11.6	-1.31	-11.3	-1.16	-11.2
Median		3	-7	4.33	0.025	0.1	4.3	361	2.27	52.9	114	0.062	-9.94	0.57	-9.43	1.84	-8.16
75 Percentile		6	-4	5.21	0.025	0.1	5.18	434	2.27	59.4	119	4.69	-5.31	4.38	-5.62	4.84	-5.16
90 Percentile		7	-3	19.3	0.025	0.1	19.3	1609	2.27	60.2	145	6.38	-3.62	6.77	-3.23	6.84	-3.16
Interquartile Range (IQR)[1]		5	5	2.55	0	0	2.55	213	0	18	39.6	6.31	6.31	5.69	5.69	6	6
Variance		12.8	12.8	54.6	0	0	54.6	379431	0	216	1180	31.7	31.7	29.3	29.3	25.2	25.2
Skewness		0.28	0.28	1.36	NA	NA	1.36	1.36	NA	-0.32	0.84	-0.92	-0.92	-0.63	-0.63	-0.49	-0.49
Coefficient of Variation (CoV)		1.06	-0.54	1.04	0	0	1.05	1.04	0	0.29	0.32	7.85	-0.61	5.73	-0.6	2.87	-0.61
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
NPR < 1.0 or NPR = 1.0																	
1.0 < NPR < 2.0																	
NPR > 2.0 or NPR =2.0																	
% NPR < 1.0 or NPR = 1.0 of																	
% 1.0 < NPR < 2.0 of Total																	
% NPR > 2.0 or NPR =2.0 of																	

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Data in blue indicates a calculated parameter.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ABA Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Testpit Drillhole Id	Material Type	NP	Available NP	Total C	Inorganic C	Inorganic CO_2	Organic C	Total CaNP	Inorganic CaNP	(Ca) CaNP	(Ca+Mg) CaNP	TNNP	Adjusted TNNP	SNNP	Adjusted SNNP	PNNP	Adjusted PNNP
		(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(% Leco)	(%)	(%)	(%)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)	(kg $CaCO_3$/t)
Method		OA-VOL08	Calculated	C-IR07	C-GAS05	C-GAS05	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated
MDL		1		0.01	0.05	0.2											

Total CaNP = % C * 10 * 100.09 / 12.01
Inorganic CaNP = % CO_2 * 10 * 100.09 / 44.01
(Ca) CaNP = (Ca(ppm) * 100.09 / 40.08) / 1000
(Ca+Mg) CaNP = ((Ca(ppm) * 100.09 / 40.08) + (Mg(ppm) * 100.09 / 24.31)) / 1000
TNNP = NP - TAP
Adjusted TNNP = Available NP - TAP
SNNP = NP - SAP
Adjusted SNNP = Available NP - SAP
PNNP = NP - PAP
Adjusted PNNP = Available NP - PAP

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ABA Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Testpit Drillhole Id	Material Type	TNPR	Adjusted TNPR	SNPR	Adjusted SNPR	PNPR	Adjusted PNPR	Fizz Rating	Comparison of Fizz Rating & NP
								Unity	
Method		Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	OA-VOL08	Calculated
MDL									
Vertical-Profile Overburden									
MLARD-TP08	Reject Pulp	11.2	0.001	200	200	200	200	1	Agree
MLARD-TP09	Reject Pulp	9.6	0.001	3.2	0.001	6.65	0.001	1	Agree
MLARD-TP11	Reject Pulp	0.001	0.001	0.001	0.001	200	200	1	Agree
Shallow Overburden									
LE-5	Reject Pulp	16	0.001	5.33	0.001	15.4	0.001	1	Agree
LF-2	Reject Pulp	5.33	0.001	8	0.001	200	200	1	Agree
LG-7	Reject Pulp	0.32	0.001	0.347	0.001	0.396	0.001	1	Agree
LG-9	Reject Pulp	0.213	0.001	0.231	0.001	0.258	0.001	1	Agree
LH-1	Reject Pulp	11.2	0.001	20.7	0.001	200	200	1	Agree
LI-1	Reject Pulp	1.07	0.001	2.33	0.001	200	200	1	Agree
LI-9	Reject Pulp	0.492	0.001	0.427	0.001	200	200	1	Agree
LJ-9	Original Pulp	0.001	0.001	0.001	0.001	200	200	1	Agree
LJ-9	Reject Pulp	0.001	0.001	0.001	0.001	200	200	1	Agree
LK-7	Reject Pulp	6.4	0.001	10.1	0.001	200	200	1	Agree
Maximum		16	0.001	200	200	200	200		
Minimum		0.001	0.001	0.001	0.001	0.26	0.001		
Mean		4.76	0.001	19.3	15.4	140	138		
Standard Deviation		5.6	4.5E-19	54.6	55.5	93.4	96.1		
10 Percentile		0.001	0.001	0.001	0.001	1.65	0.001		
25 Percentile		0.21	0.001	0.23	0.001	15.4	0.001		
Median		1.07	0.001	2.33	0.001	200	200		
75 Percentile		9.6	0.001	8	0.001	200	200		
90 Percentile		11.2	0.001	18.6	0.001	200	200		
Interquartile Range (IQR) [1]		9.39	0	7.77	0	185	200		
Variance		31.3	NA	2984	3077	8727	9231		
Skewness		0.81	-1.14	3.53	3.61	-0.95	-0.95		
Coefficient of Variation (CoV) [2]		1.18	4.5E-16	2.83	3.61	0.67	0.69		
Count		13	13	13	13	13	13		
NPR < 1.0 or NPR = 1.0		6	13	6	12	2	4		
1.0 < NPR < 2.0		1	0	0	0	0	0		
NPR > 2.0 or NPR =2.0		6	0	7	1	11	9		
% NPR < 1.0 or NPR = 1.0 of		46.15	100.00	46.15	92.31	15.38	30.77		
% 1.0 < NPR < 2.0 of Total		7.69	0.00	0.00	0.00	0.00	0.00		
% NPR > 2.0 or NPR =2.0 of		46.15	0.00	53.85	7.69	84.62	69.23		

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Data in blue indicates a calculated parameter.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ABA Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Testpit Drillhole Id	Material Type	TNPR	Adjusted TNPR	SNPR	Adjusted SNPR	PNPR	Adjusted PNPR	Fizz Rating	Comparison of Fizz Rating & NP
								Unity	
Method		Calculated	Calculated	Calculated	Calculated	Calculated	Calculated	OA-VOL08	Calculated
MDL									

TNPR = NP / TAP
Note: If % S(Total) < 0.01 then TNPR = 200
Note: If % S(Total) > 0.01 and NP < = 0 then TNPR = 0.001
Adjusted TNPR = UNP / TAP
Note: If % S(Total) < 0.01 then Adjusted TNPR = 200
Note: If % S(Total) > 0.01 and Available NP < = 0 then Adjusted TNPR = 0.001
SNPR = NP / SAP
Note: If % S(Sulphide + del) < 0.01 then SNPR = 200
'Note: If % S(Sulphide + del) > 0.01 and NP < = 0 then SNPR = 0.001
Adjusted SNPR = UNP / SAP
Note: If % S(Sulphide + del) < 0.01 then Adjusted SNPR = 200
Note: If % S(Sulphide + del) > 0.01 and Available NP < = 0 then Adjusted SNPR = 0.001
PNPR = NP / PAP
Note: If % S(Pyrite, Calc) < 0.01 then PNPR = 200
Note: If % S(Pyrite, Calc) > 0.01 and NP < = 0 then PNPR = 0.001
Adjusted PNPR = UNP / TAP
Note: If % S(Pyrite, Calc) < 0.005 then Adjusted PNPR = 200
Note: If % S(Pyrite, Calc) > 0.005 and Available NP < = 0 then Adjusted PNPR = 0.001

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ICP Metals Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.
Rare earth elements may not be totally soluble in MS61 method.

Testpit	Material	Silver	Aluminum	Arsenic	Barium	Beryllium	Bismuth	Calcium	Cadmium	Cerium	Cobalt	Chromium	Cesium	Copper	Iron	Gallium	Germanium
Drillhole Id	Type	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Method		ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61
MDL		0.01	100	0.2	10	0.05	0.01	100	0.02	0.01	0.1	1	0.05	0.2	100	0.05	0.05
Crustal Abundance: From		0.037	4200	1	0.4	1	0.007	5100	0.035	11.5	0.1	2	0.4	4	3800	4	0.2
Crustal Abundance: To		0.11	88000	13	2300	3	0.01	312400	0.42	345	74	170	6	250	86500	30	8
Vertical-Profile Overburden																	
MLARD-TP08	Reject Pulp	0.68	83900	6.6	380	1.14	0.71	21200	0.09	25.2	18.1	167	2.02	572	48600	20.2	0.14
MLARD-TP09	Reject Pulp	0.17	84800	16.9	450	0.97	0.13	32000	0.35	21.6	23.4	140	1.71	75.4	68500	19.8	0.15
MLARD-TP11	Reject Pulp	0.66	83200	4.5	260	4.45	0.1	16600	0.22	94.1	7.7	61	1.61	29.8	45100	34.8	0.21
Shallow Overburden																	
LE-5	Reject Pulp	0.35	85400	11.8	450	1.33	2.17	15400	0.38	25	18.3	76	3.1	93.3	61500	22.1	0.15
LF-2	Reject Pulp	0.6	77600	7.1	330	1.43	0.62	7300	0.08	24.7	14.4	53	3.86	655	48400	22.7	0.11
LG-7	Reject Pulp	0.07	58600	4	260	4.14	0.11	19400	0.39	79.8	4.2	50	1.3	388	21400	25.4	0.19
LG-9	Reject Pulp	0.07	49500	2.7	280	3.72	0.05	22600	0.18	74.8	6.9	54	0.93	88.4	27000	17.55	0.18
LH-1	Reject Pulp	0.08	86600	4.4	240	2.06	0.09	22300	0.12	42.3	12.9	45	3.12	28.9	53100	26.9	0.15
LI-1	Reject Pulp	0.16	76700	3.3	290	4.45	0.08	18900	0.27	88.2	15.5	69	1.69	43	46100	29.8	0.2
LI-9	Reject Pulp	0.93	68900	6.3	320	1.93	0.35	16100	0.14	41.7	24.6	183	1.62	1980	70500	23.6	0.15
LJ-9	Original Pulp	0.45	71500	6.4	320	3.58	0.09	24100	0.24	60.9	11.3	180	1.46	18.3	48800	28.1	0.11
LJ-9	Reject Pulp	0.45	71500	6.4	320	3.58	0.09	24100	0.24	60.9	11.3	180	1.46	18.3	48800	28.1	0.11
LK-7	Reject Pulp	0.81	48600	3.8	360	4.06	0.05	23800	0.2	72.2	8.7	47	1.28	489	28700	20.8	0.11
Maximum		0.93	86600	16.9	450	4.45	2.17	32000	0.39	94.1	24.6	183	3.86	1980	70500	34.8	0.21
Minimum		0.07	48600	2.7	240	0.97	0.05	7300	0.08	21.6	4.2	45	0.93	18.3	21400	17.6	0.11
Mean		0.42	72831	6.48	328	2.83	0.36	20292	0.22	54.7	13.6	100	1.94	345	47423	24.6	0.15
Standard Deviation		0.3	13265	3.91	67.3	1.36	0.59	5882	0.1	26.1	6.24	58.8	0.87	544	14903	4.82	0.035
10 Percentile		0.072	51320	3.4	260	1.18	0.056	15540	0.096	24.8	7.06	47.6	1.28	20.4	27340	19.9	0.11
25 Percentile		0.16	68900	4	280	1.43	0.09	16600	0.14	25.2	8.7	53	1.46	29.8	45100	20.8	0.11
Median		0.45	76700	6.3	320	3.58	0.1	21200	0.22	60.9	12.9	69	1.62	88.4	48600	23.6	0.15
75 Percentile		0.66	83900	6.6	360	4.06	0.35	23800	0.27	74.8	18.1	167	2.02	489	53100	28.1	0.18
90 Percentile		0.78	85280	10.9	436	4.39	0.69	24100	0.37	86.5	22.4	180	3.12	638	67100	29.5	0.2
Interquartile Range (IQR)[1]		0.5	15000	2.6	80	2.63	0.26	7200	0.13	49.6	9.4	114	0.56	459	8000	7.3	0.07
Variance		0.089	175963974	15.3	4536	1.86	0.34	34602436	0.011	680	38.9	3458	0.76	295771	222108590	23.2	0.0013
Skewness		0.24	-0.88	1.89	0.77	-0.18	2.84	-0.32	0.32	0.048	0.38	0.57	1.27	2.58	-0.24	0.59	0.31
Coefficient of Variation (CoV)[2]		0.71	0.18	0.6	0.21	0.48	1.65	0.29	0.47	0.48	0.46	0.59	0.45	1.58	0.31	0.2	0.24
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

0.93 NOTE: if data is boxed, then data is 3 times the maximum crustal abundance.

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile
[2] Coefficient of Variation (CoV) = standard deviation divided by mean
NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ICP Metals Data**
Comments: Deeper overburden test pit samples were collected by MDAG personne Shallow overburden test pit samples were collected by Copper Fox personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.
Rare earth elements may not be totally soluble in MS61 method.
Hg-CV41:Detection limits on samples requiring dilutions due to interferences or high concentration levels have been increased according to the dilution factor.
ME-MS61:Interference: Mo>400ppm on ICP-MS Cd ICP-AES results shown.

Testpit	Material	Hafnium	Mercury	Indium	Potassium	Lanthanum	Lithium	Magnesium	Manganese	Molybdenum	Sodium	Niobium	Nickel	Phosphorus	Lead	Rubidium	Rhenium
Drillhole Id	Type	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Re
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Method		ME-MS61	Hg-CV41	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61
MDL		0.1	0.01	0.005	100	0.5	0.2	100	5	0.05	100	0.1	0.2	10	0.5	0.1	0.002
Crustal Abundance: From		0.3	0.03	0.01	40	10	5	1600	390	0.2	400	0.3	2	170	1	0.2	NA
Crustal Abundance: To		11	0.4	0.26	48000	115	66	47000	6700	27	40400	35	225	1500	80	170	NA
Vertical-Profile Overburden																	
MLARD-TP08	Reject Pulp	2.2	0.02	0.051	13000	12.4	13.5	23200	657	20.2	29500	11	60.7	680	7.8	54.4	0.002
MLARD-TP09	Reject Pulp	1.9	0.01	0.07	12600	10.2	16.6	25500	960	3.6	28400	7.7	46.1	820	7.6	44.3	*0.001*
MLARD-TP11	Reject Pulp	15.8	0.03	0.107	29000	49.7	18.4	7500	906	6.95	40200	95.8	16.1	1000	10.2	77.5	*0.001*
Shallow Overburden																	
LE-5	Reject Pulp	3.1	0.01	0.101	13800	11.9	16.7	19100	988	6.75	24200	15	25.7	1260	20	57.6	*0.001*
LF-2	Reject Pulp	3.3	0.02	0.062	14700	12	13.8	15100	661	33.4	21400	18.7	16.3	950	5.5	63.2	0.003
LG-7	Reject Pulp	12.8	0.06	0.081	19700	40.1	17.3	4000	424	$\boxed{338}$	26700	68.6	42	770	9.4	66.3	0.323
LG-9	Reject Pulp	8.9	0.08	0.064	14000	38.6	13.2	5700	704	22.1	19600	48.5	27.2	1010	5.9	44.5	0.007
LH-1	Reject Pulp	5.4	0.01	0.073	14400	19.6	17.6	14200	650	4.06	37700	36.1	21.5	970	5.9	55.2	*0.001*
LI-1	Reject Pulp	12.5	0.03	0.104	25500	44.7	23.2	10900	930	5.88	35800	77.1	20.6	870	9.5	81.1	*0.001*
LI-9	Reject Pulp	5.5	0.04	0.128	14400	20.6	15.3	21700	1150	4.74	23900	35.8	46.4	990	8.6	51	*0.001*
LJ-9	Original Pulp	9.9	0.02	0.079	21600	31.6	16.1	14400	701	4.76	32600	63.8	38.1	540	10	68.3	0.002
LJ-9	Reject Pulp	9.9	0.02	0.079	21600	31.6	16.1	14400	701	4.76	32600	63.8	38.1	540	10	68.3	0.002
LK-7	Reject Pulp	9.8	0.12	0.072	15400	39.6	12.3	4800	1030	10.5	21000	61.2	71.1	1490	6.1	46.7	0.01
Maximum		15.8	0.12	0.13	29000	49.7	23.2	25500	1150	338	40200	95.8	71.1	1490	20	81.1	0.32
Minimum		1.9	0.01	0.051	12600	10.2	12.3	4000	424	3.6	19600	7.7	16.1	540	5.5	44.3	0.001
Mean		7.77	0.036	0.082	17669	27.9	16.2	13885	805	35.8	28738	46.4	36.1	915	8.96	59.9	0.027
Standard Deviation		4.52	0.033	0.022	5292	14.1	2.82	7124	203	91.2	6692	28	17.1	265	3.74	12.1	0.089
10 Percentile		2.38	0.01	0.062	13160	11.9	13.3	4980	651	4.2	21080	11.8	17.2	568	5.9	44.9	0.001
25 Percentile		3.3	0.02	0.07	14000	12.4	13.8	7500	661	4.76	23900	18.7	21.5	770	6.1	51	0.001
Median		8.9	0.02	0.079	14700	31.6	16.1	14400	704	6.75	28400	48.5	38.1	950	8.6	57.6	0.002
75 Percentile		9.9	0.04	0.1	21600	39.6	17.3	19100	960	20.2	32600	63.8	46.1	1000	10	68.3	0.003
90 Percentile		12.7	0.076	0.11	24720	43.8	18.2	22900	1022	31.1	37320	75.4	57.8	1210	10.2	75.7	0.0094
Interquartile Range (IQR) [1]		6.6	0.02	0.031	7600	27.2	3.5	11600	299	15.4	8700	45.1	24.6	230	3.9	17.3	0.002
Variance		20.4	0.0011	0.00047	28000641	197	7.96	50748077	41387	8326	44789231	786	293	70360	14	145	0.0079
Skewness		0.2	1.76	0.75	1.08	0.055	1.09	0.12	-0.034	3.54	0.28	0.079	0.69	0.59	2.29	0.33	3.6
Coefficient of Variation (CoV) [2]		0.58	0.9	0.26	0.3	0.5	0.17	0.51	0.25	2.55	0.23	0.6	0.47	0.29	0.42	0.2	3.26
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

0.93 NOTE: if data is boxed, then data is 3 times the maximum crustal abundance.

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **ICP Metals Data**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.
Rare earth elements may not be totally soluble in MS61 method.

Testpit	Material	Sulphur	Antimony	Scandium	Selenium	Tin	Strontium	Tantalum	Tellurium	Thorium	Titanium	Thallium	Uranium	Vanadium	Tungsten	Yttrium	Zinc	Zirconium
Drillhole Id	Type	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Method		ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61	ME-MS61
MDL		100	0.05	1	1	0.2	0.2	0.05	0.05	0.2	50	0.02	0.1	1	0.1	0.1	2	0.5
Crustal Abundance: From		240	0.1	NA	0.05	0.5	1	0.8	NA	0.004	300	0.16	0.45	20	0.6	20	16	19
Crustal Abundance: To		2400	1.5	NA	0.6	6	2000	4.2	NA	17	13800	2.3	3.7	250	2.2	90	165	500
Vertical-Profile Overburden																		
MLARD-TP08	Reject Pulp	100	1.32	16.3	1	1.2	336	0.73	0.15	2.5	4420	0.17	1.1	173	3.1	12.8	78	80
MLARD-TP09	Reject Pulp	400	1.73	21.5	1	1.1	405	0.45	0.07	1.7	5420	0.15	1	242	1.3	14.7	86	59.4
MLARD-TP11	Reject Pulp	200	0.61	7.7	2	6.9	158	5.94	0.05	9.8	3910	0.24	3.4	75	2	38.2	103	**500**
Shallow Overburden																		
LE-5	Reject Pulp	300	3.5	17.3	2	1.7	281	0.97	1.4	2.6	4940	0.27	1.4	190	2.4	12.7	150	105
LF-2	Reject Pulp	200	3.53	12.2	2	2	138.5	1.14	0.13	2.8	4580	0.25	1.5	148	3.1	10.3	63	117.5
LG-7	Reject Pulp	7600	0.94	7.8	7	4.9	159.5	5.05	*0.025*	9.7	2190	0.22	3.7	23	1.7	36.4	79	**500**
LG-9	Reject Pulp	2400	0.62	7.9	3	3.3	151	3.17	*0.025*	7.2	2070	0.16	3	44	1	33.5	52	374
LH-1	Reject Pulp	200	1.43	13	2	2.9	317	2.48	*0.025*	3.6	5950	0.2	1.4	133	1.8	19.9	72	195
LI-1	Reject Pulp	200	0.49	11.1	2	5.6	172.5	5.25	*0.025*	9.2	3740	0.18	3.2	84	1.6	36.3	95	489
LI-9	Reject Pulp	1800	2.56	16.9	3	3.1	174	2.44	0.26	4.5	4530	0.13	2.1	151	2.7	16.9	109	197
LJ-9	Original Pulp	400	0.9	14.2	2	4.6	237	3.88	*0.025*	6.5	4290	0.2	2.4	121	2.2	26.7	90	393
LJ-9	Reject Pulp	400	0.9	14.2	2	4.6	237	3.88	*0.025*	6.5	4290	0.2	2.4	121	2.2	26.7	90	393
LK-7	Reject Pulp	1100	0.64	11.4	4	3.9	122.5	3.32	*0.025*	7.3	1980	0.18	2.8	34	1.4	40.6	57	414
Maximum		7600	3.53	21.5	7	6.9	405	5.94	1.4	9.8	5950	0.27	3.7	242	3.1	40.6	150	500
Minimum		100	0.49	7.7	1	1.1	122	0.45	0.025	1.7	1980	0.13	1	23	1	10.3	52	59.4
Mean		1177	1.47	13.2	2.54	3.52	222	2.98	0.17	5.68	4024	0.2	2.26	118	2.04	25.1	86.5	294
Standard Deviation		2056	1.07	4.16	1.56	1.77	88.6	1.81	0.38	2.9	1252	0.041	0.92	64.8	0.66	11.1	25.6	171
10 Percentile		200	0.61	7.82	1.2	1.3	141	0.78	0.025	2.52	2094	0.15	1.16	36	1.32	12.7	58.2	85
25 Percentile		200	0.64	11.1	2	2	158	1.14	0.025	2.8	3740	0.17	1.4	75	1.6	14.7	72	118
Median		400	0.94	13	2	3.3	174	3.17	0.025	6.5	4290	0.2	2.4	121	2	26.7	86	374
75 Percentile		1100	1.73	16.3	3	4.6	281	3.88	0.13	7.3	4580	0.22	3	151	2.4	36.3	95	414
90 Percentile		2280	3.31	17.2	3.8	5.46	332	5.21	0.24	9.6	5324	0.25	3.36	187	3.02	37.8	108	498
Interquartile Range (IQR)[1]		900	1.09	5.2	1	2.6	123	2.74	0.11	4.5	840	0.05	1.6	76	0.8	21.6	23	296
Variance		4225256	1.14	17.3	2.44	3.13	7843	3.28	0.14	8.44	1567842	0.0017	0.85	4198	0.44	122	655	29184
Skewness		2.95	1.21	0.33	2.17	0.28	0.84	0.1	3.39	0.11	-0.56	0.28	0.069	0.17	0.28	0.058	1.11	-0.15
Coefficient of Variation (CoV)[2]		1.75	0.72	0.31	0.61	0.5	0.4	0.61	2.19	0.51	0.31	0.21	0.41	0.55	0.33	0.44	0.3	0.58
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

0.93 NOTE: if data is boxed, then data is 3 times the maximum crustal abundance.

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Whole Rock by XRF**
Comments: Deeper overburden test pit samples were collected by MDAG personnel.
Shallow overburden test pit samples were collected by Copper Fox personnel.

Testpit Drillhole Id	Material Type	Al_2O_3	BaO	CaO	Cr_2O_3	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	SrO	TiO_2	LOI	Total
		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Method		ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06	ME-XRF06
MDL		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Vertical-Profile Overburden																
MLARD-TP08	Reject Pulp	15.76	0.04	2.99	0.03	7.3	1.57	3.73	0.09	3.91	0.15	57.13	0.04	0.85	6.14	99.73
MLARD-TP09	Reject Pulp	15.73	0.05	4.49	0.02	10.04	1.51	4.1	0.13	3.56	0.179	52.5	0.04	0.96	6.39	99.70
MLARD-TP11	Reject Pulp	15.07	0.03	2.18	0.01	6.45	3.43	1.15	0.12	5.07	0.209	53.5	0.02	0.65	11.95	99.84
Shallow Overburden																
LE-5	Reject Pulp	17.21	0.05	2.23	0.01	8.84	1.7	3.31	0.13	3.11	0.268	55	0.03	0.89	7.2	99.98
LF-2	Reject Pulp	16.94	0.03	1.14	0.01	7.08	1.85	2.72	0.09	2.92	0.209	56.1	0.02	0.86	9.76	99.73
LG-7	Reject Pulp	11.57	0.03	2.75	0.01	3.09	2.58	0.75	0.06	3.55	0.168	36	0.02	0.39	39	99.97
LG-9	Reject Pulp	9.31	0.03	3.11	0.01	3.77	1.73	1.02	0.09	2.53	0.214	28.99	0.02	0.37	48.3	99.49
LH-1	Reject Pulp	17.17	0.02	3.1	0.01	7.5	1.75	2.51	0.08	4.83	0.206	52.96	0.04	1.05	8.61	99.84
LI-1	Reject Pulp	15.54	0.03	2.73	0.01	6.85	3.23	2.04	0.13	4.8	0.193	52.09	0.02	0.68	11.55	99.89
LI-9	Reject Pulp	13.33	0.03	2.3	0.03	10.27	1.75	3.86	0.15	3.02	0.211	51	0.02	0.81	13.2	99.98
LJ-9	Original Pulp	14.4	0.03	3.42	0.03	7.1	2.67	2.6	0.1	4.35	0.126	53.42	0.02	0.78	10.4	99.45
LJ-9	Reject Pulp	14.4	0.03	3.42	0.03	7.1	2.67	2.6	0.1	4.35	0.126	53.42	0.02	0.78	10.4	99.45
LK-7	Reject Pulp	10.17	0.04	3.48	0.01	4.31	1.96	0.92	0.15	2.87	0.336	30.71	0.02	0.37	44.3	99.65
Maximum		17.2	0.05	4.49	0.03	10.3	3.43	4.1	0.15	5.07	0.34	57.1	0.04	1.05	48.3	
Minimum		9.31	0.02	1.14	0.01	3.09	1.51	0.75	0.06	2.53	0.13	29	0.02	0.37	6.14	
Mean		14.4	0.034	2.87	0.017	6.9	2.18	2.41	0.11	3.76	0.2	48.7	0.025	0.73	17.5	
Standard Deviation		2.59	0.0087	0.81	0.0095	2.18	0.65	1.17	0.028	0.85	0.057	9.81	0.0088	0.22	15.3	
10 Percentile		10.5	0.03	2.19	0.01	3.88	1.6	0.94	0.082	2.88	0.13	31.8	0.02	0.37	6.55	
25 Percentile		13.3	0.03	2.3	0.01	6.45	1.73	1.15	0.09	3.02	0.17	51	0.02	0.65	8.61	
Median		15.1	0.03	2.99	0.01	7.1	1.85	2.6	0.1	3.56	0.21	53	0.02	0.78	10.4	
75 Percentile		15.8	0.04	3.42	0.03	7.5	2.67	3.31	0.13	4.35	0.21	53.5	0.03	0.86	13.2	
90 Percentile		17.1	0.048	3.47	0.03	9.8	3.12	3.83	0.15	4.82	0.26	55.9	0.04	0.95	43.2	
Interquartile Range (IQR) [1]		2.43	0.01	1.12	0.02	1.05	0.94	2.16	0.04	1.33	0.043	2.5	0.01	0.21	4.59	
Variance		6.69	0.000076	0.66	0.00009	4.74	0.42	1.36	0.00077	0.73	0.0032	96.3	0.000077	0.051	234	
Skewness		-0.88	0.87	-0.21	0.73	-0.25	0.86	-0.099	-0.016	0.19	1.03	-1.43	1.18	-0.63	1.44	
Coefficient of Variation (CoV) [2]		0.18	0.26	0.28	0.56	0.32	0.3	0.48	0.25	0.23	0.28	0.2	0.35	0.31	0.88	
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Data in blue indicates a calculated parameter.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Shake Flask Analysis**
Comments: This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed.
Particulates were observed after the extracts have been filtered.
Some of the metals detection limits were increased due to high levels of metals in these samples.
Seven of the raw cuts are being analyzed for Total Organic Carbon.

Testpit Drillhole Id	Material Type	Moisture	Acidity ($CaCO_3$ mg/L)	Total Alkalinity ($CaCO_3$ mg/L)	Br Bromide (mg/L)	Cl Chloride (mg/L)	Conductivity (uS/cm)	F Fluoride (mg/L)	N (NO_3) Nitrate (mg/L as N)	N (NO_2) Nitrite (mg/L as N)	pH (pH units)	Sulphate (SO_4 mg/L)	Dissolved Organic Carbon (mg/L)
Vertical-Profile Overburden													
MLARD-TP08	Reject Pulp	1.40	6.9	70.0	*0.5*	*5*	218	*0.2*	0.17	0.027	6.81	*5*	
MLARD-TP09	Reject Pulp	1.28	16.0	45.9	*0.5*	*5*	208	*0.2*	0.20	*0.01*	6.38	*5*	199
MLARD-TP11	Reject Pulp	2.44	104	37.9	*1.25*	*12.5*	297	*0.5*	*0.125*	*0.025*	5.26	*12.5*	
Shallow Overburden													
LE-5	Reject Pulp	1.71	9.1	33.5	*0.5*	*5*	125	*0.2*	0.29	*0.01*	6.16	*5*	104
LF-2	Reject Pulp	1.96	7.6	66.7	*0.5*	*5*	194	*0.2*	0.22	*0.01*	6.36	*5*	161
LG-7	Reject Pulp	6.16	14.1	87.7	*0.5*	*5*	993	*0.2*	*0.05*	*0.01*	6.09	395	
LG-9	Reject Pulp	8.05	29.7	56.3	*0.5*	*5*	659	*0.2*	*0.05*	*0.01*	5.58	209	
LH-1	Reject Pulp	1.67	6.2	138	*0.5*	*5*	329	*0.2*	*0.05*	*0.01*	6.70	*5*	
LI-1	Reject Pulp	2.40	101	47.3	*1.25*	*12.5*	332	*0.5*	0.40	*0.025*	5.94	*12.5*	561
LI-9	Reject Pulp	2.20	40.8	52.1	*0.5*	*5*	319	*0.2*	0.32	*0.01*	5.79	14	450
LJ-9	Original Pulp	1.47	106	32.6	*1.25*	*12.5*	249	*0.5*	0.39	*0.025*	5.35	*12.5*	494
LJ-9	Reject Pulp	1.93	99.1	35.7	*1.25*	*12.5*	265	*0.5*	*0.125*	*0.025*	5.39	*12.5*	527
LK-7	Reject Pulp	9.13	19.4	118	*1.25*	*12.5*	364	*0.5*	*0.125*	*0.025*	6.02	*12.5*	
Maximum		9.13	106	138	1.25	12.5	993	0.5	0.4	0.027	6.81	395	561
Minimum		1.28	6.2	32.6	0.5	5	125	0.2	0.05	0.01	5.26	5	104
Mean		3.22	43.1	63.2	0.79	7.88	350	0.32	0.19	0.017	5.99	54.3	357
Standard Deviation		2.7	42.4	33.2	0.38	3.8	232	0.15	0.12	0.008	0.5	116	194
10 Percentile		1.41	7.04	33.9	0.5	5	197	0.2	0.05	0.01	5.36	5	138
25 Percentile		1.67	9.1	37.9	0.5	5	218	0.2	0.12	0.01	5.58	5	180
Median		1.96	19.4	52.1	0.5	5	297	0.2	0.17	0.01	6.02	12.5	450
75 Percentile		2.44	99.1	70	1.25	12.5	332	0.5	0.29	0.025	6.36	12.5	510
90 Percentile		7.67	103	112	1.25	12.5	600	0.5	0.38	0.025	6.64	170	541
Interquartile Range (IQR) [1]		0.77	90	32.1	0.75	7.5	114	0.3	0.16	0.015	0.78	7.5	330
Variance		7.27	1797	1100	0.14	14.4	53636	0.023	0.015	0.000064	0.25	13543	37554
Skewness		1.57	0.78	1.34	0.54	0.54	2.16	0.54	0.49	0.19	0.085	2.64	-0.34
Coefficient of Variation (CoV) [2]		0.84	0.98	0.52	0.48	0.48	0.66	0.48	0.64	0.47	0.084	2.14	0.54
Count		13	13	13	13	13	13	13	13	13	13	13	7

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Shake Flask Analysis**
Comments: This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed.
Particulates were observed after the extracts have been filtered.
Some of the metals detection limits were increased due to high levels of metals in these samples.

Leachable Metals

Testpit Drillhole Id	Material Type	Dissolved Aluminum Al (mg/L)	Dissolved Antimony Sb (mg/L)	Dissolved Arsenic As (mg/L)	Dissolved Barium Ba (mg/L)	Dissolved Beryllium Be (mg/L)	Dissolved Bismuth Bi (mg/L)	Dissolved Boron B (mg/L)	Dissolved Cadmium Cd (mg/L)	Dissolved Calcium Ca (mg/L)	Dissolved Chromium Cr (mg/L)	Dissolved Cobalt Co (mg/L)	Dissolved Copper Cu (mg/L)	Dissolved Iron Fe (mg/L)	Dissolved Lead Pb (mg/L)	Dissolved Lithium Li (mg/L)	Dissolved Magnesium Mg (mg/L)	Dissolved Manganese Mn (mg/L)
Vertical-Profile Overburden																		
MLARD-TP08	Reject Pulp	13.6	0.00089	0.0067	0.142	0.00062	0.00105	0.059	0.00121	6.18	0.0558	0.0138	0.680	16.8	0.00633	0.0087	21.5	0.429
MLARD-TP09	Reject Pulp	13.1	0.00066	0.0134	0.0894	*0.00025*	*0.00025*	0.059	0.000405	7.49	0.0393	0.0152	0.123	18.1	0.00564	0.0084	19.3	0.551
MLARD-TP11	Reject Pulp	18.0	0.00051	0.0073	0.0750	0.0011	*0.0005*	0.048	0.00079	6.01	0.0273	0.00796	0.108	24.7	0.0102	0.012	4.20	0.929
Shallow Overburden																		
LE-5	Reject Pulp	11.1	0.00087	0.0088	0.154	0.00074	0.00213	0.059	0.000337	3.30	0.0226	0.0101	0.0758	17.2	0.0154	*0.0025*	8.52	0.776
LF-2	Reject Pulp	8.65	0.00184	0.0079	0.147	0.00067	*0.00025*	0.051	0.00105	9.67	0.0110	0.00645	0.390	9.78	0.00393	*0.0025*	9.22	1.05
LG-7	Reject Pulp	0.872	0.00479	0.0072	0.188	*0.0005*	*0.0005*	0.118	0.00254	118	0.0035	0.00220	0.0302	1.54	0.00069	*0.005*	24.3	0.253
LG-9	Reject Pulp	3.14	0.00081	0.0025	0.143	*0.0005*	*0.0005*	0.062	0.00024	82.2	0.0097	0.00661	0.104	4.51	0.00161	*0.005*	8.63	1.84
LH-1	Reject Pulp	9.47	0.00065	0.0036	0.0987	0.00073	*0.00025*	0.045	0.00186	25.9	0.0139	0.00853	0.0408	11.3	0.00272	0.0057	13.3	0.676
LI-1	Reject Pulp	25.1	0.00032	0.0108	0.0992	0.0021	*0.0005*	0.053	0.00082	10.6	0.0401	0.0429	0.127	24.8	0.00857	0.011	9.69	1.79
LI-9	Reject Pulp	12.6	0.00048	0.0075	0.191	*0.00025*	*0.00025*	0.045	0.000254	11.4	0.0626	0.0301	0.316	13.3	0.00258	*0.0025*	16.4	3.04
LJ-9	Original Pulp	21.0	0.00051	0.0097	0.113	*0.0005*	*0.0005*	0.039	0.00066	5.73	0.0737	0.0112	0.0554	20.3	0.00600	*0.005*	5.08	0.276
LJ-9	Reject Pulp	15.5	0.00040	0.0090	0.114	0.0012	*0.0005*	0.060	0.00063	6.22	0.0565	0.0120	0.166	18.2	0.0505	*0.005*	5.88	0.346
LK-7	Reject Pulp	7.42	0.00093	0.0042	0.288	0.00063	*0.00025*	0.056	0.00371	67.8	0.0237	0.00786	0.597	8.02	0.00264	*0.0025*	12.6	1.35
Maximum		25.1	0.0048	0.013	0.29	0.0021	0.0021	0.12	0.0037	118	0.074	0.043	0.68	24.8	0.05	0.012	24.3	3.04
Minimum		0.87	0.00032	0.0025	0.075	0.00025	0.00025	0.039	0.00024	3.3	0.0035	0.0022	0.03	1.54	0.00069	0.0025	4.2	0.25
Mean		12.3	0.0011	0.0076	0.14	0.00075	0.00057	0.058	0.0011	27.7	0.034	0.013	0.22	14.5	0.009	0.0058	12.2	1.02
Standard Deviation		6.74	0.0012	0.003	0.057	0.00049	0.00052	0.019	0.001	37.1	0.023	0.011	0.21	7.23	0.013	0.0033	6.44	0.81
10 Percentile		4	0.00042	0.0037	0.091	0.0003	0.00025	0.045	0.00027	5.79	0.01	0.0065	0.044	5.21	0.0018	0.0025	5.24	0.29
25 Percentile		8.65	0.00051	0.0067	0.099	0.0005	0.00025	0.048	0.0004	6.18	0.014	0.0079	0.076	9.78	0.0026	0.0025	8.52	0.43
Median		12.6	0.00066	0.0075	0.14	0.00063	0.0005	0.056	0.00079	9.67	0.027	0.01	0.12	16.8	0.0056	0.005	9.69	0.78
75 Percentile		15.5	0.00089	0.009	0.15	0.00074	0.0005	0.059	0.0012	25.9	0.056	0.014	0.32	18.2	0.0086	0.0084	16.4	1.35
90 Percentile		20.4	0.0017	0.011	0.19	0.0012	0.00094	0.062	0.0024	79.3	0.061	0.027	0.56	23.8	0.014	0.011	21.1	1.83
Interquartile Range (IQR) [1]		6.85	0.00038	0.0023	0.055	0.00024	0.00025	0.011	0.0008	19.7	0.042	0.0059	0.24	8.42	0.0059	0.0059	7.88	0.92
Variance		45.5	0.0000014	0.0000089	0.0032	0.00000024	0.00000027	0.00037	0.000001	1375	0.00051	0.00012	0.046	52.2	0.00017	0.000011	41.5	0.65
Skewness		0.18	3.03	0.036	1.46	1.91	2.66	2.76	1.68	1.7	0.38	1.99	1.37	-0.29	3.05	0.76	0.64	1.44
Coefficient of Variation (CoV) [2]		0.55	1.13	0.39	0.4	0.65	0.9	0.33	0.92	1.34	0.67	0.82	0.99	0.5	1.46	0.56	0.53	0.79
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Shake Flask Analysis**
Comments: This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed.
Particulates were observed after the extracts have been filtered.
Some of the metals detection limits were increased due to high levels of metals in these samples.

Testpit Drillhole Id	Material Type	Dissolved Mercury Hg (mg/L)	Dissolved Molybdenum Mo (mg/L)	Dissolved Nickel Ni (mg/L)	Dissolved Phosphorus P (mg/L)	Dissolved Potassium K (mg/L)	Dissolved Selenium Se (mg/L)	Dissolved Silicon Si (mg/L)	Dissolved Silver Ag (mg/L)	Dissolved Sodium Na (mg/L)	Dissolved Strontium Sr (mg/L)	Dissolved Thallium Tl (mg/L)	Dissolved Tin Sn (mg/L)	Dissolved Titanium Ti (mg/L)	Dissolved Uranium U (mg/L)	Dissolved Vanadium V (mg/L)	Dissolved Zinc Zn (mg/L)
Vertical-Profile Overburden																	
MLARD-TP08	Reject Pulp	*0.000025*	0.177	0.0442	0.44	15.0	0.00123	27.4	0.000395	33.6	0.0455	*0.00005*	*0.00025*	0.303	0.000425	0.100	0.068
MLARD-TP09	Reject Pulp	*0.000025*	0.00653	0.0395	0.39	10.8	0.00086	32.1	0.000309	31.8	0.0397	*0.00005*	*0.00025*	0.410	0.000702	0.0794	0.055
MLARD-TP11	Reject Pulp	*0.000025*	0.00567	0.0164	1.69	14.0	0.0011	61.0	0.00316	65.5	0.0312	*0.0001*	0.0022	0.841	0.00196	0.0380	0.047
Shallow Overburden																	
LE-5	Reject Pulp	*0.000025*	0.00527	0.0141	0.88	8.22	0.00090	33.4	0.000255	20.3	0.0266	*0.00005*	*0.00025*	0.284	0.000604	0.0705	0.065
LF-2	Reject Pulp	*0.000025*	0.0382	0.00875	0.50	23.1	0.00087	29.4	0.000241	20.2	0.0268	0.00011	*0.00025*	0.154	0.000297	0.0479	0.028
LG-7	Reject Pulp	*0.000025*	2.97	0.0381	1.07	14.2	0.0112	20.9	0.00023	72.6	0.895	*0.0001*	*0.0005*	0.051	0.000314	0.0046	*0.01*
LG-9	Reject Pulp	*0.000025*	0.0137	0.0258	1.58	8.79	0.0013	24.3	0.00058	14.2	0.347	*0.0001*	*0.0005*	0.152	0.000461	0.0093	*0.01*
LH-1	Reject Pulp	*0.000025*	0.0262	0.0167	0.48	14.0	0.00064	25.9	0.000343	50.9	0.0844	*0.00005*	0.00060	0.276	0.000505	0.0453	0.034
LI-1	Reject Pulp	*0.000025*	0.00467	0.0222	1.52	20.8	0.0014	70.9	0.00262	60.9	0.0557	*0.0001*	0.0019	1.18	0.00240	0.0468	0.045
LI-9	Reject Pulp	*0.000025*	0.00320	0.0266	0.57	22.2	0.00203	47.8	0.000455	33.4	0.0441	*0.00005*	0.00062	0.388	0.000379	0.0415	0.039
LJ-9	Original Pulp	*0.000025*	0.00436	0.0291	1.21	8.70	*0.0005*	39.7	0.00228	58.0	0.0368	*0.0001*	0.0012	0.550	0.00175	0.0667	0.059
LJ-9	Reject Pulp	*0.000025*	0.00311	0.0283	1.00	11.0	*0.0005*	53.8	0.00167	56.0	0.0360	*0.0001*	*0.0005*	0.441	0.00131	0.0514	0.068
LK-7	Reject Pulp	0.000138	0.0235	0.0918	3.20	8.74	0.00360	32.4	0.00252	18.8	0.190	0.00015	0.00081	0.289	0.000779	0.0179	0.017
Maximum		0.00014	2.97	0.092	3.2	23.1	0.011	70.9	0.0032	72.6	0.9	0.00015	0.0022	1.18	0.0024	0.1	0.068
Minimum		0.000025	0.0031	0.0088	0.39	8.22	0.0005	20.9	0.00023	14.2	0.027	0.00005	0.00025	0.051	0.0003	0.0046	0.01
Mean		0.000034	0.25	0.031	1.12	13.8	0.002	38.4	0.0012	41.2	0.14	0.000085	0.00076	0.41	0.00091	0.048	0.042
Standard Deviation		0.000031	0.82	0.021	0.77	5.26	0.0029	15.4	0.0011	20.2	0.24	0.000032	0.00064	0.31	0.0007	0.027	0.021
10 Percentile		0.000025	0.0034	0.015	0.45	8.71	0.00053	24.6	0.00024	19.1	0.028	0.00005	0.00025	0.15	0.00033	0.011	0.011
25 Percentile		0.000025	0.0047	0.017	0.5	8.79	0.00086	27.4	0.00031	20.3	0.036	0.00005	0.00025	0.28	0.00042	0.038	0.028
Median		0.000025	0.0065	0.027	1	14	0.0011	32.4	0.00046	33.6	0.044	0.0001	0.0005	0.3	0.0006	0.047	0.045
75 Percentile		0.000025	0.026	0.038	1.52	15	0.0014	47.8	0.0023	58	0.084	0.0001	0.00081	0.44	0.0013	0.067	0.059
90 Percentile		0.000025	0.15	0.043	1.67	21.9	0.0033	59.6	0.0026	64.6	0.32	0.00011	0.0018	0.78	0.0019	0.078	0.067
Interquartile Range (IQR) [1]		0	0.022	0.021	1.02	6.21	0.00054	20.4	0.002	37.7	0.048	0.00005	0.00056	0.16	0.00088	0.029	0.031
Variance		9.8E-10	0.67	0.00044	0.6	27.7	0.0000083	238	0.0000012	406	0.059	1E-09	0.0000004	0.093	0.0000005	0.00075	0.00044
Skewness		3.61	3.59	2.18	1.7	0.76	3.15	1.01	0.77	0.12	2.88	0.25	1.54	1.57	1.17	0.15	-0.3
Coefficient of Variation (CoV) [2]		0.93	3.24	0.68	0.69	0.38	1.43	0.4	0.96	0.49	1.7	0.38	0.84	0.75	0.77	0.57	0.5
Count		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

APPENDIX B. Compiled Results of Aqueous Digestions of Colloid Precipitants from Stabilized Dissolved Shake-Flask Samples

Project: **Schaft Creek**
Client: Copper Fox Metals Inc.
Data: **Shake Flask Analysis - Digestion of Precipitant**
Comments: This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed.

For samples with enough precipitant remaining, the particulates that were observed and filtered out after the extraction have been redissolved and analyzed.

Some of the metals detection limits were increased due to high levels of metals in these samples.

Digestion of Precipitant

Testpit	Material	Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium
Drillhole Id	Type	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Vertical-Profile Overburden																	
MLARD-TP08	Reject Pulp	6.95	*0.1*	*0.1*	0.036	*0.0025*	*0.1*	*0.05*	*0.005*	0.618	0.024	*0.005*	0.174	7.09	*0.025*	*0.005*	3.97
MLARD-TP09	Reject Pulp																
MLARD-TP11	Reject Pulp	1.23	*0.1*	*0.1*	*0.005*	*0.0025*	*0.1*	*0.05*	*0.005*	0.276	*0.005*	*0.005*	*0.005*	1.97	*0.025*	*0.005*	0.35
Shallow Overburden																	
LE-5	Reject Pulp																
LF-2	Reject Pulp																
LG-7	Reject Pulp																
LG-9	Reject Pulp																
LH-1	Reject Pulp	7.19	*0.1*	*0.1*	0.033	*0.0025*	*0.1*	*0.05*	*0.005*	2.91	0.013	*0.005*	*0.005*	7.14	*0.025*	*0.005*	3.08
LI-1	Reject Pulp																
LI-9	Reject Pulp																
LJ-9	Original Pulp																
LJ-9	Reject Pulp																
LK-7	Reject Pulp																
Maximum		7.19	0.1	0.1	0.036	0.0025	0.1	0.05	0.005	2.91	0.024	0.005	0.17	7.14	0.025	0.005	3.97
Minimum		1.23	0.1	0.1	0.005	0.0025	0.1	0.05	0.005	0.28	0.005	0.005	0.005	1.97	0.025	0.005	0.35
Mean		5.12	0.1	0.1	0.025	0.0025	0.1	0.05	0.005	1.27	0.014	0.005	0.061	5.4	0.025	0.005	2.47
Standard Deviation		3.37	1.7E-17	1.7E-17	0.017	0	1.7E-17	8.5E-18	0	1.43	0.0095	0	0.098	2.97	4.2E-18	0	1.89
10 Percentile		2.37	0.1	0.1	0.011	0.0025	0.1	0.05	0.005	0.34	0.0066	0.005	0.005	2.99	0.025	0.005	0.9
25 Percentile		4.09	0.1	0.1	0.019	0.0025	0.1	0.05	0.005	0.45	0.009	0.005	0.005	4.53	0.025	0.005	1.72
Median		6.95	0.1	0.1	0.033	0.0025	0.1	0.05	0.005	0.62	0.013	0.005	0.005	7.09	0.025	0.005	3.08
75 Percentile		7.07	0.1	0.1	0.034	0.0025	0.1	0.05	0.005	1.76	0.018	0.005	0.09	7.12	0.025	0.005	3.53
90 Percentile		7.14	0.1	0.1	0.035	0.0025	0.1	0.05	0.005	2.45	0.022	0.005	0.14	7.13	0.025	0.005	3.79
Interquartile Range (IQR) [1]		2.98	0	0	0.016	0	0	0	0	1.32	0.0095	0	0.084	2.58	0	0	1.81
Variance		11.4	NA	NA	0.00029	0	NA	NA	0	2.05	0.000091	0	0.0095	8.82	NA	0	3.56
Skewness		-1.72	-2.45	-2.45	-1.67	NA	-2.45	-2.45	NA	1.62	0.47	NA	1.73	-1.73	-2.45	NA	-1.31
Coefficient of Variation (CoV) [2]		0.66	1.7E-16	1.7E-16	0.69	0	1.7E-16	1.7E-16	0	1.13	0.68	0	1.59	0.55	1.7E-16	0	0.76
Count		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

Project:	**Schaft Creek**
Client:	Copper Fox Metals Inc.
Data:	**Shake Flask Analysis - Digestion of Precipitant**
Comments:	This analysis is based upon the extraction procedure outlined in "Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia" BC Ministry of Energy and Mines, (Dr. William A. Price, 1997). In summary, the sample is extracted at a 3:1 liquid to solids ratio for 24 hours using deionized water . The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed. For samples with enough precipitant remaining, the particulates that were observed and filtered out after the extraction have been redissolved and analyzed. Some of the metals detection limits were increased due to high levels of metals in these samples.

