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EXECUTIVE SUMMARY

In this report, the Savannah River National Laboratory (SRNL) provides chemical analysis for several simulated low-activity waste (LAW) glass compositions, as well as chemical analysis of the wash solutions resulting from the preparation of these glasses. The Pacific Northwest National Laboratory (PNNL) selected and fabricated these glasses as part of a study on sulfur retention in glasses previously evaluated. The resulting data will be used in the development of improved property/composition models for LAW glass production at Hanford.

Chemical analyses were performed on a representative sample of each of the study glasses to allow for comparisons with the targeted compositions. Glass standards were intermittently measured to assess the performance of the analytical instruments over the course of these analyses. There were no issues with measurements of the glass standards. A review of the individual glass composition measurements identified no analytical issues of concern. Minor differences between the targeted and measured concentrations of some of the baseline glass components were noted, including some low values for Al_2O_3, CaO, Na_2O, and ZrO_2.

Chemical analyses were also performed on a representative sample of each of the wash solutions resulting from the preparation of the sulfur saturated melt (SSM) versions of the study glasses. No issues were noted for the measurements of the solution standards. Several elements had measurable concentrations in the wash solutions, including B, Ca, Cl, Cr, K, Li, Na, P, S, and V. The measured concentrations of Na in the wash solutions were in the range of 200-1200 mg/L. This may be attributed to both the excess sodium sulfate added as part of the SSM preparation process, as well as to the lower measured concentrations of Na_2O in some of the SSM versions of the study glasses. The measured concentrations of sulfate in the wash solutions were in the range of about 750-2250 mg/L. PNNL may wish to make further comparisons between the compositions of the glasses and the compositions of the wash solutions.

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LIST OF ABBREVIATIONS

BDL	Below Detection Limit
DOE	U.S. Department of Energy
IC	Ion Chromatography
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
HLW	High-Level Waste
KH	Potassium hydroxide digestion
LAW	Low-Activity Waste
LM	Lithium Metaborate fusion
LRM	Low-level Reference Material
ORP	Office of River Protection
PF	Peroxide Fusion
PNNL	Pacific Northwest National Laboratory
ppm	Parts Per Million
SRNL	Savannah River National Laboratory
SSM	Sulfur Saturated Melt
TTQAP	Task Technical and Quality Assurance Plan
wt %	Weight Percent
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.0 Introduction

The U.S. Department of Energy (DOE) Office of River Protection (ORP) has requested that the Savannah River National Laboratory (SRNL) provide expert evaluation and experimental work in support of the River Protection Project vitrification technology development program. DOE is building the Hanford Tank Waste Treatment and Immobilization Plant (WTP) at the Hanford Site in Washington to remediate 55 million gallons of radioactive waste that is temporarily stored in 177 underground tanks. The low-activity waste (LAW) fraction will be partitioned from the high-level waste (HLW). Both the LAW and HLW will then be vitrified into borosilicate glass using Joule-heated ceramic melters.

Efforts are being made to increase the loading of Hanford tank wastes in the glass while conforming to processing requirements and product quality regulations. DOE-ORP has requested that SRNL support the advancement of glass formulations and process control strategies in key technical areas, as defined in the Task Technical and Quality Assurance Plan (TTQAP).[1] Two of these areas are enhancing waste glass property/composition models and broadening the compositional regions over which those models are applicable.

In this report, SRNL provides chemical analysis for several simulated LAW glass compositions, as well as chemical analysis of the wash solutions resulting from the preparation of these glasses. The Pacific Northwest National Laboratory (PNNL) selected and fabricated these glasses as part of a study on sulfur retention in glasses previously evaluated at the Vitreous State Laboratory. The resulting data will be used in the development of improved property/composition models for LAW glass production at Hanford.

2.0 Experimental Procedure

2.1 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in Savannah River Site Manual E7, Procedure 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2. Laboratory data for this study were recorded in the SRNL Electronic Laboratory Notebook system, experiment C3489-00079-18.

2.2 Glasses Selected for Study

The glass compositions in this study were selected and fabricated at PNNL. Identifiers for each of the glasses are listed in Table 2-1. In the sections that follow, the methods used for measuring chemical compositions of the glasses and wash solutions are described, and reviews of the resulting data are provided. Detailed data from these analyses are included in the appendices.

Table 2-1. Glass Identifiers Included in This Study

Glass ID		Glass ID
LAWA161-BL		ORPLB4-BL
LAWA161-SSM-S		ORPLB4-SSM-S
LAWA161-SSM-S #2		ORPLC5-BL
LAWA187-BL		ORPLC5-SSM-S
LAWA187-SSM-S		ORPLD1-BL
LAWB99-BL		ORPLD1-ET-SSM-S
LAWB99-SSM-S		ORPLD1-SSM-S
LAWB99-SSM-S #2		ORPLD6-BL
LAWC100-BL		ORPLD6-SSM-S
LAWC100-SSM-S		ORPLE12-BL
ORPLA20-BL		ORPLE12-SSM-S
ORPLA20-SSM-S		ORPLF7-BL
ORPLA20-SSM-S #2		ORPLF7-SSM-S
ORPLA38-1-BL		ORPLG27-BL
ORPLA38-1-SSM-S		ORPLG27-SSM-S

2.3 Glass Composition Analysis

Chemical analyses were performed under the auspices of an analytical plan[2] on a representative sample of each of the glasses listed in Table 2-1 to allow for comparisons with the targeted compositions. Three dissolution techniques, sodium peroxide fusion (PF),[3] lithium metaborate fusion (LM),[4] and potassium hydroxide fusion (KH),[5] were used for preparing each of the glass samples for analysis. Note that, after discussion with PNNL, cesium concentrations were not measured due to their low targeted concentrations of less than 0.2 weight percent (wt %) and the expense associated with additional analysis for this element.

Each of the prepared samples was analyzed twice for each element of interest by Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)[6] or ion chromatography (IC).[7] Glass standards were also intermittently measured to assess the performance of the ICP-AES and IC instruments over the course of these analyses. Specifically, several samples of the low-level reference material (LRM)[8] were included as part of the analytical plan. The LRM composition reported as the "Consensus Average" is used as the reference composition of this glass for the purposes of this study.[8] The preparation and measurement methods used for each of the reported glass components are listed in Table 2-2.

Table 2-2. Preparation and Measurement Methods Used in Reporting the Concentrations of Each of the Analytes of the Study Glasses

Analyte	Preparation Method	Measurement Method
Al	PF	ICP-AES
B	PF	ICP-AES
Ca	LM	ICP-AES
Cl	KH	IC
Cr	LM and KH	ICP-AES
F	KH	IC
Fe	LM	ICP-AES
K	LM	ICP-AES
Li	PF	ICP-AES
Mg	LM	ICP-AES
Mn	LM	ICP-AES
Na	LM	ICP-AES
Ni	LM	ICP-AES
P	LM	ICP-AES
Pb	LM	ICP-AES
S	LM	ICP-AES
Si	PF	ICP-AES
Sn	PF	ICP-AES
V	LM	ICP-AES
Zn	LM	ICP-AES
Zr	LM	ICP-AES

2.4 Wash Solution Analysis

Chemical analyses were performed under the auspices of an analytical plan[2] on a representative sample of each of the wash solutions from the SSM glasses listed in Table 2-1. These wash solutions were prepared at PNNL and provided to SRNL for analysis. The samples were diluted based on the observed concentrations of the species in solution and acidified as appropriate (only when visible solids were present) in preparation for the analyses.

Each of the samples was analyzed in triplicate for each element of interest by ICP-AES[6] and IC.[7] Solution standards and blanks were also intermittently measured to assess the performance of the ICP-AES and IC instruments over the course of these analyses.

The measurement methods used for each of the reported wash solution components are listed in Table 2-3.

Table 2-3. Measurement Methods Used in Reporting the Concentrations of Each of the Analytes of the Wash Solutions

Analyte	Measurement Method
Al	ICP-AES
B	ICP-AES
Ca	ICP-AES
Cl^-	IC
Cr	ICP-AES
F^-	IC
Fe	ICP-AES
K	ICP-AES
Li	ICP-AES
Mg	ICP-AES
Mn	ICP-AES
Na	ICP-AES
Ni	ICP-AES
P	ICP-AES
Pb	ICP-AES
PO_4^-	IC
S	ICP-AES
SO_4^{2-}	IC
Si	ICP-AES
Sn	ICP-AES
V	ICP-AES
Zn	ICP-AES
Zr	ICP-AES

3.0 Results and Discussion

3.1 Review and Evaluation of the Glass Composition Measurements

Table A-1 and Table A-2 in Appendix A provide the elemental concentration measurements in wt % for the study glasses as prepared by the LM method. Table A-3 in Appendix A provides the elemental concentration measurements in wt % for the study glasses as prepared by the PF method. Table A-4 in Appendix A provides the elemental concentration measurements in wt % for the study glasses as prepared by the KH method. Elemental measurements for samples of the LRM standard glass are also included in the tables of Appendix A. These unprocessed data are provided so that the values are readily available should they be of interest for future reviews.

In the sections that follow, the analytical sequences of the measurements are explored, the measurements of the LRM standard glass are investigated, the measurements for each glass are reviewed, the average chemical composition for each glass is determined, and comparisons are made between the measurements and the targeted compositions of the glasses. JMP™ Pro Version 11.2.1 (SAS Institute, Inc.)[9] was used to support these analyses.

3.1.1 Treatment of Detection Limits

The elemental concentrations in Table A-1 through Table A-4 of Appendix A were converted to oxide concentrations by multiplying the values for each element by the gravimetric factor for the corresponding oxide. During the process of converting to oxide concentrations, an elemental concentration measurement that was reported to be below the detection limit of the analytical process used was set to the detection limit

for the purposes of review and calculating a sum of oxides for each glass. Those oxides with one or more concentration measurements that were below the associated detection limit (BDL) will be denoted with a less than symbol (<) as the measured compositions are reported.

3.1.2 Measurements in Analytical Sequence

Exhibit A-1 in Appendix A provides plots of the wt % measurements generated for each sample by oxide and analytical block. The plots are in analytical sequence within each calibration block with different symbols and colors being used to represent each of the study and standard glasses. These plots include all the measurement data from Table A-1 through Table A-4 in Appendix A, with each plotted point identified by its Lab ID (from the analytical study plan[2]). Plotting the data in this format provides an opportunity to identify gross trends in performance of the analytical instruments within and among calibration blocks. A review of these plots did not identify any gross patterns or trends in the analytical process over the course of these measurements. Only minor, block-to-block calibration shifts are seen. For example, minor calibration effects are visible between the two sub-blocks within the first analytical block for the Na_2O measurements. In all cases, the instrument check standards were within specification. These small calibration effects are typical of ICP-AES analyses and are negated by taking the average of the measurements for each analyte.

3.1.3 Composition Measurements by Glass Identifier

Exhibit A-2 in Appendix A provides plots of the oxide concentration measurements by the PNNL Glass ID (including the LRM reference glass) by Lab ID grouped by targeted concentration. Different symbols and colors are used to represent the different glasses. These plots show the individual measurements across the two instrument calibrations for each glass. Plotting the data in this format provides an opportunity to review the values for each individual glass as a function of the duplicate measurements. A review of the plots presented in these exhibits reveals the repeatability of the two individual values for each oxide for each glass. Some degree of scatter among the Al_2O_3, B_2O_3, Na_2O, and SiO_2 measurements was noted for the study glasses. There were no indications of an error in preparation or measurement that had to be addressed in treatment of the data. Therefore, the entire set of measurement data was used in determining representative, measured compositions for the study glasses.

3.1.4 Results for the LRM Standard

Exhibit A-3 in Appendix A provides a comparison of the LRM results to their acceptability limits utilized by SRNL.[6] The review is in the form of plots of the measurements arranged by preparation method and element, framed by upper and lower acceptability limits for the concentration of the element in question. The results show that all the measurements for the elements present in the LRM standard glass were within the acceptability limits utilized by SRNL in conducting instrument and procedure assessments during the execution of these analyses.

3.1.5 Measured versus Targeted Compositions

From the discussion of Section 3.1.3, all of the measurements for each oxide for each glass (i.e., all of the measurements in Table A-1 through Table A-4 in Appendix A) were averaged to determine a representative chemical composition for each glass. A sum of oxides was also computed for each glass based upon the averaged, measured values. Exhibit A-4 in Appendix A provides plots showing the result for each glass for each oxide to allow PNNL to draw comparisons between the measured and targeted values. The following observations are offered from a review of these plots:

- The measured concentrations of Al_2O_3 are somewhat below the targeted values for many of the study glasses.
- The measured concentrations of CaO, Cr_2O_3, P_2O_5, and ZrO_2 are low for some of the study glasses.
- The measured concentrations of chlorine are low for most of the study glasses, perhaps due to volatility during melting.

- The measured concentration of K_2O is low for glass ORPLG27-SSM-S.
- The measured concentrations of Li_2O are low for those glasses that contain this oxide.
- The measured Na_2O concentrations are low for most of the study glasses, while the measured Na_2O concentration for the LRM glass was close to the reference value.
- Some of the measured SO_3 values are above the targeted values, as expected for the sulfur saturated melts (SSM).

Table A-5 in Appendix A provides a summary of the average compositions as well as the targeted compositions and some associated differences and relative differences. All the measured sums of oxides for the study glasses fall within the interval of 96.3 to 100.6 wt %, indicating acceptable recovery of the glass components. Entries in Table A-5 show the relative differences between the measured values and the targeted values for the oxides with targeted values above 5 wt %. The relative differences are shaded if they are 10% or more.[a] The shaded cells are consistent with the observations listed above.

3.2 Review and Evaluation of Wash Solution Measurements

Table B-1 in Appendix B provides the elemental concentration measurements in mg/L for the wash solutions as measured by ICP-AES. Table B-2 in Appendix B provides the anion concentration measurements in mg/L for the wash solutions as measured by IC. Elemental measurements of the blanks and standard solutions are also included in the tables of Appendix B. These unprocessed data are provided so that the values are readily available should they be of interest for future reviews.

In the sections that follow, the analytical sequences of the measurements are explored, the measurements of the standard solutions and the wash solutions are reviewed, and the average chemical composition for each wash solution is determined. JMP™ Pro Version 11.2.1 (SAS Institute, Inc.)[9] was used to support these analyses.

3.2.1 Treatment of Detection Limits

The elemental and anion concentrations in Table B-1 and Table B-2 of Appendix B include measurements that were reported to be below the detection limit of the analytical process used. These values were set to the detection limit for the purposes of review and calculating an average composition for each wash solution. Those analytes with one or more concentration measurements that were below the associated detection limit (BDL) will be denoted with a less than symbol (<) as the measured compositions are reported.

3.2.2 Measurements in Analytical Sequence

Exhibit B-1 in Appendix B provides plots of the mg/L measurements generated for each wash solution sample by element or anion and analytical block. The plots are in analytical sequence within each calibration block with different symbols and colors being used to represent each of the wash solutions and standard solutions. These plots include all the measurement data from Table B-1 and Table B-2 in Appendix B, with each plotted point identified by its Lab ID. Plotting the data in this format provides an opportunity to identify gross trends in performance of the analytical instruments within and among calibration blocks. A review of these plots did not identify any gross patterns or trends in the analytical process over the course of these measurements.

3.2.3 Composition Measurements by Wash Solution Identifier

Exhibit B-2 in Appendix B provides plots of the elemental and anion concentration measurements grouped by the wash solution identifier (including the blanks and standard solutions). Different symbols and colors are used to represent the different solutions. Plotting the data in this format provides an opportunity to

[a] These criteria were selected arbitrarily for the purpose of highlighting differences from targeted concentrations that may be of practical concern.

review the values for each individual solution as a function of the triplicate measurements. The plots in Appendix B for PO_4^{3-} and SO_4^{2-} include the measured values from both ICP-AES and IC for comparison. The measured S and P concentrations from the ICP-AES analyses were converted to PO_4^{3-} and SO_4^{2-} concentrations by multiplying by the appropriate gravimetric factors to support these comparisons. A review of the plots presented in these exhibits reveals the repeatability of the three individual values for each analyte for each solution. Minor scatter among the triplicate measurements of some of the analytes of the study glasses was noted. These observations were not considered to indicate an error in preparation or measurement that had to be addressed in treatment of the data. Therefore, the entire set of measurement data was used in determining representative, measured compositions for the wash solutions.

3.2.4 Results for the Standard Solutions

Table B-3 in Appendix B provides comparisons of the standard solution results to their reference values. Although not a detailed comparison, the results in this table indicate no issues with the performance of the analyses.

3.2.5 Measured Compositions of the Wash Solutions

From the discussion of Section 3.2.3, all of the measurements for each analyte for each wash solution (i.e., all of the measurements in Table B-1 and Table B-2 of Appendix B) were averaged to determine a representative chemical composition for each solution. Table B-4 in Appendix B provides a summary of the average measured compositions of the wash solutions. The following observations are offered from a review of Table B-4:

- The measured concentrations of Al, F, Fe, Mg, Mn, Ni, PO_4^{3-} (by IC), Pb, Si, Sn, Zn, and Zr in the wash solutions were at or below the detection limits.
- The measured concentrations of B ranged from about 5-30 mg/L.
- The measured concentrations of Cl ranged from below detection limits to about 100 mg/L.
- The measured concentrations of Ca (about 5-60 mg/L) and Cr (about 2-65 mg/L) in the wash solutions may be related to the lower measured values for these components noted in the SSM versions of the study glasses.
- The measured concentration of K in the wash solution from glass ORPLG27-SSM-S was about 290 mg/L, which may correspond with the low measured value of K for this glass.
- The measured concentrations of Li (for the glasses containing this element) ranged from about 20-60 mg/L.
- The measured concentrations of Na in the wash solutions were in the range of 200-1200 mg/L. This may be attributed to both the excess sodium sulfate added as part of the SSM preparation process, as well as to the lower measured concentrations of Na_2O in some of the SSM versions of the study glasses.
- The concentrations of P were measurable for some of the wash solutions by ICP-AES but below the detection limit of the IC method, and the measured values ranged from about 2-7 mg/L.
- The measured concentrations of S were similar by both the ICP-AES and IC methods (ICP-AES data converted to SO_4^{2-} basis for comparison), and were in the range of about 220-750 mg/L S, or about 750-2250 mg/L SO_4^{2-}.
- The measured concentrations of V ranged from about 3-39 mg/L.

4.0 Summary

In this report, SRNL provides chemical analysis for several simulated LAW glass compositions, as well as chemical analysis of the wash solutions resulting from the preparation of these glasses. PNNL selected and fabricated these glasses as part of a study on sulfur retention in glasses previously evaluated at the Vitreous

State Laboratory. The resulting data will be used in the development of improved property/composition models for LAW glass production at Hanford.

Chemical analyses were performed on a representative sample of each of the study glasses to allow for comparisons with the targeted compositions. Three dissolution techniques, sodium peroxide fusion, lithium metaborate fusion, and potassium hydroxide fusion, were used for preparing each of the glass samples for analysis. Each of the samples was analyzed twice for each element of interest by ICP-AES or IC. Glass standards were intermittently measured to assess the performance of the analytical instruments over the course of these analyses. There were no issues with measurements of the glass standards.

A review of the individual glass composition measurements identified no analytical issues of concern. Some degree of scatter among the Al_2O_3, B_2O_3, Na_2O, and SiO_2 measurements was noted. There were no indications of an error in preparation or measurement that had to be addressed in treatment of the data. Minor differences between the targeted and measured concentrations of some of the baseline glass components were noted, including some low values for Al_2O_3, CaO, Na_2O, and ZrO_2.

Chemical analyses were also performed on a representative sample of each of the wash solutions resulting from the preparation of the SSM versions of the study glasses. The samples were analyzed in triplicate for each element of interest by ICP-AES or IC. No issues were noted for the measurements of the solution standards. Several elements had measurable concentrations in the wash solutions, including B, Ca, Cl, Cr, K, Li, Na, P, S, and V. The measured concentration of K in the wash solution from glass ORPLG27-SSM-S was about 290 mg/L, which may correspond with the low measured value of K for this glass. The measured concentrations of Na in the wash solutions were in the range of 200-1200 mg/L. This may be attributed to both the excess sodium sulfate added as part of the SSM preparation process, as well as to the lower measured concentrations of Na_2O in some of the SSM versions of the study glasses. The measured concentrations of sulfate in the wash solutions were similar by both the ICP-AES and IC methods (SO_4^{2-} basis), and were in the range of about 750-2250 mg/L. PNNL may wish to make further comparisons between the compositions of the glasses and the compositions of the wash solutions.

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Appendix A Tables and Exhibits Supporting the Chemical Analysis of the Study Glasses

Table A-1. LM Elemental Measurements of the Study Glasses – Part 1

ID	Block	Sub-Blk	Sequence	Lab ID	Ca (wt %)	Cr (wt %)	Fe (wt %)	K (wt %)	Mg (wt %)	Mn (wt %)	Na (wt %)	Ni (wt %)
LRM	1	1	1	LRMLM111	0.440	0.113	0.856	1.12	<0.100	<0.100	14.7	0.120
LAWA187-SSM-S	1	1	2	R29LM1	4.16	0.199	0.571	0.333	0.494	<0.100	16.1	<0.0500
LAWA161-SSM-S #2	1	1	3	R28LM1	5.29	<0.100	0.636	0.284	0.542	<0.100	14.4	<0.0500
ORPLA20-SSM-S	1	1	4	R23LM1	2.46	0.239	0.210	0.366	0.540	<0.100	16.7	<0.0500
LAWB99-SSM-S #2	1	1	5	R09LM1	6.54	<0.100	0.785	0.315	0.659	<0.100	7.94	<0.0500
LAWC100-SSM-S	1	1	6	R08LM1	5.38	<0.100	0.693	0.120	0.597	<0.100	13.9	<0.0500
ORPLA20-BL	1	1	7	R25LM1	2.44	0.338	0.218	0.450	0.569	<0.100	16.4	<0.0500
ORPLA20-SSM-S #2	1	1	8	R20LM1	2.37	0.242	0.216	0.355	0.558	<0.100	16.5	<0.0500
LAWB99-SSM-S	1	1	9	R14LM1	6.40	<0.100	0.748	0.311	0.638	<0.100	7.74	<0.0500
LRM	1	1	10	LRMLM112	0.447	0.114	0.871	1.13	<0.100	<0.100	15.0	0.123
LAWC100-BL	1	1	11	R17LM1	5.42	<0.100	0.620	0.126	0.540	<0.100	14.0	<0.0500
LAWA161-SSM-S	1	1	12	R22LM1	5.03	<0.100	0.621	0.277	0.526	<0.100	14.8	<0.0500
LAWA187-BL	1	1	13	R19LM1	3.98	0.306	0.563	0.409	0.490	<0.100	16.1	<0.0500
LAWB99-BL	1	1	14	R11LM1	6.58	<0.100	0.731	0.348	0.626	<0.100	6.66	<0.0500
LAWA161-BL	1	1	15	R02LM1	5.02	<0.100	0.648	0.362	0.548	<0.100	14.3	<0.0500
ORPLA38-1-BL	1	1	16	R15LM1	2.33	0.315	0.182	0.434	0.575	<0.100	16.9	<0.0500
ORPLA38-1-SSM-S	1	1	17	R07LM1	2.28	0.216	0.173	0.349	0.541	<0.100	17.2	<0.0500
LRM	1	1	18	LRMLM113	0.443	0.127	0.961	1.26	<0.100	<0.100	15.3	0.137
LRM	1	2	1	LRMLM121	0.423	0.118	0.891	1.12	<0.100	<0.100	14.0	0.123
ORPLA38-1-SSM-S	1	2	2	R07LM2	2.39	0.219	0.172	0.334	0.536	<0.100	15.6	<0.0500
LAWA161-SSM-S #2	1	2	3	R28LM2	5.24	<0.100	0.695	0.308	0.585	<0.100	13.4	<0.0500
LAWA187-BL	1	2	4	R19LM2	4.72	0.347	0.627	0.464	0.536	<0.100	14.5	<0.0500
ORPLA20-SSM-S #2	1	2	5	R20LM2	2.50	0.246	0.217	0.345	0.558	<0.100	14.6	<0.0500
ORPLA20-SSM-S	1	2	6	R23LM2	2.45	0.238	0.204	0.349	0.525	<0.100	15.9	<0.0500
LAWB99-BL	1	2	7	R11LM2	6.56	<0.100	0.787	0.372	0.664	<0.100	6.53	<0.0500
LAWB99-SSM-S	1	2	8	R14LM2	7.24	<0.100	0.761	0.313	0.639	<0.100	8.76	<0.0500
LAWA161-SSM-S	1	2	9	R22LM2	5.67	<0.100	0.684	0.307	0.571	<0.100	13.8	<0.0500
LRM	1	2	10	LRMLM122	0.407	0.126	0.955	1.22	<0.100	<0.100	14.0	0.133
LAWA187-SSM-S	1	2	11	R29LM2	4.61	0.220	0.622	0.353	0.532	<0.100	15.1	<0.0500
LAWC100-SSM-S	1	2	12	R08LM2	5.70	<0.100	0.686	0.113	0.586	<0.100	12.7	<0.0500
LAWA161-BL	1	2	13	R02LM2	5.53	<0.100	0.696	0.374	0.580	<0.100	12.6	<0.0500
ORPLA38-1-BL	1	2	14	R15LM2	2.19	0.336	0.188	0.437	0.597	<0.100	14.4	<0.0500
ORPLA20-BL	1	2	15	R25LM2	2.29	0.330	0.207	0.425	0.543	<0.100	15.8	<0.0500
LAWC100-BL	1	2	16	R17LM2	5.24	<0.100	0.644	0.127	0.553	<0.100	13.5	<0.0500
LAWB99-SSM-S #2	1	2	17	R09LM2	6.35	<0.100	0.738	0.287	0.617	<0.100	7.62	<0.0500
LRM	1	2	18	LRMLM123	0.390	0.119	0.909	1.15	<0.100	<0.100	14.0	0.127
LRM	2	1	1	LRMLM211	0.401	0.133	1.02	1.39	<0.100	<0.100	14.7	0.146

Table A-1. LM Elemental Measurements of the Study Glasses – Part 1 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Ca (wt %)	Cr (wt %)	Fe (wt %)	K (wt %)	Mg (wt %)	Mn (wt %)	Na (wt %)	Ni (wt %)
ORPLD6-SSM-S	2	1	2	R05LM1	5.81	0.208	0.228	0.125	0.623	<0.100	15.0	<0.0500
ORPLE12-BL	2	1	3	R04LM1	7.29	0.349	0.194	0.494	0.659	<0.100	11.2	<0.0500
ORPLF7-BL	2	1	4	R12LM1	7.04	0.387	0.228	0.449	0.606	<0.100	8.87	<0.0500
ORPLE12-SSM-S	2	1	5	R01LM1	7.01	0.269	0.190	0.408	0.659	<0.100	11.5	<0.0500
ORPLB4-SSM-S	2	1	6	R27LM1	1.39	0.253	0.705	<0.100	0.584	<0.100	16.7	<0.0500
ORPLB4-BL	2	1	7	R16LM1	1.38	0.362	0.717	0.111	0.574	<0.100	16.5	<0.0500
ORPLD6-BL	2	1	8	R18LM1	5.72	0.348	0.229	0.159	0.627	<0.100	15.3	<0.0500
ORPLD1-BL	2	1	9	R10LM1	5.80	0.371	0.729	0.148	0.628	<0.100	14.4	<0.0500
LRM	2	1	10	LRMLM212	0.404	0.136	1.02	1.39	<0.100	<0.100	14.8	0.147
ORPLC5-BL	2	1	11	R06LM1	1.40	0.374	0.715	0.452	0.585	<0.100	15.8	<0.0500
ORPLD1-SSM-S	2	1	12	R03LM1	5.69	0.222	0.727	0.119	0.619	<0.100	14.3	<0.0500
ORPLC5-SSM-S	2	1	13	R26LM1	1.38	0.252	0.725	0.398	0.588	<0.100	15.7	<0.0500
ORPLG27-BL	2	1	14	R24LM1	1.91	0.415	0.215	4.66	0.281	<0.100	14.1	<0.0500
ORPLF7-SSM-S	2	1	15	R21LM1	6.84	0.297	0.244	0.366	0.624	<0.100	9.38	<0.0500
ORPLG27-SSM-S	2	1	16	R13LM1	1.91	0.279	0.211	3.74	0.273	<0.100	14.8	<0.0500
ORPLD1-ET-SSM-S	2	1	17	R30LM1	5.67	0.234	0.763	0.118	0.644	<0.100	14.6	<0.0500
LRM	2	1	18	LRMLM213	0.395	0.133	1.02	1.38	<0.100	<0.100	15.0	0.146
LRM	2	2	1	LRMLM221	0.378	0.128	1.02	1.37	<0.100	<0.100	15.2	0.141
ORPLC5-SSM-S	2	2	2	R26LM2	1.36	0.244	0.713	0.391	0.572	<0.100	16.3	<0.0500
ORPLB4-BL	2	2	3	R16LM2	1.35	0.359	0.713	0.104	0.566	<0.100	16.6	<0.0500
ORPLB4-SSM-S	2	2	4	R27LM2	1.38	0.248	0.699	<0.100	0.577	<0.100	17.0	<0.0500
ORPLE12-SSM-S	2	2	5	R01LM2	7.27	0.255	0.178	0.381	0.633	<0.100	11.7	<0.0500
ORPLF7-BL	2	2	6	R12LM2	7.26	0.395	0.229	0.461	0.615	<0.100	9.08	<0.0500
ORPLD1-BL	2	2	7	R10LM2	5.93	0.378	0.752	0.147	0.633	<0.100	14.5	<0.0500
ORPLF7-SSM-S	2	2	8	R21LM2	7.06	0.297	0.242	0.356	0.624	<0.100	9.57	<0.0500
ORPLE12-BL	2	2	9	R04LM2	7.36	0.349	0.190	0.489	0.657	<0.100	11.2	<0.0500
LRM	2	2	10	LRMLM222	0.382	0.126	0.995	1.34	<0.100	<0.100	14.9	0.136
ORPLG27-SSM-S	2	2	11	R13LM2	1.93	0.270	0.203	3.68	0.265	<0.100	15.1	<0.0500
ORPLD1-SSM-S	2	2	12	R03LM2	5.70	0.217	0.728	0.111	0.615	<0.100	14.7	<0.0500
ORPLC5-BL	2	2	13	R06LM2	1.44	0.363	0.697	0.439	0.568	<0.100	16.3	<0.0500
ORPLG27-BL	2	2	14	R24LM2	1.98	0.417	0.212	4.67	0.278	<0.100	14.6	<0.0500
ORPLD6-BL	2	2	15	R18LM2	5.83	0.348	0.226	0.151	0.623	<0.100	15.1	<0.0500
ORPLD6-SSM-S	2	2	16	R05LM2	5.80	0.204	0.223	0.116	0.614	<0.100	14.9	<0.0500
ORPLD1-ET-SSM-S	2	2	17	R30LM2	5.91	0.224	0.749	0.110	0.627	<0.100	14.5	<0.0500
LRM	2	2	18	LRMLM223	0.380	0.126	1.00	1.35	<0.100	<0.100	14.7	0.138

Table A-2. LM Elemental Measurements of the Study Glasses – Part 2

ID	Block	Sub-Blk	Sequence	Lab ID	P (wt %)	Pb (wt %)	S (wt %)	Sn (wt %)	V (wt %)	Zn (wt %)	Zr (wt %)
LRM	1	1	1	LRMLM111	0.164	0.0738	0.086	<0.100	<0.100	<0.100	0.680
LAWA187-SSM-S	1	1	2	R29LM1	<0.100	<0.0500	0.491	0.684	0.470	2.27	2.06
LAWA161-SSM-S #2	1	1	3	R28LM1	<0.100	<0.0500	0.474	<0.100	0.492	2.35	2.07
ORPLA20-SSM-S	1	1	4	R23LM1	<0.100	<0.0500	0.388	2.03	<0.100	2.18	4.12
LAWB99-SSM-S #2	1	1	5	R09LM1	<0.100	<0.0500	0.661	<0.100	0.655	2.72	2.45
LAWC100-SSM-S	1	1	6	R08LM1	0.105	<0.0500	0.510	<0.100	0.532	2.37	1.96
ORPLA20-BL	1	1	7	R25LM1	<0.100	<0.0500	0.079	2.08	<0.100	2.15	4.22
ORPLA20-SSM-S #2	1	1	8	R20LM1	<0.100	<0.0500	0.411	1.98	<0.100	2.09	4.00
LAWB99-SSM-S	1	1	9	R14LM1	<0.100	<0.0500	0.678	<0.100	0.624	2.65	2.33
LRM	1	1	10	LRMLM112	0.165	0.0744	0.0859	<0.100	<0.100	<0.100	0.699
LAWC100-BL	1	1	11	R17LM1	0.101	<0.0500	0.438	<0.100	0.492	2.38	2.01
LAWA161-SSM-S	1	1	12	R22LM1	<0.100	<0.0500	0.484	<0.100	0.469	2.23	1.90
LAWA187-BL	1	1	13	R19LM1	<0.100	<0.0500	0.279	0.666	0.484	2.14	1.94
LAWB99-BL	1	1	14	R11LM1	<0.100	<0.0500	0.275	<0.100	0.621	2.67	2.34
LAWA161-BL	1	1	15	R02LM1	<0.100	<0.0500	0.078	<0.100	0.511	2.19	1.96
ORPLA38-1-BL	1	1	16	R15LM1	<0.100	<0.0500	0.370	2.04	0.494	2.22	4.03
ORPLA38-1-SSM-S	1	1	17	R07LM1	<0.100	<0.0500	0.404	1.91	0.440	2.20	3.85
LRM	1	1	18	LRMLM113	0.190	0.0852	0.0905	<0.100	<0.100	<0.100	0.689
LRM	1	2	1	LRMLM121	0.170	0.0764	0.0749	<0.100	<0.100	<0.100	0.651
ORPLA38-1-SSM-S	1	2	2	R07LM2	<0.100	<0.0500	0.426	2.02	0.438	2.27	4.01
LAWA161-SSM-S #2	1	2	3	R28LM2	<0.100	<0.0500	0.502	<0.100	0.537	2.27	1.99
LAWA187-BL	1	2	4	R19LM2	<0.100	<0.0500	0.303	0.774	0.540	2.54	2.24
ORPLA20-SSM-S #2	1	2	5	R20LM2	<0.100	<0.0500	0.418	2.07	<0.100	2.19	4.23
ORPLA20-SSM-S	1	2	6	R23LM2	<0.100	<0.0500	0.421	1.95	<0.100	2.15	4.14
LAWB99-BL	1	2	7	R11LM2	<0.100	<0.0500	0.281	<0.100	0.667	2.60	2.25
LAWB99-SSM-S	1	2	8	R14LM2	<0.100	<0.0500	0.693	<0.100	0.638	2.96	2.54
LAWA161-SSM-S	1	2	9	R22LM2	<0.100	<0.0500	0.488	<0.100	0.516	2.47	2.08
LRM	1	2	10	LRMLM122	0.183	0.0820	0.0892	<0.100	<0.100	<0.100	0.639
LAWA187-SSM-S	1	2	11	R29LM2	<0.100	<0.0500	0.540	0.761	0.513	2.48	2.19
LAWC100-SSM-S	1	2	12	R08LM2	0.100	<0.0500	0.546	<0.100	0.530	2.45	1.99
LAWA161-BL	1	2	13	R02LM2	<0.100	<0.0500	0.084	<0.100	0.545	2.39	2.08
ORPLA38-1-BL	1	2	14	R15LM2	<0.100	<0.0500	0.378	1.89	0.514	2.05	3.80
ORPLA20-BL	1	2	15	R25LM2	<0.100	<0.0500	0.072	1.93	<0.100	1.98	3.98
LAWC100-BL	1	2	16	R17LM2	0.103	<0.0500	0.475	<0.100	0.514	2.21	1.88
LAWB99-SSM-S #2	1	2	17	R09LM2	<0.100	<0.0500	0.705	<0.100	0.622	2.56	2.31
LRM	1	2	18	LRMLM123	0.175	0.0763	0.0919	<0.100	<0.100	<0.100	0.602
LRM	2	1	1	LRMLM211	0.199	0.0918	0.0872	<0.100	<0.100	<0.100	0.656

Table A-2. LM Elemental Measurements of the Study Glasses – Part 2 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	P (wt %)	Pb (wt %)	S (wt %)	Sn (wt %)	V (wt %)	Zn (wt %)	Zr (wt %)
ORPLD6-SSM-S	2	1	2	R05LM1	0.102	<0.0500	0.563	<0.100	1.09	2.49	2.54
ORPLE12-BL	2	1	3	R04LM1	<0.100	<0.0500	0.498	<0.100	1.03	2.68	2.40
ORPLF7-BL	2	1	4	R12LM1	<0.100	<0.0500	0.754	<0.100	1.48	2.37	2.78
ORPLE12-SSM-S	2	1	5	R01LM1	<0.100	<0.0500	0.780	<0.100	1.01	2.61	2.45
ORPLB4-SSM-S	2	1	6	R27LM1	<0.100	<0.0500	0.474	0.779	1.11	1.96	4.40
ORPLB4-BL	2	1	7	R16LM1	<0.100	<0.0500	0.204	0.765	1.17	1.92	4.35
ORPLD6-BL	2	1	8	R18LM1	0.126	<0.0500	0.409	<0.100	1.18	2.43	2.76
ORPLD1-BL	2	1	9	R10LM1	0.117	<0.0500	0.373	<0.100	0.589	2.47	2.07
LRM	2	1	10	LRMLM212	0.204	0.0883	0.0886	<0.100	<0.100	<0.100	0.651
ORPLC5-BL	2	1	11	R06LM1	<0.100	<0.0500	0.209	0.793	1.19	1.95	4.44
ORPLD1-SSM-S	2	1	12	R03LM1	<0.100	<0.0500	0.539	<0.100	0.558	2.44	1.87
ORPLC5-SSM-S	2	1	13	R26LM1	<0.100	<0.0500	0.400	0.784	1.11	1.93	4.34
ORPLG27-BL	2	1	14	R24LM1	<0.100	<0.0500	0.163	2.50	<0.100	2.16	4.67
ORPLF7-SSM-S	2	1	15	R21LM1	<0.100	<0.0500	0.849	<0.100	1.46	2.37	2.77
ORPLG27-SSM-S	2	1	16	R13LM1	<0.100	<0.0500	0.446	2.44	<0.100	2.14	4.66
ORPLD1-ET-SSM-S	2	1	17	R30LM1	0.124	<0.0500	0.580	<0.100	0.581	2.45	2.11
LRM	2	1	18	LRMLM213	0.203	0.0902	0.0804	<0.100	<0.100	<0.100	0.661
LRM	2	2	1	LRMLM221	0.204	0.0843	0.0892	<0.100	<0.100	<0.100	0.597
ORPLC5-SSM-S	2	2	2	R26LM2	<0.100	<0.0500	0.390	0.777	1.09	1.95	4.36
ORPLB4-BL	2	2	3	R16LM2	<0.100	<0.0500	0.201	0.764	1.16	1.93	4.34
ORPLB4-SSM-S	2	2	4	R27LM2	<0.100	<0.0500	0.460	0.776	1.10	1.99	4.48
ORPLE12-SSM-S	2	2	5	R01LM2	<0.100	<0.0500	0.742	<0.100	0.983	2.77	2.52
ORPLF7-BL	2	2	6	R12LM2	<0.100	<0.0500	0.788	<0.100	1.51	2.50	2.87
ORPLD1-BL	2	2	7	R10LM2	0.118	<0.0500	0.391	<0.100	0.596	2.59	2.10
ORPLF7-SSM-S	2	2	8	R21LM2	<0.100	<0.0500	0.862	<0.100	1.47	2.49	2.85
ORPLE12-BL	2	2	9	R04LM2	<0.100	<0.0500	0.508	<0.100	1.03	2.77	2.44
LRM	2	2	10	LRMLM222	0.196	0.0814	0.0856	<0.100	<0.100	<0.100	0.683
ORPLG27-SSM-S	2	2	11	R13LM2	<0.100	<0.0500	0.425	2.49	<0.100	2.22	4.77
ORPLD1-SSM-S	2	2	12	R03LM2	<0.100	<0.0500	0.553	<0.100	0.557	2.46	1.88
ORPLC5-BL	2	2	13	R06LM2	<0.100	<0.0500	0.206	0.770	1.17	2.07	4.62
ORPLG27-BL	2	2	14	R24LM2	<0.100	<0.0500	0.173	2.61	<0.100	2.31	4.90
ORPLD6-BL	2	2	15	R18LM2	0.125	<0.0500	0.411	<0.100	1.18	2.53	2.80
ORPLD6-SSM-S	2	2	16	R05LM2	<0.100	<0.0500	0.555	<0.100	1.08	2.54	2.55
ORPLD1-ET-SSM-S	2	2	17	R30LM2	0.116	<0.0500	0.565	<0.100	0.568	2.61	2.18
LRM	2	2	18	LRMLM223	0.195	0.0812	0.0808	<0.100	<0.100	<0.100	0.682

Table A-3. PF Elemental Measurements of the Study Glasses

ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt %)	B (wt %)	Li (wt %)	Si (wt %)
LRM	1	1	1	LRMPF111	5.00	2.57	<0.100	26.0
ORPLA20-SSM-S	1	1	2	R23PF1	3.42	2.76	<0.100	20.2
LAWC100-BL	1	1	3	R17PF1	5.16	4.42	<0.100	16.8
ORPLA20-BL	1	1	4	R25PF1	3.46	2.93	<0.100	19.5
LAWB99-SSM-S	1	1	5	R14PF1	5.00	3.53	1.31	20.3
LAWA187-SSM-S	1	1	6	R29PF1	5.43	4.20	<0.100	16.2
LAWA161-BL	1	1	7	R02PF1	5.12	4.40	<0.100	17.0
LAWA161-SSM-S	1	1	8	R22PF1	5.09	4.47	<0.100	16.7
ORPLA38-1-SSM-S	1	1	9	R07PF1	3.61	2.68	<0.100	19.4
LRM	1	1	10	LRMPF112	4.87	2.53	<0.100	25.2
LAWC100-SSM-S	1	1	11	R08PF1	5.17	4.36	<0.100	16.7
LAWA187-BL	1	1	12	R19PF1	5.29	4.21	<0.100	16.9
LAWB99-BL	1	1	13	R11PF1	5.12	3.79	1.40	20.8
LAWB99-SSM-S #2	1	1	14	R09PF1	4.96	3.59	1.28	20.6
ORPLA20-SSM-S #2	1	1	15	R20PF1	3.52	2.89	<0.100	20.1
ORPLA38-1-BL	1	1	16	R15PF1	3.58	2.76	<0.100	19.8
LAWA161-SSM-S #2	1	1	17	R28PF1	5.20	4.79	<0.100	16.7
LRM	1	1	18	LRMPF113	5.11	2.71	<0.100	26.1
LRM	1	2	1	LRMPF121	4.77	2.26	<0.100	25.0
ORPLA20-SSM-S #2	1	2	2	R20PF2	3.50	2.64	<0.100	20.6
ORPLA20-BL	1	2	3	R25PF2	3.51	2.80	<0.100	20.4
ORPLA20-SSM-S	1	2	4	R23PF2	3.46	2.58	<0.100	20.2
LAWA161-SSM-S	1	2	5	R22PF2	5.09	4.16	<0.100	17.6
LAWB99-SSM-S #2	1	2	6	R09PF2	4.98	3.33	1.27	20.3
LAWC100-BL	1	2	7	R17PF2	5.30	4.36	<0.100	17.1
LAWA187-BL	1	2	8	R19PF2	5.45	4.15	<0.100	16.5
LAWA187-SSM-S	1	2	9	R29PF2	5.35	3.88	<0.100	16.6
LRM	1	2	10	LRMPF122	5.02	2.43	<0.100	25.9
LAWC100-SSM-S	1	2	11	R08PF2	5.21	4.19	<0.100	17.4
LAWB99-SSM-S	1	2	12	R14PF2	4.92	3.25	1.27	19.9
LAWA161-BL	1	2	13	R02PF2	5.19	4.19	<0.100	16.9
LAWB99-BL	1	2	14	R11PF2	4.99	3.37	1.35	20.8
LAWA161-SSM-S #2	1	2	15	R28PF2	4.95	4.17	<0.100	18.1
ORPLA38-1-BL	1	2	16	R15PF2	3.58	2.60	<0.100	20.3
ORPLA38-1-SSM-S	1	2	17	R07PF2	3.54	2.46	<0.100	20.8
LRM	1	2	18	LRMPF123	5.13	2.51	<0.100	27.2
LRM	2	1	1	LRMPF211	4.80	2.37	<0.100	24.8
ORPLD1-SSM-S	2	1	2	R03PF1	5.34	3.78	<0.100	17.6
ORPLE12-SSM-S	2	1	3	R01PF1	3.90	3.15	0.955	18.3
ORPLE12-BL	2	1	4	R04PF1	3.86	3.15	0.995	19.6
ORPLB4-BL	2	1	5	R16PF1	5.10	2.74	<0.100	18.9
ORPLD6-SSM-S	2	1	6	R05PF1	5.26	3.02	<0.100	17.7
ORPLD1-BL	2	1	7	R10PF1	5.16	3.73	<0.100	17.7
ORPLB4-SSM-S	2	1	8	R27PF1	5.00	2.57	<0.100	19.2
ORPLF7-BL	2	1	9	R12PF1	4.36	2.96	1.72	19.1
LRM	2	1	10	LRMPF212	4.98	2.37	<0.100	24.8
ORPLG27-SSM-S	2	1	11	R13PF1	3.03	2.43	<0.100	19.6
ORPLF7-SSM-S	2	1	12	R21PF1	4.48	2.99	1.66	19.8
ORPLC5-SSM-S	2	1	13	R26PF1	5.31	2.74	<0.100	18.9
ORPLD1-ET-SSM-S	2	1	14	R30PF1	5.28	3.94	<0.100	16.9
ORPLC5-BL	2	1	15	R06PF1	5.39	2.89	<0.100	18.3
ORPLG27-BL	2	1	16	R24PF1	3.13	2.52	<0.100	19.7
ORPLD6-BL	2	1	17	R18PF1	5.45	3.26	<0.100	17.9
LRM	2	1	18	LRMPF213	4.95	2.38	<0.100	25.5
LRM	2	2	1	LRMPF221	4.77	2.29	<0.100	25.4
ORPLC5-SSM-S	2	2	2	R26PF2	5.17	2.67	<0.100	19.3
ORPLE12-BL	2	2	3	R04PF2	3.80	2.99	1.00	19.0
ORPLD1-SSM-S	2	2	4	R03PF2	5.37	3.79	<0.100	17.1
ORPLE12-SSM-S	2	2	5	R01PF2	3.84	3.03	0.972	18.7

Table A-3. PF Elemental Measurements of the Study Glasses (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt %)	B (wt %)	Li (wt %)	Si (wt %)
ORPLF7-SSM-S	2	2	6	R21PF2	4.45	2.90	1.68	19.5
ORPLG27-BL	2	2	7	R24PF2	3.07	2.38	<0.100	19.2
ORPLC5-BL	2	2	8	R06PF2	5.20	2.65	<0.100	18.4
ORPLG27-SSM-S	2	2	9	R13PF2	3.06	2.36	<0.100	19.7
LRM	2	2	10	LRMPF222	4.88	2.30	<0.100	25.6
ORPLD6-BL	2	2	11	R18PF2	5.16	2.96	<0.100	17.4
ORPLD1-BL	2	2	12	R10PF2	5.01	3.50	<0.100	17.4
ORPLD6-SSM-S	2	2	13	R05PF2	5.23	2.95	<0.100	17.6
ORPLF7-BL	2	2	14	R12PF2	4.35	2.87	1.75	19.3
ORPLB4-SSM-S	2	2	15	R27PF2	5.16	2.62	<0.100	18.6
ORPLD1-ET-SSM-S	2	2	16	R30PF2	5.12	3.60	<0.100	16.9
ORPLB4-BL	2	2	17	R16PF2	4.93	2.54	<0.100	18.2
LRM	2	2	18	LRMPF223	4.93	2.36	<0.100	24.3

Table A-4. KH Elemental Measurements of the Study Glasses

ID	Block	Sub-Blk	Sequence	Lab ID	Cl (wt %)	F (wt %)
LRM	1	1	1	LRMKH111	<0.0500	0.837
LAWA187-SSM-S	1	1	2	R29KH1	0.195	<0.0500
ORPLA38-1-BL	1	1	3	R15KH1	0.526	<0.0500
ORPLA20-SSM-S #2	1	1	4	R20KH1	0.189	<0.0500
LAWB99-BL	1	1	5	R11KH1	<0.0500	0.098
LAWA161-BL	1	1	6	R02KH1	0.865	<0.0500
LAWA161-SSM-S	1	1	7	R22KH1	0.360	<0.0500
LAWC100-BL	1	1	8	R17KH1	0.478	0.183
ORPLA38-1-SSM-S	1	1	9	R07KH1	0.185	<0.0500
LRM	1	1	10	LRMKH112	<0.0500	0.885
LAWB99-SSM-S #2	1	1	11	R09KH1	<0.0500	0.095
ORPLA20-BL	1	1	12	R25KH1	0.537	<0.0500
ORPLA20-SSM-S	1	1	13	R23KH1	0.191	<0.0500
LAWA161-SSM-S #2	1	1	14	R28KH1	0.365	<0.0500
LAWC100-SSM-S	1	1	15	R08KH1	0.176	0.166
LAWA187-BL	1	1	16	R19KH1	0.483	<0.0500
LAWB99-SSM-S	1	1	17	R14KH1	<0.0500	0.091
LRM	1	1	18	LRMKH113	<0.0500	0.878
LRM	1	2	1	LRMKH121	<0.0500	0.849
LAWA161-SSM-S	1	2	2	R22KH2	0.360	<0.0500
LAWA187-BL	1	2	3	R19KH2	0.476	<0.0500
LAWC100-BL	1	2	4	R17KH2	0.489	0.194
LAWC100-SSM-S	1	2	5	R08KH2	0.185	0.159
ORPLA20-SSM-S	1	2	6	R23KH2	0.188	<0.0500
ORPLA38-1-SSM-S	1	2	7	R07KH2	0.195	<0.0500
ORPLA20-BL	1	2	8	R25KH2	0.540	<0.0500
LAWA161-SSM-S #2	1	2	9	R28KH2	0.366	<0.0500
LRM	1	2	10	LRMKH122	<0.0500	0.892
LAWB99-BL	1	2	11	R11KH2	<0.0500	0.105
ORPLA20-SSM-S #2	1	2	12	R20KH2	0.190	<0.0500
LAWA187-SSM-S	1	2	13	R29KH2	0.189	<0.0500
ORPLA38-1-BL	1	2	14	R15KH2	0.534	<0.0500
LAWA161-BL	1	2	15	R02KH2	0.872	<0.0500
LAWB99-SSM-S #2	1	2	16	R09KH2	<0.0500	0.096
LAWB99-SSM-S	1	2	17	R14KH2	<0.0500	0.094
LRM	1	2	18	LRMKH123	<0.0500	0.884
LRM	2	1	1	LRMKH211	<0.0500	0.818
ORPLC5-SSM-S	2	1	2	R26KH1	0.160	<0.0500
ORPLB4-BL	2	1	3	R16KH1	0.0843	0.450
ORPLF7-BL	2	1	4	R12KH1	<0.0500	0.122
ORPLD1-SSM-S	2	1	5	R03KH1	0.0841	0.153
ORPLE12-SSM-S	2	1	6	R01KH1	<0.0500	0.208
ORPLC5-BL	2	1	7	R06KH1	0.503	<0.0500
ORPLG27-SSM-S	2	1	8	R13KH1	0.0585	0.118
ORPLE12-BL	2	1	9	R04KH1	<0.0500	0.198
LRM	2	1	10	LRMKH212	<0.0500	0.812
ORPLB4-SSM-S	2	1	11	R27KH1	<0.0500	0.339
ORPLD6-SSM-S	2	1	12	R05KH1	0.0992	0.170
ORPLD1-ET-SSM-S	2	1	13	R30KH1	0.0697	0.164
ORPLG27-BL	2	1	14	R24KH1	0.151	0.126
ORPLF7-SSM-S	2	1	15	R21KH1	<0.0500	0.099
ORPLD6-BL	2	1	16	R18KH1	0.284	0.186
ORPLD1-BL	2	1	17	R10KH1	0.220	0.171
LRM	2	1	18	LRMKH213	<0.0500	0.814
LRM	2	2	1	LRMKH221	<0.0500	0.813
ORPLE12-BL	2	2	2	R04KH2	<0.0500	0.195
ORPLB4-SSM-S	2	2	3	R27KH2	<0.0500	0.336
ORPLG27-BL	2	2	4	R24KH2	0.152	0.114
ORPLD1-ET-SSM-S	2	2	5	R30KH2	0.0696	0.141

Table A-4. KH Elemental Measurements of the Study Glasses (continued)

ORPLC5-BL	2	2	6	R06KH2	0.508	<0.0500
ORPLD1-SSM-S	2	2	7	R03KH2	0.0880	0.145
ORPLB4-BL	2	2	8	R16KH2	0.0948	0.410
ORPLG27-SSM-S	2	2	9	R13KH2	0.0689	0.096
LRM	2	2	10	LRMKH222	<0.0500	0.814
ORPLD1-BL	2	2	11	R10KH2	0.253	0.161
ORPLD6-BL	2	2	12	R18KH2	0.274	0.177
ORPLF7-SSM-S	2	2	13	R21KH2	<0.0500	0.090
ORPLF7-BL	2	2	14	R12KH2	<0.0500	0.101
ORPLD6-SSM-S	2	2	15	R05KH2	0.0984	0.165
ORPLE12-SSM-S	2	2	16	R01KH2	<0.0500	0.173
ORPLC5-SSM-S	2	2	17	R26KH2	0.159	<0.0500
LRM	2	2	18	LRMKH223	<0.0500	0.817