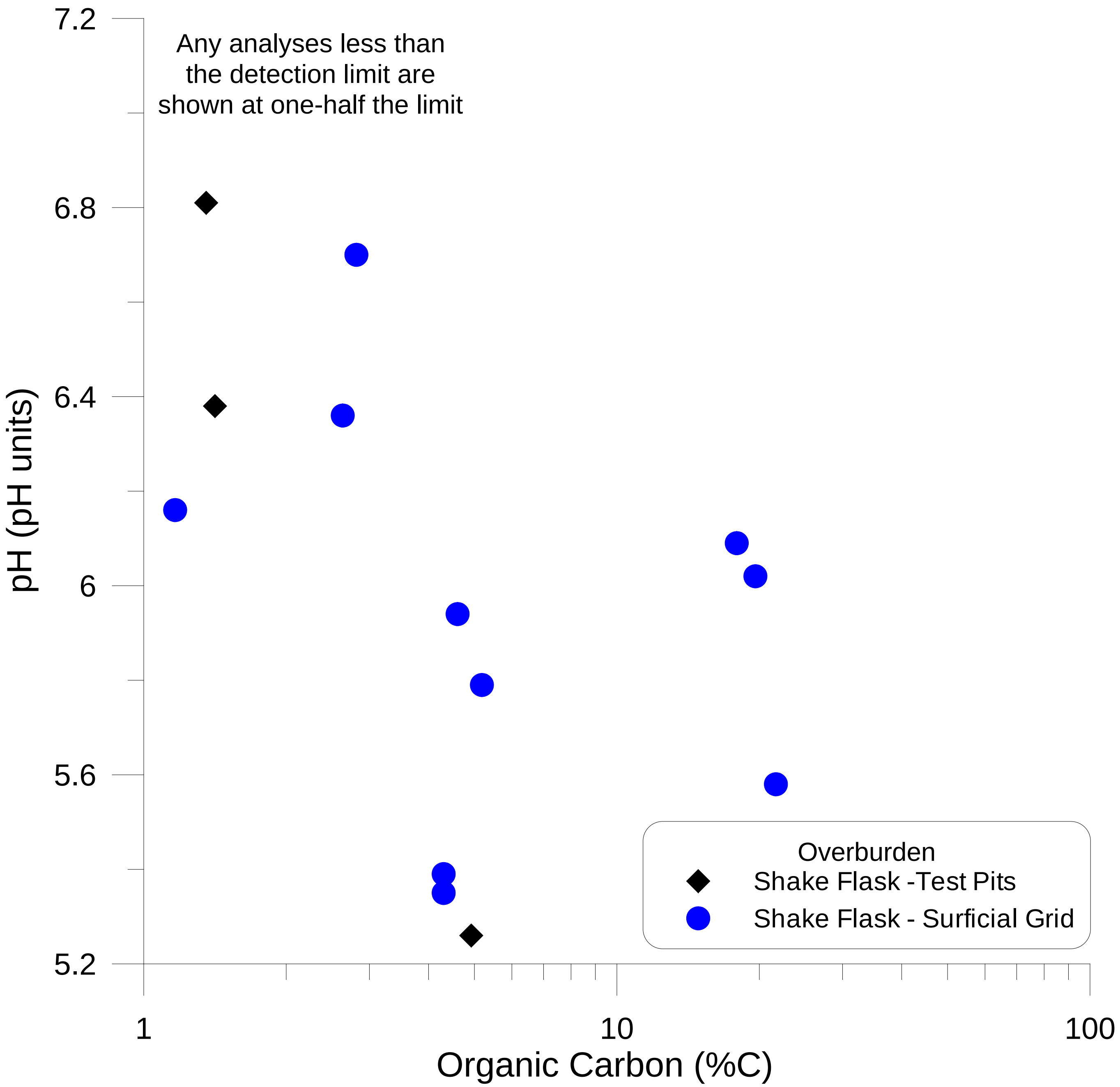
Testpit Drillhole Id	Material Type	Manganese Mn (mg/L)	Molybdenum Mo (mg/L)	Nickel Ni (mg/L)	Phosphorus P (mg/L)	Potassium K (mg/L)	Selenium Se (mg/L)	Silicon Si (mg/L)	Silver Ag (mg/L)	Sodium Na (mg/L)	Strontium Sr (mg/L)	Thallium Tl (mg/L)	Tin Sn (mg/L)	Titanium Ti (mg/L)	Vanadium V (mg/L)	Zinc Zn (mg/L)
Vertical-Profile Overburden																
MLARD-TP08	Reject Pulp	0.0959	*0.015*	*0.025*	*0.15*	*1*	*0.1*	3.79	*0.005*	*1*	0.0052	*0.1*	*0.015*	0.219	*0.015*	0.0234
MLARD-TP09	Reject Pulp															
MLARD-TP11	Reject Pulp	0.0539	*0.015*	*0.025*	0.60	*1*	*0.1*	1.27	*0.005*	*1*	*0.0025*	*0.1*	*0.015*	0.099	*0.015*	0.0196
Shallow Overburden																
LE-5	Reject Pulp															
LF-2	Reject Pulp															
LG-7	Reject Pulp															
LG-9	Reject Pulp															
LH-1	Reject Pulp	0.128	*0.015*	*0.025*	*0.15*	*1*	*0.1*	3.39	*0.005*	*1*	0.0081	*0.1*	*0.015*	0.280	*0.015*	0.0217
LI-1	Reject Pulp															
LI-9	Reject Pulp															
LJ-9	Original Pulp															
LJ-9	Reject Pulp															
LK-7	Reject Pulp															
Maximum		0.13	0.015	0.025	0.6	1	0.1	3.79	0.005	1	0.0081	0.1	0.015	0.28	0.015	0.023
Minimum		0.054	0.015	0.025	0.15	1	0.1	1.27	0.005	1	0.0025	0.1	0.015	0.099	0.015	0.02
Mean		0.093	0.015	0.025	0.3	1	0.1	2.82	0.005	1	0.0053	0.1	0.015	0.2	0.015	0.022
Standard Deviation		0.037	0	4.2E-18	0.26	0	1.7E-17	1.35	0	0	0.0028	1.7E-17	0	0.092	0	0.0019
10 Percentile		0.062	0.015	0.025	0.15	1	0.1	1.69	0.005	1	0.003	0.1	0.015	0.12	0.015	0.02
25 Percentile		0.075	0.015	0.025	0.15	1	0.1	2.33	0.005	1	0.0038	0.1	0.015	0.16	0.015	0.021
Median		0.096	0.015	0.025	0.15	1	0.1	3.39	0.005	1	0.0052	0.1	0.015	0.22	0.015	0.022
75 Percentile		0.11	0.015	0.025	0.38	1	0.1	3.59	0.005	1	0.0066	0.1	0.015	0.25	0.015	0.023
90 Percentile		0.12	0.015	0.025	0.51	1	0.1	3.71	0.005	1	0.0075	0.1	0.015	0.27	0.015	0.023
Interquartile Range (IQR) [1]		0.037	0	0	0.22	0	0	1.26	0	0	0.0028	0	0	0.09	0	0.0019
Variance		0.0014	0	NA	0.068	0	NA	1.83	0	0	0.0000078	NA	0	0.0085	0	0.0000036
Skewness		-0.4	NA	-2.45	1.73	NA	-2.45	-1.56	NA	NA	0.11	-2.45	NA	-0.92	NA	-0.31
Coefficient of Variation (CoV) [2]		0.4	0	1.7E-16	0.87	0	1.7E-16	0.48	0	0	0.53	1.7E-16	0	0.46	0	0.088
Count		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

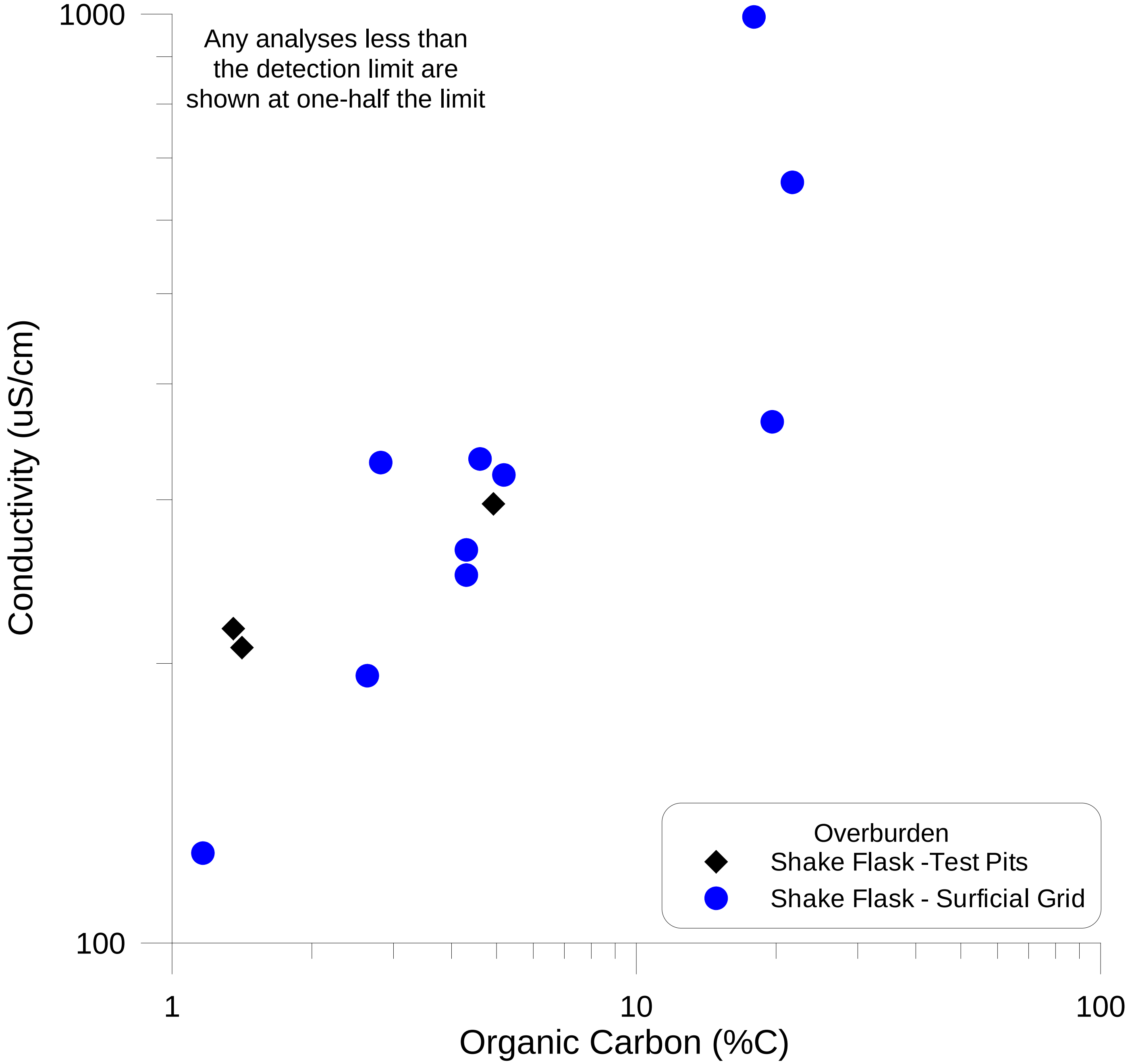
[1] Interquartile Range (IQR) = 75th percentile minus 25th percentile

[2] Coefficient of Variation (CoV) = standard deviation divided by mean

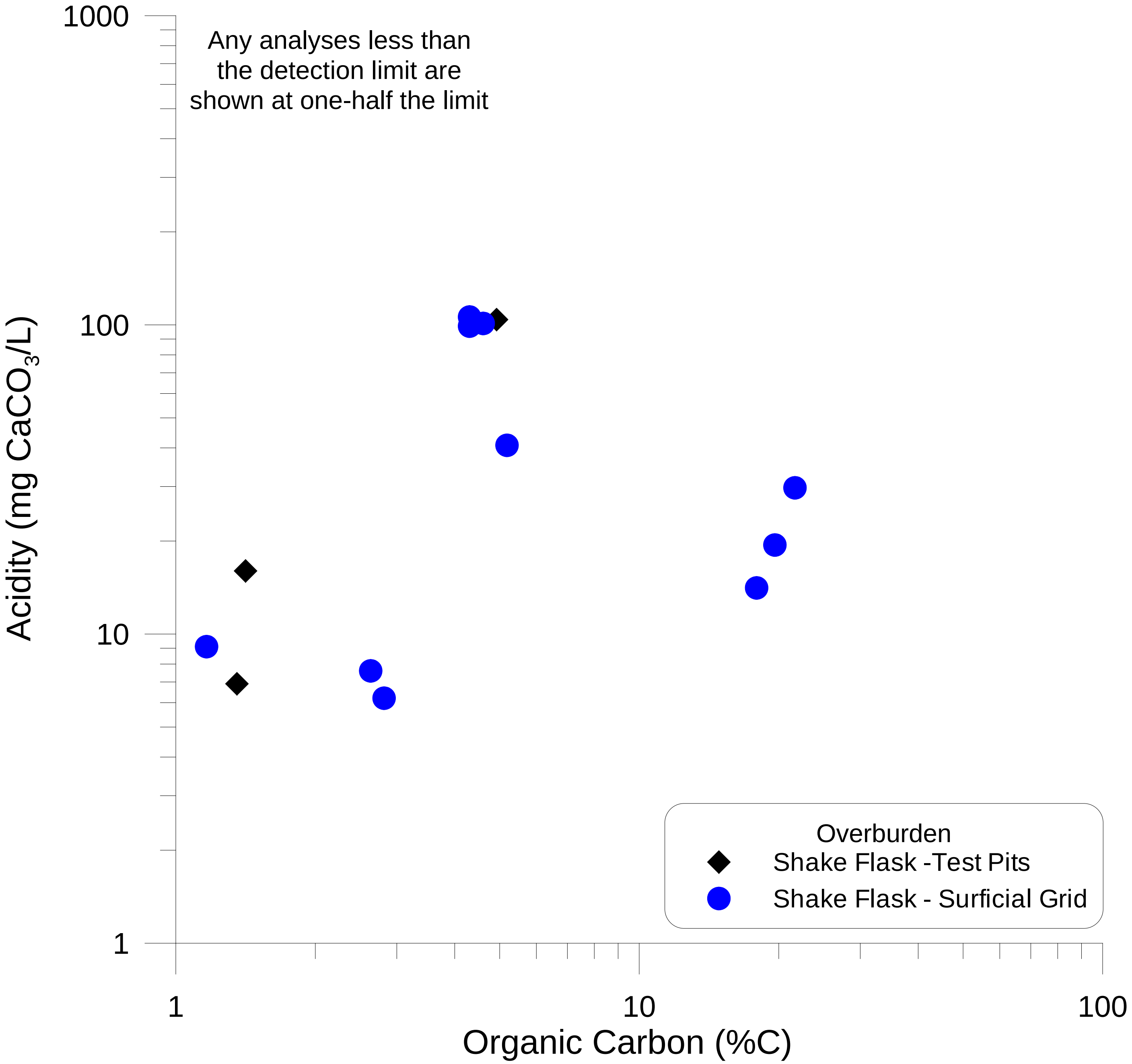
NOTE: If data was reported as < detection limit half the detection limit is shown in italics and was used in subsequent calculations.

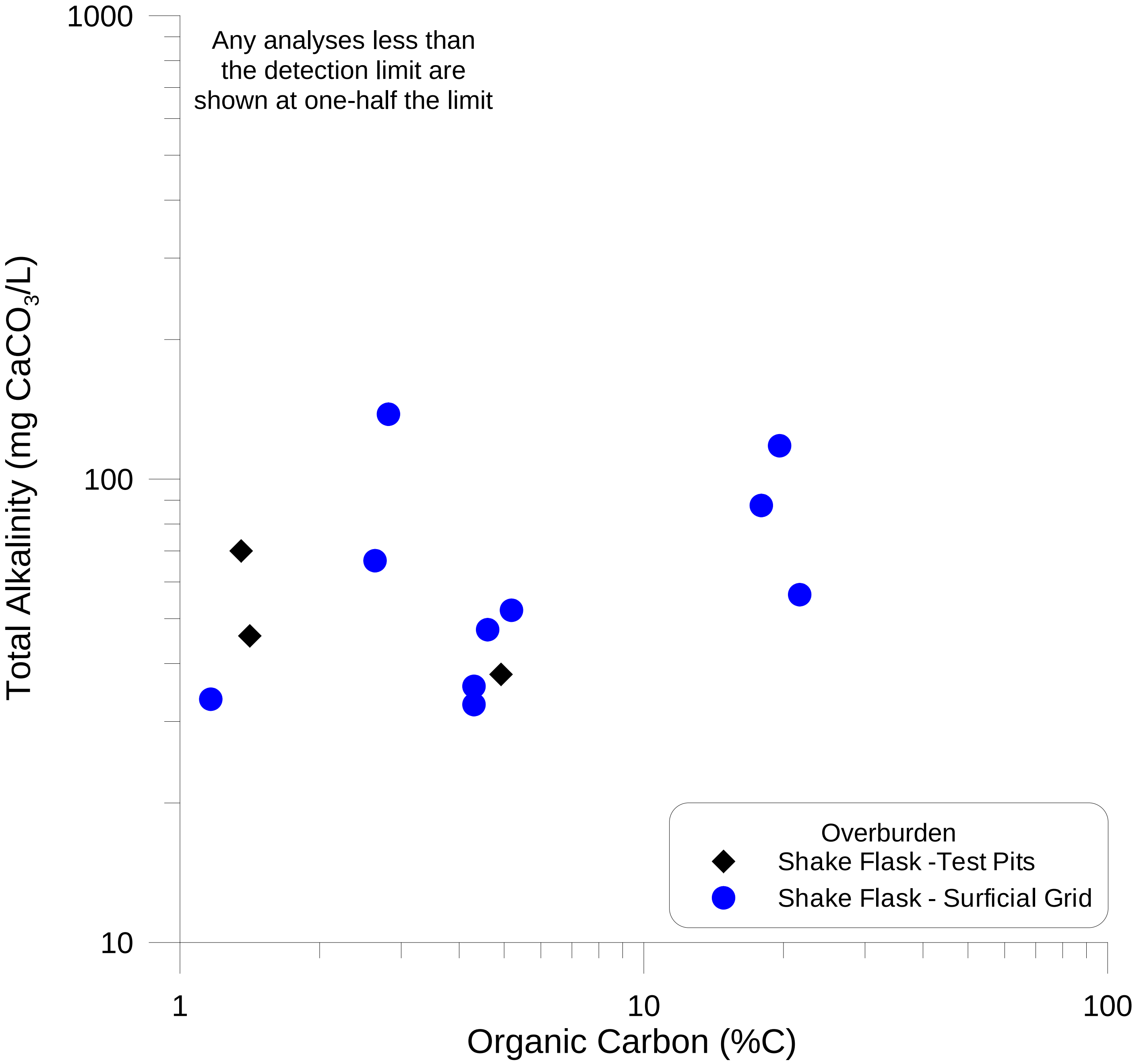
APPENDIX C. Scatterplots of Shake-Flask-Leached Parameters with Solid-Phase Organic Carbon

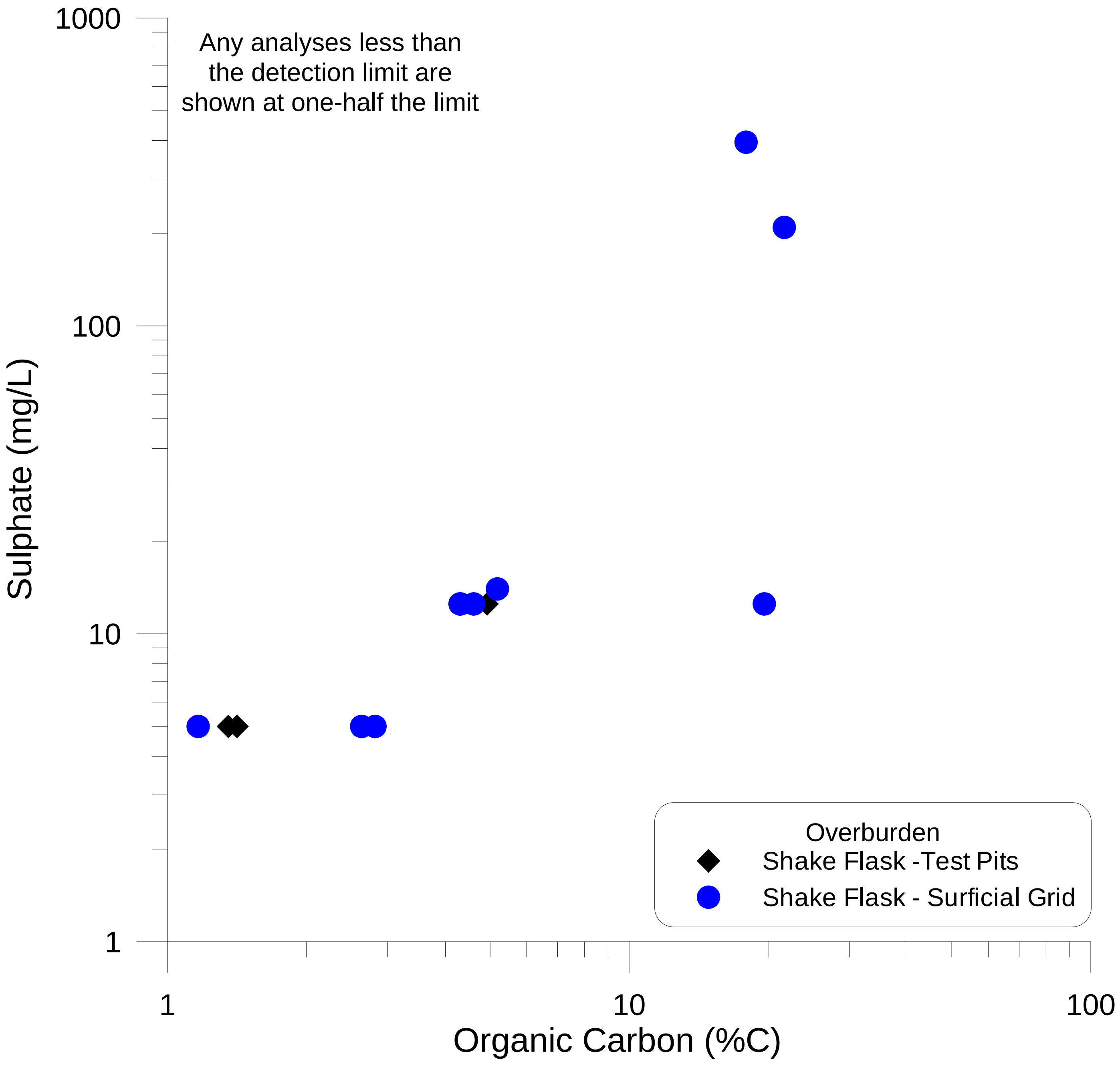

Any analyses less than
the detection limit are
shown at one-half the limit
pH (pH units)
7.2
6.8
6.4
6
5.6
5.2
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid



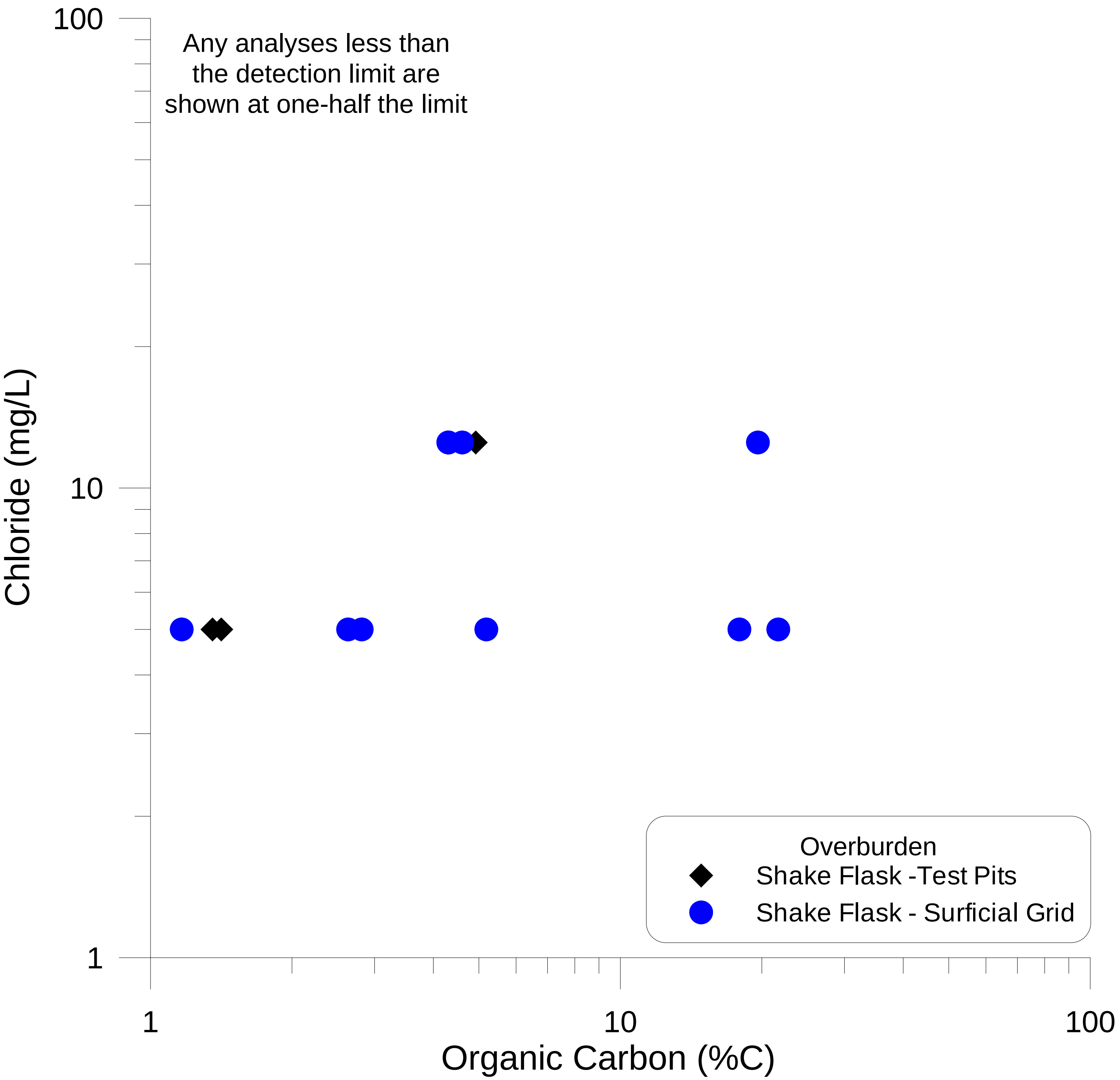
1000
100
1
10
100
Conductivity (uS/cm)
Organic Carbon (%C)
Any analyses less than the detection limit are shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

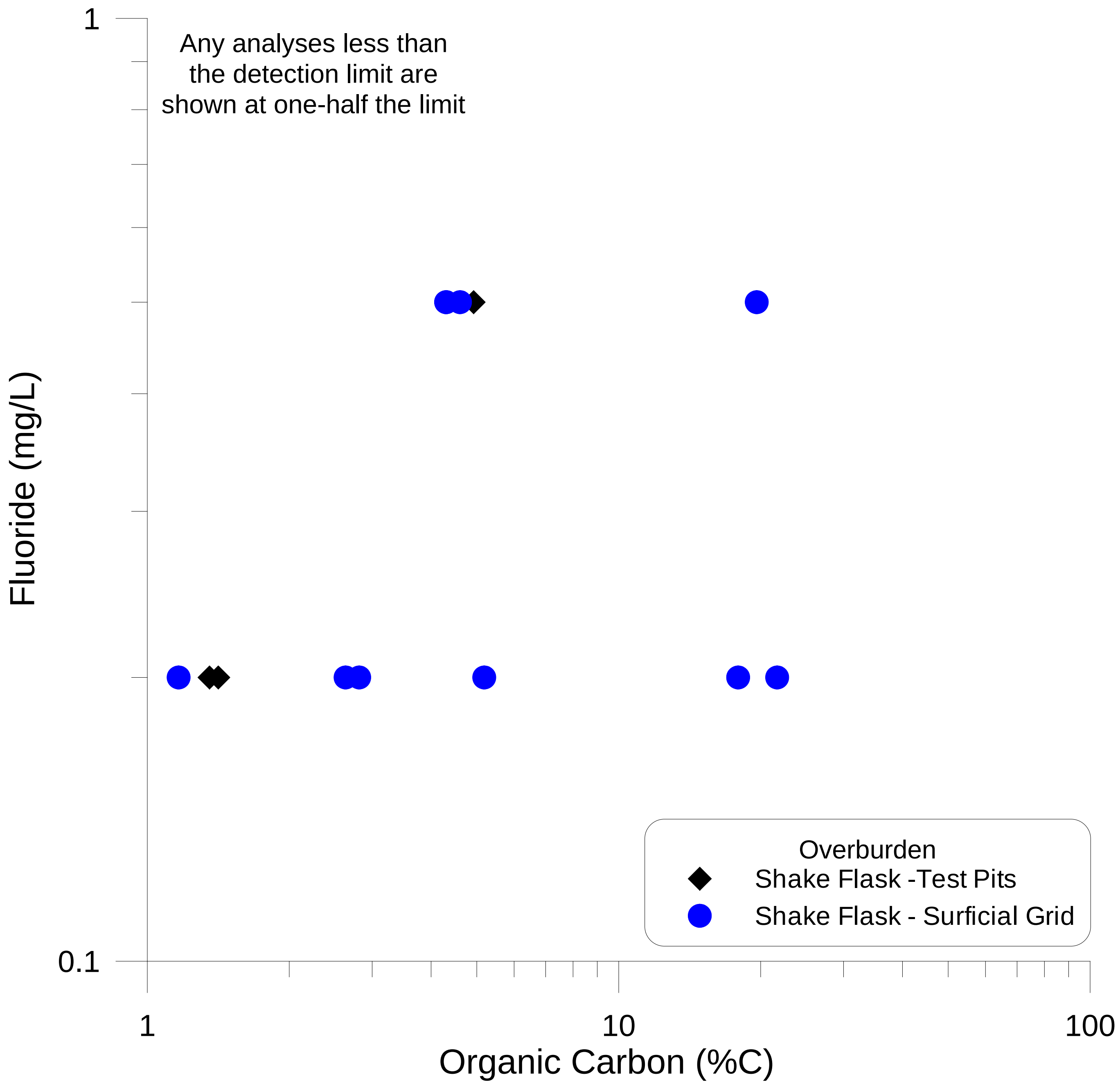

1000
100
10
1
1
10
100
Acidity (mg CaCO$_3$/L)
Organic Carbon (%C)
Any analyses less than the detection limit are shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid


1000
100
10
1
10
100
Total Alkalinity (mg CaCO$_3$/L)
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

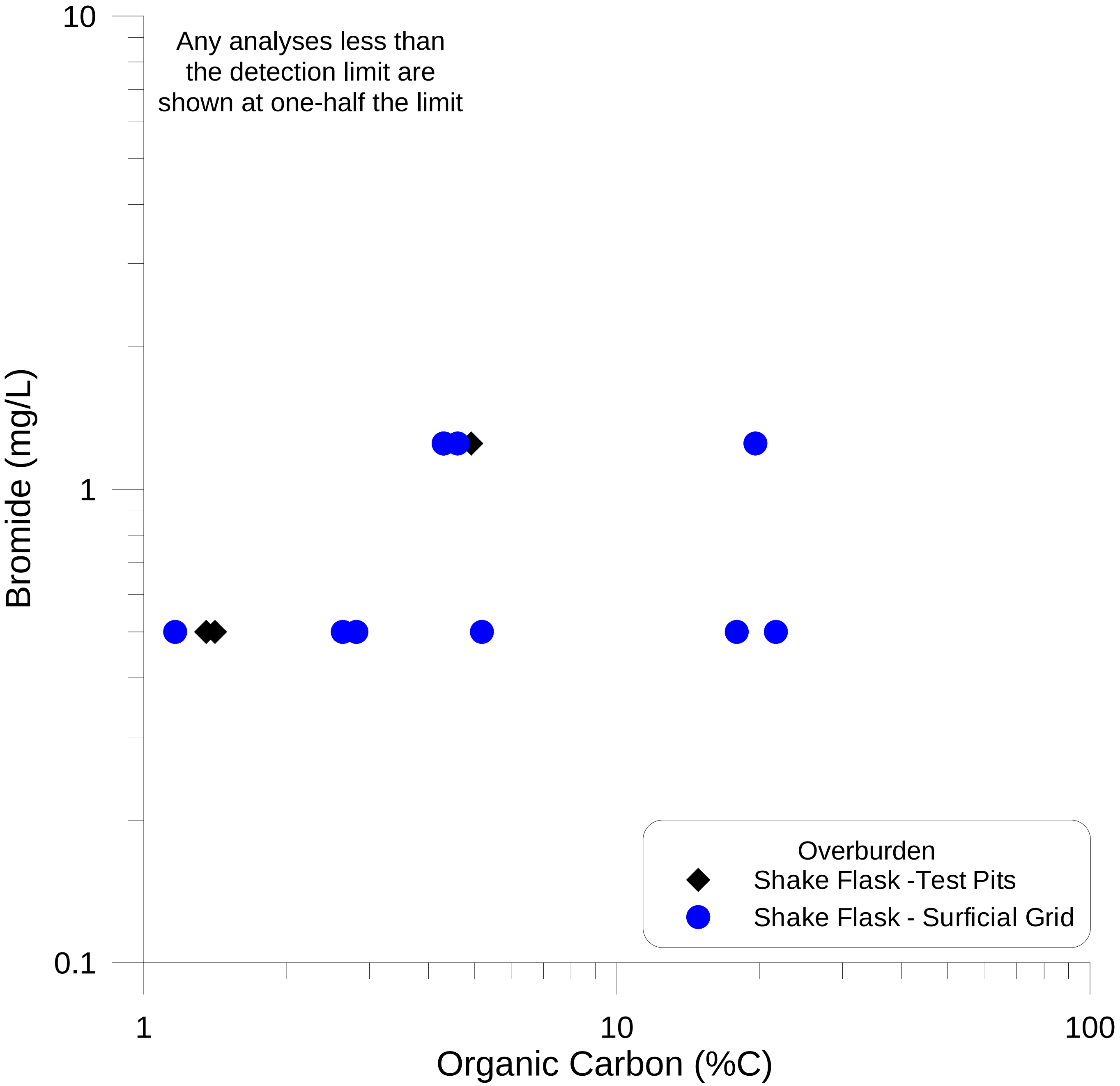


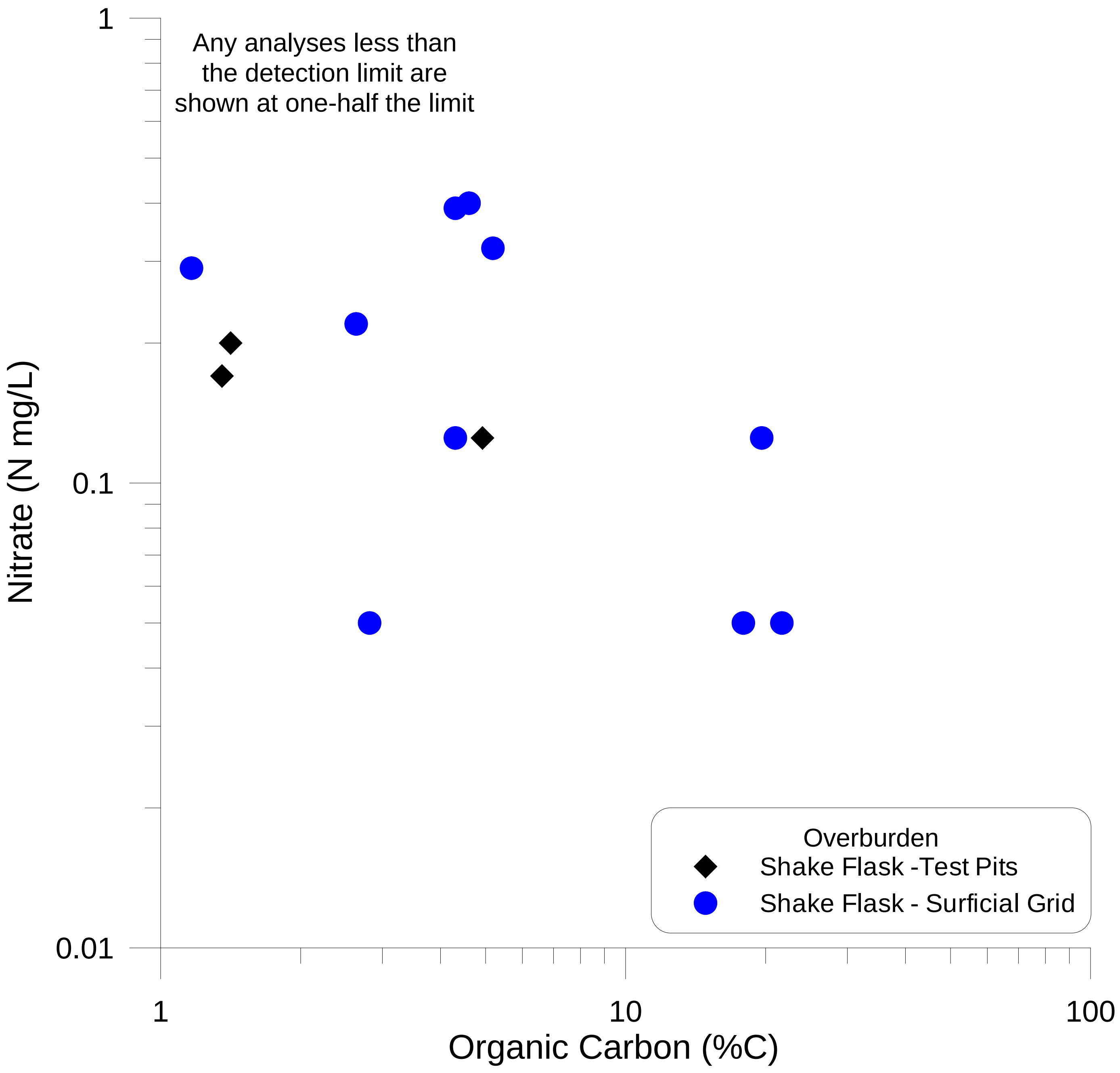
Any analyses less than
the detection limit are
shown at one-half the limit
Sulphate (mg/L)
1000
100
10
1
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

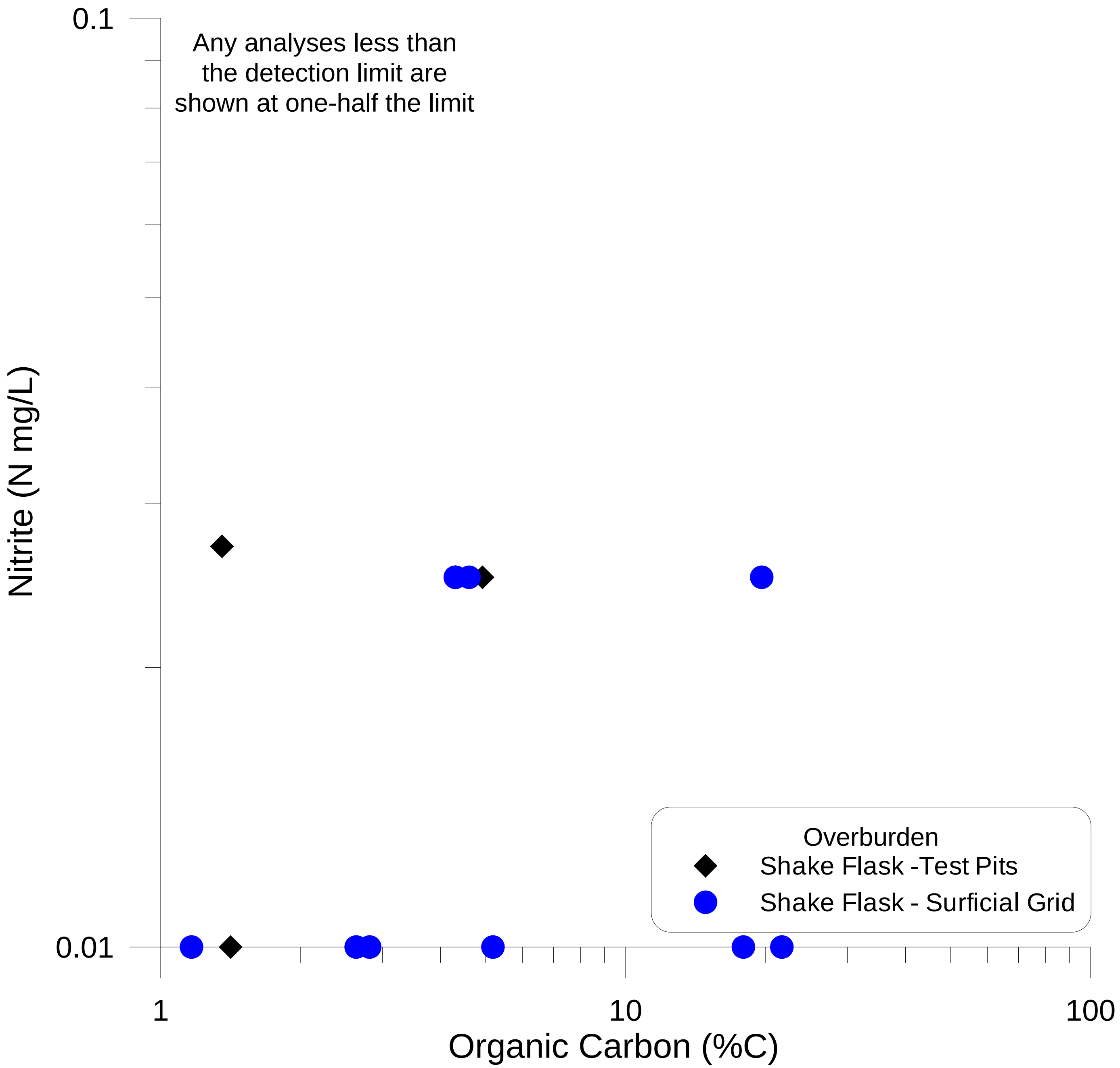

Any analyses less than
the detection limit are
shown at one-half the limit
100
10
1
Chloride (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

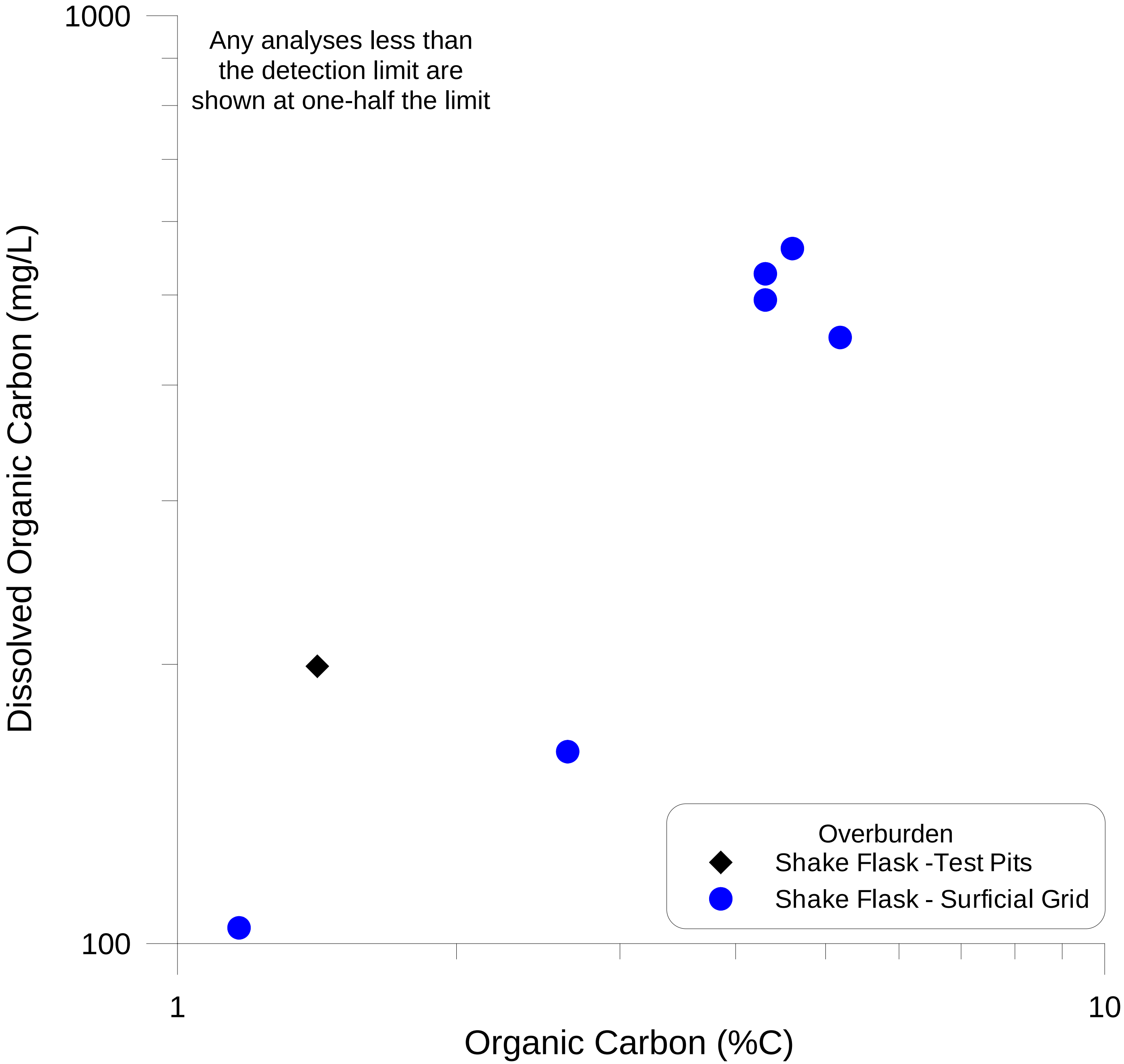


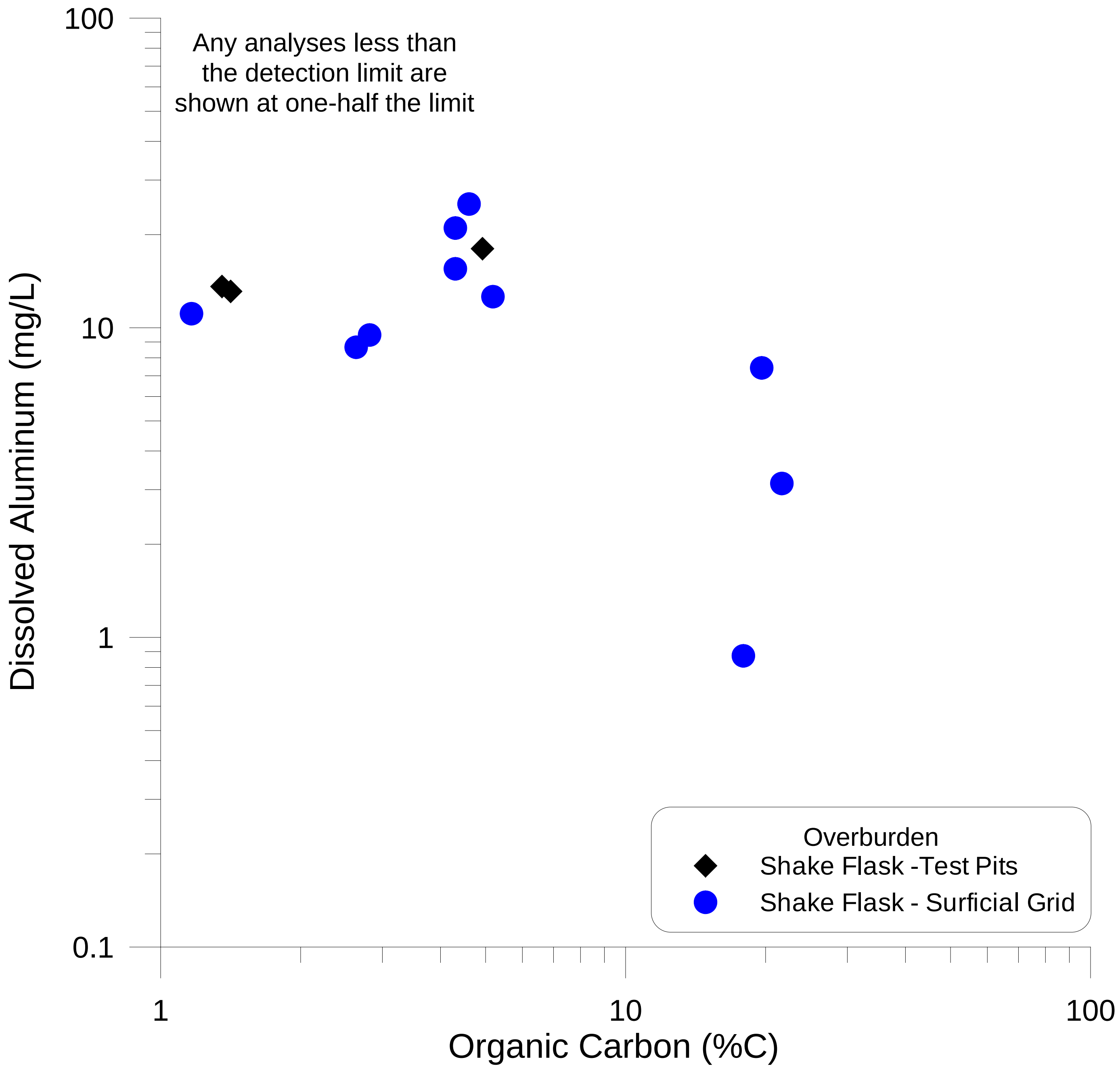
1
0.1
Fluoride (mg/L)
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