Table A-5. Comparison of Targeted and Measured Glass Compositions

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
LAWA161-BL	Al_2O_3		9.740	10.160	-0.420	-4.1%
LAWA161-BL	B_2O_3		13.830	13.670	0.160	1.2%
LAWA161-BL	CaO		7.381	7.990	-0.609	-7.6%
LAWA161-BL	Cl		0.869	1.170	-0.302	
LAWA161-BL	Cr_2O_3	<	0.146	0.020	0.126	
LAWA161-BL	F	<	0.050	0.000	0.050	
LAWA161-BL	Fe_2O_3		0.961	1.000	-0.039	
LAWA161-BL	K_2O		0.443	0.440	0.003	
LAWA161-BL	Li_2O	<	0.215	0.000	0.215	
LAWA161-BL	MgO		0.935	1.000	-0.065	
LAWA161-BL	MnO	<	0.129	0.000	0.129	
LAWA161-BL	Na_2O		18.131	20.660	-2.529	-12.2%
LAWA161-BL	NiO	<	0.064	0.000	0.064	
LAWA161-BL	P_2O_5	<	0.229	0.000	0.229	
LAWA161-BL	PbO	<	0.054	0.000	0.054	
LAWA161-BL	PO_4	<	0.050	0.000	0.050	
LAWA161-BL	SiO_2		36.261	36.580	-0.319	-0.9%
LAWA161-BL	SnO_2	<	0.127	0.000	0.127	
LAWA161-BL	SO_3		0.202	0.190	0.012	
LAWA161-BL	V_2O_5		0.943	1.000	-0.057	
LAWA161-BL	ZnO		2.851	2.990	-0.139	
LAWA161-BL	ZrO_2		2.729	2.990	-0.261	
LAWA161-BL	Sum		96.288	99.860	-3.572	-3.6%
LAWA161-SSM-S	Al_2O_3		9.618	10.160	-0.542	-5.3%
LAWA161-SSM-S	B_2O_3		13.894	13.670	0.224	1.6%
LAWA161-SSM-S	CaO		7.486	7.990	-0.504	-6.3%
LAWA161-SSM-S	Cl		0.360	1.170	-0.810	
LAWA161-SSM-S	Cr_2O_3	<	0.146	0.020	0.126	
LAWA161-SSM-S	F	<	0.050	0.000	0.050	
LAWA161-SSM-S	Fe_2O_3		0.933	1.000	-0.067	
LAWA161-SSM-S	K_2O		0.352	0.440	-0.088	
LAWA161-SSM-S	Li_2O	<	0.215	0.000	0.215	
LAWA161-SSM-S	MgO		0.910	1.000	-0.090	
LAWA161-SSM-S	MnO	<	0.129	0.000	0.129	
LAWA161-SSM-S	Na_2O		19.276	20.660	-1.384	-6.7%
LAWA161-SSM-S	NiO	<	0.064	0.000	0.064	
LAWA161-SSM-S	P_2O_5	<	0.229	0.000	0.229	
LAWA161-SSM-S	PbO	<	0.054	0.000	0.054	
LAWA161-SSM-S	PO_4	<	0.050	0.000	0.050	
LAWA161-SSM-S	SiO_2		36.689	36.580	0.109	0.3%
LAWA161-SSM-S	SnO_2	<	0.127	0.000	0.127	
LAWA161-SSM-S	SO_3		1.214	0.190	1.024	
LAWA161-SSM-S	V_2O_5		0.879	1.000	-0.121	
LAWA161-SSM-S	ZnO		2.925	2.990	-0.065	
LAWA161-SSM-S	ZrO_2		2.688	2.990	-0.302	
LAWA161-SSM-S	Sum		98.237	99.860	-1.623	-1.6%
LAWA161-SSM-S #2	Al_2O_3		9.589	10.160	-0.571	-5.6%
LAWA161-SSM-S #2	B_2O_3		14.425	13.670	0.755	5.5%
LAWA161-SSM-S #2	CaO		7.367	7.990	-0.623	-7.8%
LAWA161-SSM-S #2	Cl		0.366	1.170	-0.805	
LAWA161-SSM-S #2	Cr_2O_3	<	0.146	0.020	0.126	
LAWA161-SSM-S #2	F	<	0.050	0.000	0.050	
LAWA161-SSM-S #2	Fe_2O_3		0.952	1.000	-0.049	
LAWA161-SSM-S #2	K_2O		0.357	0.440	-0.083	
LAWA161-SSM-S #2	Li_2O	<	0.215	0.000	0.215	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
LAWA161-SSM-S #2	MgO		0.935	1.000	-0.066	
LAWA161-SSM-S #2	MnO	<	0.129	0.000	0.129	
LAWA161-SSM-S #2	Na_2O		18.737	20.660	-1.923	-9.3%
LAWA161-SSM-S #2	NiO	<	0.064	0.000	0.064	
LAWA161-SSM-S #2	P_2O_5	<	0.229	0.000	0.229	
LAWA161-SSM-S #2	PbO	<	0.054	0.000	0.054	
LAWA161-SSM-S #2	PO_4	<	0.050	0.000	0.050	
LAWA161-SSM-S #2	SiO_2		37.224	36.580	0.644	1.8%
LAWA161-SSM-S #2	SnO_2	<	0.127	0.000	0.127	
LAWA161-SSM-S #2	SO_3		1.219	0.190	1.029	
LAWA161-SSM-S #2	V_2O_5		0.919	1.000	-0.082	
LAWA161-SSM-S #2	ZnO		2.876	2.990	-0.115	
LAWA161-SSM-S #2	ZrO_2		2.742	2.990	-0.248	
LAWA161-SSM-S #2	Sum		98.719	99.860	-1.141	-1.1%
LAWA187-BL	Al_2O_3		10.147	10.650	-0.503	-4.7%
LAWA187-BL	B_2O_3		13.459	12.790	0.669	5.2%
LAWA187-BL	CaO		6.087	6.480	-0.394	-6.1%
LAWA187-BL	Cl		0.480	0.650	-0.171	
LAWA187-BL	Cr_2O_3		0.477	0.520	-0.043	
LAWA187-BL	F	<	0.050	0.000	0.050	
LAWA187-BL	Fe_2O_3		0.851	0.910	-0.059	
LAWA187-BL	K_2O		0.526	0.510	0.016	
LAWA187-BL	Li_2O	<	0.215	0.000	0.215	
LAWA187-BL	MgO		0.851	0.910	-0.059	
LAWA187-BL	MnO	<	0.129	0.000	0.129	
LAWA187-BL	Na_2O		20.624	23.000	-2.376	-10.3%
LAWA187-BL	NiO	<	0.064	0.000	0.064	
LAWA187-BL	P_2O_5	<	0.229	0.000	0.229	
LAWA187-BL	PbO	<	0.054	0.000	0.054	
LAWA187-BL	PO_4	<	0.050	0.000	0.050	
LAWA187-BL	SiO_2		35.726	34.860	0.866	2.5%
LAWA187-BL	SnO_2		0.914	1.000	-0.086	
LAWA187-BL	SO_3		0.727	0.750	-0.023	
LAWA187-BL	V_2O_5		0.914	0.980	-0.066	
LAWA187-BL	ZnO		2.913	3.000	-0.087	
LAWA187-BL	ZrO_2		2.823	3.000	-0.177	
LAWA187-BL	Sum		98.259	100.010	-1.751	-1.8%
LAWA187-SSM-S	Al_2O_3		10.184	10.650	-0.466	-4.4%
LAWA187-SSM-S	B_2O_3		13.008	12.790	0.218	1.7%
LAWA187-SSM-S	CaO		6.136	6.480	-0.345	-5.3%
LAWA187-SSM-S	Cl		0.192	0.650	-0.458	
LAWA187-SSM-S	Cr_2O_3		0.306	0.520	-0.214	
LAWA187-SSM-S	F	<	0.050	0.000	0.050	
LAWA187-SSM-S	Fe_2O_3		0.853	0.910	-0.057	
LAWA187-SSM-S	K_2O		0.413	0.510	-0.097	
LAWA187-SSM-S	Li_2O	<	0.215	0.000	0.215	
LAWA187-SSM-S	MgO		0.851	0.910	-0.059	
LAWA187-SSM-S	MnO	<	0.129	0.000	0.129	
LAWA187-SSM-S	Na_2O		21.029	23.000	-1.971	-8.6%
LAWA187-SSM-S	NiO	<	0.064	0.000	0.064	
LAWA187-SSM-S	P_2O_5	<	0.229	0.000	0.229	
LAWA187-SSM-S	PbO	<	0.054	0.000	0.054	
LAWA187-SSM-S	PO_4	<	0.050	0.000	0.050	
LAWA187-SSM-S	SiO_2		35.085	34.860	0.224	0.6%
LAWA187-SSM-S	SnO_2		0.917	1.000	-0.083	
LAWA187-SSM-S	SO_3		1.287	0.750	0.537	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
LAWA187-SSM-S	V_2O_5		0.877	0.980	-0.103	
LAWA187-SSM-S	ZnO		2.956	3.000	-0.044	
LAWA187-SSM-S	ZrO_2		2.871	3.000	-0.130	
LAWA187-SSM-S	Sum		97.706	100.010	-2.304	-2.3%
LAWB99-BL	Al_2O_3		9.551	10.150	-0.599	-5.9%
LAWB99-BL	B_2O_3		11.527	11.010	0.517	4.7%
LAWB99-BL	CaO		9.193	10.210	-1.017	-10.0%
LAWB99-BL	Cl	<	0.050	0.010	0.040	
LAWB99-BL	Cr_2O_3	<	0.146	0.110	0.036	
LAWB99-BL	F		0.102	0.070	0.032	
LAWB99-BL	Fe_2O_3		1.085	1.150	-0.065	
LAWB99-BL	K_2O		0.434	0.410	0.024	
LAWB99-BL	Li_2O		2.960	3.540	-0.580	
LAWB99-BL	MgO		1.070	1.150	-0.080	
LAWB99-BL	MnO	<	0.129	0.000	0.129	
LAWB99-BL	Na_2O		8.890	10.000	-1.110	-11.1%
LAWB99-BL	NiO	<	0.064	0.000	0.064	
LAWB99-BL	P_2O_5	<	0.229	0.030	0.199	
LAWB99-BL	PbO	<	0.054	0.000	0.054	
LAWB99-BL	PO_4	<	0.050	0.040	0.010	
LAWB99-BL	SiO_2		44.497	43.080	1.417	3.3%
LAWB99-BL	SnO_2	<	0.127	0.000	0.127	
LAWB99-BL	SO_3		0.694	0.750	-0.056	
LAWB99-BL	V_2O_5		1.150	1.240	-0.090	
LAWB99-BL	ZnO		3.280	3.540	-0.260	
LAWB99-BL	ZrO_2		3.100	3.540	-0.440	
LAWB99-BL	Sum		98.332	99.990	-1.658	-1.7%
LAWB99-SSM-S	Al_2O_3		9.372	10.150	-0.778	-7.7%
LAWB99-SSM-S	B_2O_3		10.916	11.010	-0.095	-0.9%
LAWB99-SSM-S	CaO		9.543	10.210	-0.668	-6.5%
LAWB99-SSM-S	Cl	<	0.050	0.010	0.040	
LAWB99-SSM-S	Cr_2O_3	<	0.146	0.110	0.036	
LAWB99-SSM-S	F		0.093	0.070	0.023	
LAWB99-SSM-S	Fe_2O_3		1.079	1.150	-0.071	
LAWB99-SSM-S	K_2O		0.376	0.410	-0.034	
LAWB99-SSM-S	Li_2O		2.777	3.540	-0.763	
LAWB99-SSM-S	MgO		1.059	1.150	-0.091	
LAWB99-SSM-S	MnO	<	0.129	0.000	0.129	
LAWB99-SSM-S	Na_2O		11.121	10.000	1.121	11.2%
LAWB99-SSM-S	NiO	<	0.064	0.000	0.064	
LAWB99-SSM-S	P_2O_5	<	0.229	0.030	0.199	
LAWB99-SSM-S	PbO	<	0.054	0.000	0.054	
LAWB99-SSM-S	PO_4	<	0.050	0.040	0.010	
LAWB99-SSM-S	SiO_2		43.000	43.080	-0.080	-0.2%
LAWB99-SSM-S	SnO_2	<	0.127	0.000	0.127	
LAWB99-SSM-S	SO_3		1.712	0.750	0.962	
LAWB99-SSM-S	V_2O_5		1.127	1.240	-0.114	
LAWB99-SSM-S	ZnO		3.492	3.540	-0.048	
LAWB99-SSM-S	ZrO_2		3.289	3.540	-0.251	
LAWB99-SSM-S	Sum		99.752	99.990	-0.238	-0.2%
LAWB99-SSM-S #2	Al_2O_3		9.391	10.150	-0.759	-7.5%
LAWB99-SSM-S #2	B_2O_3		11.141	11.010	0.131	1.2%
LAWB99-SSM-S #2	CaO		9.018	10.210	-1.192	-11.7%
LAWB99-SSM-S #2	Cl	<	0.050	0.010	0.040	
LAWB99-SSM-S #2	Cr_2O_3	<	0.146	0.110	0.036	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
LAWB99-SSM-S #2	F		0.096	0.070	0.026	
LAWB99-SSM-S #2	Fe_2O_3		1.089	1.150	-0.061	
LAWB99-SSM-S #2	K_2O		0.363	0.410	-0.047	
LAWB99-SSM-S #2	Li_2O		2.745	3.540	-0.795	
LAWB99-SSM-S #2	MgO		1.058	1.150	-0.092	
LAWB99-SSM-S #2	MnO	<	0.129	0.000	0.129	
LAWB99-SSM-S #2	Na_2O		10.487	10.000	0.487	4.9%
LAWB99-SSM-S #2	NiO	<	0.064	0.000	0.064	
LAWB99-SSM-S #2	P_2O_5	<	0.229	0.030	0.199	
LAWB99-SSM-S #2	PbO	<	0.054	0.000	0.054	
LAWB99-SSM-S #2	PO_4	<	0.050	0.040	0.010	
LAWB99-SSM-S #2	SiO_2		43.749	43.080	0.669	1.6%
LAWB99-SSM-S #2	SnO_2	<	0.127	0.000	0.127	
LAWB99-SSM-S #2	SO_3		1.705	0.750	0.955	
LAWB99-SSM-S #2	V_2O_5		1.140	1.240	-0.100	
LAWB99-SSM-S #2	ZnO		3.286	3.540	-0.254	
LAWB99-SSM-S #2	ZrO_2		3.215	3.540	-0.325	
LAWB99-SSM-S #2	Sum		99.281	99.990	-0.709	-0.7%
LAWC100-BL	Al_2O_3		9.882	10.160	-0.278	-2.7%
LAWC100-BL	B_2O_3		14.135	13.680	0.455	3.3%
LAWC100-BL	CaO		7.458	8.020	-0.562	-7.0%
LAWC100-BL	Cl		0.484	0.650	-0.167	
LAWC100-BL	Cr_2O_3	<	0.146	0.020	0.126	
LAWC100-BL	F		0.189	0.190	-0.002	
LAWC100-BL	Fe_2O_3		0.904	1.000	-0.096	
LAWC100-BL	K_2O		0.152	0.150	0.002	
LAWC100-BL	Li_2O	<	0.215	0.000	0.215	
LAWC100-BL	MgO		0.906	1.000	-0.094	
LAWC100-BL	MnO	<	0.129	0.000	0.129	
LAWC100-BL	Na_2O		18.535	20.000	-1.465	-7.3%
LAWC100-BL	NiO	<	0.064	0.030	0.034	
LAWC100-BL	P_2O_5		0.234	0.270	-0.036	
LAWC100-BL	PbO	<	0.054	0.010	0.044	
LAWC100-BL	PO_4		0.155	0.361	-0.206	
LAWC100-BL	SiO_2		36.261	36.620	-0.359	-1.0%
LAWC100-BL	SnO_2	<	0.127	0.000	0.127	
LAWC100-BL	SO_3		1.140	1.200	-0.060	
LAWC100-BL	V_2O_5		0.898	1.000	-0.102	
LAWC100-BL	ZnO		2.857	3.000	-0.143	
LAWC100-BL	ZrO_2		2.627	3.000	-0.373	
LAWC100-BL	Sum		97.396	100.000	-2.604	-2.6%
LAWC100-SSM-S	Al_2O_3		9.807	10.160	-0.354	-3.5%
LAWC100-SSM-S	B_2O_3		13.765	13.680	0.085	0.6%
LAWC100-SSM-S	CaO		7.752	8.020	-0.268	-3.3%
LAWC100-SSM-S	Cl		0.181	0.650	-0.470	
LAWC100-SSM-S	Cr_2O_3	<	0.146	0.020	0.126	
LAWC100-SSM-S	F		0.163	0.190	-0.028	
LAWC100-SSM-S	Fe_2O_3		0.986	1.000	-0.014	
LAWC100-SSM-S	K_2O		0.140	0.150	-0.010	
LAWC100-SSM-S	Li_2O	<	0.215	0.000	0.215	
LAWC100-SSM-S	MgO		0.981	1.000	-0.019	
LAWC100-SSM-S	MnO	<	0.129	0.000	0.129	
LAWC100-SSM-S	Na_2O		17.928	20.000	-2.072	-10.4%
LAWC100-SSM-S	NiO	<	0.064	0.030	0.034	
LAWC100-SSM-S	P_2O_5		0.235	0.270	-0.035	
LAWC100-SSM-S	PbO	<	0.054	0.010	0.044	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
LAWC100-SSM-S	PO_4		0.177	0.361	-0.184	
LAWC100-SSM-S	SiO_2		36.475	36.620	-0.145	-0.4%
LAWC100-SSM-S	SnO_2	<	0.127	0.000	0.127	
LAWC100-SSM-S	SO_3		1.318	1.200	0.118	
LAWC100-SSM-S	V_2O_5		0.948	1.000	-0.052	
LAWC100-SSM-S	ZnO		3.000	3.000	0.000	
LAWC100-SSM-S	ZrO_2		2.668	3.000	-0.332	
LAWC100-SSM-S	Sum		97.081	100.000	-2.919	-2.9%
LRM	Al_2O_3		9.323	9.510	-0.187	-2.0%
LRM	B_2O_3		7.803	7.850	-0.047	-0.6%
LRM	CaO		0.570	0.540	0.030	
LRM	Cl	<	0.050	0.000	0.050	
LRM	Cr_2O_3		0.183	0.190	-0.007	
LRM	F		0.843	0.860	-0.017	
LRM	Fe_2O_3		1.372	1.380	-0.008	
LRM	K_2O		1.528	1.480	0.048	
LRM	Li_2O	<	0.215	0.110	0.105	
LRM	MgO	<	0.166	0.100	0.066	
LRM	MnO	<	0.129	0.098	0.031	
LRM	Na_2O		19.804	20.030	-0.226	-1.1%
LRM	NiO		0.172	0.190	-0.019	
LRM	P_2O_5		0.429	0.540	-0.111	
LRM	PbO		0.088	0.100	-0.012	
LRM	PO_4		0.622	0.723	-0.101	
LRM	SiO_2		54.517	54.200	0.316	0.6%
LRM	SnO_2	<	0.127	0.000	0.127	
LRM	SO_3		0.214	0.300	-0.086	
LRM	V_2O_5	<	0.179	0.000	0.179	
LRM	ZnO	<	0.125	0.000	0.125	
LRM	ZrO_2		0.888	0.930	-0.042	
LRM	Sum		98.724	98.408	0.316	0.3%
ORPLA20-BL	Al_2O_3		6.585	6.700	-0.115	-1.7%
ORPLA20-BL	B_2O_3		9.225	8.800	0.425	4.8%
ORPLA20-BL	CaO		3.309	3.340	-0.031	
ORPLA20-BL	Cl		0.539	0.680	-0.142	
ORPLA20-BL	Cr_2O_3		0.488	0.500	-0.012	
ORPLA20-BL	F	<	0.050	0.000	0.050	
ORPLA20-BL	Fe_2O_3		0.304	0.300	0.004	
ORPLA20-BL	K_2O		0.527	0.540	-0.013	
ORPLA20-BL	Li_2O	<	0.215	0.000	0.215	
ORPLA20-BL	MgO		0.922	0.930	-0.008	
ORPLA20-BL	MnO	<	0.129	0.000	0.129	
ORPLA20-BL	Na_2O		21.703	24.000	-2.297	-9.6%
ORPLA20-BL	NiO	<	0.064	0.000	0.064	
ORPLA20-BL	P_2O_5	<	0.229	0.000	0.229	
ORPLA20-BL	PbO	<	0.054	0.000	0.054	
ORPLA20-BL	PO_4	<	0.050	0.000	0.050	
ORPLA20-BL	SiO_2		42.679	42.510	0.169	0.4%
ORPLA20-BL	SnO_2		2.546	2.760	-0.215	
ORPLA20-BL	SO_3		0.189	0.180	0.009	
ORPLA20-BL	V_2O_5	<	0.179	0.000	0.179	
ORPLA20-BL	ZnO		2.571	2.760	-0.190	
ORPLA20-BL	ZrO_2		5.538	6.000	-0.462	-7.7%
ORPLA20-BL	Sum		98.043	100.000	-1.957	-2.0%
ORPLA20-SSM-S	Al_2O_3		6.500	6.700	-0.200	-3.0%

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLA20-SSM-S	B_2O_3		8.597	8.800	-0.203	-2.3%
ORPLA20-SSM-S	CaO		3.435	3.340	0.095	
ORPLA20-SSM-S	Cl		0.190	0.680	-0.491	
ORPLA20-SSM-S	Cr_2O_3		0.349	0.500	-0.151	
ORPLA20-SSM-S	F	<	0.050	0.000	0.050	
ORPLA20-SSM-S	Fe_2O_3		0.296	0.300	-0.004	
ORPLA20-SSM-S	K_2O		0.431	0.540	-0.109	
ORPLA20-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLA20-SSM-S	MgO		0.883	0.930	-0.047	
ORPLA20-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLA20-SSM-S	Na_2O		21.972	24.000	-2.028	-8.4%
ORPLA20-SSM-S	NiO	<	0.064	0.000	0.064	
ORPLA20-SSM-S	P_2O_5	<	0.229	0.000	0.229	
ORPLA20-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLA20-SSM-S	PO_4	<	0.050	0.000	0.050	
ORPLA20-SSM-S	SiO_2		43.214	42.510	0.704	1.7%
ORPLA20-SSM-S	SnO_2		2.527	2.760	-0.234	
ORPLA20-SSM-S	SO_3		1.010	0.180	0.830	
ORPLA20-SSM-S	V_2O_5	<	0.179	0.000	0.179	
ORPLA20-SSM-S	ZnO		2.695	2.760	-0.065	
ORPLA20-SSM-S	ZrO_2		5.579	6.000	-0.421	-7.0%
ORPLA20-SSM-S	Sum		98.596	100.000	-1.404	-1.4%
ORPLA20-SSM-S #2	Al_2O_3		6.632	6.700	-0.068	-1.0%
ORPLA20-SSM-S #2	B_2O_3		8.903	8.800	0.103	1.2%
ORPLA20-SSM-S #2	CaO		3.407	3.340	0.067	
ORPLA20-SSM-S #2	Cl		0.190	0.680	-0.491	
ORPLA20-SSM-S #2	Cr_2O_3		0.357	0.500	-0.143	
ORPLA20-SSM-S #2	F	<	0.050	0.000	0.050	
ORPLA20-SSM-S #2	Fe_2O_3		0.310	0.300	0.010	
ORPLA20-SSM-S #2	K_2O		0.422	0.540	-0.118	
ORPLA20-SSM-S #2	Li_2O	<	0.215	0.000	0.215	
ORPLA20-SSM-S #2	MgO		0.925	0.930	-0.005	
ORPLA20-SSM-S #2	MnO	<	0.129	0.000	0.129	
ORPLA20-SSM-S #2	Na_2O		20.961	24.000	-3.039	-12.7%
ORPLA20-SSM-S #2	NiO	<	0.064	0.000	0.064	
ORPLA20-SSM-S #2	P_2O_5	<	0.229	0.000	0.229	
ORPLA20-SSM-S #2	PbO	<	0.054	0.000	0.054	
ORPLA20-SSM-S #2	PO_4	<	0.050	0.000	0.050	
ORPLA20-SSM-S #2	SiO_2		43.535	42.510	1.025	2.4%
ORPLA20-SSM-S #2	SnO_2		2.571	2.760	-0.189	
ORPLA20-SSM-S #2	SO_3		1.035	0.180	0.855	
ORPLA20-SSM-S #2	V_2O_5	<	0.179	0.000	0.179	
ORPLA20-SSM-S #2	ZnO		2.664	2.760	-0.096	
ORPLA20-SSM-S #2	ZrO_2		5.559	6.000	-0.442	-7.4%
ORPLA20-SSM-S #2	Sum		98.389	100.000	-1.611	-1.6%
ORPLA38-1-BL	Al_2O_3		6.764	6.940	-0.176	-2.5%
ORPLA38-1-BL	B_2O_3		8.629	8.210	0.419	5.1%
ORPLA38-1-BL	CaO		3.162	3.120	0.042	
ORPLA38-1-BL	Cl		0.530	0.670	-0.140	
ORPLA38-1-BL	Cr_2O_3		0.476	0.490	-0.014	
ORPLA38-1-BL	F	<	0.050	0.000	0.050	
ORPLA38-1-BL	Fe_2O_3		0.265	0.260	0.005	
ORPLA38-1-BL	K_2O		0.525	0.530	-0.005	
ORPLA38-1-BL	Li_2O	<	0.215	0.000	0.215	
ORPLA38-1-BL	MgO		0.972	0.980	-0.008	
ORPLA38-1-BL	MnO	<	0.129	0.000	0.129	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLA38-1-BL	Na_2O		21.096	24.000	-2.904	-12.1%
ORPLA38-1-BL	NiO	<	0.064	0.000	0.064	
ORPLA38-1-BL	P_2O_5	<	0.229	0.000	0.229	
ORPLA38-1-BL	PbO	<	0.054	0.000	0.054	
ORPLA38-1-BL	PO_4	<	0.050	0.000	0.050	
ORPLA38-1-BL	SiO_2		42.893	41.430	1.463	3.5%
ORPLA38-1-BL	SnO_2		2.495	2.660	-0.165	
ORPLA38-1-BL	SO_3		0.934	0.990	-0.056	
ORPLA38-1-BL	V_2O_5		0.900	0.910	-0.010	
ORPLA38-1-BL	ZnO		2.658	2.800	-0.142	
ORPLA38-1-BL	ZrO_2		5.288	6.000	-0.712	-11.9%
ORPLA38-1-BL	Sum		98.327	99.990	-1.663	-1.7%
ORPLA38-1-SSM-S	Al_2O_3		6.755	6.940	-0.185	-2.7%
ORPLA38-1-SSM-S	B_2O_3		8.275	8.210	0.065	0.8%
ORPLA38-1-SSM-S	CaO		3.267	3.120	0.147	
ORPLA38-1-SSM-S	Cl		0.190	0.670	-0.480	
ORPLA38-1-SSM-S	Cr_2O_3		0.318	0.490	-0.172	
ORPLA38-1-SSM-S	F	<	0.050	0.000	0.050	
ORPLA38-1-SSM-S	Fe_2O_3		0.247	0.260	-0.013	
ORPLA38-1-SSM-S	K_2O		0.411	0.530	-0.119	
ORPLA38-1-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLA38-1-SSM-S	MgO		0.893	0.980	-0.087	
ORPLA38-1-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLA38-1-SSM-S	Na_2O		22.107	24.000	-1.893	-7.9%
ORPLA38-1-SSM-S	NiO	<	0.064	0.000	0.064	
ORPLA38-1-SSM-S	P_2O_5	<	0.229	0.000	0.229	
ORPLA38-1-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLA38-1-SSM-S	PO_4	<	0.050	0.000	0.050	
ORPLA38-1-SSM-S	SiO_2		43.000	41.430	1.570	3.8%
ORPLA38-1-SSM-S	SnO_2		2.495	2.660	-0.165	
ORPLA38-1-SSM-S	SO_3		1.036	0.990	0.046	
ORPLA38-1-SSM-S	V_2O_5		0.784	0.910	-0.126	
ORPLA38-1-SSM-S	ZnO		2.782	2.800	-0.018	
ORPLA38-1-SSM-S	ZrO_2		5.309	6.000	-0.691	-11.5%
ORPLA38-1-SSM-S	Sum		98.610	99.990	-1.380	-1.4%
ORPLB4-BL	Al_2O_3		9.476	10.030	-0.554	-5.5%
ORPLB4-BL	B_2O_3		8.501	8.520	-0.019	-0.2%
ORPLB4-BL	CaO		1.910	1.900	0.010	
ORPLB4-BL	Cl		0.090	0.110	-0.020	
ORPLB4-BL	Cr_2O_3		0.527	0.530	-0.003	
ORPLB4-BL	F		0.430	0.470	-0.040	
ORPLB4-BL	Fe_2O_3		1.022	0.960	0.062	
ORPLB4-BL	K_2O		0.130	0.110	0.020	
ORPLB4-BL	Li_2O	<	0.215	0.000	0.215	
ORPLB4-BL	MgO		0.945	0.930	0.015	
ORPLB4-BL	MnO	<	0.129	0.060	0.069	
ORPLB4-BL	Na_2O		22.309	24.000	-1.691	-7.0%
ORPLB4-BL	NiO	<	0.064	0.040	0.024	
ORPLB4-BL	P_2O_5	<	0.229	0.220	0.009	
ORPLB4-BL	PbO	<	0.054	0.000	0.054	
ORPLB4-BL	PO_4		0.176	0.294	-0.119	
ORPLB4-BL	SiO_2		39.684	40.060	-0.376	-0.9%
ORPLB4-BL	SnO_2		0.971	1.000	-0.029	
ORPLB4-BL	SO_3		0.506	0.500	0.006	
ORPLB4-BL	V_2O_5		2.080	2.000	0.080	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLB4-BL	ZnO		2.396	2.370	0.026	
ORPLB4-BL	ZrO_2		5.869	6.040	-0.171	-2.8%
ORPLB4-BL	Sum		97.536	99.850	-2.314	-2.3%
ORPLB4-SSM-S	Al_2O_3		9.599	10.030	-0.431	-4.3%
ORPLB4-SSM-S	B_2O_3		8.356	8.520	-0.164	-1.9%
ORPLB4-SSM-S	CaO		1.938	1.900	0.038	
ORPLB4-SSM-S	Cl	<	0.050	0.110	-0.060	
ORPLB4-SSM-S	Cr_2O_3		0.366	0.530	-0.164	
ORPLB4-SSM-S	F		0.338	0.470	-0.133	
ORPLB4-SSM-S	Fe_2O_3		1.004	0.960	0.044	
ORPLB4-SSM-S	K_2O	<	0.121	0.110	0.011	
ORPLB4-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLB4-SSM-S	MgO		0.963	0.930	0.033	
ORPLB4-SSM-S	MnO	<	0.129	0.060	0.069	
ORPLB4-SSM-S	Na_2O		22.714	24.000	-1.286	-5.4%
ORPLB4-SSM-S	NiO	<	0.064	0.040	0.024	
ORPLB4-SSM-S	P_2O_5	<	0.229	0.220	0.009	
ORPLB4-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLB4-SSM-S	PO_4		0.186	0.294	-0.109	
ORPLB4-SSM-S	SiO_2		40.433	40.060	0.373	0.9%
ORPLB4-SSM-S	SnO_2		0.987	1.000	-0.013	
ORPLB4-SSM-S	SO_3		1.166	0.500	0.666	
ORPLB4-SSM-S	V_2O_5		1.973	2.000	-0.027	
ORPLB4-SSM-S	ZnO		2.459	2.370	0.088	
ORPLB4-SSM-S	ZrO_2		5.998	6.040	-0.042	-0.7%
ORPLB4-SSM-S	Sum		99.152	99.850	-0.698	-0.7%
ORPLC5-BL	Al_2O_3		10.005	10.040	-0.035	-0.3%
ORPLC5-BL	B_2O_3		8.919	8.520	0.399	4.7%
ORPLC5-BL	CaO		1.987	1.910	0.077	
ORPLC5-BL	Cl		0.506	0.620	-0.115	
ORPLC5-BL	Cr_2O_3		0.539	0.530	0.009	
ORPLC5-BL	F	<	0.050	0.010	0.040	
ORPLC5-BL	Fe_2O_3		1.009	0.970	0.039	
ORPLC5-BL	K_2O		0.537	0.540	-0.003	
ORPLC5-BL	Li_2O	<	0.215	0.000	0.215	
ORPLC5-BL	MgO		0.956	0.930	0.026	
ORPLC5-BL	MnO	<	0.129	0.000	0.129	
ORPLC5-BL	Na_2O		21.635	23.570	-1.935	-8.2%
ORPLC5-BL	NiO	<	0.064	0.000	0.064	
ORPLC5-BL	P_2O_5	<	0.229	0.190	0.039	
ORPLC5-BL	PbO	<	0.054	0.000	0.054	
ORPLC5-BL	PO_4		0.167	0.254	-0.088	
ORPLC5-BL	SiO_2		39.256	40.100	-0.844	-2.1%
ORPLC5-BL	SnO_2		0.992	1.000	-0.008	
ORPLC5-BL	SO_3		0.518	0.520	-0.002	
ORPLC5-BL	V_2O_5		2.107	2.000	0.107	
ORPLC5-BL	ZnO		2.502	2.370	0.132	
ORPLC5-BL	ZrO_2		6.119	6.040	0.079	1.3%
ORPLC5-BL	Sum		98.328	99.860	-1.532	-1.5%
ORPLC5-SSM-S	Al_2O_3		9.901	10.040	-0.139	-1.4%
ORPLC5-SSM-S	B_2O_3		8.710	8.520	0.190	2.2%
ORPLC5-SSM-S	CaO		1.917	1.910	0.007	
ORPLC5-SSM-S	Cl		0.160	0.620	-0.461	
ORPLC5-SSM-S	Cr_2O_3		0.363	0.530	-0.168	
ORPLC5-SSM-S	F	<	0.050	0.010	0.040	
ORPLC5-SSM-S	Fe_2O_3		1.028	0.970	0.058	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLC5-SSM-S	K_2O		0.475	0.540	-0.065	
ORPLC5-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLC5-SSM-S	MgO		0.962	0.930	0.032	
ORPLC5-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLC5-SSM-S	Na_2O		21.568	23.570	-2.002	-8.5%
ORPLC5-SSM-S	NiO	<	0.064	0.000	0.064	
ORPLC5-SSM-S	P_2O_5	<	0.229	0.190	0.039	
ORPLC5-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLC5-SSM-S	PO_4		0.133	0.254	-0.121	
ORPLC5-SSM-S	SiO_2		40.861	40.100	0.761	1.9%
ORPLC5-SSM-S	SnO_2		0.991	1.000	-0.009	
ORPLC5-SSM-S	SO_3		0.986	0.520	0.466	
ORPLC5-SSM-S	V_2O_5		1.964	2.000	-0.036	
ORPLC5-SSM-S	ZnO		2.415	2.370	0.045	
ORPLC5-SSM-S	ZrO_2		5.876	6.040	-0.164	-2.7%
ORPLC5-SSM-S	Sum		98.916	99.860	-0.944	-0.9%
ORPLD1-BL	Al_2O_3		9.608	10.160	-0.552	-5.4%
ORPLD1-BL	B_2O_3		11.640	12.050	-0.410	-3.4%
ORPLD1-BL	CaO		8.206	8.020	0.186	2.3%
ORPLD1-BL	Cl		0.237	0.330	-0.094	
ORPLD1-BL	Cr_2O_3		0.547	0.500	0.047	
ORPLD1-BL	F		0.166	0.170	-0.004	
ORPLD1-BL	Fe_2O_3		1.059	1.000	0.059	
ORPLD1-BL	K_2O		0.178	0.160	0.018	
ORPLD1-BL	Li_2O	<	0.215	0.000	0.215	
ORPLD1-BL	MgO		1.046	1.000	0.046	
ORPLD1-BL	MnO	<	0.129	0.000	0.129	
ORPLD1-BL	Na_2O		19.479	21.000	-1.521	-7.2%
ORPLD1-BL	NiO	<	0.064	0.040	0.024	
ORPLD1-BL	P_2O_5		0.269	0.290	-0.021	
ORPLD1-BL	PbO	<	0.054	0.010	0.044	
ORPLD1-BL	PO_4		0.225	0.388	-0.164	
ORPLD1-BL	SiO_2		37.545	37.170	0.375	1.0%
ORPLD1-BL	SnO_2	<	0.127	0.000	0.127	
ORPLD1-BL	SO_3		0.954	0.960	-0.006	
ORPLD1-BL	V_2O_5		1.058	1.000	0.058	
ORPLD1-BL	ZnO		3.149	3.000	0.149	
ORPLD1-BL	ZrO_2		2.816	3.000	-0.184	
ORPLD1-BL	Sum		98.545	99.860	-1.315	-1.3%
ORPLD1-ET-SSM-S	Al_2O_3		9.825	10.160	-0.335	-3.3%
ORPLD1-ET-SSM-S	B_2O_3		12.139	12.050	0.089	0.7%
ORPLD1-ET-SSM-S	CaO		8.101	8.020	0.081	1.0%
ORPLD1-ET-SSM-S	Cl		0.070	0.330	-0.260	
ORPLD1-ET-SSM-S	Cr_2O_3		0.335	0.500	-0.165	
ORPLD1-ET-SSM-S	F		0.153	0.170	-0.018	
ORPLD1-ET-SSM-S	Fe_2O_3		1.081	1.000	0.081	
ORPLD1-ET-SSM-S	K_2O		0.137	0.160	-0.023	
ORPLD1-ET-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLD1-ET-SSM-S	MgO		1.054	1.000	0.054	
ORPLD1-ET-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLD1-ET-SSM-S	Na_2O		19.613	21.000	-1.387	-6.6%
ORPLD1-ET-SSM-S	NiO	<	0.064	0.040	0.024	
ORPLD1-ET-SSM-S	P_2O_5		0.275	0.290	-0.015	
ORPLD1-ET-SSM-S	PbO	<	0.054	0.010	0.044	
ORPLD1-ET-SSM-S	PO_4		0.234	0.388	-0.155	
ORPLD1-ET-SSM-S	SiO_2		36.154	37.170	-1.016	-2.7%

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLD1-ET-SSM-S	SnO_2	<	0.127	0.000	0.127	
ORPLD1-ET-SSM-S	SO_3		1.430	0.960	0.470	
ORPLD1-ET-SSM-S	V_2O_5		1.026	1.000	0.026	
ORPLD1-ET-SSM-S	ZnO		3.149	3.000	0.149	
ORPLD1-ET-SSM-S	ZrO_2		2.898	3.000	-0.103	
ORPLD1-ET-SSM-S	Sum		98.028	99.860	-1.832	-1.8%
ORPLD1-SSM-S	Al_2O_3		10.118	10.160	-0.042	-0.4%
ORPLD1-SSM-S	B_2O_3		12.187	12.050	0.137	1.1%
ORPLD1-SSM-S	CaO		7.968	8.020	-0.052	-0.6%
ORPLD1-SSM-S	Cl		0.086	0.330	-0.244	
ORPLD1-SSM-S	Cr_2O_3		0.321	0.500	-0.179	
ORPLD1-SSM-S	F		0.149	0.170	-0.021	
ORPLD1-SSM-S	Fe_2O_3		1.040	1.000	0.040	
ORPLD1-SSM-S	K_2O		0.139	0.160	-0.022	
ORPLD1-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLD1-SSM-S	MgO		1.023	1.000	0.023	
ORPLD1-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLD1-SSM-S	Na_2O		19.546	21.000	-1.454	-6.9%
ORPLD1-SSM-S	NiO	<	0.064	0.040	0.024	
ORPLD1-SSM-S	P_2O_5	<	0.229	0.290	-0.061	
ORPLD1-SSM-S	PbO	<	0.054	0.010	0.044	
ORPLD1-SSM-S	PO_4		0.179	0.388	-0.210	
ORPLD1-SSM-S	SiO_2		37.117	37.170	-0.053	-0.1%
ORPLD1-SSM-S	SnO_2	<	0.127	0.000	0.127	
ORPLD1-SSM-S	SO_3		1.363	0.960	0.403	
ORPLD1-SSM-S	V_2O_5		0.995	1.000	-0.005	
ORPLD1-SSM-S	ZnO		3.050	3.000	0.050	
ORPLD1-SSM-S	ZrO_2		2.533	3.000	-0.467	
ORPLD1-SSM-S	Sum		98.454	99.860	-1.406	-1.4%
ORPLD6-BL	Al_2O_3		10.024	10.120	-0.096	-1.0%
ORPLD6-BL	B_2O_3		10.014	9.870	0.144	1.5%
ORPLD6-BL	CaO		8.080	7.910	0.170	2.2%
ORPLD6-BL	Cl		0.279	0.350	-0.071	
ORPLD6-BL	Cr_2O_3		0.509	0.500	0.009	
ORPLD6-BL	F		0.182	0.180	0.002	
ORPLD6-BL	Fe_2O_3		0.325	0.300	0.025	
ORPLD6-BL	K_2O		0.187	0.170	0.017	
ORPLD6-BL	Li_2O	<	0.215	0.000	0.215	
ORPLD6-BL	MgO		1.036	0.990	0.046	
ORPLD6-BL	MnO	<	0.129	0.000	0.129	
ORPLD6-BL	Na_2O		20.490	22.000	-1.510	-6.9%
ORPLD6-BL	NiO	<	0.064	0.040	0.024	
ORPLD6-BL	P_2O_5		0.288	0.300	-0.012	
ORPLD6-BL	PbO	<	0.054	0.010	0.044	
ORPLD6-BL	PO_4		0.241	0.401	-0.161	
ORPLD6-BL	SiO_2		37.759	37.330	0.429	1.1%
ORPLD6-BL	SnO_2	<	0.127	0.000	0.127	
ORPLD6-BL	SO_3		1.024	1.010	0.014	
ORPLD6-BL	V_2O_5		2.107	1.970	0.137	
ORPLD6-BL	ZnO		3.087	2.970	0.117	
ORPLD6-BL	ZrO_2		3.755	3.990	-0.235	
ORPLD6-BL	Sum		99.733	100.010	-0.277	-0.3%
ORPLD6-SSM-S	Al_2O_3		9.910	10.120	-0.210	-2.1%
ORPLD6-SSM-S	B_2O_3		9.611	9.870	-0.259	-2.6%
ORPLD6-SSM-S	CaO		8.122	7.910	0.212	2.7%

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLD6-SSM-S	Cl		0.099	0.350	-0.251	
ORPLD6-SSM-S	Cr_2O_3		0.301	0.500	-0.199	
ORPLD6-SSM-S	F		0.168	0.180	-0.013	
ORPLD6-SSM-S	Fe_2O_3		0.322	0.300	0.022	
ORPLD6-SSM-S	K_2O		0.145	0.170	-0.025	
ORPLD6-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLD6-SSM-S	MgO		1.026	0.990	0.036	
ORPLD6-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLD6-SSM-S	Na_2O		20.153	22.000	-1.847	-8.4%
ORPLD6-SSM-S	NiO	<	0.064	0.040	0.024	
ORPLD6-SSM-S	P_2O_5	<	0.231	0.300	-0.069	
ORPLD6-SSM-S	PbO	<	0.054	0.010	0.044	
ORPLD6-SSM-S	PO_4		0.241	0.401	-0.161	
ORPLD6-SSM-S	SiO_2		37.759	37.330	0.429	1.1%
ORPLD6-SSM-S	SnO_2	<	0.127	0.000	0.127	
ORPLD6-SSM-S	SO_3		1.396	1.010	0.386	
ORPLD6-SSM-S	V_2O_5		1.937	1.970	-0.033	
ORPLD6-SSM-S	ZnO		3.131	2.970	0.161	
ORPLD6-SSM-S	ZrO_2		3.438	3.990	-0.552	
ORPLD6-SSM-S	Sum		98.338	100.010	-1.673	-1.7%
ORPLE12-BL	Al_2O_3		7.237	7.600	-0.363	-4.8%
ORPLE12-BL	B_2O_3		9.885	9.850	0.035	0.4%
ORPLE12-BL	CaO		10.249	10.050	0.199	2.0%
ORPLE12-BL	Cl	<	0.050	0.020	0.030	
ORPLE12-BL	Cr_2O_3		0.510	0.500	0.010	
ORPLE12-BL	F		0.197	0.200	-0.004	
ORPLE12-BL	Fe_2O_3		0.275	0.240	0.035	
ORPLE12-BL	K_2O		0.592	0.550	0.042	
ORPLE12-BL	Li_2O		2.148	2.500	-0.353	
ORPLE12-BL	MgO		1.091	1.050	0.041	
ORPLE12-BL	MnO	<	0.129	0.000	0.129	
ORPLE12-BL	Na_2O		15.098	16.000	-0.902	-5.6%
ORPLE12-BL	NiO	<	0.064	0.000	0.064	
ORPLE12-BL	P_2O_5	<	0.229	0.120	0.109	
ORPLE12-BL	PbO	<	0.054	0.000	0.054	
ORPLE12-BL	PO_4		0.108	0.161	-0.053	
ORPLE12-BL	SiO_2		41.289	41.410	-0.121	-0.3%
ORPLE12-BL	SnO_2	<	0.127	0.000	0.127	
ORPLE12-BL	SO_3		1.256	1.250	0.006	
ORPLE12-BL	V_2O_5		1.839	1.750	0.089	
ORPLE12-BL	ZnO		3.392	3.220	0.172	
ORPLE12-BL	ZrO_2		3.269	3.540	-0.271	
ORPLE12-BL	Sum		98.977	99.850	-0.873	-0.9%
ORPLE12-SSM-S	Al_2O_3		7.312	7.600	-0.288	-3.8%
ORPLE12-SSM-S	B_2O_3		9.950	9.850	0.100	1.0%
ORPLE12-SSM-S	CaO		9.990	10.050	-0.060	-0.6%
ORPLE12-SSM-S	Cl	<	0.050	0.020	0.030	
ORPLE12-SSM-S	Cr_2O_3		0.383	0.500	-0.117	
ORPLE12-SSM-S	F		0.191	0.200	-0.010	
ORPLE12-SSM-S	Fe_2O_3		0.263	0.240	0.023	
ORPLE12-SSM-S	K_2O		0.475	0.550	-0.075	
ORPLE12-SSM-S	Li_2O		2.074	2.500	-0.426	
ORPLE12-SSM-S	MgO		1.071	1.050	0.021	
ORPLE12-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLE12-SSM-S	Na_2O		15.637	16.000	-0.363	-2.3%
ORPLE12-SSM-S	NiO	<	0.064	0.000	0.064	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLE12-SSM-S	P_2O_5	<	0.229	0.120	0.109	
ORPLE12-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLE12-SSM-S	PO_4		0.122	0.161	-0.039	
ORPLE12-SSM-S	SiO_2		39.577	41.410	-1.833	-4.4%
ORPLE12-SSM-S	SnO_2	<	0.127	0.000	0.127	
ORPLE12-SSM-S	SO_3		1.900	1.250	0.650	
ORPLE12-SSM-S	V_2O_5		1.779	1.750	0.029	
ORPLE12-SSM-S	ZnO		3.349	3.220	0.129	
ORPLE12-SSM-S	ZrO_2		3.357	3.540	-0.183	
ORPLE12-SSM-S	Sum		97.960	99.850	-1.890	-1.9%
ORPLF7-BL	Al_2O_3		8.229	8.600	-0.371	-4.3%
ORPLF7-BL	B_2O_3		9.386	9.500	-0.114	-1.2%
ORPLF7-BL	CaO		10.004	9.720	0.284	2.9%
ORPLF7-BL	Cl	<	0.050	0.010	0.040	
ORPLF7-BL	Cr_2O_3		0.572	0.560	0.012	
ORPLF7-BL	F		0.112	0.080	0.032	
ORPLF7-BL	Fe_2O_3		0.327	0.300	0.027	
ORPLF7-BL	K_2O		0.548	0.500	0.048	
ORPLF7-BL	Li_2O		3.735	4.350	-0.615	
ORPLF7-BL	MgO		1.012	0.980	0.032	
ORPLF7-BL	MnO	<	0.129	0.000	0.129	
ORPLF7-BL	Na_2O		12.098	12.000	0.098	0.8%
ORPLF7-BL	NiO	<	0.064	0.000	0.064	
ORPLF7-BL	P_2O_5	<	0.229	0.040	0.189	
ORPLF7-BL	PbO	<	0.054	0.000	0.054	
ORPLF7-BL	PO_4	<	0.050	0.054	-0.004	
ORPLF7-BL	SiO_2		41.075	42.140	-1.065	-2.5%
ORPLF7-BL	SnO_2	<	0.127	0.000	0.127	
ORPLF7-BL	SO_3		1.925	1.930	-0.005	
ORPLF7-BL	V_2O_5		2.669	2.500	0.169	
ORPLF7-BL	ZnO		3.031	2.910	0.121	
ORPLF7-BL	ZrO_2		3.816	3.880	-0.064	
ORPLF7-BL	Sum		99.191	100.000	-0.809	-0.8%
ORPLF7-SSM-S	Al_2O_3		8.437	8.600	-0.163	-1.9%
ORPLF7-SSM-S	B_2O_3		9.483	9.500	-0.017	-0.2%
ORPLF7-SSM-S	CaO		9.724	9.720	0.004	0.0%
ORPLF7-SSM-S	Cl	<	0.050	0.010	0.040	
ORPLF7-SSM-S	Cr_2O_3		0.434	0.560	-0.126	
ORPLF7-SSM-S	F		0.095	0.080	0.015	
ORPLF7-SSM-S	Fe_2O_3		0.347	0.300	0.047	
ORPLF7-SSM-S	K_2O		0.435	0.500	-0.065	
ORPLF7-SSM-S	Li_2O		3.595	4.350	-0.755	
ORPLF7-SSM-S	MgO		1.035	0.980	0.055	
ORPLF7-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLF7-SSM-S	Na_2O		12.772	12.000	0.772	6.4%
ORPLF7-SSM-S	NiO	<	0.064	0.000	0.064	
ORPLF7-SSM-S	P_2O_5	<	0.229	0.040	0.189	
ORPLF7-SSM-S	PbO	<	0.054	0.000	0.054	
ORPLF7-SSM-S	PO_4	<	0.050	0.054	-0.004	
ORPLF7-SSM-S	SiO_2		42.037	42.140	-0.103	-0.2%
ORPLF7-SSM-S	SnO_2	<	0.127	0.000	0.127	
ORPLF7-SSM-S	SO_3		2.136	1.930	0.206	
ORPLF7-SSM-S	V_2O_5		2.615	2.500	0.115	
ORPLF7-SSM-S	ZnO		3.025	2.910	0.115	
ORPLF7-SSM-S	ZrO_2		3.796	3.880	-0.084	

Table A-5. Comparison of Targeted and Measured Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted (wt %)	% Difference of Measured versus Targeted
ORPLF7-SSM-S	Sum		100.619	100.000	0.619	0.6%
ORPLG27-BL	Al_2O_3		5.858	6.030	-0.173	-2.9%
ORPLG27-BL	B_2O_3		7.889	7.920	-0.031	-0.4%
ORPLG27-BL	CaO		2.721	2.690	0.031	
ORPLG27-BL	Cl		0.152	0.230	-0.079	
ORPLG27-BL	Cr_2O_3		0.608	0.590	0.018	
ORPLG27-BL	F		0.120	0.090	0.030	
ORPLG27-BL	Fe_2O_3		0.305	0.280	0.025	
ORPLG27-BL	K_2O		5.620	5.750	-0.131	-2.3%
ORPLG27-BL	Li_2O	<	0.215	0.000	0.215	
ORPLG27-BL	MgO		0.464	0.440	0.024	
ORPLG27-BL	MnO	<	0.129	0.000	0.129	
ORPLG27-BL	Na_2O		19.344	21.000	-1.656	-7.9%
ORPLG27-BL	NiO	<	0.064	0.010	0.054	
ORPLG27-BL	P_2O_5	<	0.229	0.140	0.089	
ORPLG27-BL	PbO	<	0.054	0.010	0.044	
ORPLG27-BL	PO_4		0.135	0.187	-0.053	
ORPLG27-BL	SiO_2		41.609	42.100	-0.491	-1.2%
ORPLG27-BL	SnO_2		3.244	3.190	0.054	
ORPLG27-BL	SO_3		0.420	0.410	0.010	
ORPLG27-BL	V_2O_5	<	0.179	0.000	0.179	
ORPLG27-BL	ZnO		2.782	2.690	0.092	
ORPLG27-BL	ZrO_2		6.464	6.440	0.024	0.4%
ORPLG27-BL	Sum		98.467	100.010	-1.543	-1.5%
ORPLG27-SSM-S	Al_2O_3		5.754	6.030	-0.277	-4.6%
ORPLG27-SSM-S	B_2O_3		7.712	7.920	-0.208	-2.6%
ORPLG27-SSM-S	CaO		2.687	2.690	-0.003	
ORPLG27-SSM-S	Cl		0.064	0.230	-0.166	
ORPLG27-SSM-S	Cr_2O_3		0.401	0.590	-0.189	
ORPLG27-SSM-S	F		0.107	0.090	0.017	
ORPLG27-SSM-S	Fe_2O_3		0.296	0.280	0.016	
ORPLG27-SSM-S	K_2O		4.469	5.750	-1.281	-22.3%
ORPLG27-SSM-S	Li_2O	<	0.215	0.000	0.215	
ORPLG27-SSM-S	MgO		0.446	0.440	0.006	
ORPLG27-SSM-S	MnO	<	0.129	0.000	0.129	
ORPLG27-SSM-S	Na_2O		20.153	21.000	-0.847	-4.0%
ORPLG27-SSM-S	NiO	<	0.064	0.010	0.054	
ORPLG27-SSM-S	P_2O_5	<	0.229	0.140	0.089	
ORPLG27-SSM-S	PbO	<	0.054	0.010	0.044	
ORPLG27-SSM-S	PO_4		0.105	0.187	-0.083	
ORPLG27-SSM-S	SiO_2		42.037	42.100	-0.063	-0.1%
ORPLG27-SSM-S	SnO_2		3.130	3.190	-0.060	
ORPLG27-SSM-S	SO_3		1.087	0.410	0.677	
ORPLG27-SSM-S	V_2O_5	<	0.179	0.000	0.179	
ORPLG27-SSM-S	ZnO		2.714	2.690	0.024	
ORPLG27-SSM-S	ZrO_2		6.369	6.440	-0.071	-1.1%
ORPLG27-SSM-S	Sum		98.294	100.010	-1.716	-1.7%

Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence

Analyte (wt%)=Al2O3 (wt%), Prep Method=PF
Variability Chart for Measured

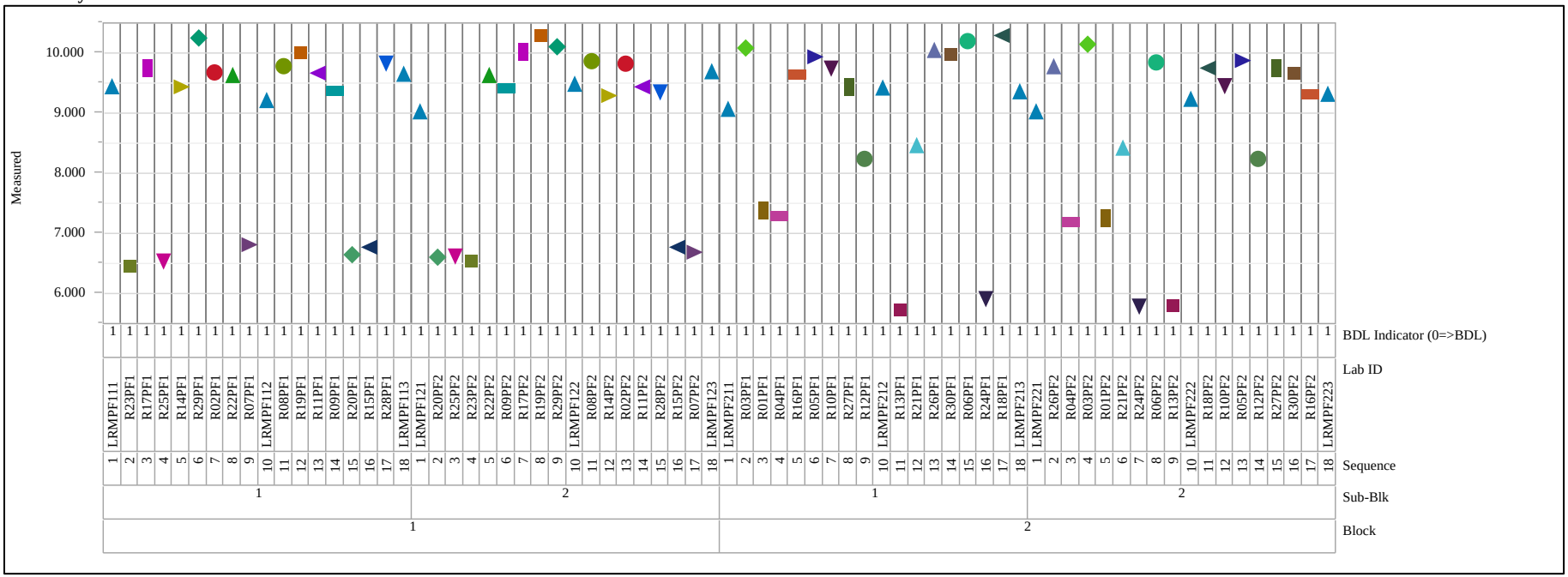


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=B2O3 (wt%), Prep Method=PF
Variability Chart for Measured

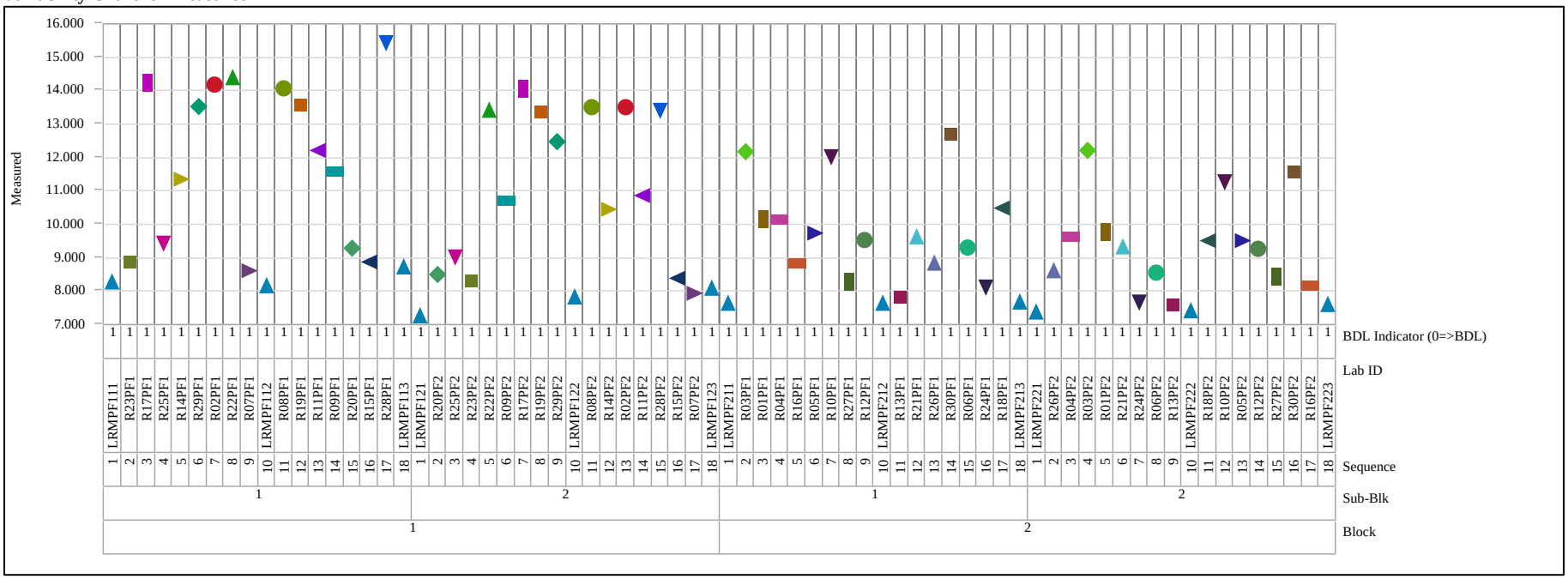


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=CaO (wt%), Prep Method=LM
Variability Chart for Measured

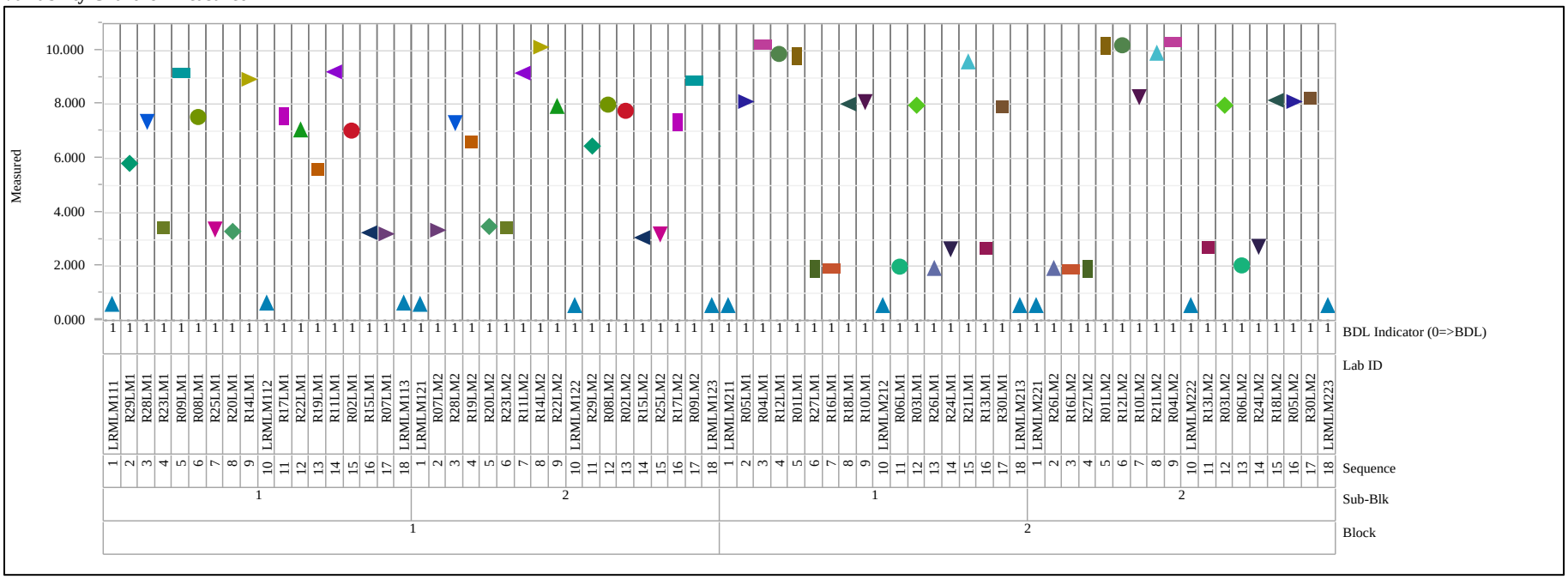


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=Cl (wt%), Prep Method=KH
Variability Chart for Measured

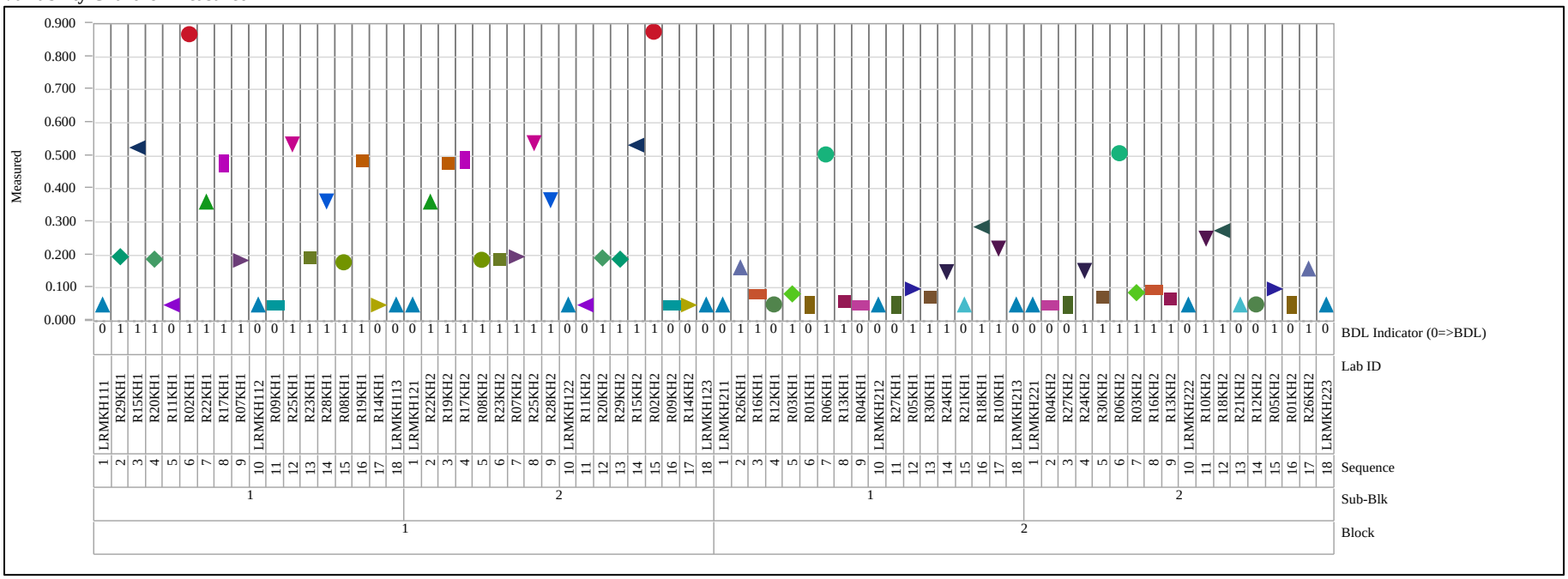


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=Cr2O3 (wt%), Prep Method=LM
Variability Chart for Measured

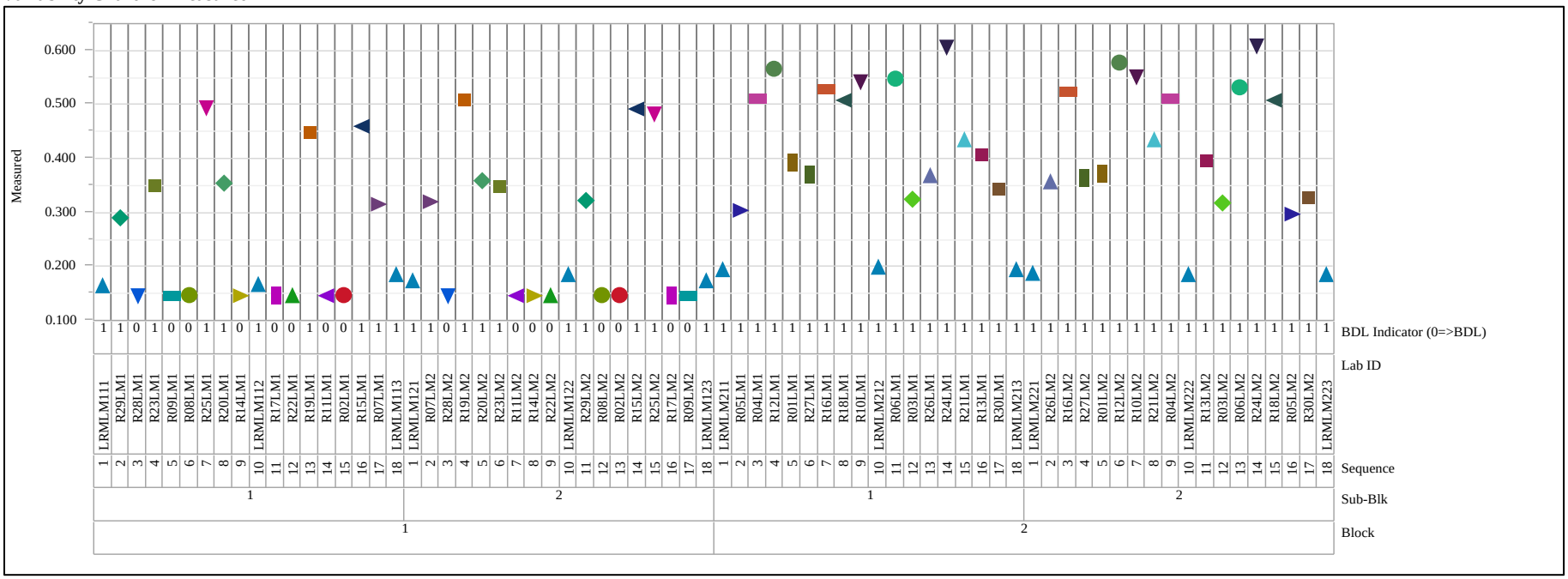


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=F (wt%), Prep Method=KH
Variability Chart for Measured