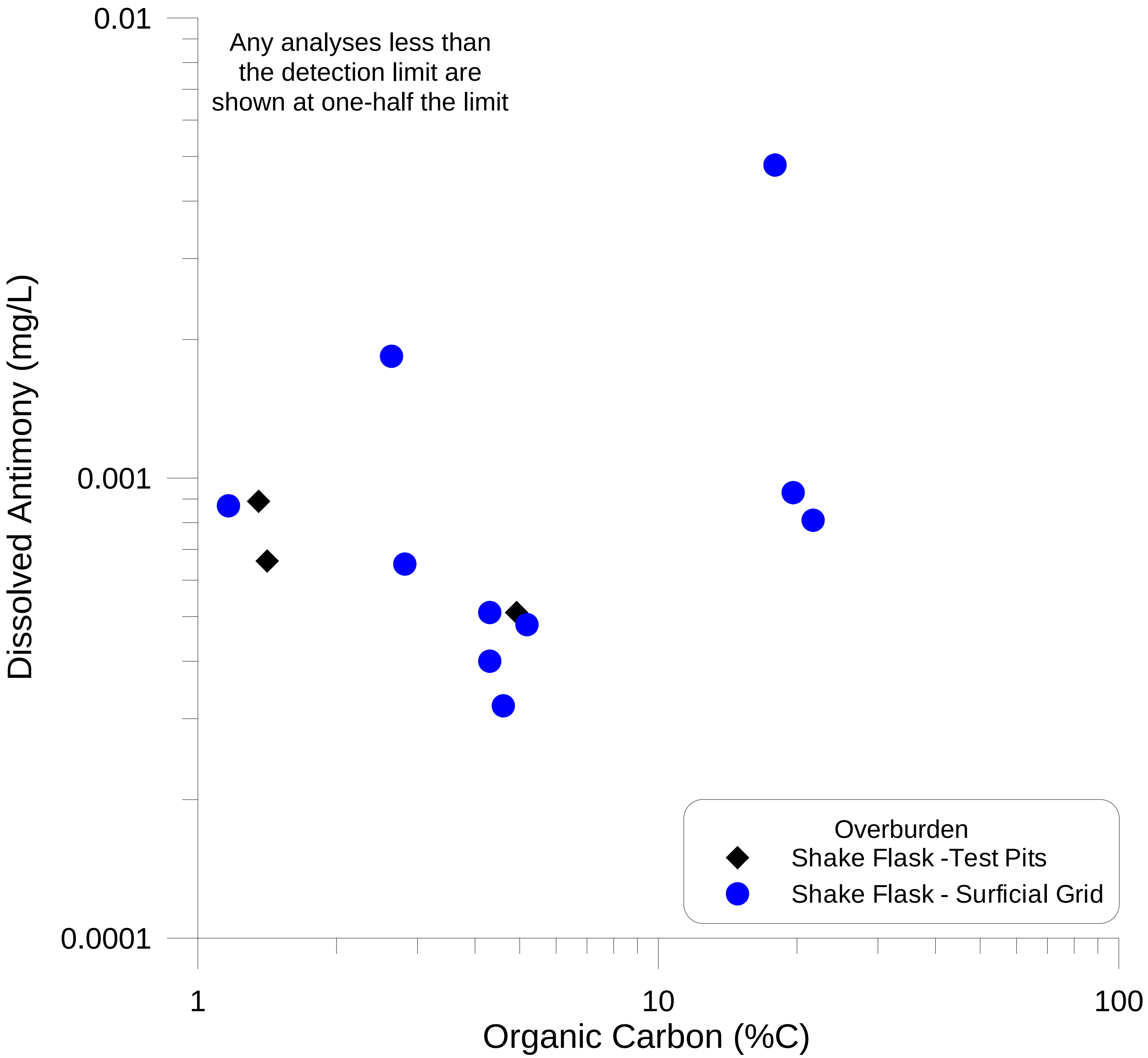

10
1
0.1
Bromide (mg/L)
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

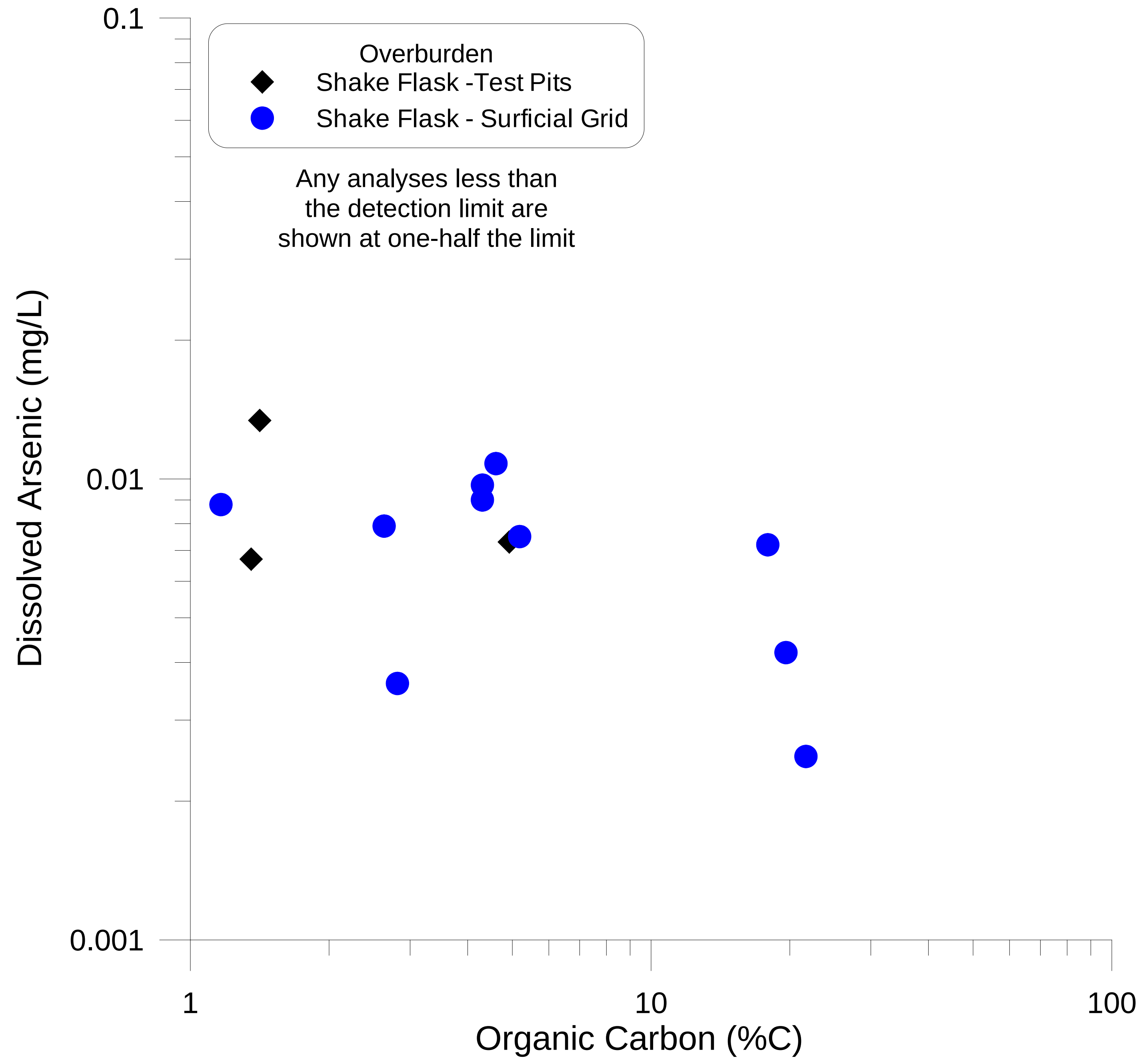

Any analyses less than
the detection limit are
shown at one-half the limit
Nitrate (N mg/L)
1
0.1
0.01
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

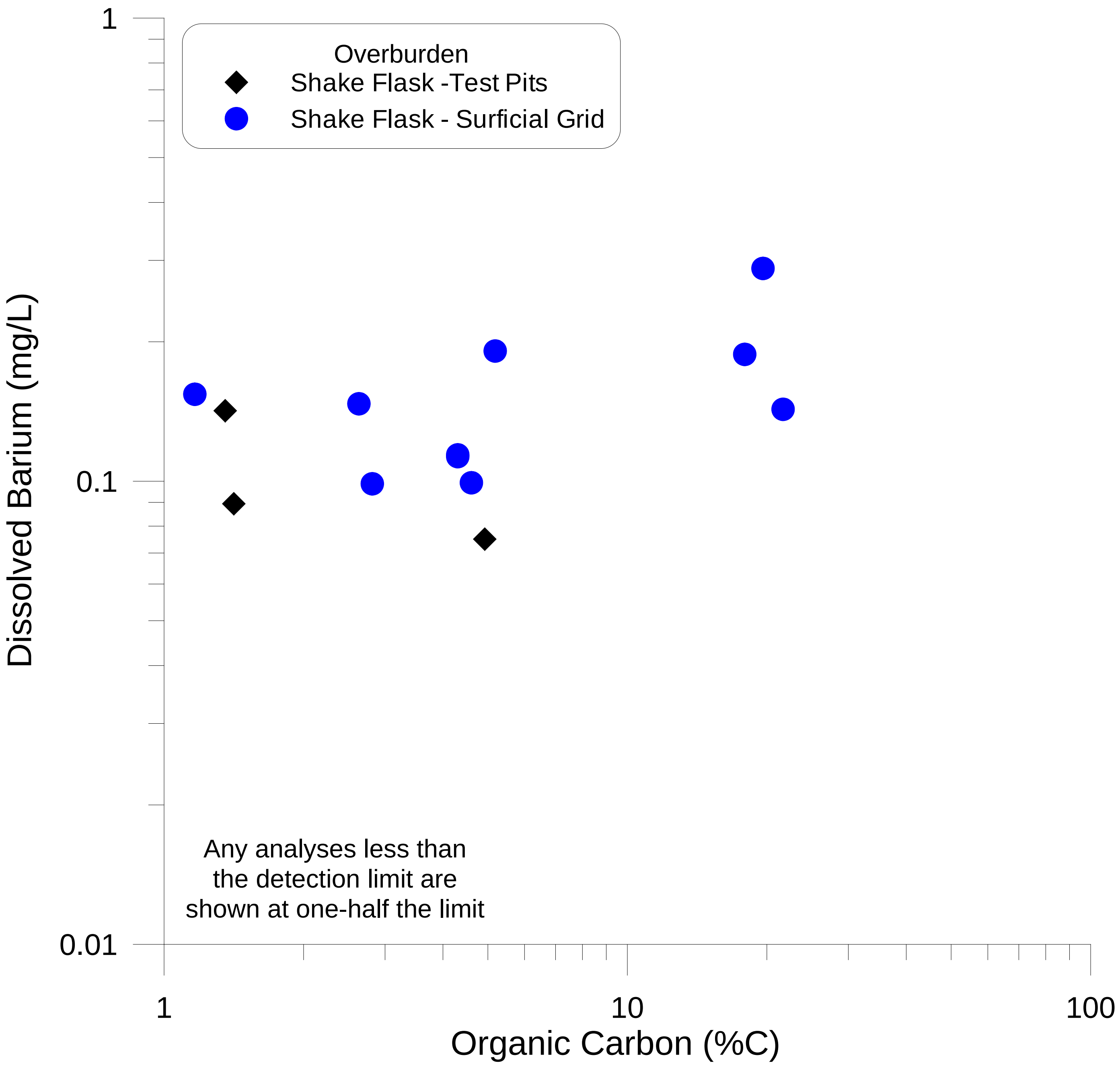

0.1
0.01
Any analyses less than
the detection limit are
shown at one-half the limit
Nitrite (N mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
1
10
100
Organic Carbon (%C)

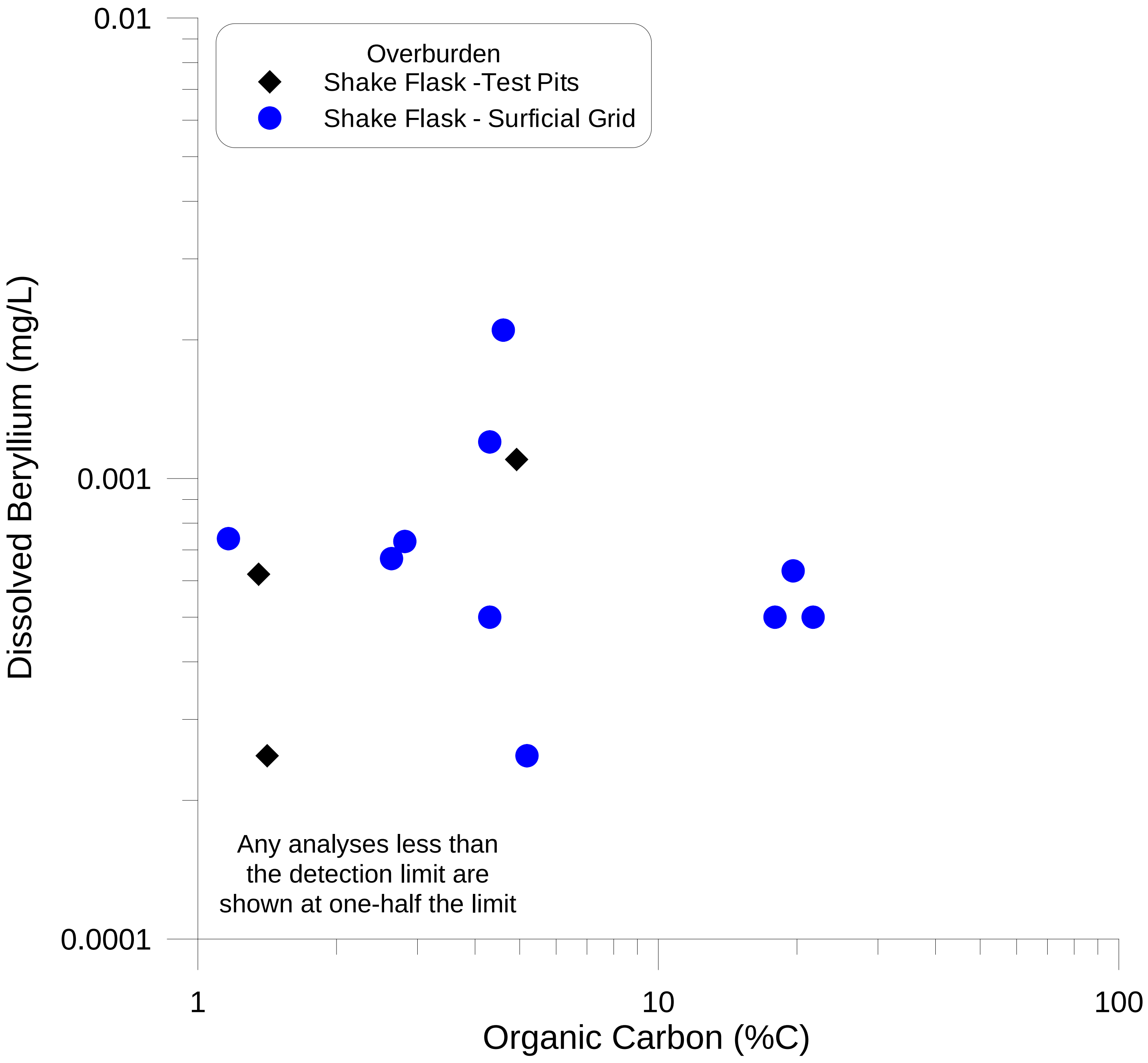

1000
100
1
10
Dissolved Organic Carbon (mg/L)
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid


100
10
1
0.1
Dissolved Aluminum (mg/L)
Any analyses less than
the detection limit are
shown at one-half the limit
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

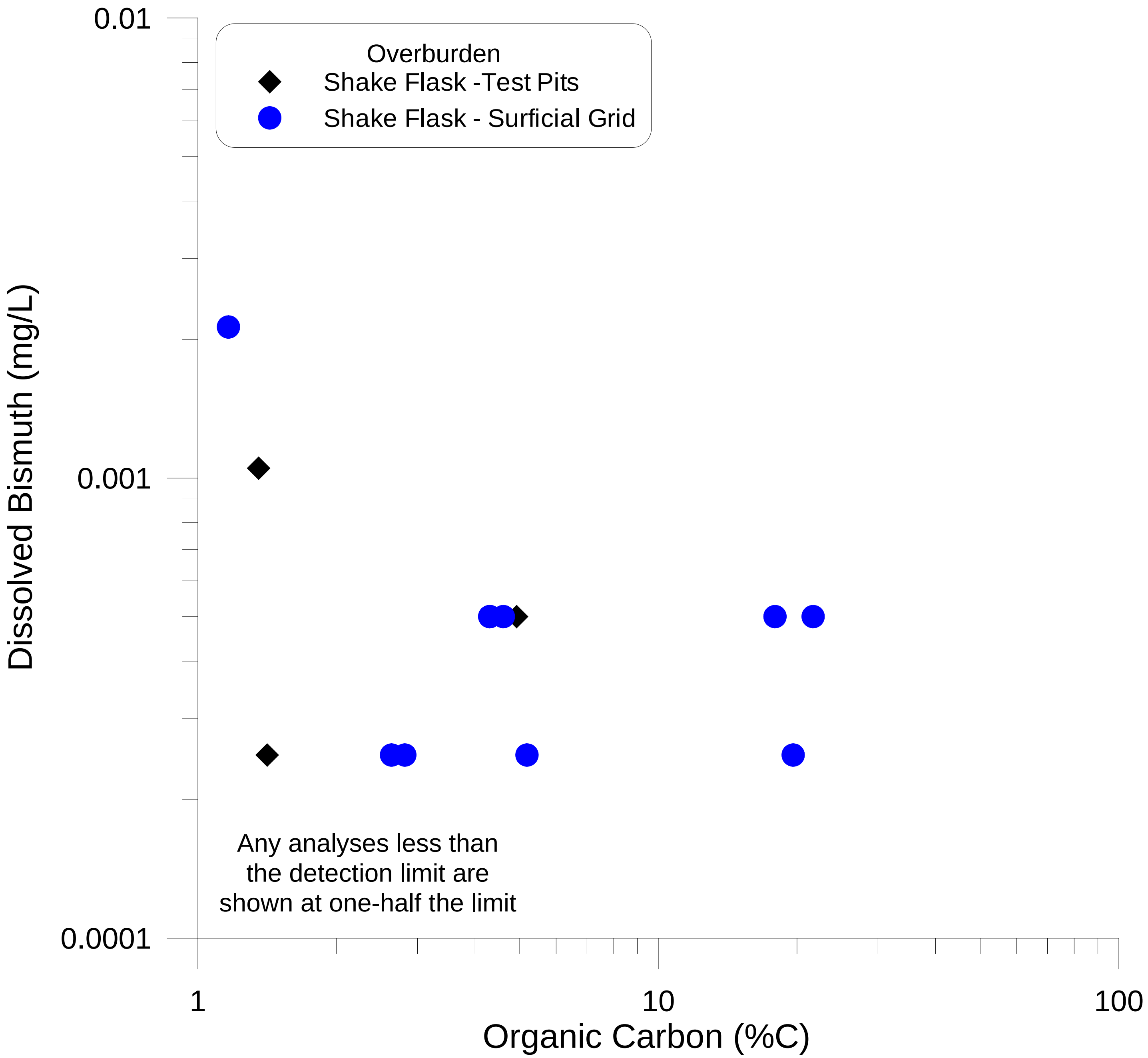

0.01
0.001
0.0001
Dissolved Antimony (mg/L)
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

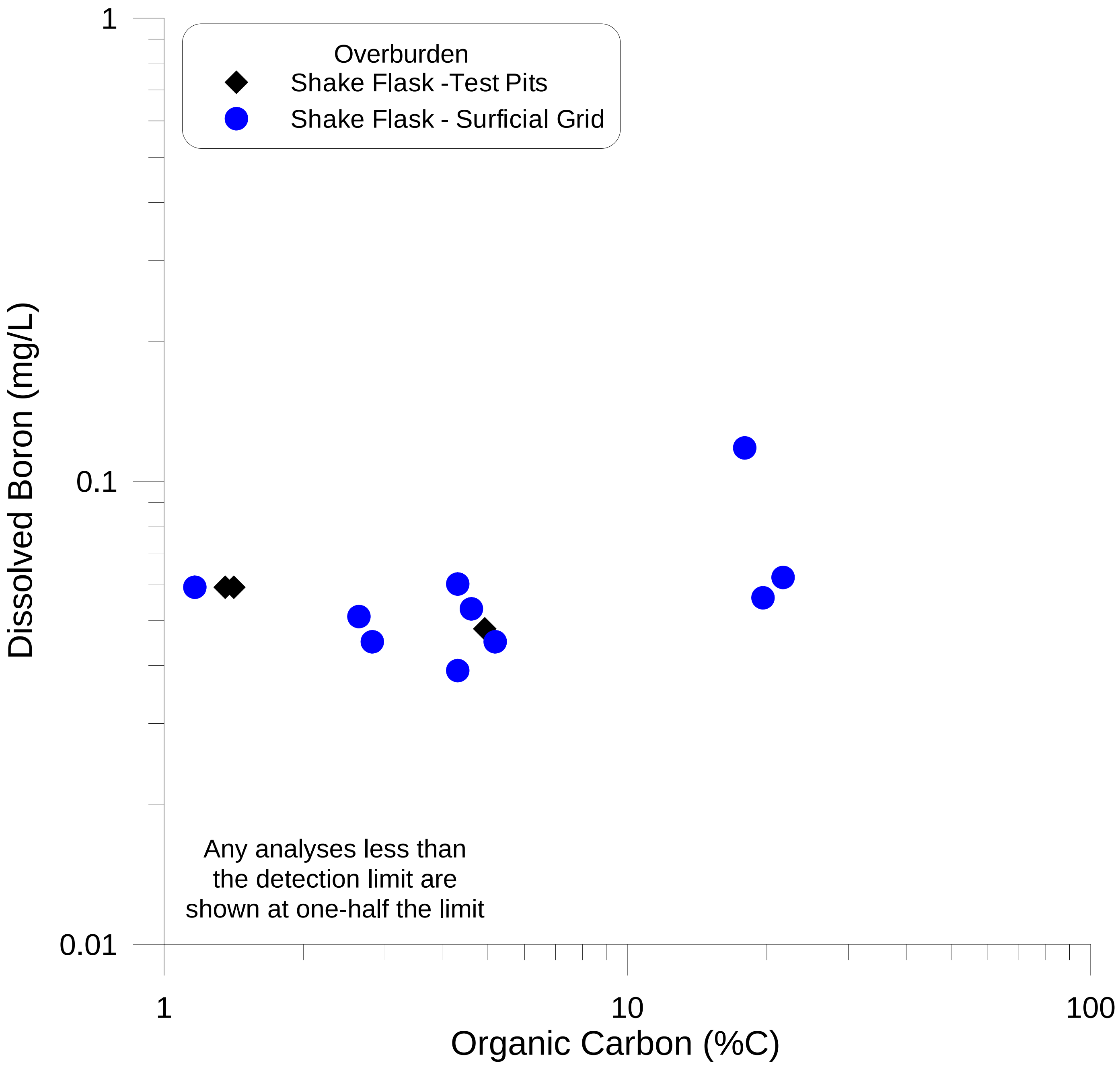

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
0.1
0.01
0.001
Dissolved Arsenic (mg/L)
1
10
100
Organic Carbon (%C)

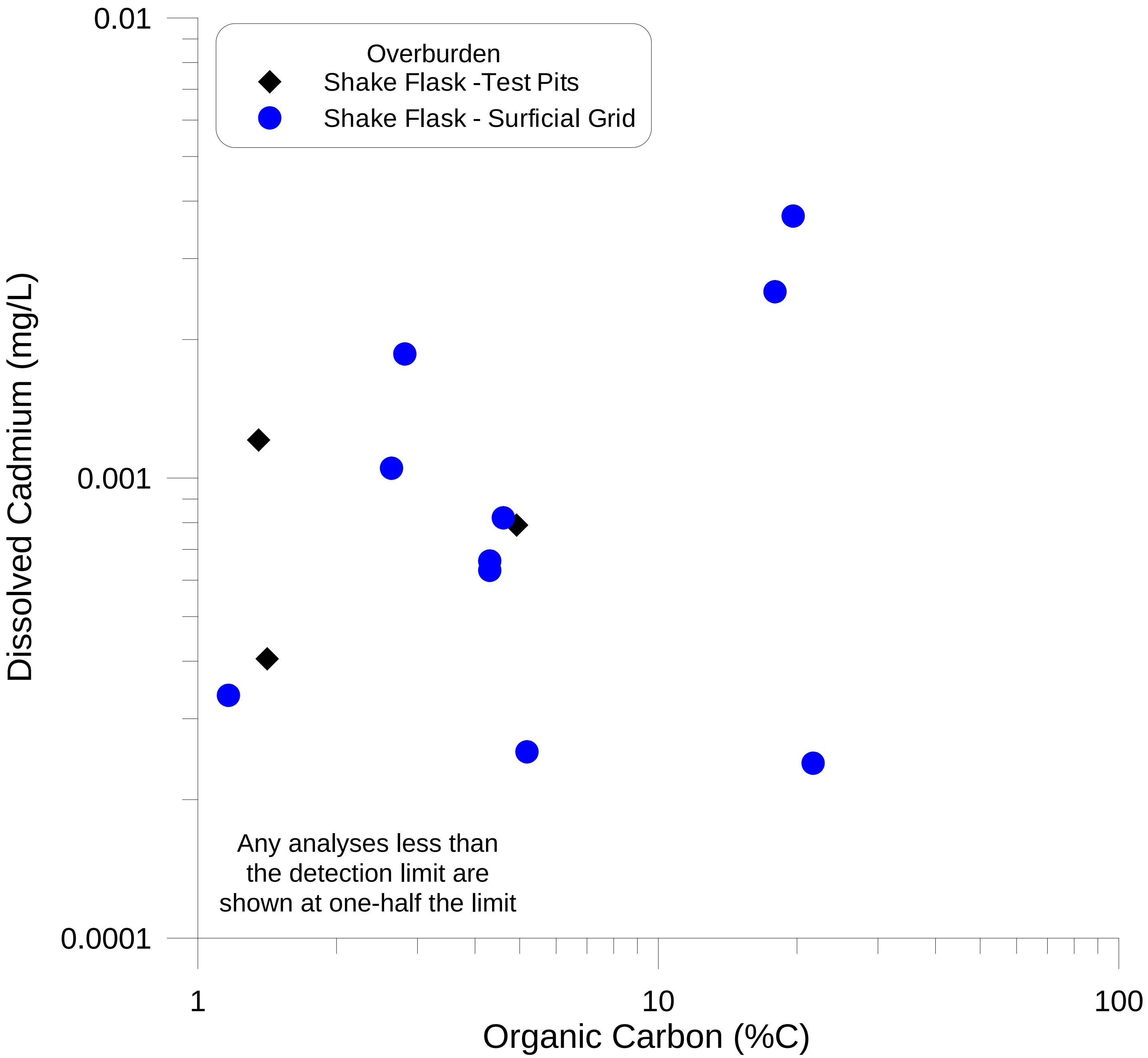

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Barium (mg/L)
1
0.1
0.01
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit

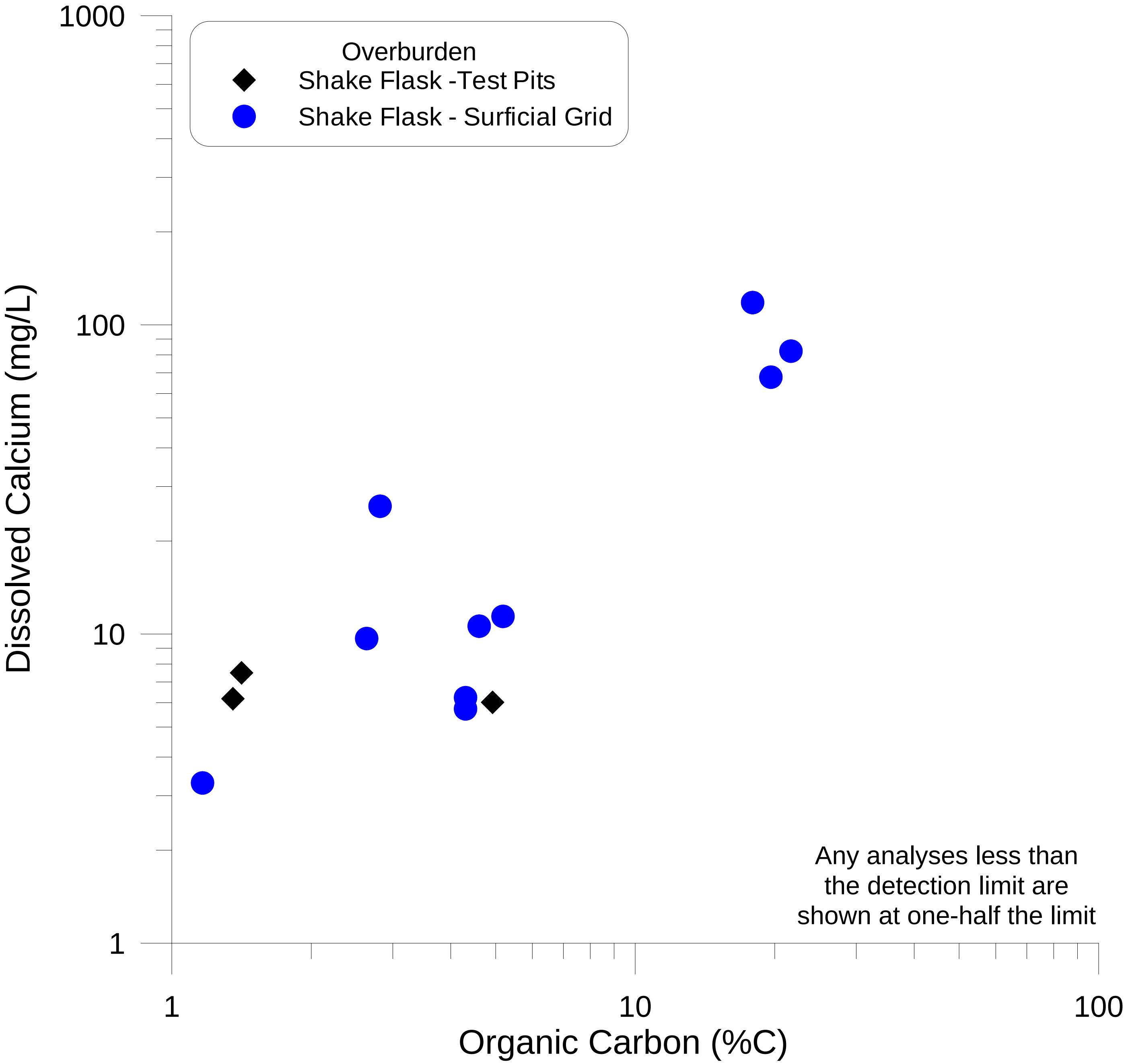


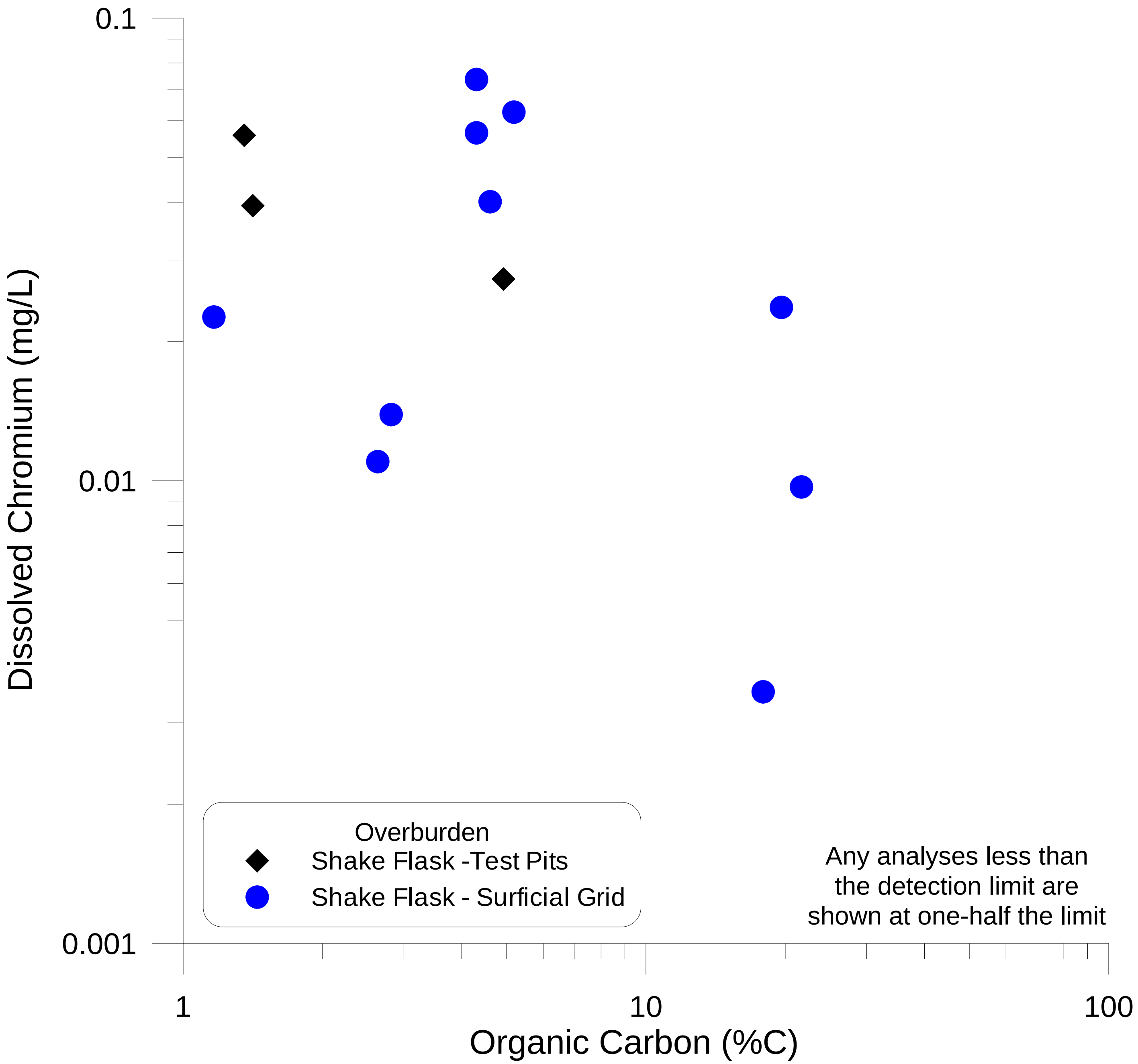
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
Dissolved Beryllium (mg/L)
0.01
0.001
0.0001
1
10
100
Organic Carbon (%C)

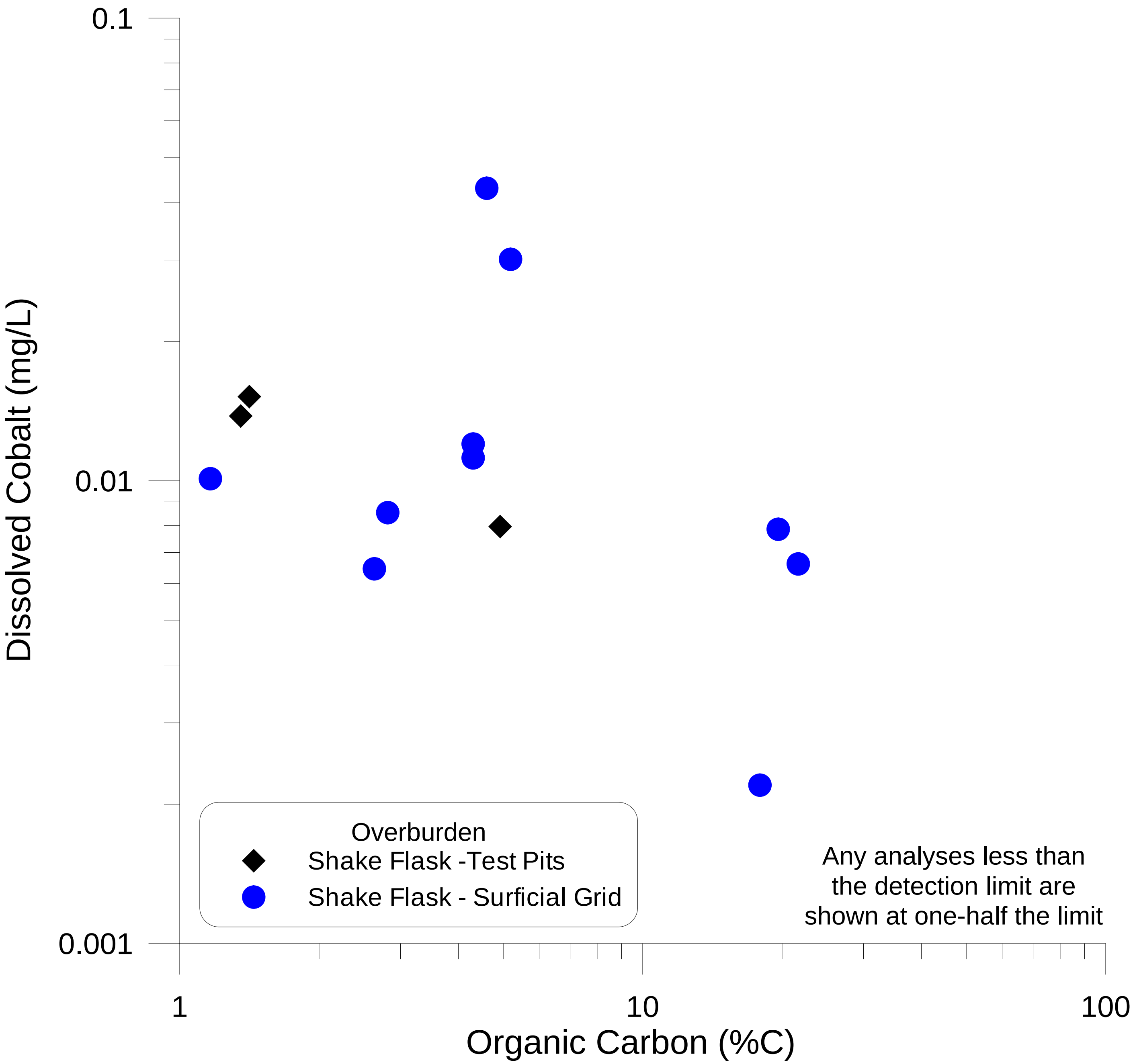

0.01
0.001
0.0001
Dissolved Bismuth (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

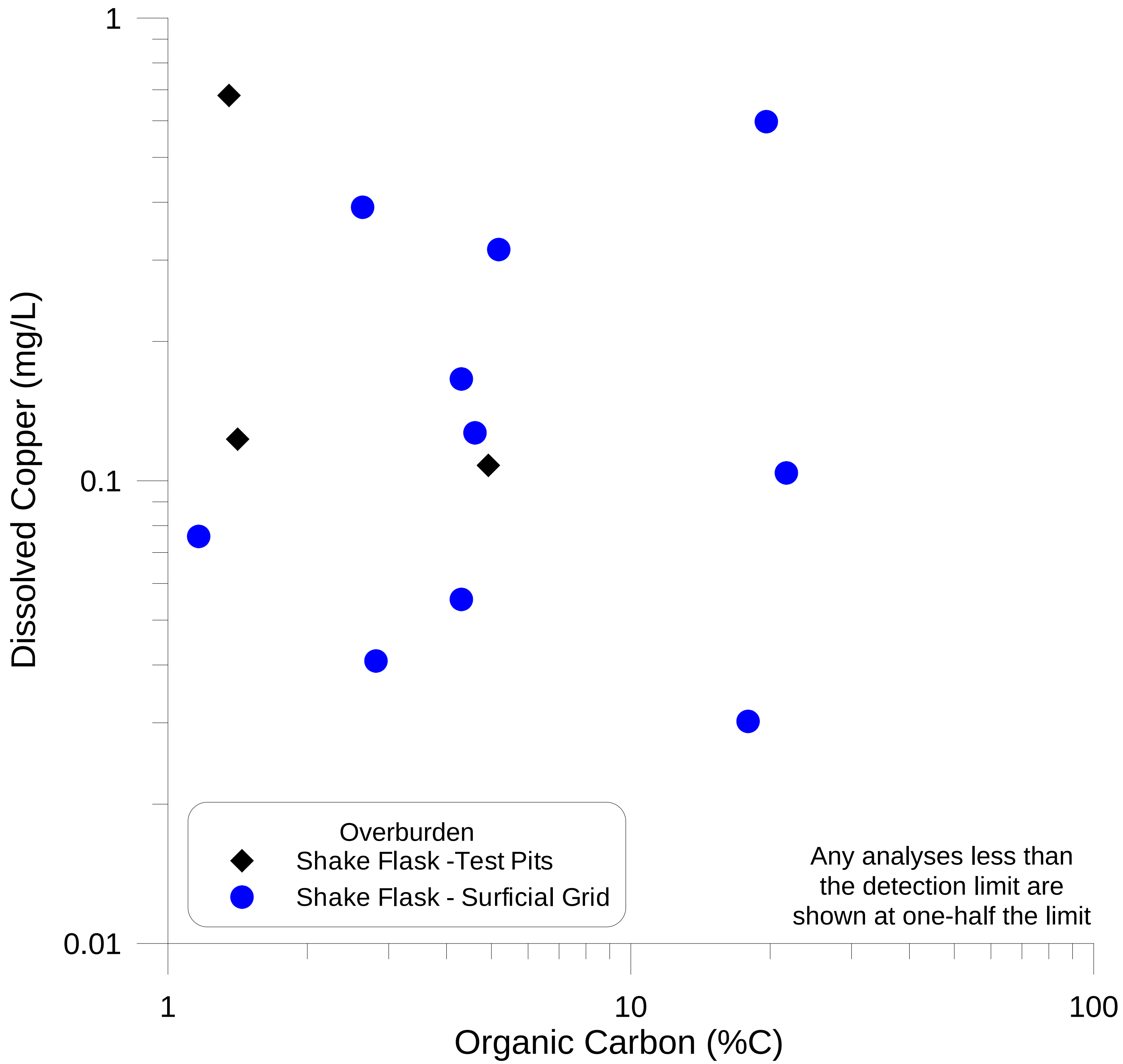

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit
Dissolved Boron (mg/L)
1
0.1
0.01
1
10
100
Organic Carbon (%C)


0.01
0.001
0.0001
Dissolved Cadmium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

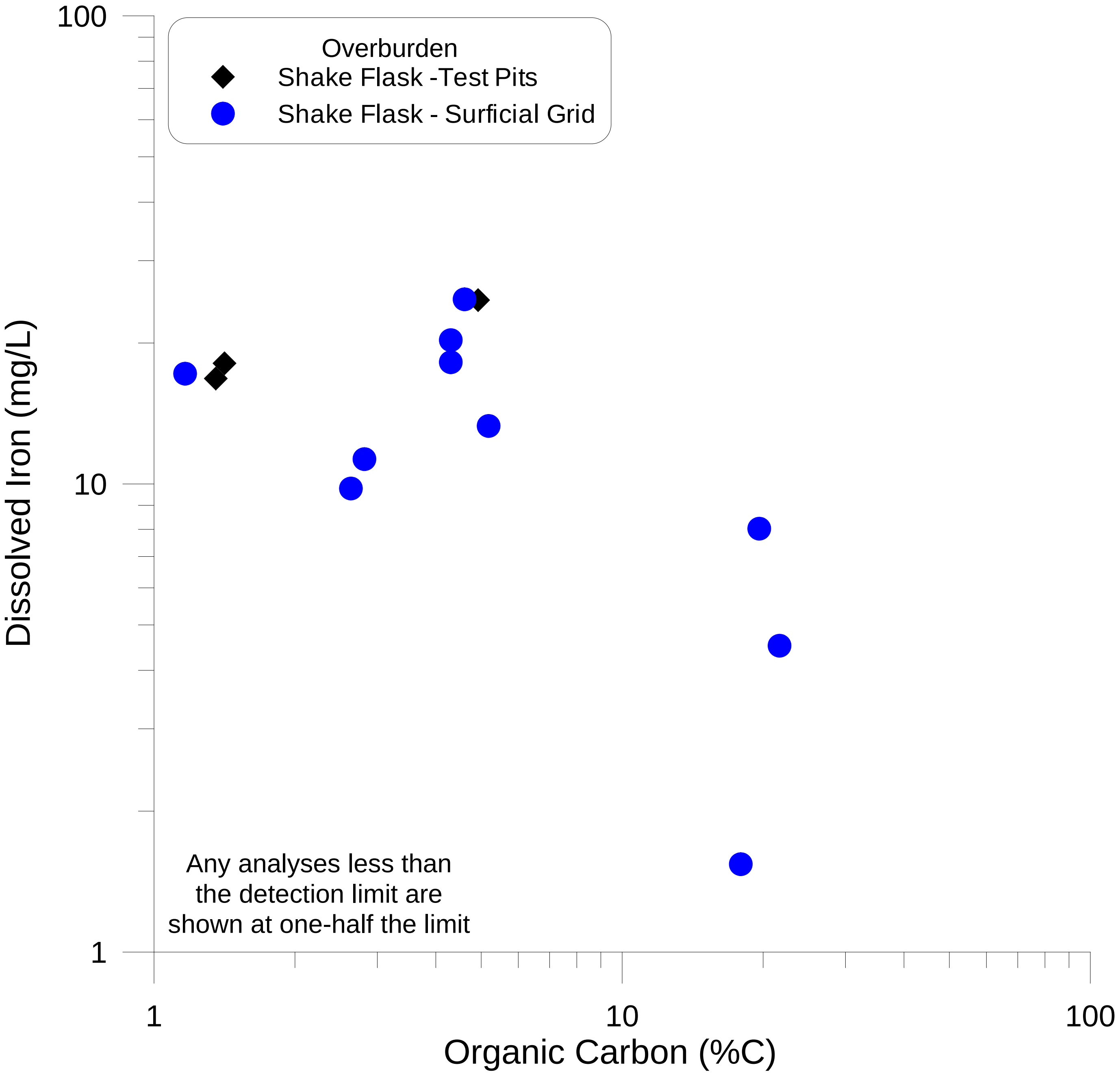

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Calcium (mg/L)
1000
100
10
1
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit

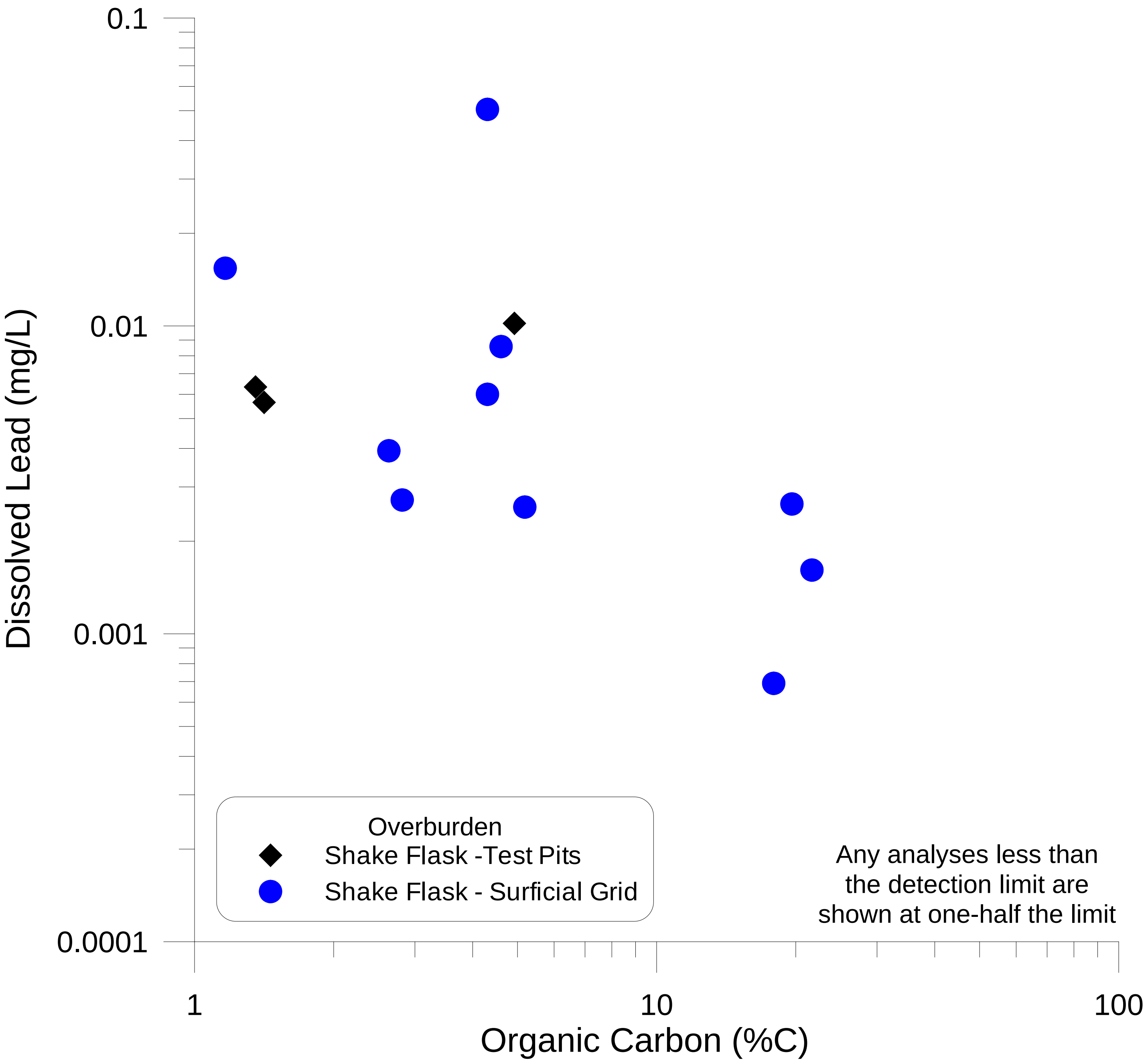

0.1
0.01
0.001
Dissolved Chromium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

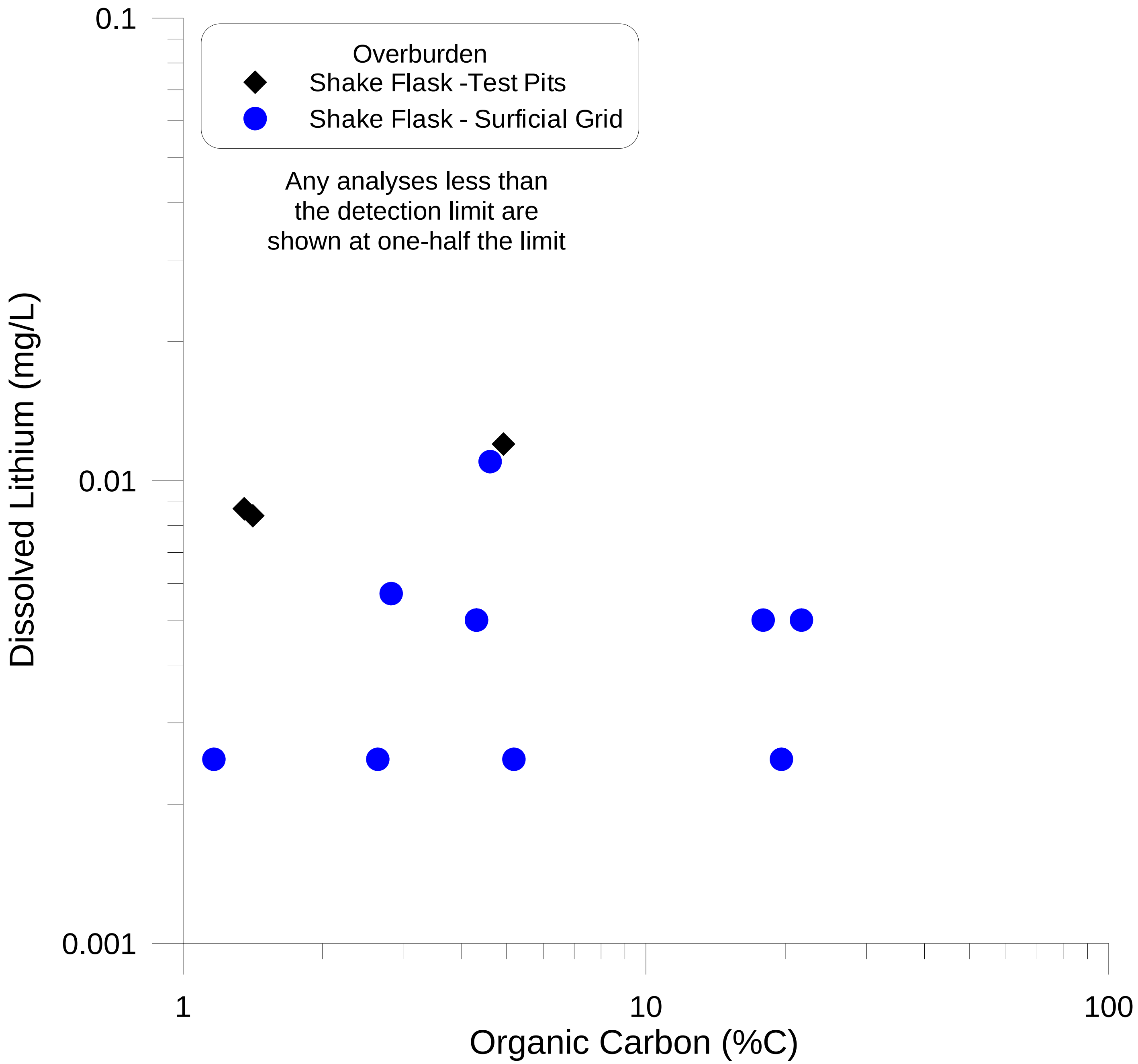

0.1
0.01
0.001
Dissolved Cobalt (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

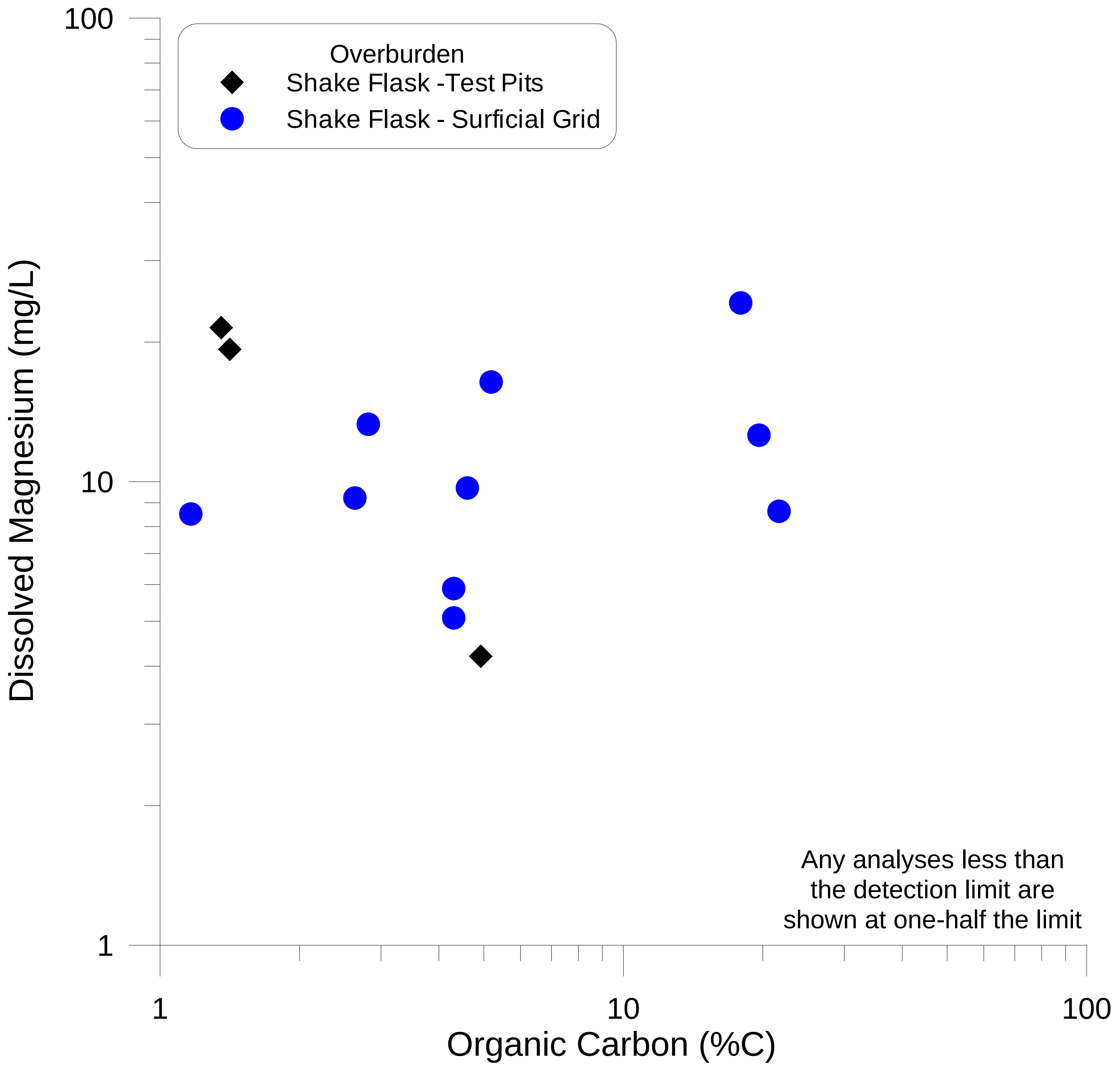


1
0.1
0.01
Dissolved Copper (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit

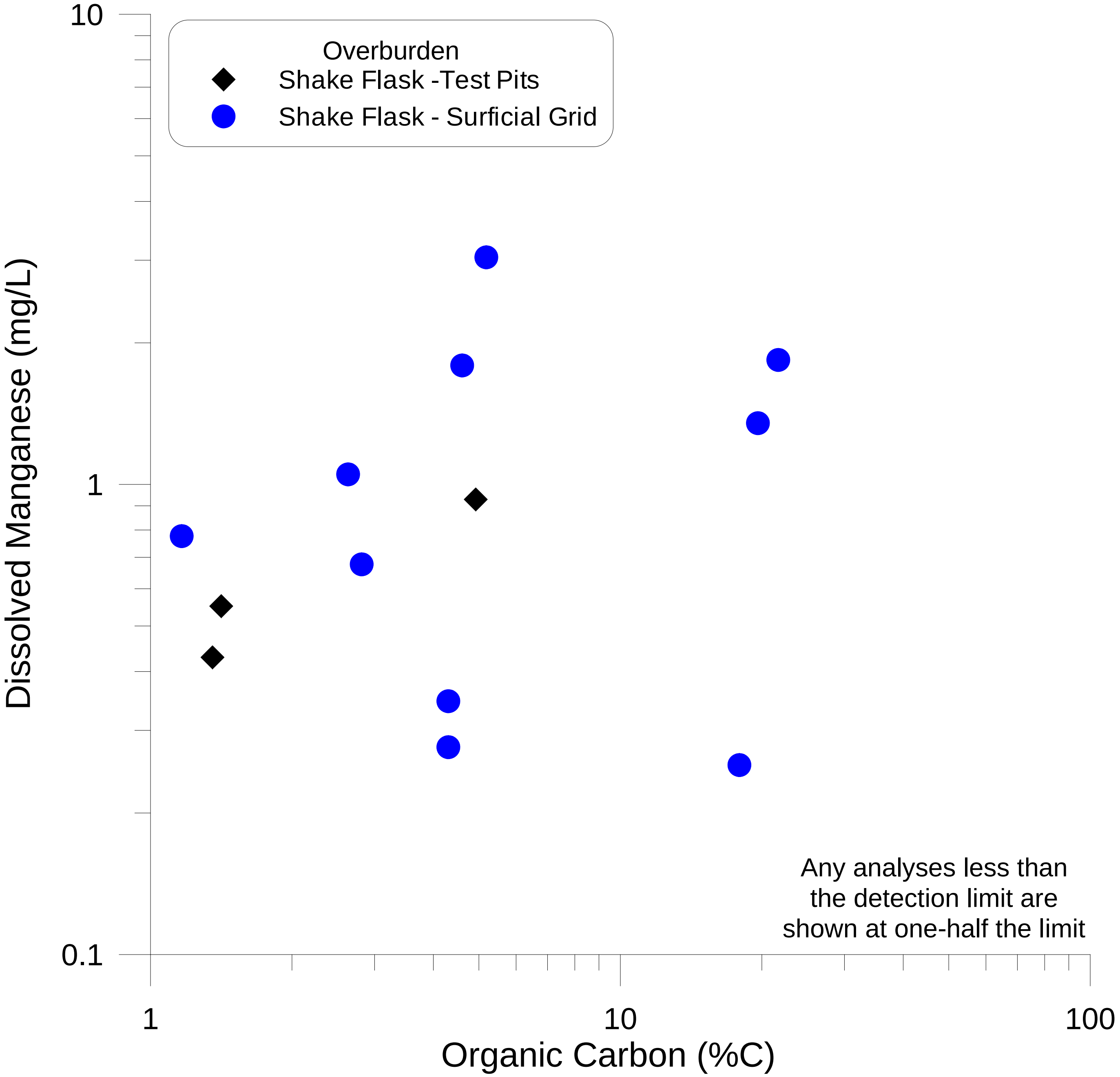

100
10
1
1
10
100
Dissolved Iron (mg/L)
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

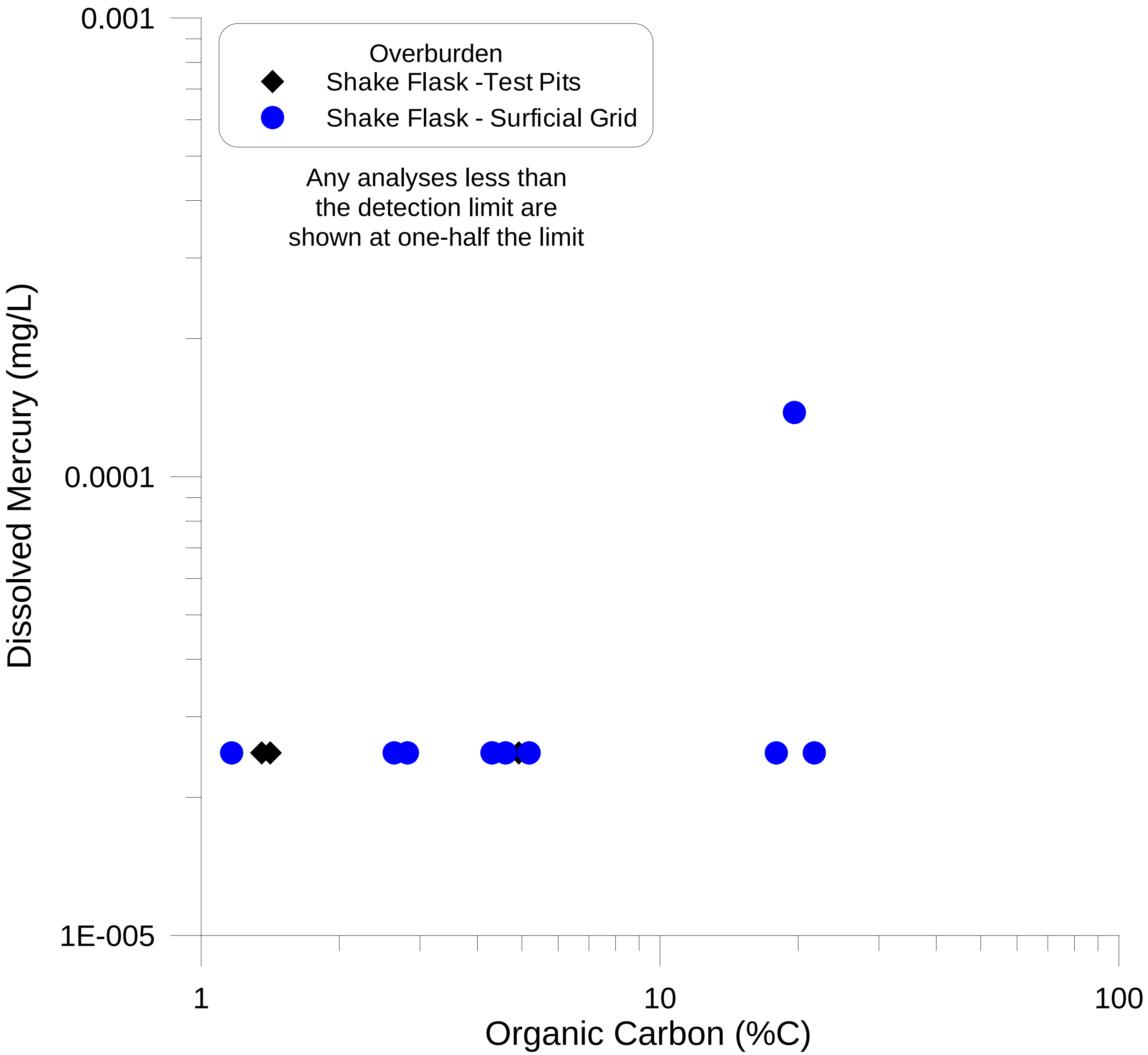

Dissolved Lead (mg/L)
0.1
0.01
0.001
0.0001
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

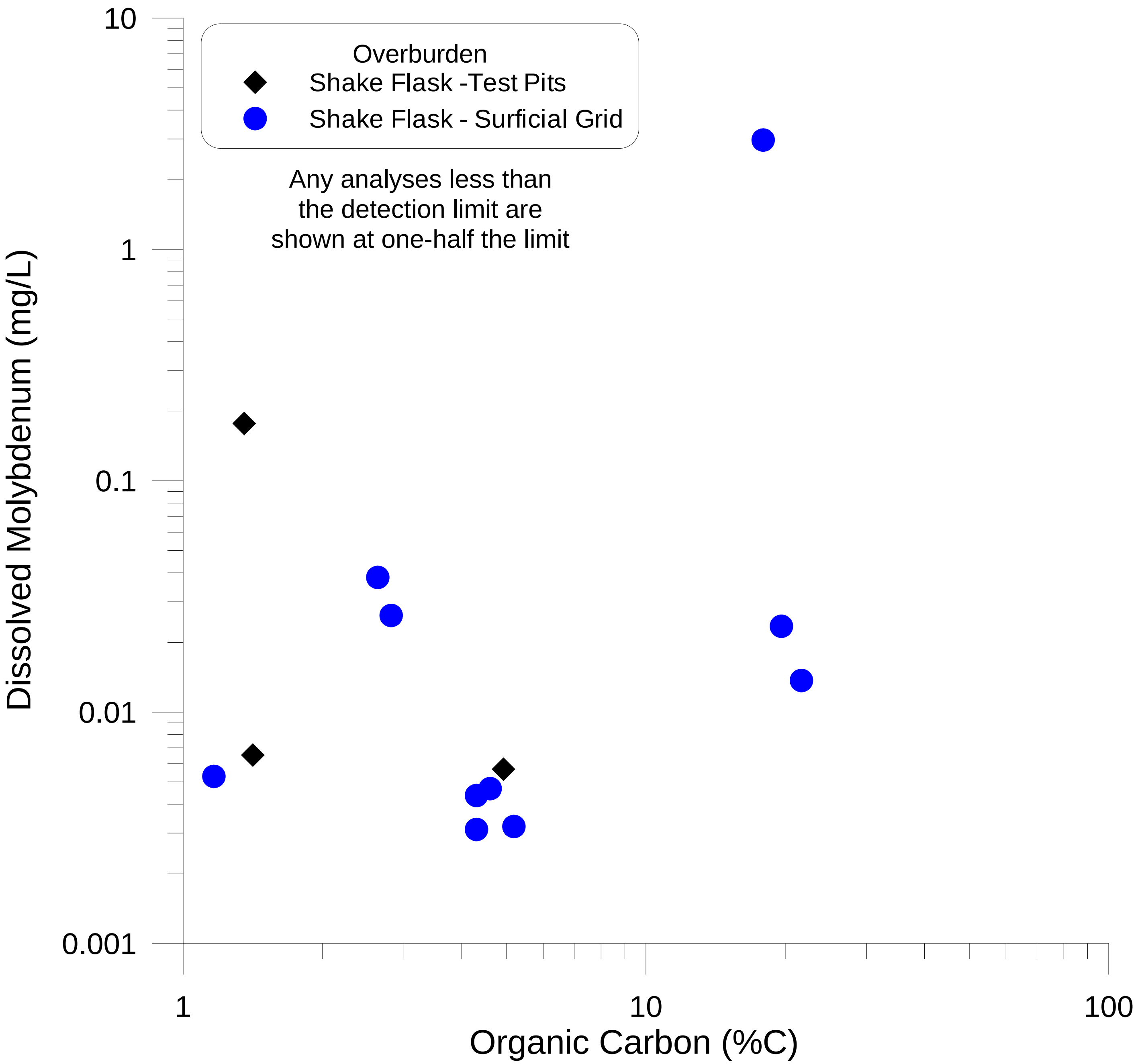

0.1
0.01
0.001
Dissolved Lithium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

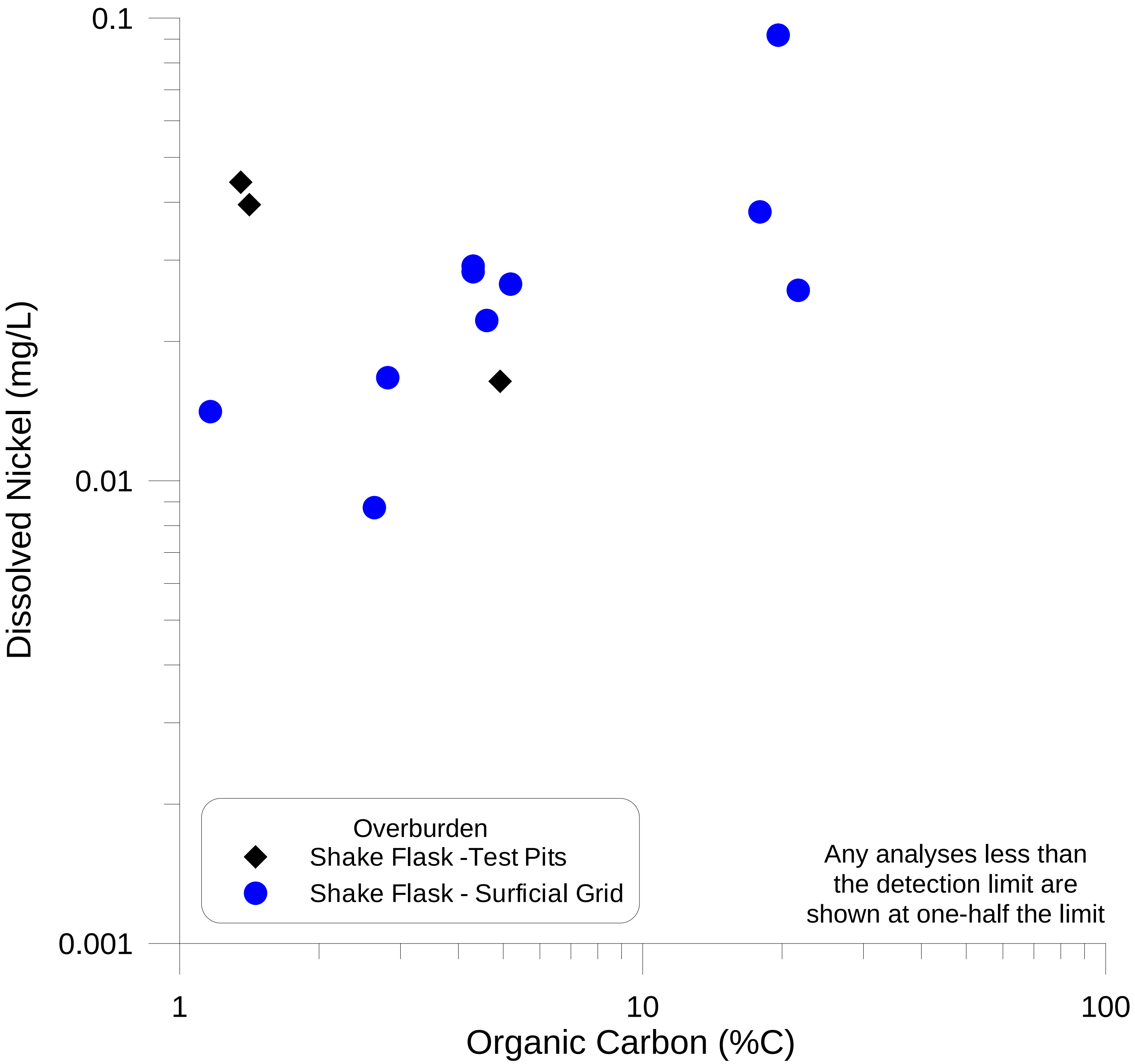


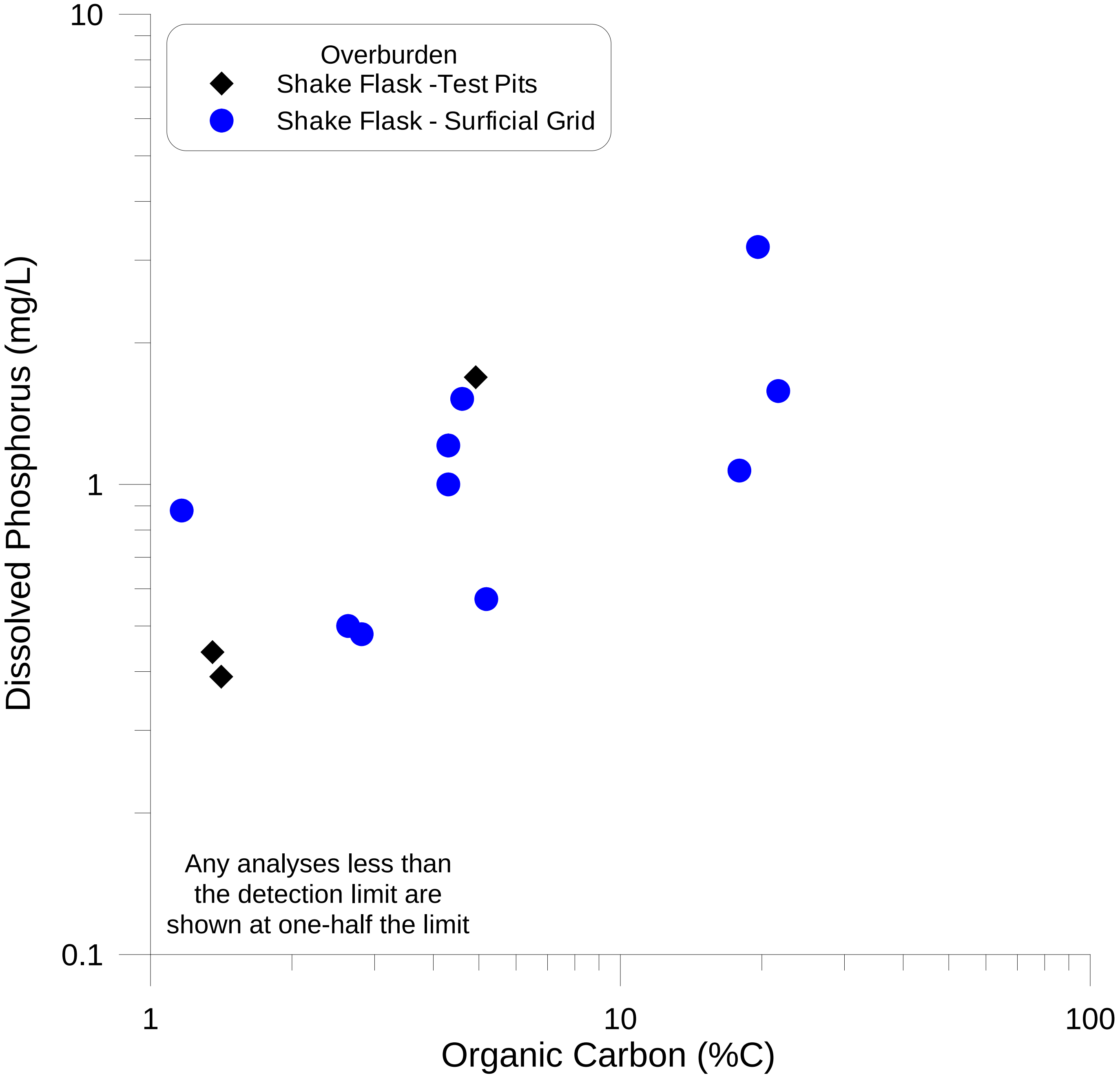
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Magnesium (mg/L)
100
10
1
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit

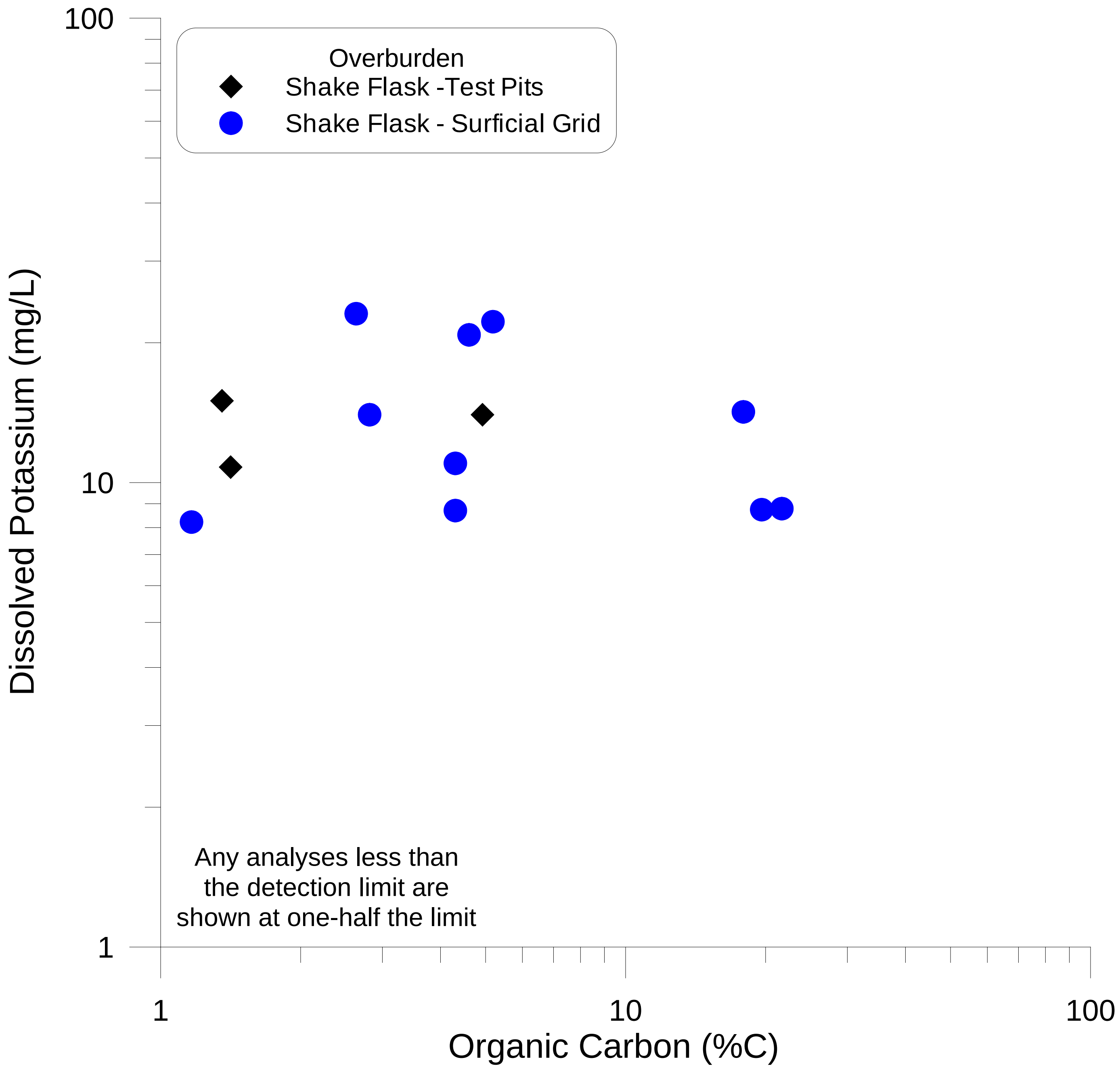

10
1
0.1
Dissolved Manganese (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

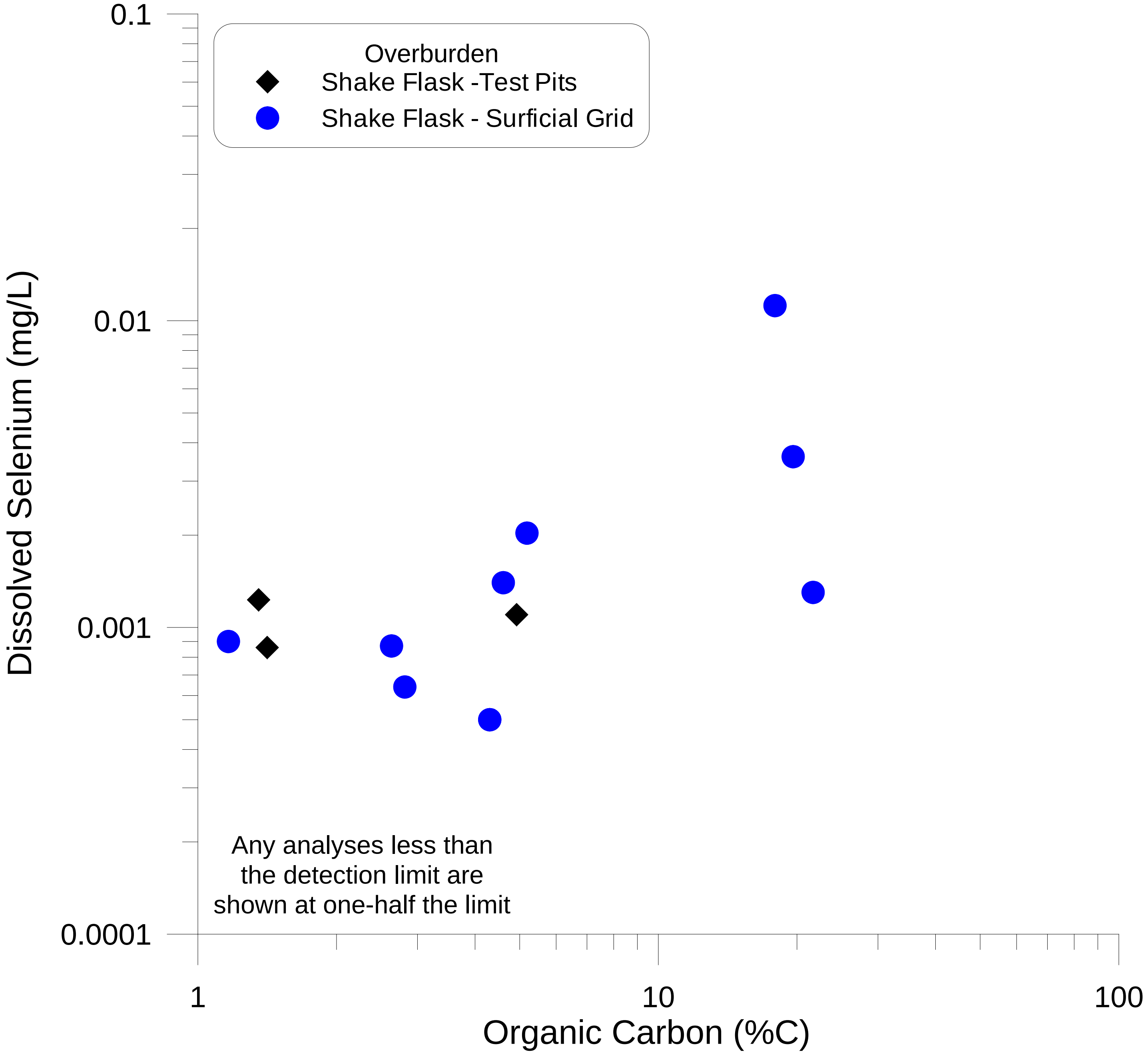

0.001
0.0001
1E-005
Dissolved Mercury (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

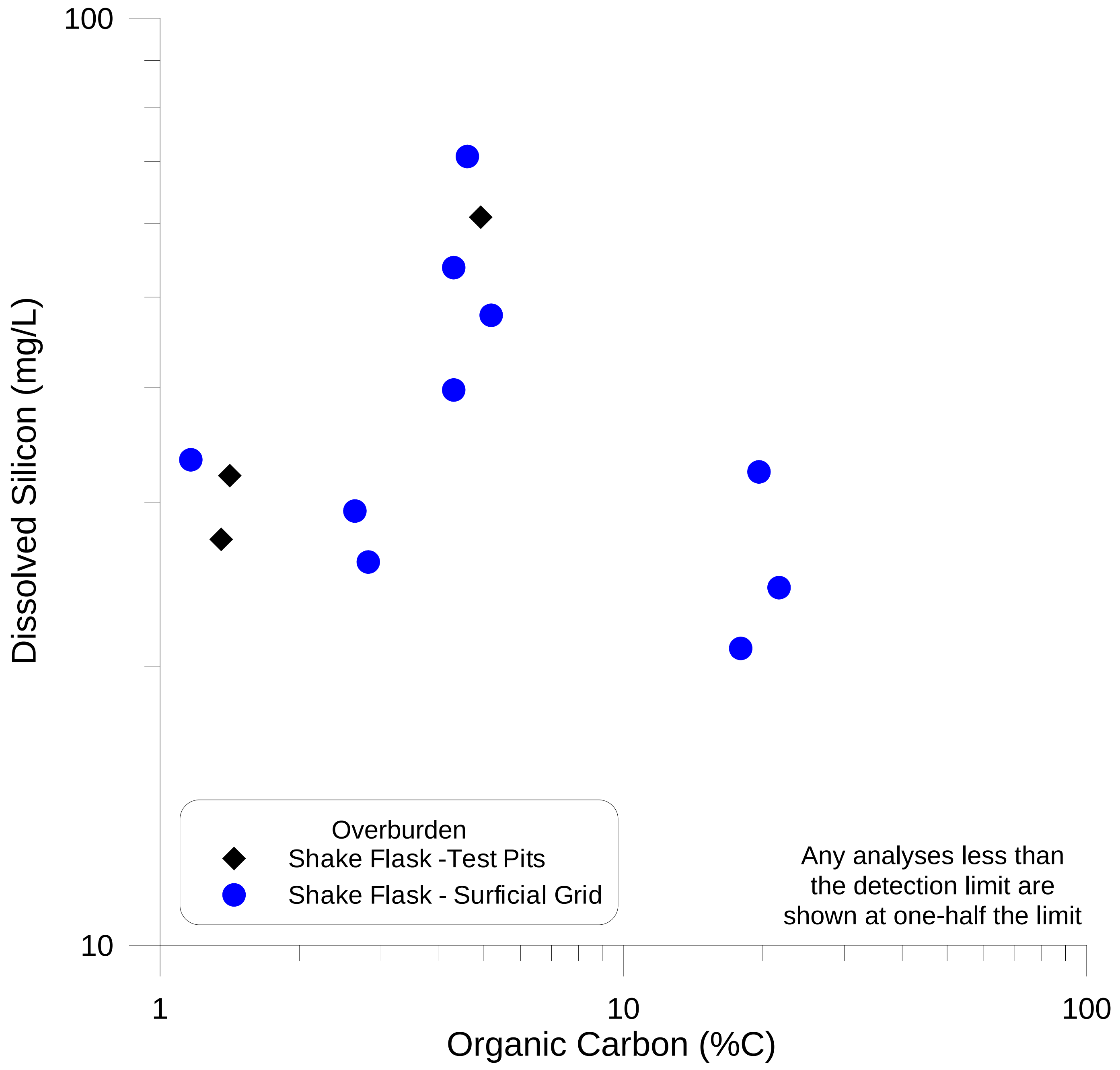

10
1
0.1
0.01
0.001
Dissolved Molybdenum (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

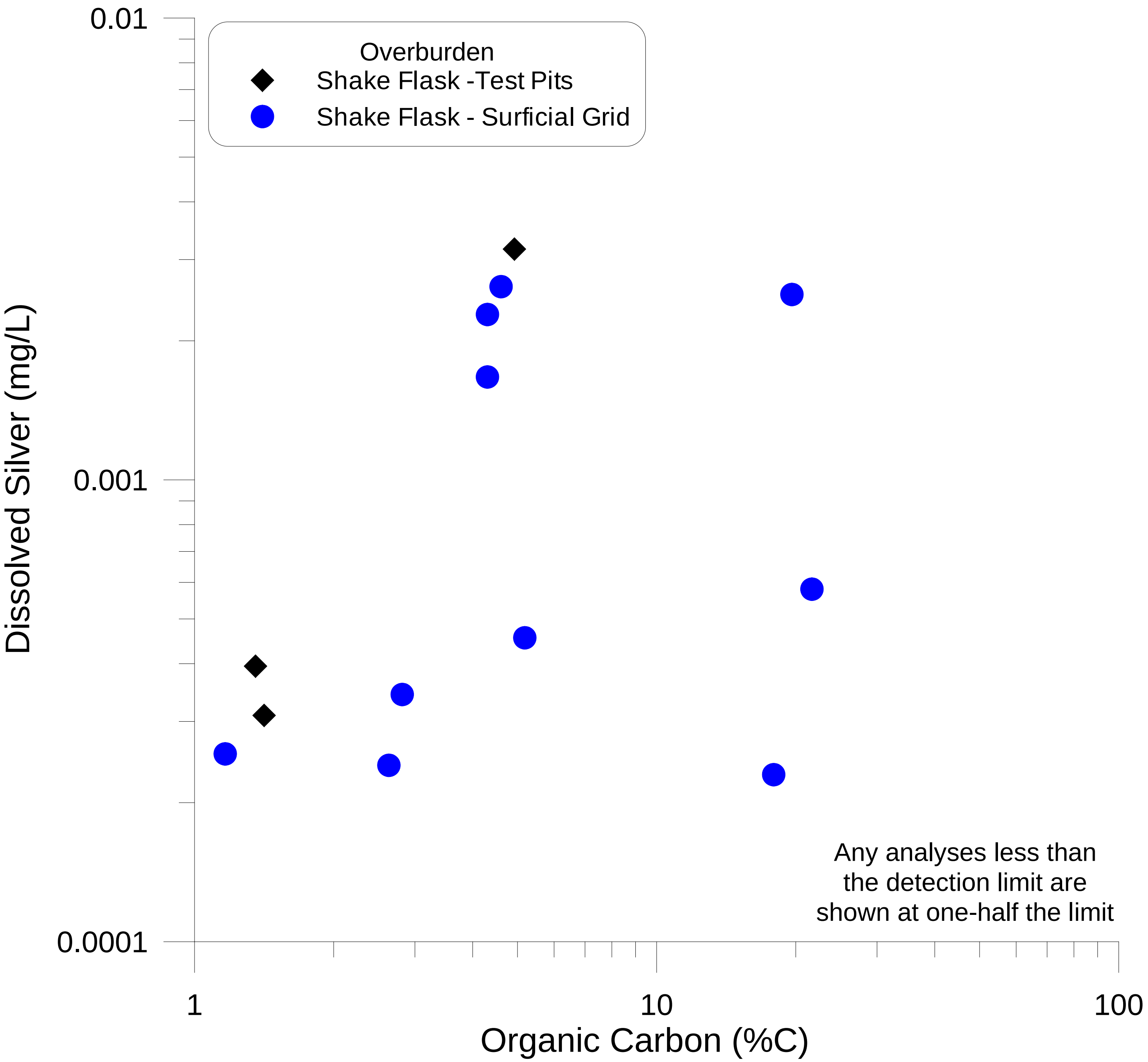

0.1
0.01
0.001
Dissolved Nickel (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

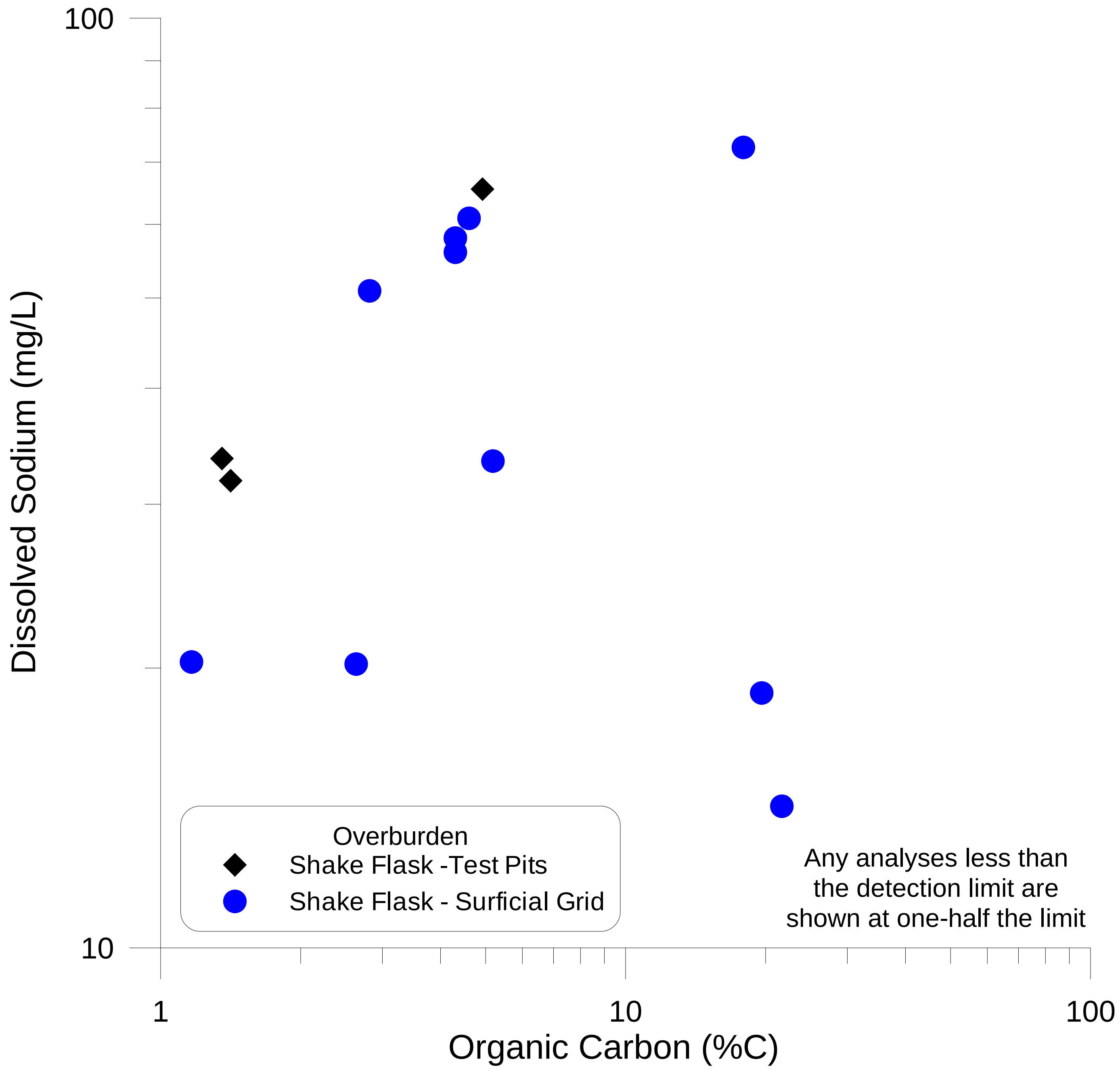

10
1
0.1
Dissolved Phosphorus (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
100
10
1
1
10
100
Dissolved Potassium (mg/L)
Organic Carbon (%C)