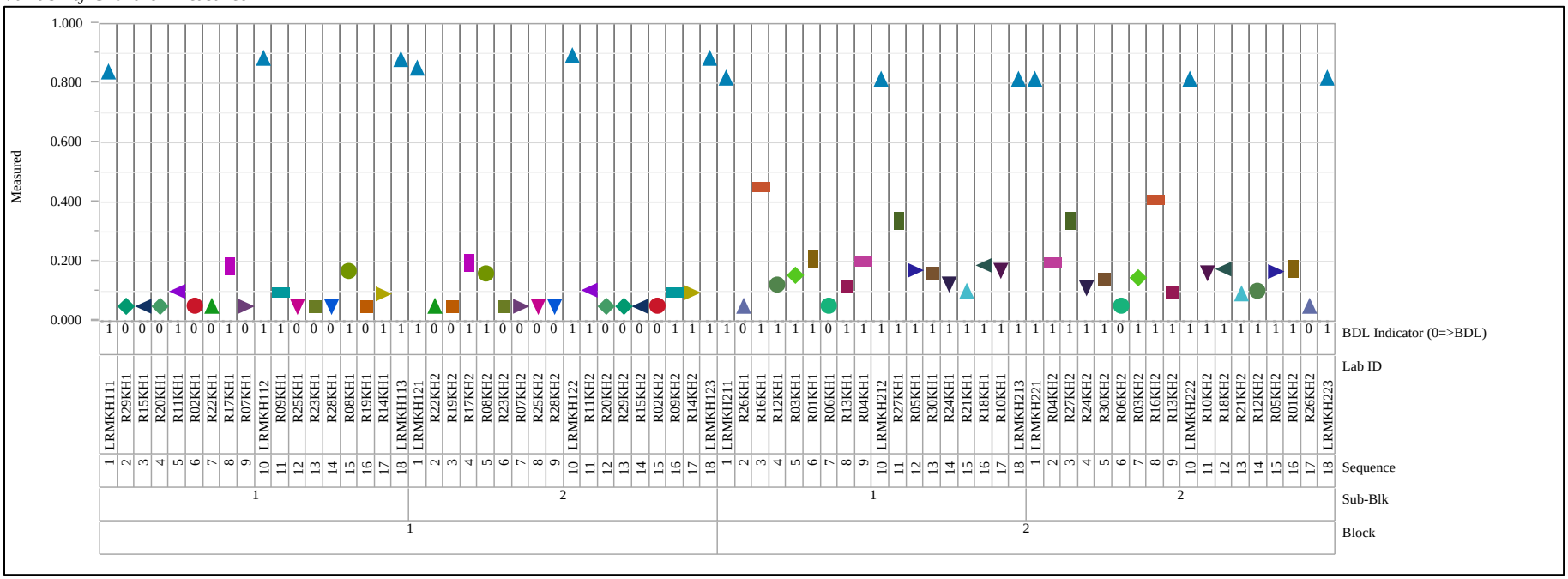


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=Fe2O3 (wt%), Prep Method=LM
Variability Chart for Measured

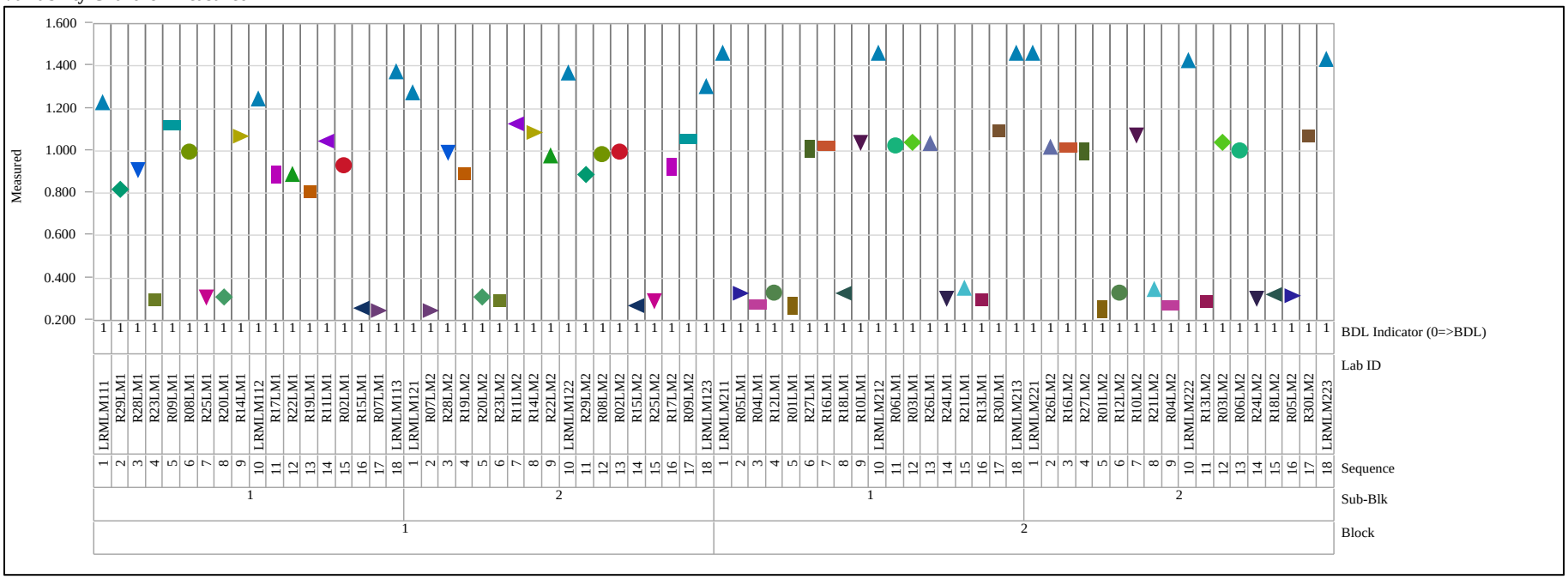


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=K2O (wt%), Prep Method=LM
Variability Chart for Measured

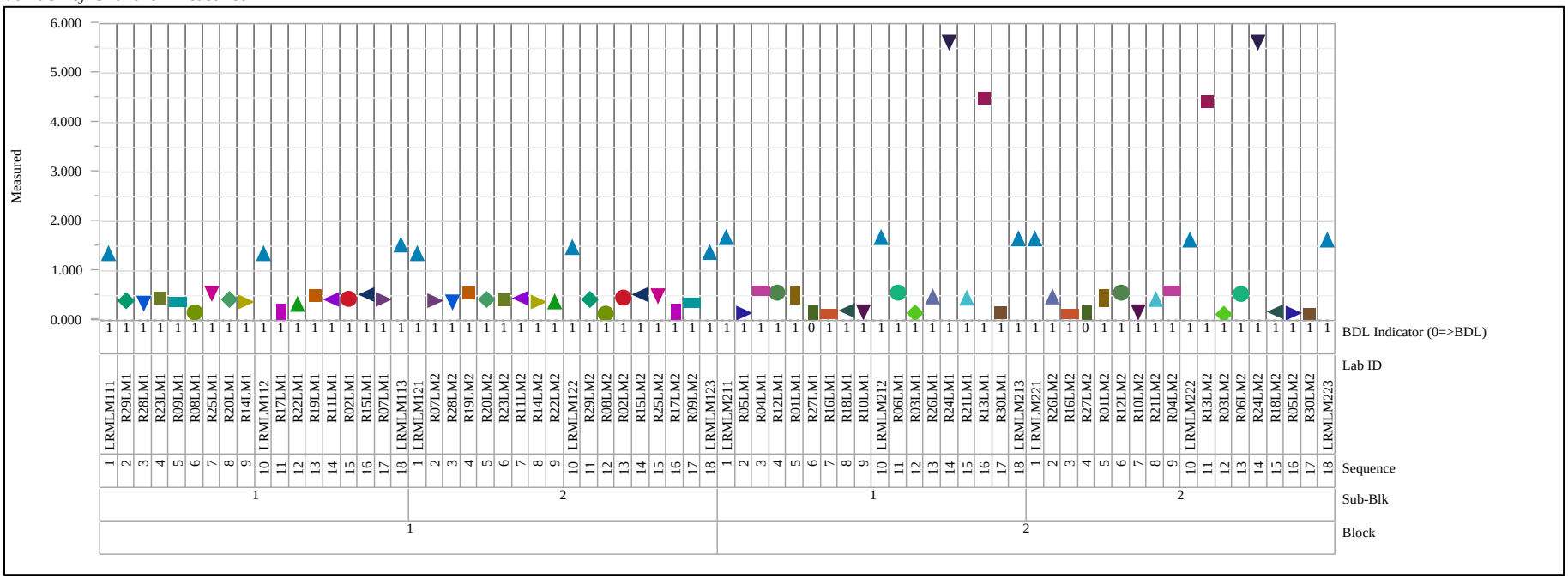


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=Li2O (wt%), Prep Method=PF
Variability Chart for Measured

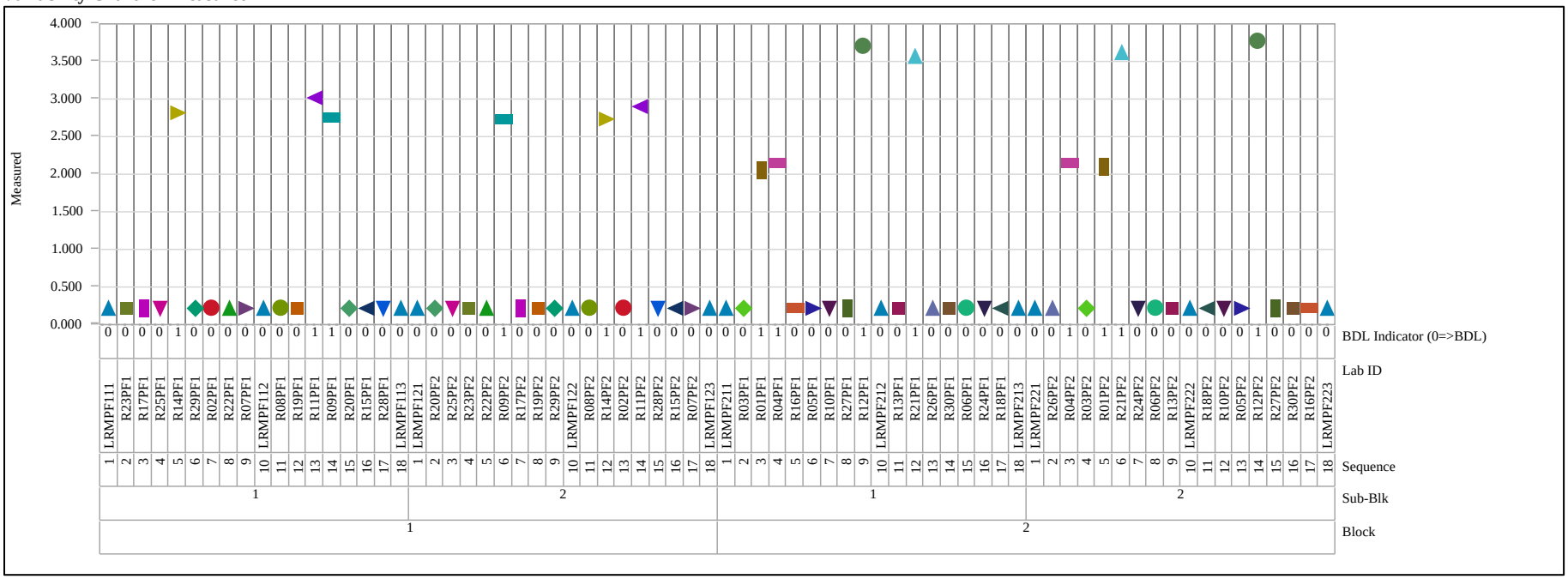


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=MgO (wt%), Prep Method=LM
Variability Chart for Measured

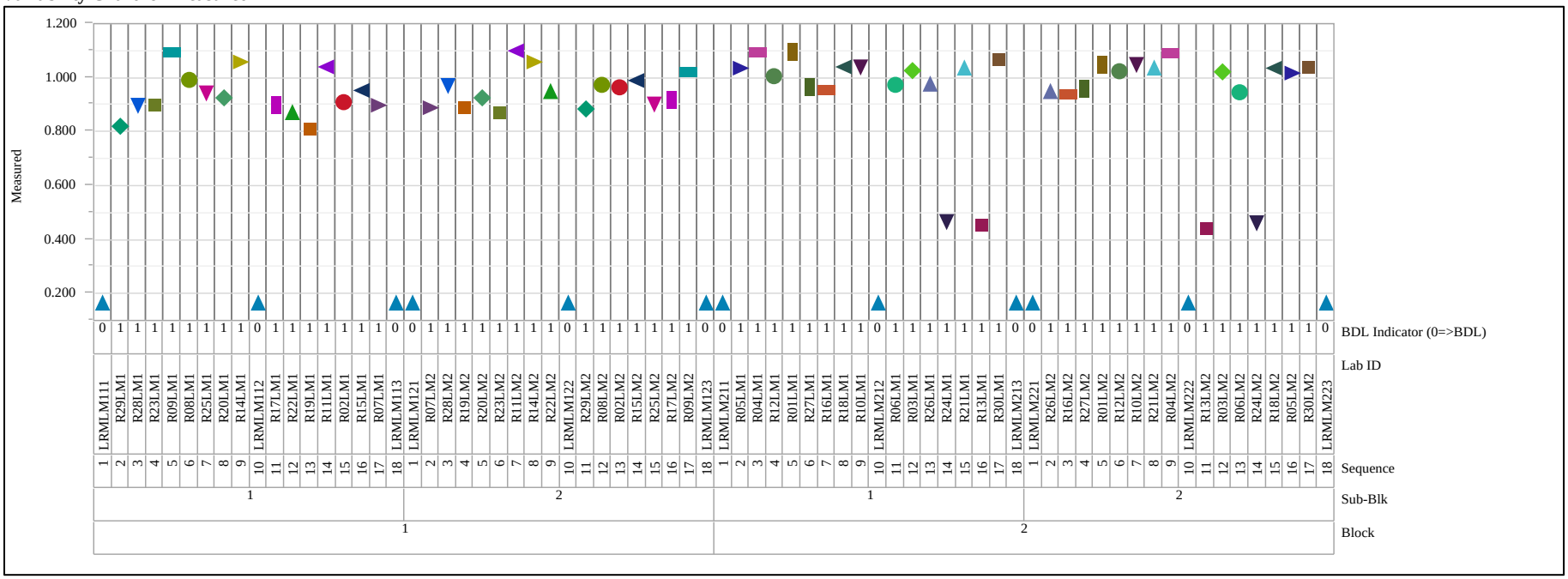


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=MnO (wt%), Prep Method=LM
Variability Chart for Measured

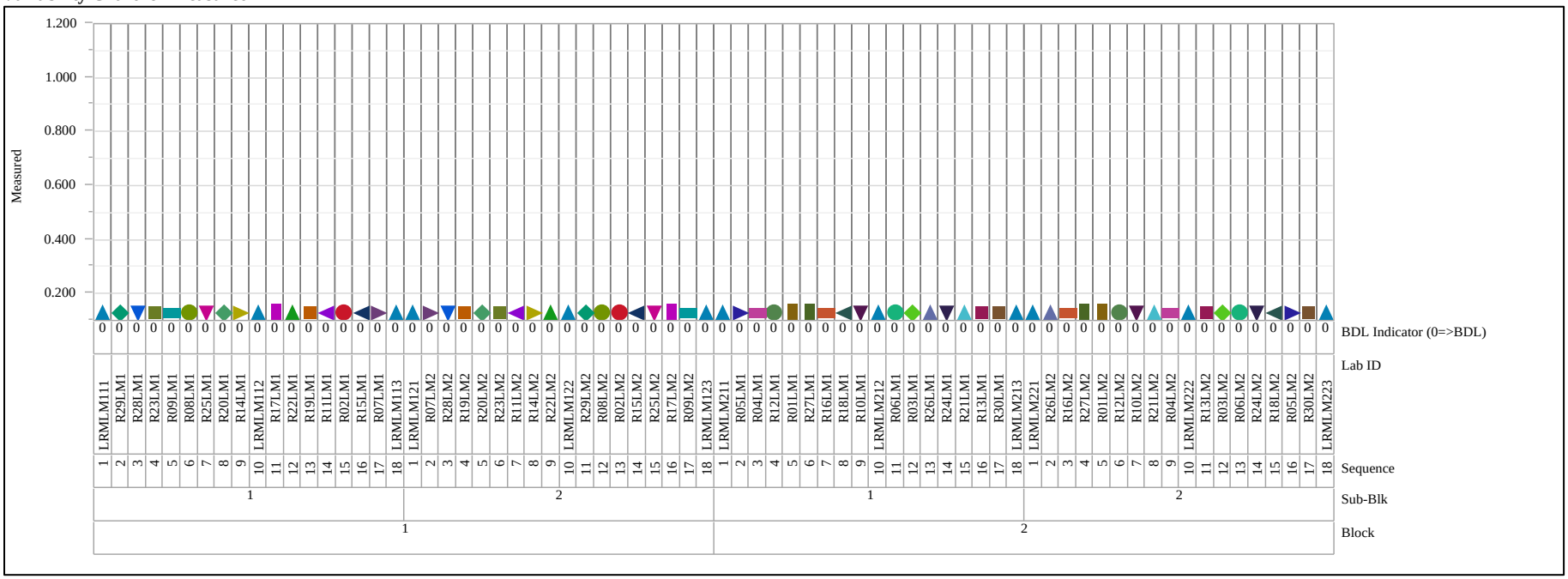


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=Na2O (wt%), Prep Method=LM
Variability Chart for Measured

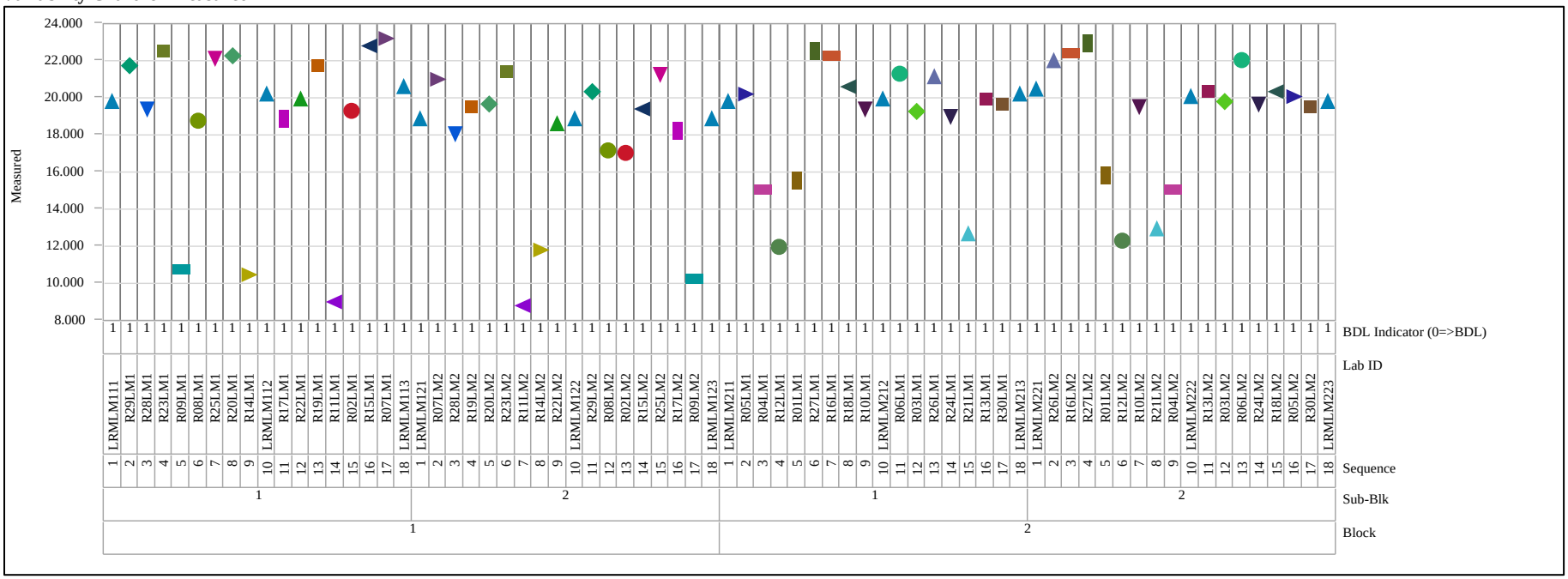


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=NiO (wt%), Prep Method=LM
Variability Chart for Measured

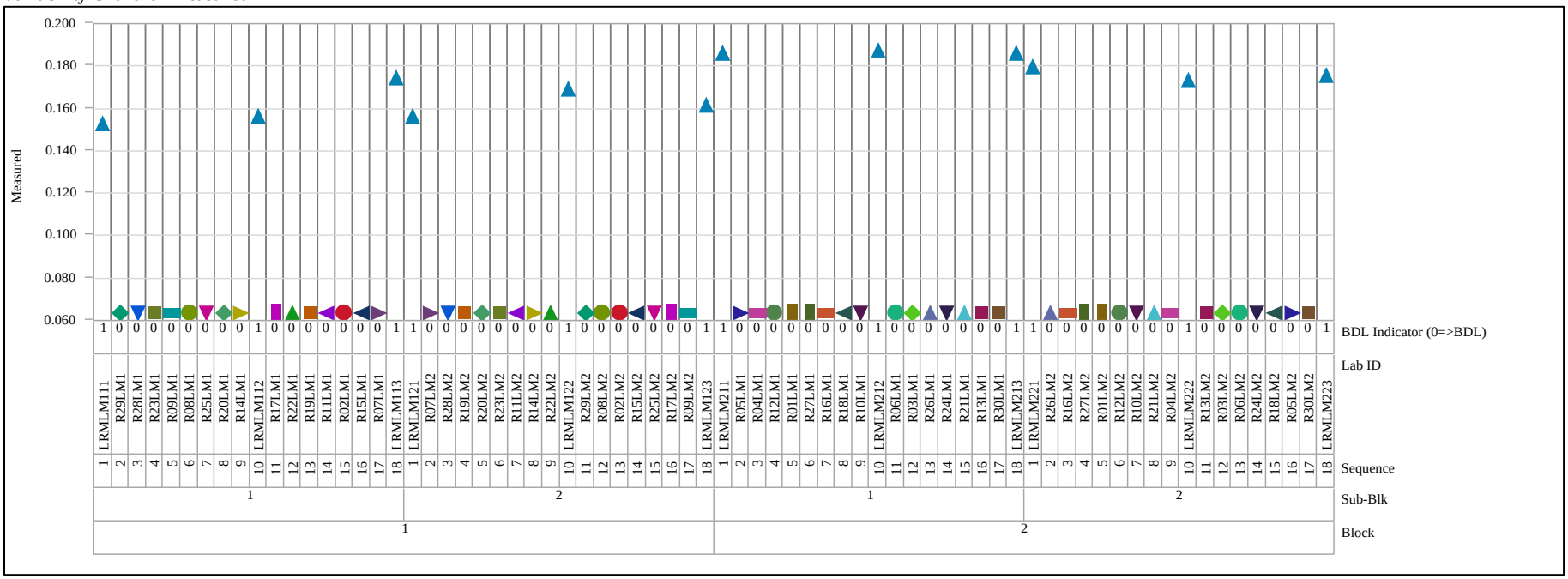


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=P2O5 (wt%), Prep Method=LM
Variability Chart for Measured

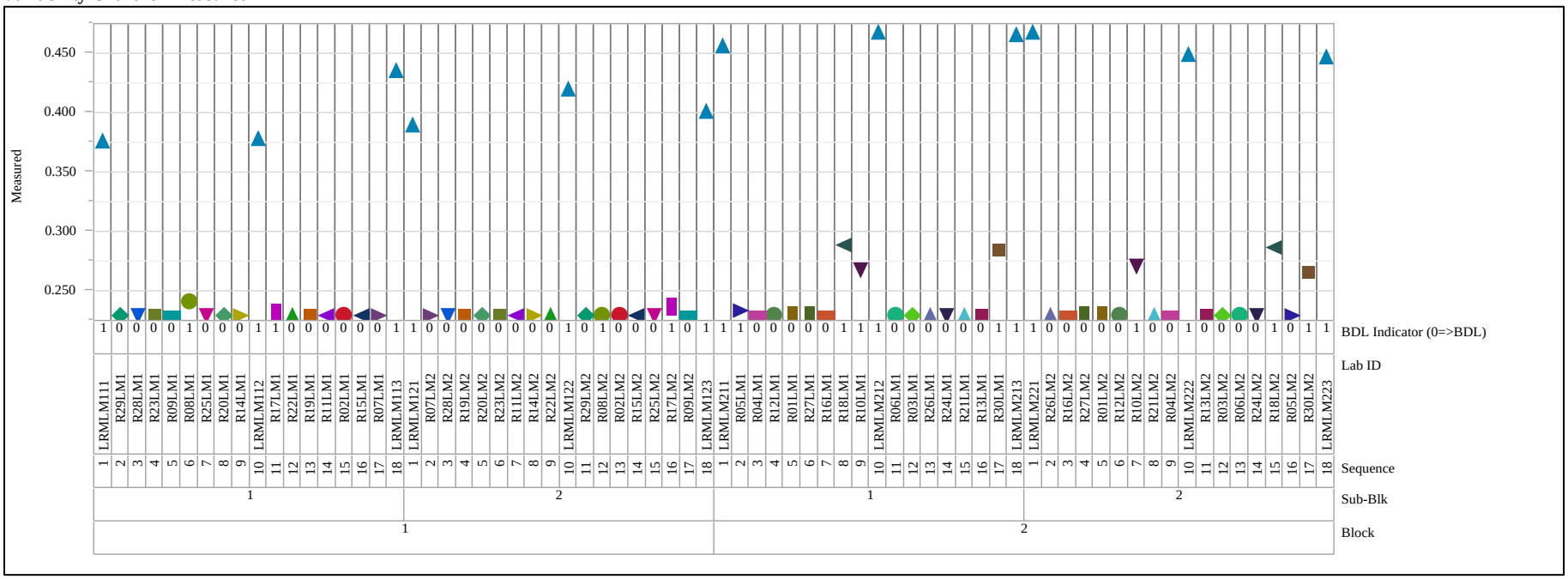


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=PbO (wt%), Prep Method=LM
Variability Chart for Measured

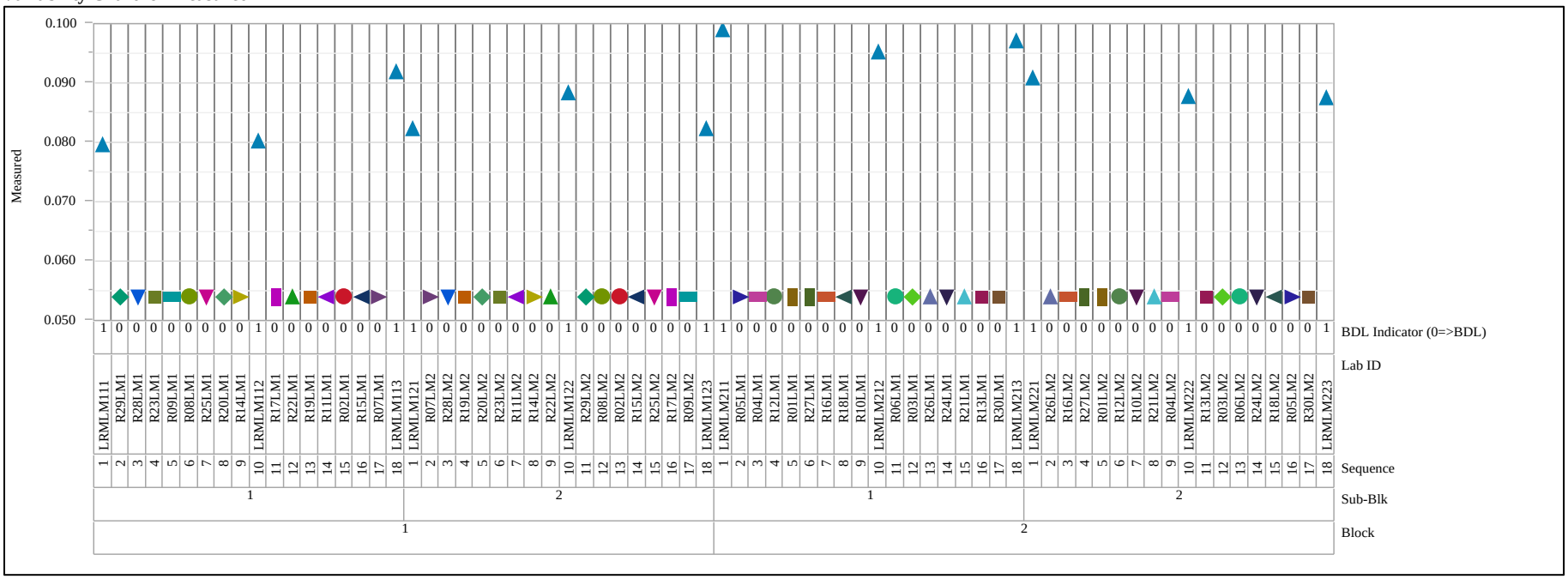


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=SiO2 (wt%), Prep Method=PF
Variability Chart for Measured

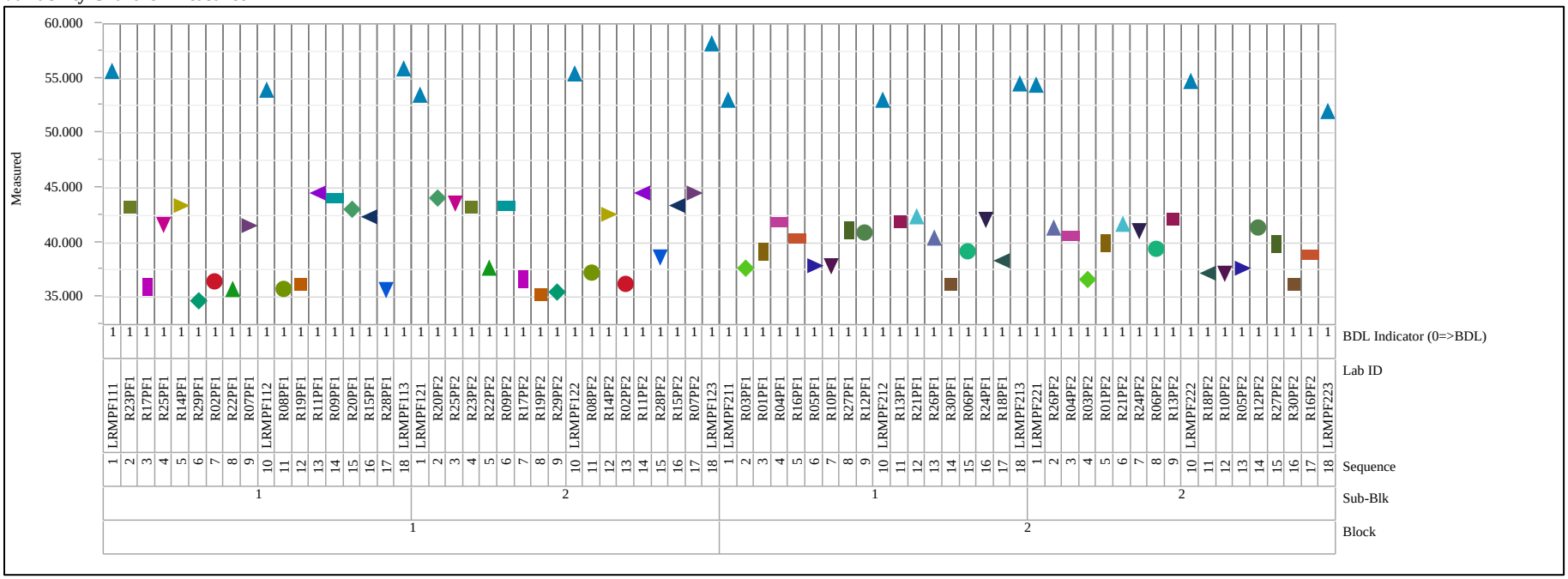


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=SnO2 (wt%), Prep Method=LM
Variability Chart for Measured

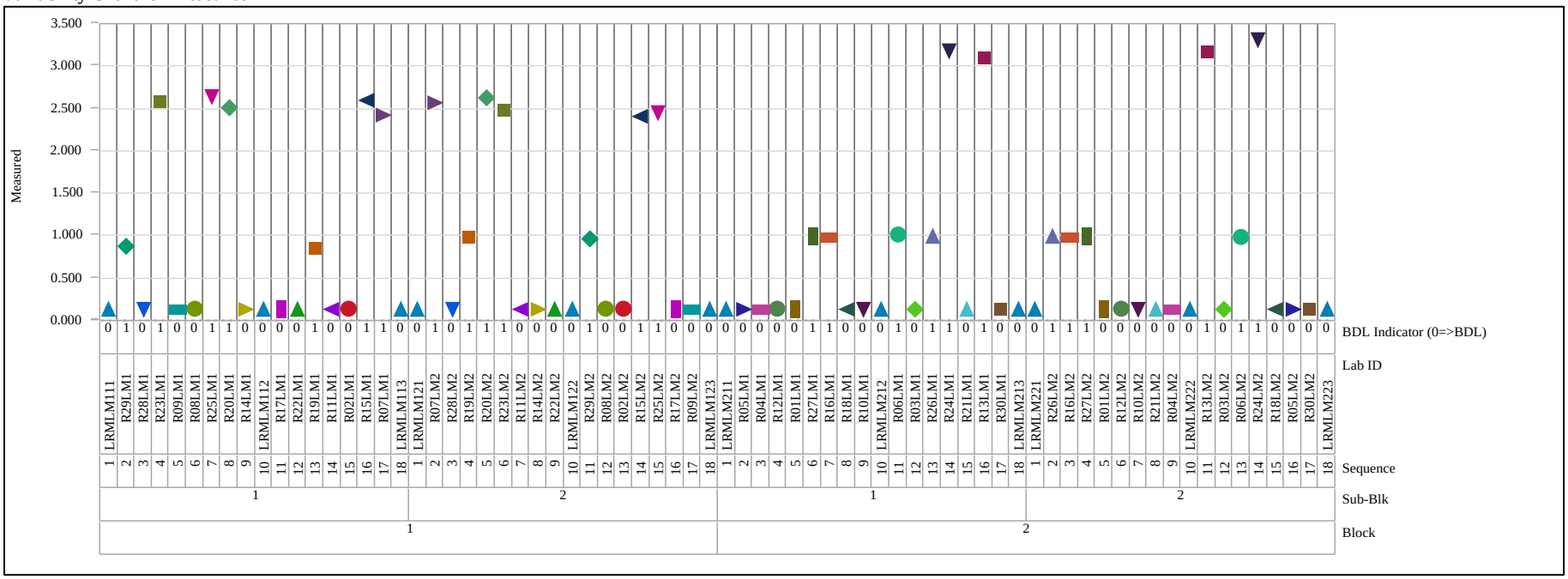


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=SO3 (wt%), Prep Method=LM
Variability Chart for Measured

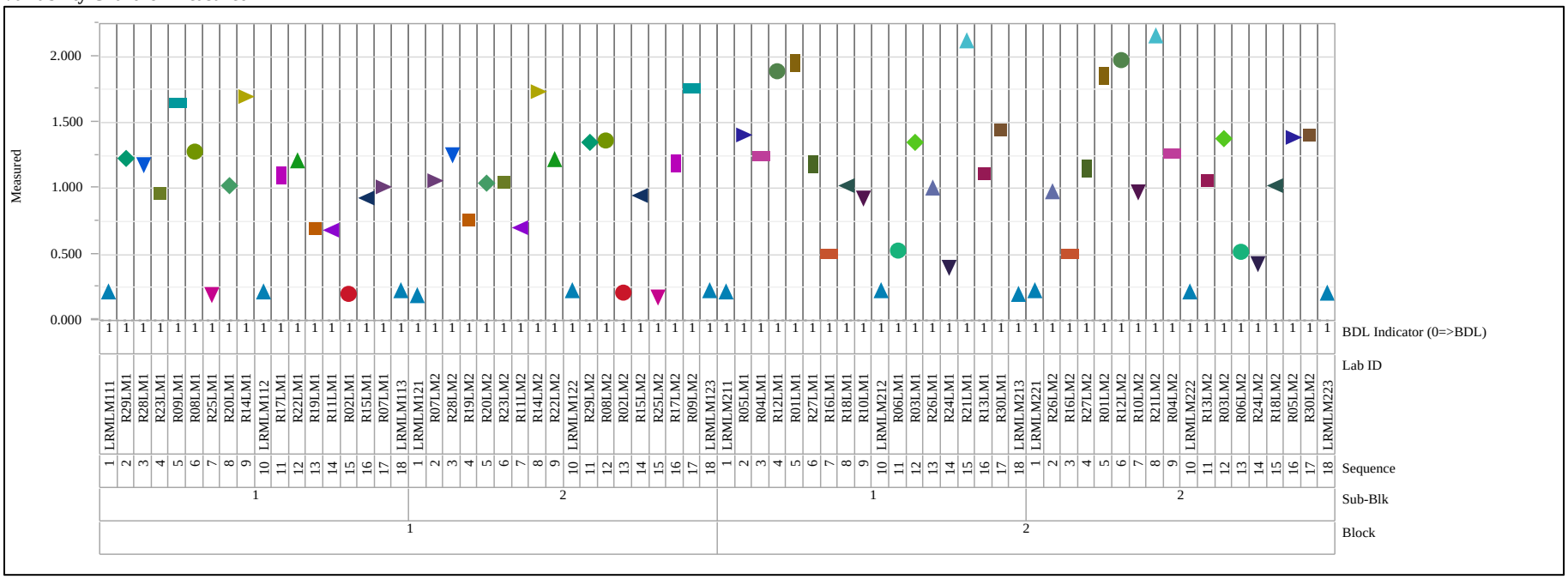


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=V2O5 (wt%), Prep Method=LM
Variability Chart for Measured

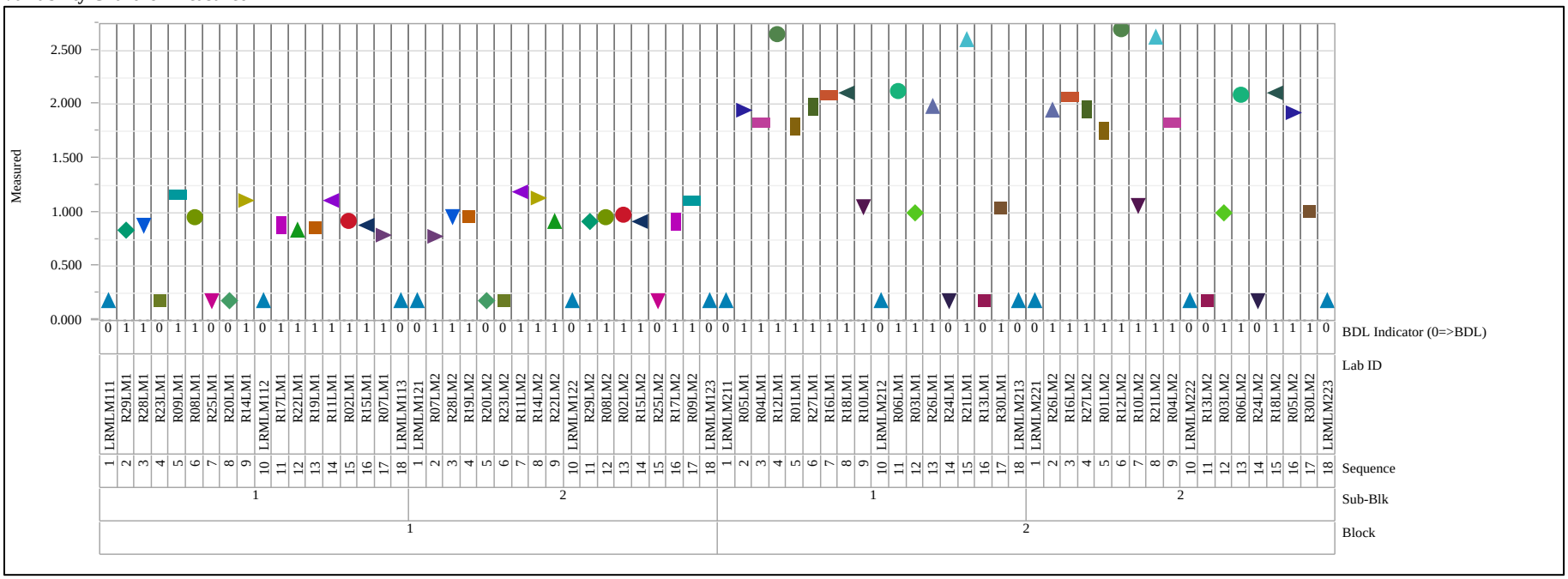


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=ZnO (wt%), Prep Method=LM
Variability Chart for Measured

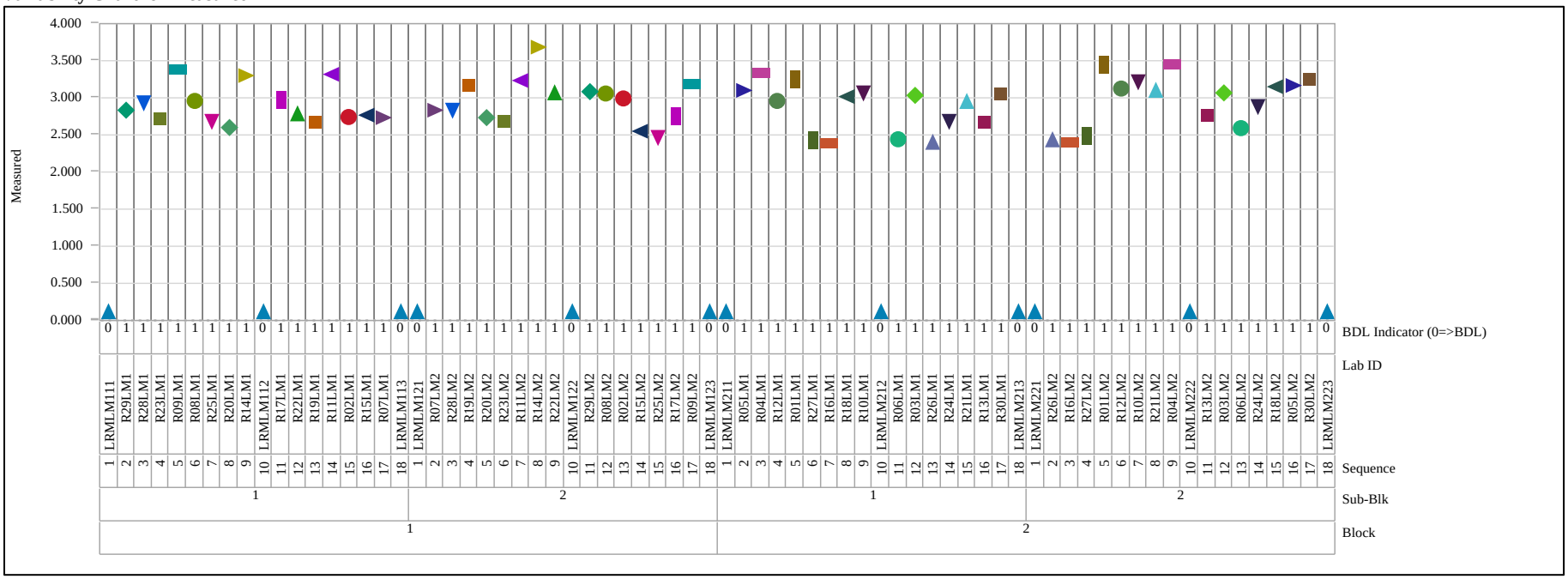


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte (wt%)=ZrO2 (wt%), Prep Method=LM
Variability Chart for Measured

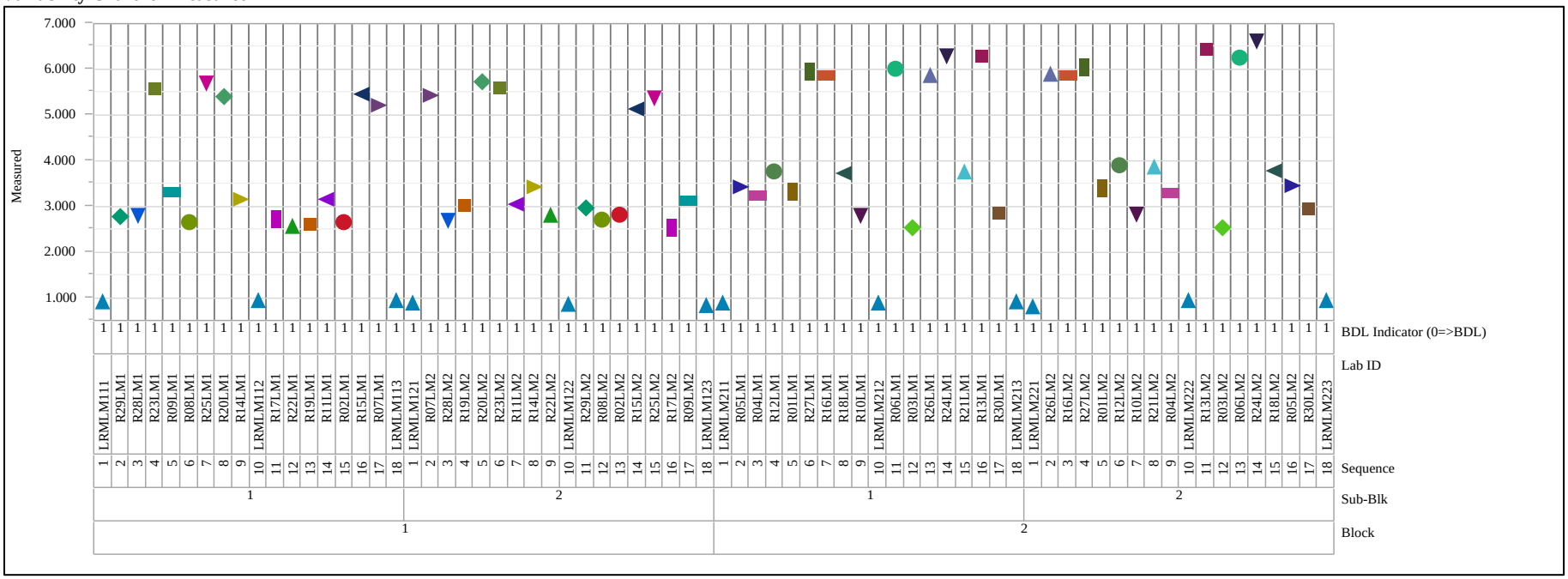


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations

Analyte (wt%)=Al2O3 (wt%), Prep Method=PF
Variability Chart for Measured

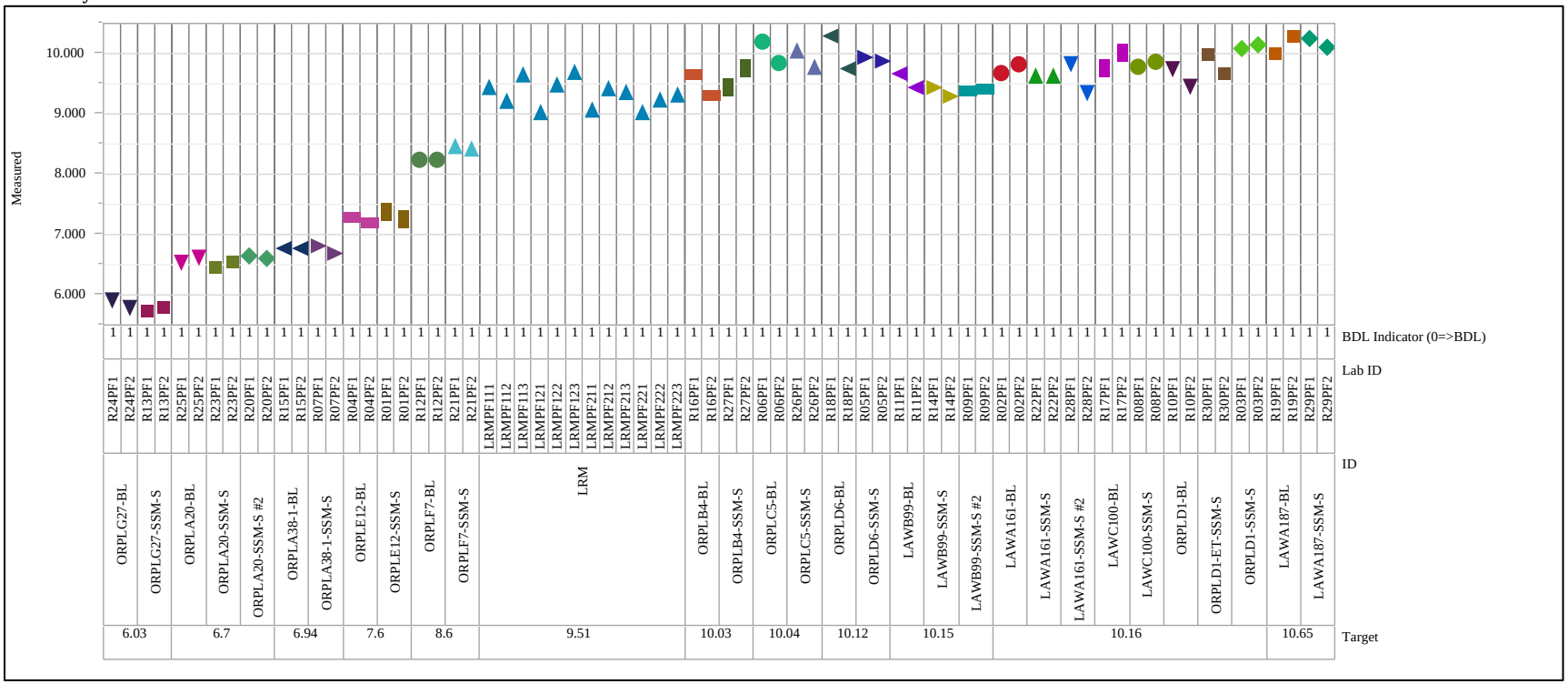


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=B2O3 (wt%), Prep Method=PF
Variability Chart for Measured

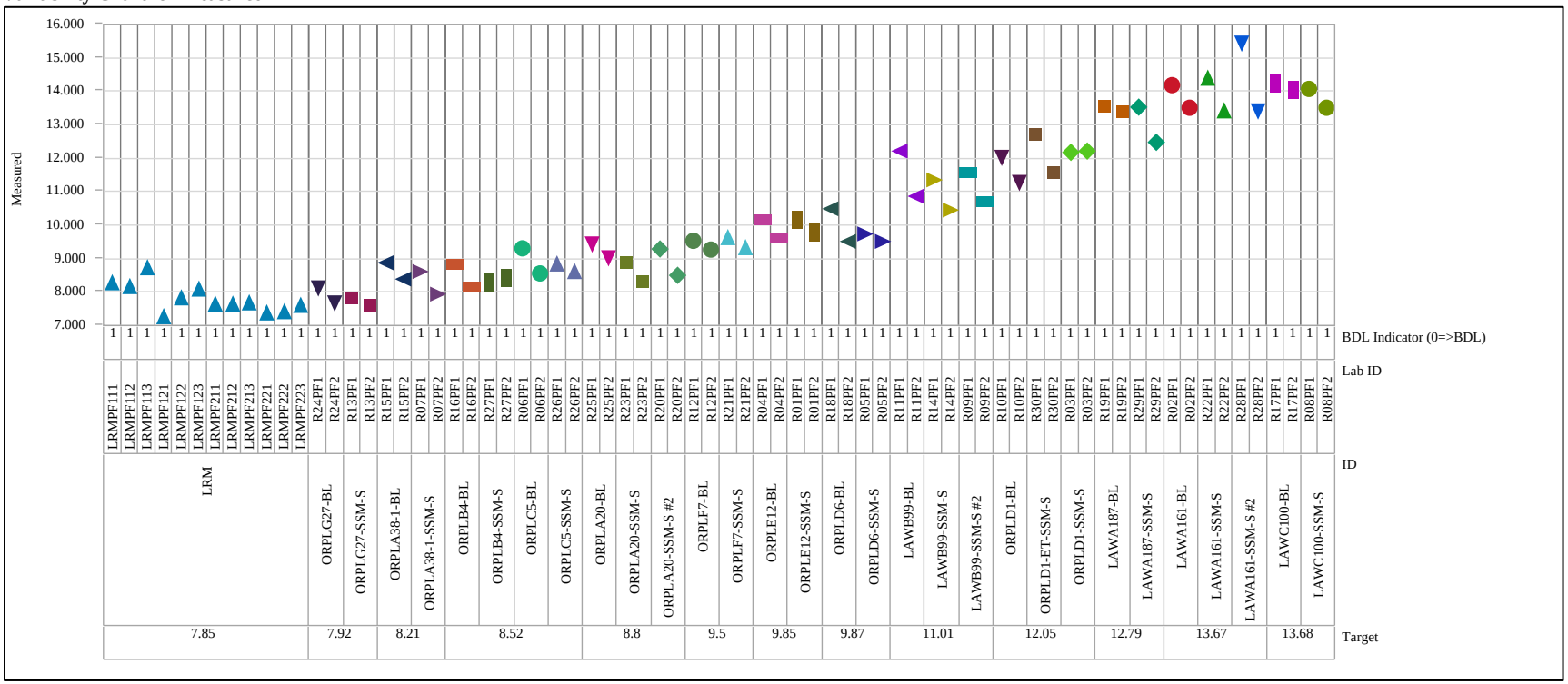


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=CaO (wt%), Prep Method=LM
Variability Chart for Measured

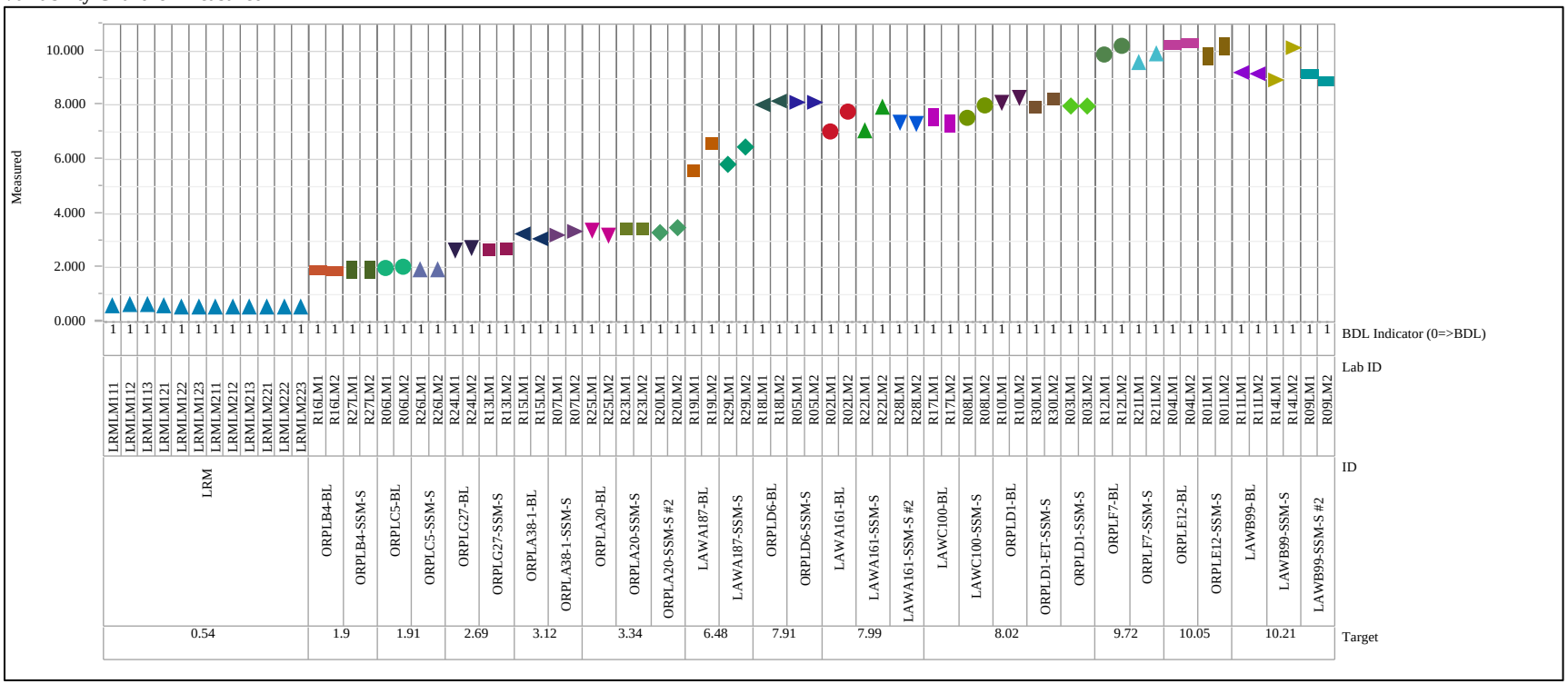


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=Cl (wt%), Prep Method=KH
Variability Chart for Measured

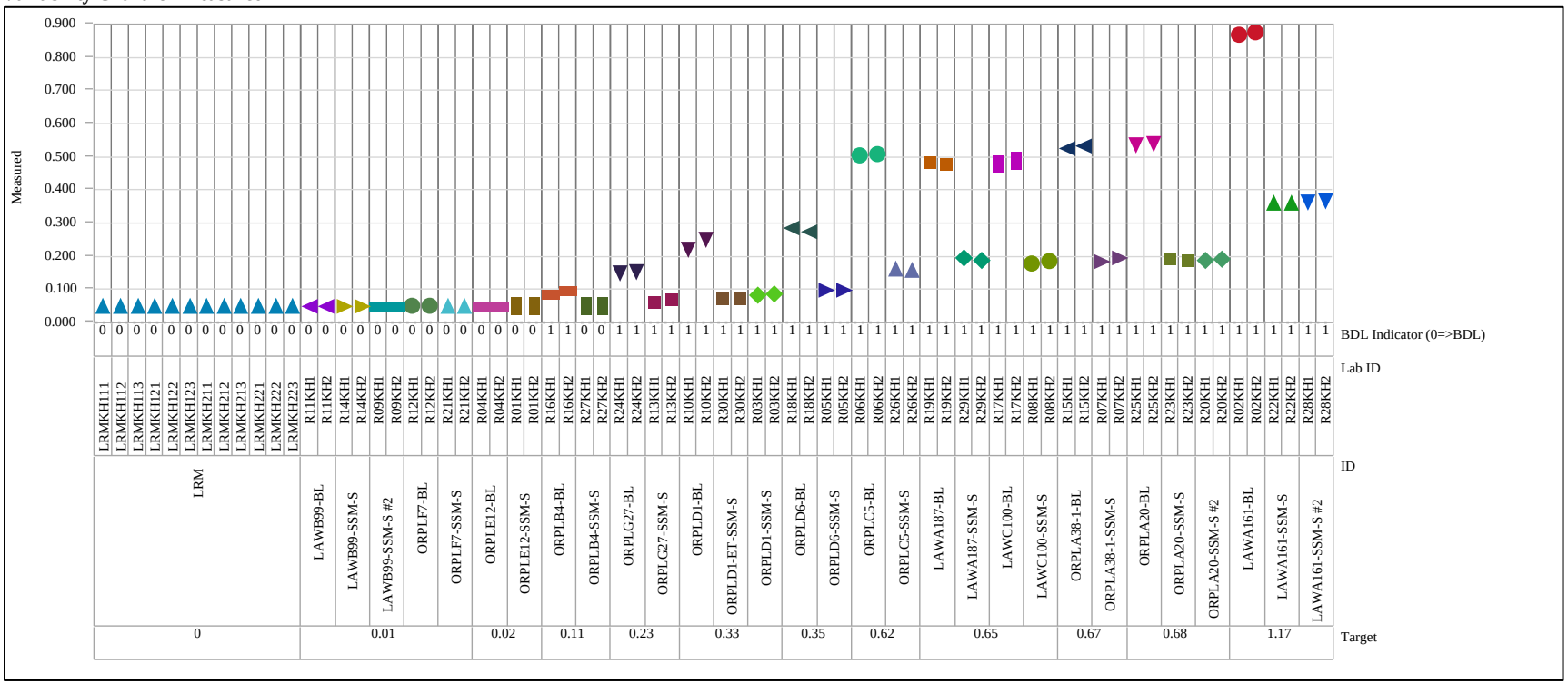


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=Cr2O3 (wt%), Prep Method=LM
Variability Chart for Measured