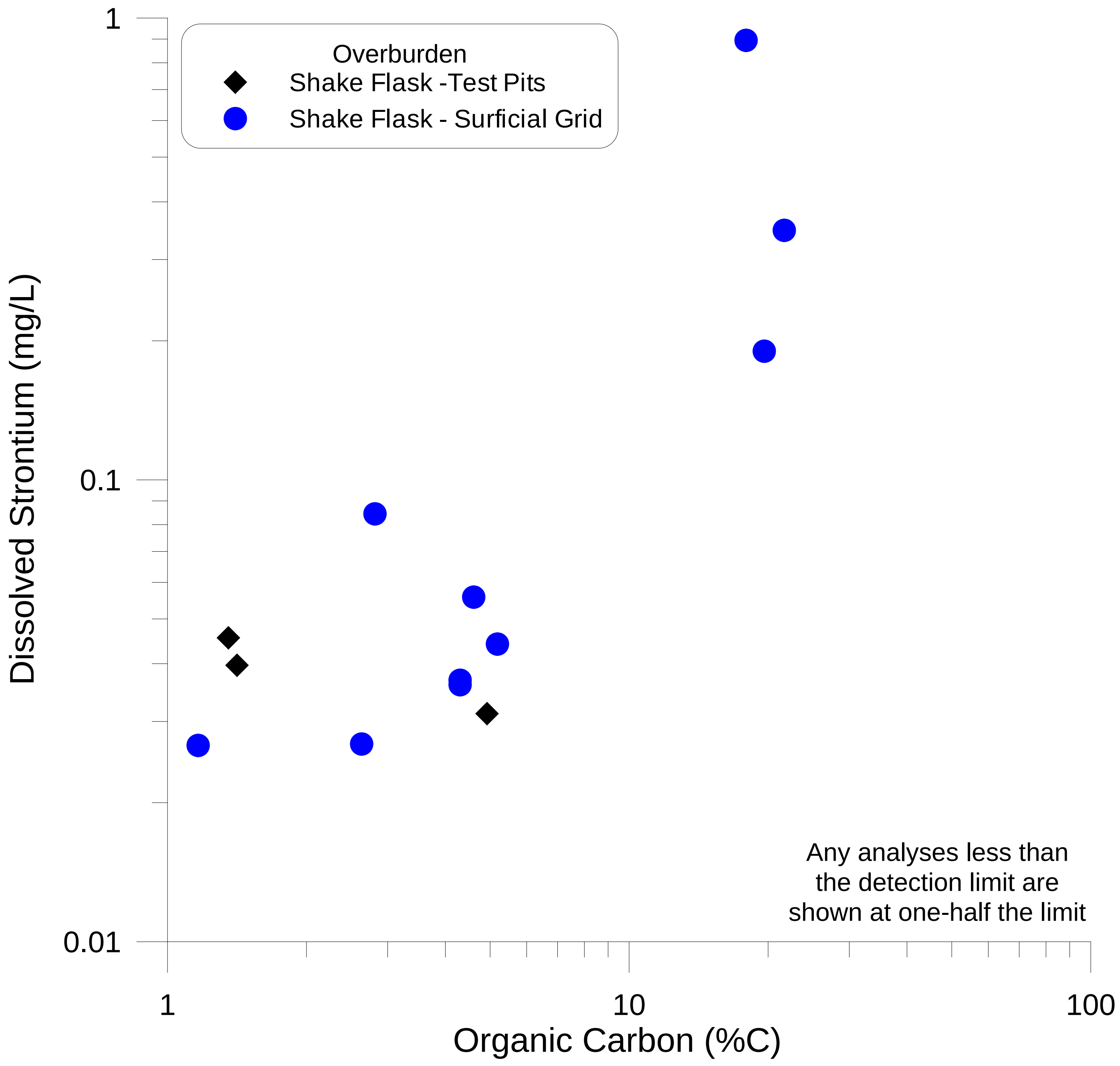

0.1
0.01
0.001
0.0001
Dissolved Selenium (mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
1
10
100
Organic Carbon (%C)

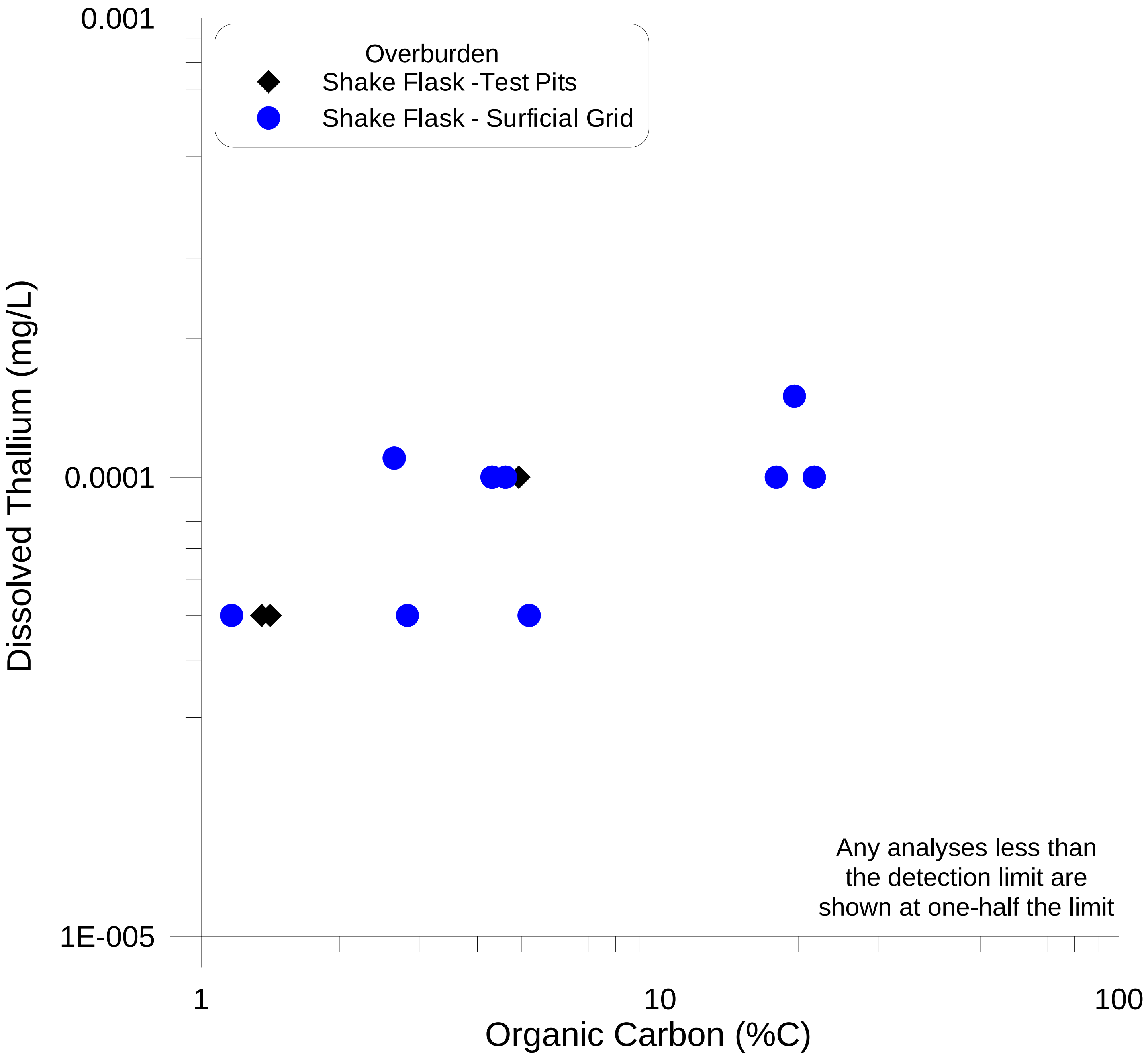

100
10
1
10
100
Dissolved Silicon (mg/L)
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

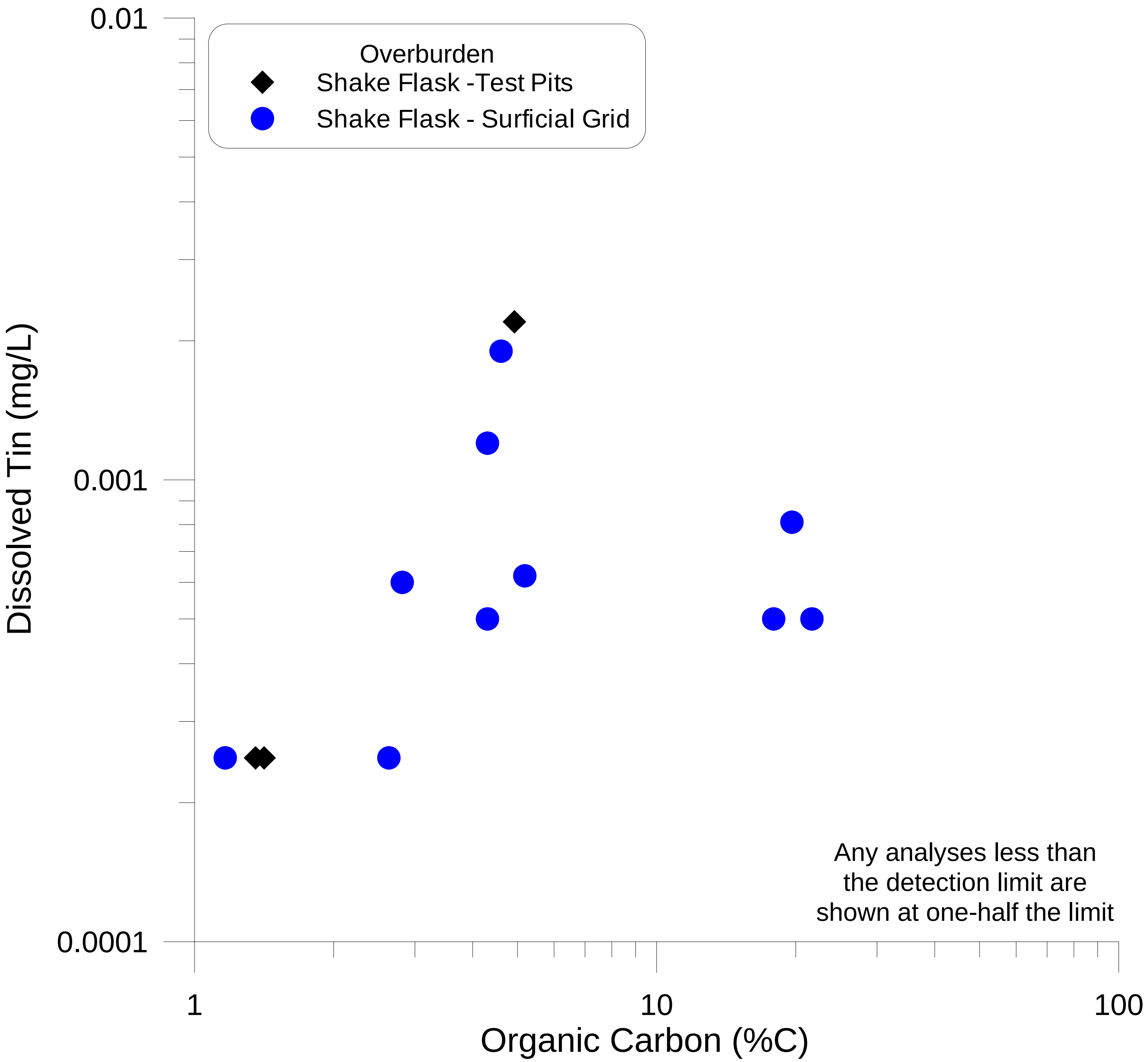

0.01
0.001
0.0001
Dissolved Silver (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

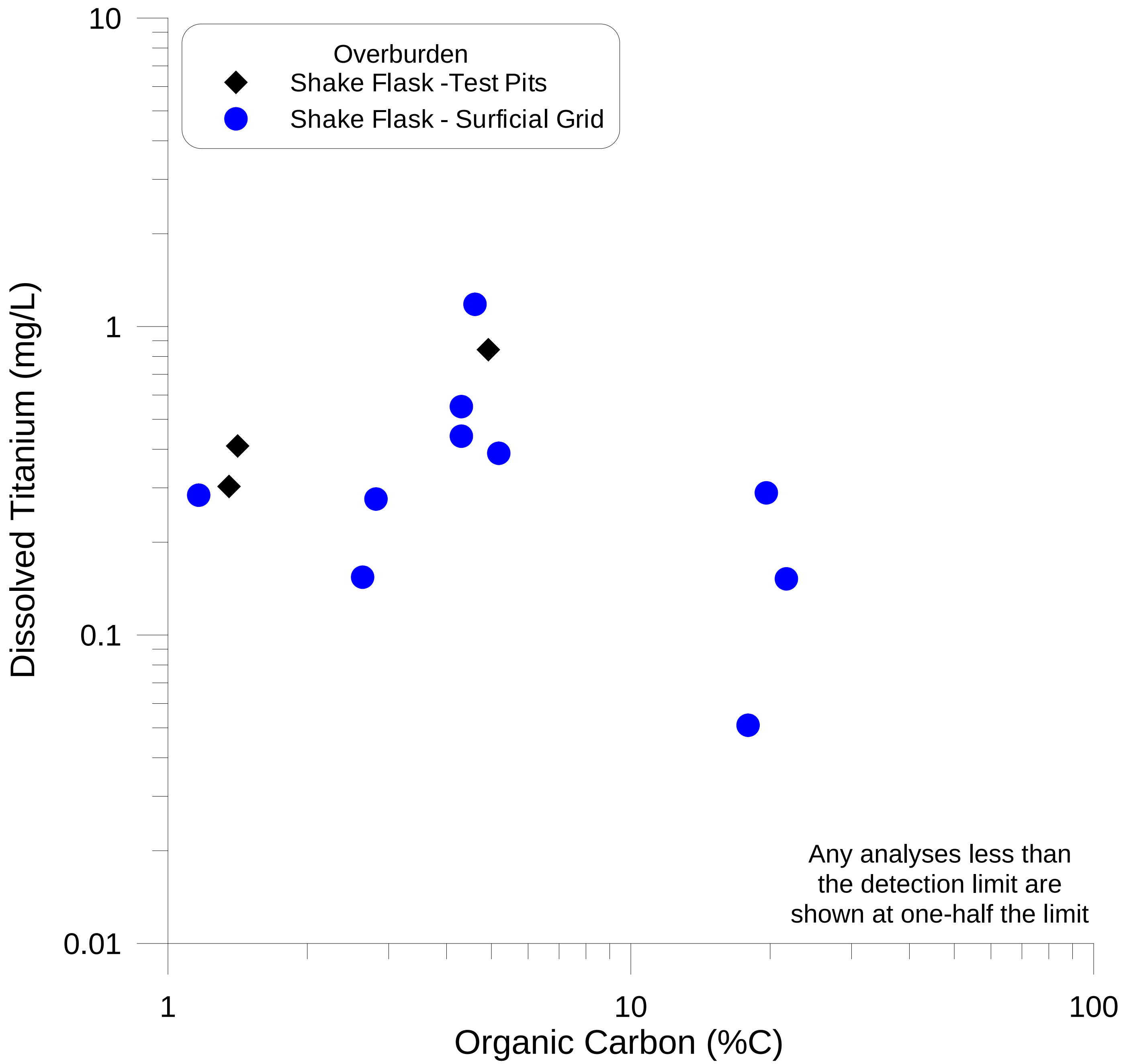


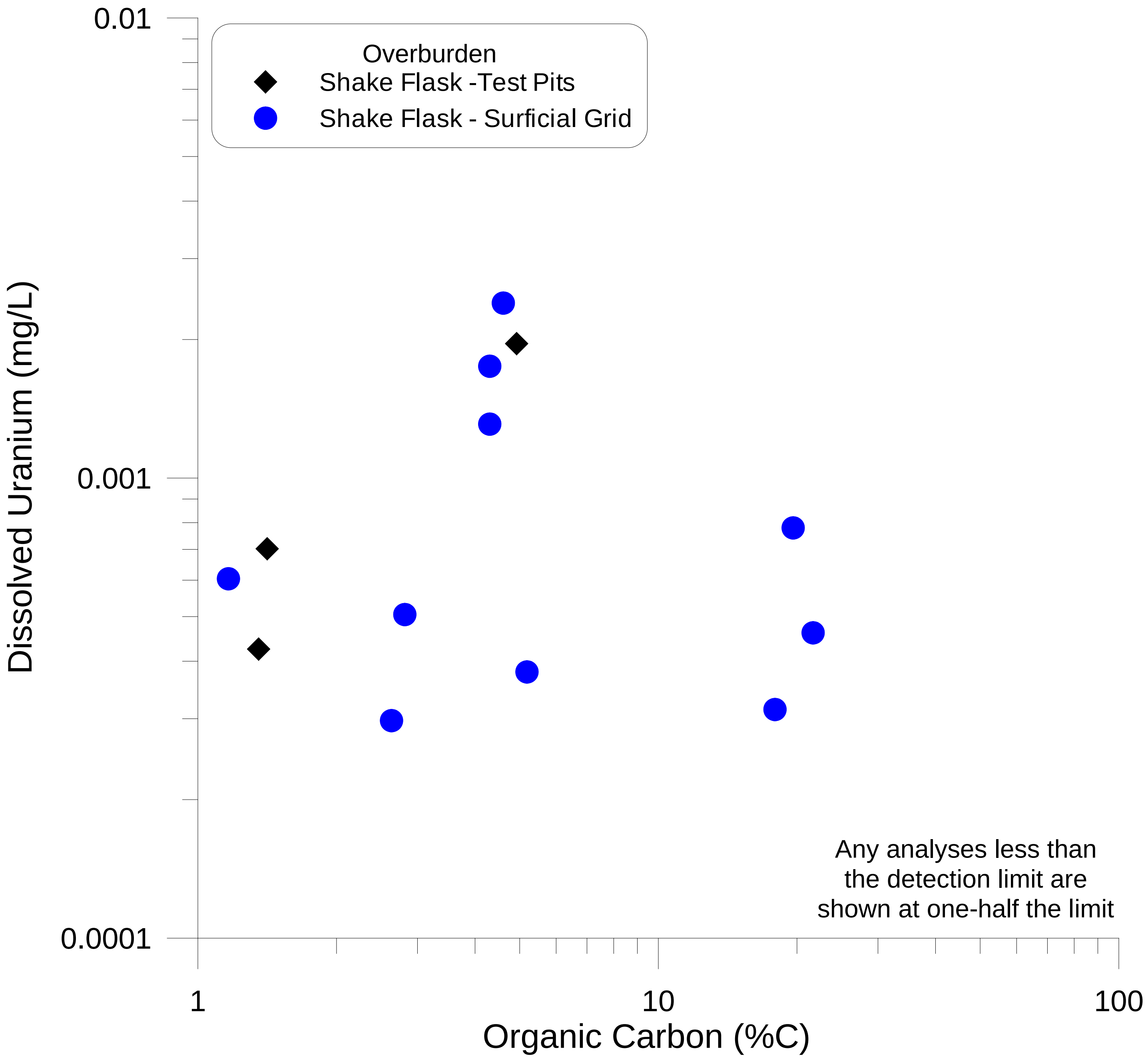
100
10
1
10
100
Dissolved Sodium (mg/L)
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

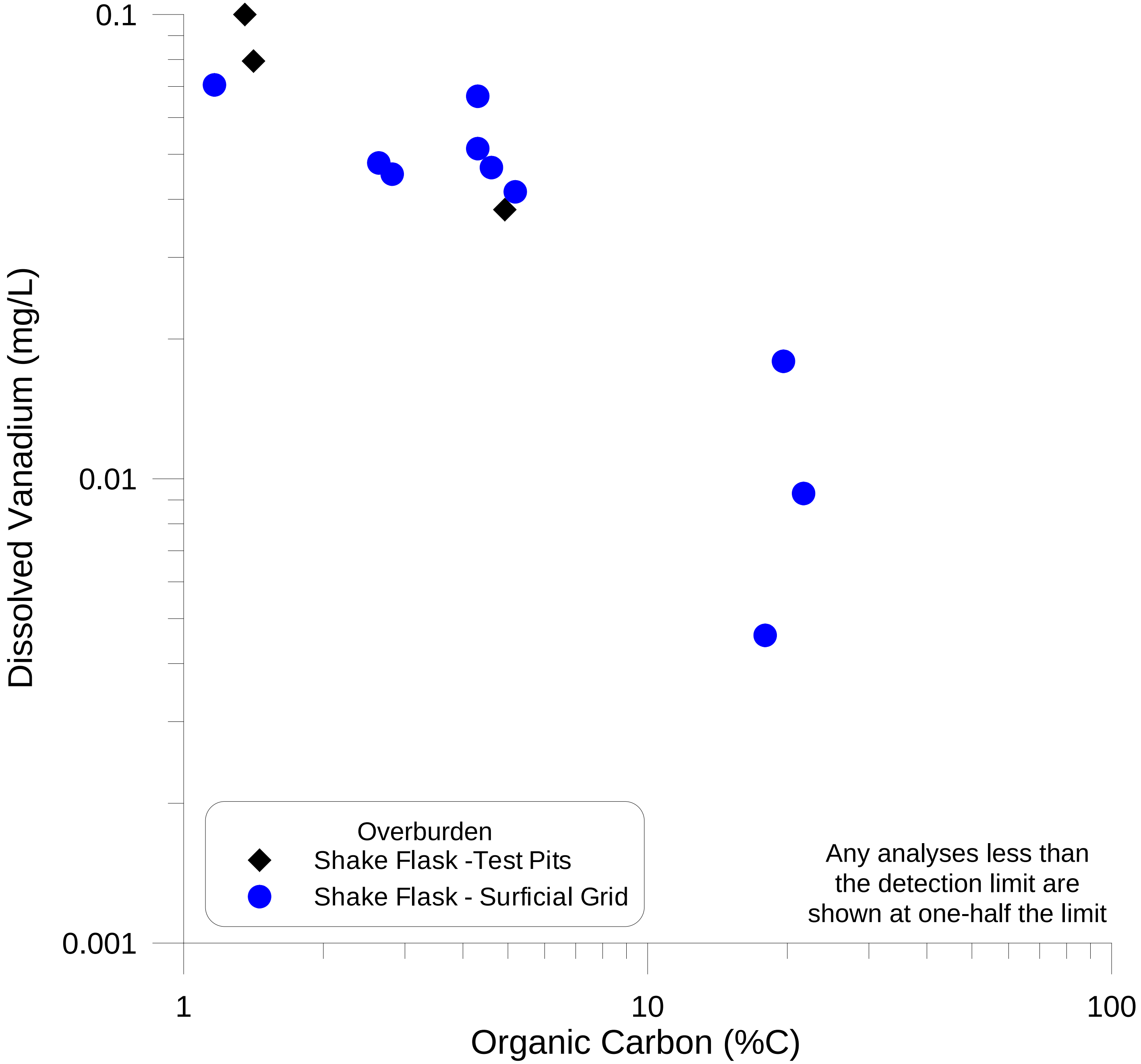

1
0.1
0.01
Dissolved Strontium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

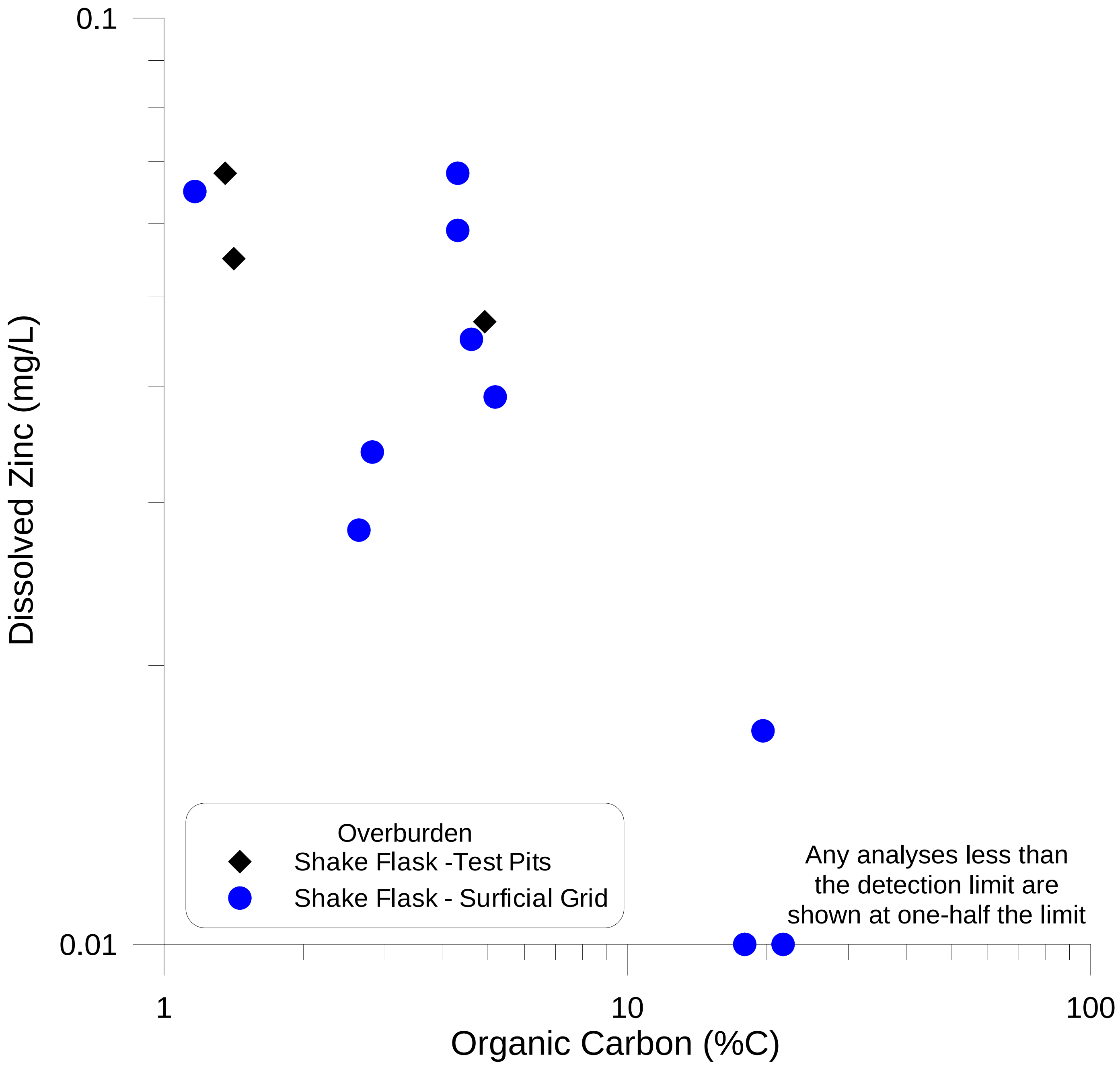

0.001
0.0001
1E-005
Dissolved Thallium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
0.01
0.001
0.0001
Dissolved Tin (mg/L)
1
10
100
Organic Carbon (%C)
Any analyses less than
the detection limit are
shown at one-half the limit

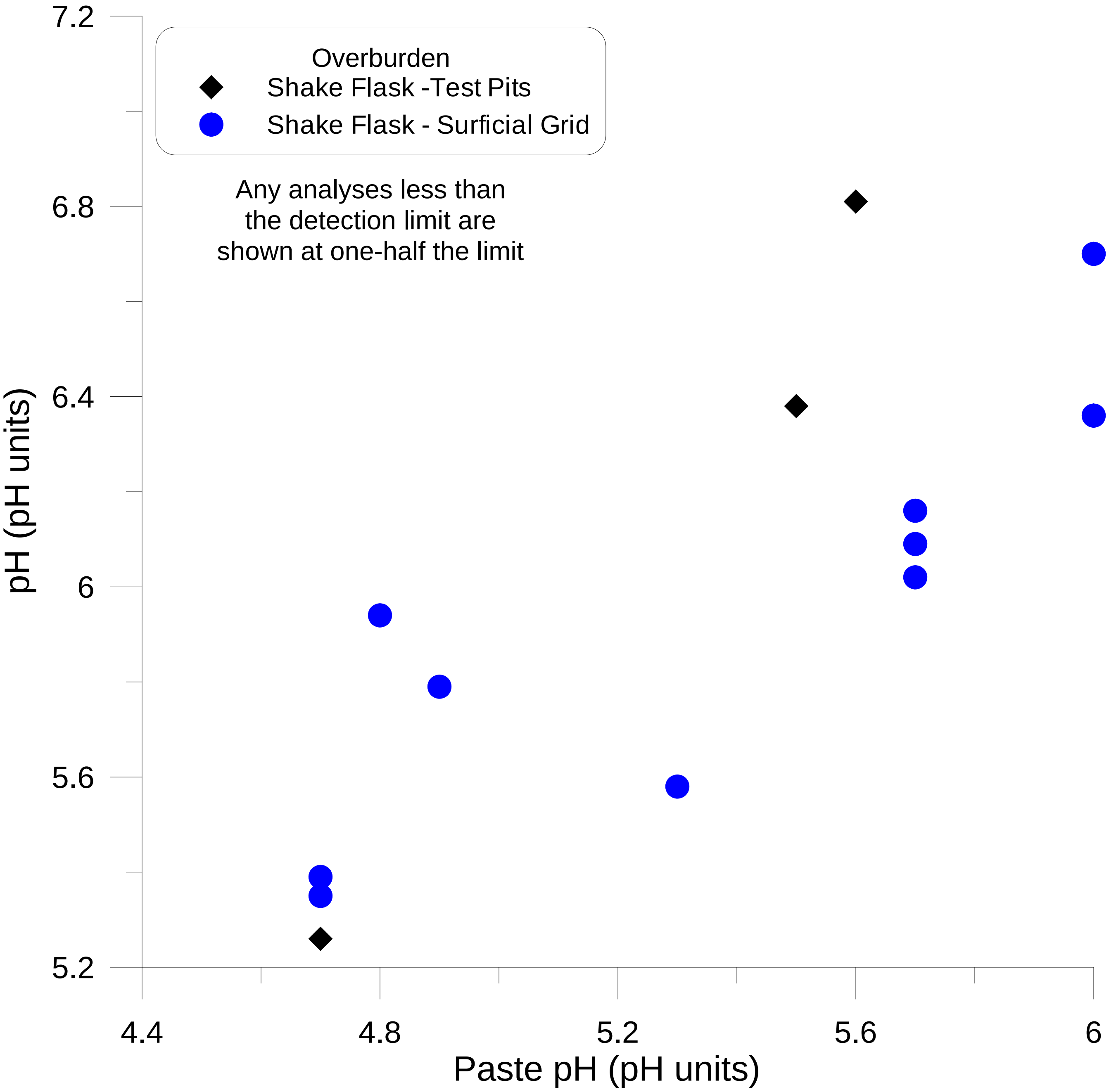

10
1
0.1
0.01
1
10
100
Dissolved Titanium (mg/L)
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


0.01
0.001
0.0001
Dissolved Uranium (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

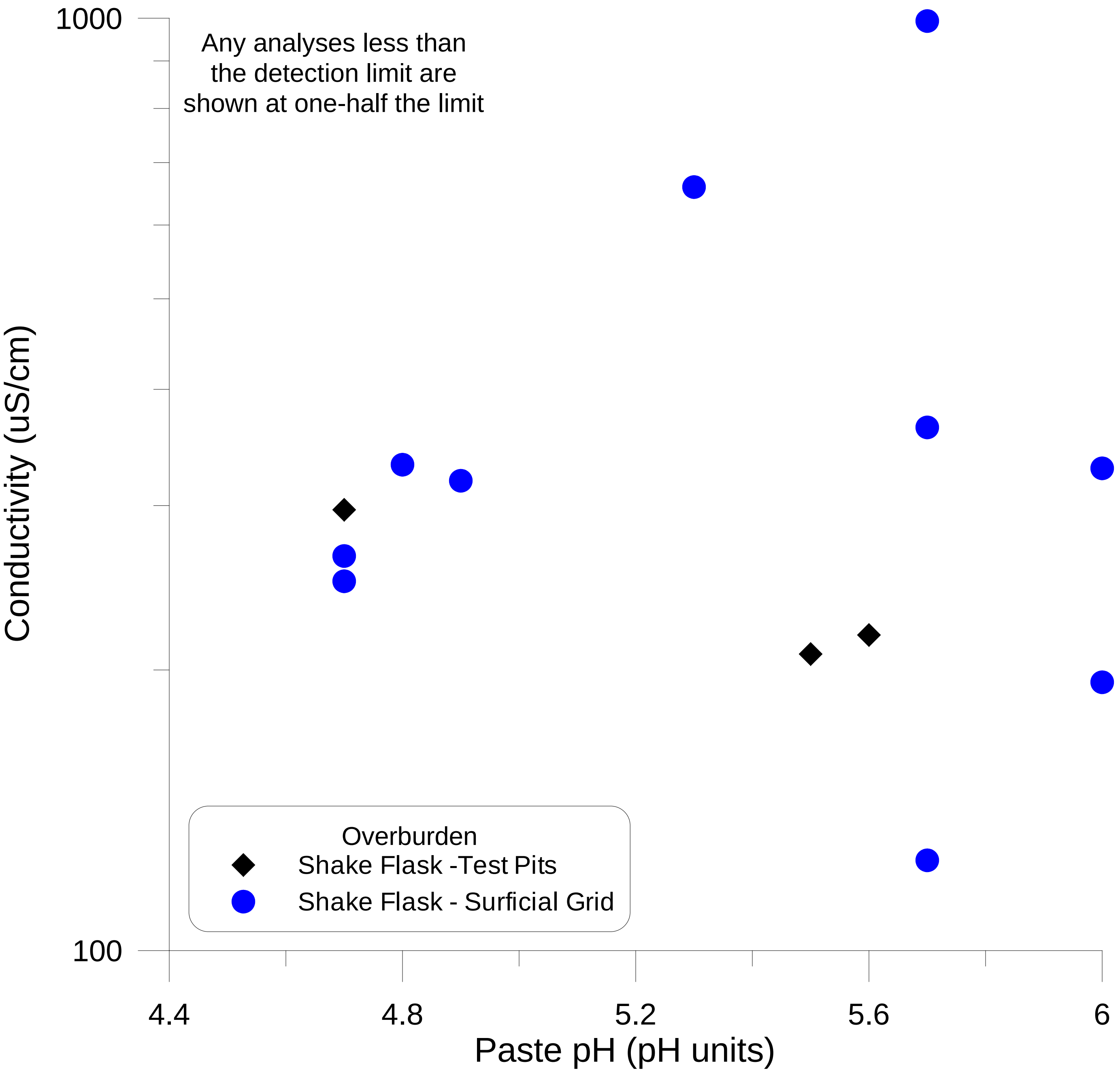

0.1
0.01
0.001
1
10
100
Dissolved Vanadium (mg/L)
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

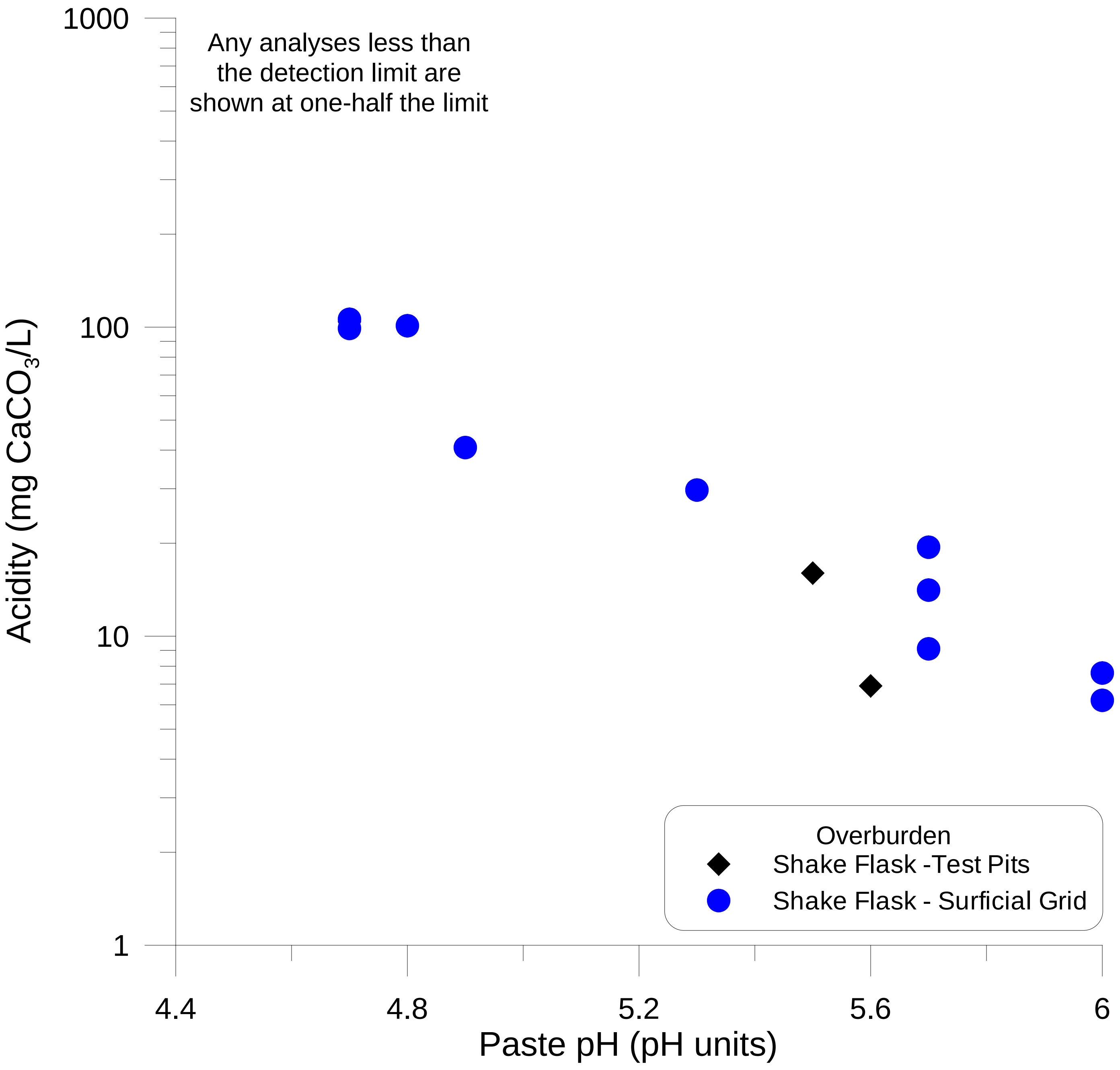

0.1
0.01
Dissolved Zinc (mg/L)
1
10
100
Organic Carbon (%C)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

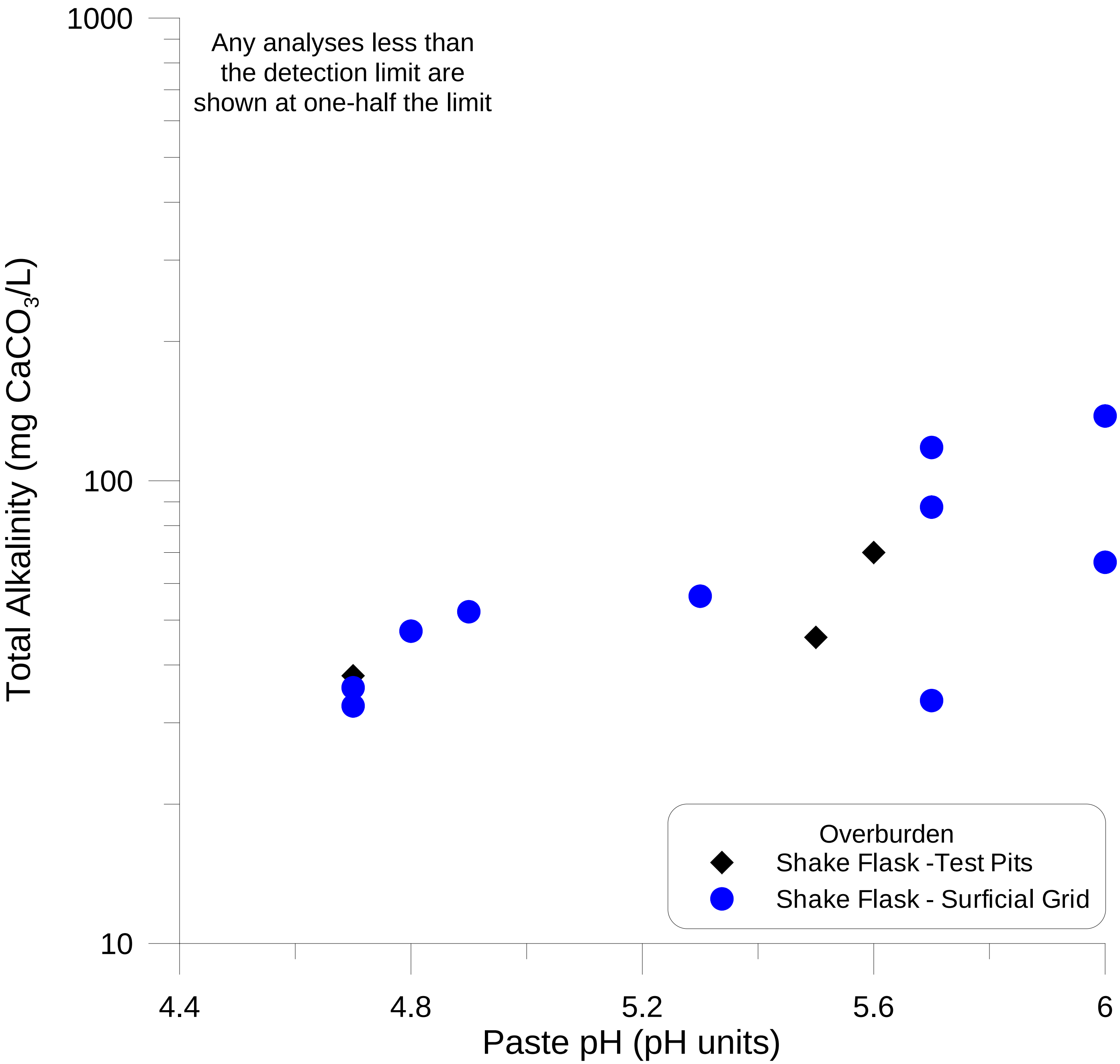
APPENDIX D. Scatterplots of Shake-Flask-Leached Parameters with Solid-Phase Paste pH

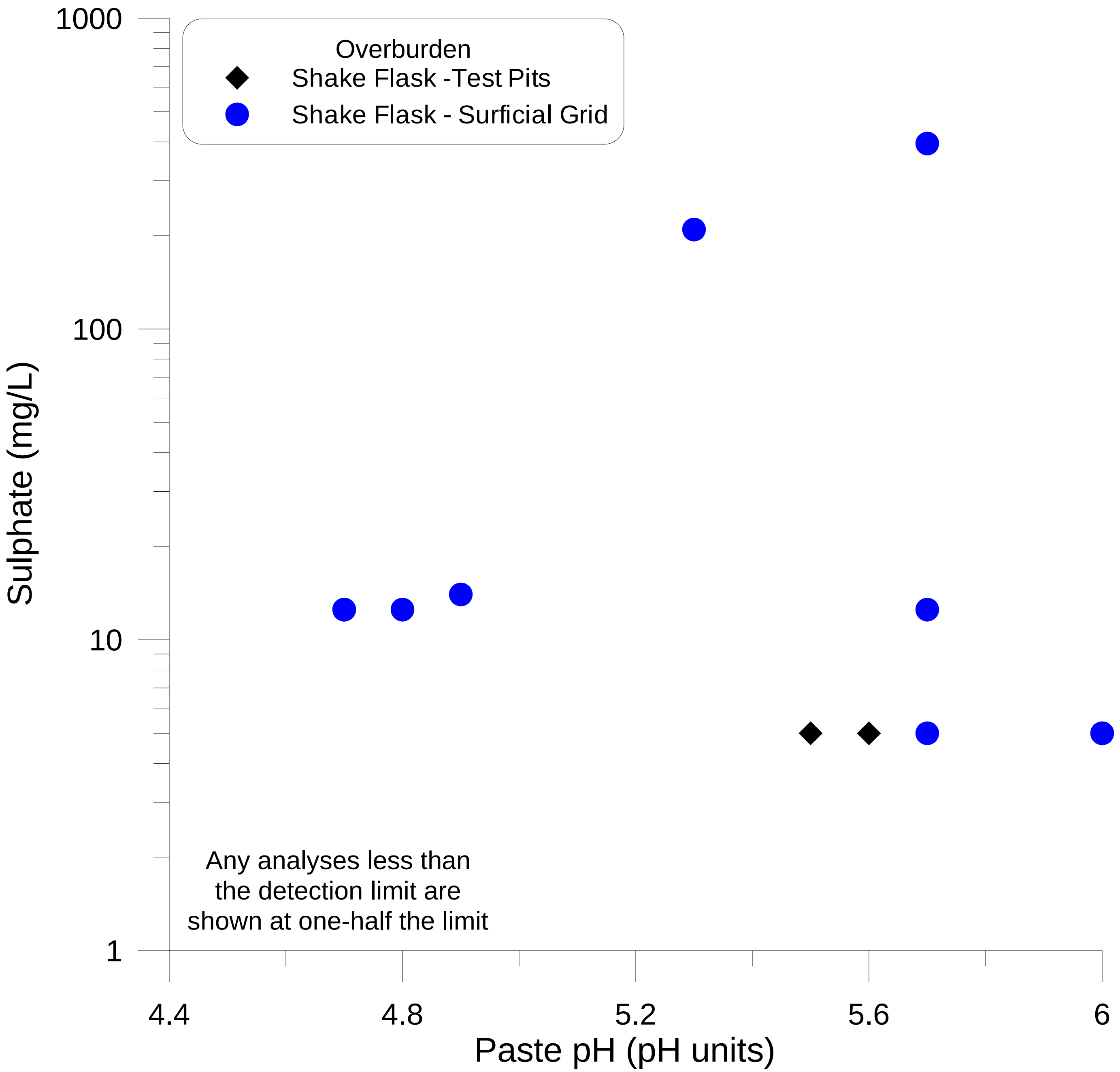


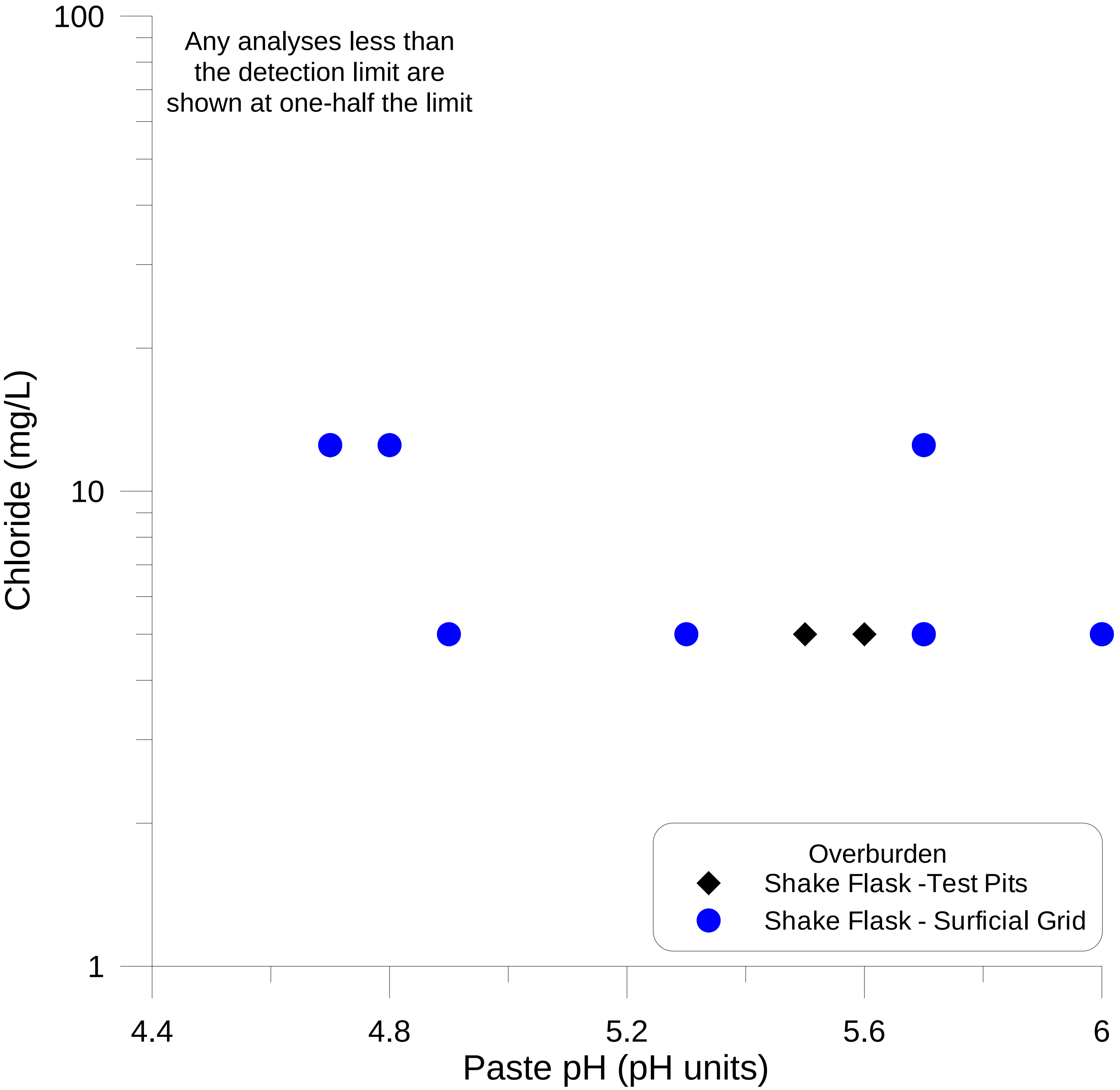
Any analyses less than
the detection limit are
shown at one-half the limit