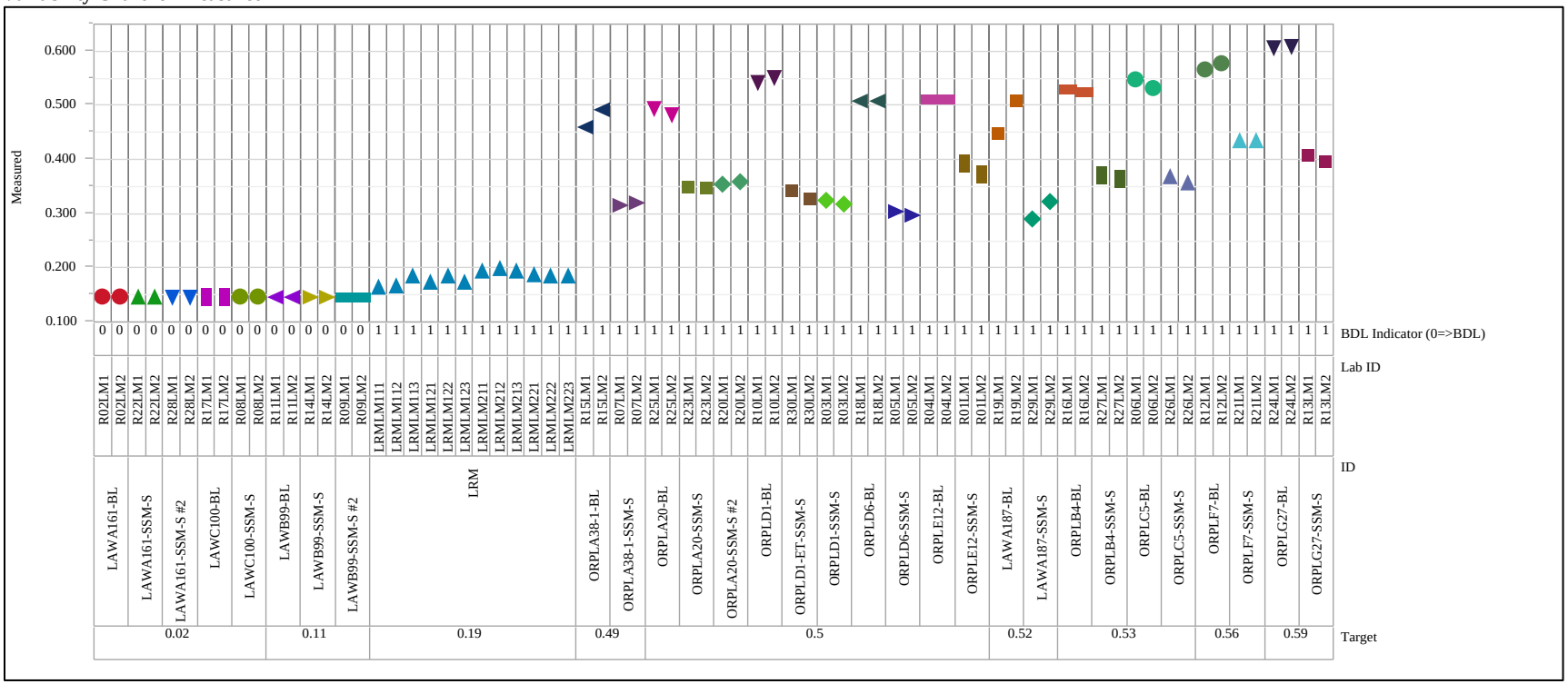


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=F (wt%), Prep Method=KH
Variability Chart for Measured

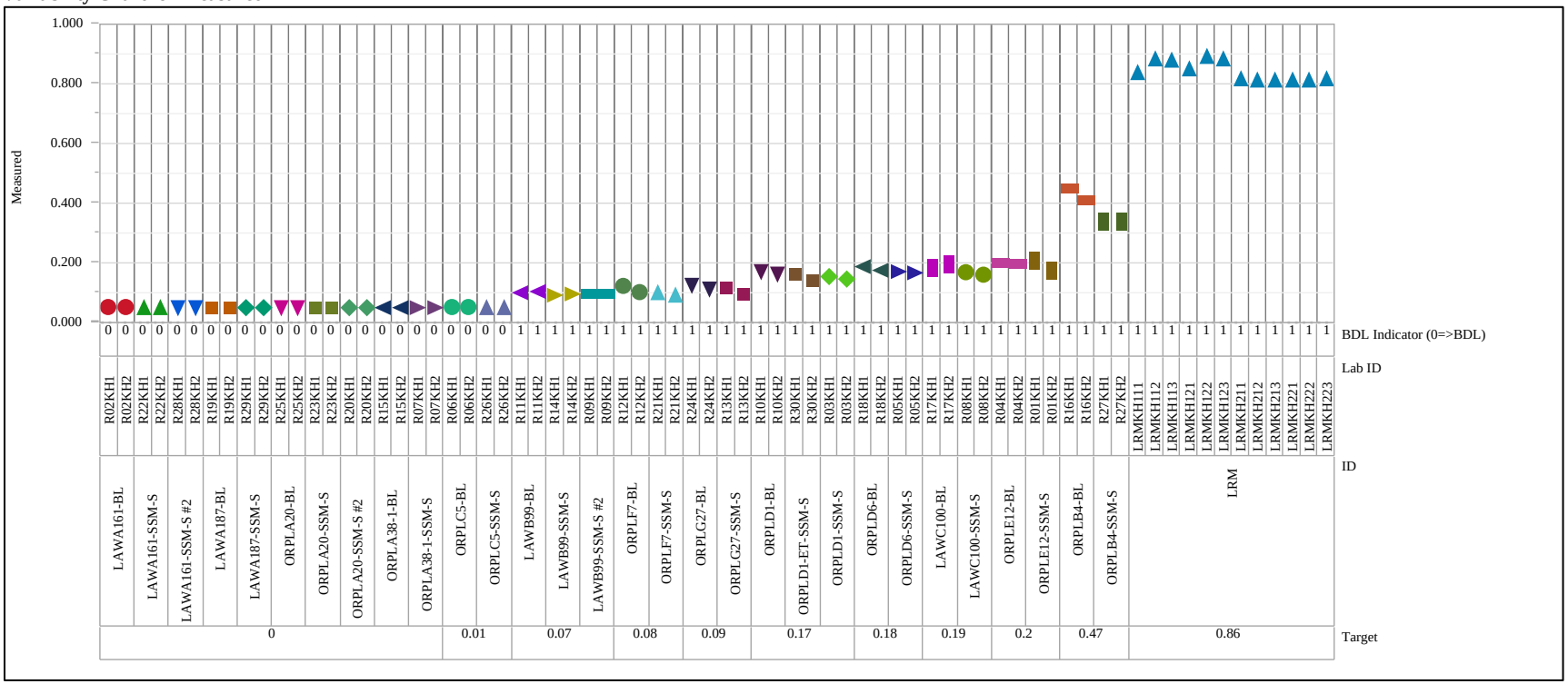


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=Fe2O3 (wt%), Prep Method=LM
Variability Chart for Measured

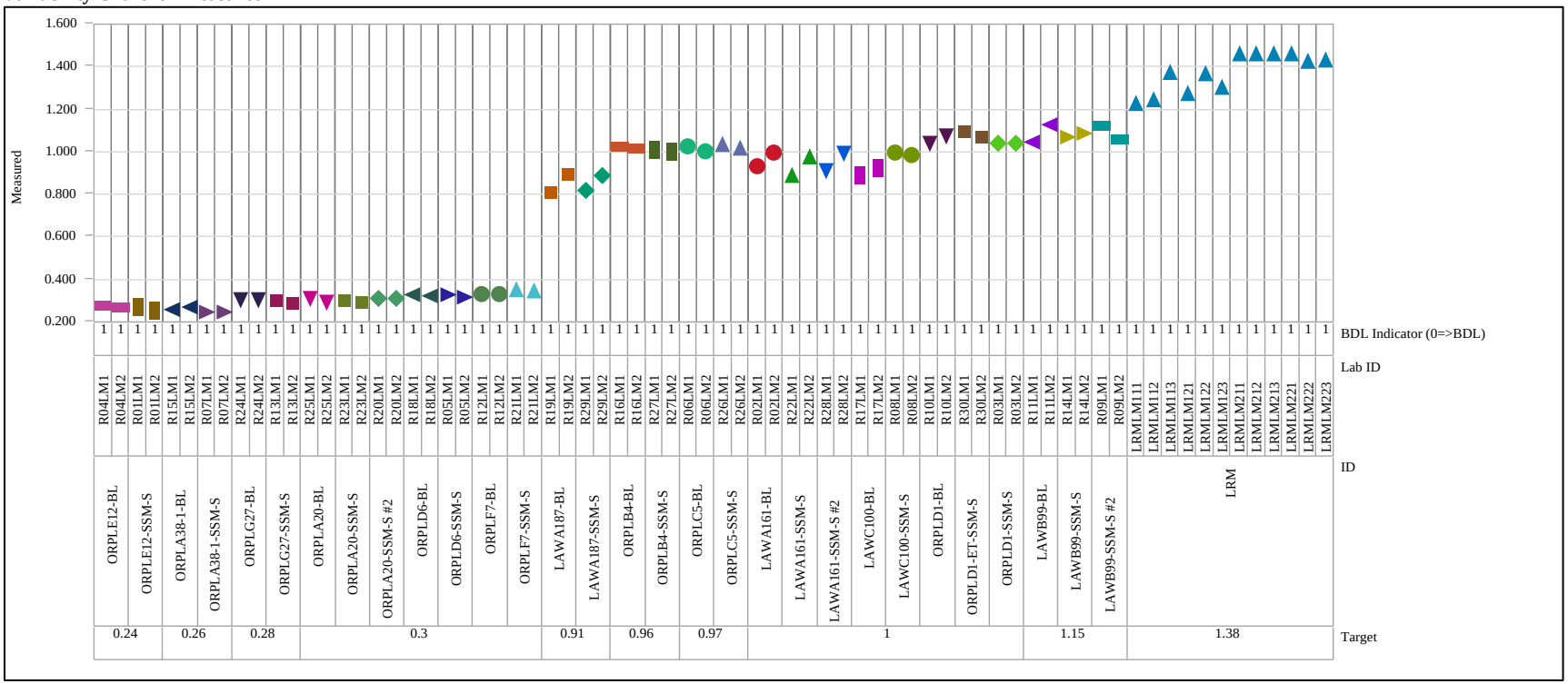


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=K2O (wt%), Prep Method=LM
Variability Chart for Measured

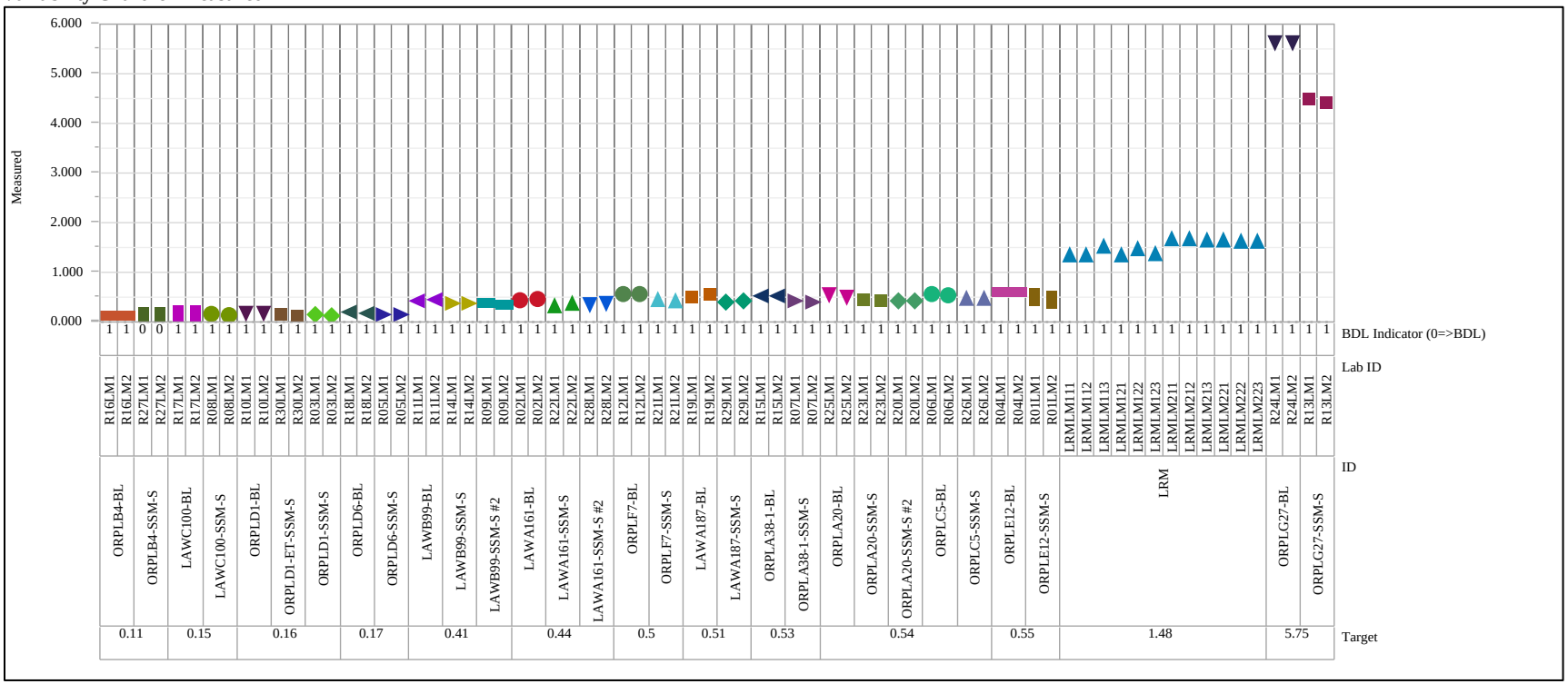


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=Li2O (wt%), Prep Method=PF
Variability Chart for Measured

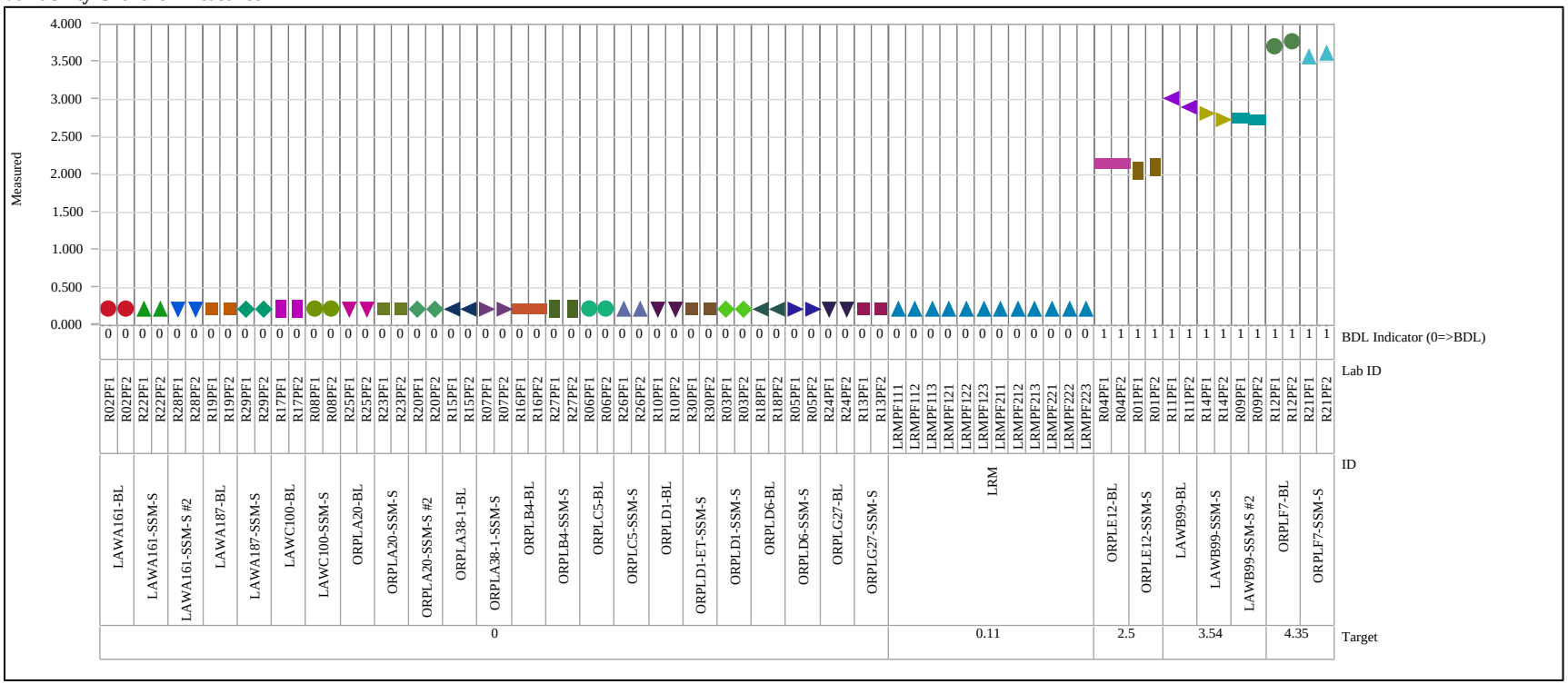


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=MgO (wt%), Prep Method=LM
Variability Chart for Measured

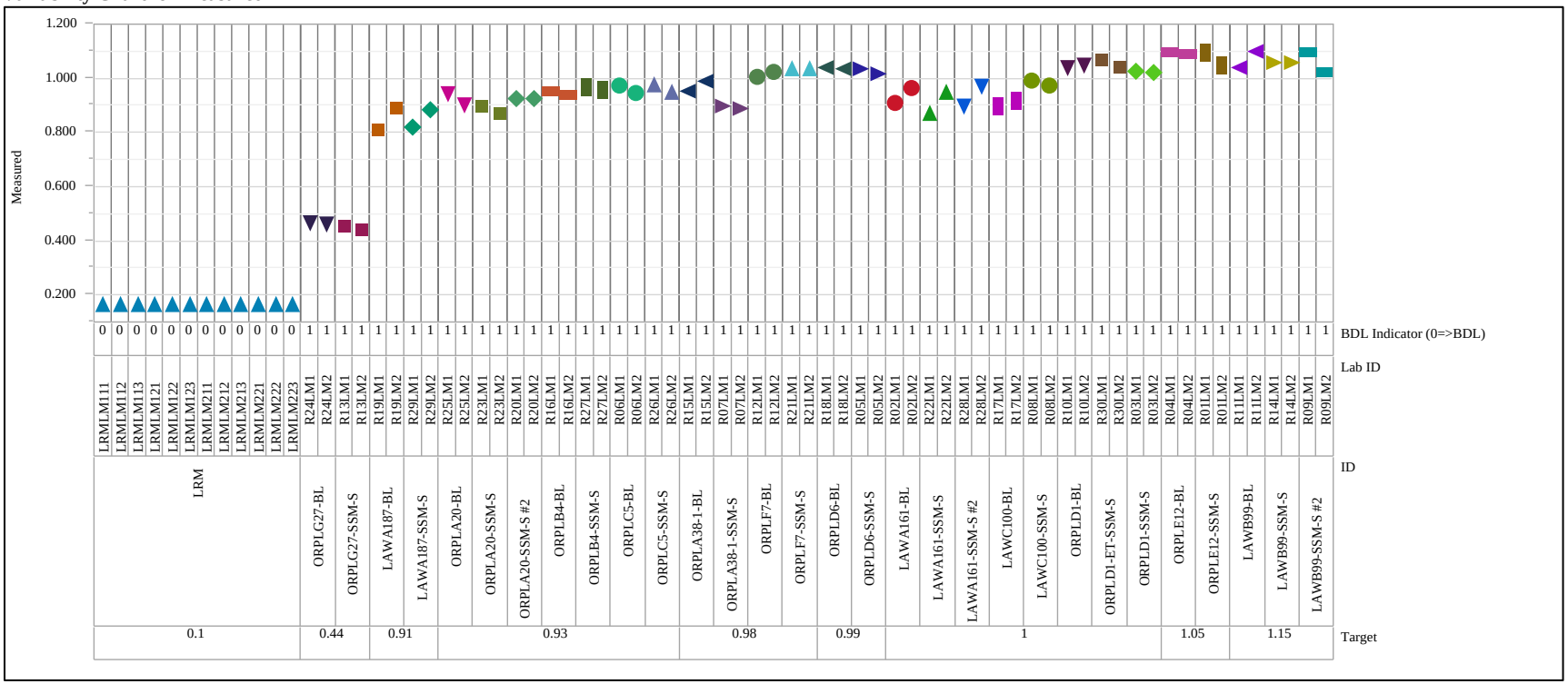


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=MnO (wt%), Prep Method=LM
Variability Chart for Measured

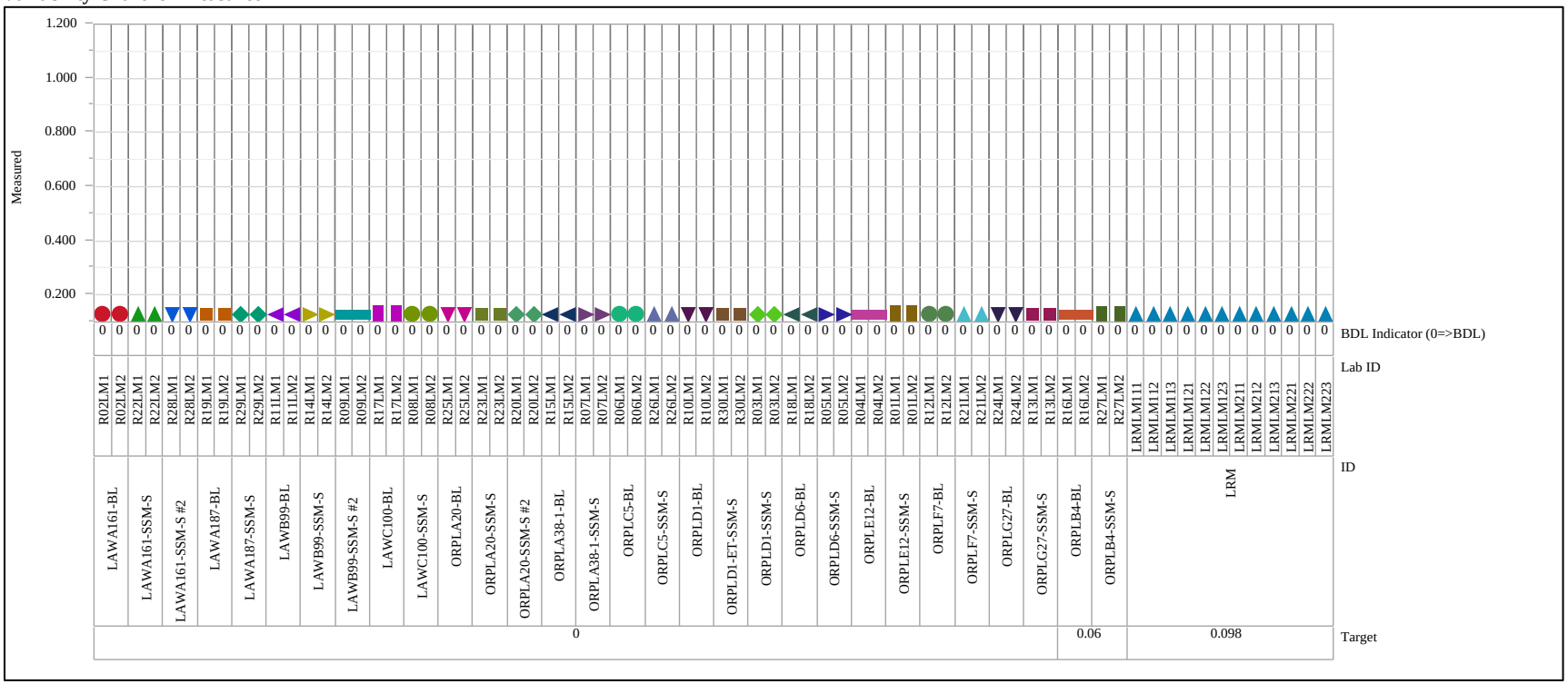


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=Na2O (wt%), Prep Method=LM
Variability Chart for Measured

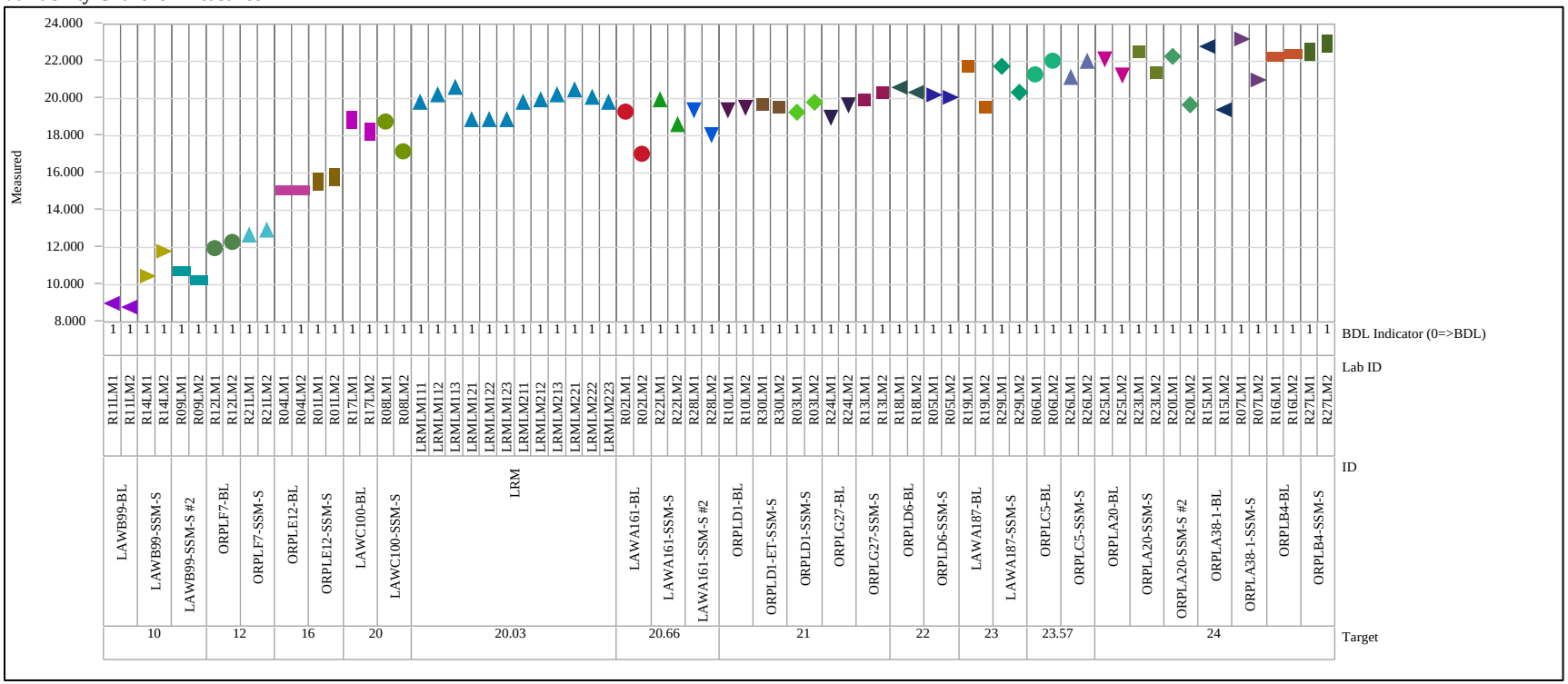


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=NiO (wt%), Prep Method=LM
Variability Chart for Measured

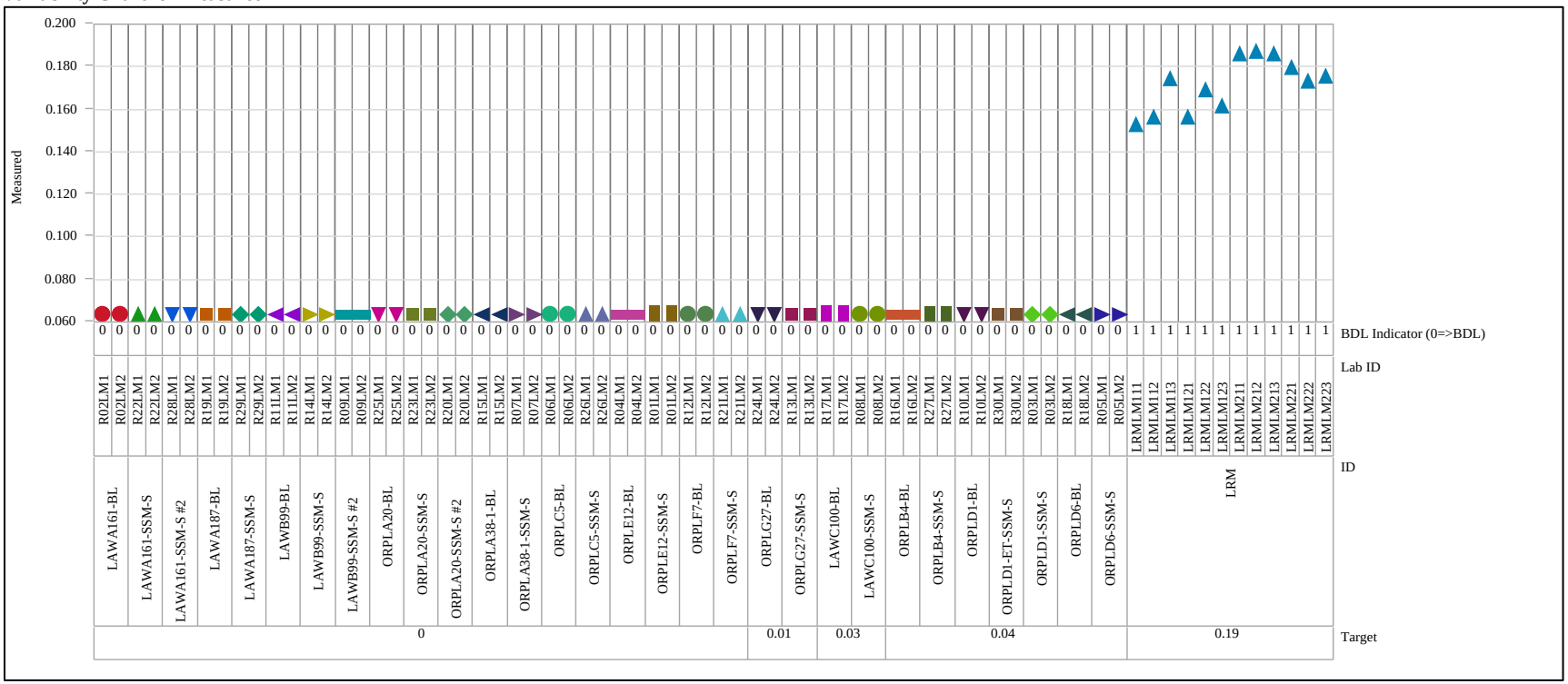


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=P2O5 (wt%), Prep Method=LM
Variability Chart for Measured

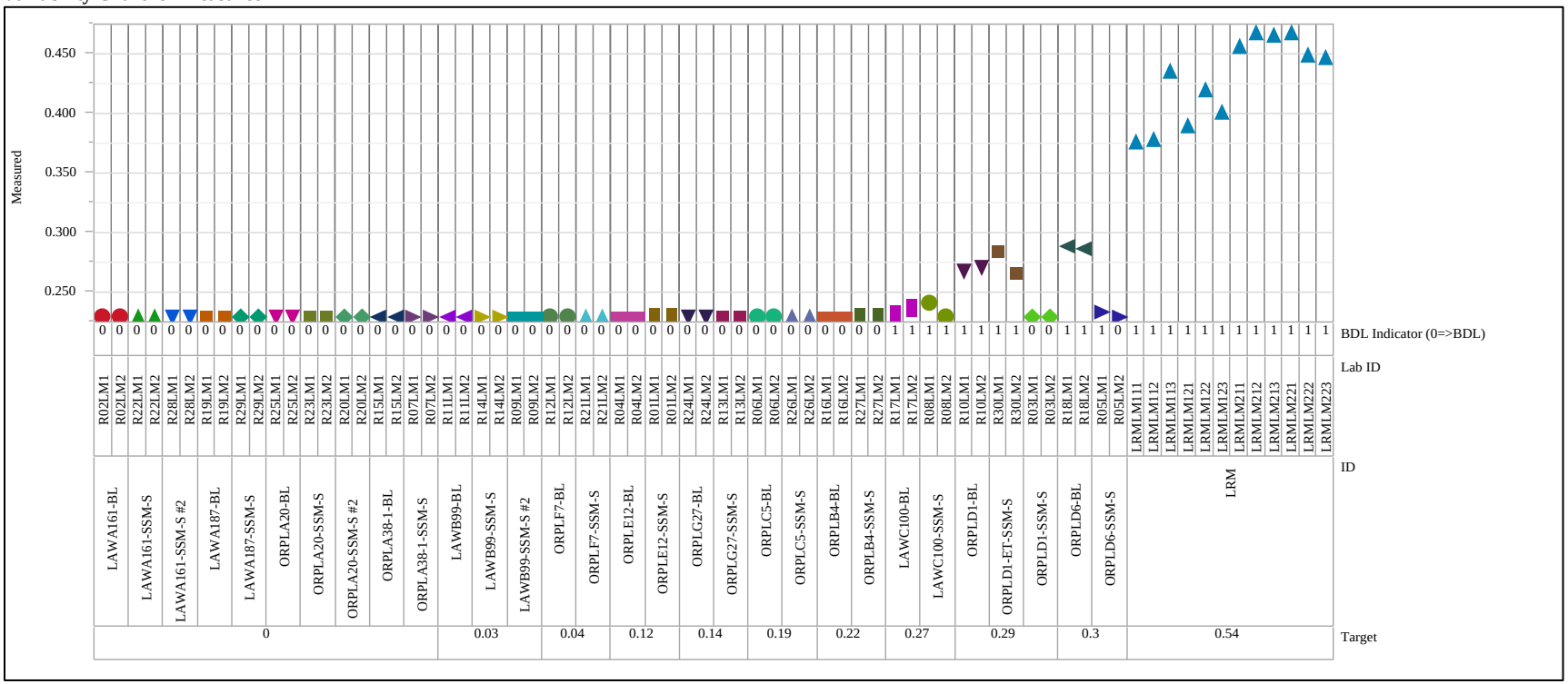


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=PbO (wt%), Prep Method=LM
Variability Chart for Measured

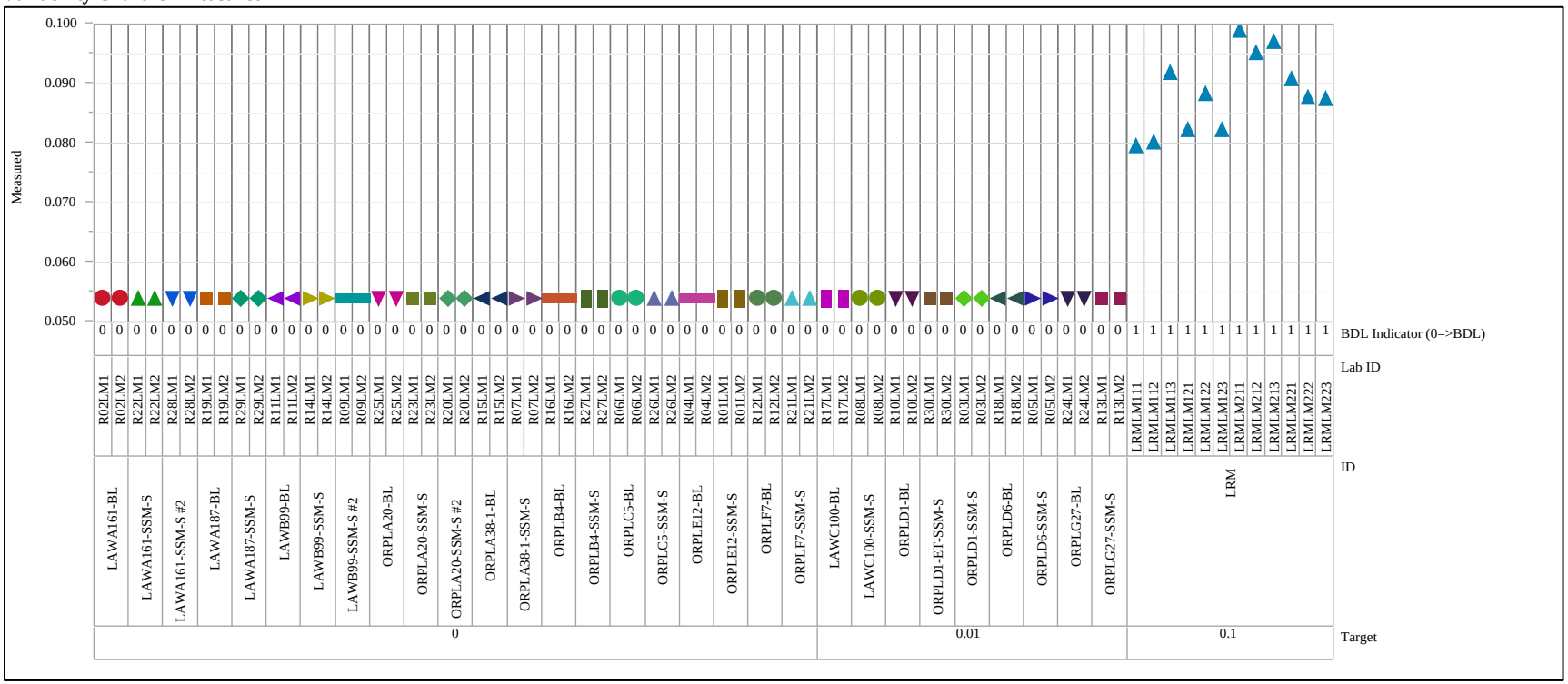


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=SiO2 (wt%), Prep Method=PF
Variability Chart for Measured

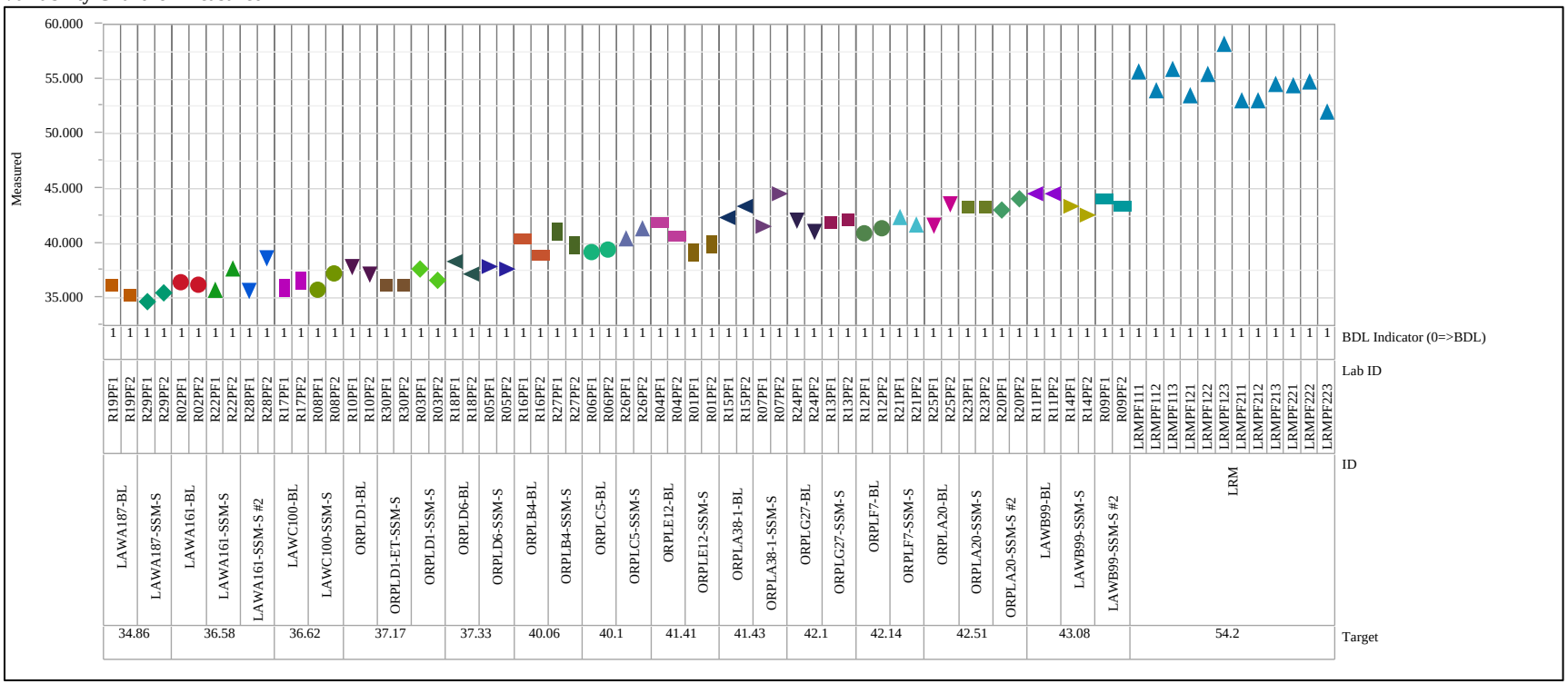


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=SnO2 (wt%), Prep Method=LM
Variability Chart for Measured

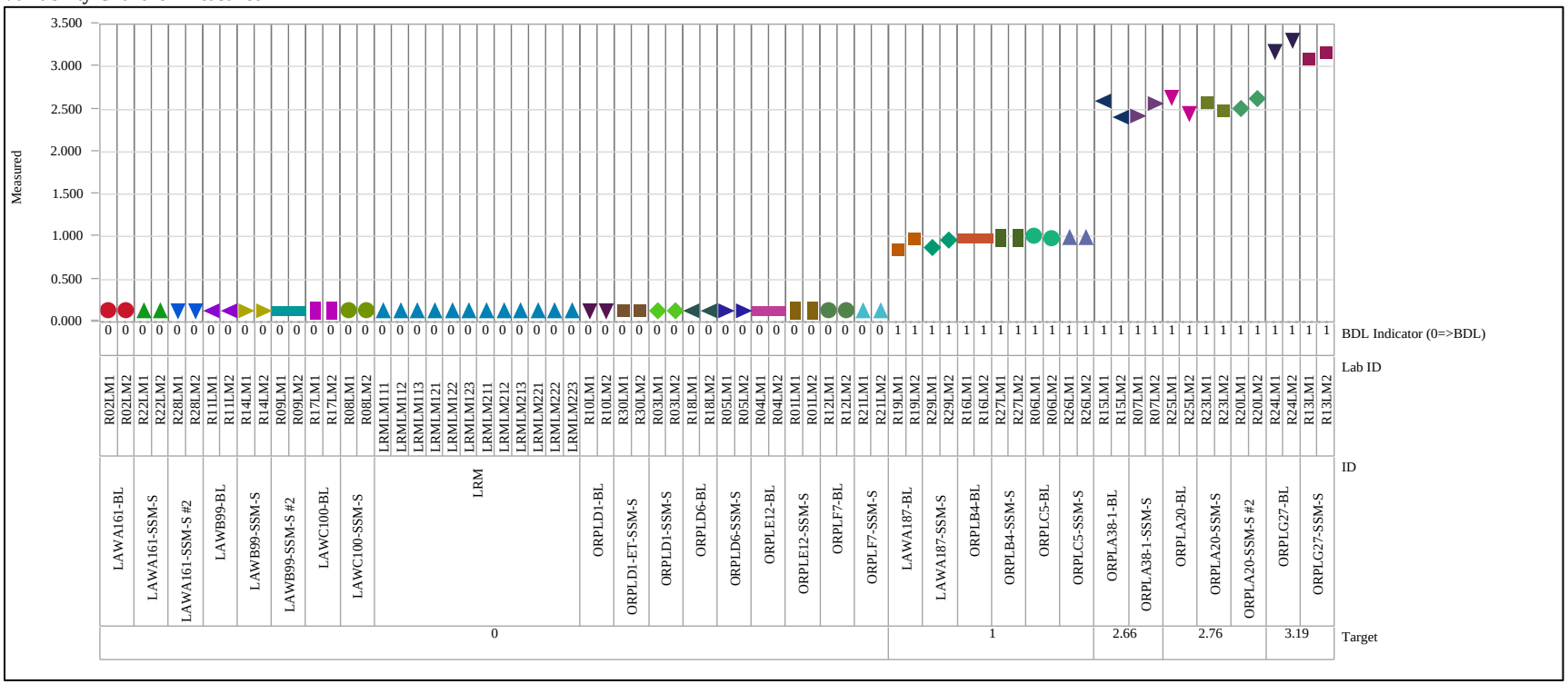


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=SO3 (wt%), Prep Method=LM
Variability Chart for Measured

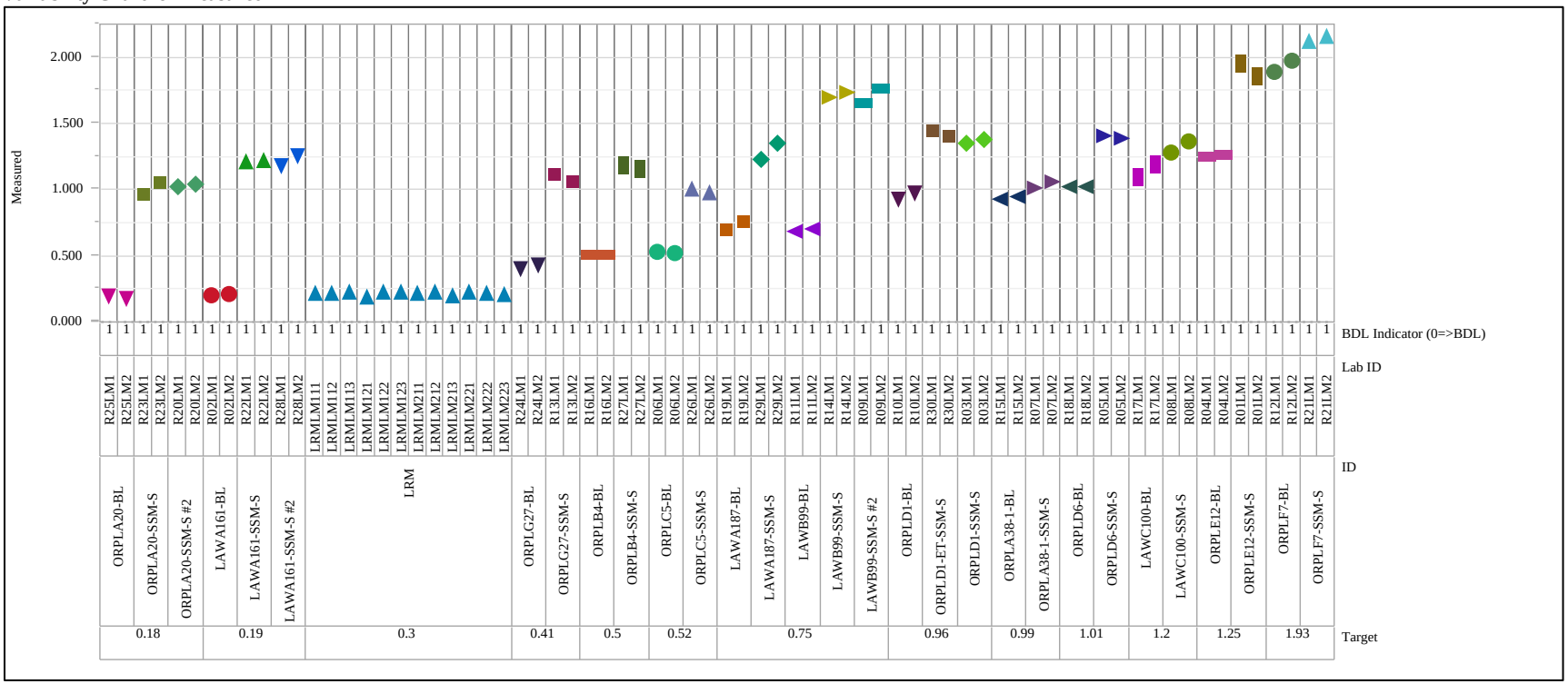


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=V2O5 (wt%), Prep Method=LM
Variability Chart for Measured

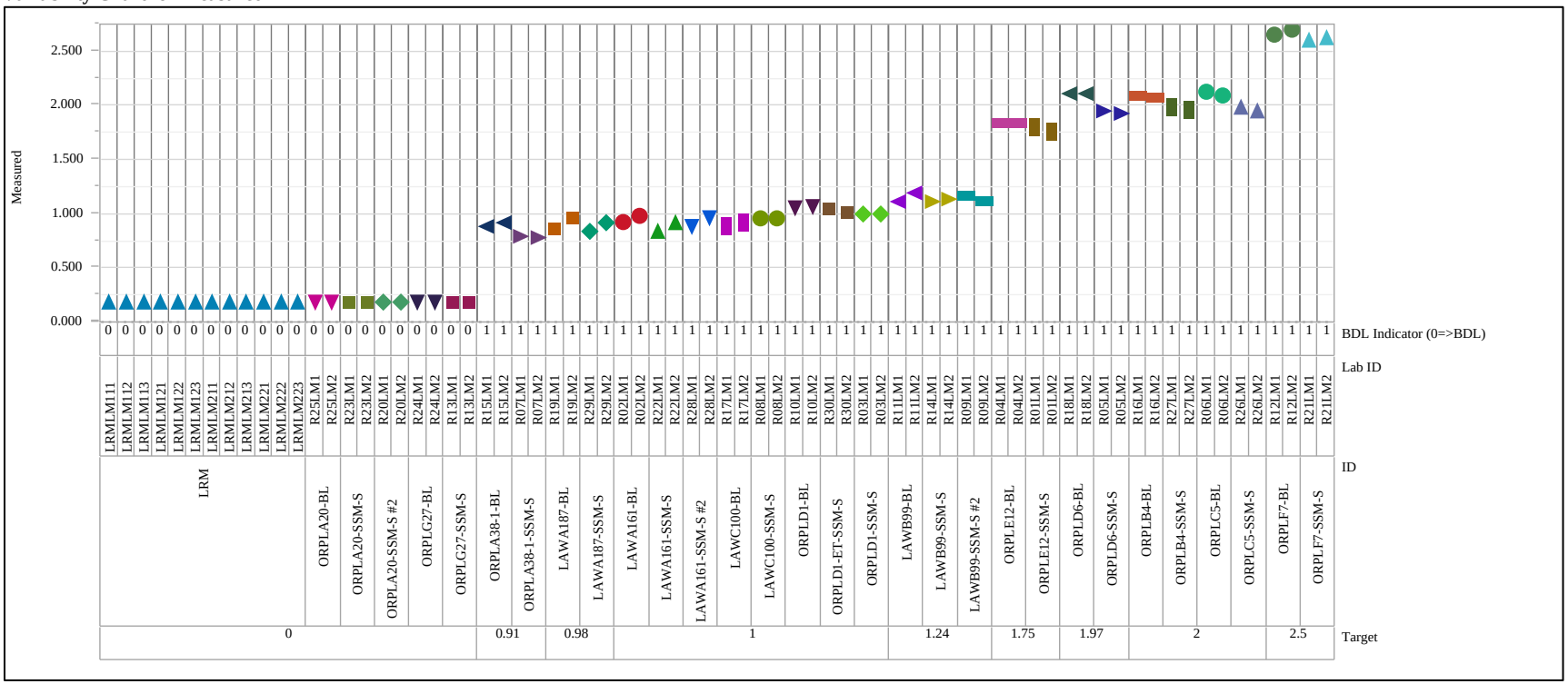


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=ZnO (wt%), Prep Method=LM
Variability Chart for Measured

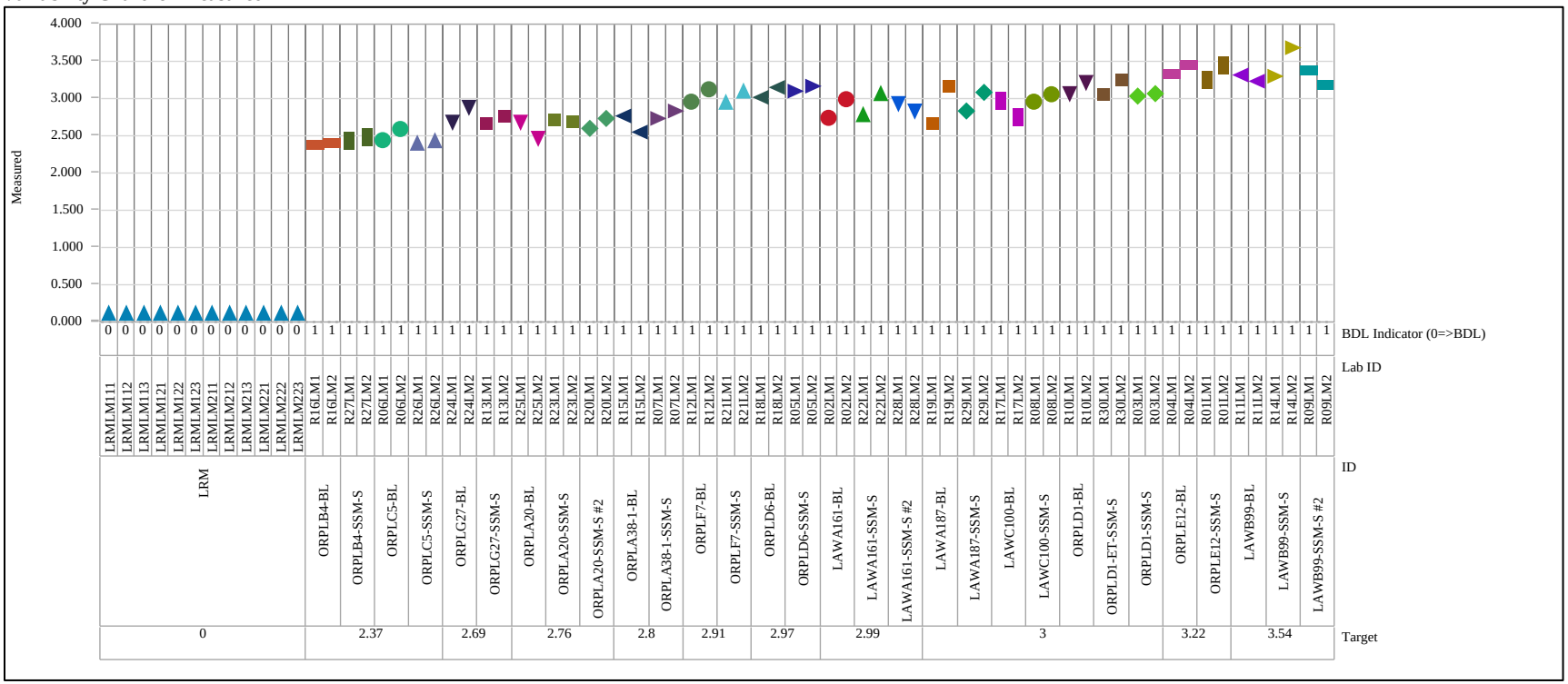


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte (wt%)=ZrO2 (wt%), Prep Method=LM
Variability Chart for Measured

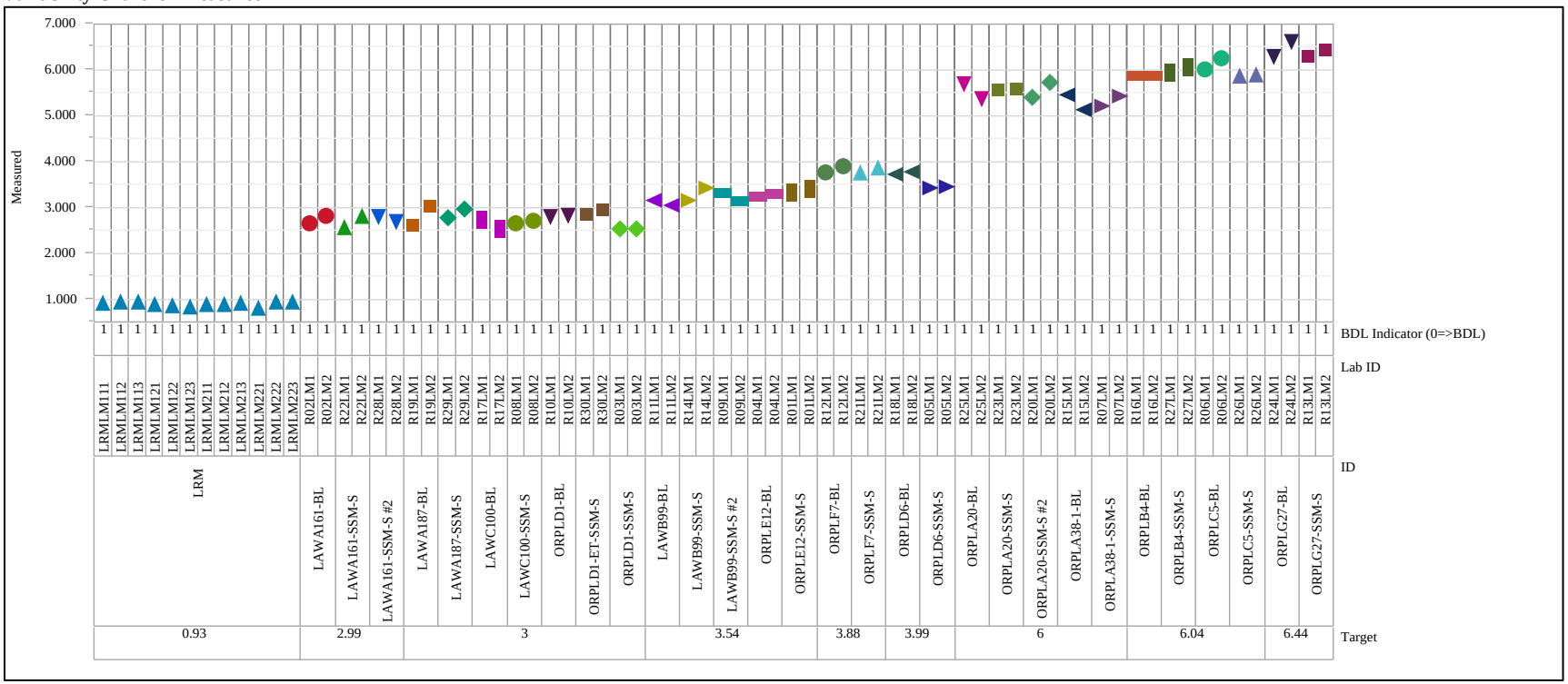
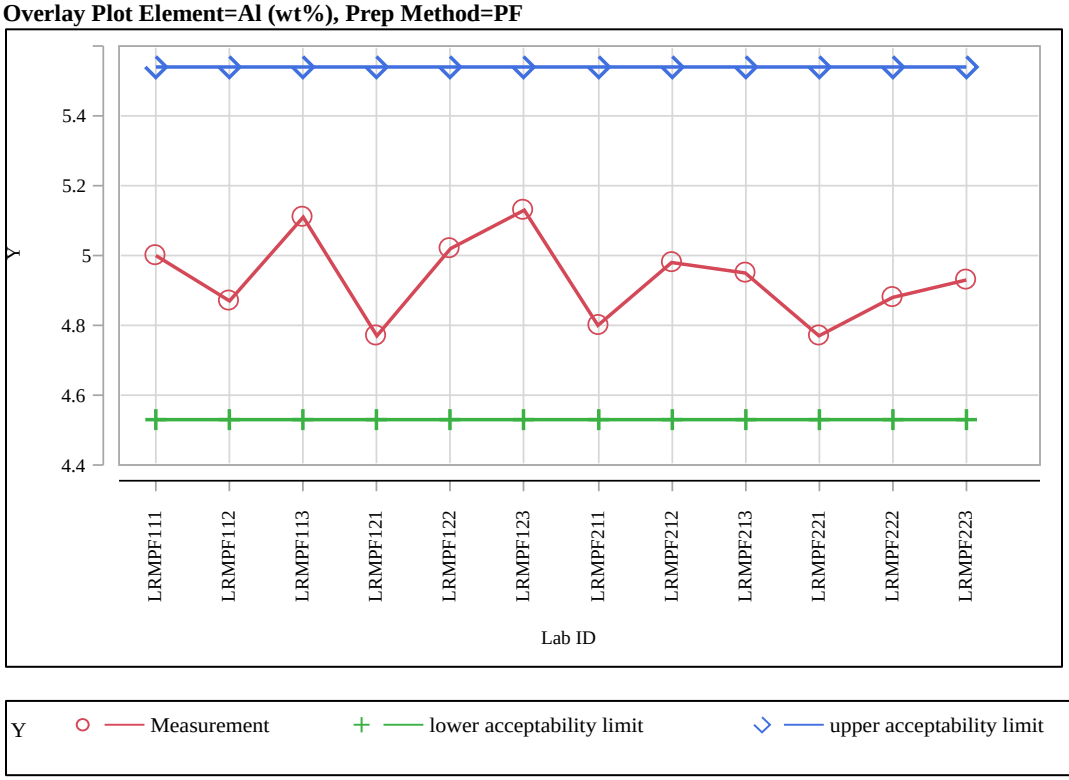
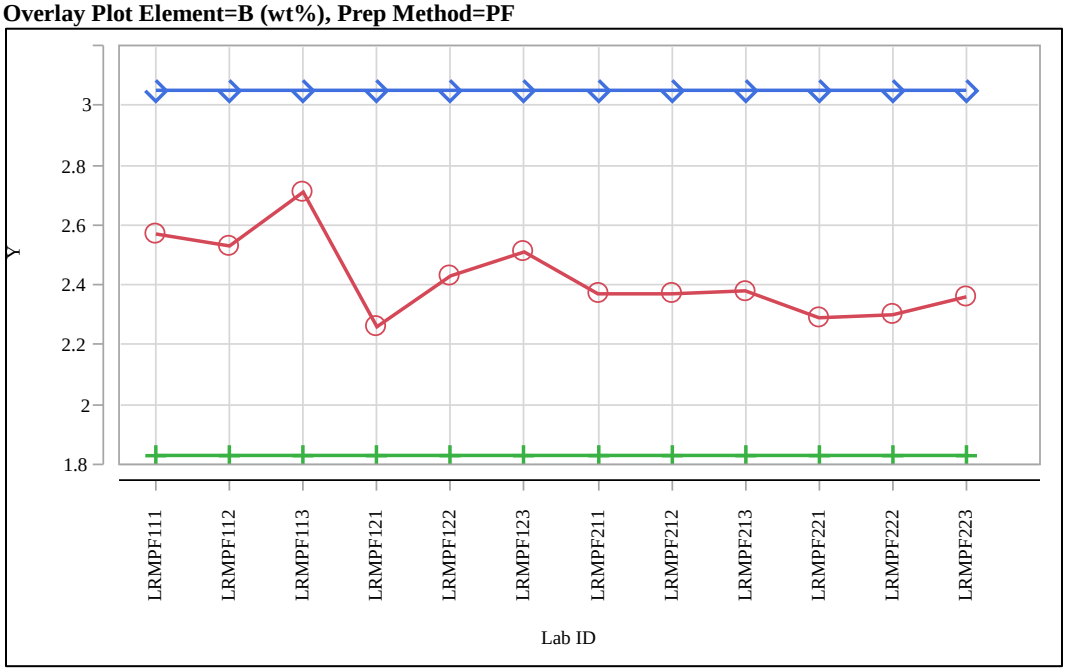


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Glass

Overlay Plot Element=Al (wt%), Prep Method=PF



Overlay Plot Element=B (wt%), Prep Method=PF



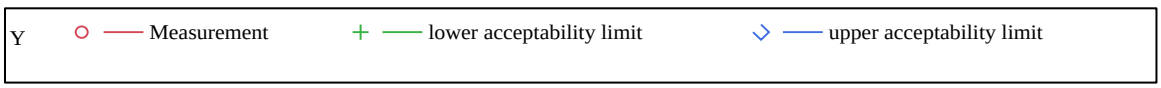
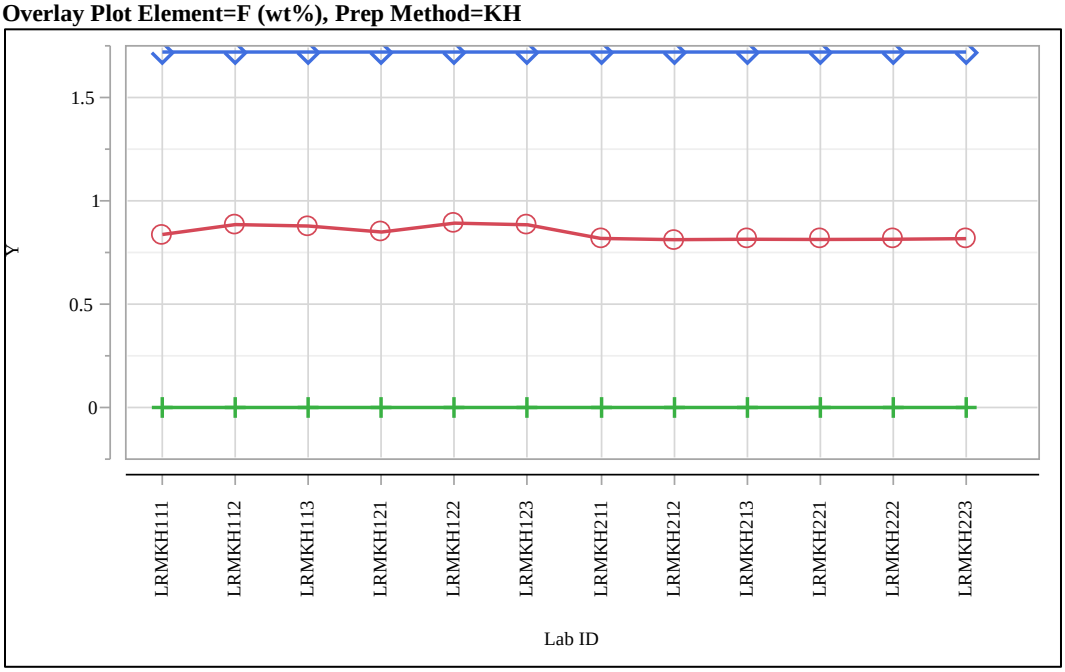
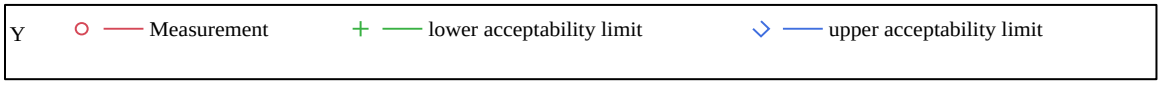


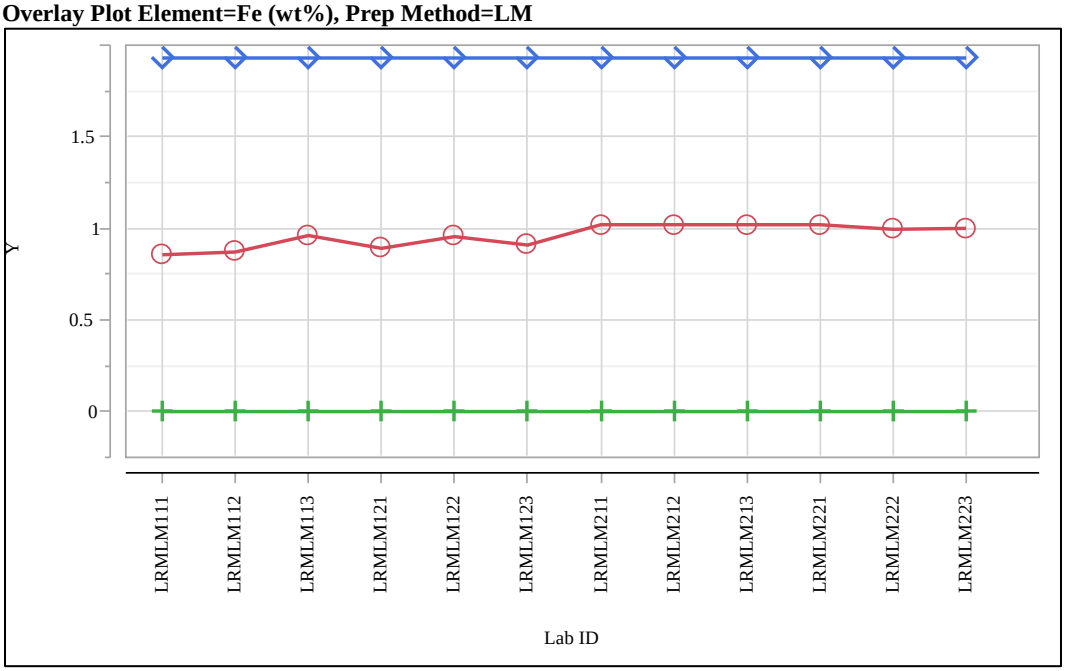
Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=F (wt%), Prep Method=KH





Overlay Plot Element=Fe (wt%), Prep Method=LM



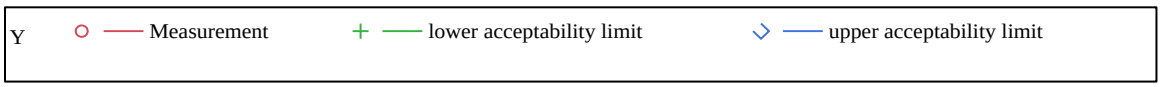
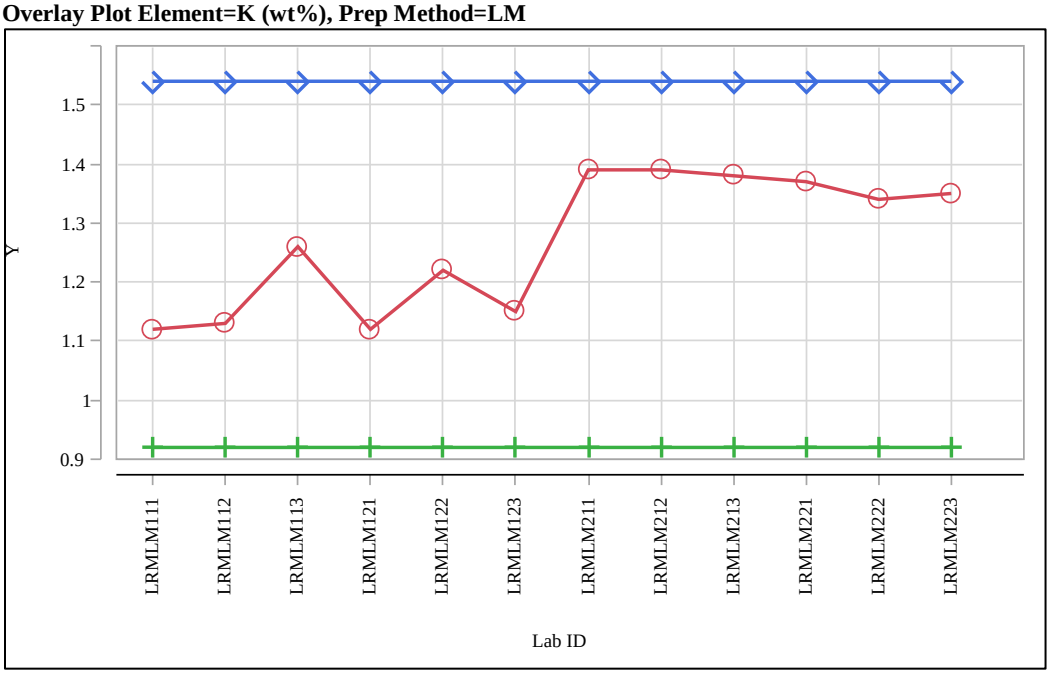
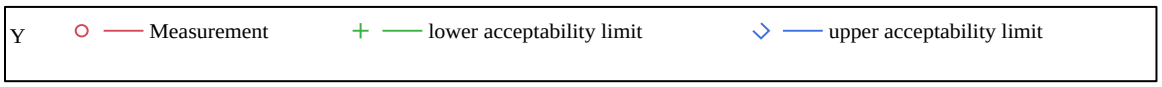


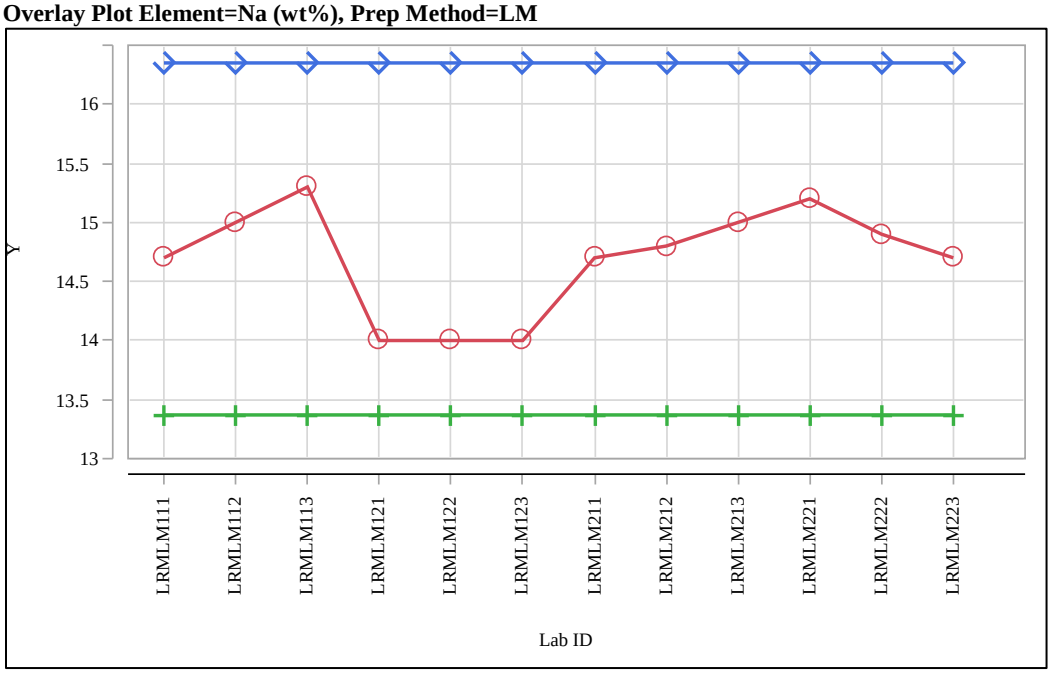
Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=K (wt%), Prep Method=LM





Overlay Plot Element=Na (wt%), Prep Method=LM



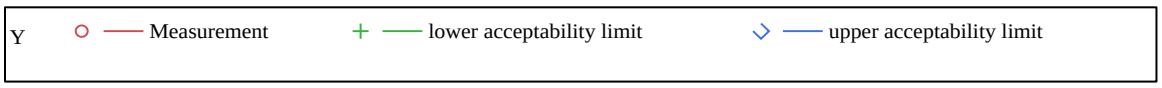
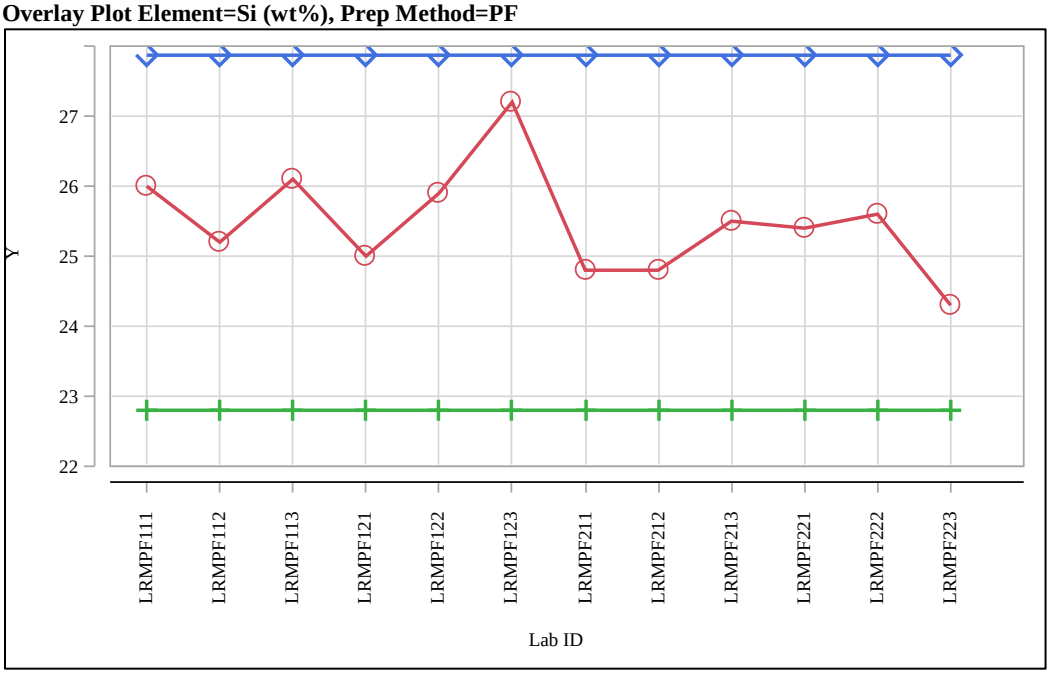
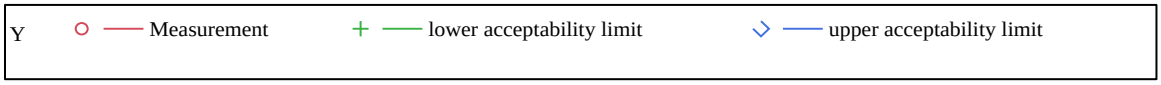


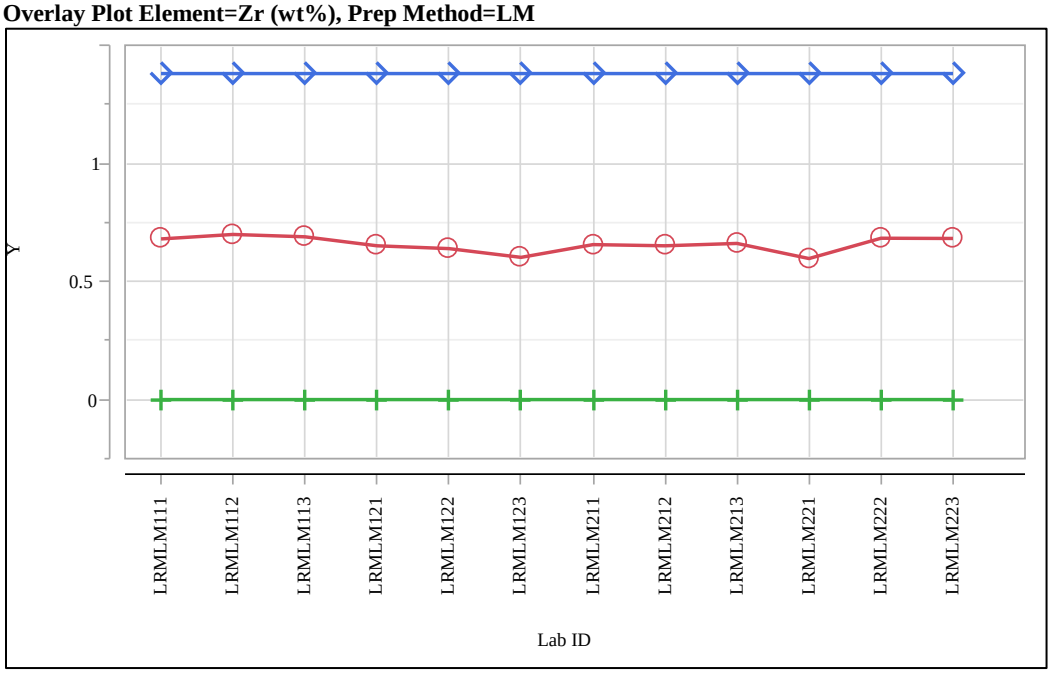
Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=Si (wt%), Prep Method=PF