1000
100
Conductivity (uS/cm)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

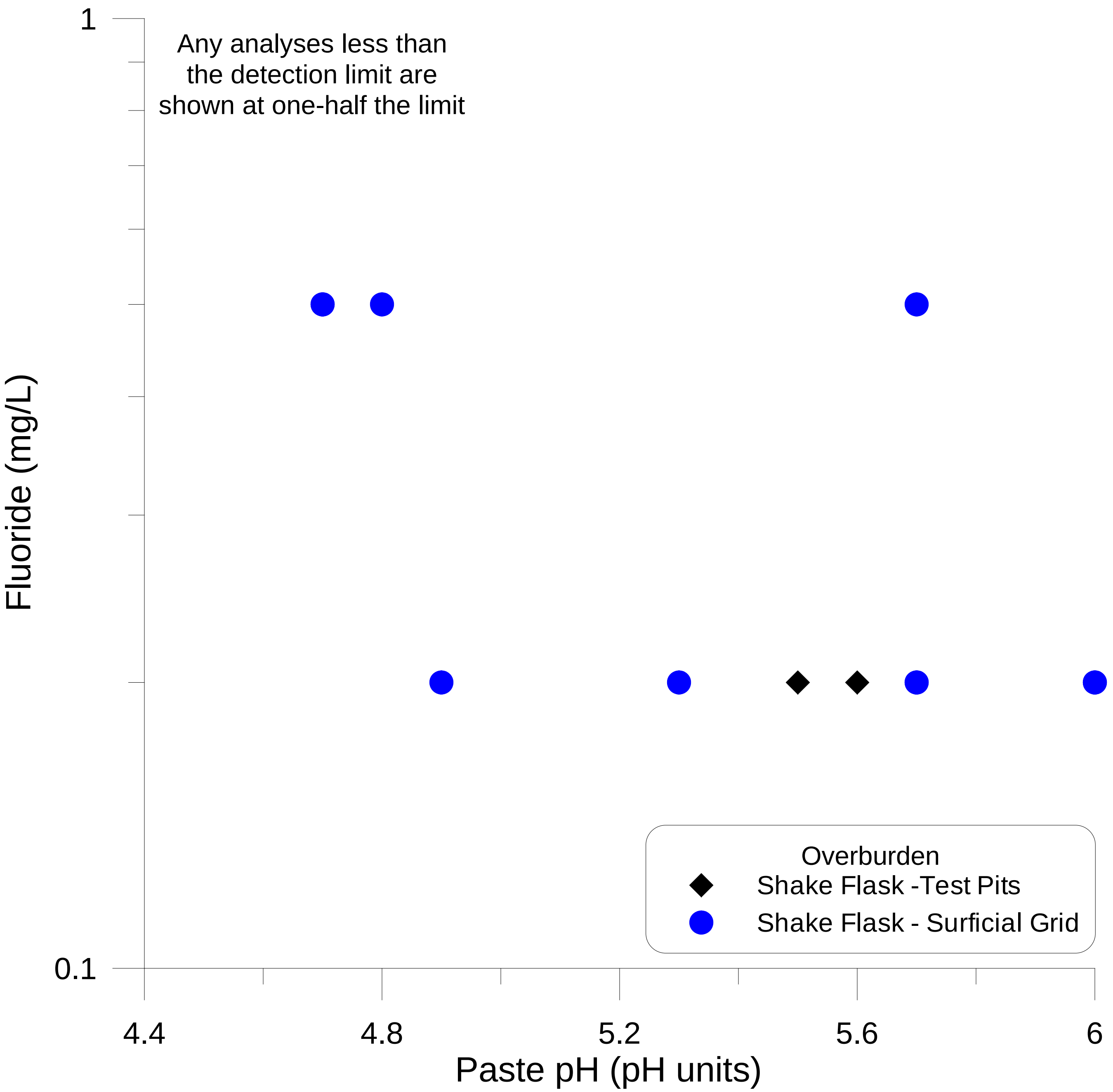

1000
100
10
1
Acidity (mg CaCO$_3$/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

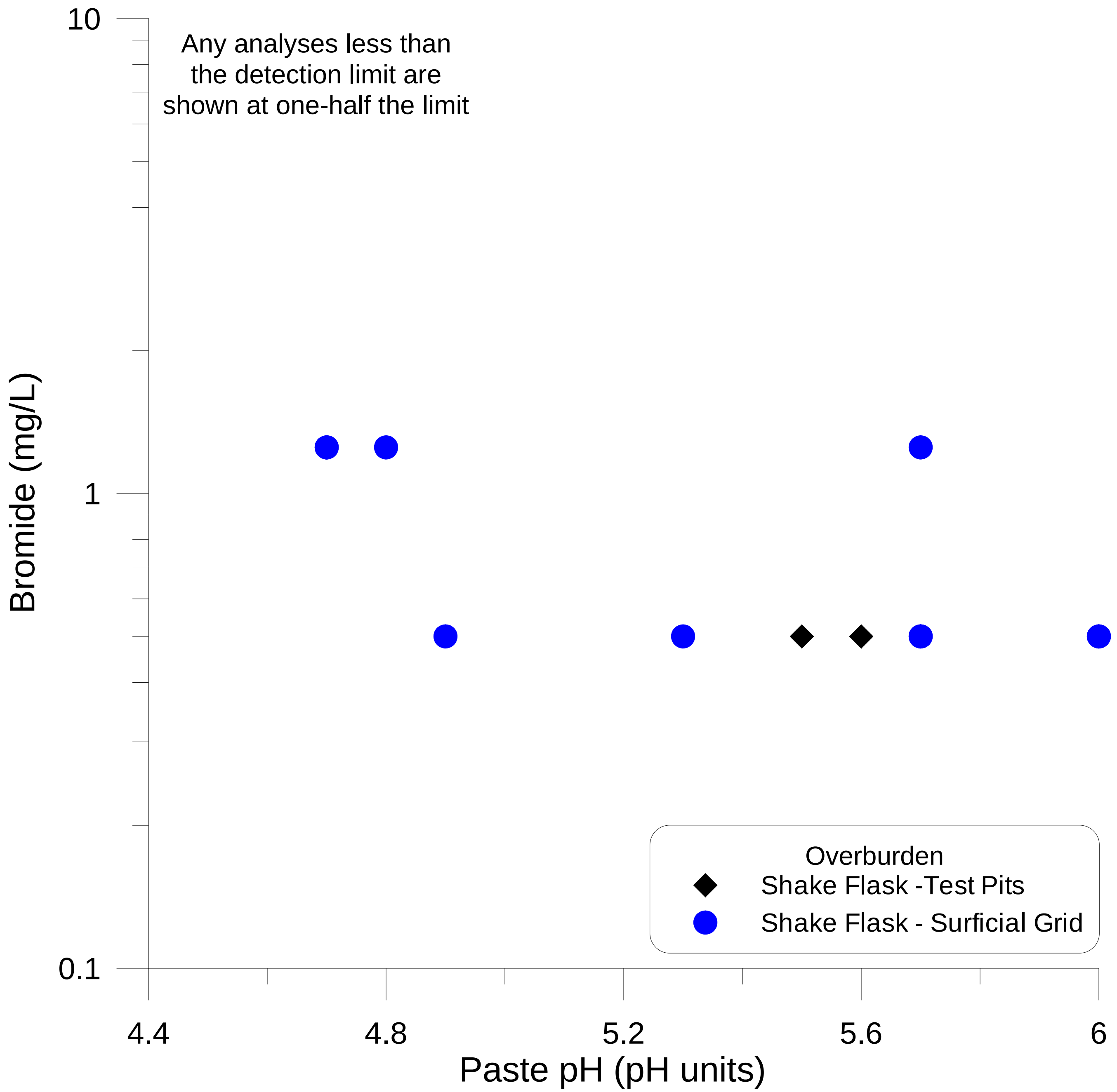

1000
100
10
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Total Alkalinity (mg $CaCO_3$/L)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
Shake Flask -Test Pits
Shake Flask - Surficial Grid


Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
1000
100
10
1
Sulphate (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

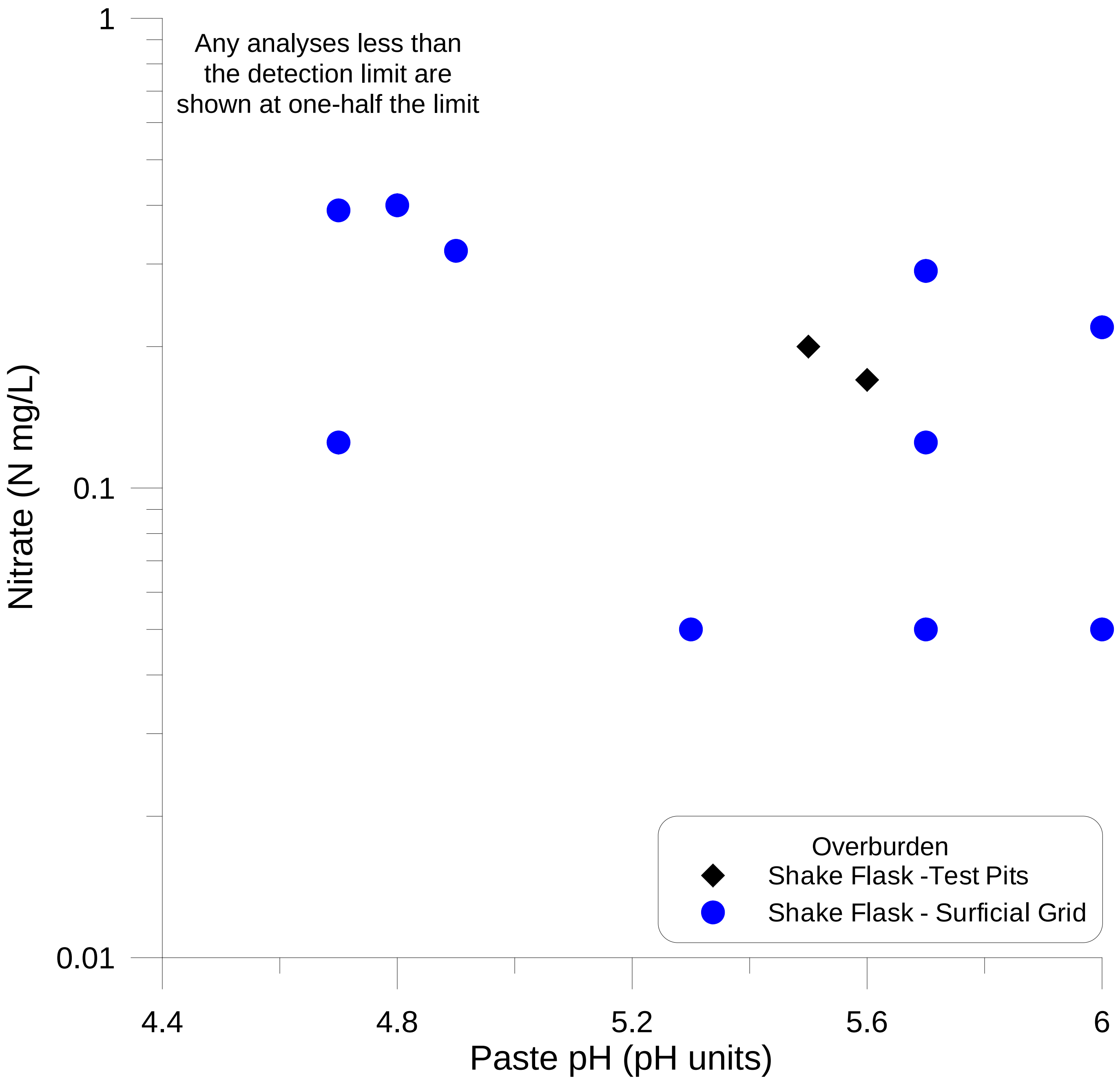


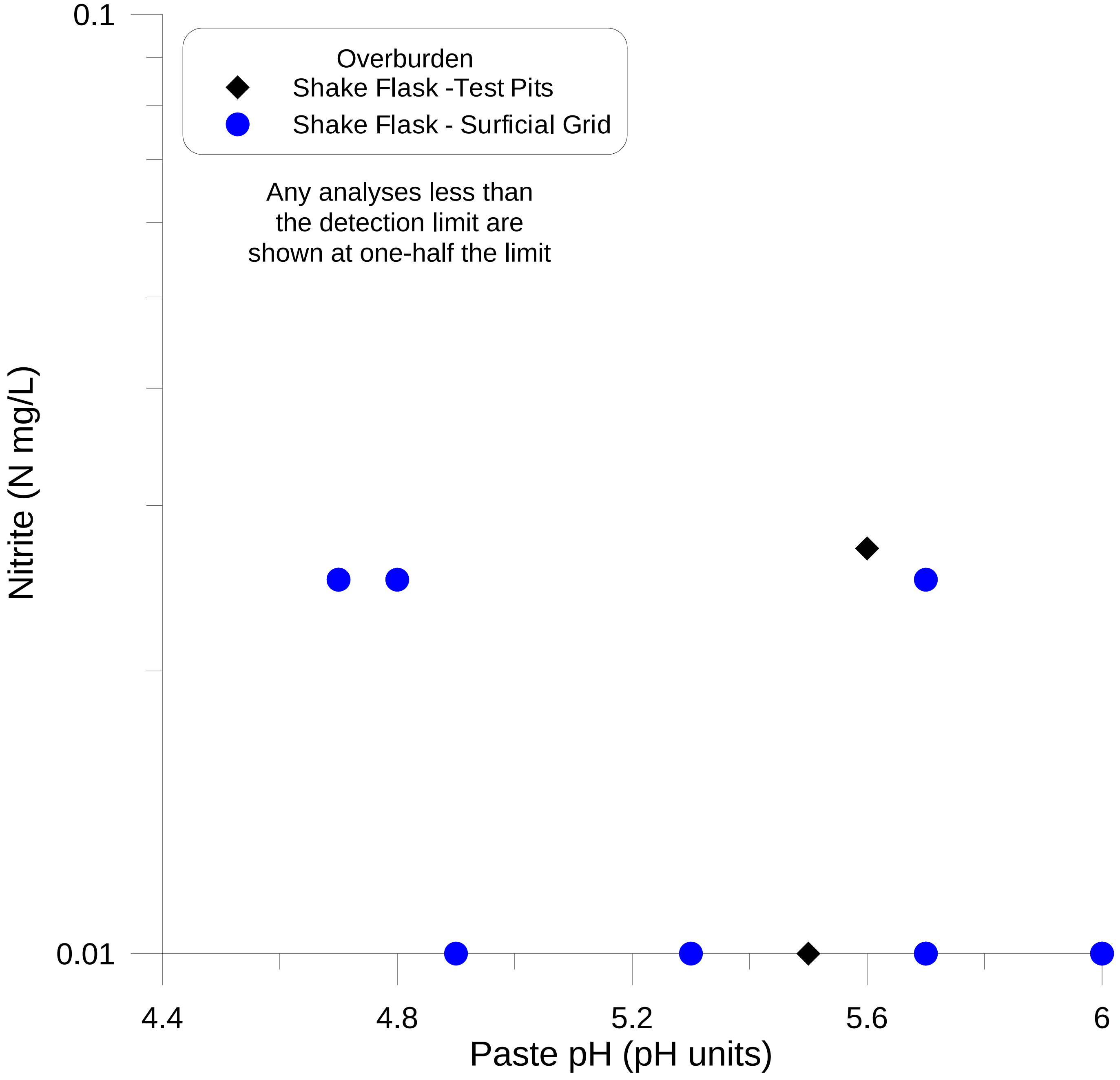
100
10
1
Chloride (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
Shake Flask -Test Pits
Shake Flask - Surficial Grid


1
0.1
Fluoride (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than the detection limit are shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

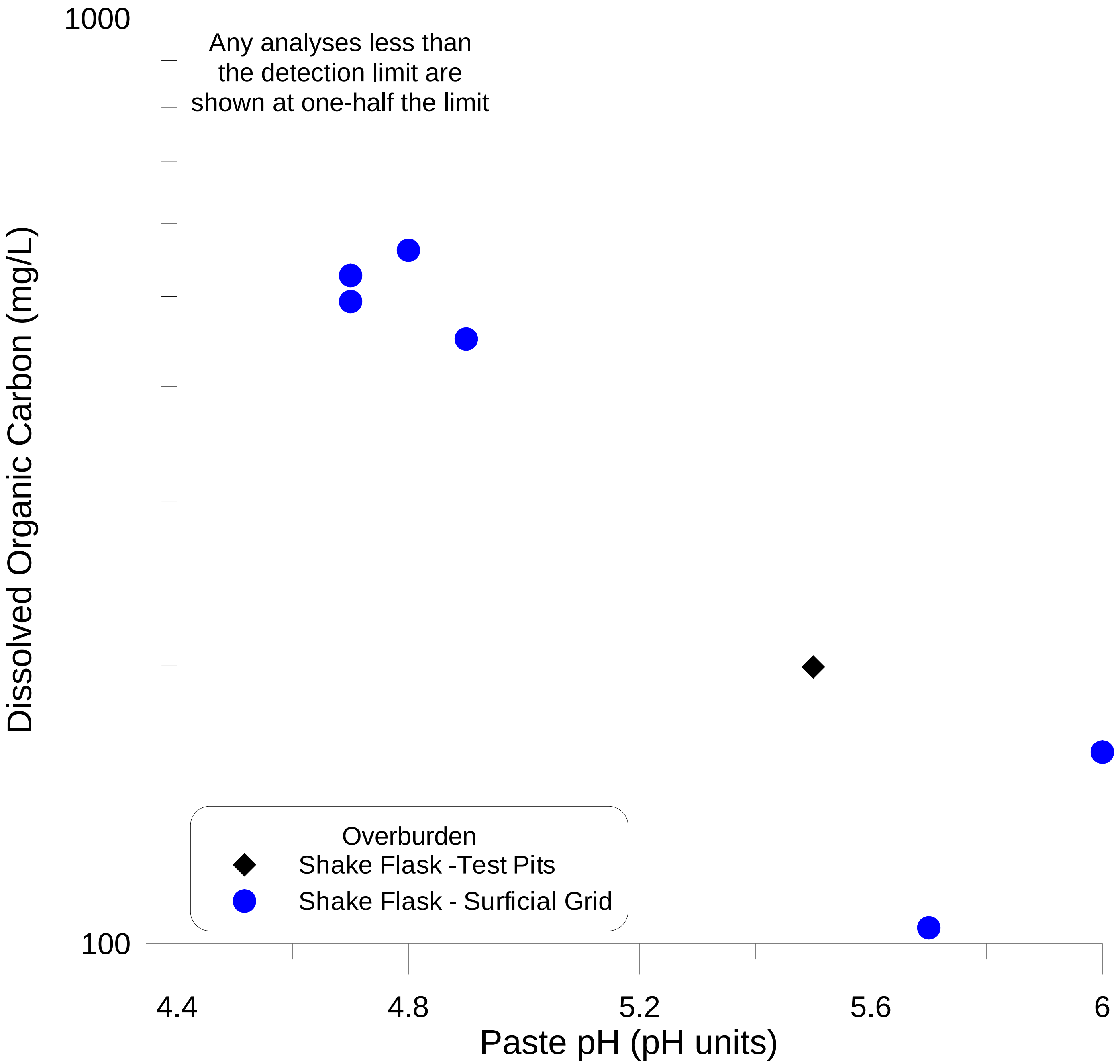


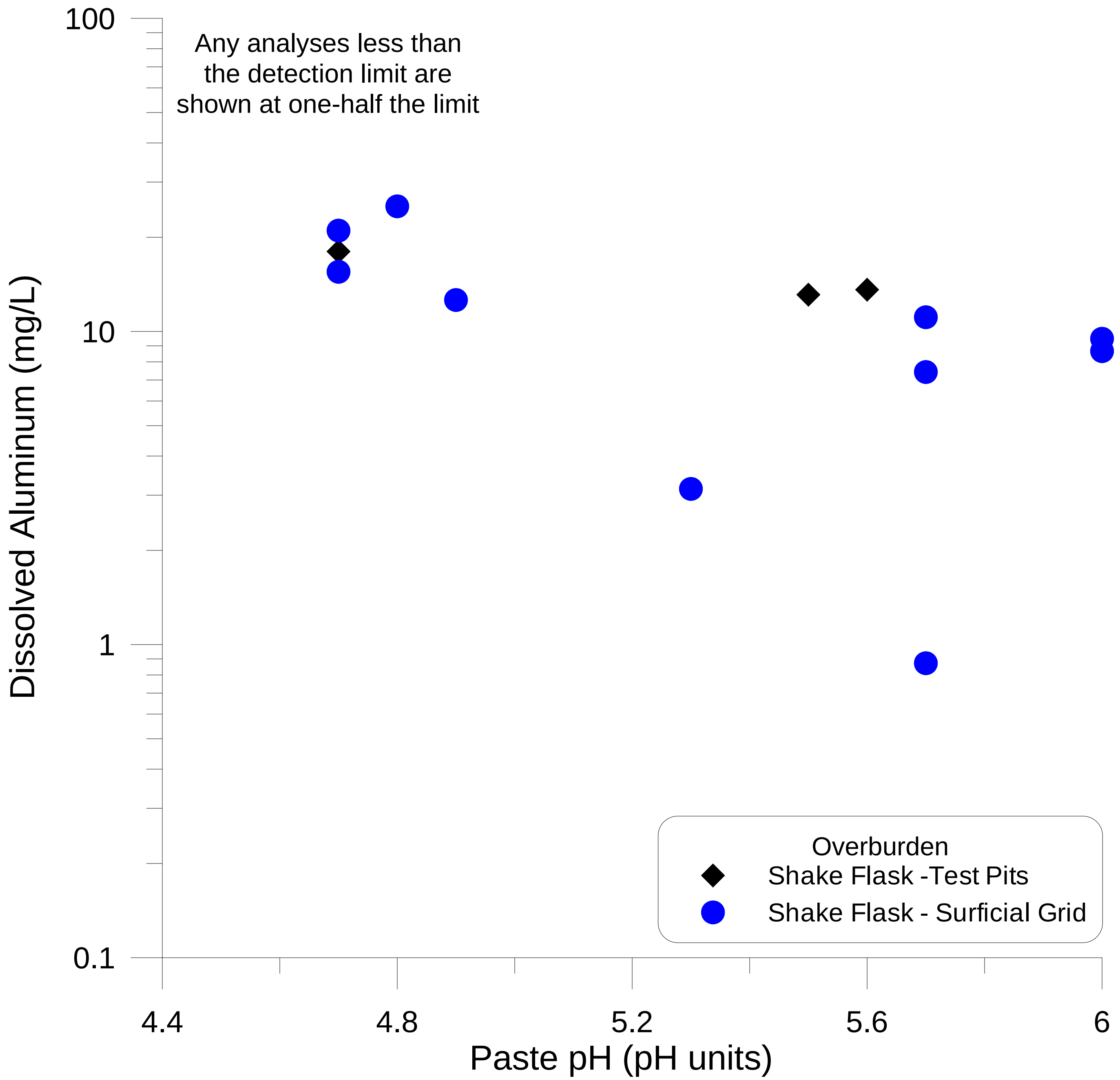
Any analyses less than
the detection limit are
shown at one-half the limit
10
1
0.1
Bromide (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

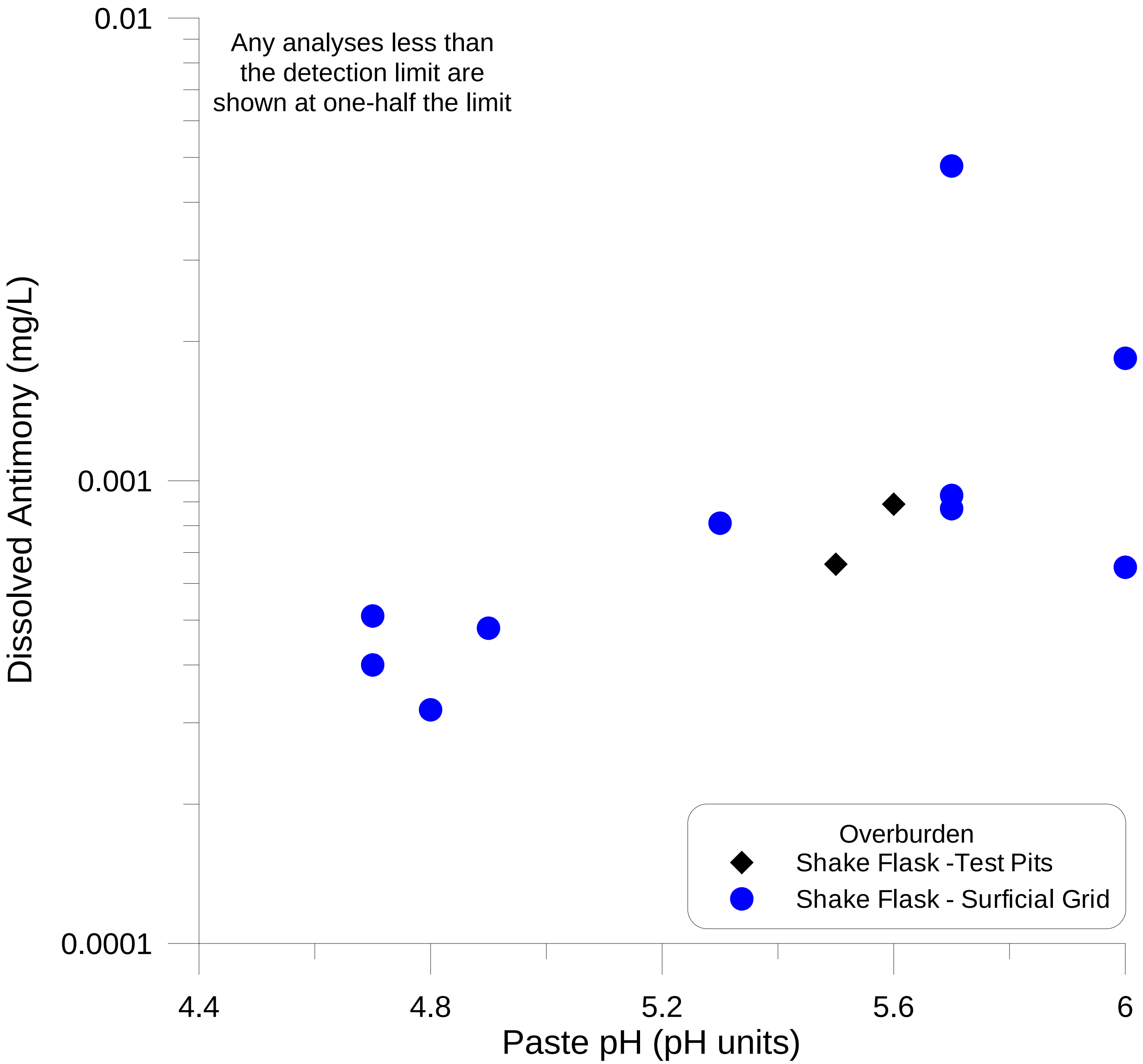

1
0.1
0.01
Nitrate (N mg/L)
Any analyses less than
the detection limit are
shown at one-half the limit
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

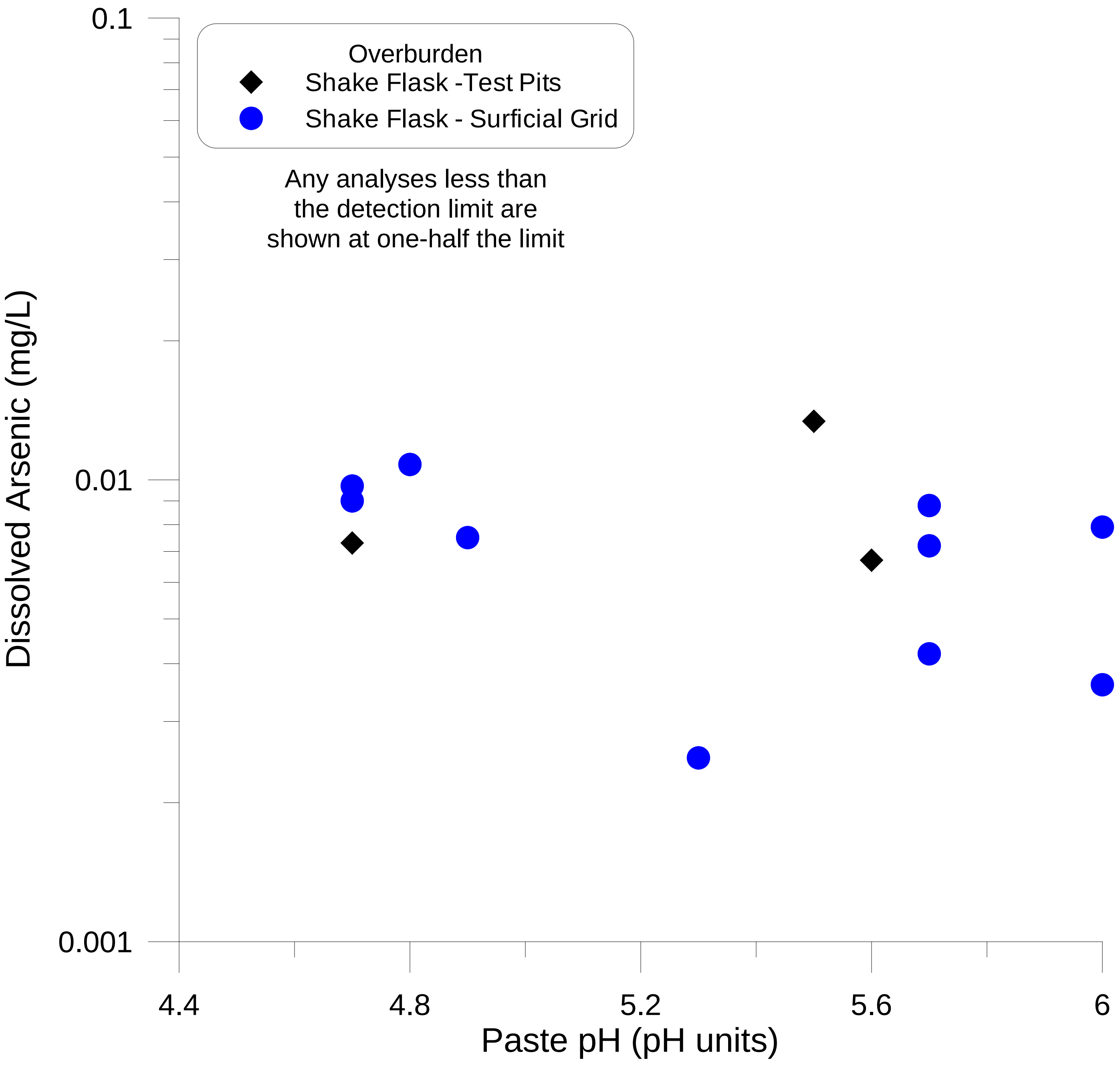


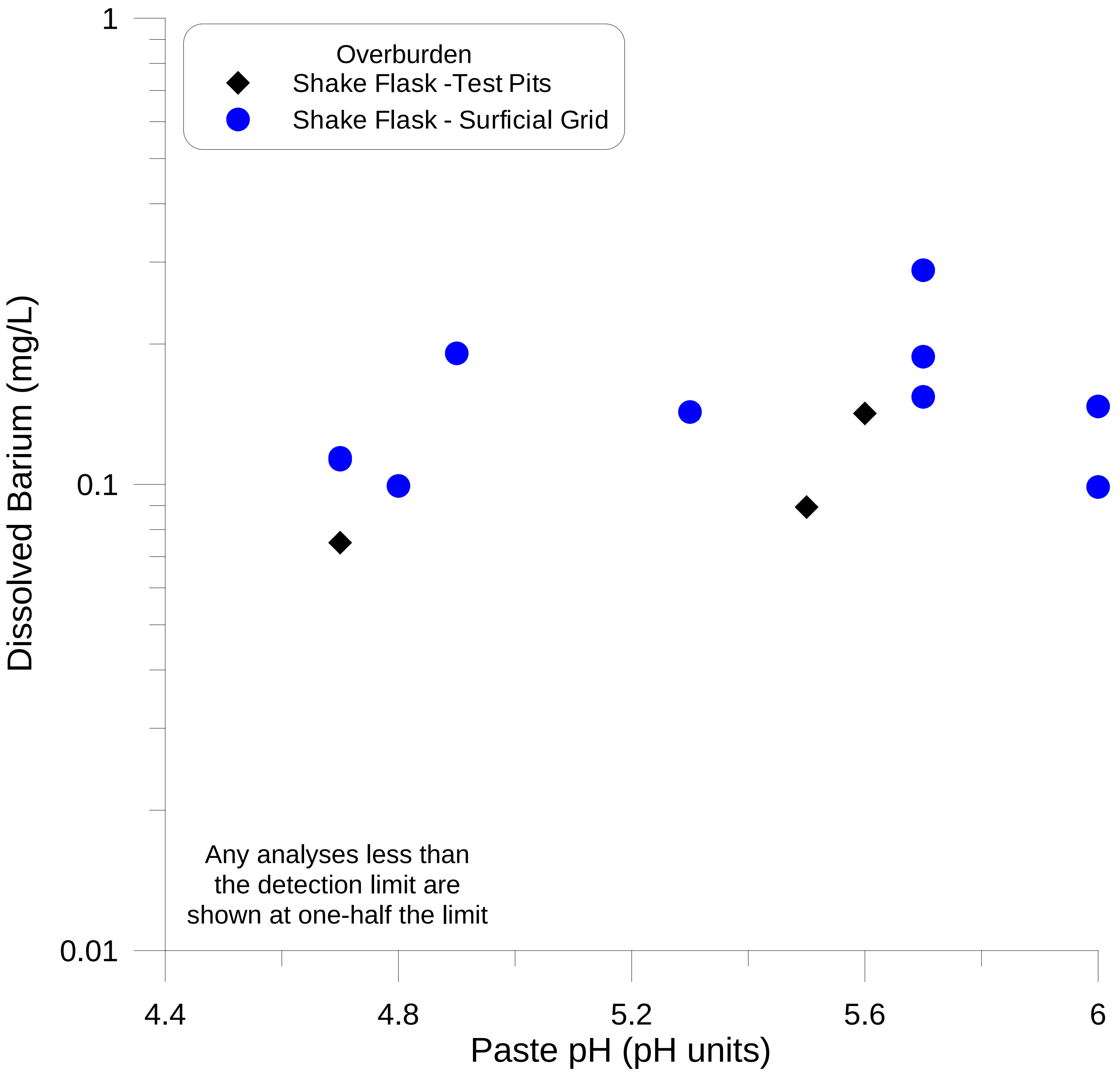
0.1
0.01
Nitrite (N mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

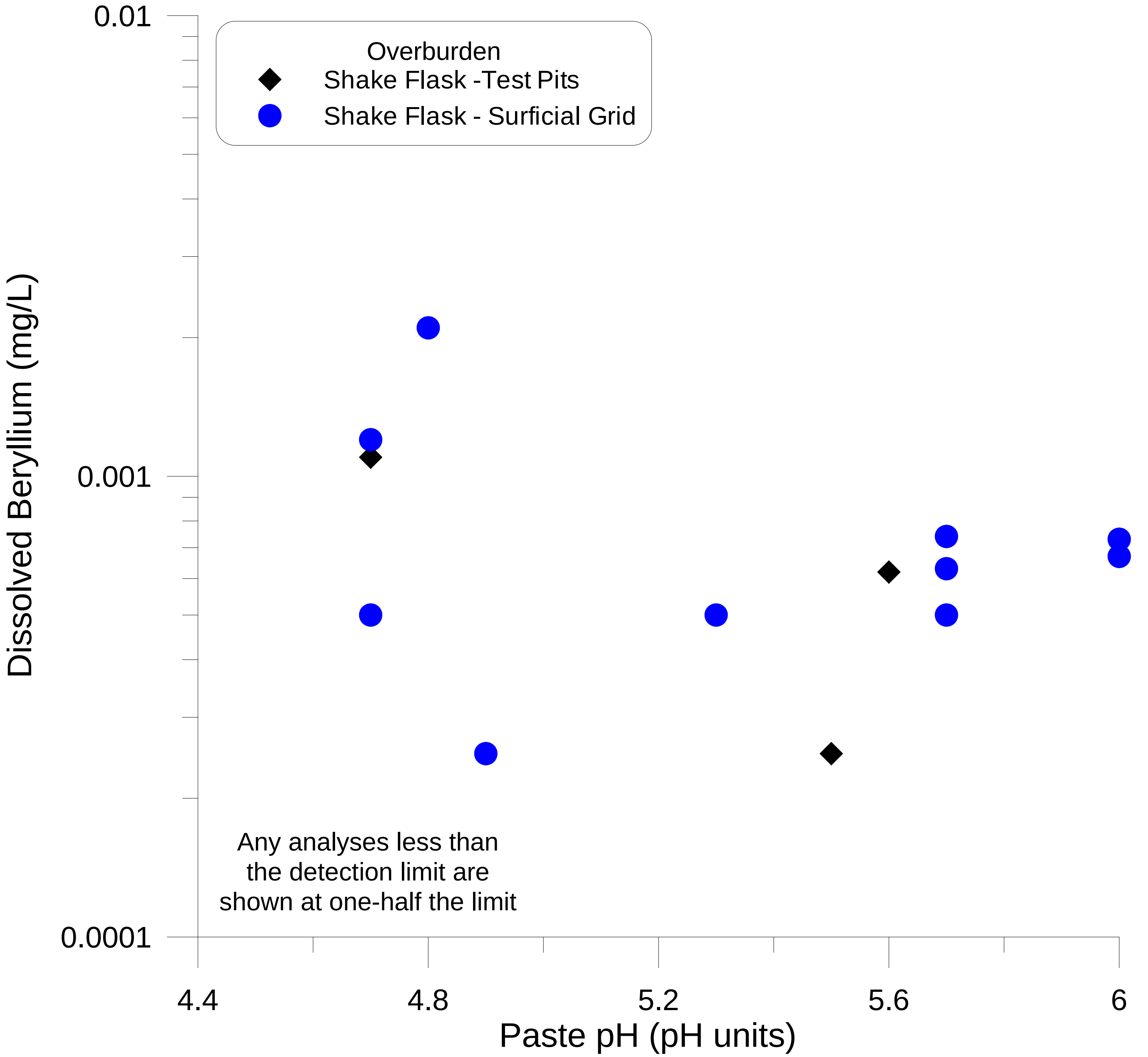

1000
Any analyses less than
the detection limit are
shown at one-half the limit
Dissolved Organic Carbon (mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
100
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

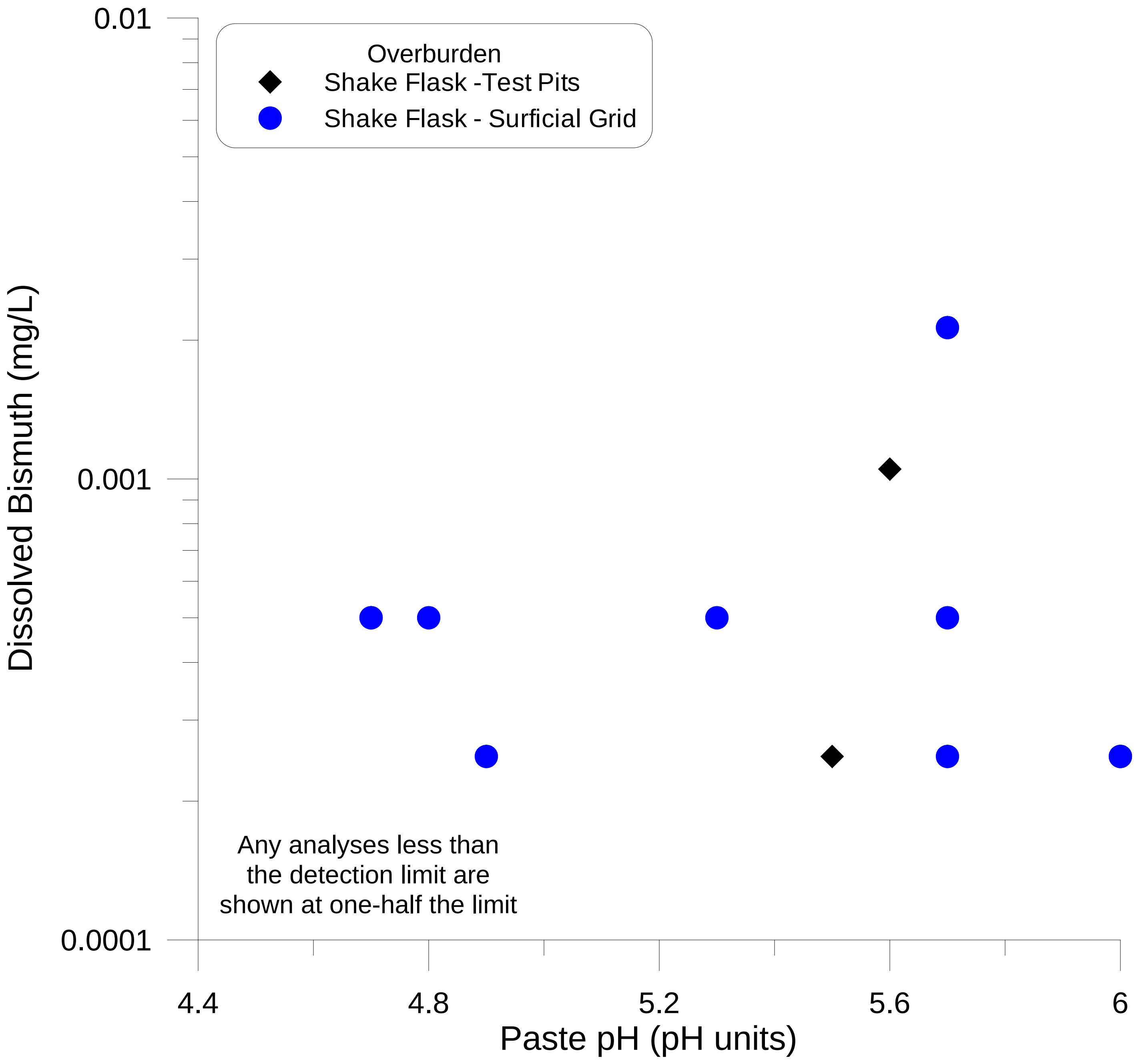

Any analyses less than
the detection limit are
shown at one-half the limit
100
10
1
0.1
Dissolved Aluminum (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid

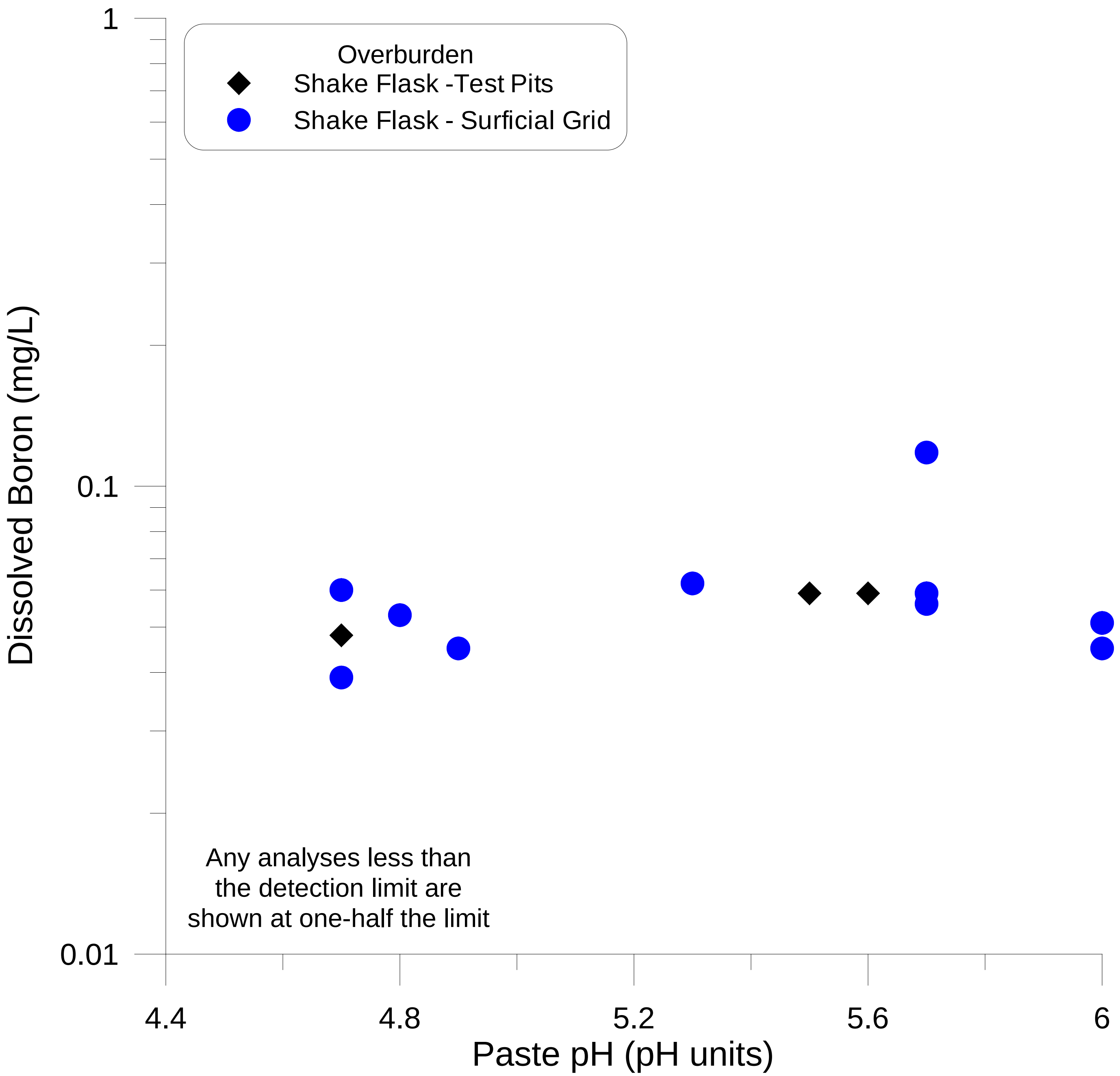

0.01
0.001
0.0001
Dissolved Antimony (mg/L)
Any analyses less than
the detection limit are
shown at one-half the limit
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

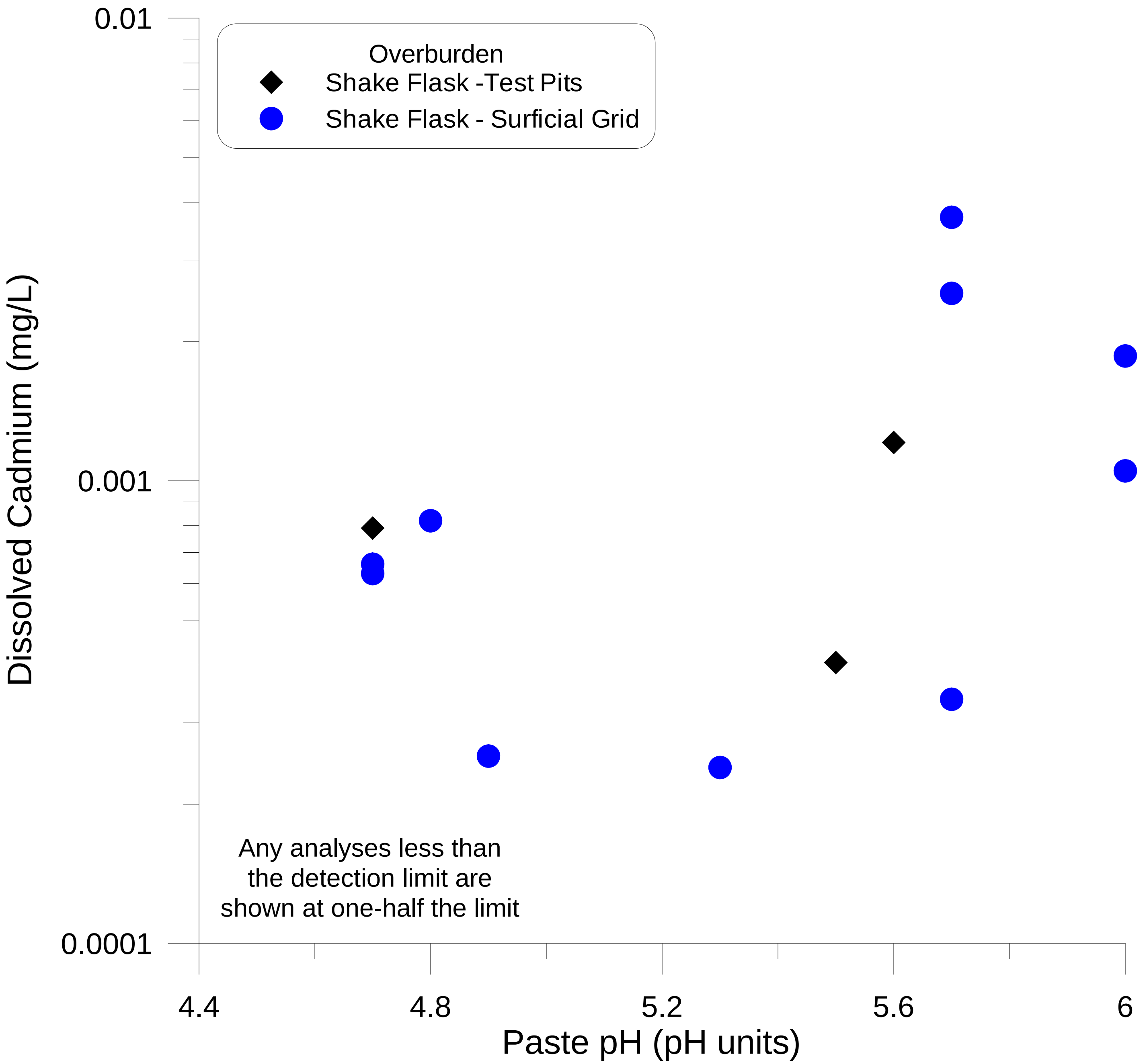

0.1
0.01
0.001
Dissolved Arsenic (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit

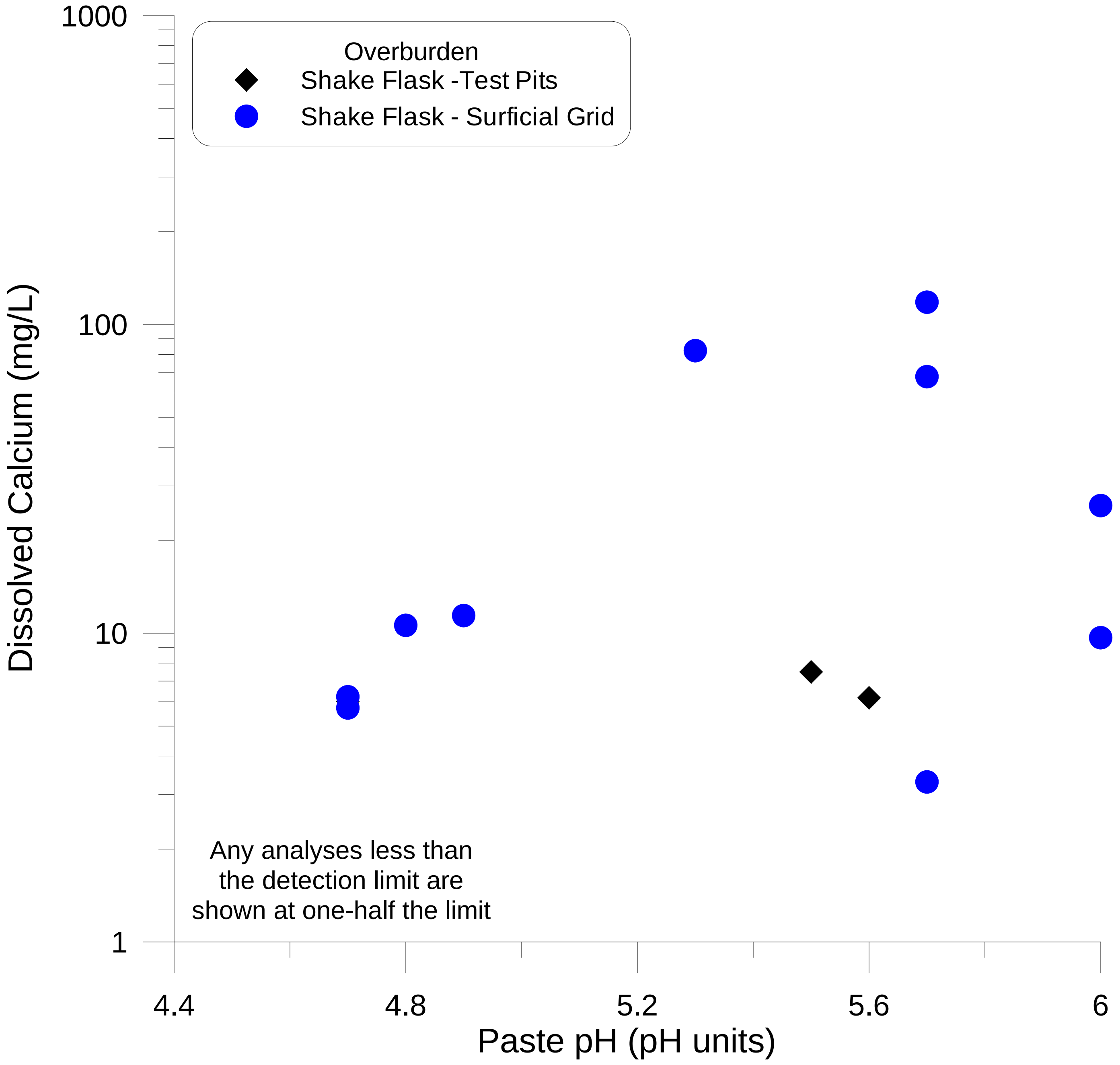

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Barium (mg/L)
1
0.1
0.01
Any analyses less than
the detection limit are
shown at one-half the limit
4.4
4.8
5.2
5.6
6
Paste pH (pH units)


0.01
0.001
0.0001
Dissolved Beryllium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

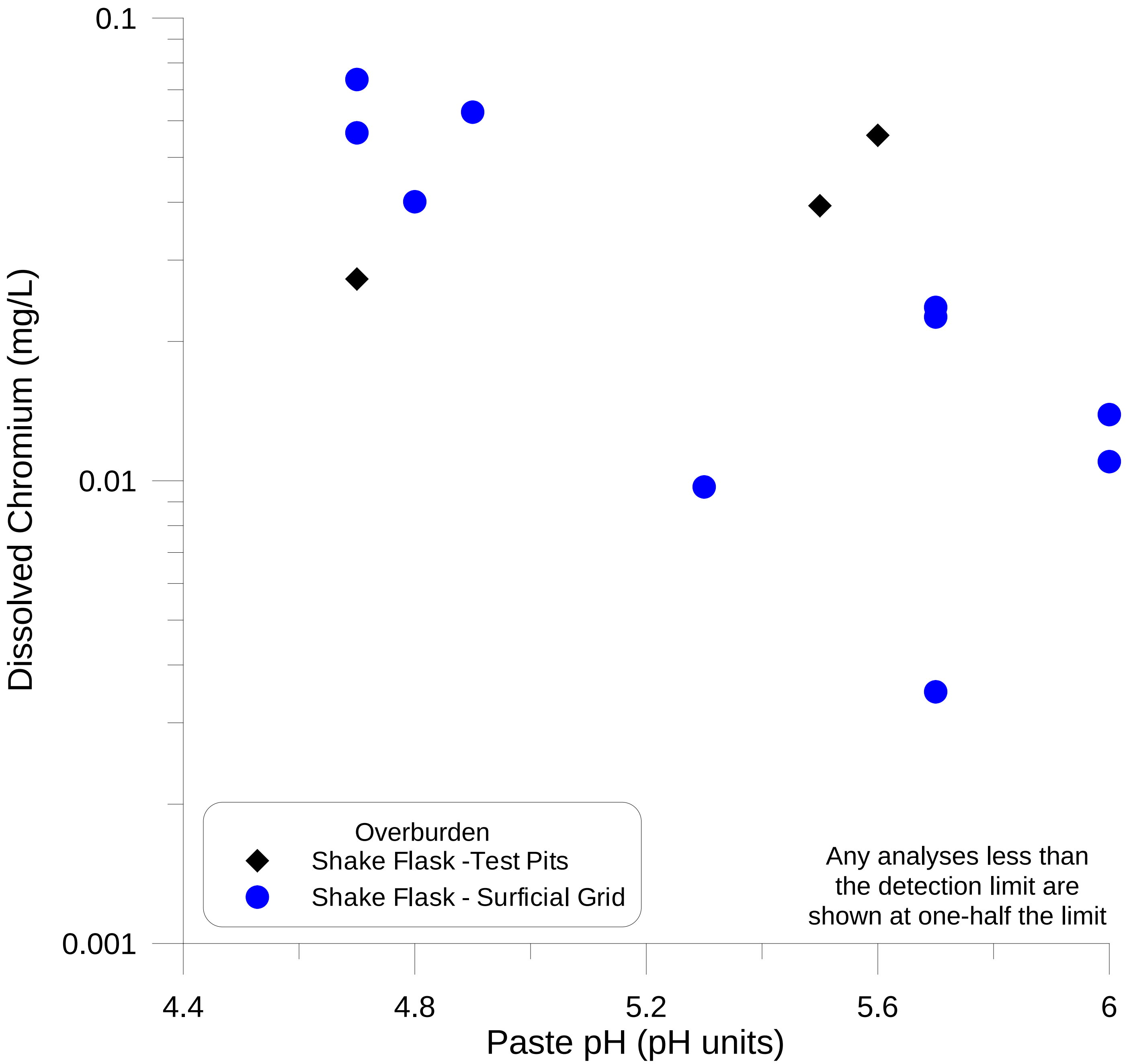

0.01
0.001
0.0001
Dissolved Bismuth (mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

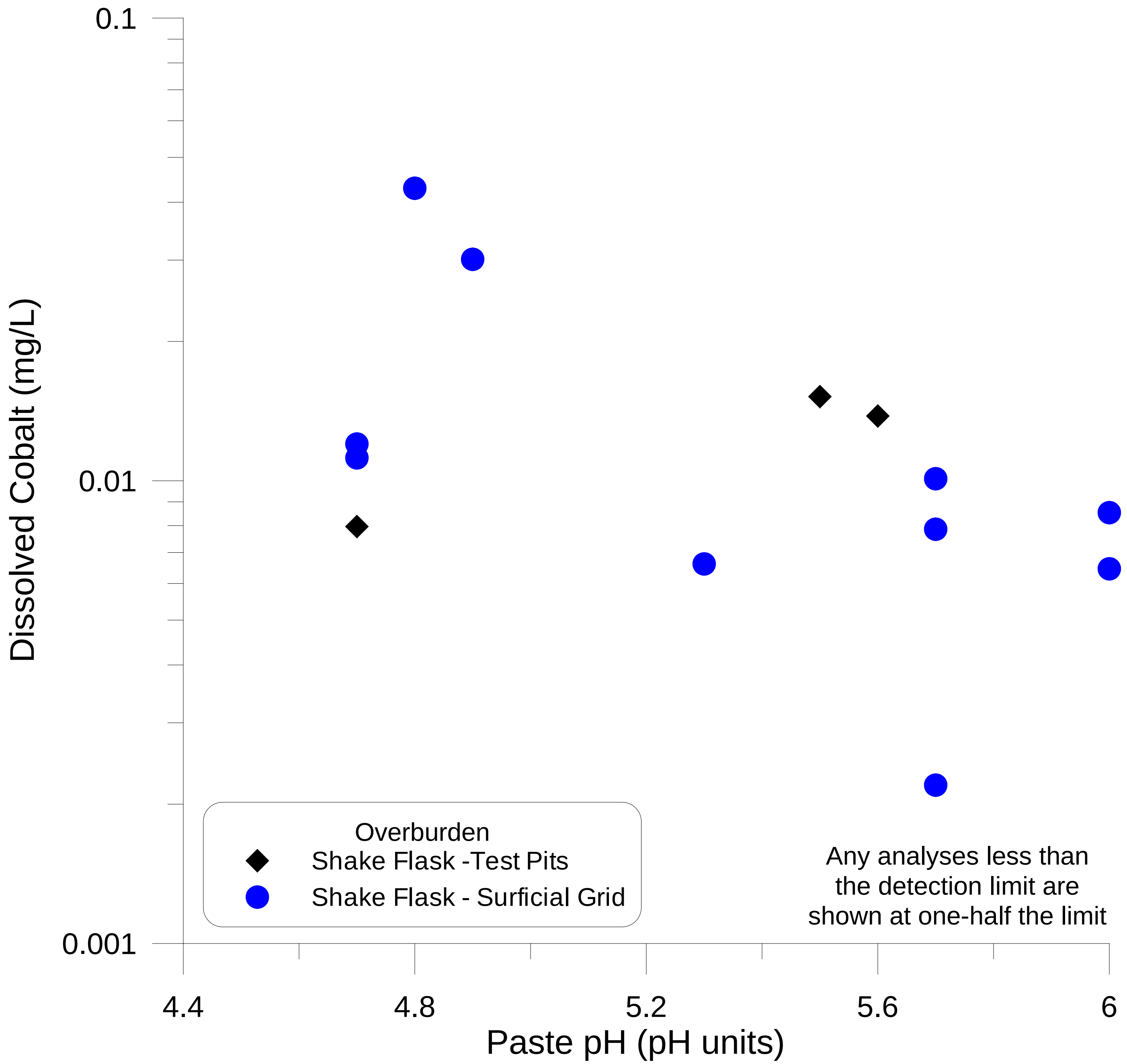

1
0.1
0.01
Dissolved Boron (mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

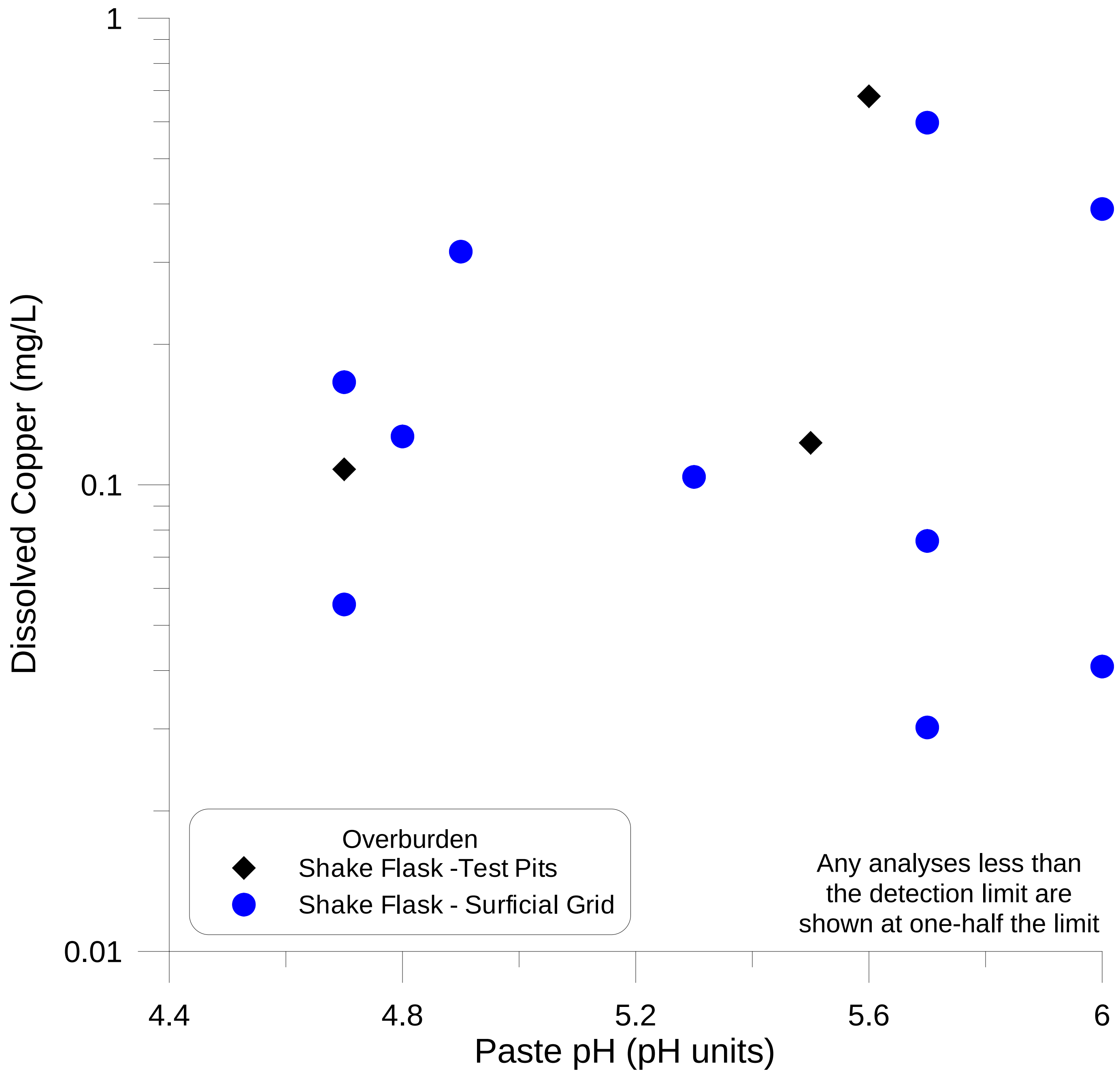

0.01
0.001
0.0001
Dissolved Cadmium (mg/L)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

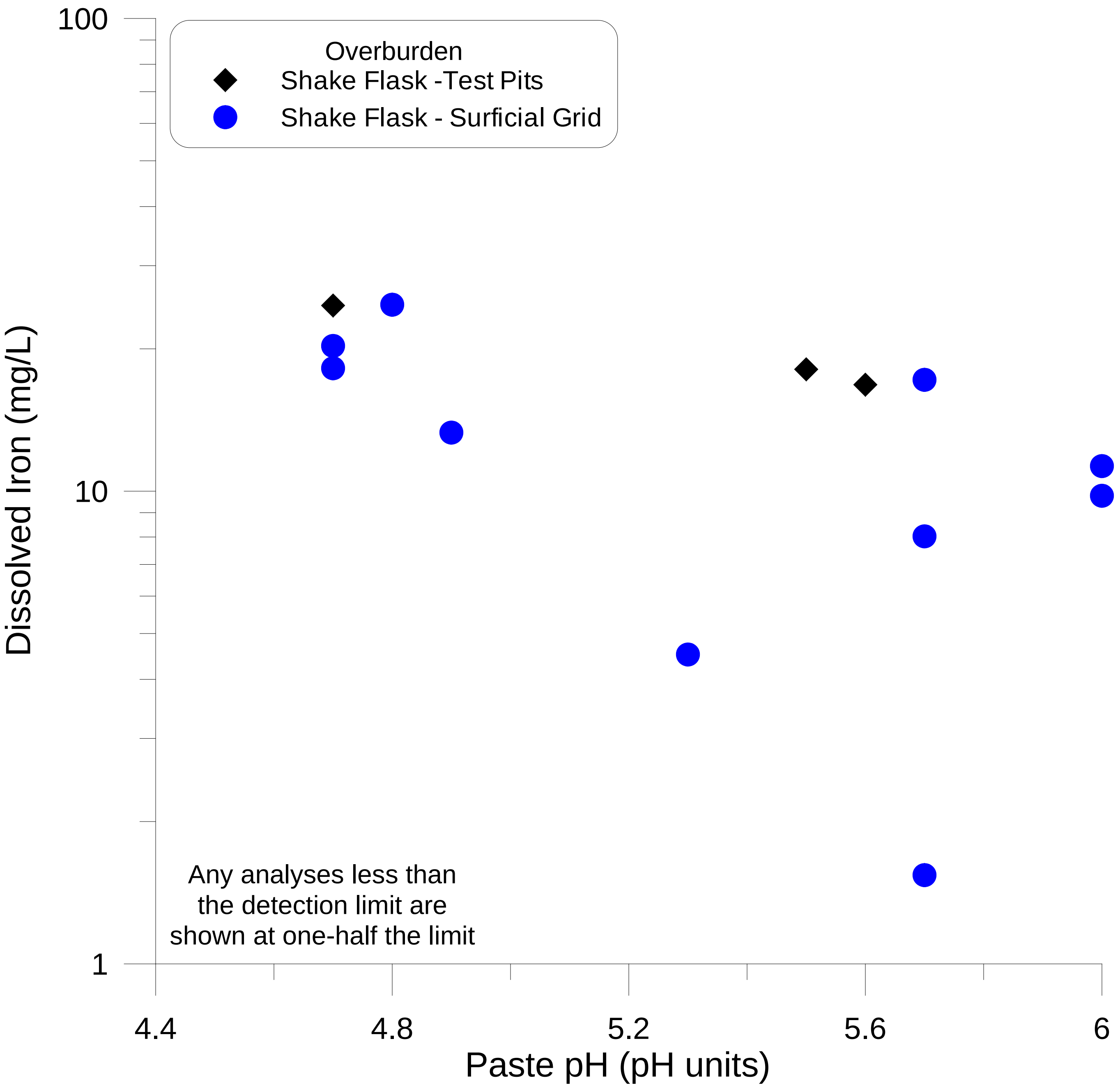


Any analyses less than
the detection limit are
shown at one-half the limit

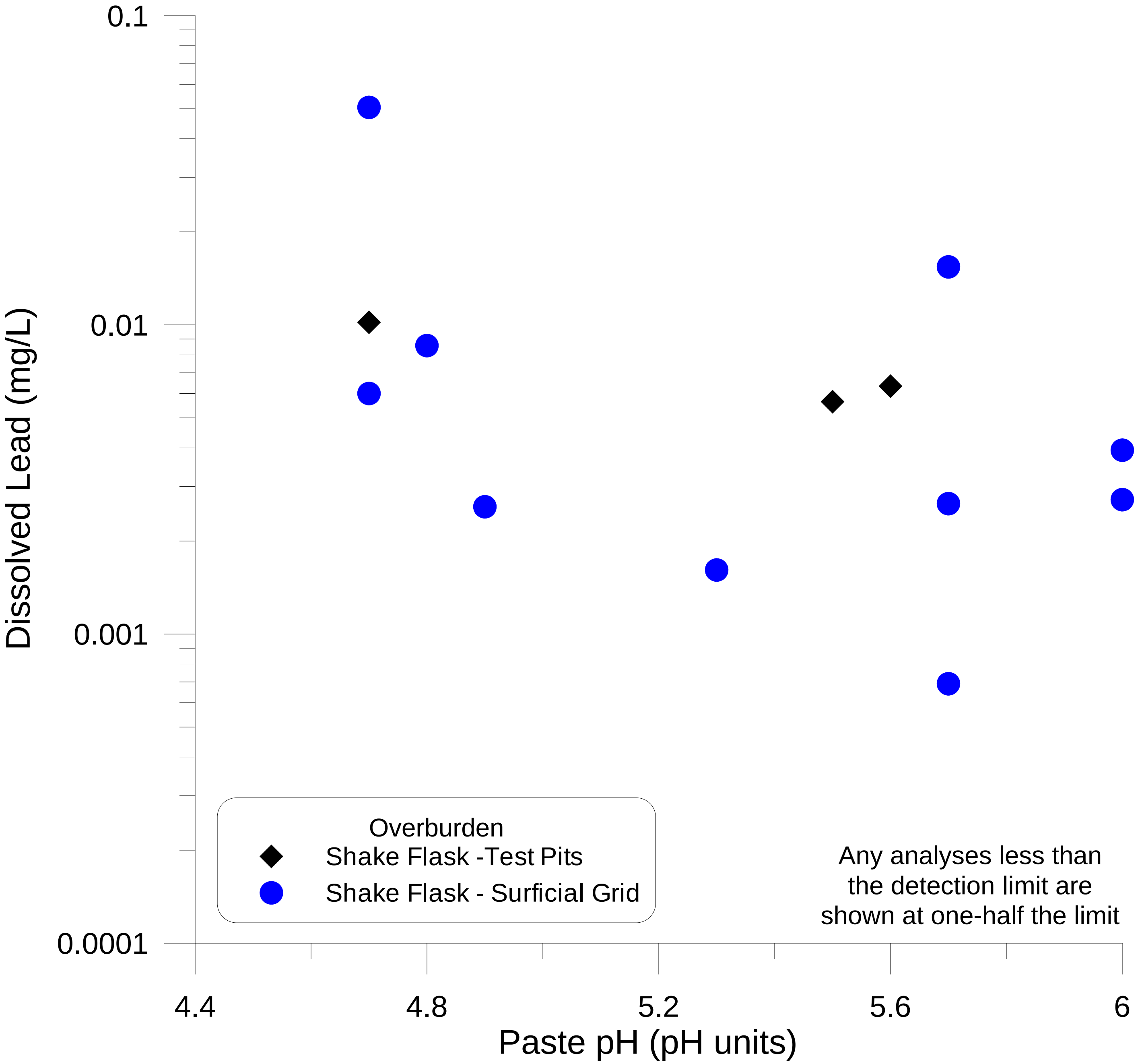

0.1
0.01
0.001
Dissolved Chromium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

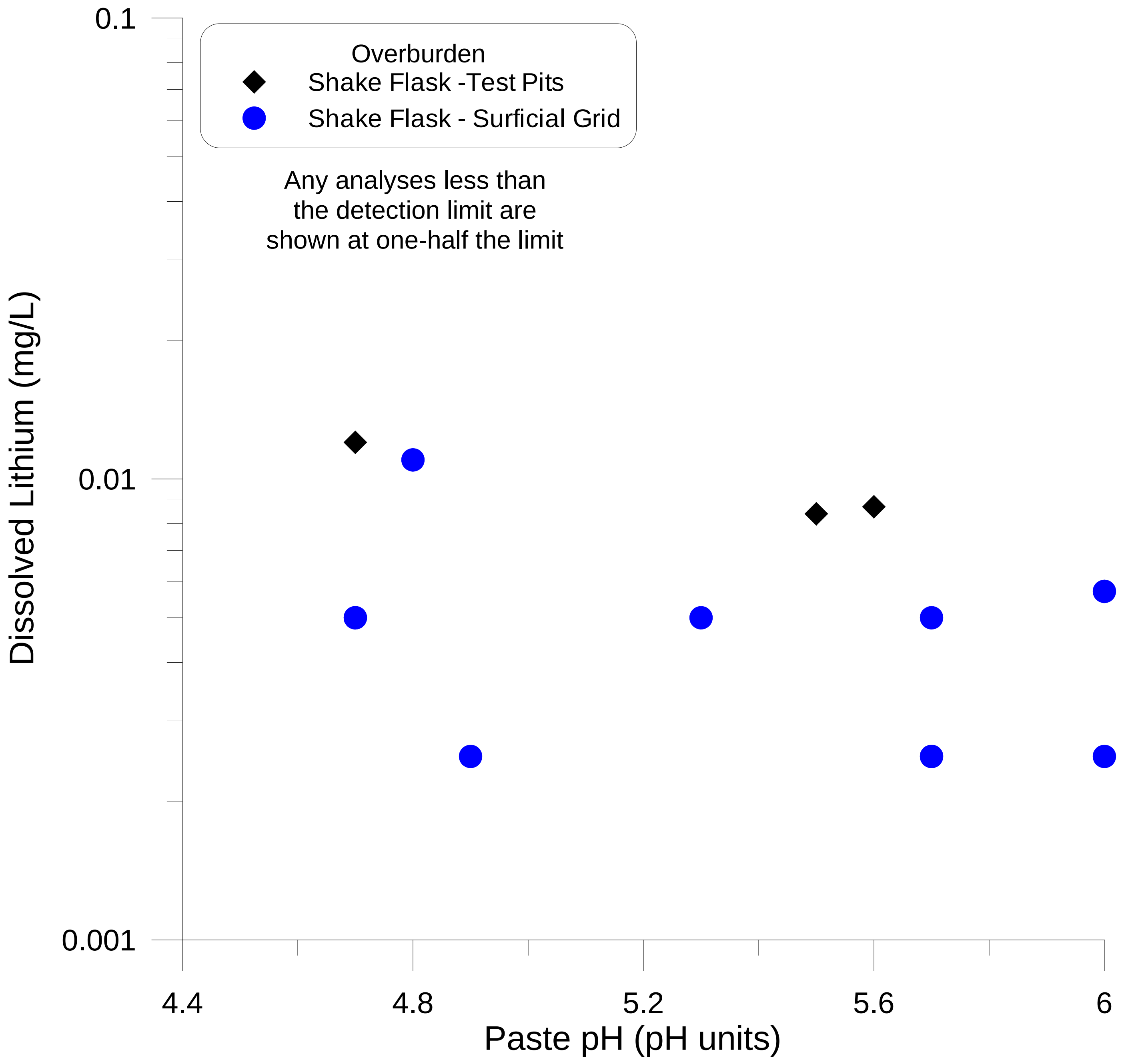

0.1
0.01
0.001
Dissolved Cobalt (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

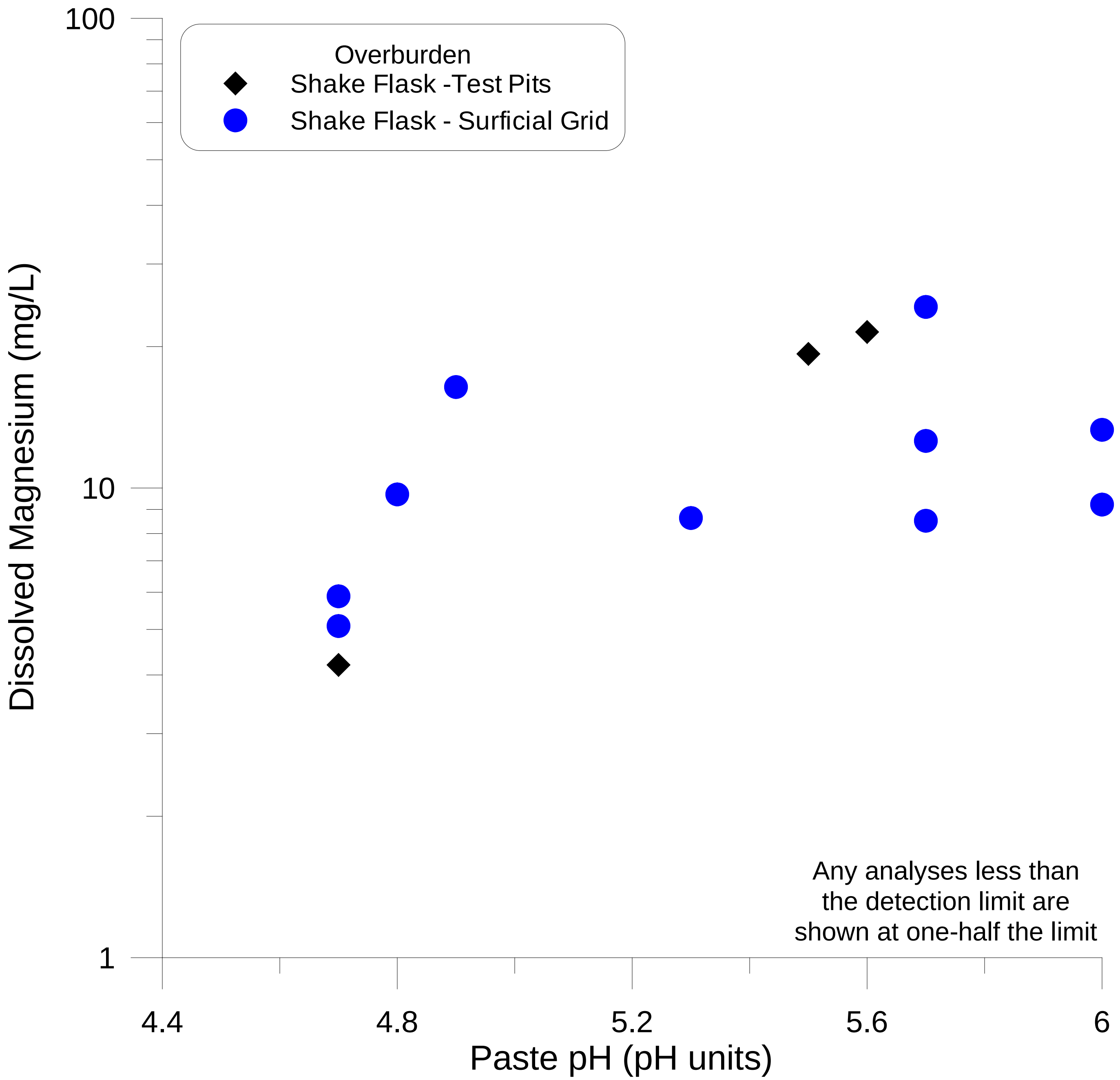

1
0.1
0.01
Dissolved Copper (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

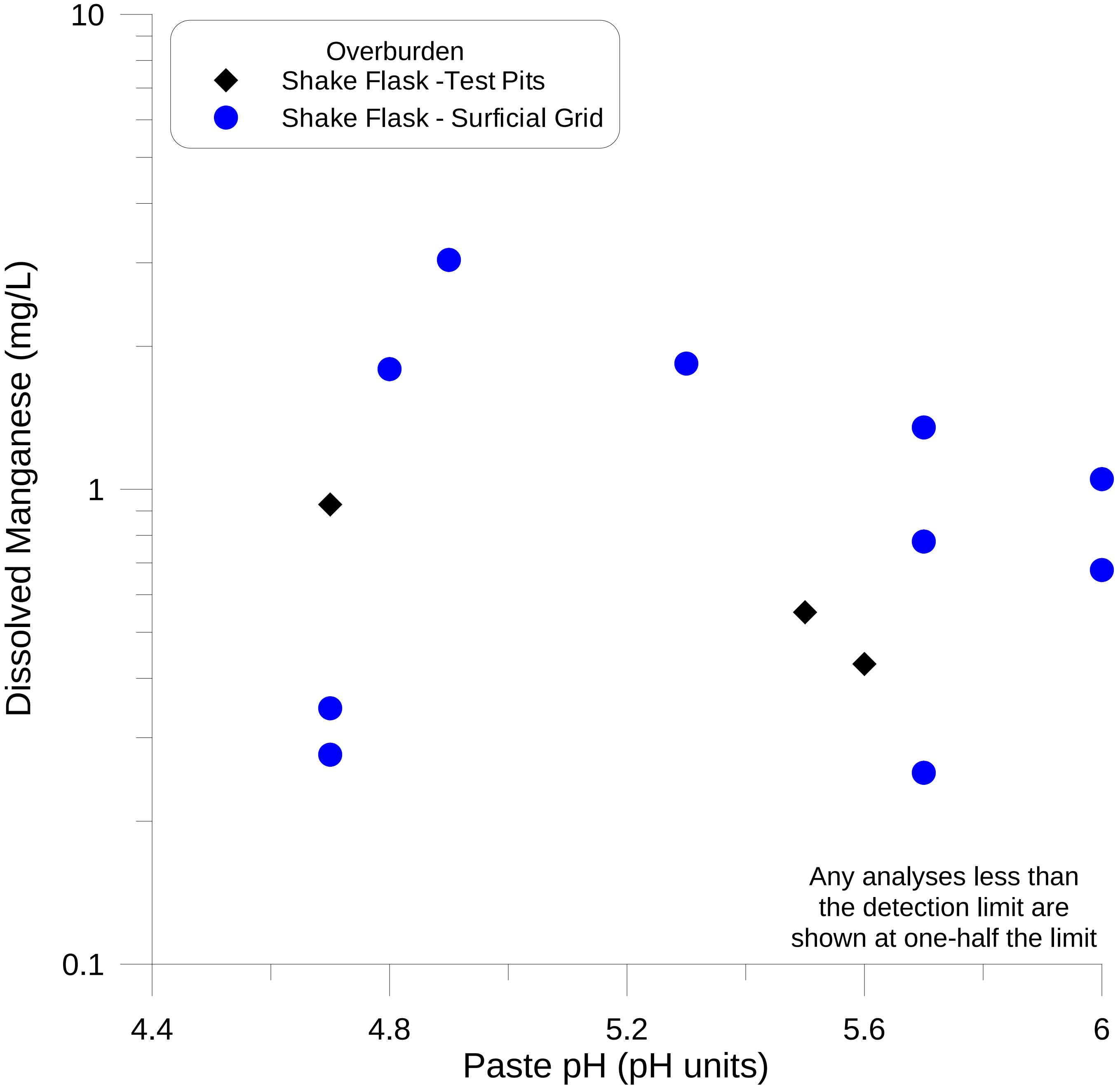


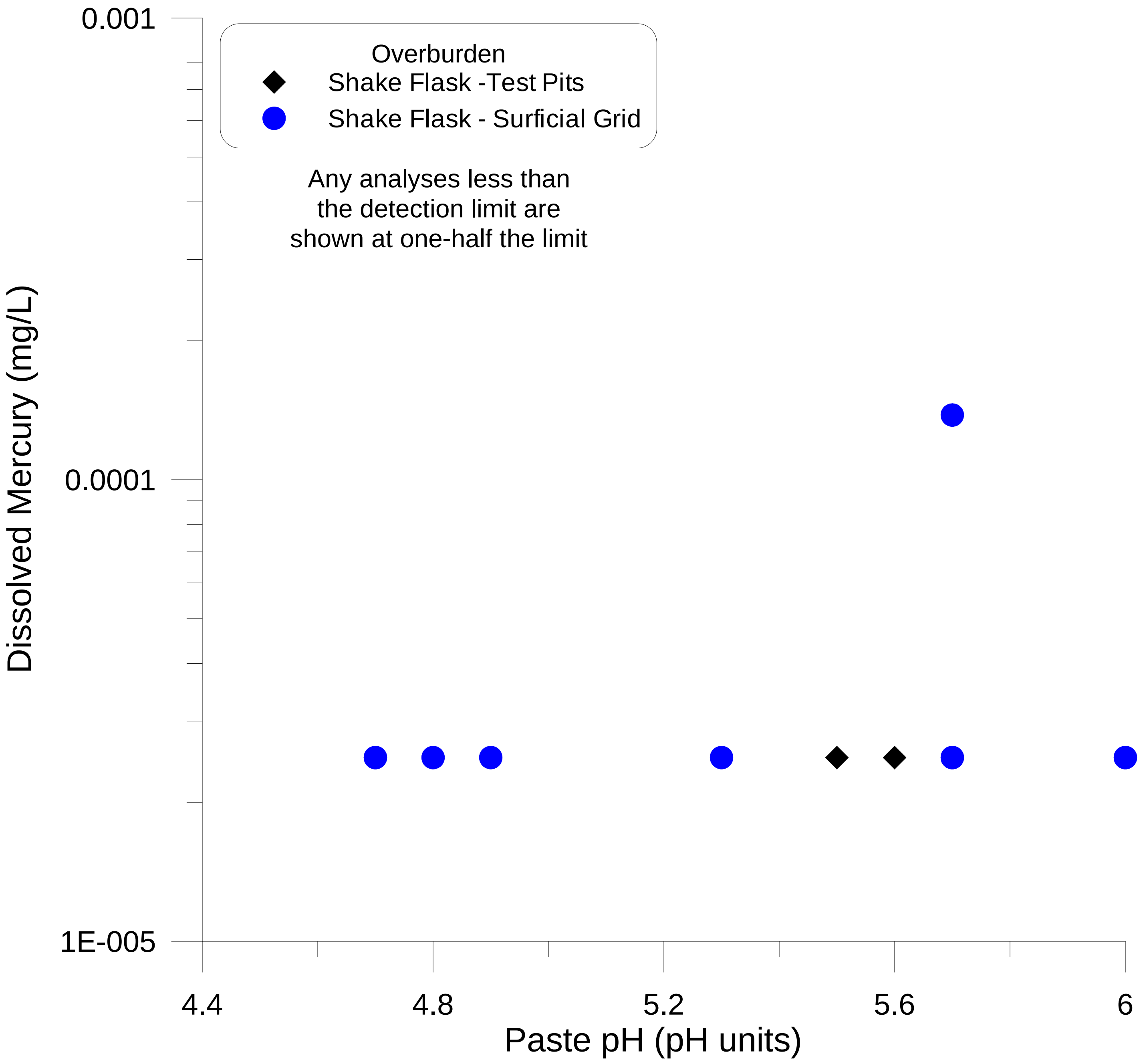
100
10
1
Dissolved Iron (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

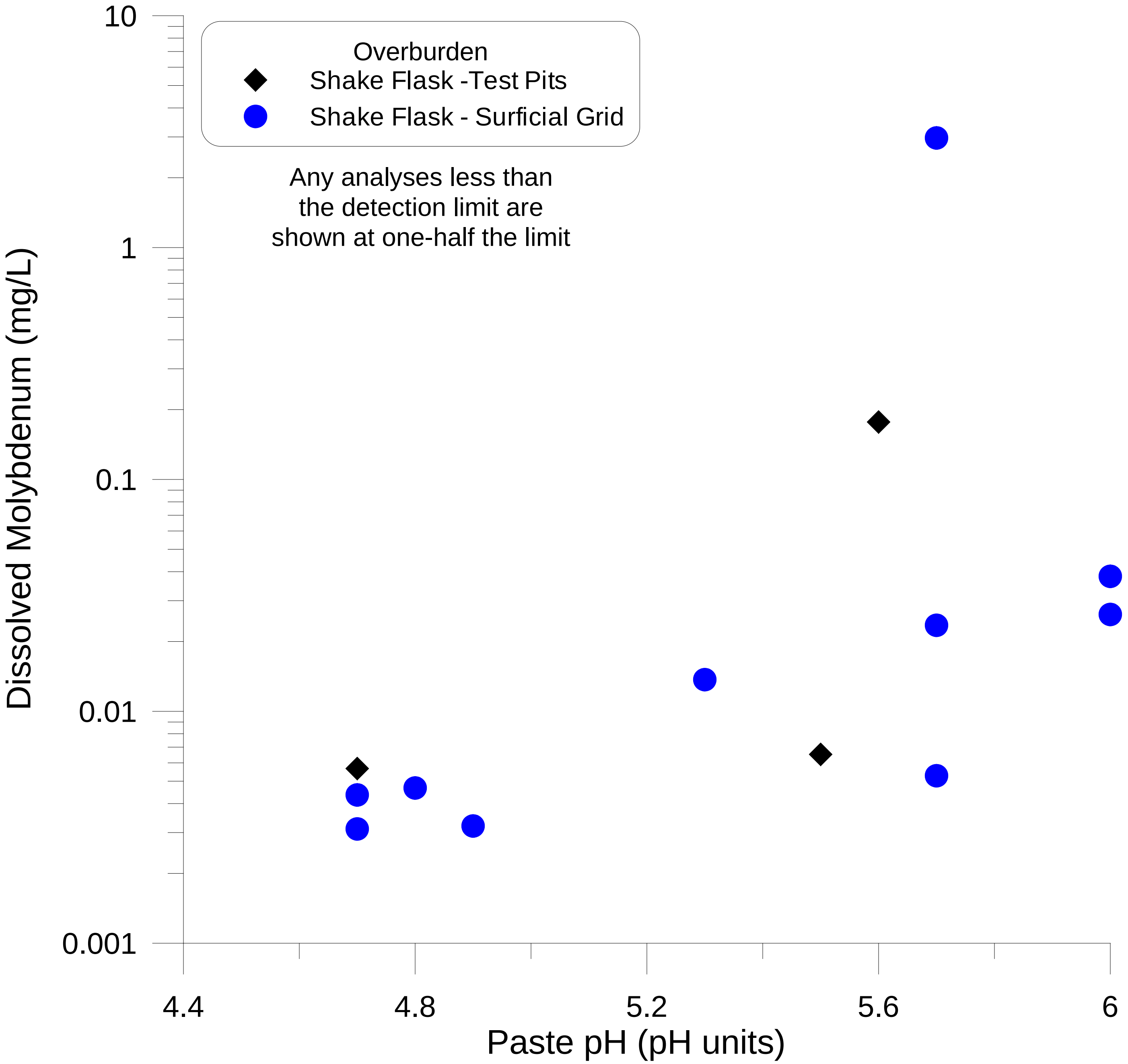

0.1
0.01
0.001
0.0001
Dissolved Lead (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

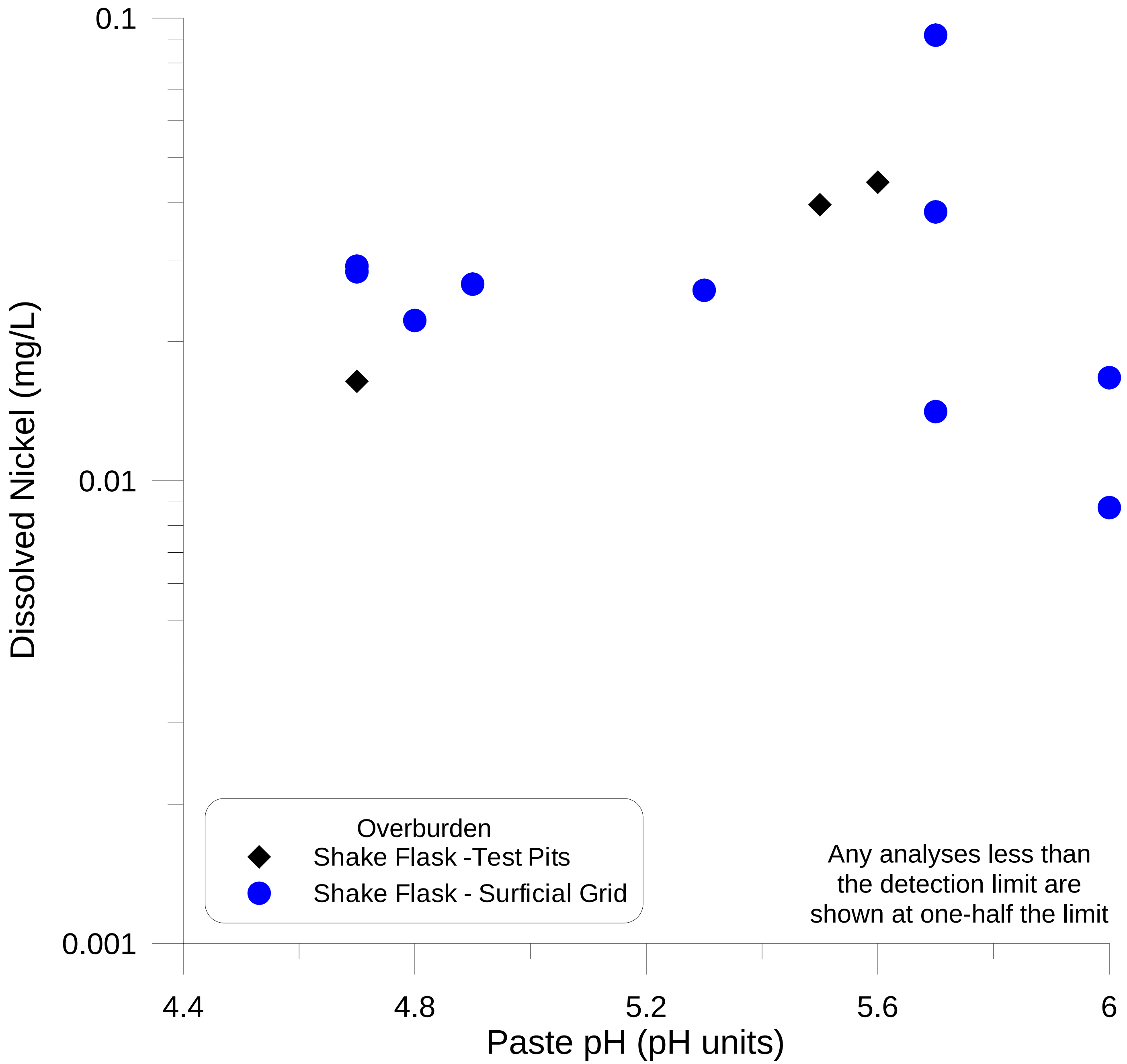

Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit
0.1
0.01
0.001
Dissolved Lithium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)


100
10
1
Dissolved Magnesium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