Overlay Plot Element=Zr (wt%), Prep Method=LM



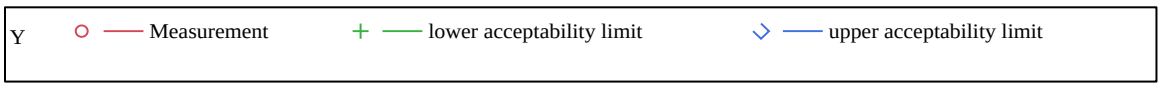


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide

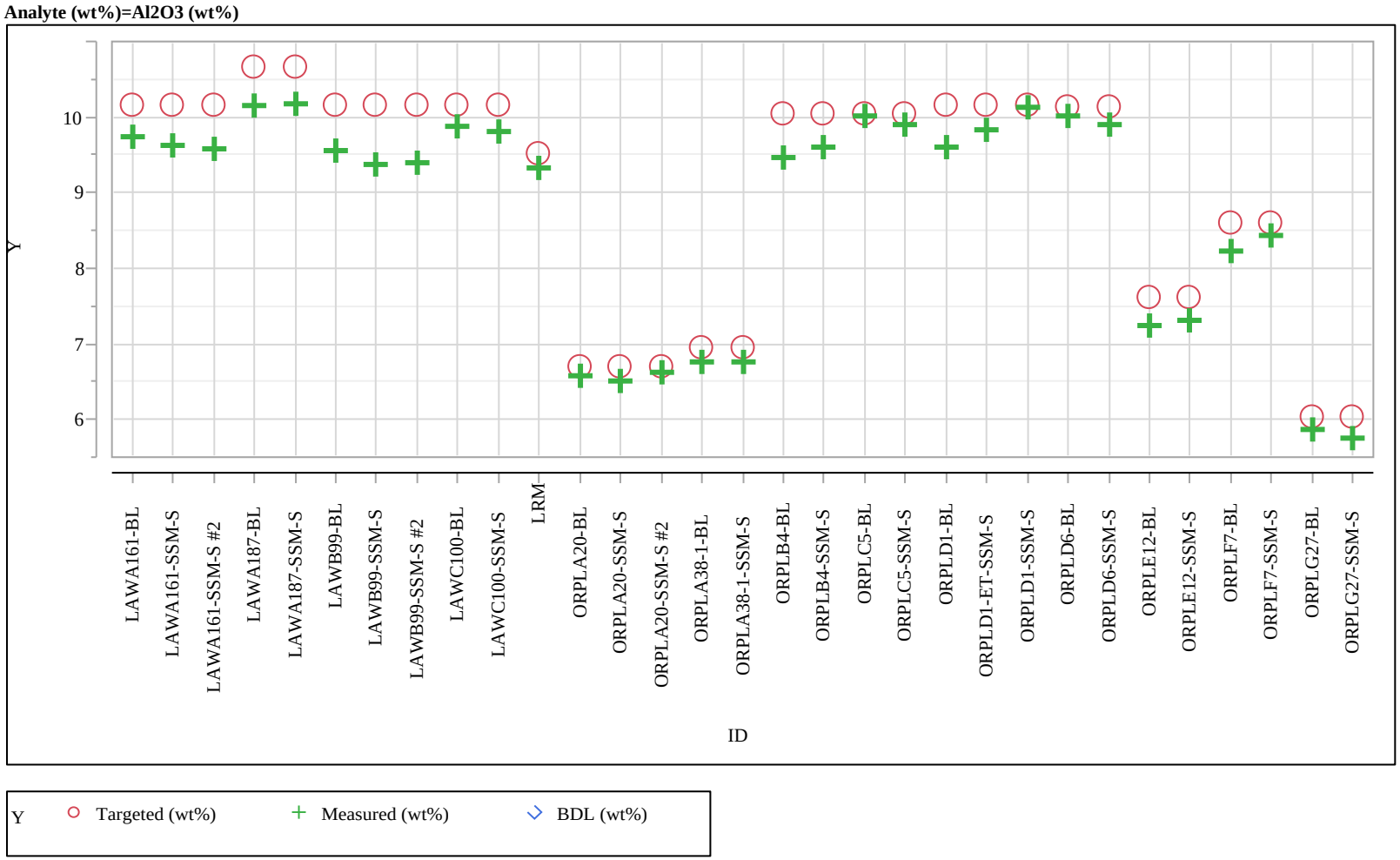


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

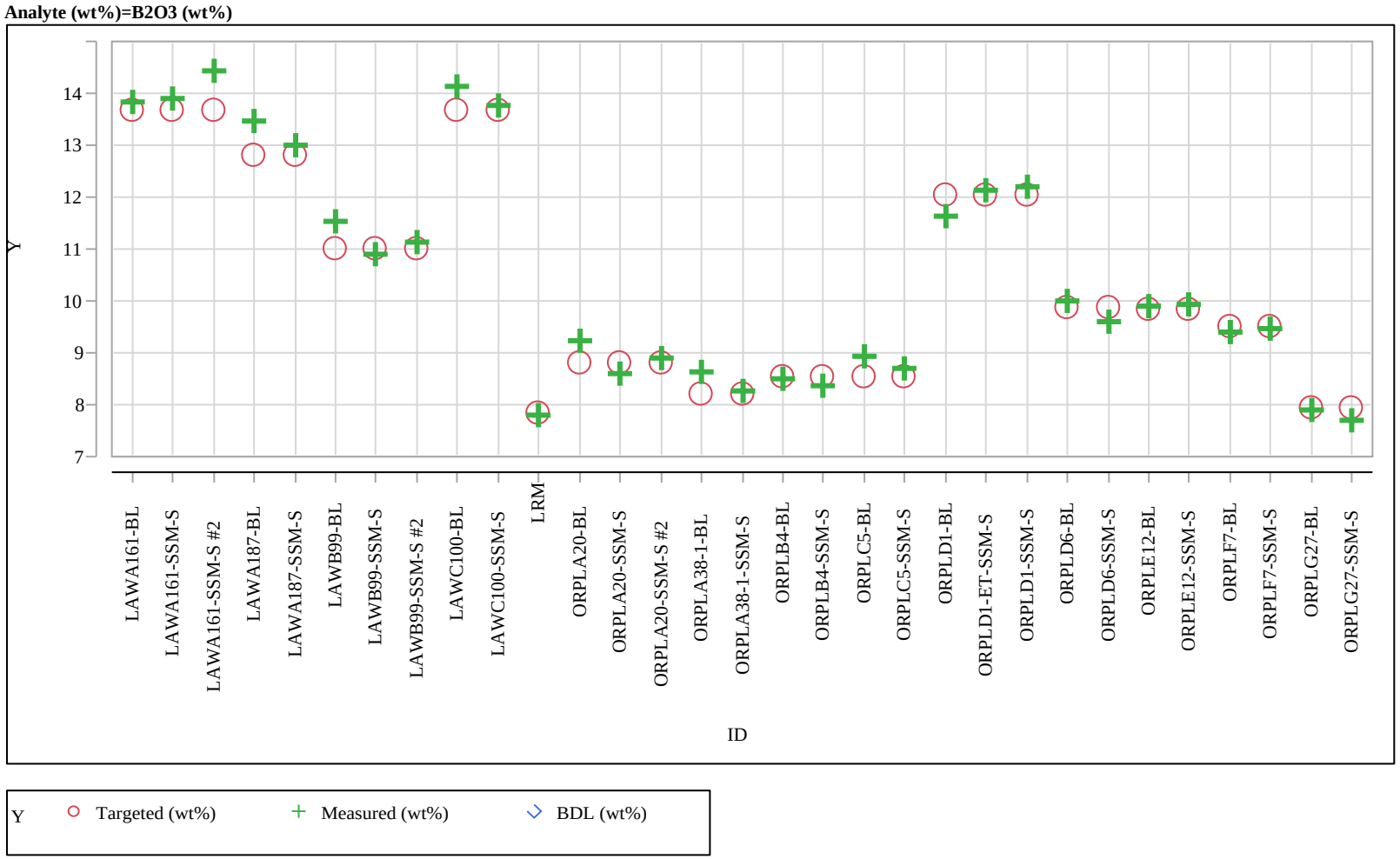


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

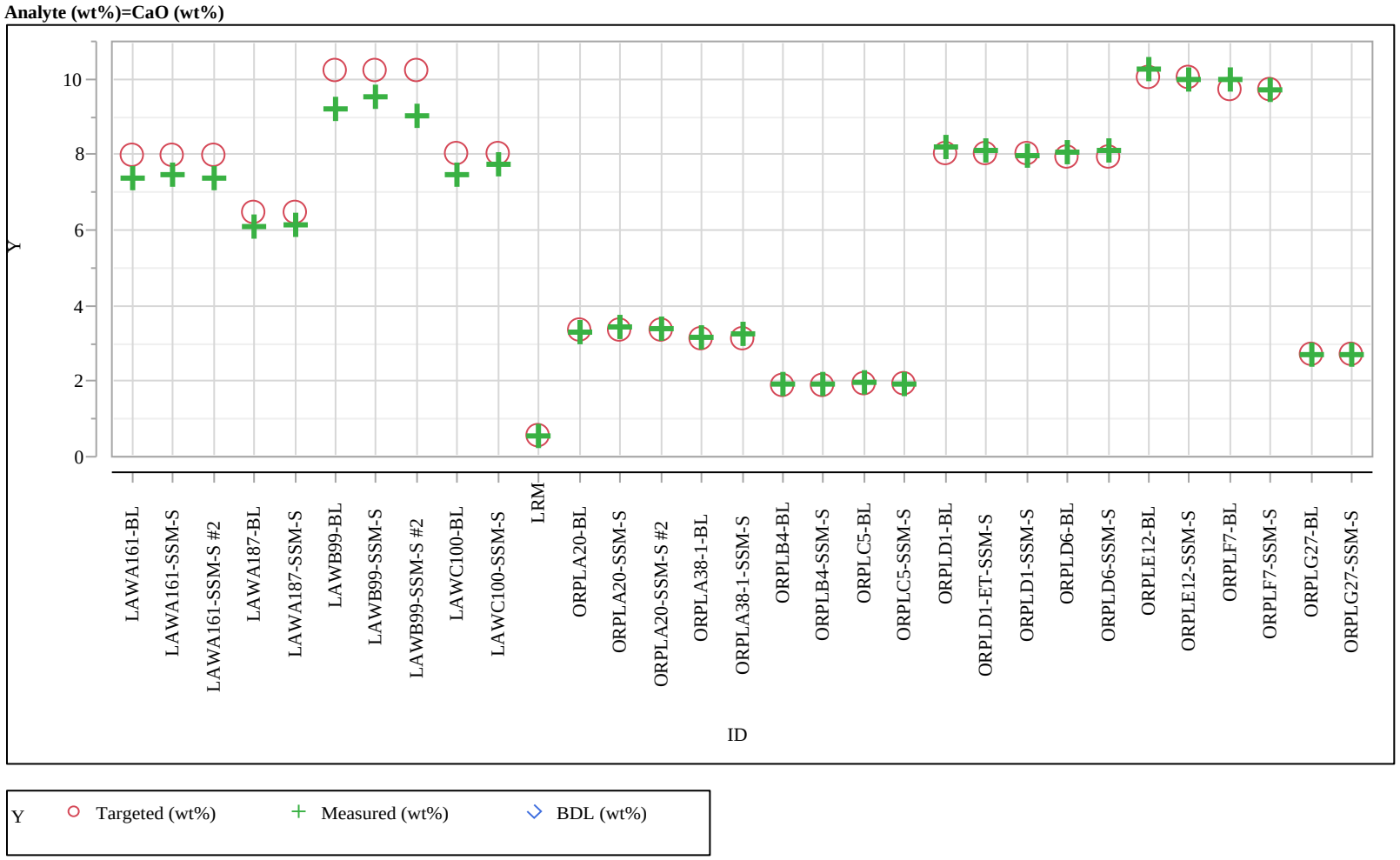


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

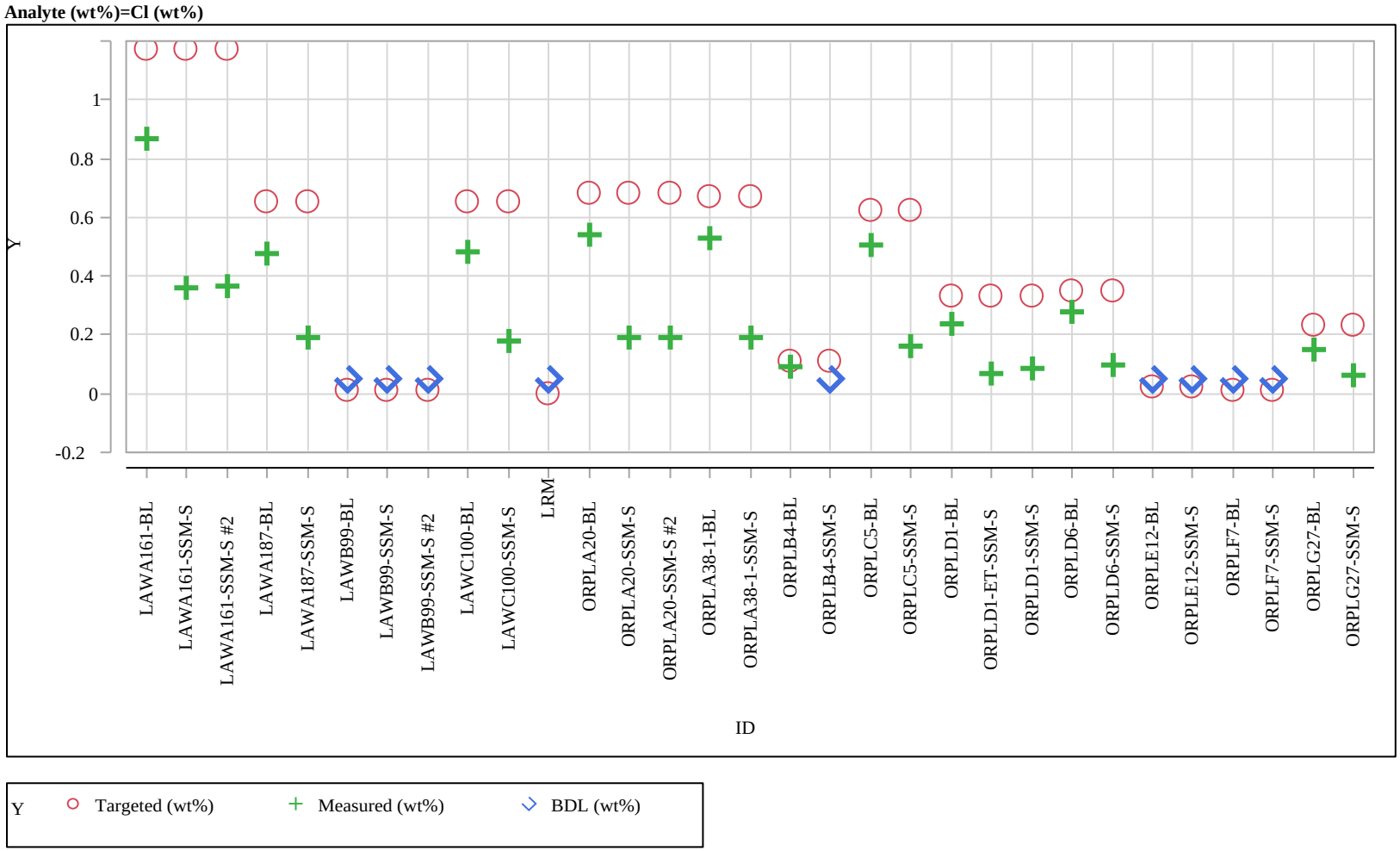


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

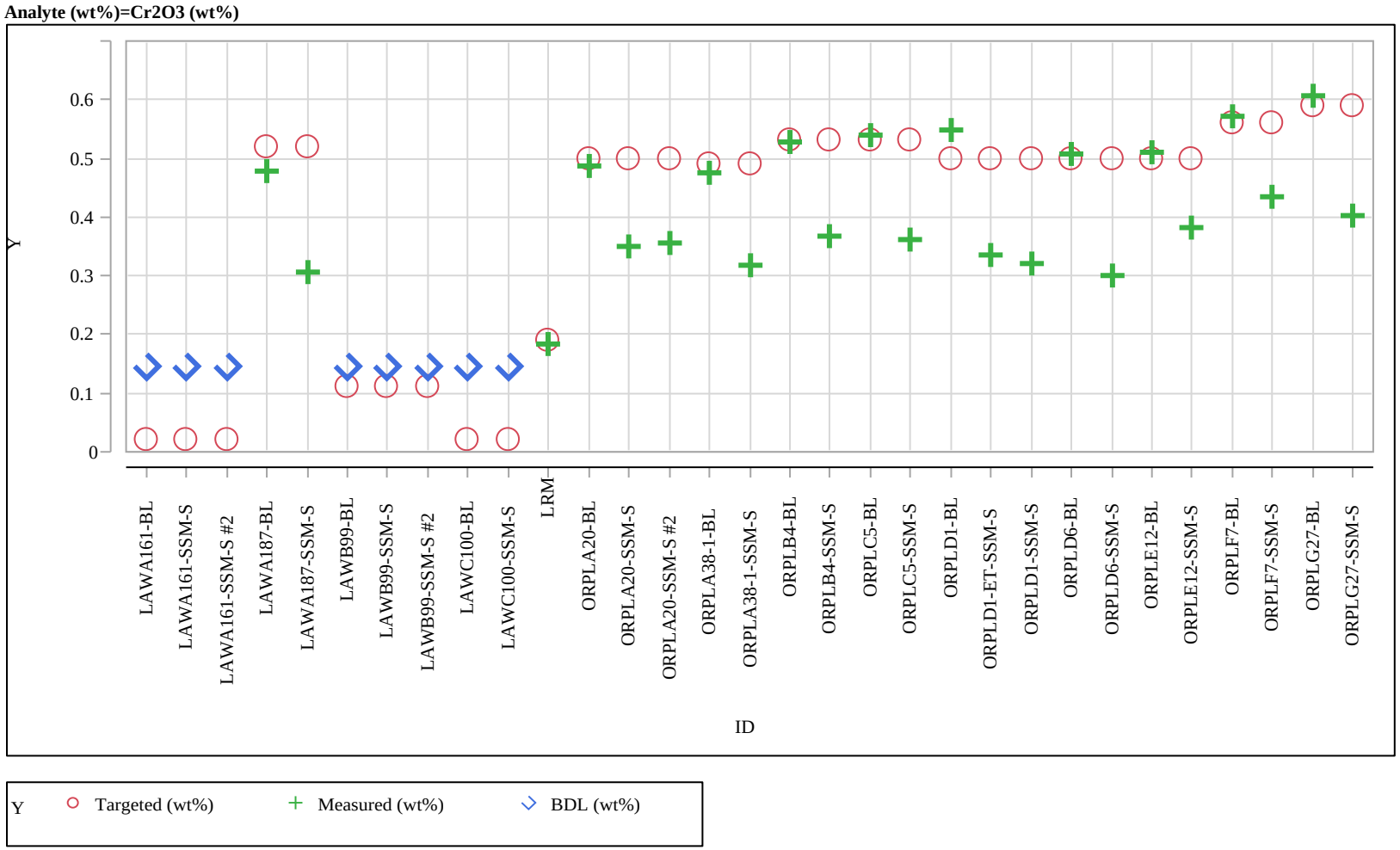


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

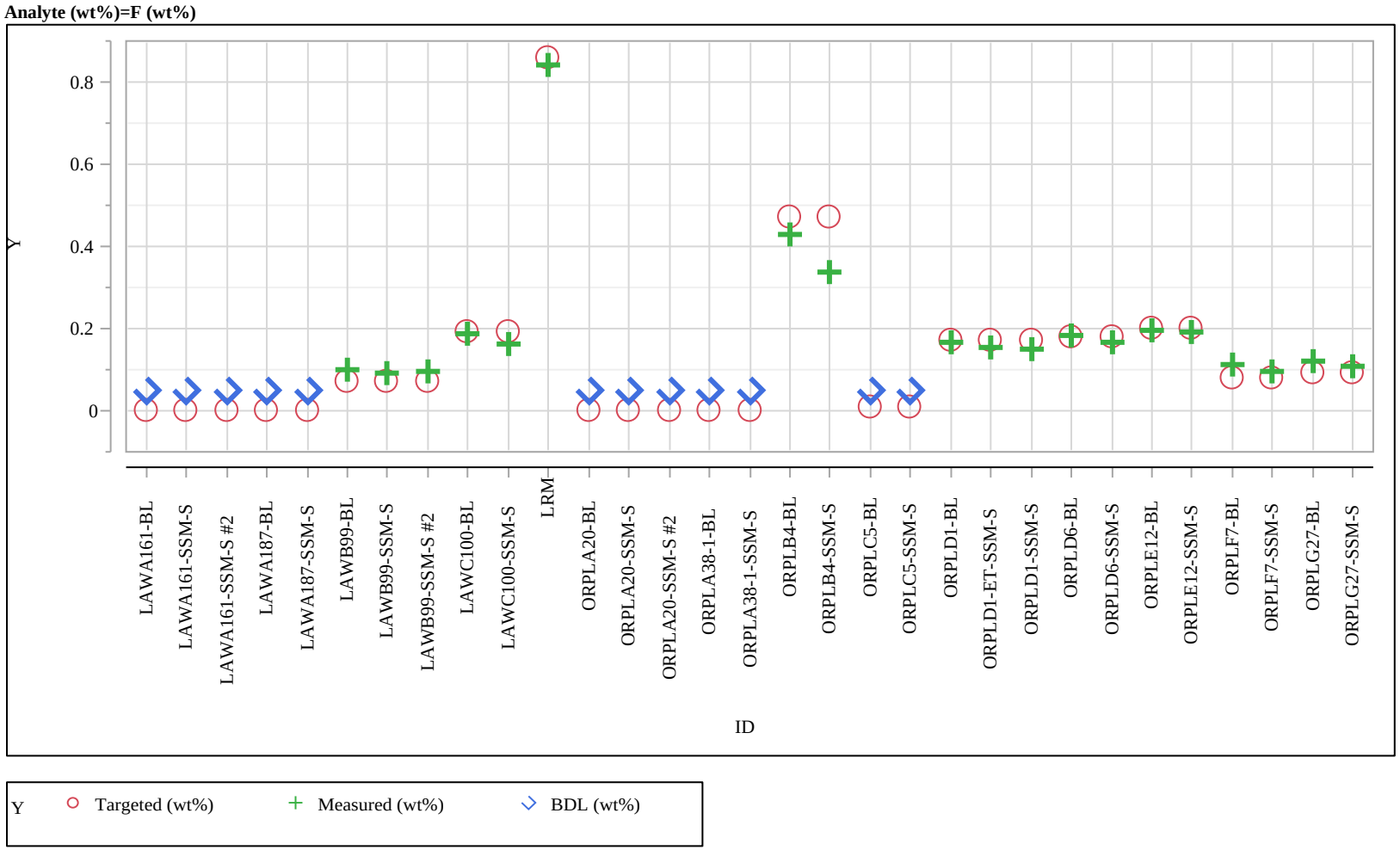


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

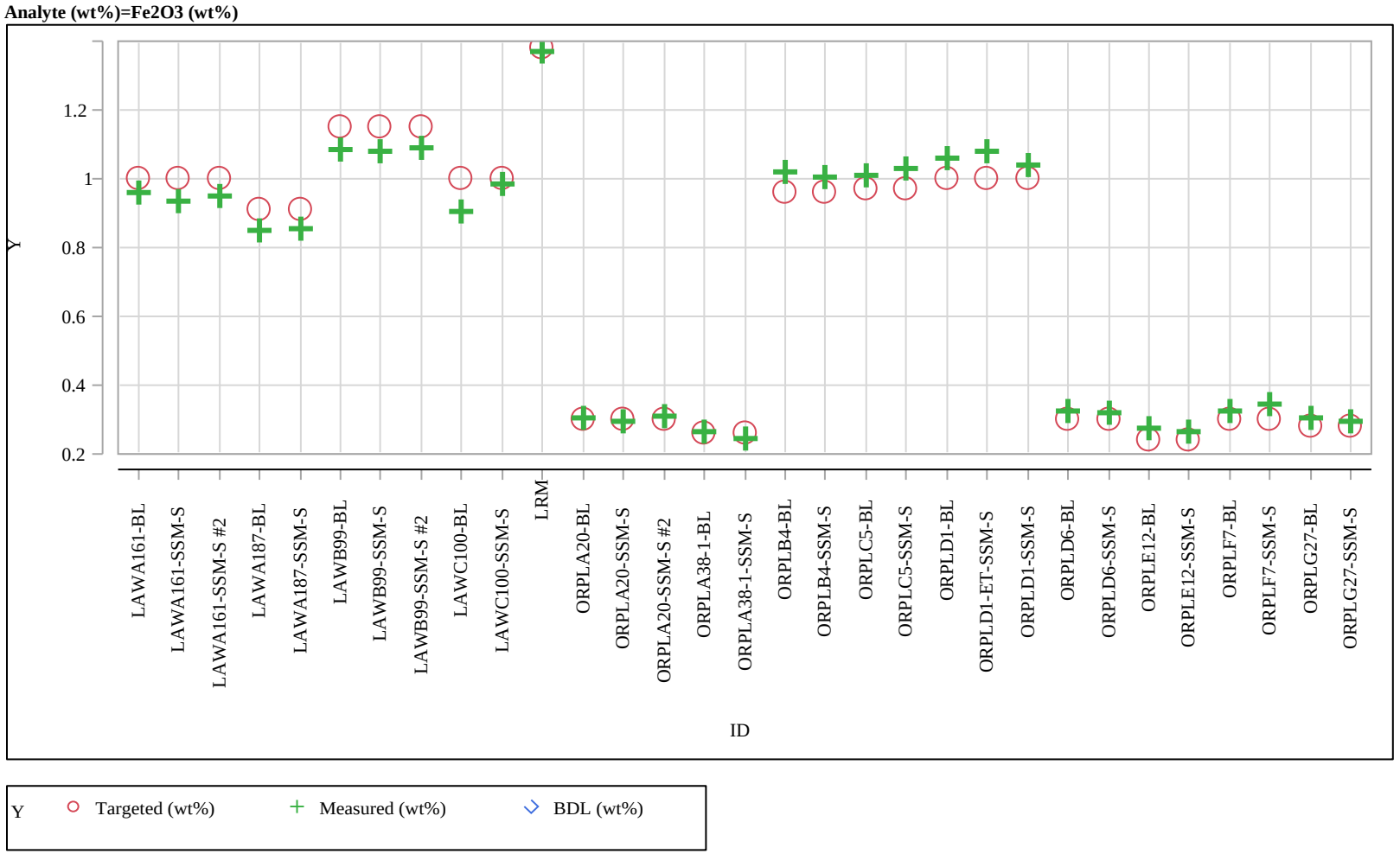


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

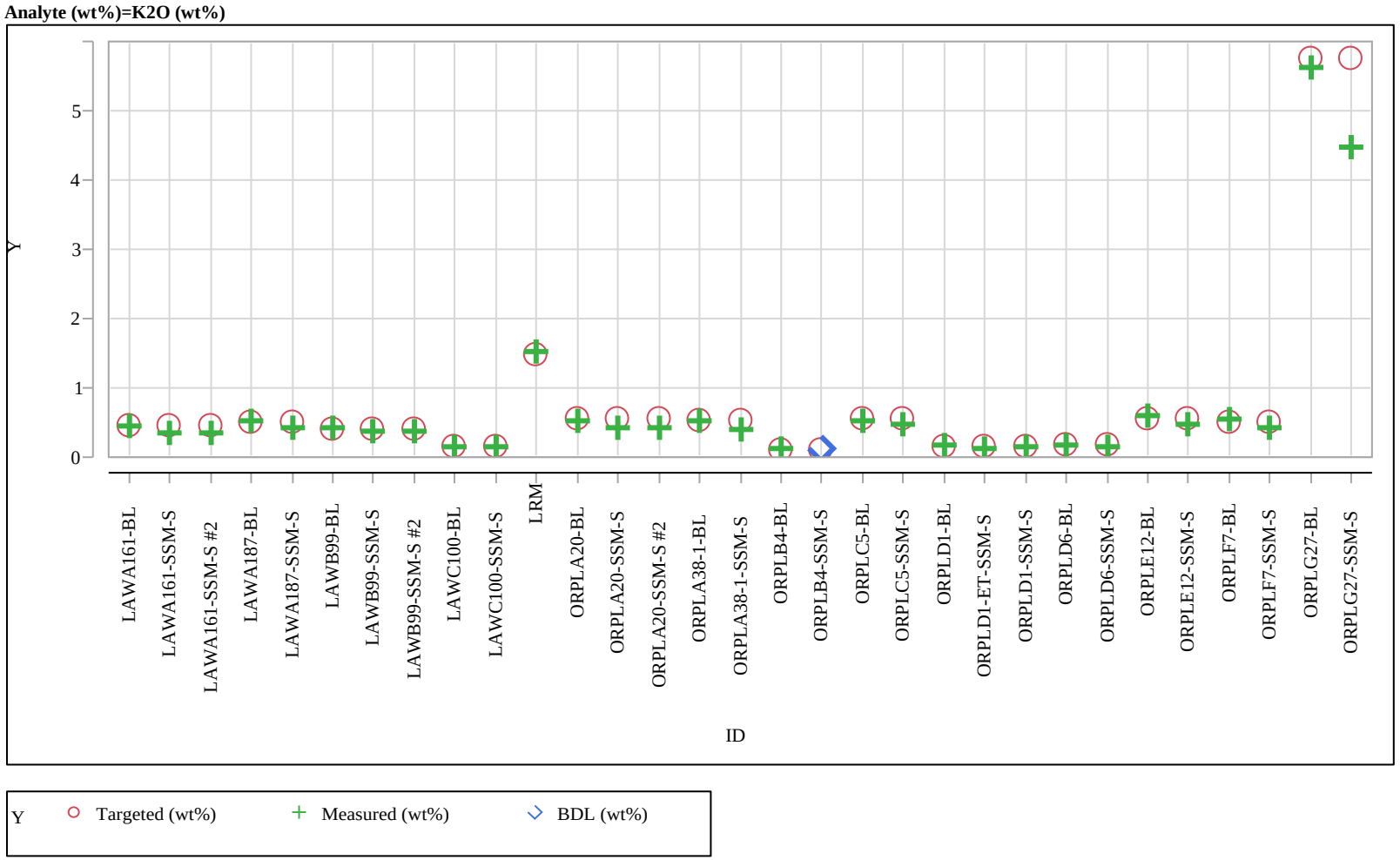


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

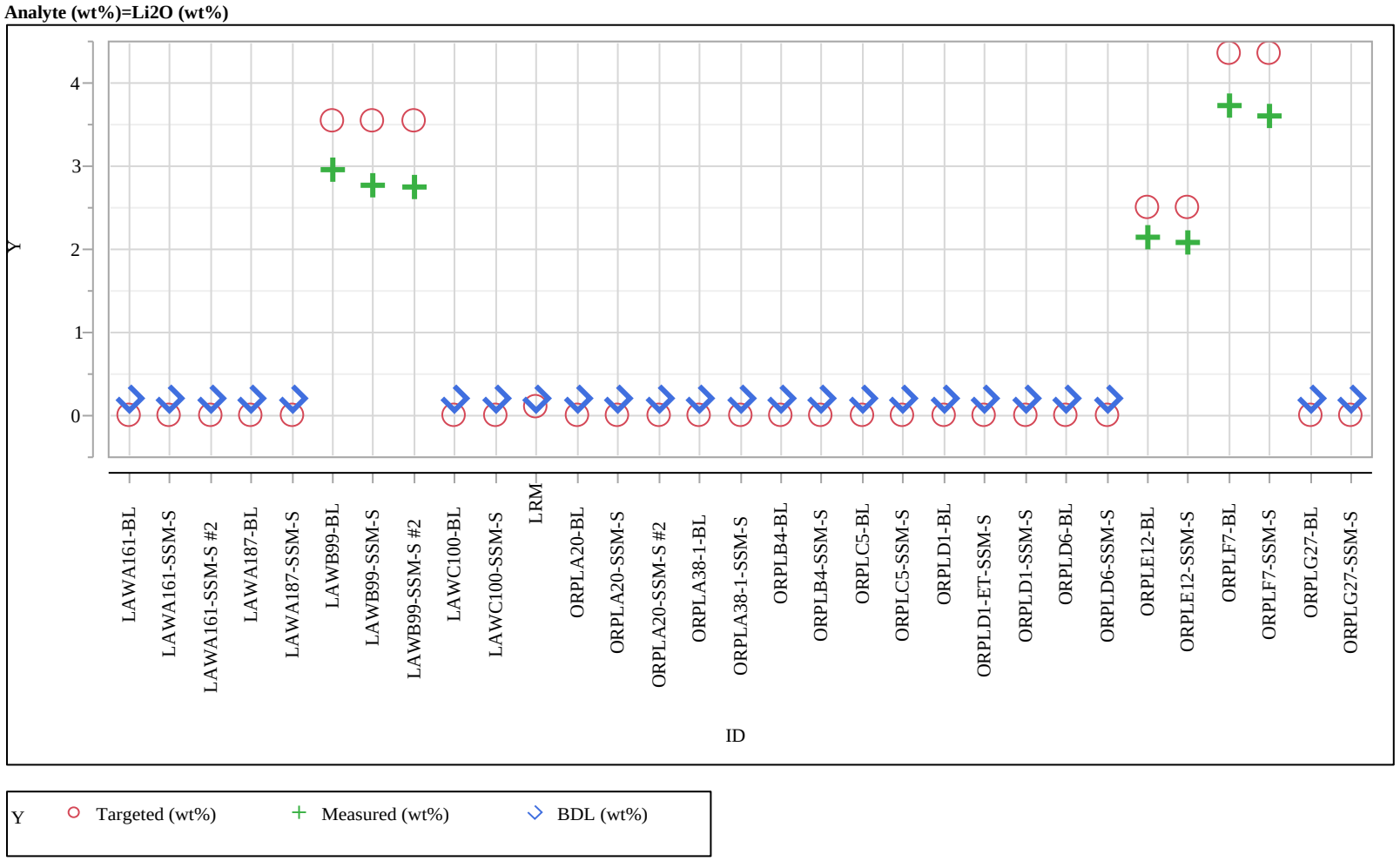


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

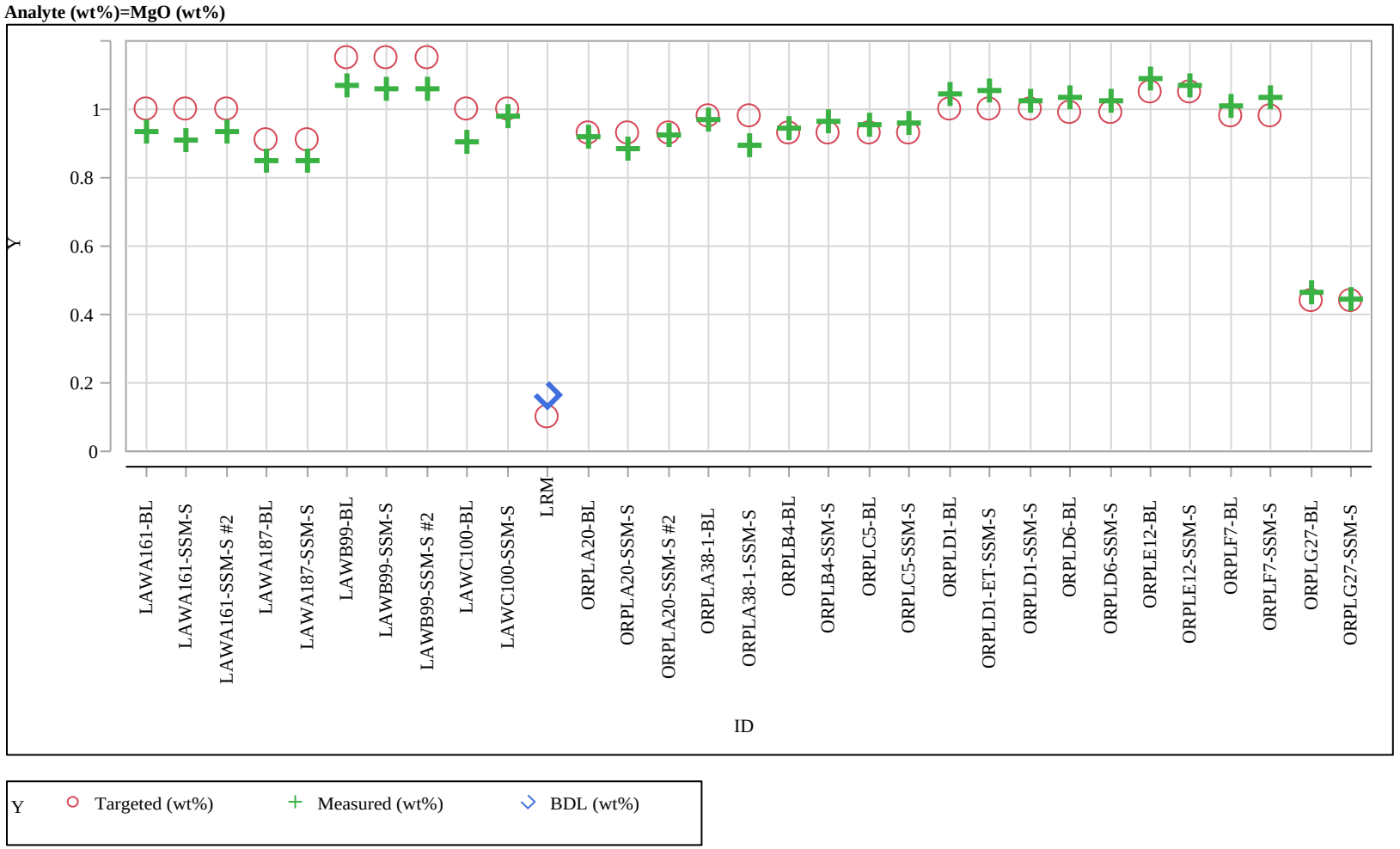


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

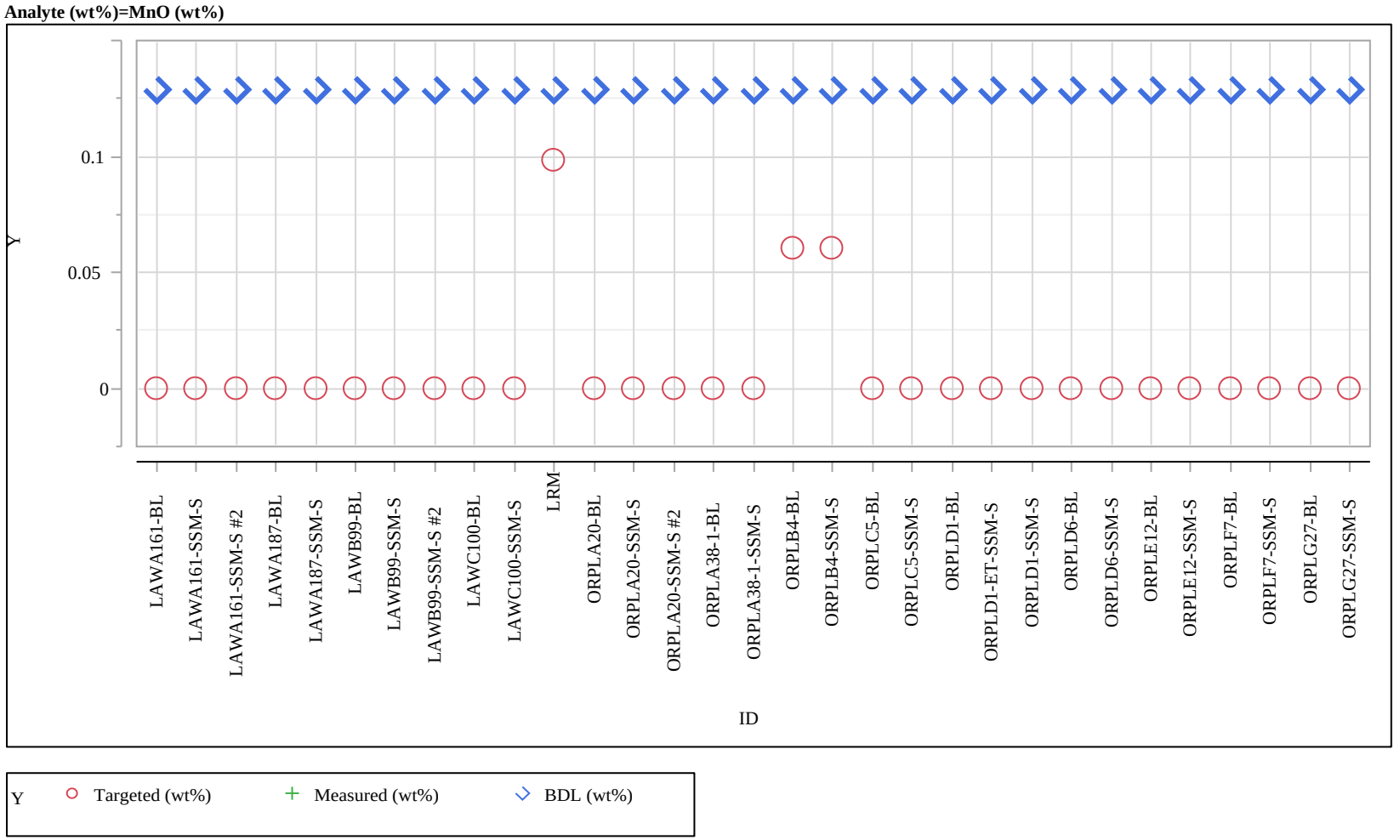


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

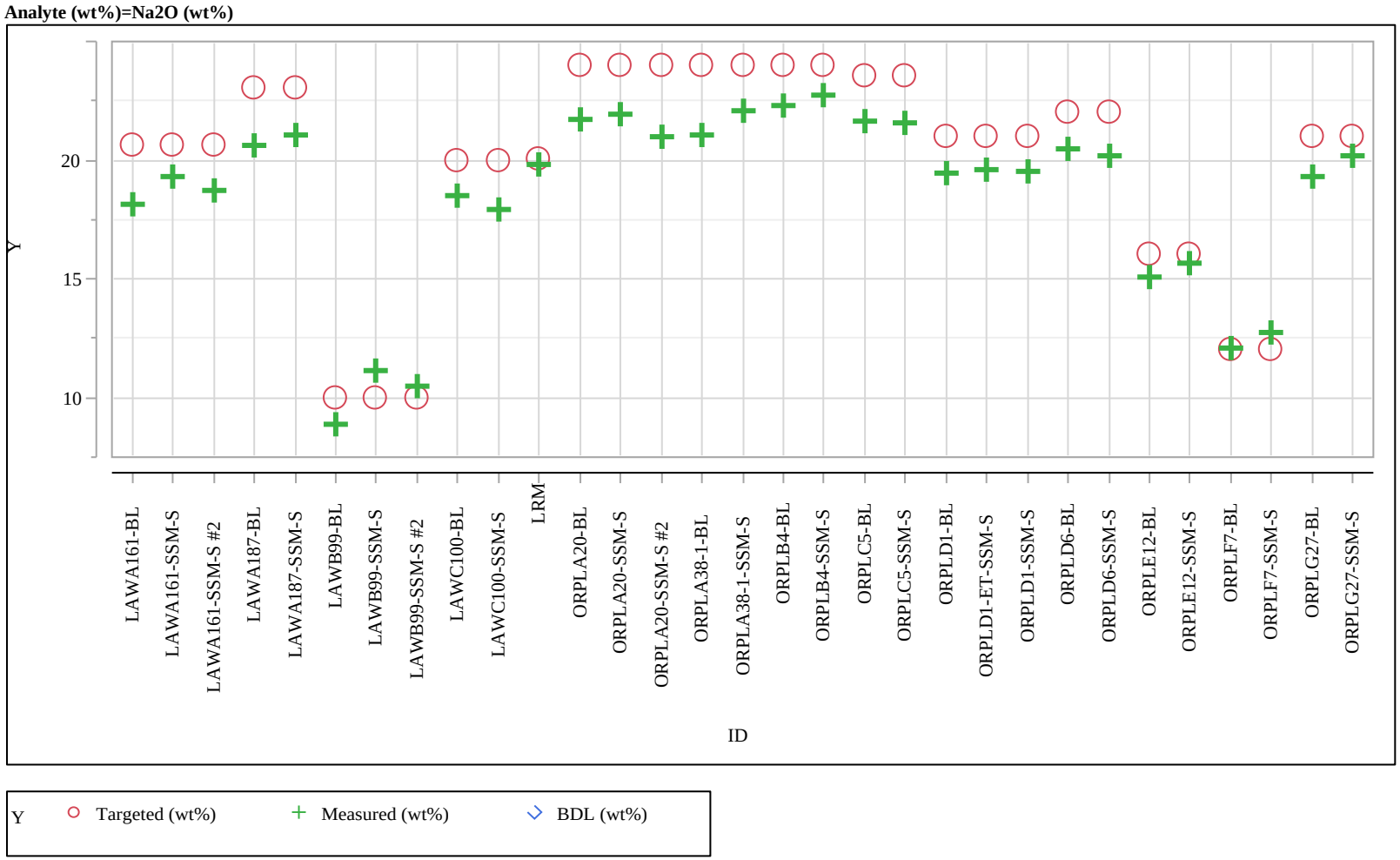


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

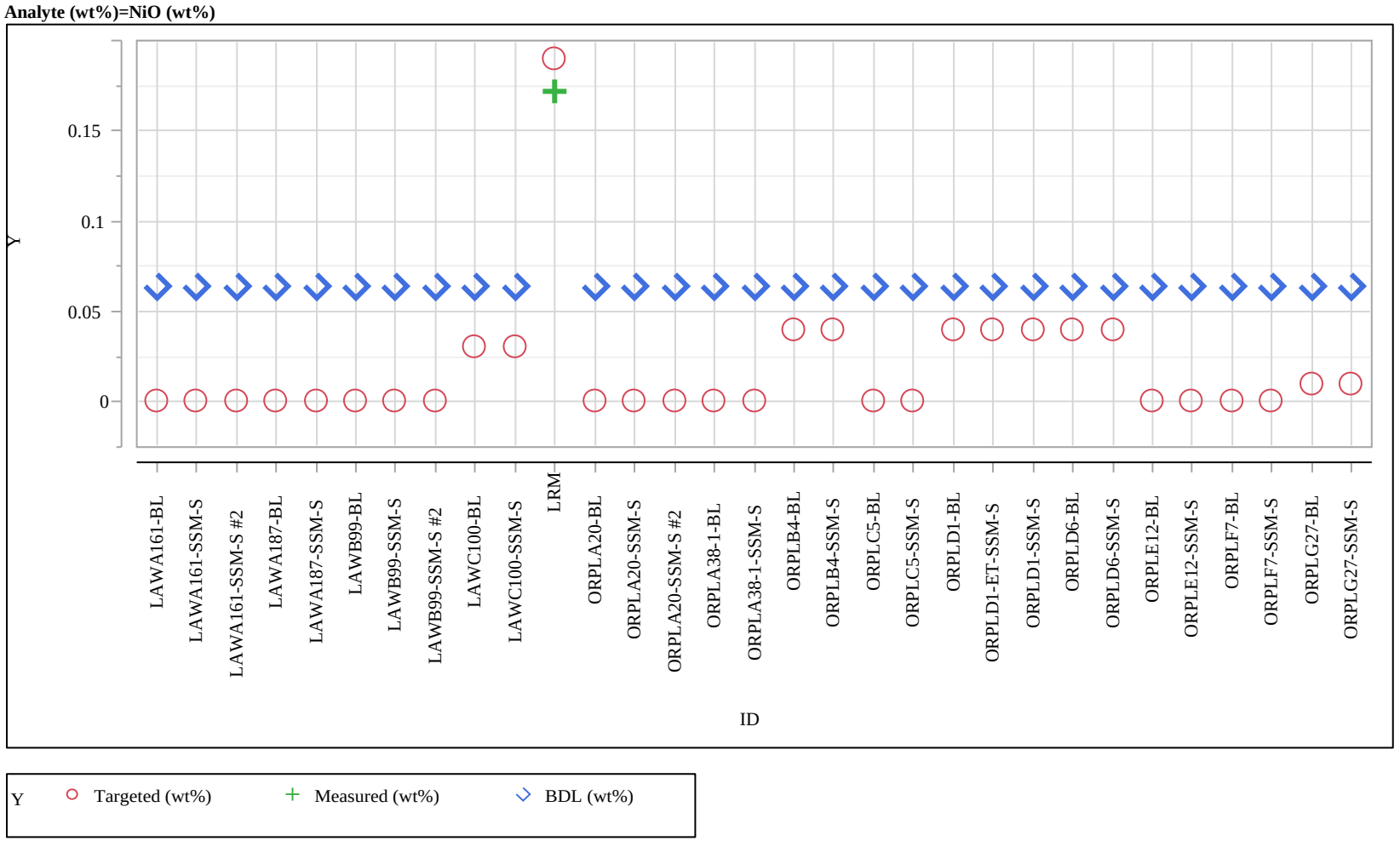


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

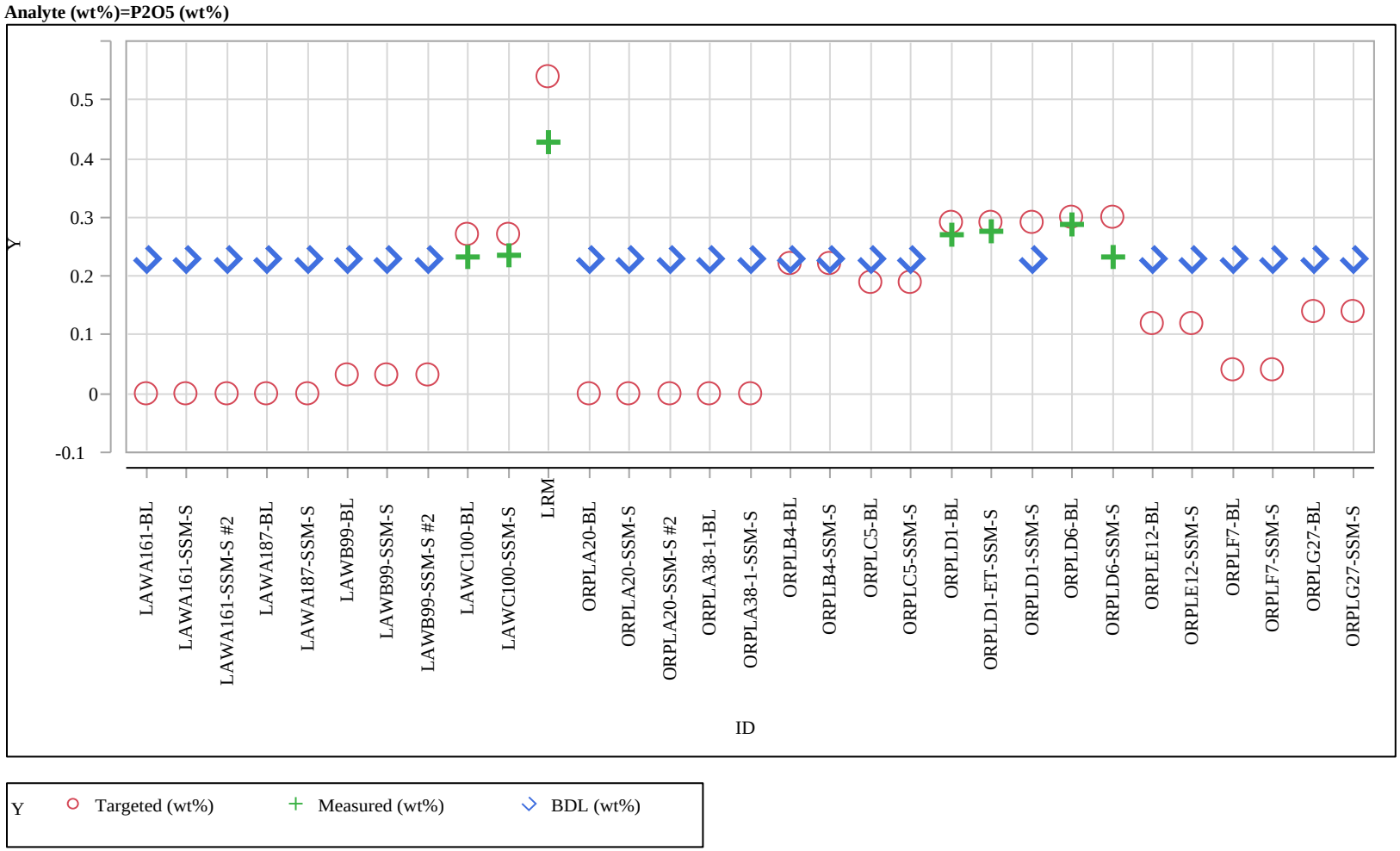


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

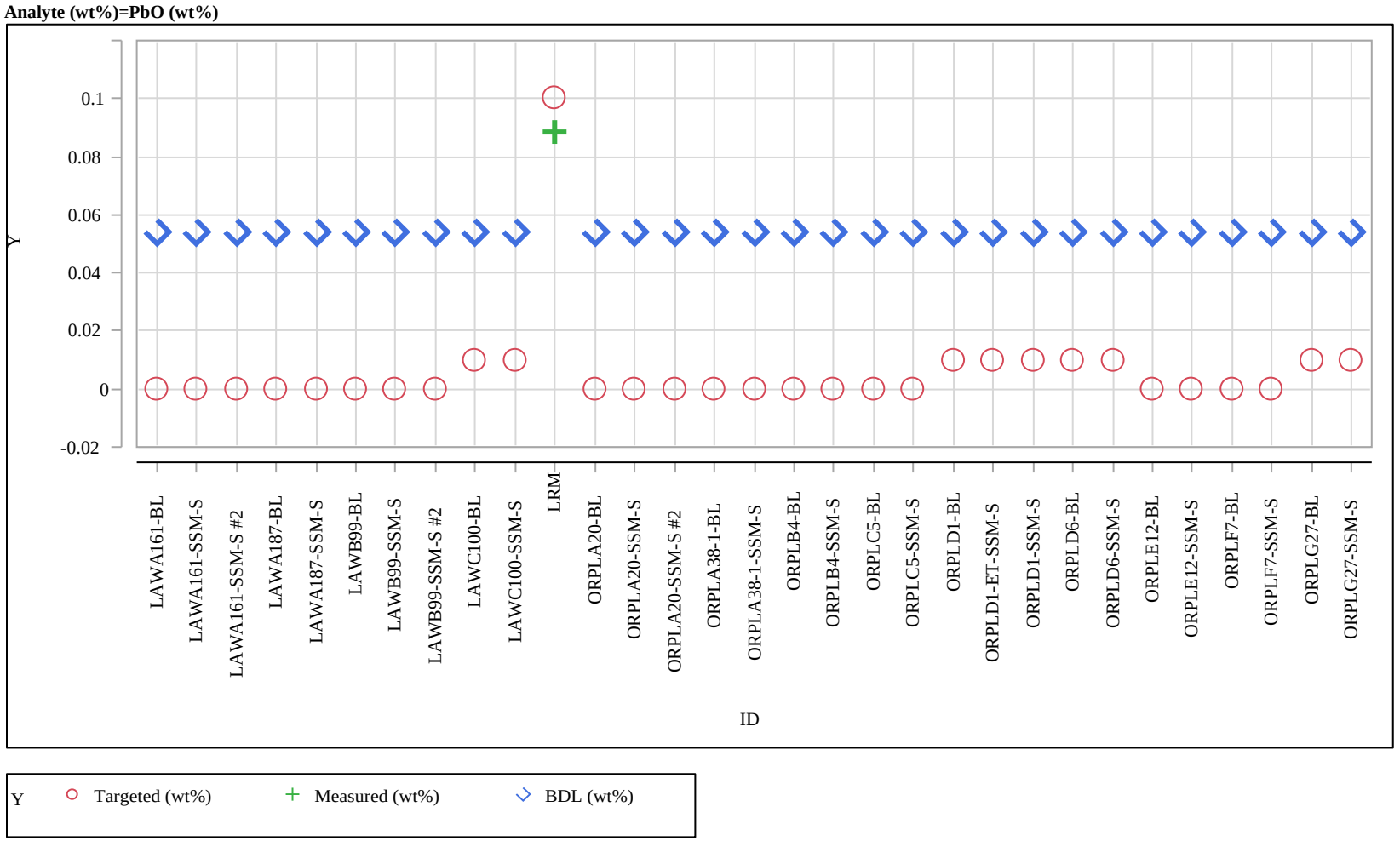


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

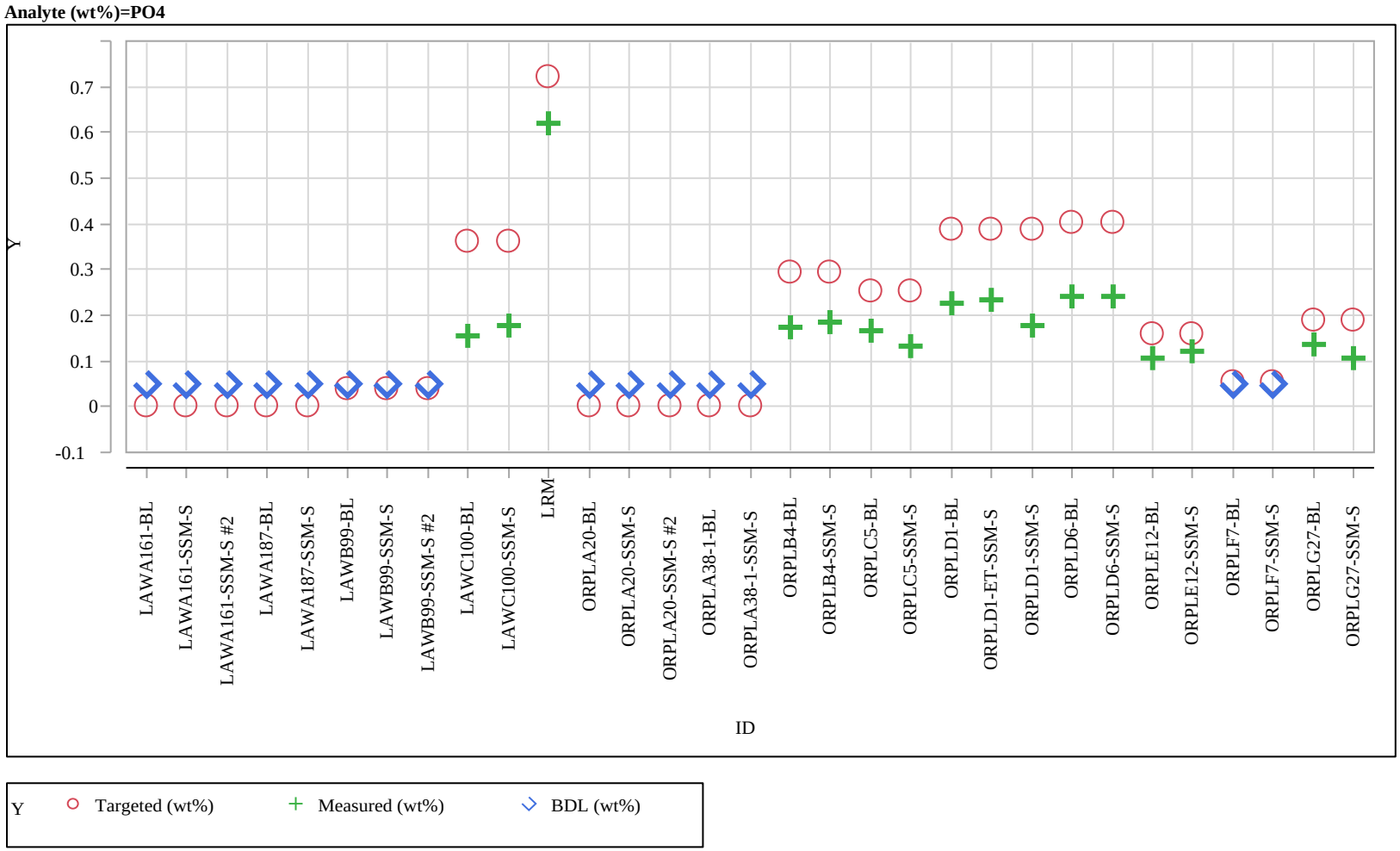


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

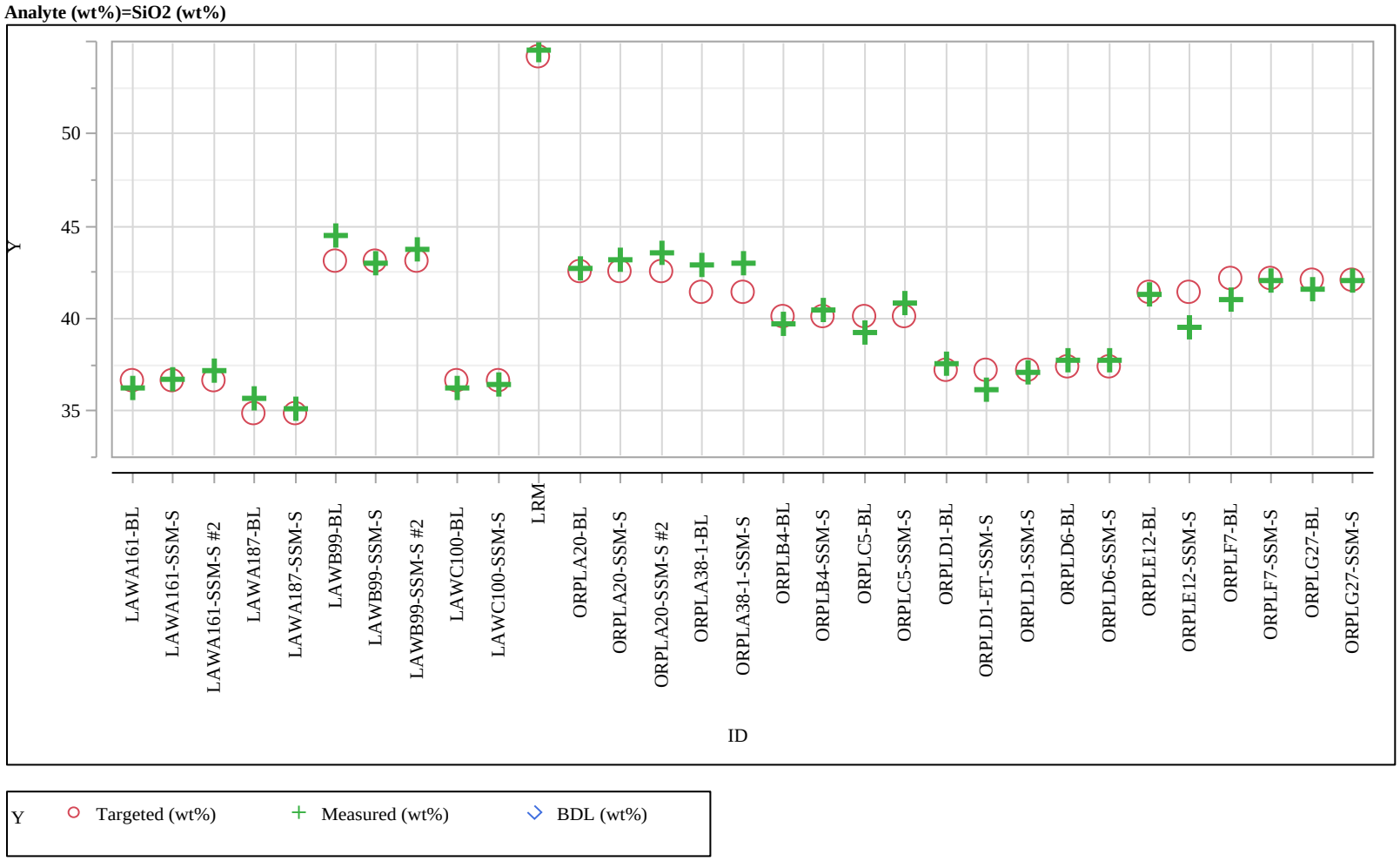


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

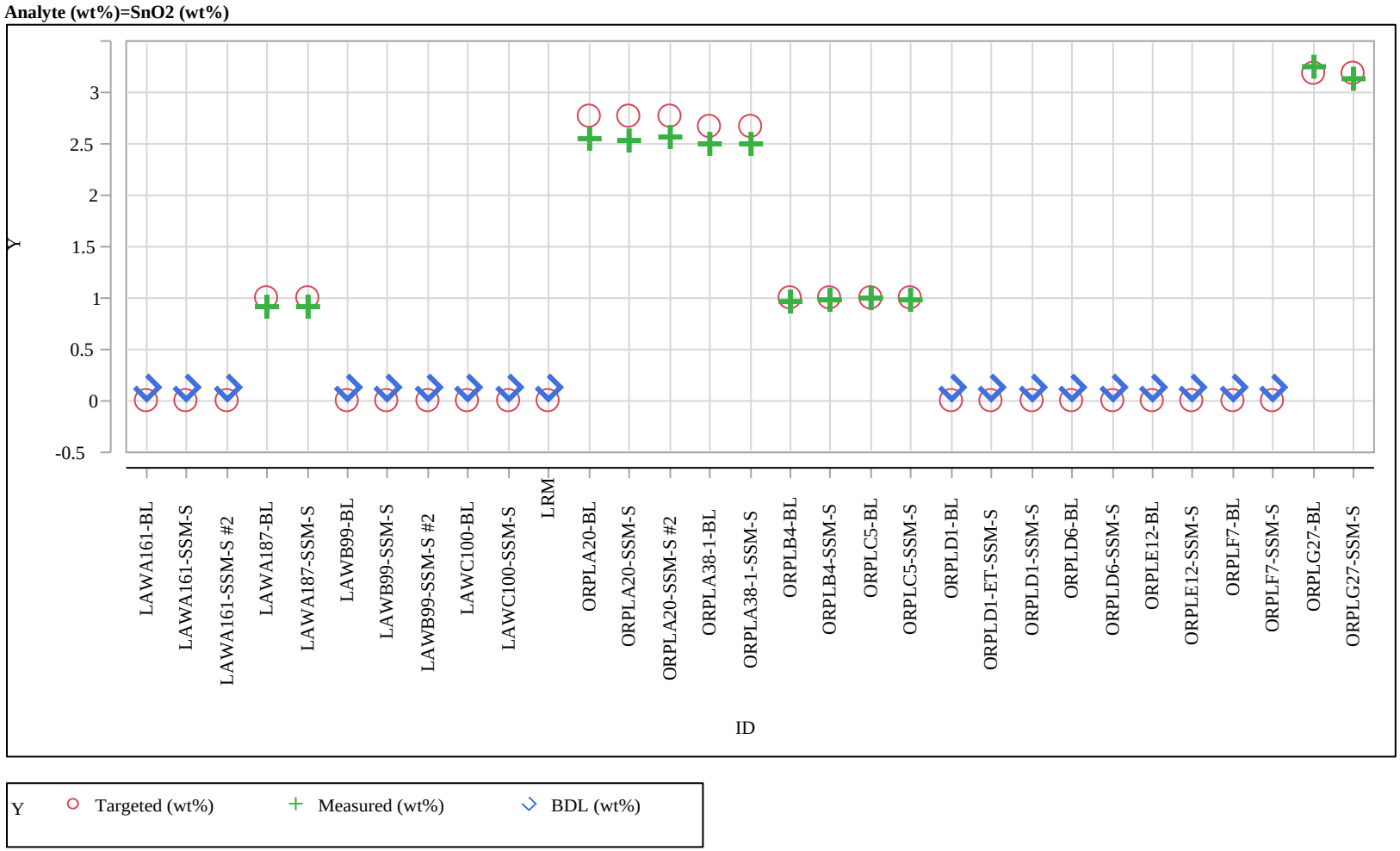


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

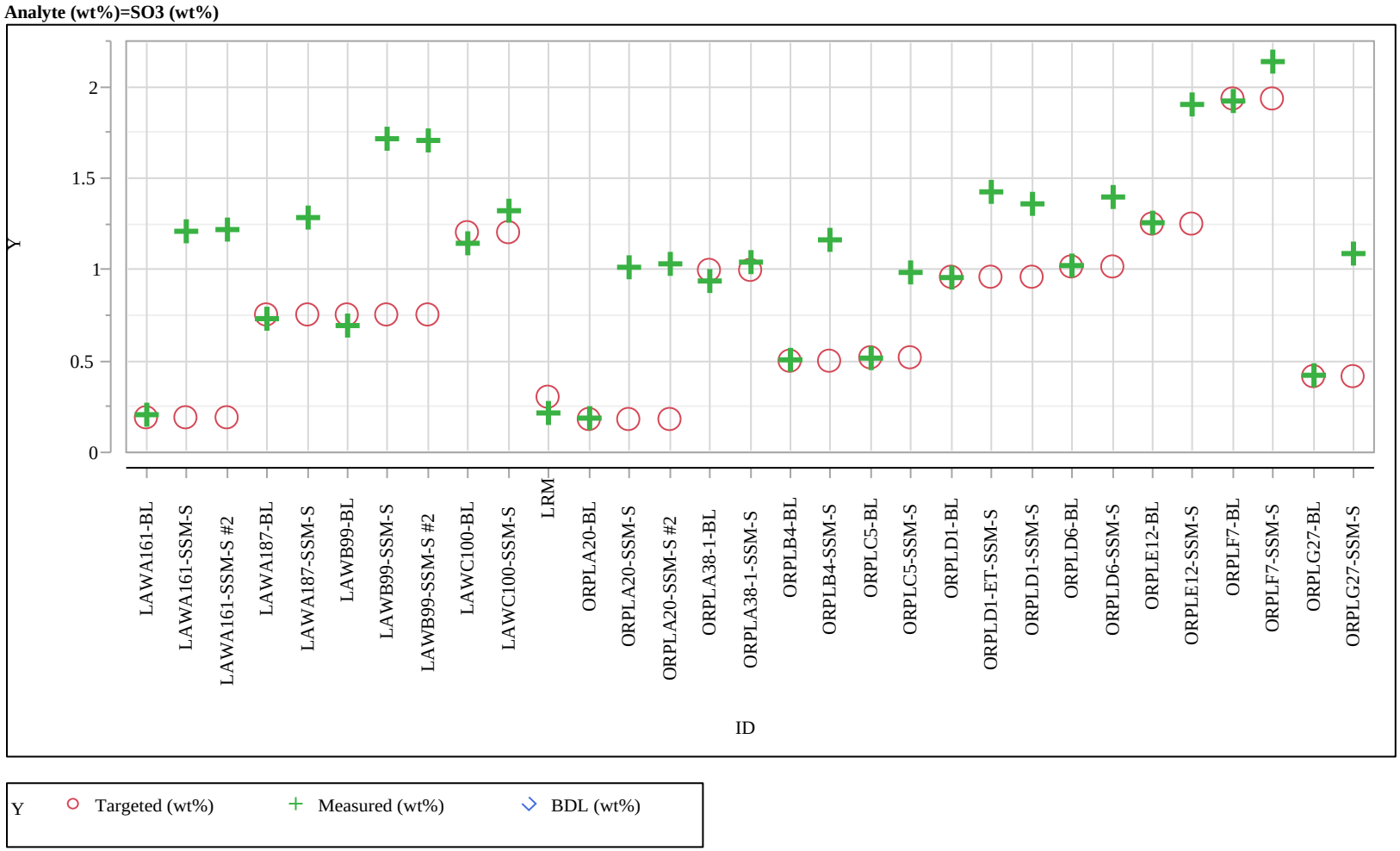


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

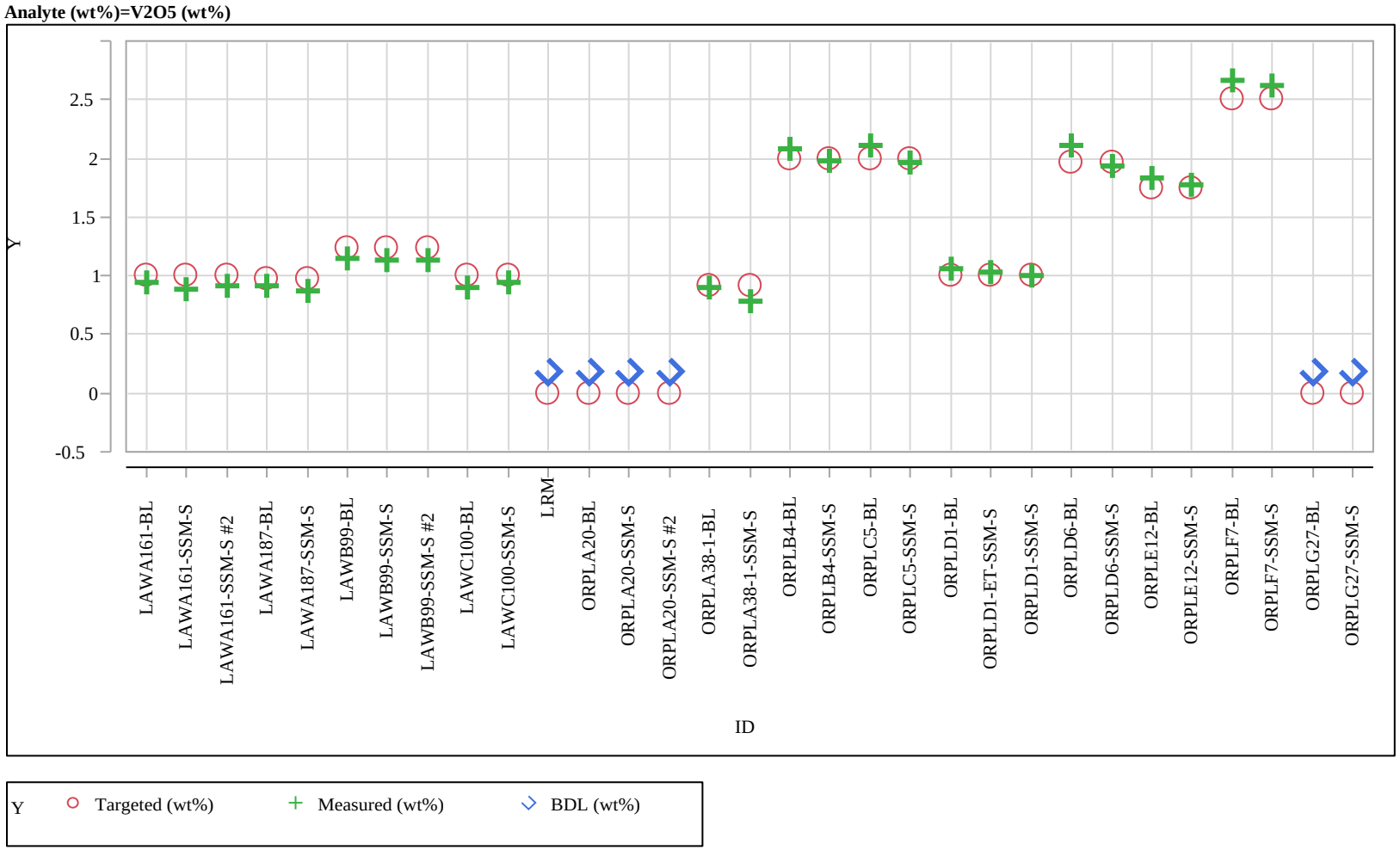


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

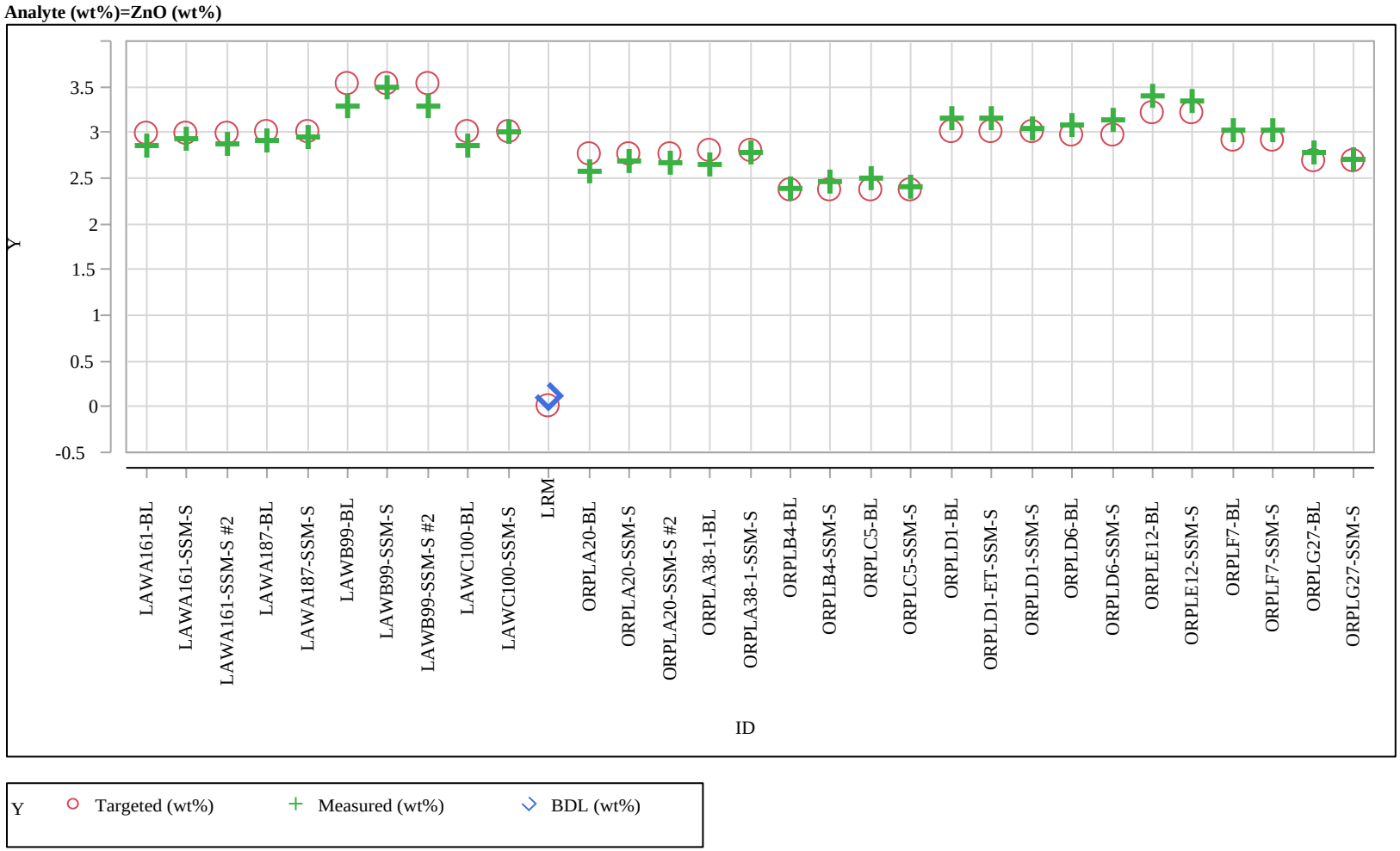


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

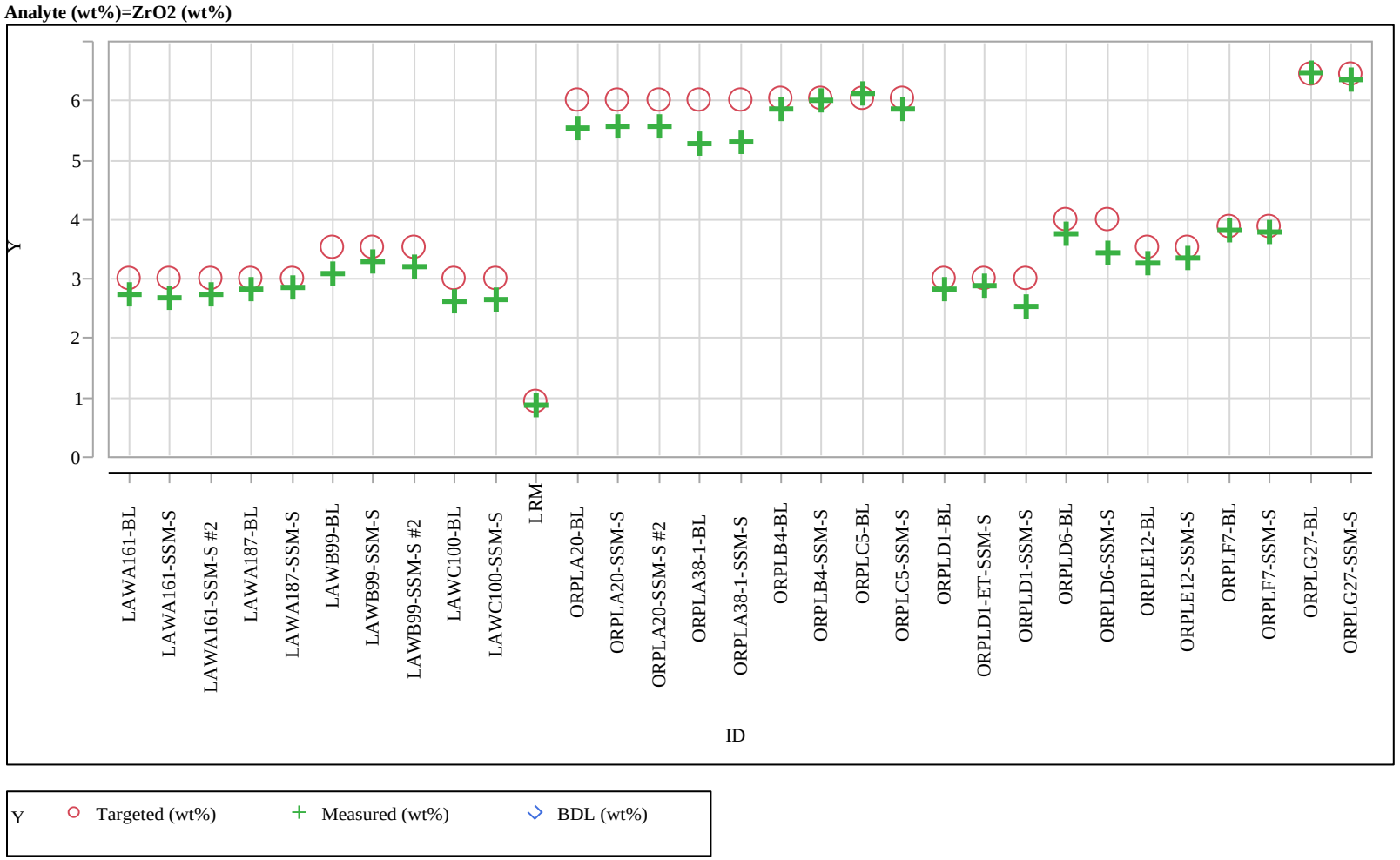
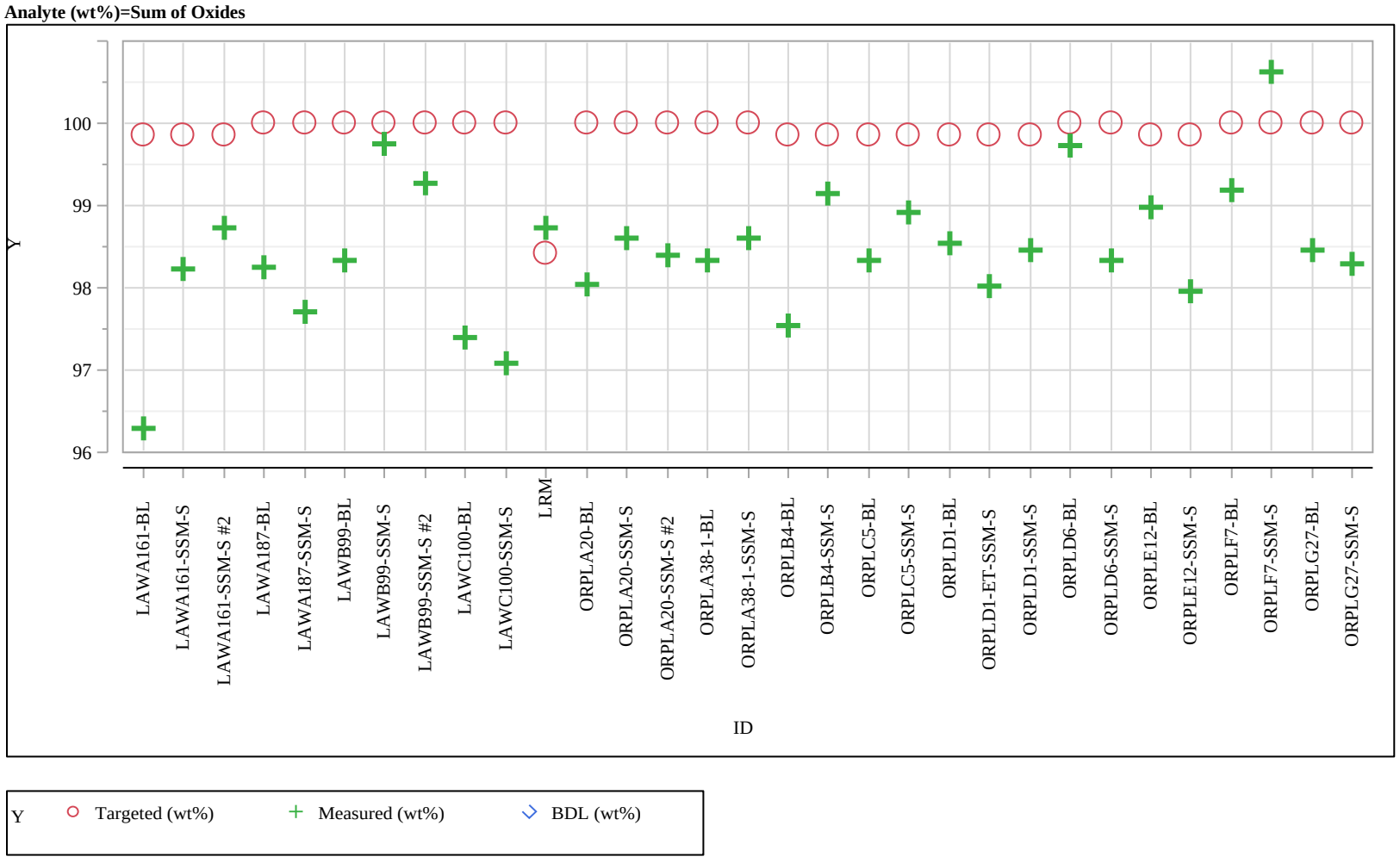


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)



Appendix B Tables and Exhibits Supporting the Wash Solution Chemical Composition Analysis

Table B-1. Measurements (mg/L) of Wash Solutions by ICP-AES

Soln ID	Block	Seq	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Mn	Na	Ni	P	Pb	S	Si	Sn	V	Zn	Zr
soln std	1	1	soln std 1-1	3.84	20.0	<1.00	<1.00	4.01	10.2	10.0	<1.00	<1.00	78.5	<1.00	<1.00	<1.00	<1.00	53.1	<2.00	<1.00	<1.00	<1.00
ORPLA38-1-SSM-W	1	2	H01-1	<1.00	27.5	5.60	42.0	<1.00	42.8	<1.00	<1.00	<1.00	1200	<1.00	<1.00	<1.00	706	7.72	<2.00	11.5	<1.00	<1.00
LAWC100-SSM-W	1	3	H06-1	<1.00	21.1	29.4	1.64	<1.00	10.3	<1.00	<1.00	<1.00	1040	<1.00	1.94	<1.00	668	3.94	<2.00	7.10	<1.00	<1.00
LAWA161-SSM-W	1	4	H13-1	<1.00	21.1	15.1	1.82	<1.00	24.7	<1.00	<1.00	<1.00	820	<1.00	<1.00	<1.00	482	4.78	<2.00	5.93	<1.00	<1.00
High-Purity Standards SM-744-063	1	5	hpstd-11	52.3	<1.00	<1.00	<1.00	50.9	<1.00	<1.00	<1.00	20.9	145	10.6	<1.00	<1.00	10.1	<1.00	<2.00	<1.00	<1.00	<1.00
LAWB99-SSM-W	1	6	H07-1	<1.00	4.50	30.6	1.45	<1.00	10.4	19.5	<1.00	<1.00	232	<1.00	<1.00	<1.00	226	2.17	<2.00	2.64	<1.00	<1.00
ORPLD1-SSM-W	1	7	H14-1	<1.00	22.1	22.3	50.4	<1.00	12.0	<1.00	<1.00	<1.00	1010	<1.00	1.88	<1.00	685	4.85	<2.00	9.12	<1.00	<1.00
ORPLE12-SSM-W	1	8	H09-1	<1.00	15.9	35.8	37.8	<1.00	43.2	26.1	<1.00	<1.00	900	<1.00	1.12	<1.00	656	4.73	<2.00	13.6	<1.00	<1.00
LAWA161-SSM-W #2	1	9	H17-1	<1.00	20.1	15.9	1.86	<1.00	22.8	<1.00	<1.00	<1.00	770	<1.00	<1.00	<1.00	503	3.22	<2.00	6.00	<1.00	<1.00
ORPLF7-SSM-W	1	10	H04-1	<1.00	11.5	64.0	44.9	<1.00	41.3	59.1	<1.00	<1.00	798	<1.00	<1.00	<1.00	719	4.70	<2.00	21.7	<1.00	<1.00
LAWB99-SSM-W #2	1	11	H08-1	<1.00	5.00	46.4	2.38	<1.00	15.8	29.4	<1.00	<1.00	321	<1.00	<1.00	<1.00	338	<1.00	<2.00	3.82	<1.00	<1.00
soln std	1	12	soln std 1-2	3.80	18.5	<1.00	<1.00	4.02	9.61	10.0	<1.00	<1.00	80.8	<1.00	<1.00	<1.00	<1.00	49.5	<2.00	<1.00	<1.00	<1.00
LAWA187-SSM-W	1	13	H12-1	<1.00	29.3	11.6	56.3	<1.00	35.3	<1.00	<1.00	<1.00	1010	<1.00	<1.00	<1.00	622	3.65	<2.00	9.53	<1.00	<1.00
ORPLD6-SSM-W	1	14	H11-1	<1.00	22.0	17.6	60.7	<1.00	12.5	<1.00	<1.00	<1.00	1040	<1.00	2.49	<1.00	688	5.31	<2.00	26.2	<1.00	<1.00
ORPLC5-SSM-W	1	15	H03-1	<1.00	21.3	4.23	54.7	<1.00	31.7	<1.00	<1.00	<1.00	1240	<1.00	6.70	<1.00	703	6.08	<2.00	39.2	<1.00	<1.00
ORPLG27-SSM-W	1	16	H16-1	<1.00	17.7	1.90	50.2	<1.00	305	<1.00	<1.00	<1.00	723	<1.00	3.81	<1.00	553	3.74	<2.00	<1.00	<1.00	<1.00
blank	1	17	blank-1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLD1-ET-SSM-W	1	18	H02-1	<1.00	25.9	24.0	67.2	<1.00	12.8	<1.00	<1.00	<1.00	1100	<1.00	2.03	<1.00	669	3.64	<2.00	9.44	<1.00	<1.00
ORPLA20-SSM-W	1	19	H15-1	<1.00	23.9	2.74	41.2	<1.00	32.9	<1.00	<1.00	<1.00	911	<1.00	<1.00	<1.00	561	4.03	<2.00	<1.00	<1.00	<1.00
High-Purity Standards SM-744-063	1	20	hpstd-12	51.6	<1.00	<1.00	<1.00	50.5	<1.00	<1.00	<1.00	21.0	146	10.6	<1.00	<1.00	10.4	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLA20-SSM-W #2	1	21	H10-1	<1.00	22.3	2.73	41.3	<1.00	32.6	<1.00	<1.00	<1.00	911	<1.00	<1.00	<1.00	560	4.35	<2.00	<1.00	<1.00	<1.00
ORPLB4-SSM-W	1	22	H05-1	<1.00	21.1	5.07	50.1	<1.00	6.79	<1.00	<1.00	<1.00	1080	<1.00	6.76	<1.00	630	5.98	<2.00	32.9	<1.00	<1.00
soln std	1	23	soln std 1-3	3.81	18.1	<1.00	<1.00	4.03	9.52	10.0	<1.00	<1.00	80.2	<1.00	<1.00	<1.00	<1.00	46.7	<2.00	<1.00	<1.00	<1.00
soln std	2	1	soln std 2-1	3.69	19.9	<1.00	<1.00	3.75	9.15	9.75	<1.00	<1.00	76.9	<1.00	<1.00	<1.00	<1.00	51.6	<2.00	<1.00	<1.00	<1.00
ORPLC5-SSM-W	2	2	H03-2	<1.00	22.7	4.02	53.7	<1.00	32.9	<1.00	<1.00	<1.00	1220	<1.00	6.23	<1.00	699	8.33	<2.00	37.7	<1.00	<1.00
LAWB99-SSM-W #2	2	3	H08-2	<1.00	5.99	44.4	2.18	<1.00	16.2	29.1	<1.00	<1.00	325	<1.00	<1.00	<1.00	349	1.73	<2.00	3.59	<1.00	<1.00
ORPLD1-SSM-W	2	4	H14-2	<1.00	24.6	21.7	49.9	<1.00	12.3	<1.00	<1.00	<1.00	1110	<1.00	1.72	<1.00	690	6.20	<2.00	8.83	<1.00	<1.00
High-Purity Standards SM-744-063	2	5	hpstd-21	51.7	<1.00	<1.00	<1.00	50.1	<1.00	<1.00	<1.00	20.2	135	9.94	<1.00	<1.00	10.4	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLE12-SSM-W	2	6	H09-2	<1.00	16.6	33.6	36.5	<1.00	46.0	25.3	<1.00	<1.00	813	<1.00	<1.00	<1.00	656	5.72	<2.00	12.7	<1.00	<1.00
ORPLA20-SSM-W #2	2	7	H10-2	<1.00	26.8	2.58	40.8	<1.00	34.7	<1.00	<1.00	<1.00	949	<1.00	<1.00	<1.00	581	5.91	<2.00	<1.00	<1.00	<1.00
LAWA161-SSM-W	2	8	H13-2	<1.00	24.5	14.8	1.66	<1.00	23.8	<1.00	<1.00	<1.00	772	<1.00	<1.00	<1.00	513	5.70	<2.00	5.54	<1.00	<1.00
LAWC100-SSM-W	2	9	H06-2	<1.00	20.3	28.5	1.42	<1.00	9.59	<1.00	<1.00	<1.00	960	<1.00	1.39	<1.00	709	4.61	<2.00	6.65	<1.00	<1.00
LAWA187-SSM-W	2	10	H12-2	<1.00	28.7	11.2	55.6	<1.00	33.0	<1.00	<1.00	<1.00	955	<1.00	<1.00	<1.00	637	4.27	<2.00	9.25	<1.00	<1.00
ORPLA38-1-SSM-W	2	11	H01-2	<1.00	26.9	5.38	41.5	<1.00	40.8	<1.00	<1.00	<1.00	1170	<1.00	<1.00	<1.00	738	7.69	<2.00	11.3	<1.00	<1.00
soln std	2	12	soln std 2-2	3.69	20.4	<1.00	<1.00	3.75	9.16	9.75	<1.00	<1.00	80.3	<1.00	<1.00	<1.00	<1.00	51.2	<2.00	<1.00	<1.00	<1.00
LAWA161-SSM-W #2	2	13	H17-2	<1.00	22.3	15.1	1.61	<1.00	25.2	<1.00	<1.00	<1.00	782	<1.00	<1.00	<1.00	511	3.82	<2.00	5.47	<1.00	<1.00
ORPLF7-SSM-W	2	14	H04-2	<1.00	11.4	61.7	43.7	<1.00	41.4	58.9	<1.00	<1.00	777	<1.00	<1.00	<1.00	735	5.12	<2.00	20.7	<1.00	<1.00
ORPLA20-SSM-W	2	15	H15-2	<1.00	27.4	2.57	40.6	<1.00	36.7	<1.00	<1.00	<1.00	929	<1.00	<1.00	<1.00	580	6.94	<2.00	<1.00	<1.00	<1.00
LAWB99-SSM-W	2	16	H07-2	<1.00	4.62	29.6	1.33	<1.00	9.29	19.4	<1.00	<1.00	215	<1.00	<1.00	<1.00	238	2.53	<2.00	2.45	<1.00	<1.00
blank	2	17	blank-2	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLB4-SSM-W	2	18	H05-2	<1.00	23.4	4.87	49.3	<1.00	6.26	<1.00	<1.00	<1.00	897	<1.00	6.02	<1.00	624	8.74	<2.00	32.0	<1.00	<1.00
ORPLG27-SSM-W	2	19	H16-2	<1.00	22.1	1.81	49.5	<1.00	285	<1.00	<1.00	<1.00	664	<1.00	3.26	<1.00	540	6.03	<2.00	<1.00	<1.00	<1.00

Table B-1. Measurements (mg/L) of Wash Solutions by ICP-AES (continued)

Soln ID	Block	Seq	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Mn	Na	Ni	P	Pb	S	Si	Sn	V	Zn	Zr
High-Purity Standards SM-744-063	2	20	hpstd-22	50.9	<1.00	<1.00	<1.00	49.7	<1.00	<1.00	<1.00	20.2	141	9.89	<1.00	<1.00	9.90	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLD1-ET-SSM-W	2	21	H02-2	<1.00	26.6	22.9	66.0	<1.00	11.7	<1.00	<1.00	<1.00	1000	<1.00	1.64	<1.00	699	4.48	<2.00	8.97	<1.00	<1.00
ORPLD6-SSM-W	2	22	H11-2	<1.00	20.3	16.9	60.2	<1.00	11.8	<1.00	<1.00	<1.00	997	<1.00	2.17	<1.00	687	5.74	<2.00	25.5	<1.00	<1.00
soln std	2	23	soln std 2-3	3.69	20.2	<1.00	<1.00	3.76	9.09	9.77	<1.00	<1.00	75.2	<1.00	<1.00	<1.00	<1.00	52.4	<2.00	<1.00	<1.00	<1.00
soln std	3	1	soln std 3-1	3.70	20.3	<1.00	<1.00	3.88	10.3	10.1	<1.00	<1.00	78.5	<1.00	<1.00	<1.00	<1.00	51.0	<2.00	<1.00	<1.00	<1.00
ORPLB4-SSM-W	3	2	H05-3	<1.00	24.4	4.99	49.3	<1.00	7.93	<1.00	<1.00	<1.00	1030	<1.00	6.32	<1.00	640	10.1	<2.00	31.8	<1.00	<1.00
LAWA161-SSM-W	3	3	H13-3	<1.00	22.2	15.0	1.75	<1.00	23.5	<1.00	<1.00	<1.00	774	<1.00	<1.00	<1.00	511	6.66	<2.00	5.83	<1.00	<1.00
ORPLD6-SSM-W	3	4	H11-3	<1.00	22.4	17.2	59.8	<1.00	13.6	<1.00	<1.00	<1.00	1070	<1.00	2.28	<1.00	678	7.00	<2.00	25.5	<1.00	<1.00
High-Purity Standards SM-744-063	3	5	hpstd-31	51.7	1.28	<1.00	<1.00	50.2	<1.00	<1.00	<1.00	20.8	148	10.3	<1.00	<1.00	10.1	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLE12-SSM-W	3	6	H09-3	<1.00	17.4	34.0	36.8	<1.00	44.3	26.0	<1.00	<1.00	842	<1.00	1.19	<1.00	663	6.82	<2.00	12.8	<1.00	<1.00
ORPLA20-SSM-W #2	3	7	H10-3	<1.00	25.1	2.60	40.5	<1.00	33.2	<1.00	<1.00	<1.00	865	<1.00	<1.00	<1.00	563	6.97	<2.00	<1.00	<1.00	<1.00
LAWA161-SSM-W #2	3	8	H17-3	<1.00	21.7	15.4	1.76	<1.00	24.5	<1.00	<1.00	<1.00	826	<1.00	<1.00	<1.00	511	5.10	<2.00	5.59	<1.00	<1.00
LAWB99-SSM-W	3	9	H07-3	<1.00	6.40	29.9	1.40	<1.00	11.1	19.9	<1.00	<1.00	238	<1.00	<1.00	<1.00	239	4.00	<2.00	2.62	<1.00	<1.00
ORPLG27-SSM-W	3	10	H16-3	<1.00	23.3	1.85	49.5	<1.00	283	<1.00	<1.00	<1.00	656	<1.00	3.69	<1.00	549	7.20	<2.00	<1.00	<1.00	<1.00
ORPLF7-SSM-W	3	11	H04-3	<1.00	12.4	62.3	44.0	<1.00	39.3	60.3	<1.00	<1.00	828	<1.00	<1.00	<1.00	760	6.37	<2.00	20.8	<1.00	<1.00
soln std	3	12	soln std 3-2	3.65	21.1	<1.00	<1.00	3.87	10.3	10.0	<1.00	<1.00	77.3	<1.00	<1.00	<1.00	<1.00	50.7	<2.00	<1.00	<1.00	<1.00
ORPLC5-SSM-W	3	13	H03-3	<1.00	22.8	4.06	53.9	<1.00	33.8	<1.00	<1.00	<1.00	1160	<1.00	6.51	<1.00	693	8.35	<2.00	38.0	<1.00	<1.00
ORPLD1-ET-SSM-W	3	14	H02-3	<1.00	25.5	23.2	66.0	<1.00	12.7	<1.00	<1.00	<1.00	1080	<1.00	1.81	<1.00	692	5.86	<2.00	9.38	<1.00	<1.00
ORPLA38-1-SSM-W	3	15	H01-3	<1.00	26.5	5.42	41.2	<1.00	40.3	<1.00	<1.00	<1.00	1190	<1.00	<1.00	<1.00	737	7.93	<2.00	11.4	<1.00	<1.00
LAWC100-SSM-W	3	16	H06-3	<1.00	20.4	28.8	1.55	<1.00	10.6	<1.00	<1.00	<1.00	1030	<1.00	1.99	<1.00	710	5.16	<2.00	6.83	<1.00	<1.00
blank	3	17	blank-3	<1.00	1.27	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.07	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00
ORPLD1-SSM-W	3	18	H14-3	<1.00	24.2	21.7	50.2	<1.00	12.5	<1.00	<1.00	<1.00	1140	<1.00	2.05	<1.00	718	6.98	<2.00	8.97	<1.00	<1.00
LAWB99-SSM-W #2	3	19	H08-3	<1.00	6.37	43.8	2.27	<1.00	15.7	29.4	<1.00	<1.00	360	<1.00	<1.00	<1.00	357	2.24	<2.00	3.56	<1.00	<1.00
High-Purity Standards SM-744-063	3	20	hpstd-32	50.9	1.18	<1.00	<1.00	49.4	<1.00	<1.00	<1.00	20.6	153	10.0	<1.00	<1.00	10.6	<1.00	<2.00	<1.00	<1.00	<1.00
LAWA187-SSM-W	3	21	H12-3	<1.00	28.4	11.2	55.5	<1.00	35.9	<1.00	<1.00	<1.00	1010	<1.00	<1.00	<1.00	632	5.82	<2.00	9.33	<1.00	<1.00
ORPLA20-SSM-W	3	22	H15-3	<1.00	25.3	2.58	40.4	<1.00	35.0	<1.00	<1.00	<1.00	919	<1.00	<1.00	<1.00	574	7.44	<2.00	<1.00	<1.00	<1.00
soln std	3	23	soln std 3-3	3.64	19.5	<1.00	<1.00	3.89	10.1	9.93	<1.00	<1.00	79.0	<1.00	<1.00	<1.00	<1.00	48.7	<2.00	<1.00	<1.00	<1.00

Table B-2. Measurements (mg/L) of Wash Solutions by IC

Soln ID	Block	Seq	Lab ID	Cl	F	PO4	SO4
10 ppm check std	1	1	10 ppm check std	9.99	10.0	10.4	10.5
IV-STOCK-59 1000mg/L	1	2	IV-STOCK-59 1000mg/L	1000	957	996	1020
LAWA161-SSM-W	1	3	H13-1	92.1	<10.0	<100	1540
ORPLC5-SSM-W	1	4	H03-1	69.8	<10.0	<100	2060
ORPLE12-SSM-W	1	5	H09-1	<10.0	<10.0	<100	1970
ORPLD6-SSM-W	1	6	H11-1	34.3	<10.0	<100	2020
ORPLB4-SSM-W	1	7	H05-1	<10.0	15.9	<100	1880
ORPLD1-SSM-W	1	8	H14-1	26.7	<10.0	<100	2090
ORPLF7-SSM-W	1	9	H04-1	<10.0	<10.0	<100	2170
ORPLD1-ET-SSM-W	1	10	H02-1	17.4	<10.0	<100	2070
LAWB99-SSM-W	1	11	H07-1	<10.0	<10.0	<100	753
ORPLA20-SSM-W	1	12	H15-1	54.6	<10.0	<100	1720
LAWA187-SSM-W	1	13	H12-1	64.3	<10.0	<100	1880
LAWB99-SSM-W #2	1	14	H08-1	<10.0	<10.0	<100	1090
blank	1	15	Blank-1	<10.0	<10.0	<100	<100
ORPLA38-1-SSM-W	1	16	H01-1	78.2	<10.0	<100	2220
LAWC100-SSM-W	1	17	H06-1	57.2	<10.0	<100	2040
LAWA161-SSM-W #2	1	18	H17-1	88.4	<10.0	<100	1540
ORPLG27-SSM-W	1	19	H16-1	18.0	<10.0	<100	1650
ORPLA20-SSM-W #2	1	20	H10-1	54.8	<10.0	<100	1710
10 ppm check std	1	21	10 ppm check std	9.92	9.90	10.1	10.4
10 ppm check std	2	1	10 ppm check std	10.1	10.1	10.3	10.5
IV-STOCK-59 1000mg/L	2	2	IV-STOCK-59 1000mg/L	1010	965	985	1030
LAWB99-SSM-W	2	3	H07-2	<10.0	<10.0	<100	759
ORPLA20-SSM-W #2	2	4	H10-2	55.4	<10.0	<100	1720
ORPLB4-SSM-W	2	5	H05-2	<10.0	15.9	<100	1880
ORPLD1-SSM-W	2	6	H14-2	24.9	<10.0	<100	2100
ORPLD6-SSM-W	2	7	H11-2	33.1	<10.0	<100	2040
ORPLA20-SSM-W	2	8	H15-2	53.6	<10.0	<100	1730
ORPLC5-SSM-W	2	9	H03-2	65.2	<10.0	<100	2070
ORPLF7-SSM-W	2	10	H04-2	<10.0	<10.0	<100	2190
ORPLG27-SSM-W	2	11	H16-2	17.5	<10.0	<100	1660
LAWA161-SSM-W	2	12	H13-2	88.2	<10.0	<100	1550
ORPLA38-1-SSM-W	2	13	H01-2	77.9	<10.0	<100	2230
LAWC100-SSM-W	2	14	H06-2	57.3	<10.0	<100	2070
blank	2	15	Blank-2	<10.0	<10.0	<100	<100
LAWB99-SSM-W #2	2	16	H08-2	<10.0	<10.0	<100	1090
LAWA161-SSM-W #2	2	17	H17-2	86.4	<10.0	<100	1490
LAWA187-SSM-W	2	18	H12-2	63.0	<10.0	<100	1840
ORPLE12-SSM-W	2	19	H09-2	<10.0	<10.0	<100	1920
ORPLD1-ET-SSM-W	2	20	H02-2	16.6	<10.0	<100	2030
10 ppm check std	2	21	10 ppm check std	9.96	9.97	10.1	10.0
10 ppm check std	3	1	10 ppm check std	10.1	10.1	10.3	10.0
IV-STOCK-59 1000mg/L	3	2	IV-STOCK-59 1000mg/L	964	969	974	980
LAWA187-SSM-W	3	3	H12-3	68.4	<10.0	<100	1840
ORPLA20-SSM-W	3	4	H15-3	55.5	<10.0	<100	1690
ORPLD6-SSM-W	3	5	H11-3	33.1	<10.0	<100	2000
ORPLG27-SSM-W	3	6	H16-3	18.1	<10.0	<100	1620
ORPLD1-ET-SSM-W	3	7	H02-3	16.8	<10.0	<100	2040
ORPLE12-SSM-W	3	8	H09-3	<10.0	<10.0	<100	1930
ORPLA20-SSM-W #2	3	9	H10-3	54.1	<10.0	<100	1690
ORPLD1-SSM-W	3	10	H14-3	25.5	<10.0	<100	2060
LAWB99-SSM-W	3	11	H07-3	<10.0	<10.0	<100	717
ORPLC5-SSM-W	3	12	H03-3	66.2	<10.0	<100	2020
ORPLA38-1-SSM-W	3	13	H01-3	78.3	<10.0	<100	2200
ORPLB4-SSM-W	3	14	H05-3	<10.0	15.1	<100	1860
blank	3	15	Blank-3	<10.0	<10.0	<100	<100

Table B-2. Measurements (mg/L) of Wash Solutions by IC (continued)

Soln ID	Block	Seq	Lab ID	Cl	F	PO4	SO4
LAWA161-SSM-W	3	16	H13-3	88.8	<10.0	<100	1510
LAWC100-SSM-W	3	17	H06-3	58.0	<10.0	<100	2040
LAWA161-SSM-W #2	3	18	H17-3	88.2	<10.0	<100	1510
LAWB99-SSM-W #2	3	19	H08-3	<10.0	<10.0	<100	1060
ORPLF7-SSM-W	3	20	H04-3	<10.0	<10.0	<100	2160
10 ppm check std	3	21	10 ppm check std	9.90	9.99	10.2	10.0

Table B-3. Results for Standards Utilized During the Measurement of the Wash Solutions

Solution ID	Analyte	Instrument	Reference Value (mg/L)	Mean (mg/L)	Number of Measurements
10 ppm check std	Cl	IC	10	10.00	6
10 ppm check std	F	IC	10	10.01	6
10 ppm check std	PO4	IC	10	10.23	6
10 ppm check std	SO4	IC	10	10.23	6
High-Purity Standards SM-744-063	Ni	ICP-AES	10	10.22	6
High-Purity Standards SM-744-063	S	ICP-AES	10	10.25	6
High-Purity Standards SM-744-063	Mn	ICP-AES	20	20.62	6
High-Purity Standards SM-744-063	Al	ICP-AES	50	51.52	6
High-Purity Standards SM-744-063	Fe	ICP-AES	50	50.13	6
High-Purity Standards SM-744-063	Na	ICP-AES	150	144.67	6
IV-STOCK-59 1000mg/L	Cl	IC	1000	991.33	3
IV-STOCK-59 1000mg/L	F	IC	1000	963.67	3
IV-STOCK-59 1000mg/L	PO4	IC	1000	985.00	3
IV-STOCK-59 1000mg/L	SO4	IC	1000	1010.00	3
soln std	Al	ICP-AES	4	3.72	9
soln std	Fe	ICP-AES	4	3.88	9
soln std	K	ICP-AES	10	9.71	9
soln std	Li	ICP-AES	10	9.92	9
soln std	B	ICP-AES	20	19.78	9
soln std	Si	ICP-AES	50	50.54	9
soln std	Na	ICP-AES	81	78.52	9

Table B-4. Average Measurements (mg/L) for the Wash Solutions

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
LAWA161-SSM-W	Al	ICP	0	1.0
LAWA161-SSM-W	B	ICP	1	22.6
LAWA161-SSM-W	Ca	ICP	1	15.0
LAWA161-SSM-W	Cl	IC	1	89.7
LAWA161-SSM-W	Cr	ICP	1	1.7
LAWA161-SSM-W	F	IC	0	10.0
LAWA161-SSM-W	Fe	ICP	0	1.0
LAWA161-SSM-W	K	ICP	1	24.0
LAWA161-SSM-W	Li	ICP	0	1.0
LAWA161-SSM-W	Mg	ICP	0	1.0
LAWA161-SSM-W	Mn	ICP	0	1.0
LAWA161-SSM-W	Na	ICP	1	788.7
LAWA161-SSM-W	Ni	ICP	0	1.0
LAWA161-SSM-W	P	ICP	0	1.0
LAWA161-SSM-W	Pb	ICP	0	1.0
LAWA161-SSM-W	PO4	IC	0	100.0
LAWA161-SSM-W	PO4	ICP	0	3.1
LAWA161-SSM-W	S	ICP	1	502.0
LAWA161-SSM-W	Si	ICP	1	5.7
LAWA161-SSM-W	Sn	ICP	0	2.0
LAWA161-SSM-W	SO4	IC	1	1533.3
LAWA161-SSM-W	SO4	ICP	1	1503.9
LAWA161-SSM-W	V	ICP	1	5.8
LAWA161-SSM-W	Zn	ICP	0	1.0
LAWA161-SSM-W	Zr	ICP	0	1.0
LAWA161-SSM-W #2	Al	ICP	0	1.0
LAWA161-SSM-W #2	B	ICP	1	21.4
LAWA161-SSM-W #2	Ca	ICP	1	15.5
LAWA161-SSM-W #2	Cl	IC	1	87.7
LAWA161-SSM-W #2	Cr	ICP	1	1.7
LAWA161-SSM-W #2	F	IC	0	10.0
LAWA161-SSM-W #2	Fe	ICP	0	1.0
LAWA161-SSM-W #2	K	ICP	1	24.2
LAWA161-SSM-W #2	Li	ICP	0	1.0
LAWA161-SSM-W #2	Mg	ICP	0	1.0
LAWA161-SSM-W #2	Mn	ICP	0	1.0
LAWA161-SSM-W #2	Na	ICP	1	792.7
LAWA161-SSM-W #2	Ni	ICP	0	1.0
LAWA161-SSM-W #2	P	ICP	0	1.0
LAWA161-SSM-W #2	Pb	ICP	0	1.0
LAWA161-SSM-W #2	PO4	IC	0	100.0
LAWA161-SSM-W #2	PO4	ICP	0	3.1
LAWA161-SSM-W #2	S	ICP	1	508.3
LAWA161-SSM-W #2	Si	ICP	1	4.0
LAWA161-SSM-W #2	Sn	ICP	0	2.0
LAWA161-SSM-W #2	SO4	IC	1	1513.3
LAWA161-SSM-W #2	SO4	ICP	1	1522.9
LAWA161-SSM-W #2	V	ICP	1	5.7
LAWA161-SSM-W #2	Zn	ICP	0	1.0
LAWA161-SSM-W #2	Zr	ICP	0	1.0
LAWA187-SSM-W	Al	ICP	0	1.0
LAWA187-SSM-W	B	ICP	1	28.8
LAWA187-SSM-W	Ca	ICP	1	11.3
LAWA187-SSM-W	Cl	IC	1	65.2
LAWA187-SSM-W	Cr	ICP	1	55.8
LAWA187-SSM-W	F	IC	0	10.0
LAWA187-SSM-W	Fe	ICP	0	1.0
LAWA187-SSM-W	K	ICP	1	34.7

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
LAWA187-SSM-W	Li	ICP	0	1.0
LAWA187-SSM-W	Mg	ICP	0	1.0
LAWA187-SSM-W	Mn	ICP	0	1.0
LAWA187-SSM-W	Na	ICP	1	991.7
LAWA187-SSM-W	Ni	ICP	0	1.0
LAWA187-SSM-W	P	ICP	0	1.0
LAWA187-SSM-W	Pb	ICP	0	1.0
LAWA187-SSM-W	PO4	IC	0	100.0
LAWA187-SSM-W	PO4	ICP	0	3.1
LAWA187-SSM-W	S	ICP	1	630.3
LAWA187-SSM-W	Si	ICP	1	4.6
LAWA187-SSM-W	Sn	ICP	0	2.0
LAWA187-SSM-W	SO4	IC	1	1853.3
LAWA187-SSM-W	SO4	ICP	1	1888.4
LAWA187-SSM-W	V	ICP	1	9.4
LAWA187-SSM-W	Zn	ICP	0	1.0
LAWA187-SSM-W	Zr	ICP	0	1.0
LAWB99-SSM-W	Al	ICP	0	1.0
LAWB99-SSM-W	B	ICP	1	5.2
LAWB99-SSM-W	Ca	ICP	1	30.0
LAWB99-SSM-W	Cl	IC	0	10.0
LAWB99-SSM-W	Cr	ICP	1	1.4
LAWB99-SSM-W	F	IC	0	10.0
LAWB99-SSM-W	Fe	ICP	0	1.0
LAWB99-SSM-W	K	ICP	1	10.3
LAWB99-SSM-W	Li	ICP	1	19.6
LAWB99-SSM-W	Mg	ICP	0	1.0
LAWB99-SSM-W	Mn	ICP	0	1.0
LAWB99-SSM-W	Na	ICP	1	228.3
LAWB99-SSM-W	Ni	ICP	0	1.0
LAWB99-SSM-W	P	ICP	0	1.0
LAWB99-SSM-W	Pb	ICP	0	1.0
LAWB99-SSM-W	PO4	IC	0	100.0
LAWB99-SSM-W	PO4	ICP	0	3.1
LAWB99-SSM-W	S	ICP	1	234.3
LAWB99-SSM-W	Si	ICP	1	2.9
LAWB99-SSM-W	Sn	ICP	0	2.0
LAWB99-SSM-W	SO4	IC	1	743.0
LAWB99-SSM-W	SO4	ICP	1	702.0
LAWB99-SSM-W	V	ICP	1	2.6
LAWB99-SSM-W	Zn	ICP	0	1.0
LAWB99-SSM-W	Zr	ICP	0	1.0
LAWB99-SSM-W #2	Al	ICP	0	1.0
LAWB99-SSM-W #2	B	ICP	1	5.8
LAWB99-SSM-W #2	Ca	ICP	1	44.9
LAWB99-SSM-W #2	Cl	IC	0	10.0
LAWB99-SSM-W #2	Cr	ICP	1	2.3
LAWB99-SSM-W #2	F	IC	0	10.0
LAWB99-SSM-W #2	Fe	ICP	0	1.0
LAWB99-SSM-W #2	K	ICP	1	15.9
LAWB99-SSM-W #2	Li	ICP	1	29.3
LAWB99-SSM-W #2	Mg	ICP	0	1.0
LAWB99-SSM-W #2	Mn	ICP	0	1.0
LAWB99-SSM-W #2	Na	ICP	1	335.3
LAWB99-SSM-W #2	Ni	ICP	0	1.0
LAWB99-SSM-W #2	P	ICP	0	1.0
LAWB99-SSM-W #2	Pb	ICP	0	1.0
LAWB99-SSM-W #2	PO4	IC	0	100.0
LAWB99-SSM-W #2	PO4	ICP	0	3.1

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
LAWB99-SSM-W #2	S	ICP	1	348.0
LAWB99-SSM-W #2	Si	ICP	0	1.7
LAWB99-SSM-W #2	Sn	ICP	0	2.0
LAWB99-SSM-W #2	SO4	IC	1	1080.0
LAWB99-SSM-W #2	SO4	ICP	1	1042.6
LAWB99-SSM-W #2	V	ICP	1	3.7
LAWB99-SSM-W #2	Zn	ICP	0	1.0
LAWB99-SSM-W #2	Zr	ICP	0	1.0
LAWC100-SSM-W	Al	ICP	0	1.0
LAWC100-SSM-W	B	ICP	1	20.6
LAWC100-SSM-W	Ca	ICP	1	28.9
LAWC100-SSM-W	Cl	IC	1	57.5
LAWC100-SSM-W	Cr	ICP	1	1.5
LAWC100-SSM-W	F	IC	0	10.0
LAWC100-SSM-W	Fe	ICP	0	1.0
LAWC100-SSM-W	K	ICP	1	10.2
LAWC100-SSM-W	Li	ICP	0	1.0
LAWC100-SSM-W	Mg	ICP	0	1.0
LAWC100-SSM-W	Mn	ICP	0	1.0
LAWC100-SSM-W	Na	ICP	1	1010.0
LAWC100-SSM-W	Ni	ICP	0	1.0
LAWC100-SSM-W	P	ICP	1	1.8
LAWC100-SSM-W	Pb	ICP	0	1.0
LAWC100-SSM-W	PO4	IC	0	100.0
LAWC100-SSM-W	PO4	ICP	1	5.4
LAWC100-SSM-W	S	ICP	1	695.7
LAWC100-SSM-W	Si	ICP	1	4.6
LAWC100-SSM-W	Sn	ICP	0	2.0
LAWC100-SSM-W	SO4	IC	1	2050.0
LAWC100-SSM-W	SO4	ICP	1	2084.1
LAWC100-SSM-W	V	ICP	1	6.9
LAWC100-SSM-W	Zn	ICP	0	1.0
LAWC100-SSM-W	Zr	ICP	0	1.0
ORPLA20-SSM-W	Al	ICP	0	1.0
ORPLA20-SSM-W	B	ICP	1	25.5
ORPLA20-SSM-W	Ca	ICP	1	2.6
ORPLA20-SSM-W	Cl	IC	1	54.6
ORPLA20-SSM-W	Cr	ICP	1	40.7
ORPLA20-SSM-W	F	IC	0	10.0
ORPLA20-SSM-W	Fe	ICP	0	1.0
ORPLA20-SSM-W	K	ICP	1	34.9
ORPLA20-SSM-W	Li	ICP	0	1.0
ORPLA20-SSM-W	Mg	ICP	0	1.0
ORPLA20-SSM-W	Mn	ICP	0	1.0
ORPLA20-SSM-W	Na	ICP	1	919.7
ORPLA20-SSM-W	Ni	ICP	0	1.0
ORPLA20-SSM-W	P	ICP	0	1.0
ORPLA20-SSM-W	Pb	ICP	0	1.0
ORPLA20-SSM-W	PO4	IC	0	100.0
ORPLA20-SSM-W	PO4	ICP	0	3.1
ORPLA20-SSM-W	S	ICP	1	571.7
ORPLA20-SSM-W	Si	ICP	1	6.1
ORPLA20-SSM-W	Sn	ICP	0	2.0
ORPLA20-SSM-W	SO4	IC	1	1713.3
ORPLA20-SSM-W	SO4	ICP	1	1712.7
ORPLA20-SSM-W	V	ICP	0	1.0
ORPLA20-SSM-W	Zn	ICP	0	1.0
ORPLA20-SSM-W	Zr	ICP	0	1.0
ORPLA20-SSM-W #2	Al	ICP	0	1.0

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
ORPLA20-SSM-W #2	B	ICP	1	24.7
ORPLA20-SSM-W #2	Ca	ICP	1	2.6
ORPLA20-SSM-W #2	Cl	IC	1	54.8
ORPLA20-SSM-W #2	Cr	ICP	1	40.9
ORPLA20-SSM-W #2	F	IC	0	10.0
ORPLA20-SSM-W #2	Fe	ICP	0	1.0
ORPLA20-SSM-W #2	K	ICP	1	33.5
ORPLA20-SSM-W #2	Li	ICP	0	1.0
ORPLA20-SSM-W #2	Mg	ICP	0	1.0
ORPLA20-SSM-W #2	Mn	ICP	0	1.0
ORPLA20-SSM-W #2	Na	ICP	1	908.3
ORPLA20-SSM-W #2	Ni	ICP	0	1.0
ORPLA20-SSM-W #2	P	ICP	0	1.0
ORPLA20-SSM-W #2	Pb	ICP	0	1.0
ORPLA20-SSM-W #2	PO4	IC	0	100.0
ORPLA20-SSM-W #2	PO4	ICP	0	3.1
ORPLA20-SSM-W #2	S	ICP	1	568.0
ORPLA20-SSM-W #2	Si	ICP	1	5.7
ORPLA20-SSM-W #2	Sn	ICP	0	2.0
ORPLA20-SSM-W #2	SO4	IC	1	1706.7
ORPLA20-SSM-W #2	SO4	ICP	1	1701.7
ORPLA20-SSM-W #2	V	ICP	0	1.0
ORPLA20-SSM-W #2	Zn	ICP	0	1.0
ORPLA20-SSM-W #2	Zr	ICP	0	1.0
ORPLA38-1-SSM-W	Al	ICP	0	1.0
ORPLA38-1-SSM-W	B	ICP	1	27.0
ORPLA38-1-SSM-W	Ca	ICP	1	5.5
ORPLA38-1-SSM-W	Cl	IC	1	78.1
ORPLA38-1-SSM-W	Cr	ICP	1	41.6
ORPLA38-1-SSM-W	F	IC	0	10.0
ORPLA38-1-SSM-W	Fe	ICP	0	1.0
ORPLA38-1-SSM-W	K	ICP	1	41.3
ORPLA38-1-SSM-W	Li	ICP	0	1.0
ORPLA38-1-SSM-W	Mg	ICP	0	1.0
ORPLA38-1-SSM-W	Mn	ICP	0	1.0
ORPLA38-1-SSM-W	Na	ICP	1	1186.7
ORPLA38-1-SSM-W	Ni	ICP	0	1.0
ORPLA38-1-SSM-W	P	ICP	0	1.0
ORPLA38-1-SSM-W	Pb	ICP	0	1.0
ORPLA38-1-SSM-W	PO4	IC	0	100.0
ORPLA38-1-SSM-W	PO4	ICP	0	3.1
ORPLA38-1-SSM-W	S	ICP	1	727.0
ORPLA38-1-SSM-W	Si	ICP	1	7.8
ORPLA38-1-SSM-W	Sn	ICP	0	2.0
ORPLA38-1-SSM-W	SO4	IC	1	2216.7
ORPLA38-1-SSM-W	SO4	ICP	1	2178.0
ORPLA38-1-SSM-W	V	ICP	1	11.4
ORPLA38-1-SSM-W	Zn	ICP	0	1.0
ORPLA38-1-SSM-W	Zr	ICP	0	1.0
ORPLB4-SSM-W	Al	ICP	0	1.0
ORPLB4-SSM-W	B	ICP	1	23.0
ORPLB4-SSM-W	Ca	ICP	1	5.0
ORPLB4-SSM-W	Cl	IC	0	10.0
ORPLB4-SSM-W	Cr	ICP	1	49.6
ORPLB4-SSM-W	F	IC	1	15.6
ORPLB4-SSM-W	Fe	ICP	0	1.0
ORPLB4-SSM-W	K	ICP	1	7.0
ORPLB4-SSM-W	Li	ICP	0	1.0
ORPLB4-SSM-W	Mg	ICP	0	1.0

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
ORPLB4-SSM-W	Mn	ICP	0	1.0
ORPLB4-SSM-W	Na	ICP	1	1002.3
ORPLB4-SSM-W	Ni	ICP	0	1.0
ORPLB4-SSM-W	P	ICP	1	6.4
ORPLB4-SSM-W	Pb	ICP	0	1.0
ORPLB4-SSM-W	PO4	IC	0	100.0
ORPLB4-SSM-W	PO4	ICP	1	19.5
ORPLB4-SSM-W	S	ICP	1	631.3
ORPLB4-SSM-W	Si	ICP	1	8.3
ORPLB4-SSM-W	Sn	ICP	0	2.0
ORPLB4-SSM-W	SO4	IC	1	1873.3
ORPLB4-SSM-W	SO4	ICP	1	1891.4
ORPLB4-SSM-W	V	ICP	1	32.2
ORPLB4-SSM-W	Zn	ICP	0	1.0
ORPLB4-SSM-W	Zr	ICP	0	1.0
ORPLC5-SSM-W	Al	ICP	0	1.0
ORPLC5-SSM-W	B	ICP	1	22.3
ORPLC5-SSM-W	Ca	ICP	1	4.1
ORPLC5-SSM-W	Cl	IC	1	67.1
ORPLC5-SSM-W	Cr	ICP	1	54.1
ORPLC5-SSM-W	F	IC	0	10.0
ORPLC5-SSM-W	Fe	ICP	0	1.0
ORPLC5-SSM-W	K	ICP	1	32.8
ORPLC5-SSM-W	Li	ICP	0	1.0
ORPLC5-SSM-W	Mg	ICP	0	1.0
ORPLC5-SSM-W	Mn	ICP	0	1.0
ORPLC5-SSM-W	Na	ICP	1	1206.7
ORPLC5-SSM-W	Ni	ICP	0	1.0
ORPLC5-SSM-W	P	ICP	1	6.5
ORPLC5-SSM-W	Pb	ICP	0	1.0
ORPLC5-SSM-W	PO4	IC	0	100.0
ORPLC5-SSM-W	PO4	ICP	1	19.9
ORPLC5-SSM-W	S	ICP	1	698.3
ORPLC5-SSM-W	Si	ICP	1	7.6
ORPLC5-SSM-W	Sn	ICP	0	2.0
ORPLC5-SSM-W	SO4	IC	1	2050.0
ORPLC5-SSM-W	SO4	ICP	1	2092.1
ORPLC5-SSM-W	V	ICP	1	38.3
ORPLC5-SSM-W	Zn	ICP	0	1.0
ORPLC5-SSM-W	Zr	ICP	0	1.0
ORPLD1-ET-SSM-W	Al	ICP	0	1.0
ORPLD1-ET-SSM-W	B	ICP	1	26.0
ORPLD1-ET-SSM-W	Ca	ICP	1	23.4
ORPLD1-ET-SSM-W	Cl	IC	1	16.9
ORPLD1-ET-SSM-W	Cr	ICP	1	66.4
ORPLD1-ET-SSM-W	F	IC	0	10.0
ORPLD1-ET-SSM-W	Fe	ICP	0	1.0
ORPLD1-ET-SSM-W	K	ICP	1	12.4
ORPLD1-ET-SSM-W	Li	ICP	0	1.0
ORPLD1-ET-SSM-W	Mg	ICP	0	1.0
ORPLD1-ET-SSM-W	Mn	ICP	0	1.0
ORPLD1-ET-SSM-W	Na	ICP	1	1060.0
ORPLD1-ET-SSM-W	Ni	ICP	0	1.0
ORPLD1-ET-SSM-W	P	ICP	1	1.8
ORPLD1-ET-SSM-W	Pb	ICP	0	1.0
ORPLD1-ET-SSM-W	PO4	IC	0	100.0
ORPLD1-ET-SSM-W	PO4	ICP	1	5.6
ORPLD1-ET-SSM-W	S	ICP	1	686.7
ORPLD1-ET-SSM-W	Si	ICP	1	4.7

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
ORPLD1-ET-SSM-W	Sn	ICP	0	2.0
ORPLD1-ET-SSM-W	SO4	IC	1	2046.7
ORPLD1-ET-SSM-W	SO4	ICP	1	2057.2
ORPLD1-ET-SSM-W	V	ICP	1	9.3
ORPLD1-ET-SSM-W	Zn	ICP	0	1.0
ORPLD1-ET-SSM-W	Zr	ICP	0	1.0
ORPLD1-SSM-W	Al	ICP	0	1.0
ORPLD1-SSM-W	B	ICP	1	23.6
ORPLD1-SSM-W	Ca	ICP	1	21.9
ORPLD1-SSM-W	Cl	IC	1	25.7
ORPLD1-SSM-W	Cr	ICP	1	50.2
ORPLD1-SSM-W	F	IC	0	10.0
ORPLD1-SSM-W	Fe	ICP	0	1.0
ORPLD1-SSM-W	K	ICP	1	12.3
ORPLD1-SSM-W	Li	ICP	0	1.0
ORPLD1-SSM-W	Mg	ICP	0	1.0
ORPLD1-SSM-W	Mn	ICP	0	1.0
ORPLD1-SSM-W	Na	ICP	1	1086.7
ORPLD1-SSM-W	Ni	ICP	0	1.0
ORPLD1-SSM-W	P	ICP	1	1.9
ORPLD1-SSM-W	Pb	ICP	0	1.0
ORPLD1-SSM-W	PO4	IC	0	100.0
ORPLD1-SSM-W	PO4	ICP	1	5.8
ORPLD1-SSM-W	S	ICP	1	697.7
ORPLD1-SSM-W	Si	ICP	1	6.0
ORPLD1-SSM-W	Sn	ICP	0	2.0
ORPLD1-SSM-W	SO4	IC	1	2083.3
ORPLD1-SSM-W	SO4	ICP	1	2090.1
ORPLD1-SSM-W	V	ICP	1	9.0
ORPLD1-SSM-W	Zn	ICP	0	1.0
ORPLD1-SSM-W	Zr	ICP	0	1.0
ORPLD6-SSM-W	Al	ICP	0	1.0
ORPLD6-SSM-W	B	ICP	1	21.6
ORPLD6-SSM-W	Ca	ICP	1	17.2
ORPLD6-SSM-W	Cl	IC	1	33.5
ORPLD6-SSM-W	Cr	ICP	1	60.2
ORPLD6-SSM-W	F	IC	0	10.0
ORPLD6-SSM-W	Fe	ICP	0	1.0
ORPLD6-SSM-W	K	ICP	1	12.6
ORPLD6-SSM-W	Li	ICP	0	1.0
ORPLD6-SSM-W	Mg	ICP	0	1.0
ORPLD6-SSM-W	Mn	ICP	0	1.0
ORPLD6-SSM-W	Na	ICP	1	1035.7
ORPLD6-SSM-W	Ni	ICP	0	1.0
ORPLD6-SSM-W	P	ICP	1	2.3
ORPLD6-SSM-W	Pb	ICP	0	1.0
ORPLD6-SSM-W	PO4	IC	0	100.0
ORPLD6-SSM-W	PO4	ICP	1	7.1
ORPLD6-SSM-W	S	ICP	1	684.3
ORPLD6-SSM-W	Si	ICP	1	6.0
ORPLD6-SSM-W	Sn	ICP	0	2.0
ORPLD6-SSM-W	SO4	IC	1	2020.0
ORPLD6-SSM-W	SO4	ICP	1	2050.2
ORPLD6-SSM-W	V	ICP	1	25.7
ORPLD6-SSM-W	Zn	ICP	0	1.0
ORPLD6-SSM-W	Zr	ICP	0	1.0
ORPLE12-SSM-W	Al	ICP	0	1.0
ORPLE12-SSM-W	B	ICP	1	16.6
ORPLE12-SSM-W	Ca	ICP	1	34.5

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
ORPLE12-SSM-W	Cl	IC	0	10.0
ORPLE12-SSM-W	Cr	ICP	1	37.0
ORPLE12-SSM-W	F	IC	0	10.0
ORPLE12-SSM-W	Fe	ICP	0	1.0
ORPLE12-SSM-W	K	ICP	1	44.5
ORPLE12-SSM-W	Li	ICP	1	25.8
ORPLE12-SSM-W	Mg	ICP	0	1.0
ORPLE12-SSM-W	Mn	ICP	0	1.0
ORPLE12-SSM-W	Na	ICP	1	851.7
ORPLE12-SSM-W	Ni	ICP	0	1.0
ORPLE12-SSM-W	P	ICP	0	1.1
ORPLE12-SSM-W	Pb	ICP	0	1.0
ORPLE12-SSM-W	PO4	IC	0	100.0
ORPLE12-SSM-W	PO4	ICP	0	3.4
ORPLE12-SSM-W	S	ICP	1	658.3
ORPLE12-SSM-W	Si	ICP	1	5.8
ORPLE12-SSM-W	Sn	ICP	0	2.0
ORPLE12-SSM-W	SO4	IC	1	1940.0
ORPLE12-SSM-W	SO4	ICP	1	1972.3
ORPLE12-SSM-W	V	ICP	1	13.0
ORPLE12-SSM-W	Zn	ICP	0	1.0
ORPLE12-SSM-W	Zr	ICP	0	1.0
ORPLF7-SSM-W	Al	ICP	0	1.0
ORPLF7-SSM-W	B	ICP	1	11.8
ORPLF7-SSM-W	Ca	ICP	1	62.7
ORPLF7-SSM-W	Cl	IC	0	10.0
ORPLF7-SSM-W	Cr	ICP	1	44.2
ORPLF7-SSM-W	F	IC	0	10.0
ORPLF7-SSM-W	Fe	ICP	0	1.0
ORPLF7-SSM-W	K	ICP	1	40.7
ORPLF7-SSM-W	Li	ICP	1	59.4
ORPLF7-SSM-W	Mg	ICP	0	1.0
ORPLF7-SSM-W	Mn	ICP	0	1.0
ORPLF7-SSM-W	Na	ICP	1	801.0
ORPLF7-SSM-W	Ni	ICP	0	1.0
ORPLF7-SSM-W	P	ICP	0	1.0
ORPLF7-SSM-W	Pb	ICP	0	1.0
ORPLF7-SSM-W	PO4	IC	0	100.0
ORPLF7-SSM-W	PO4	ICP	0	3.1
ORPLF7-SSM-W	S	ICP	1	738.0
ORPLF7-SSM-W	Si	ICP	1	5.4
ORPLF7-SSM-W	Sn	ICP	0	2.0
ORPLF7-SSM-W	SO4	IC	1	2173.3
ORPLF7-SSM-W	SO4	ICP	1	2211.0
ORPLF7-SSM-W	V	ICP	1	21.1
ORPLF7-SSM-W	Zn	ICP	0	1.0
ORPLF7-SSM-W	Zr	ICP	0	1.0
ORPLG27-SSM-W	Al	ICP	0	1.0
ORPLG27-SSM-W	B	ICP	1	21.0
ORPLG27-SSM-W	Ca	ICP	1	1.9
ORPLG27-SSM-W	Cl	IC	1	17.9
ORPLG27-SSM-W	Cr	ICP	1	49.7
ORPLG27-SSM-W	F	IC	0	10.0
ORPLG27-SSM-W	Fe	ICP	0	1.0
ORPLG27-SSM-W	K	ICP	1	291.0
ORPLG27-SSM-W	Li	ICP	0	1.0
ORPLG27-SSM-W	Mg	ICP	0	1.0
ORPLG27-SSM-W	Mn	ICP	0	1.0
ORPLG27-SSM-W	Na	ICP	1	681.0

Table B-4. Average Measurements (mg/L) for the Wash Solutions (continued)

Soln ID	Analyte	Analysis Method	BDL Indicator (0=>BDL)	Mean Measured Value (mg/L)
ORPLG27-SSM-W	Ni	ICP	0	1.0
ORPLG27-SSM-W	P	ICP	1	3.6
ORPLG27-SSM-W	Pb	ICP	0	1.0
ORPLG27-SSM-W	PO4	IC	0	100.0
ORPLG27-SSM-W	PO4	ICP	1	11.0
ORPLG27-SSM-W	S	ICP	1	547.3
ORPLG27-SSM-W	Si	ICP	1	5.7
ORPLG27-SSM-W	Sn	ICP	0	2.0
ORPLG27-SSM-W	SO4	IC	1	1643.3
ORPLG27-SSM-W	SO4	ICP	1	1639.8
ORPLG27-SSM-W	V	ICP	0	1.0
ORPLG27-SSM-W	Zn	ICP	0	1.0
ORPLG27-SSM-W	Zr	ICP	0	1.0

Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence

Analyte=Al (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

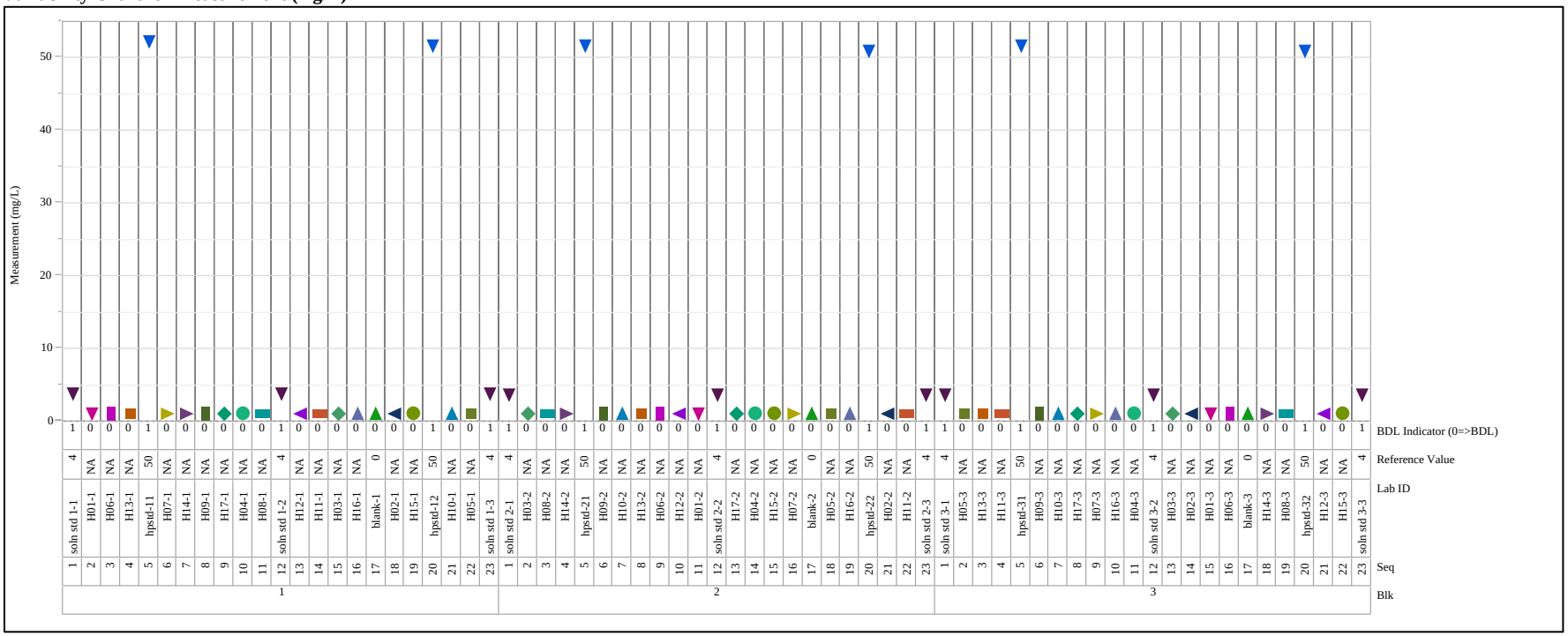


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=B (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

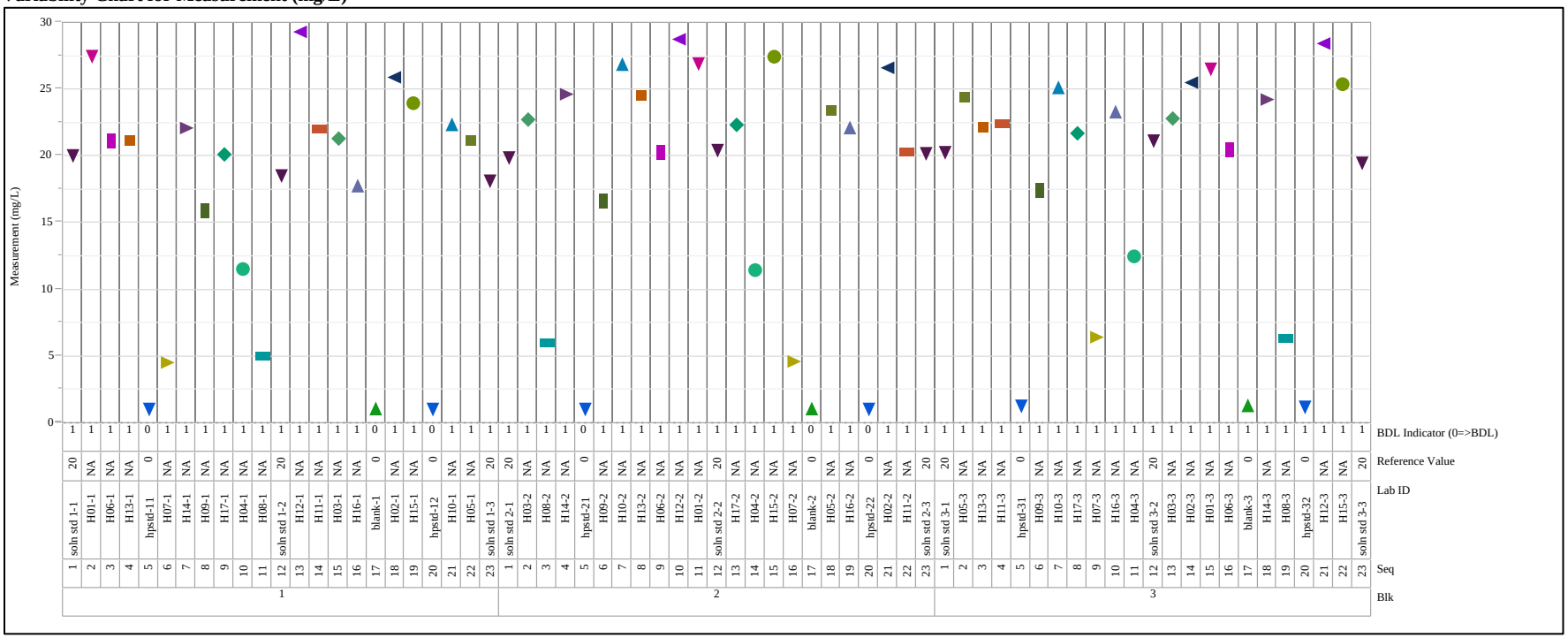


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Ca (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

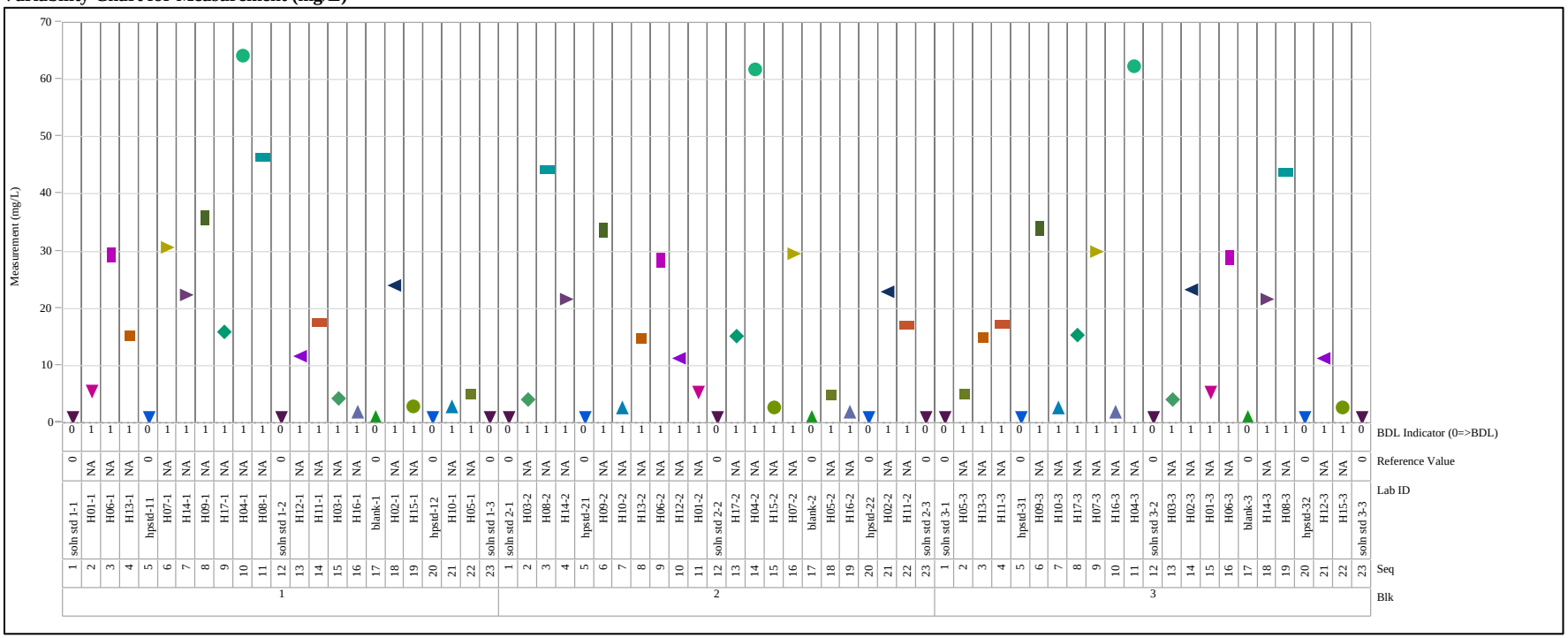


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Cl (mg/L), Analysis=IC
Variability Chart for Measurement (mg/L)

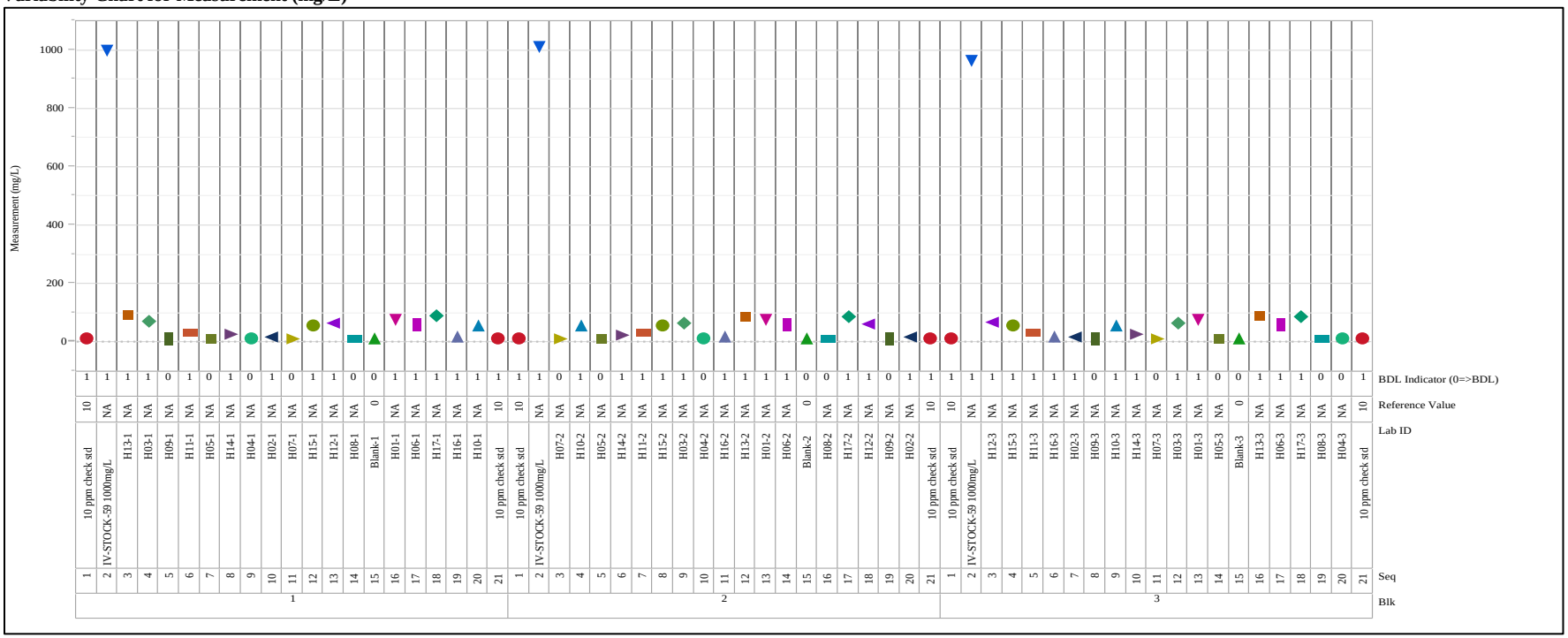


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Cr (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

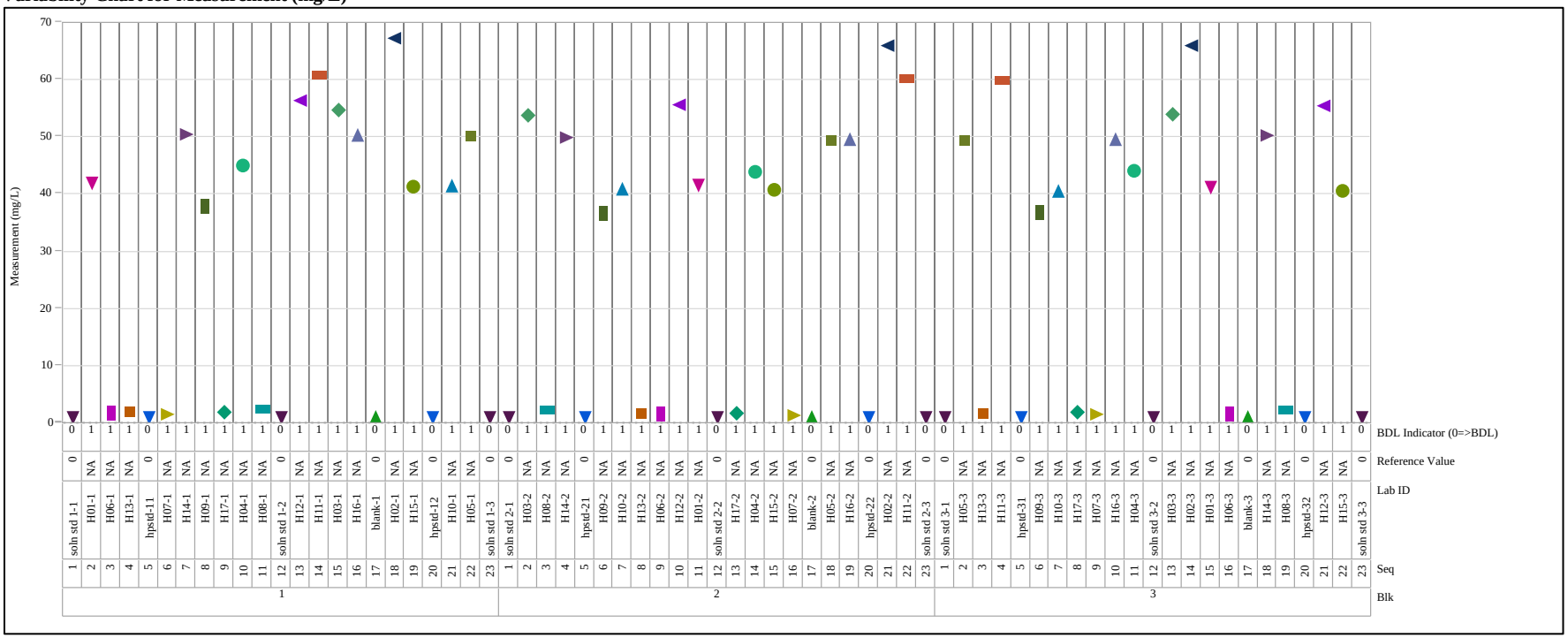


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=F (mg/L), Analysis=IC
Variability Chart for Measurement (mg/L)

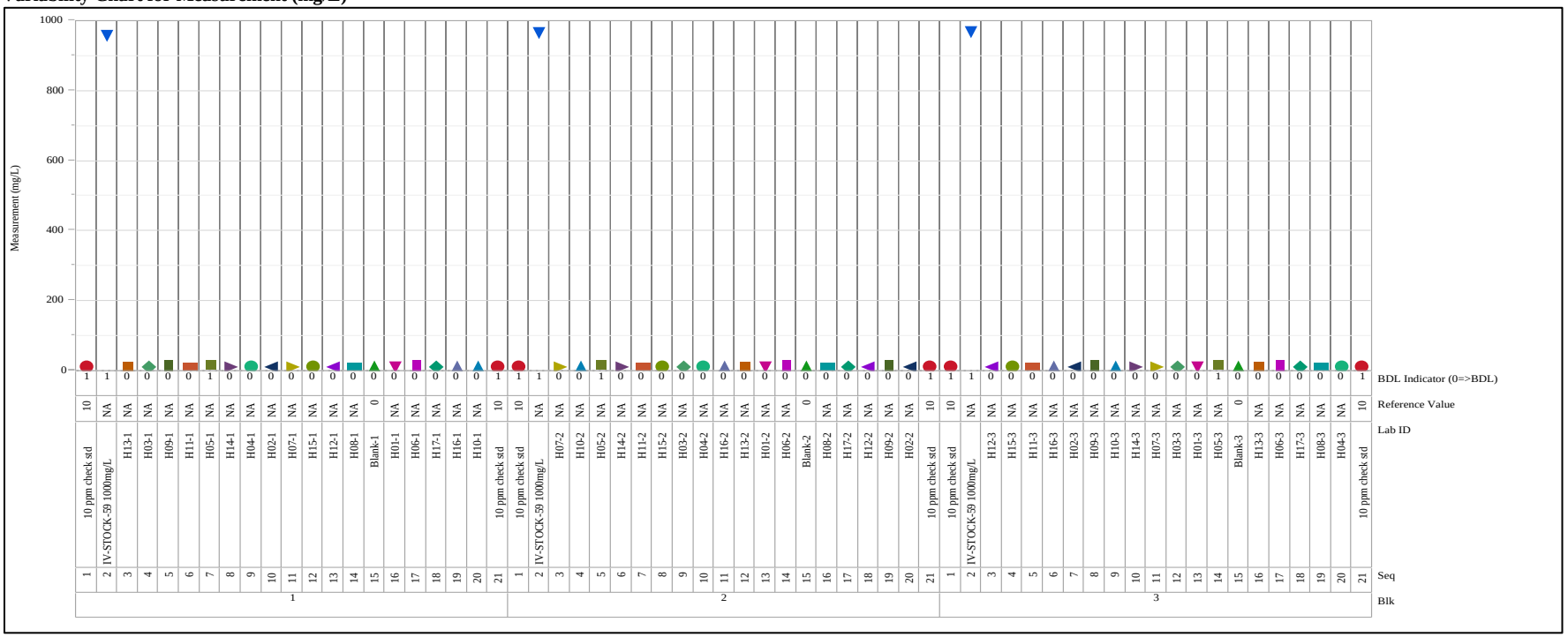


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Fe (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

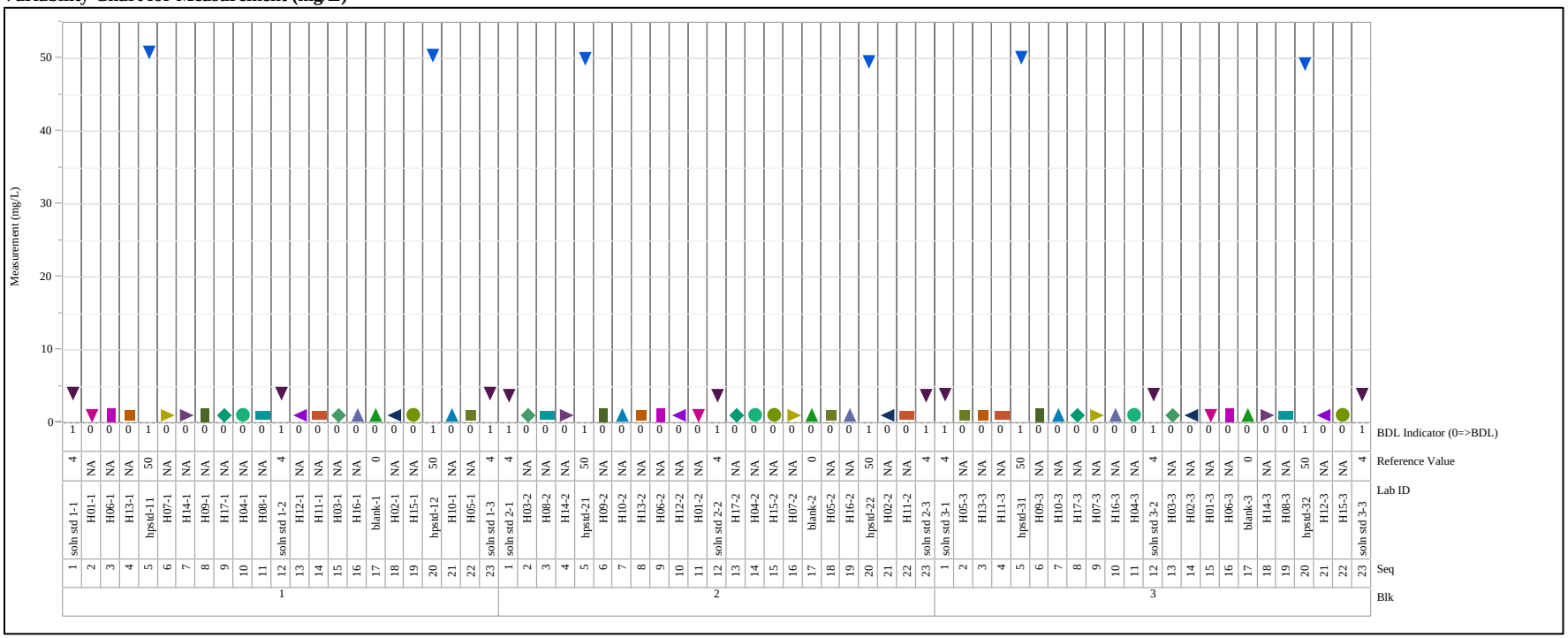


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=K (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

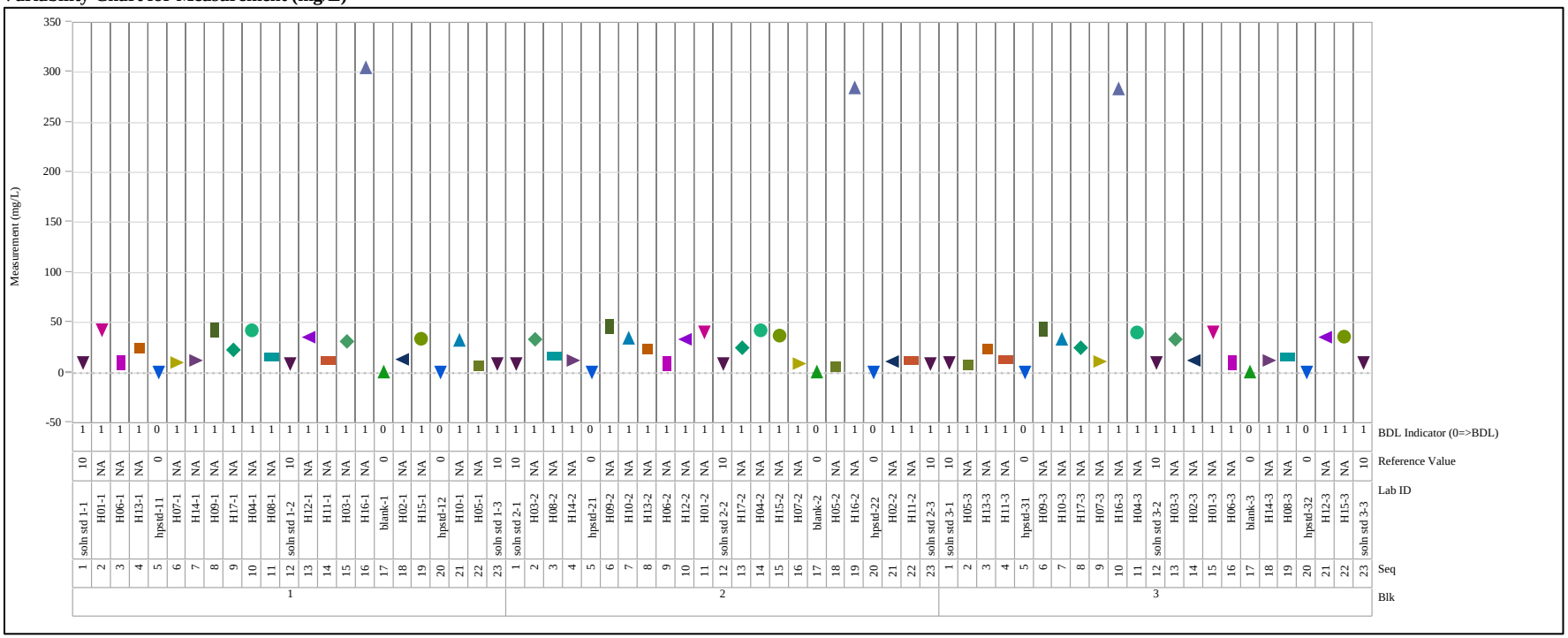


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Li (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

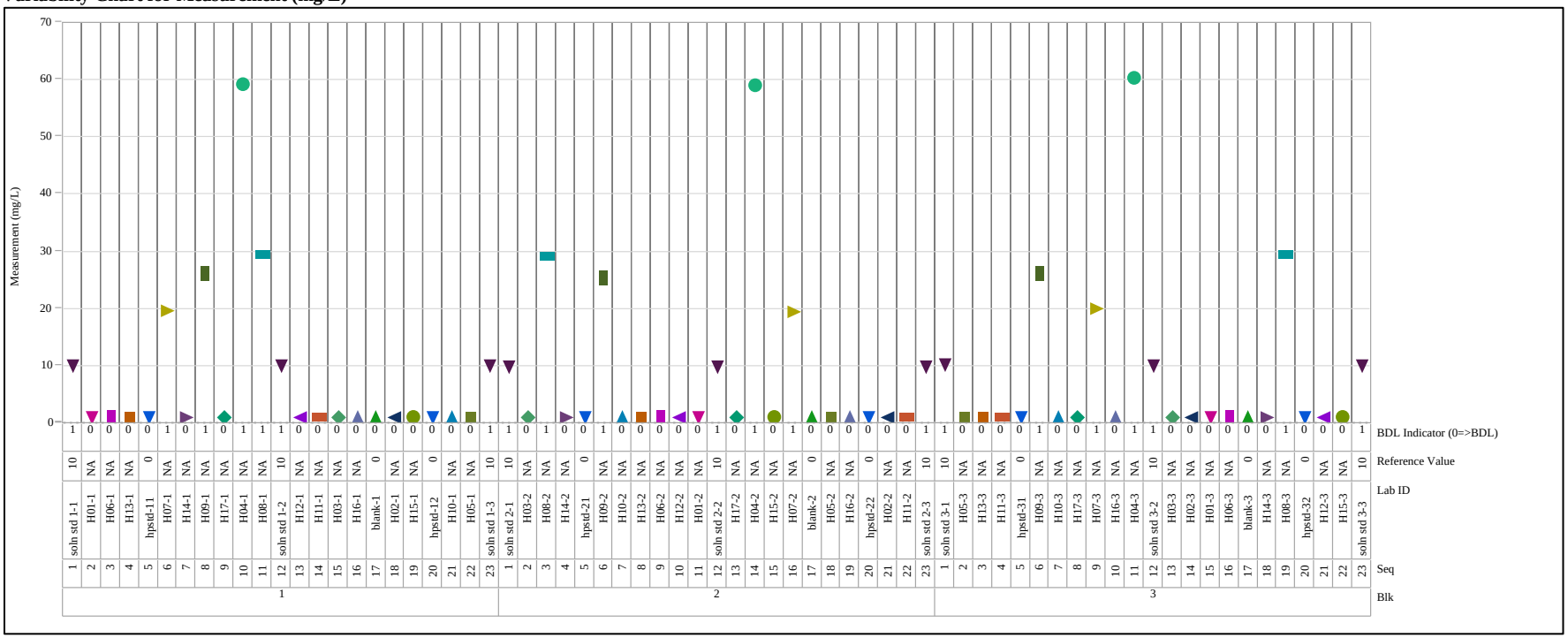


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Mg (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