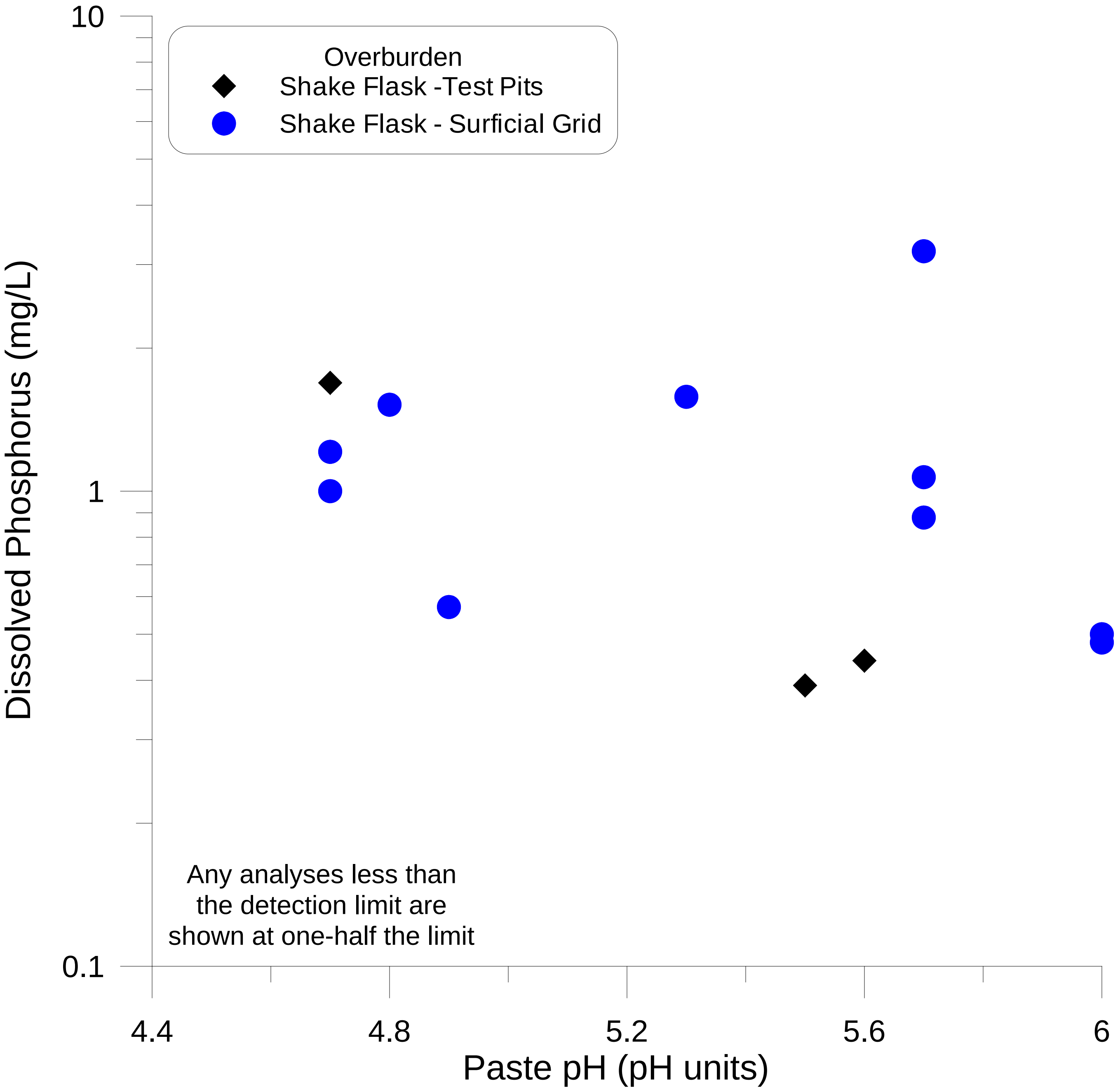

10
1
0.1
Dissolved Manganese (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

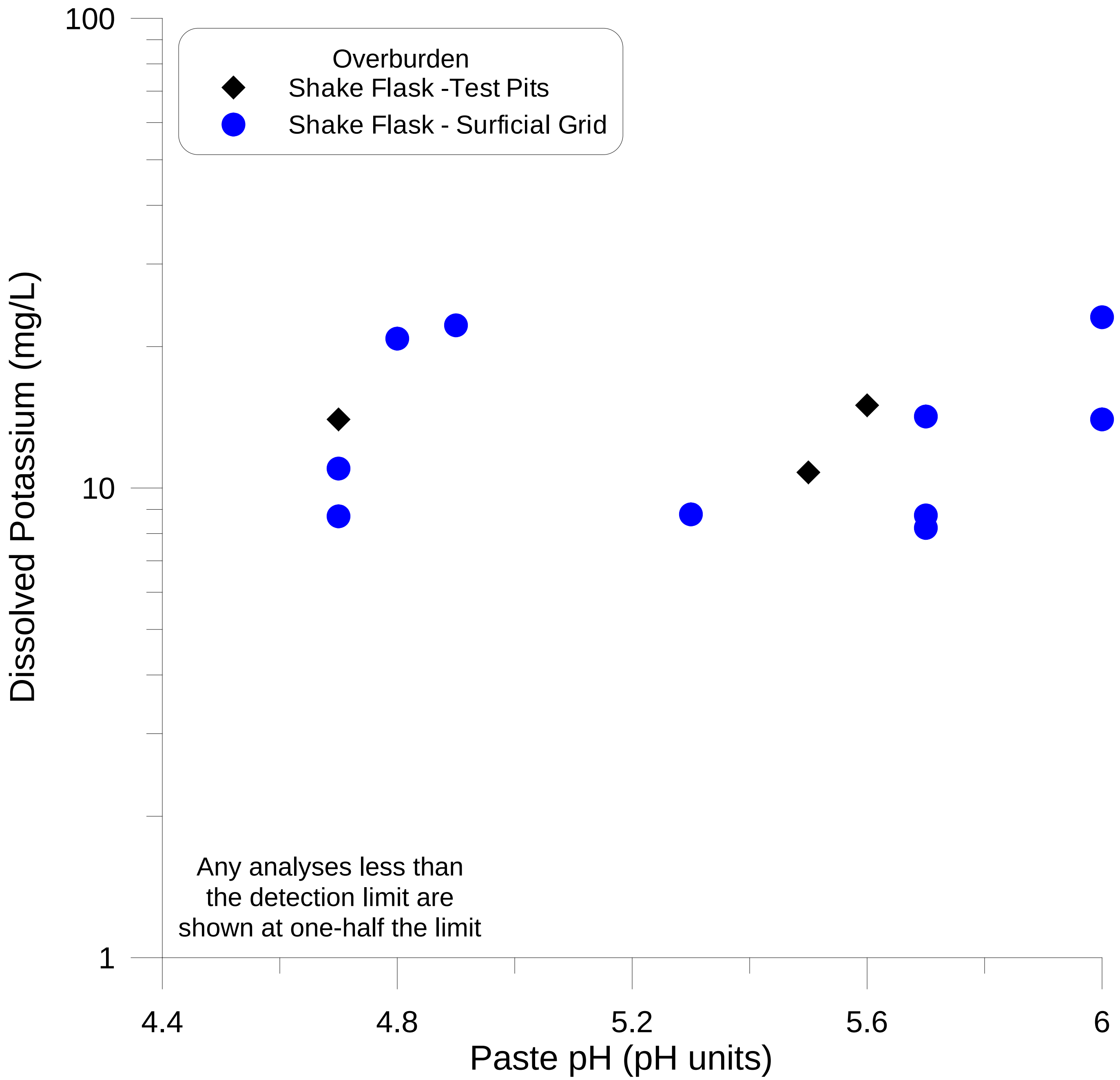

0.001
0.0001
1E-005
Dissolved Mercury (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

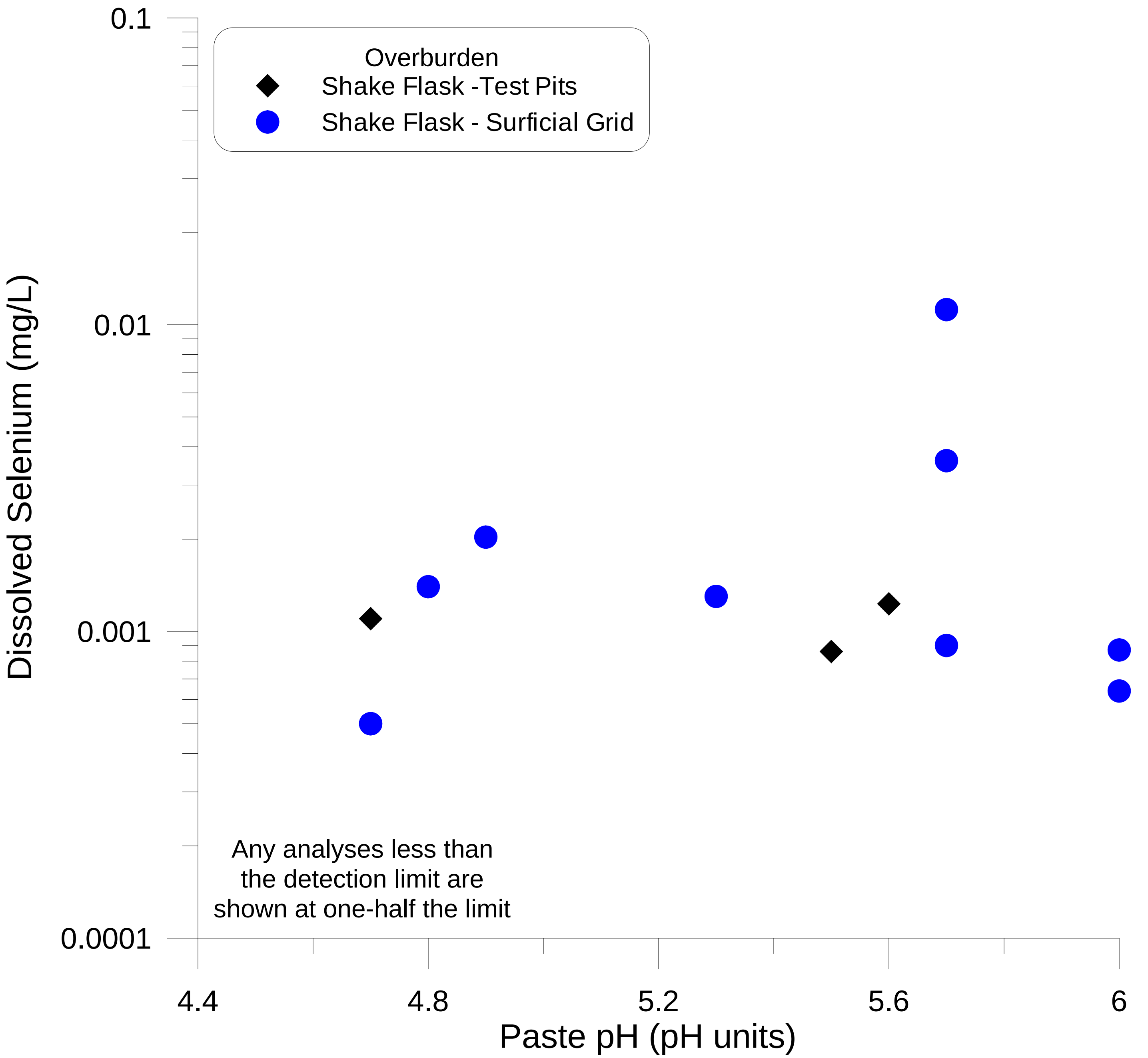

10
1
0.1
0.01
0.001
Dissolved Molybdenum (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

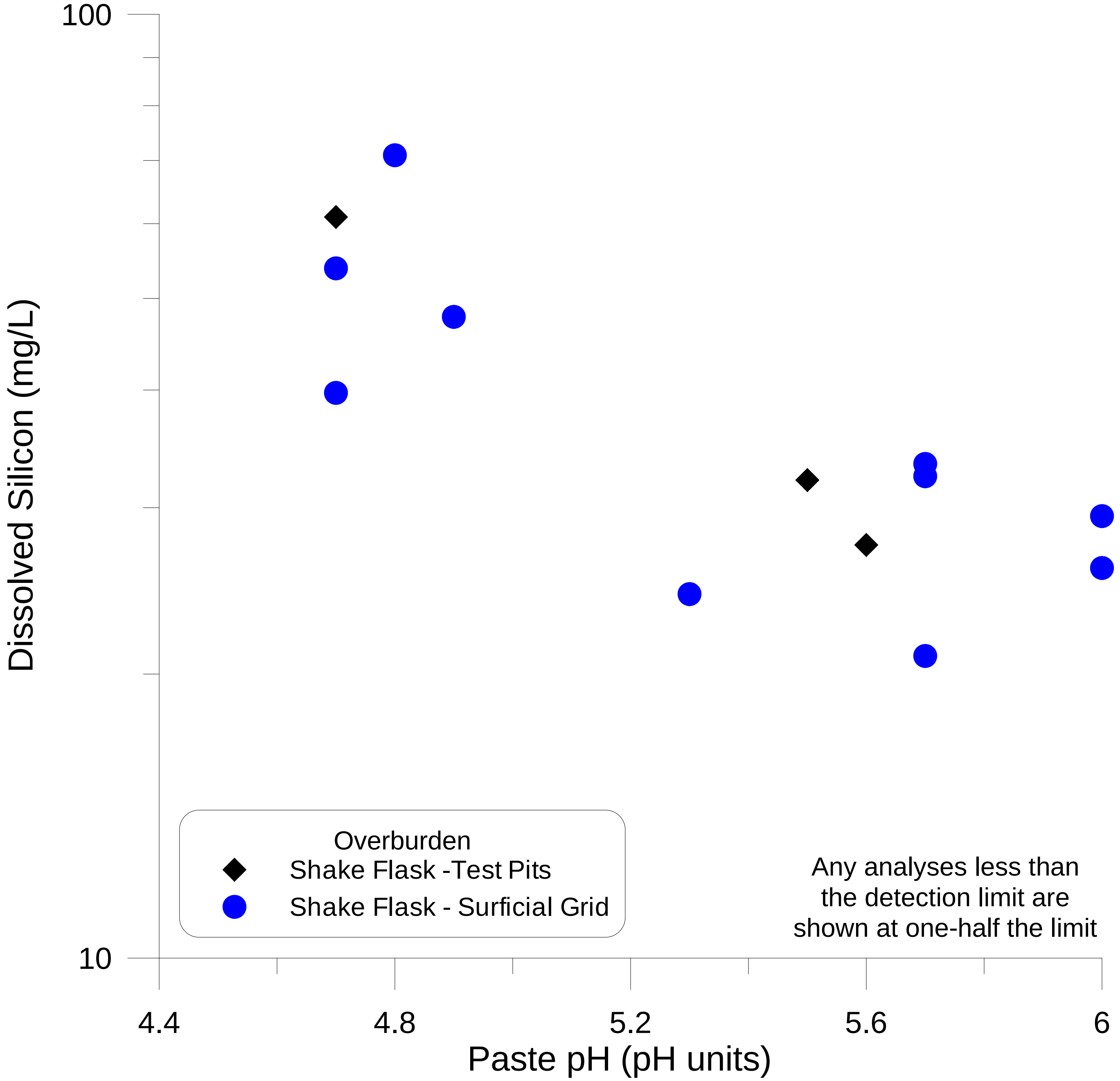


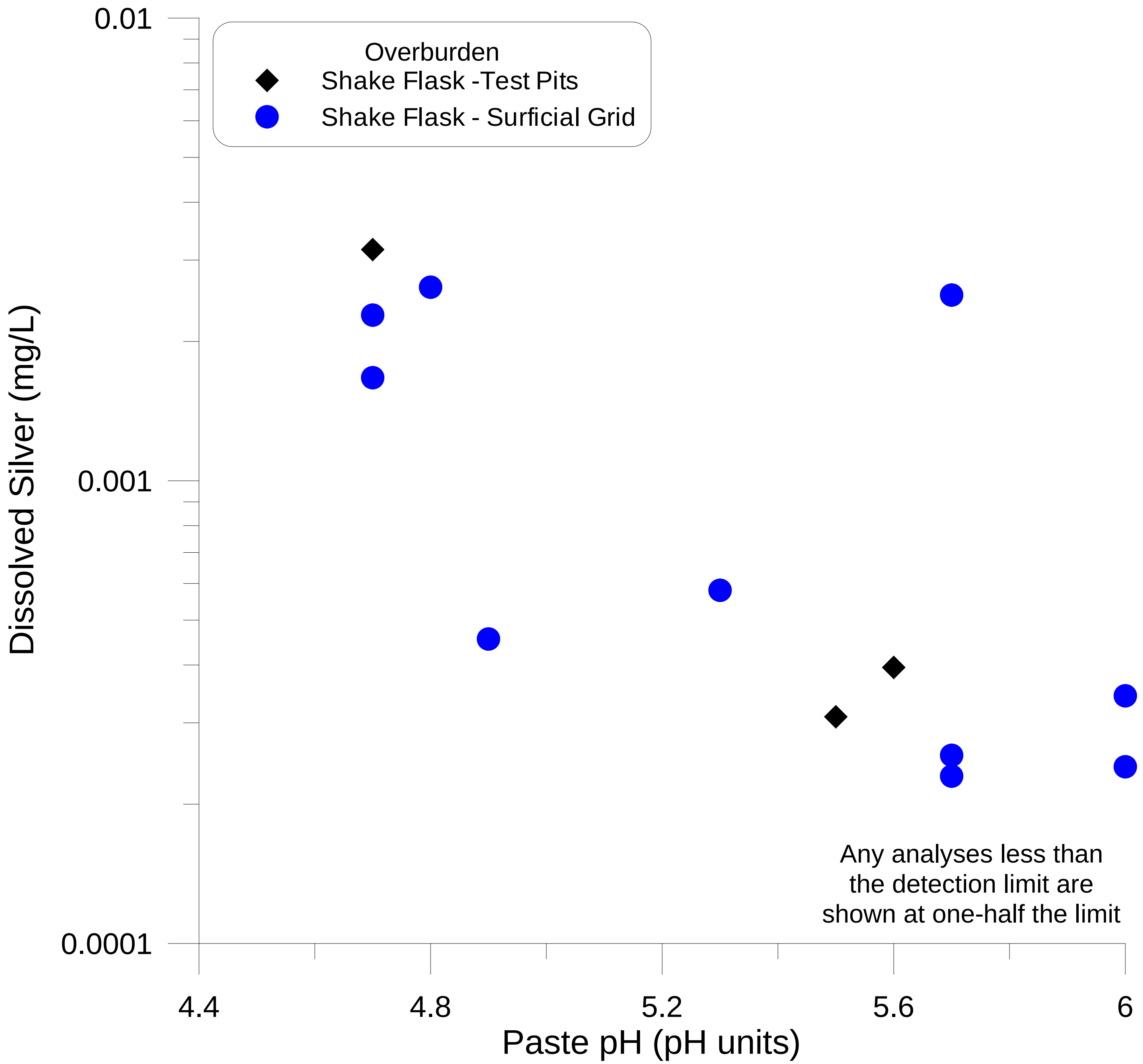
0.1
0.01
0.001
Dissolved Nickel (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

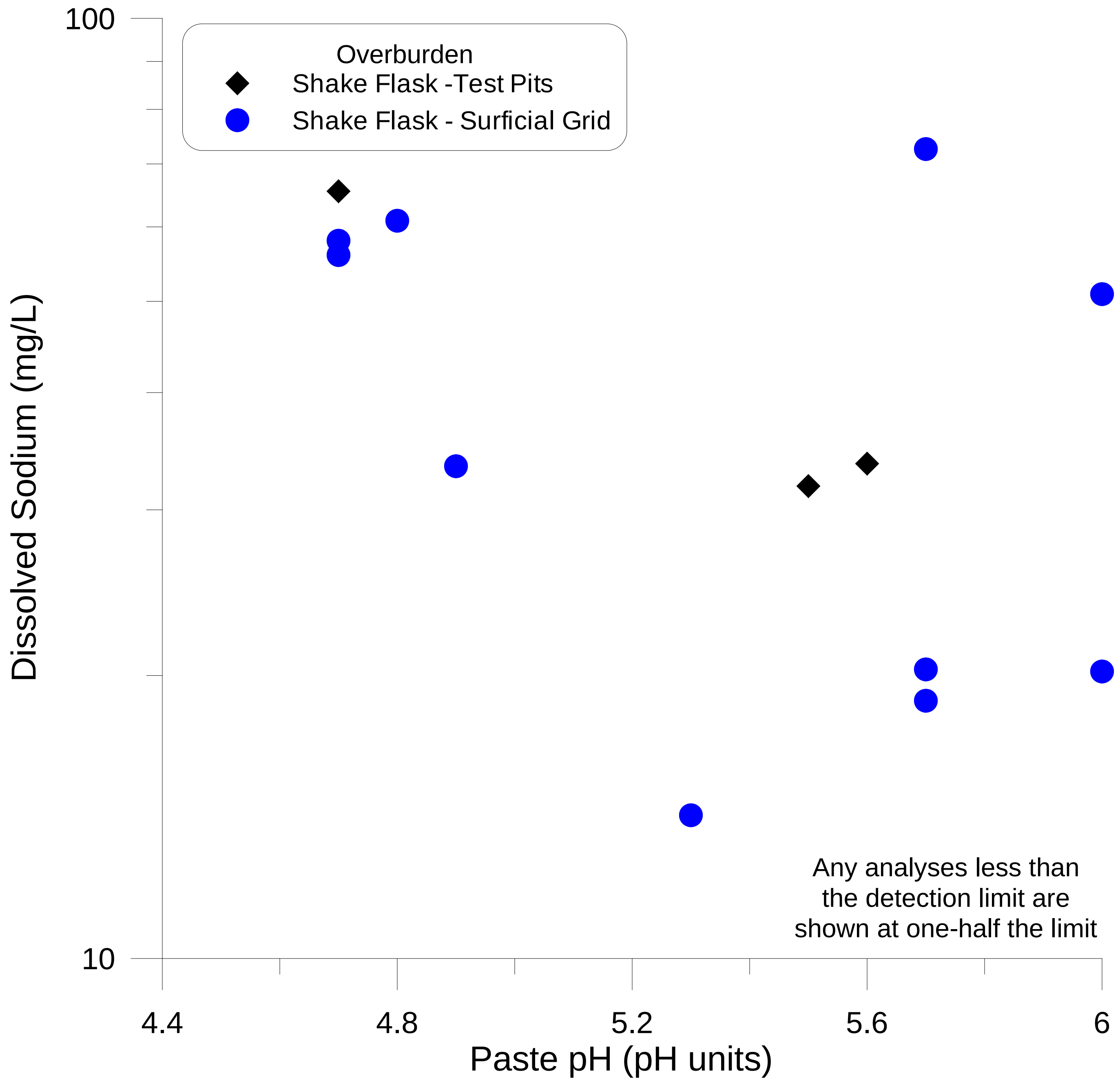

10
1
0.1
Dissolved Phosphorus (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

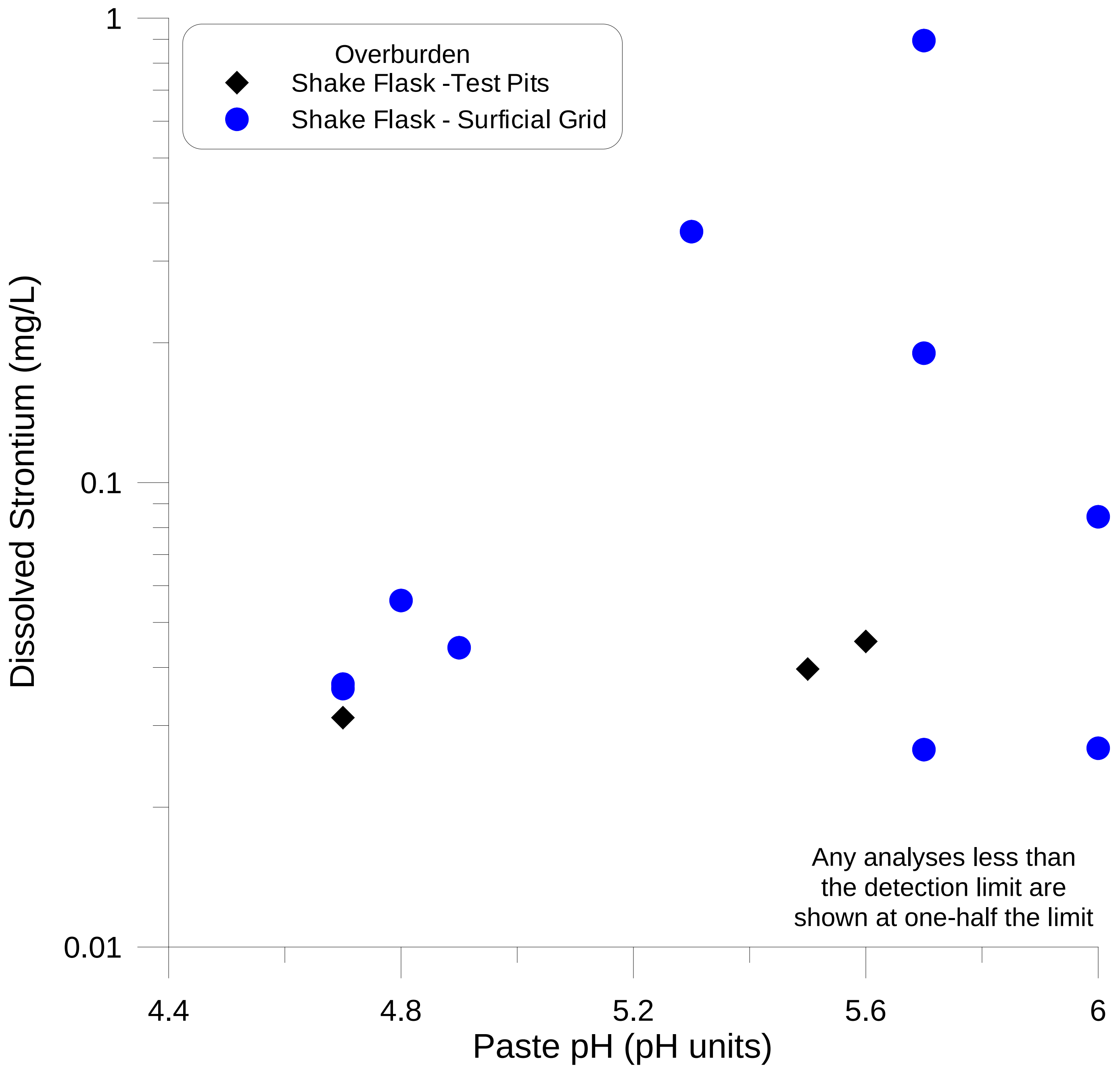

100
10
1
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Potassium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit


Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit
0.1
0.01
0.001
0.0001
Dissolved Selenium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

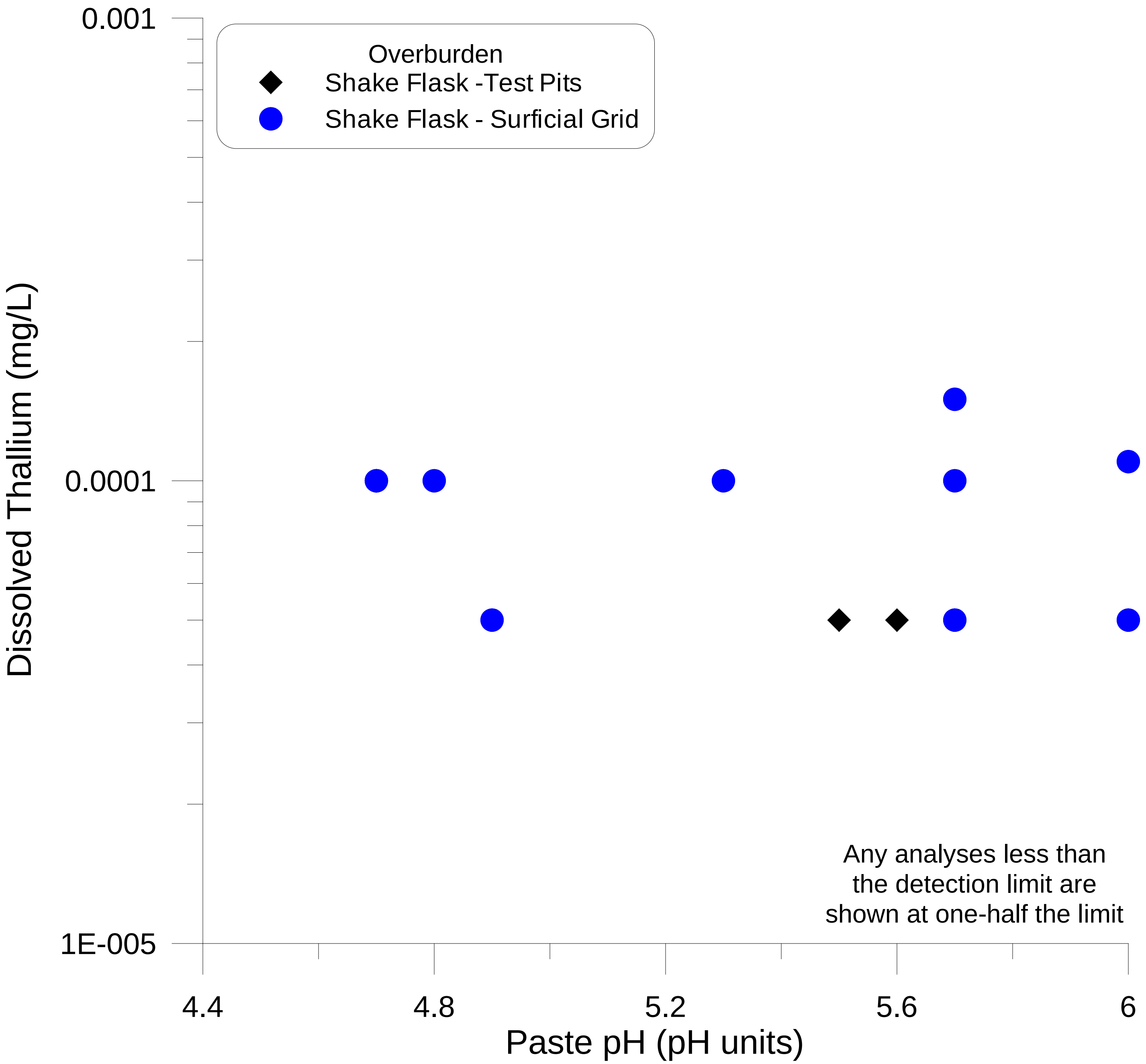

100
10
Dissolved Silicon (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


0.01
0.001
0.0001
Dissolved Silver (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit

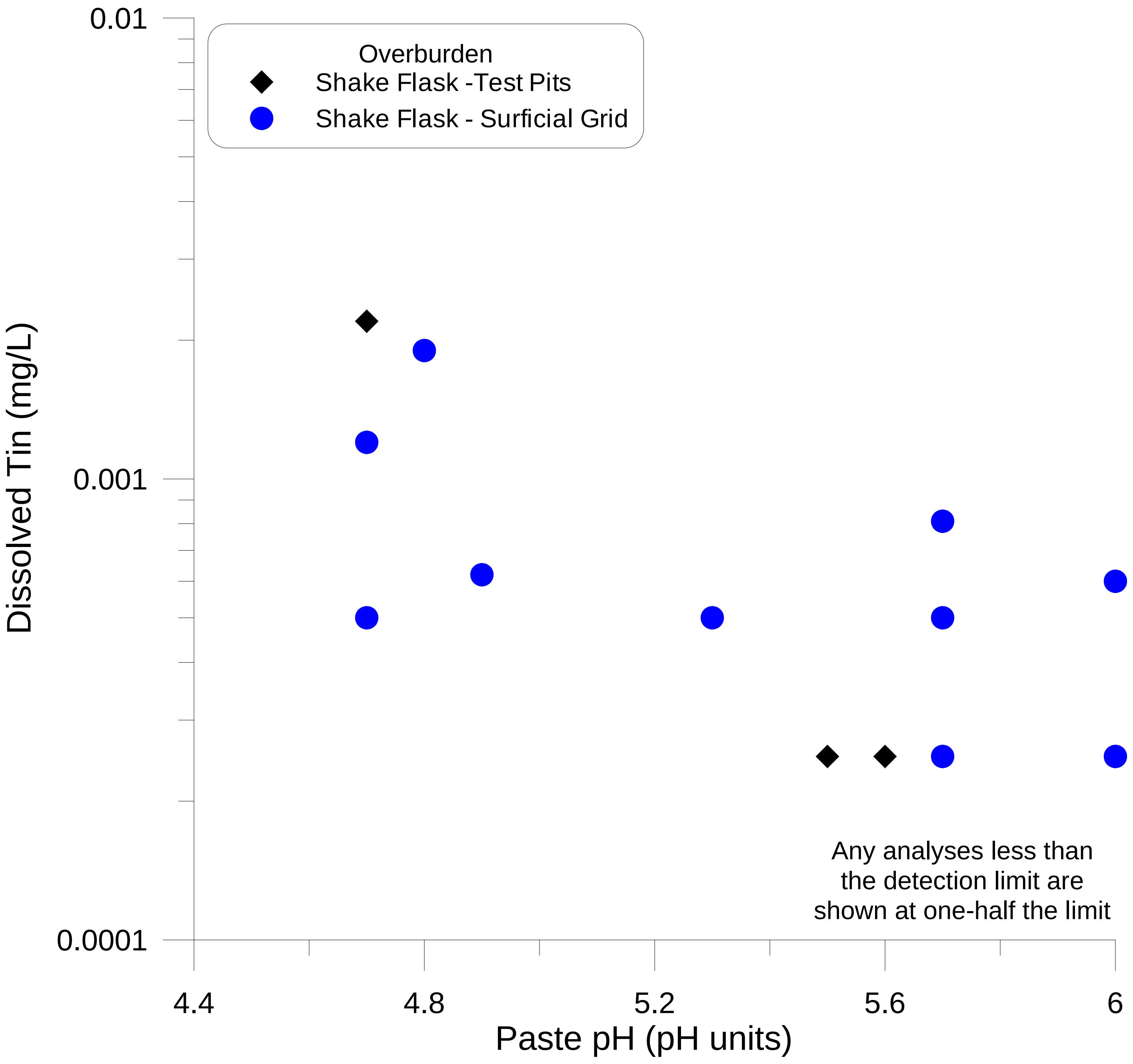

100
10
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Sodium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit

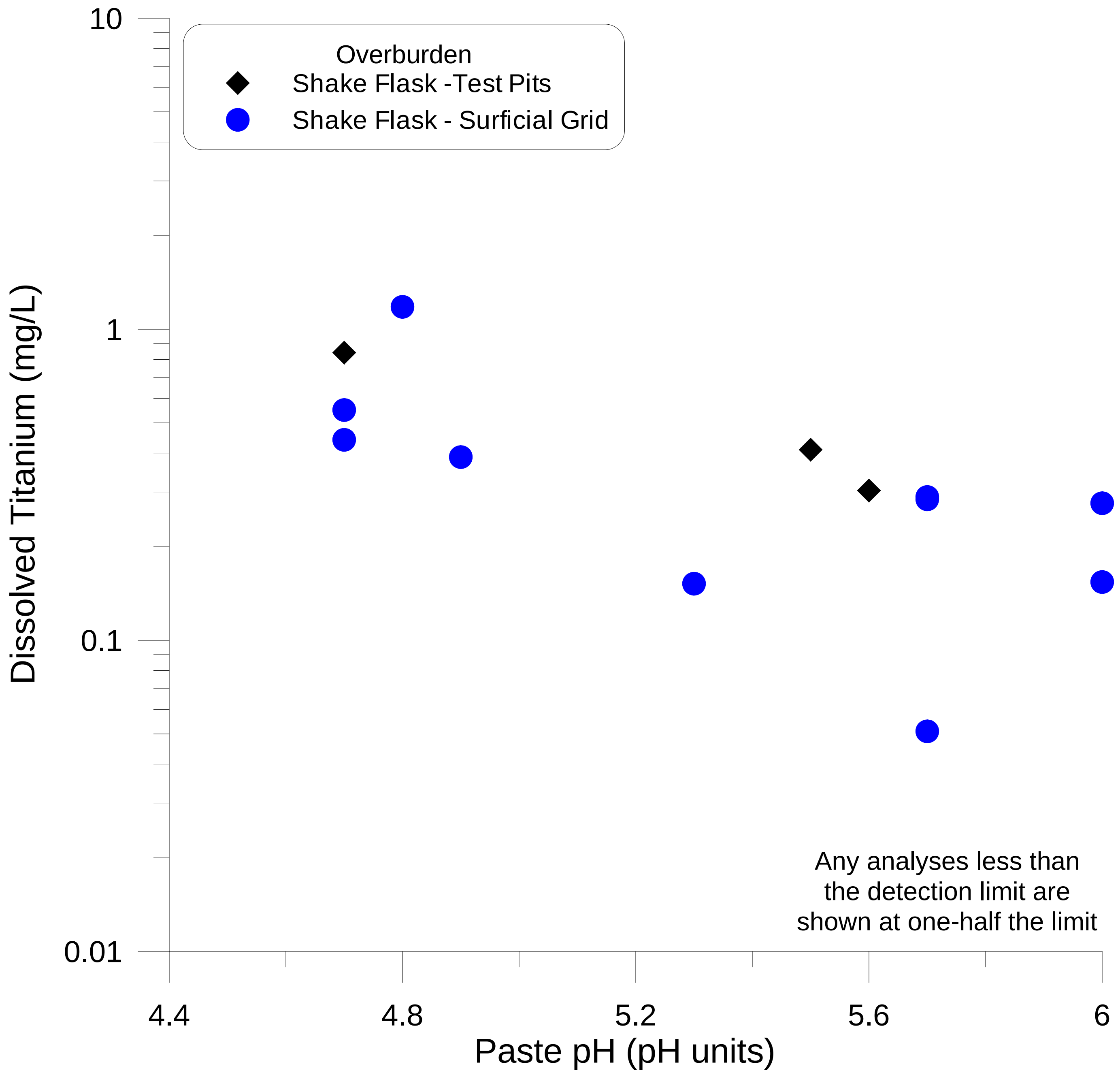


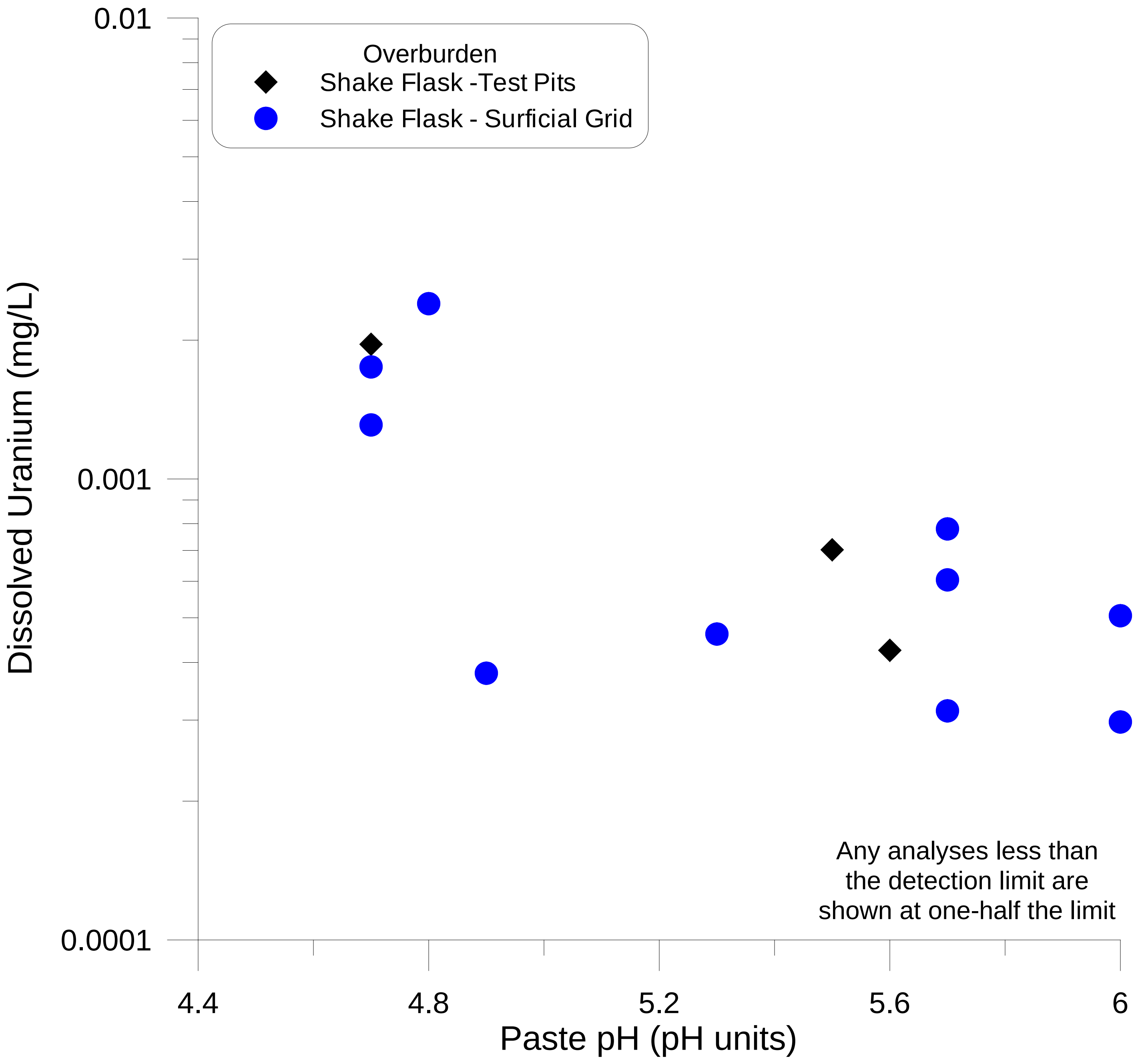
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than the detection limit are shown at one-half the limit
1
0.1
0.01
Dissolved Strontium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)

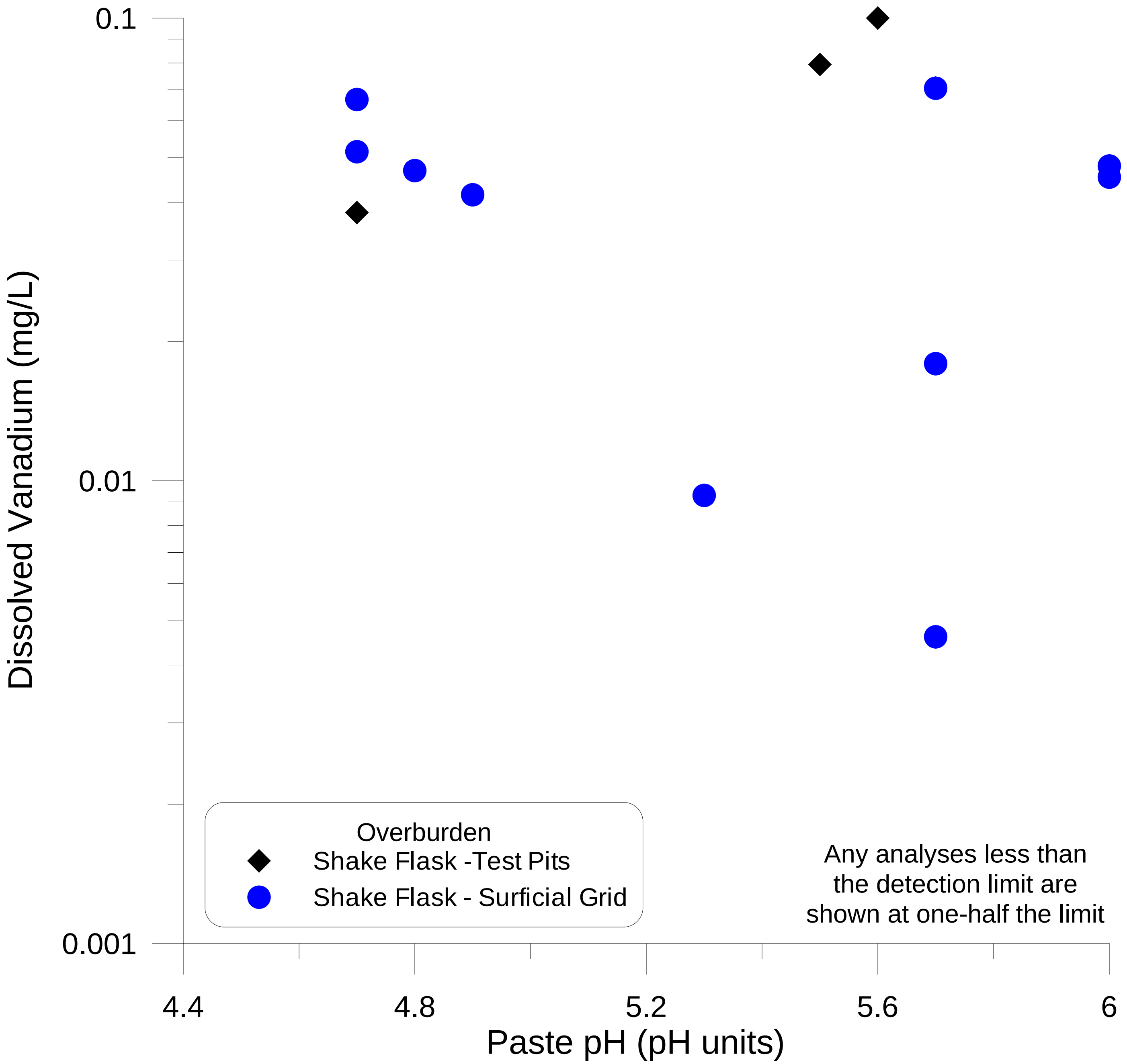


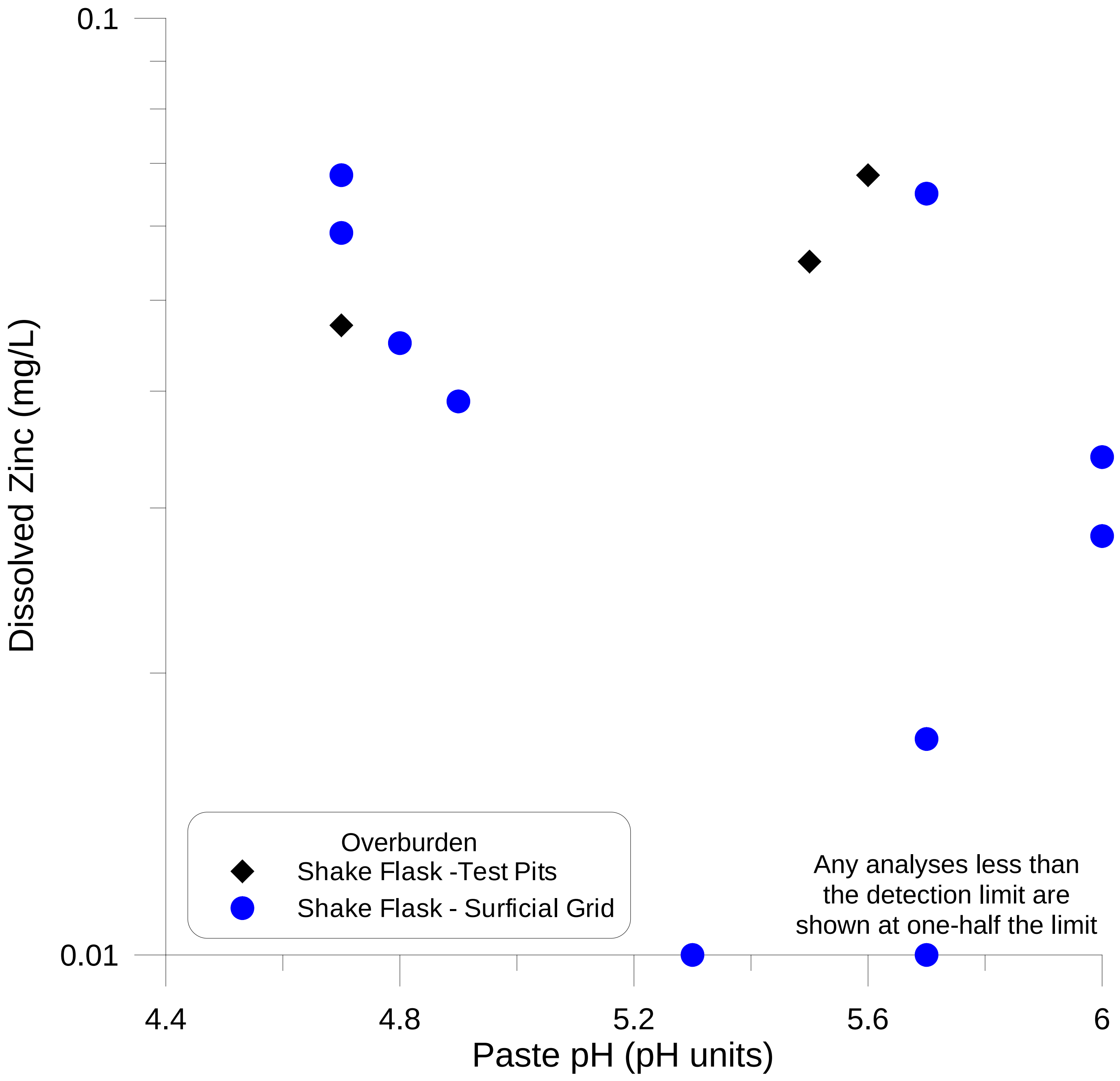
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Dissolved Thallium (mg/L)
0.001
0.0001
1E-005
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Any analyses less than
the detection limit are
shown at one-half the limit


0.01
0.001
0.0001
Dissolved Tin (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


10
1
0.1
0.01
Dissolved Titanium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit
0.01
0.001
0.0001
Dissolved Uranium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)


0.1
0.01
0.001
Dissolved Vanadium (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit


0.1
0.01
Dissolved Zinc (mg/L)
4.4
4.8
5.2
5.6
6
Paste pH (pH units)
Overburden
◆ Shake Flask -Test Pits
● Shake Flask - Surficial Grid
Any analyses less than
the detection limit are
shown at one-half the limit