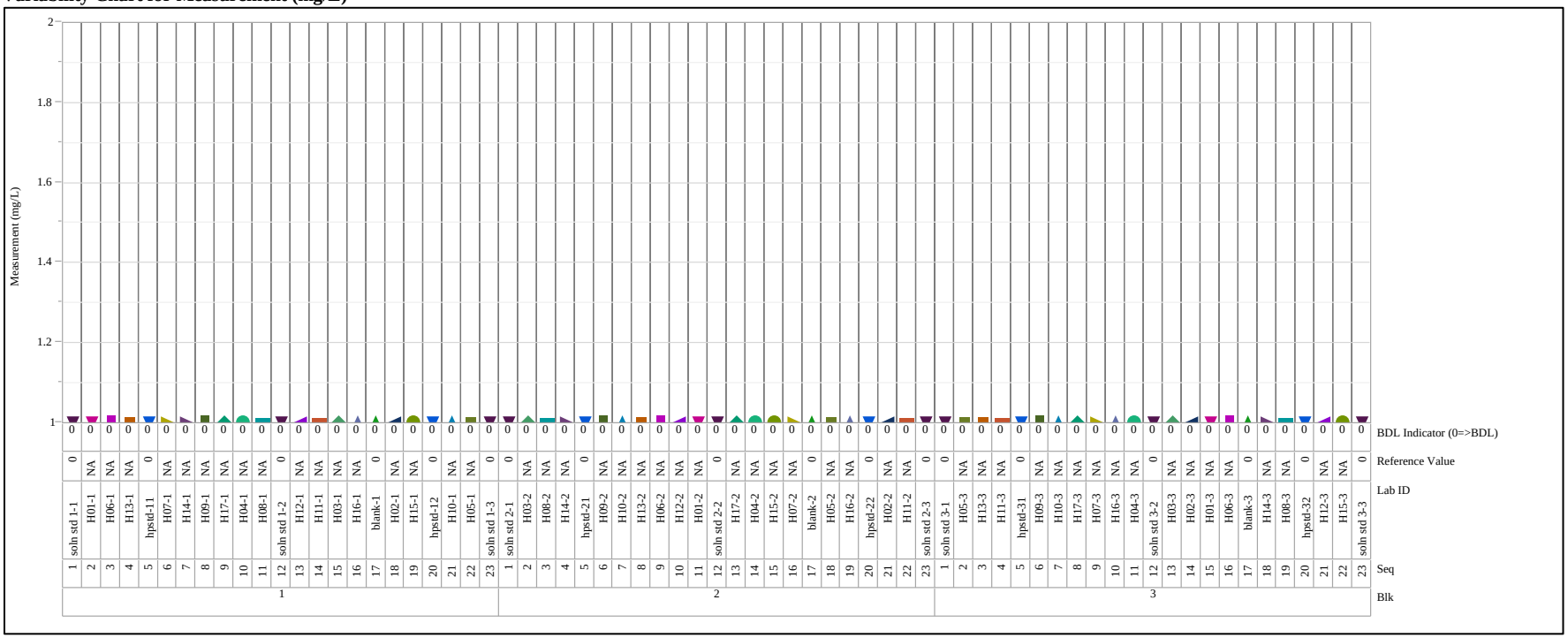


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Mn (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

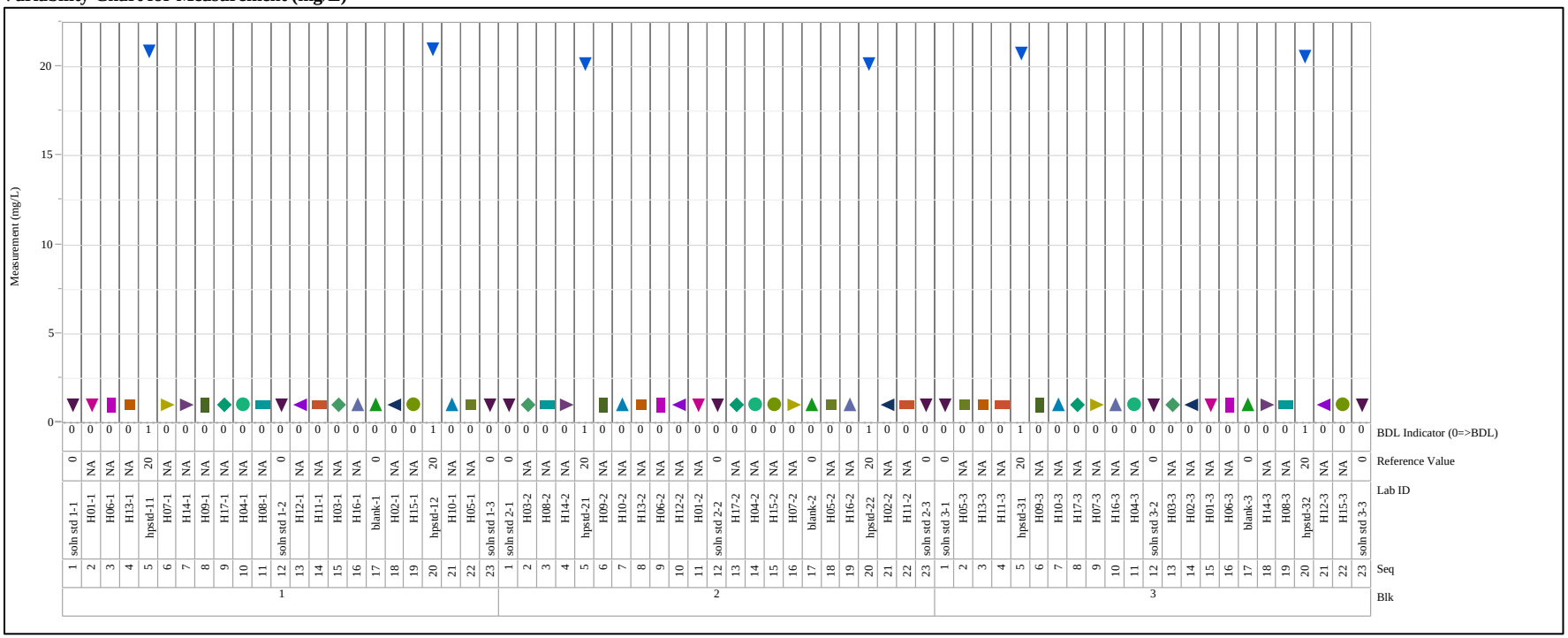


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Na (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

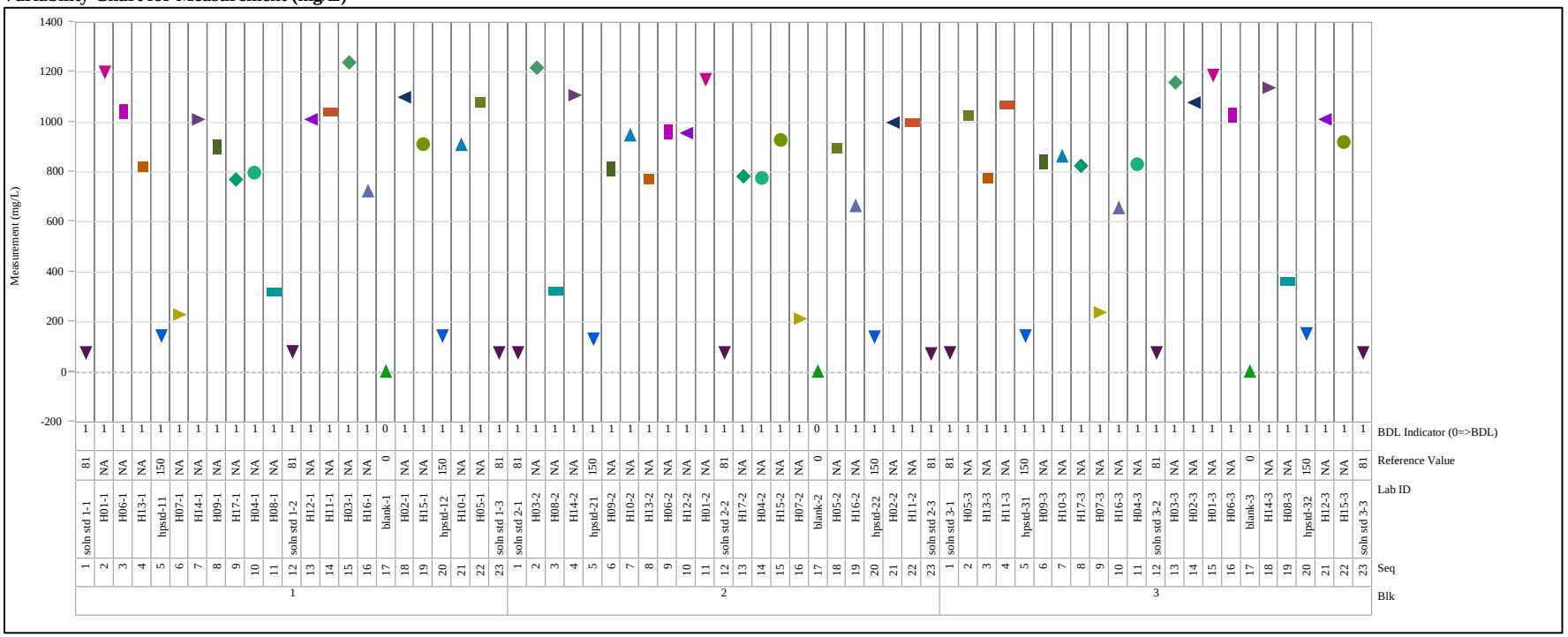


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Ni (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

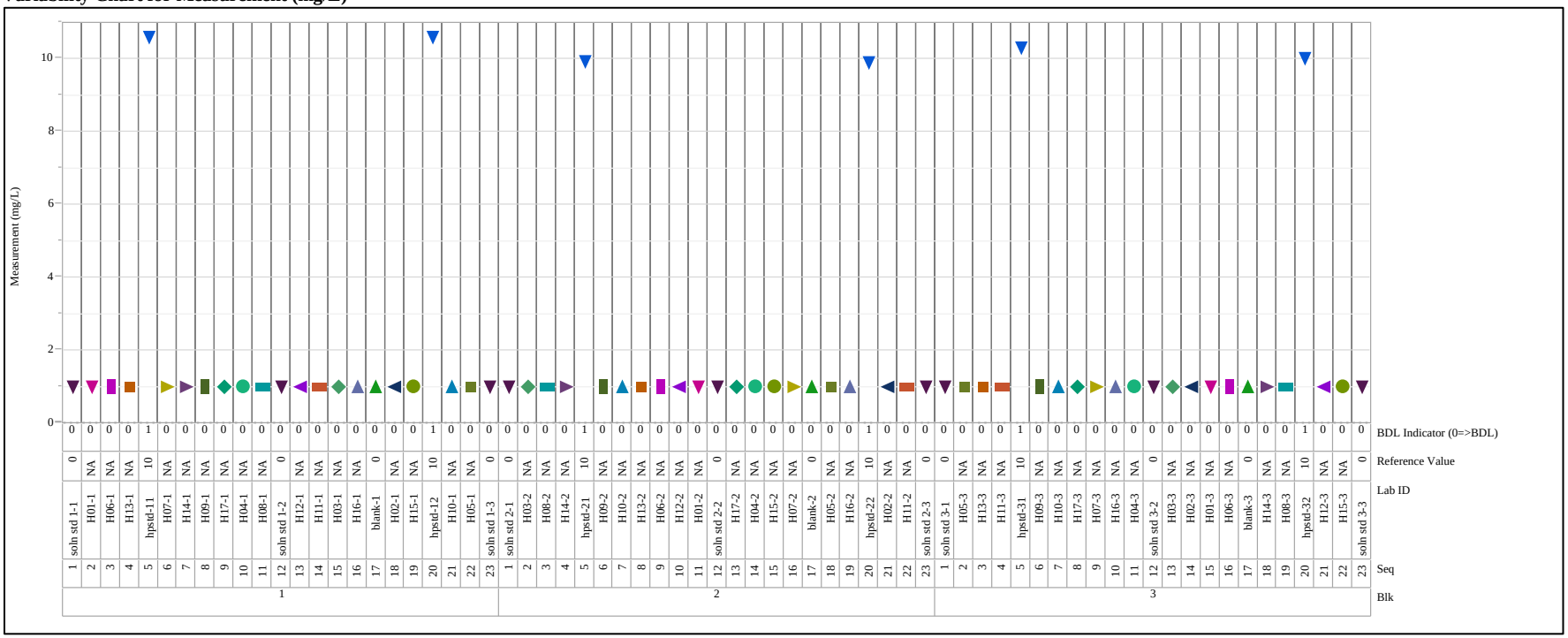


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=P (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

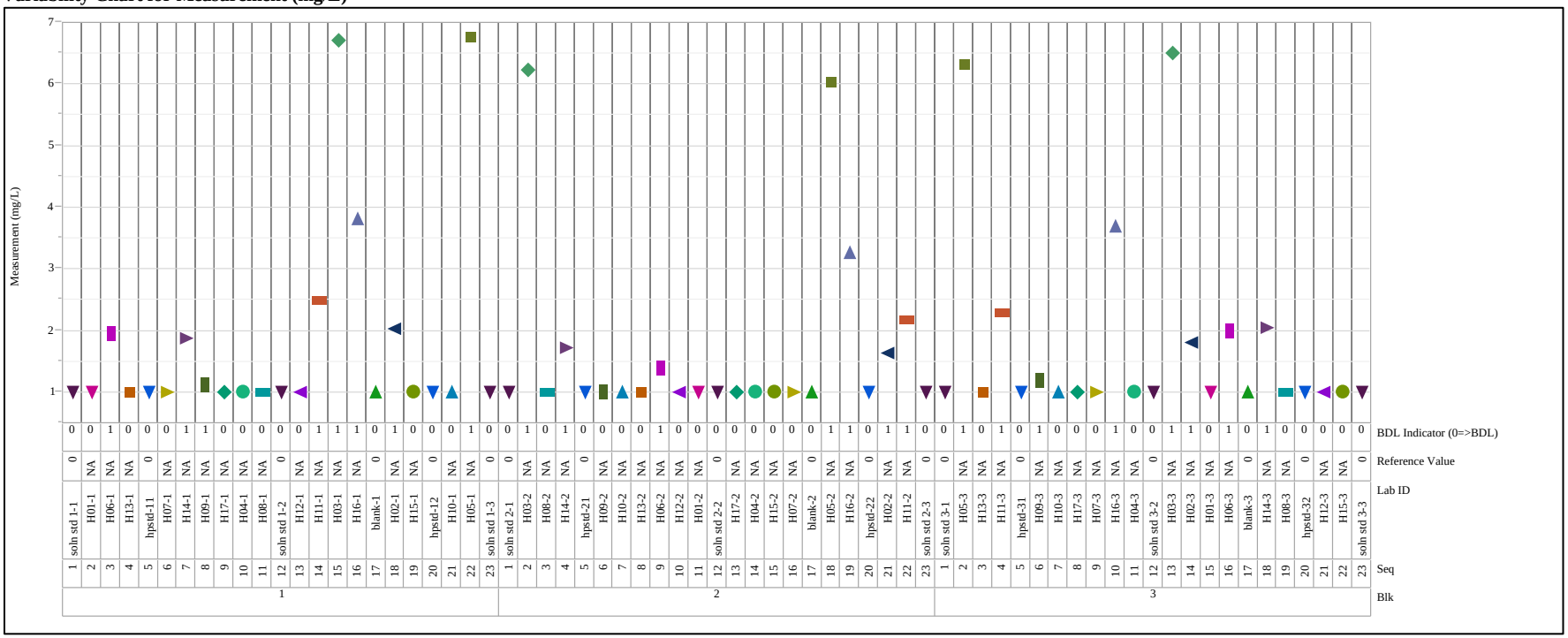


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Pb (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

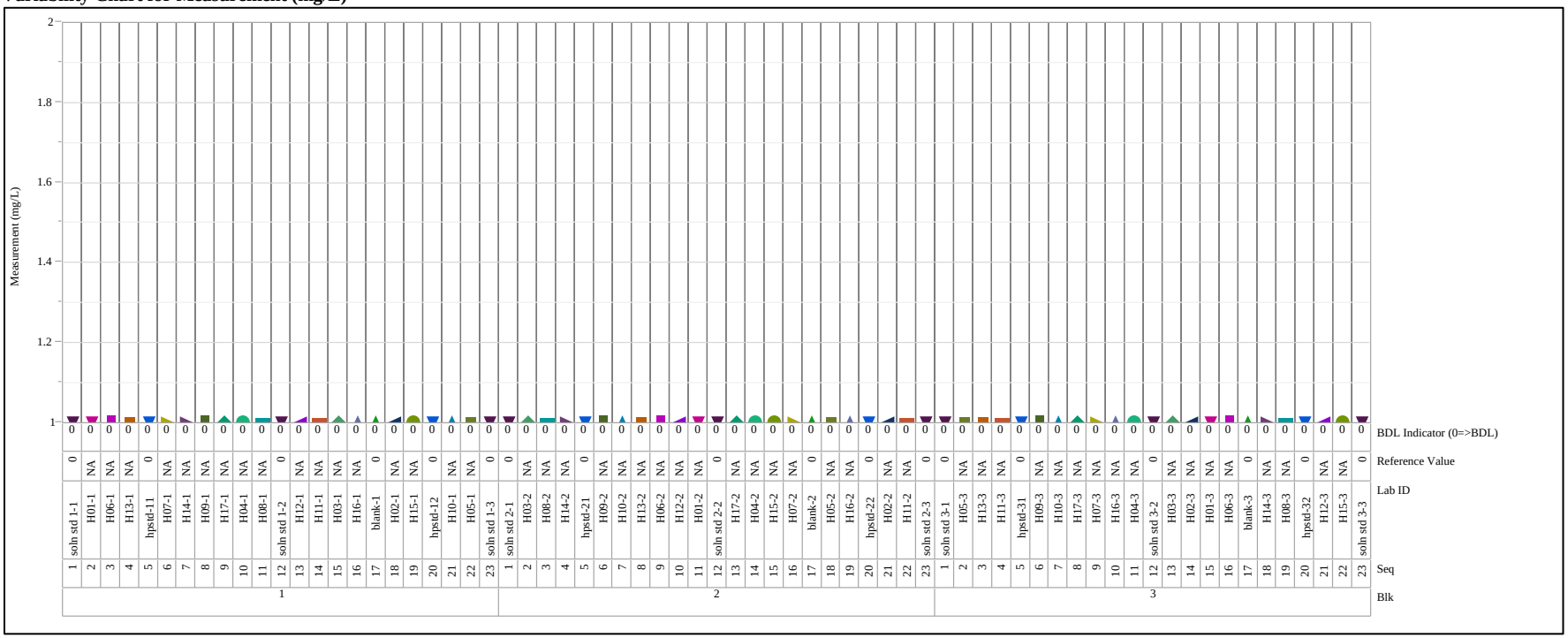


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=PO4 (mg/L), Analysis=IC
Variability Chart for Measurement (mg/L)

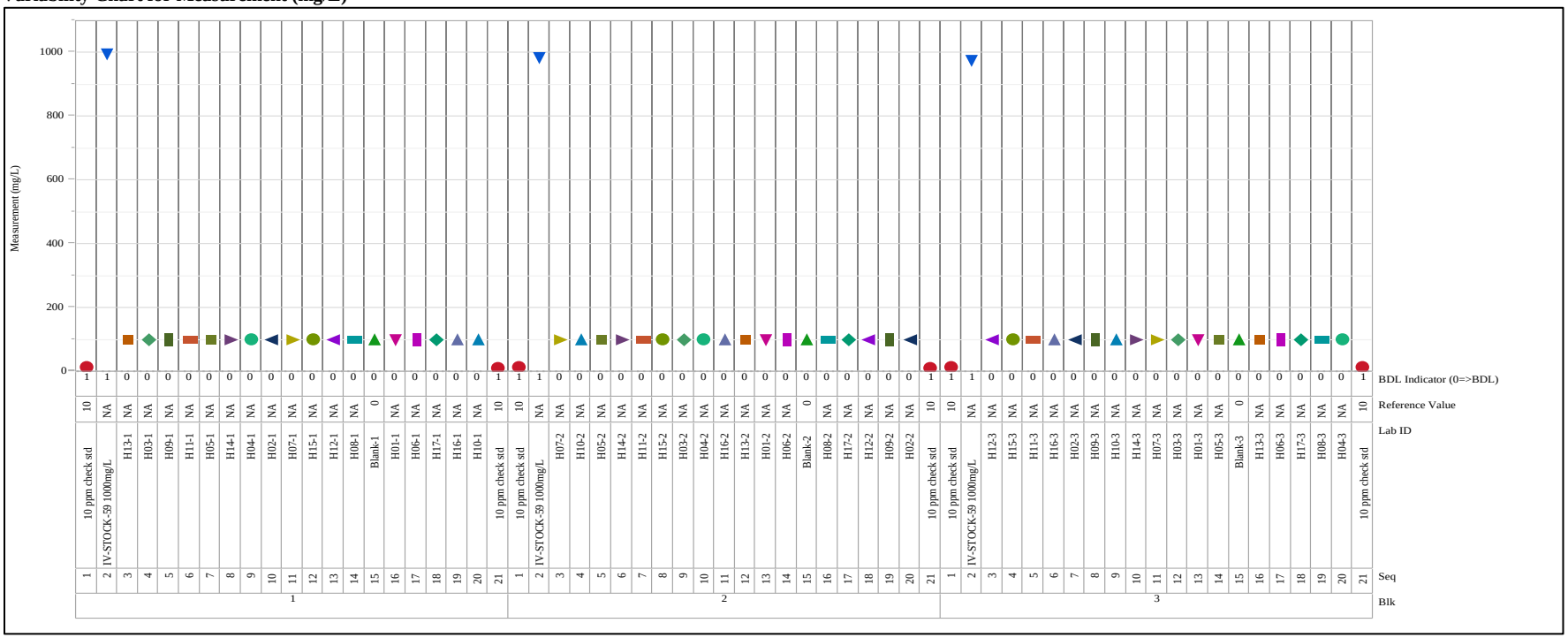


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=PO4 (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

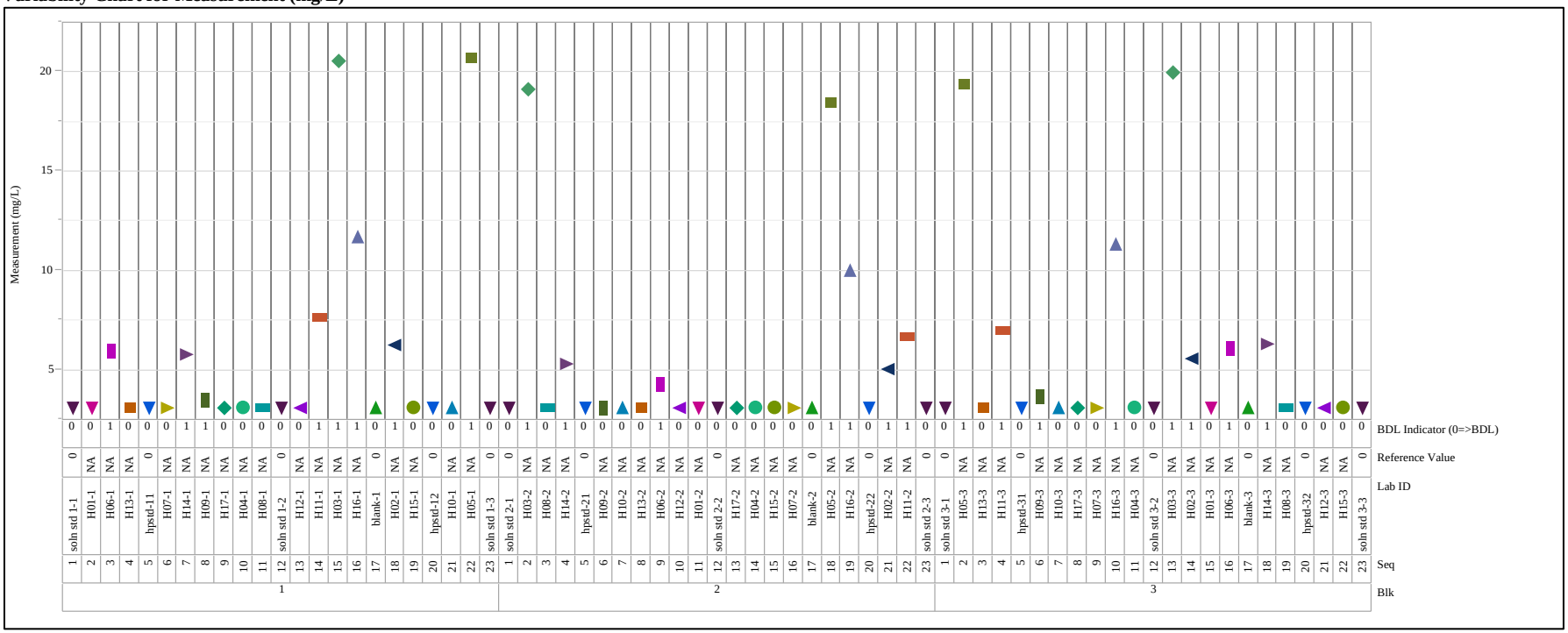


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=S (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

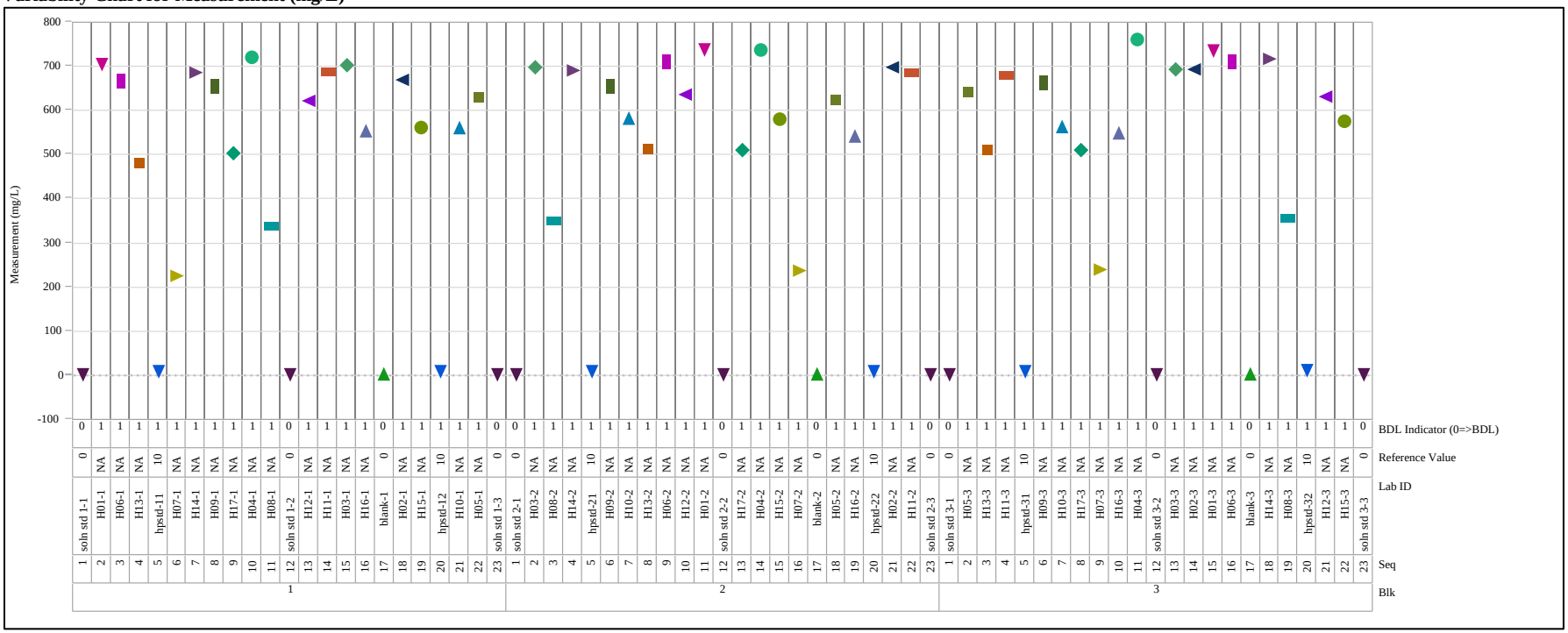


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Si (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

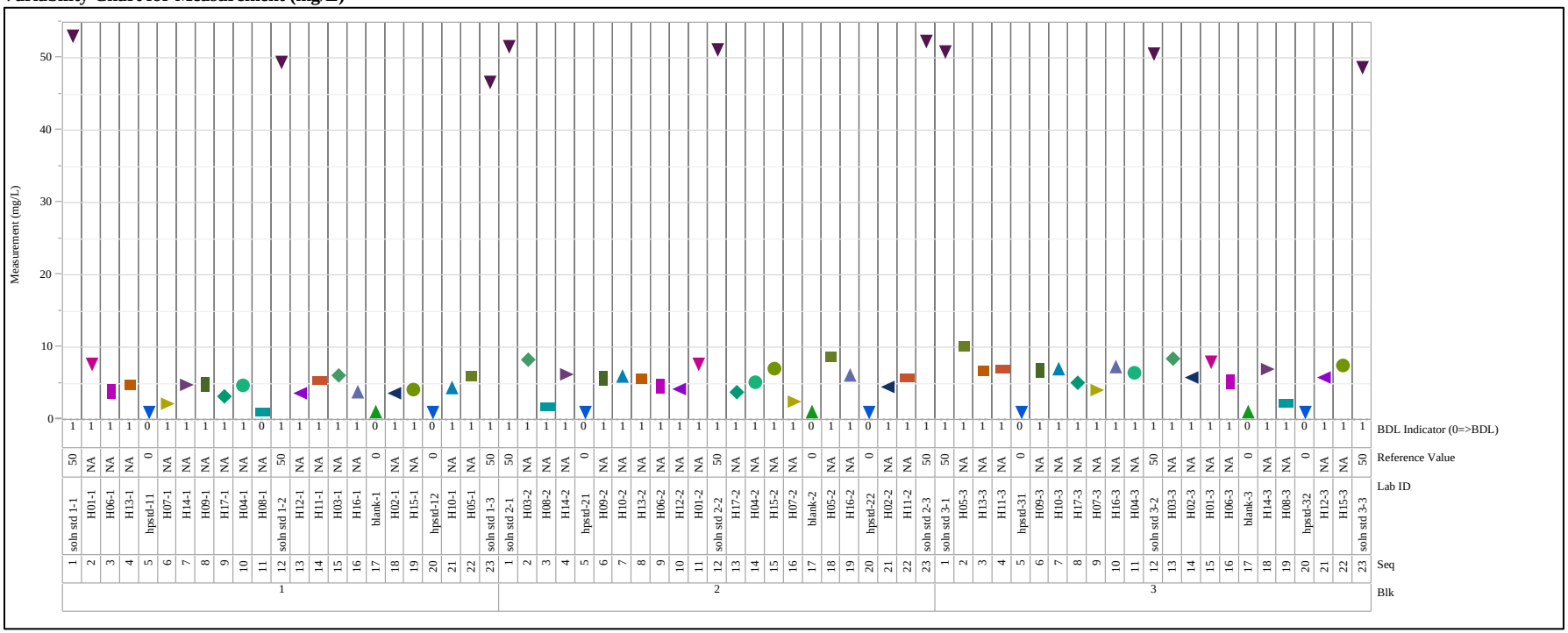


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Sn (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

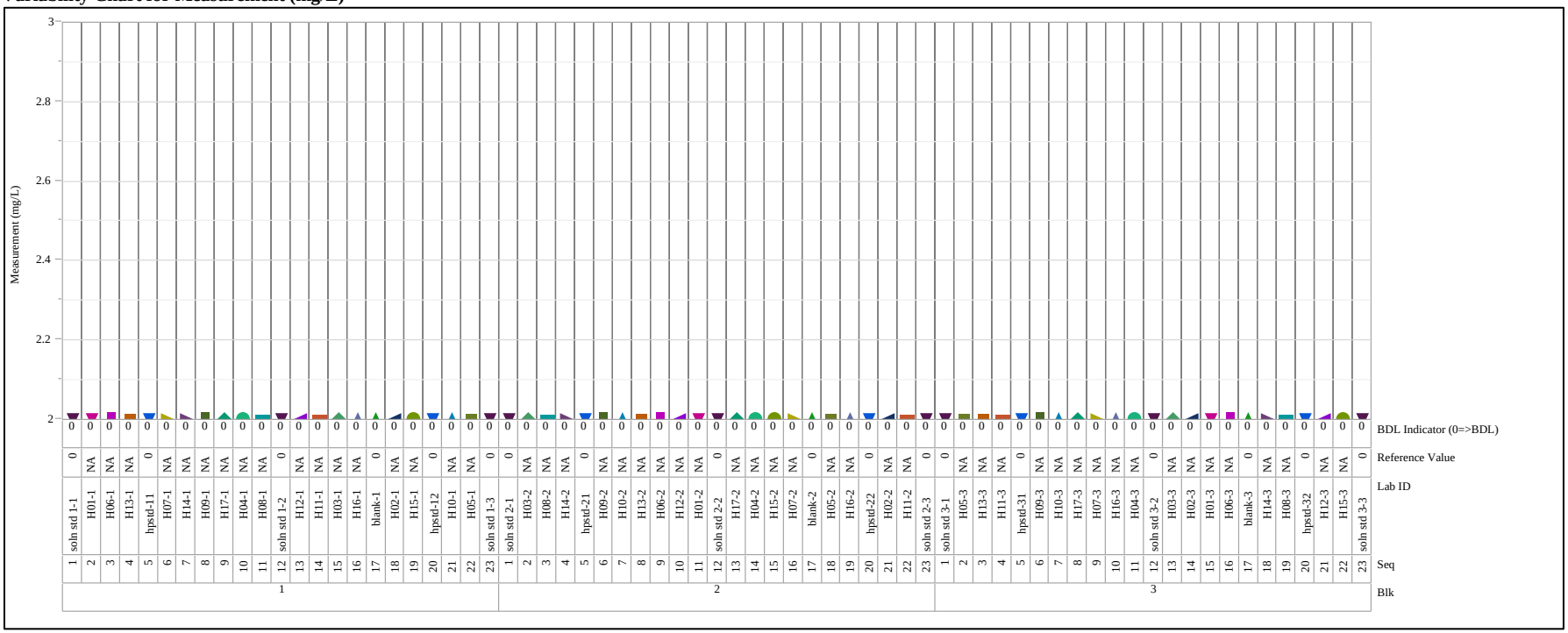


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=SO4 (mg/L), Analysis=IC
Variability Chart for Measurement (mg/L)

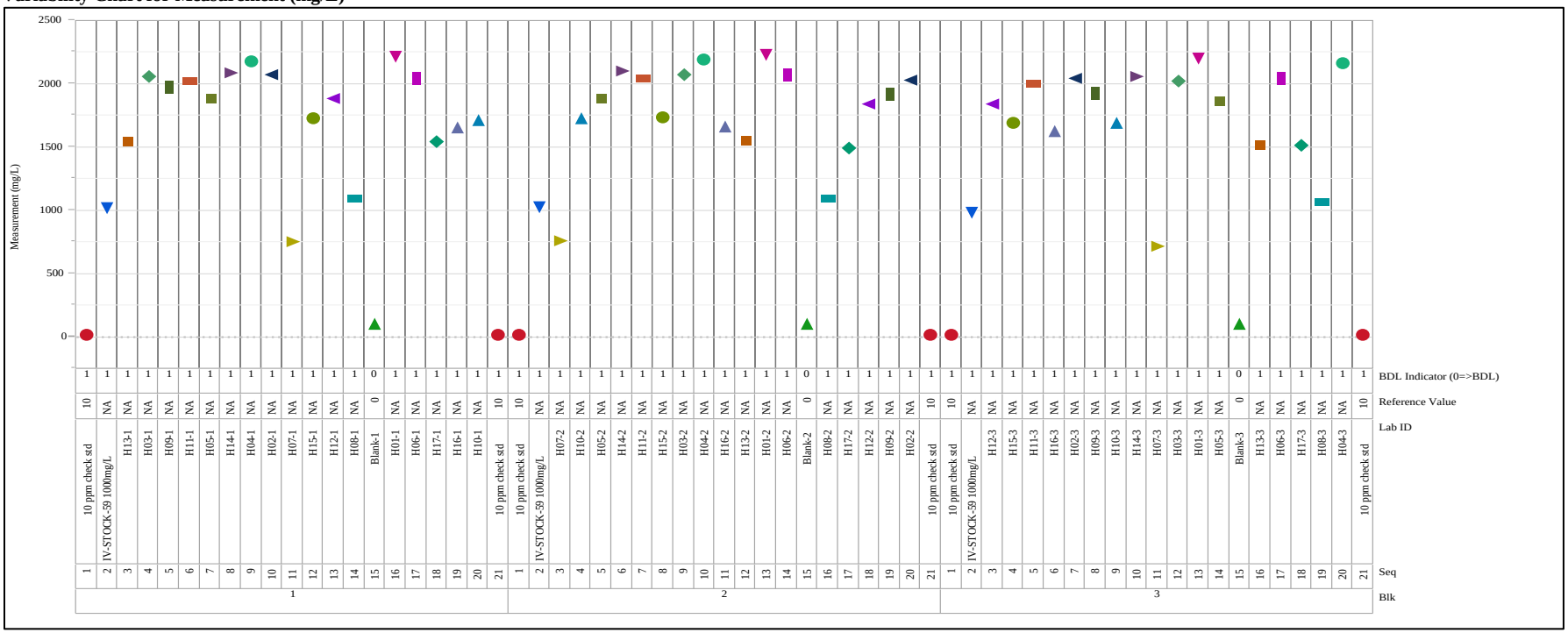


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=SO4 (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

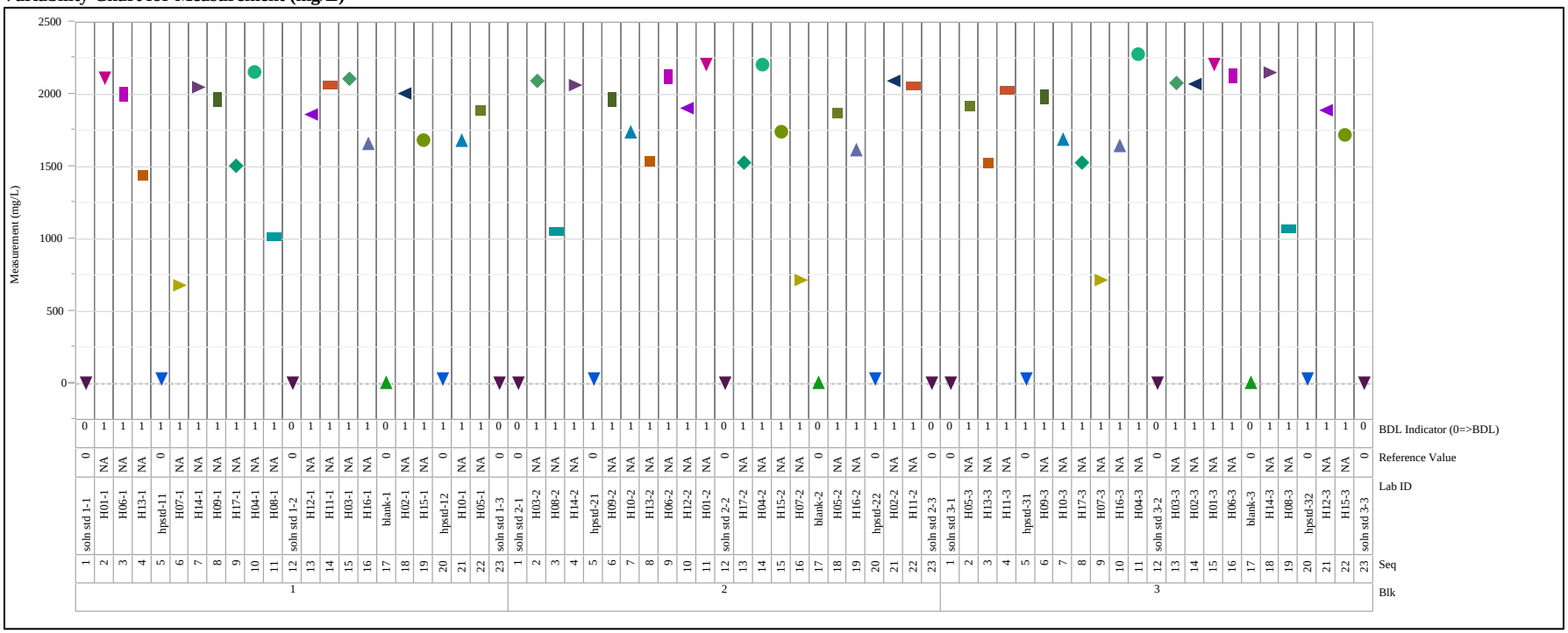


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=V (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

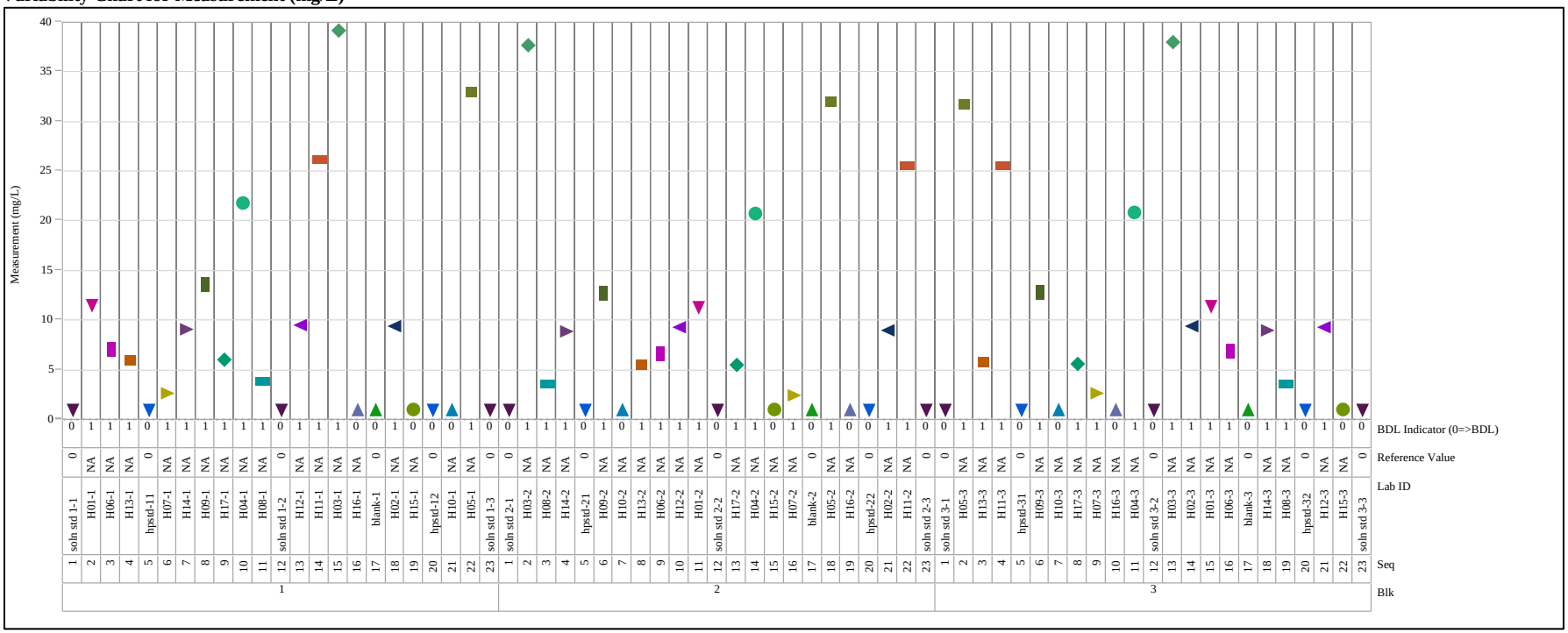


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Zn (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

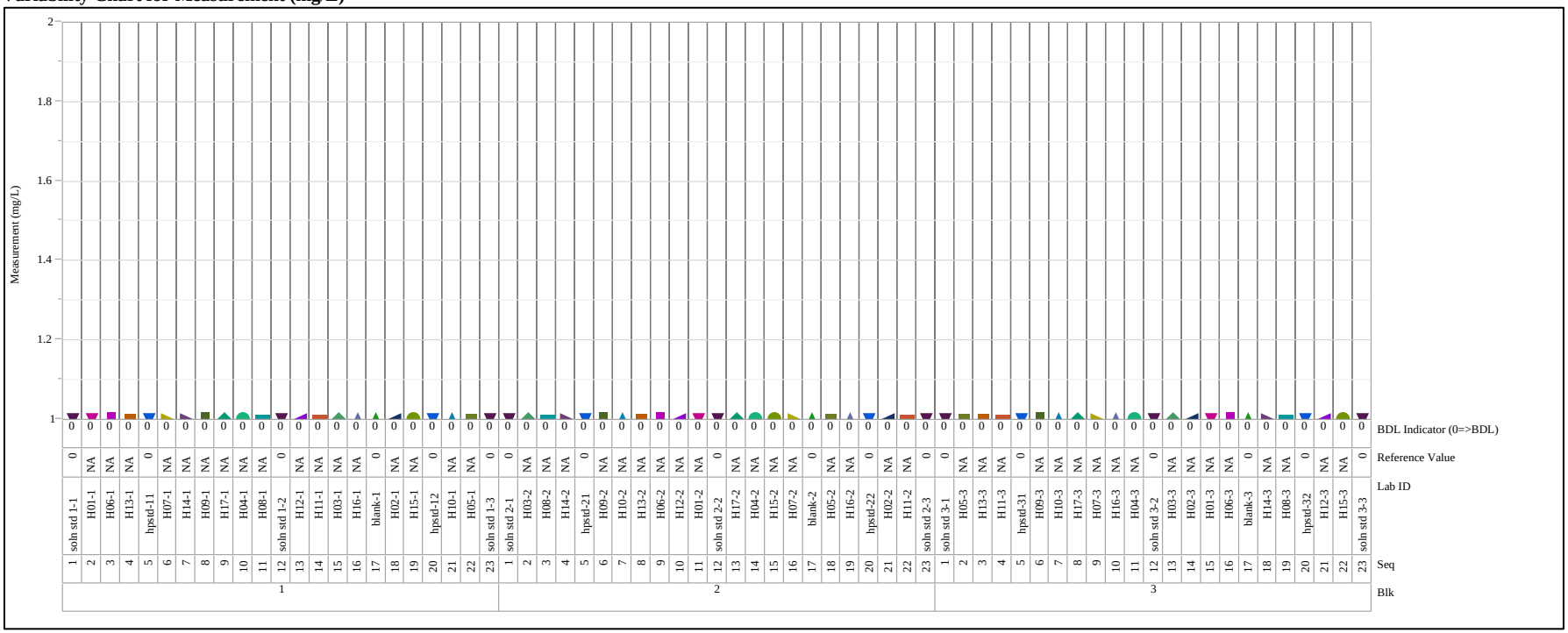


Exhibit B-1. Wash Solution Measurements by Analyte, Instrument, and Block in Analytical Sequence (continued)

Analyte=Zr (mg/L), Analysis=ICP-AES
Variability Chart for Measurement (mg/L)

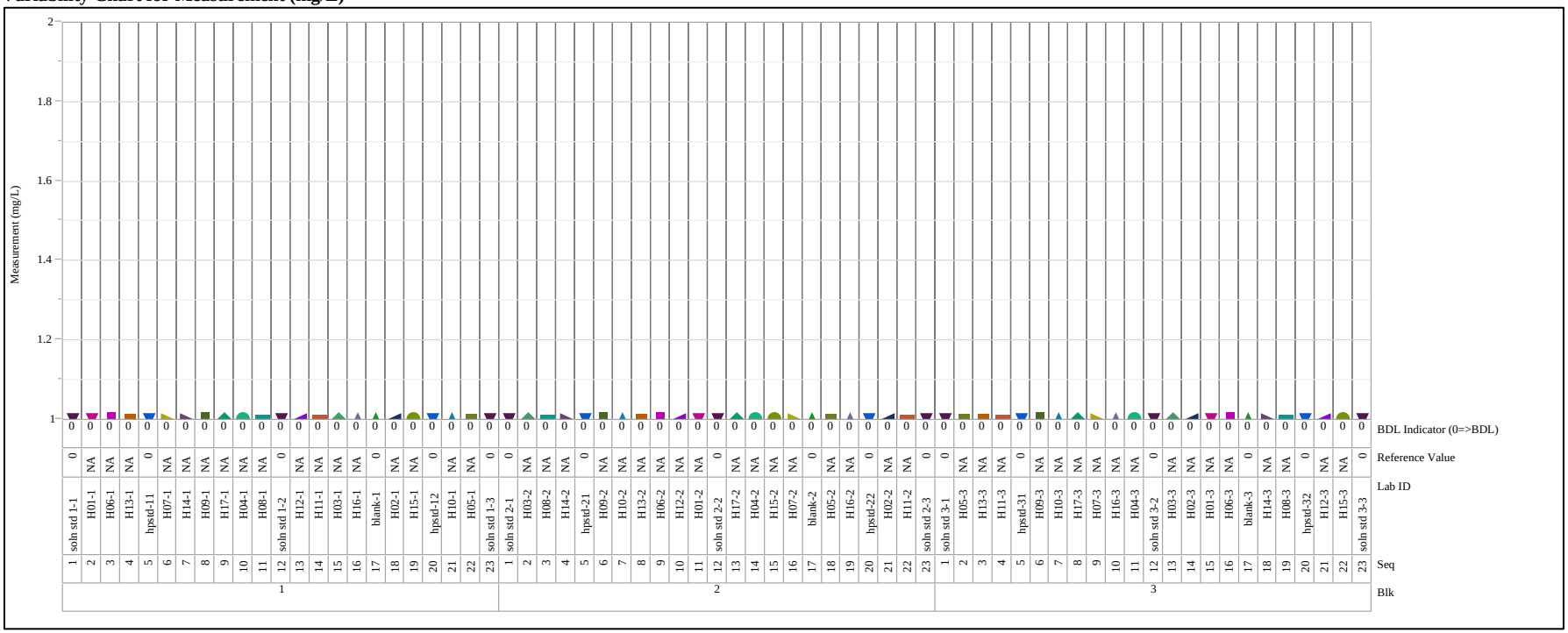


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier

Analyte=Al (mg/L)
Variability Chart for Measurement (mg/L)

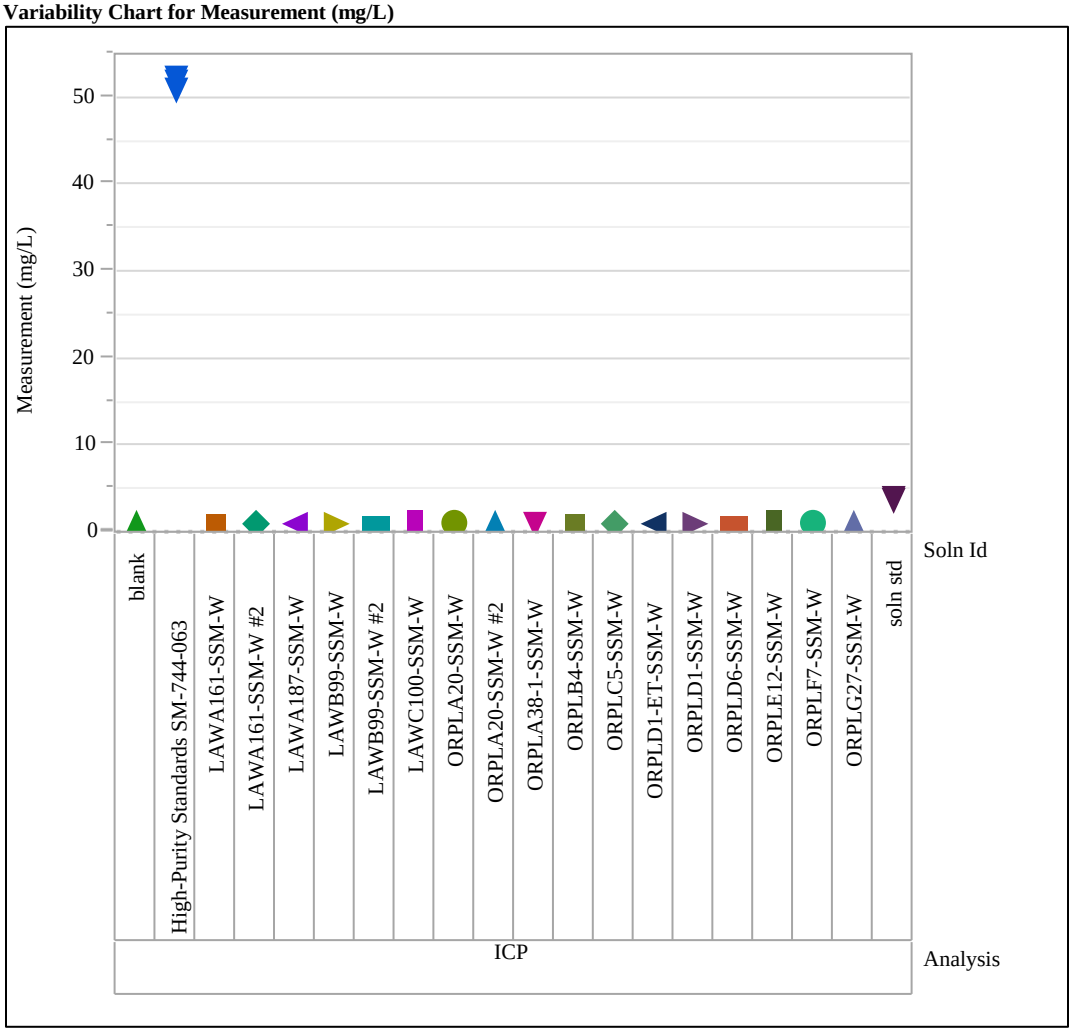


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=B (mg/L)
Variability Chart for Measurement (mg/L)

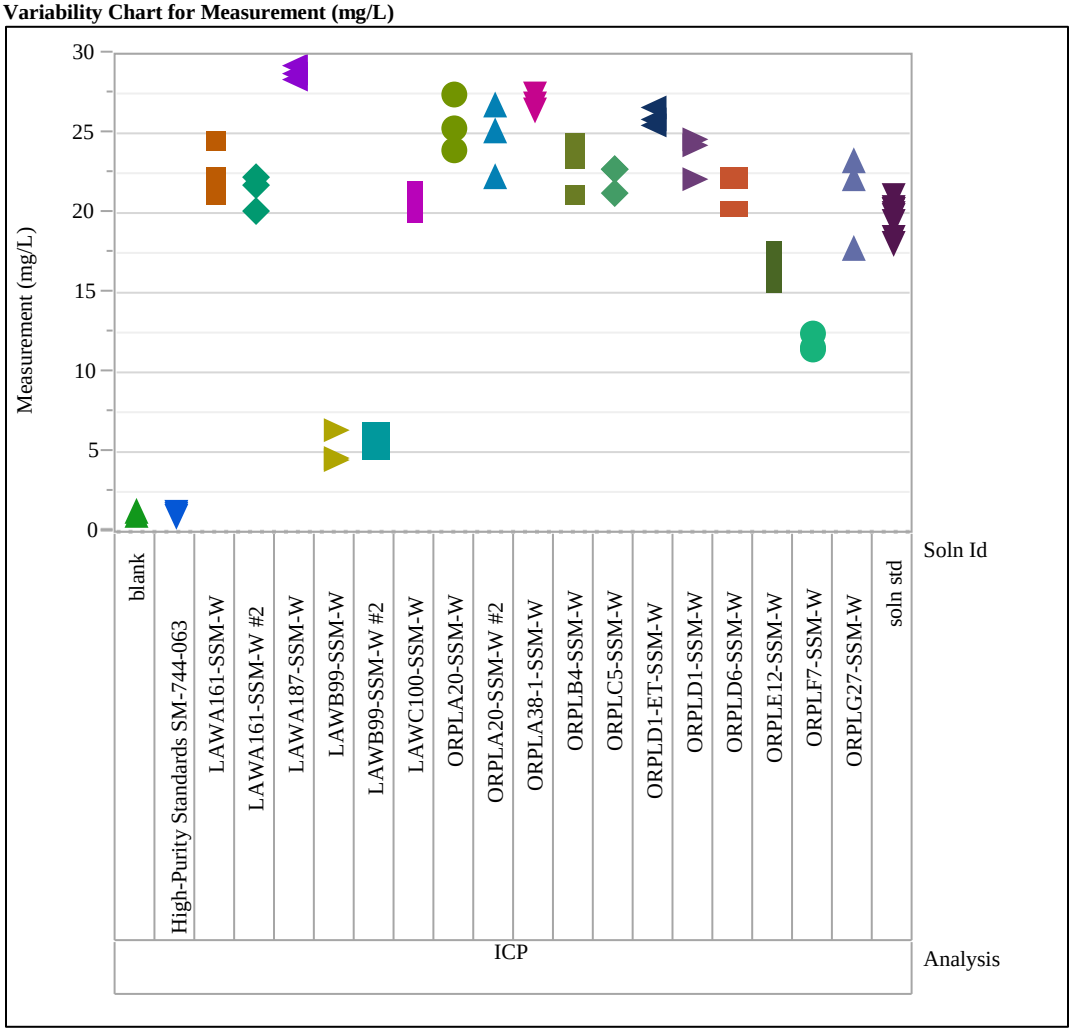


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Ca (mg/L)
Variability Chart for Measurement (mg/L)

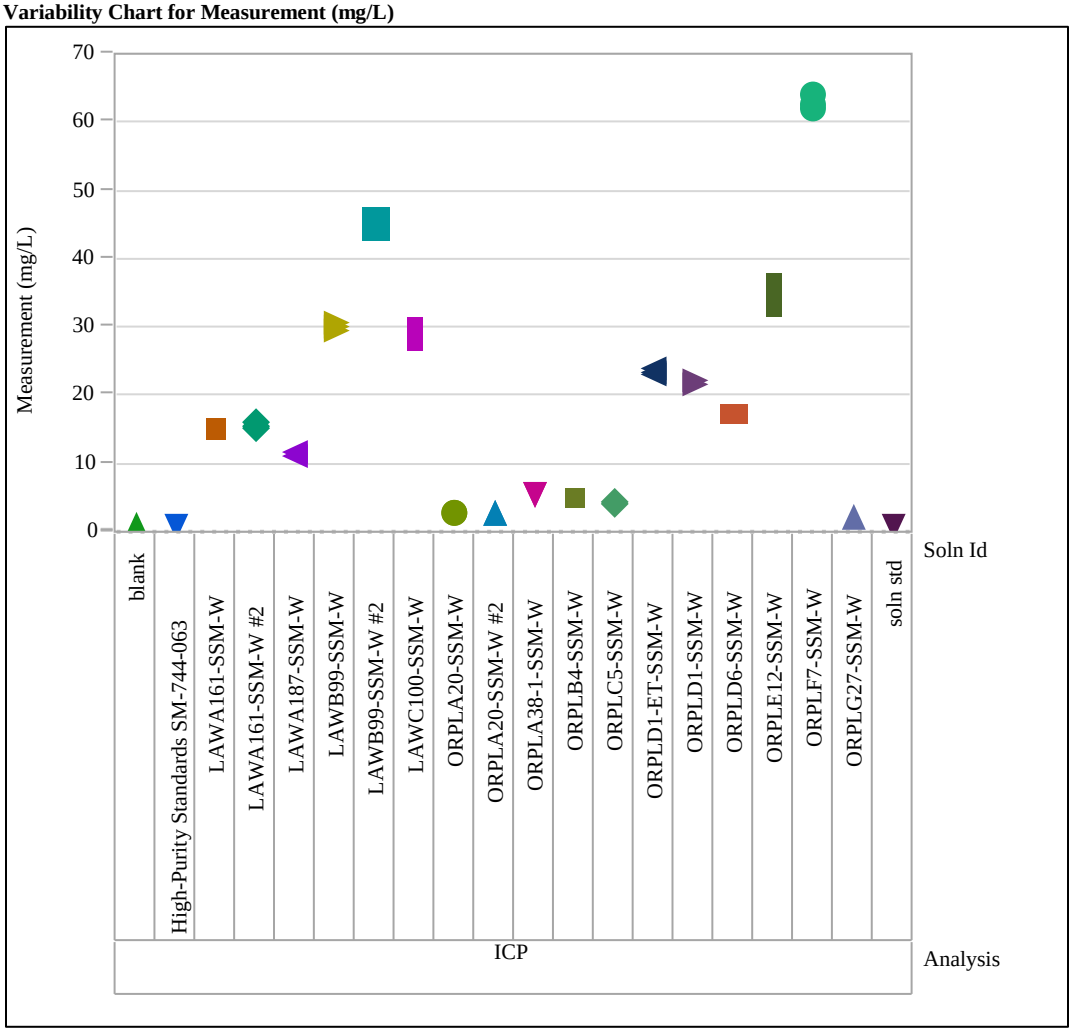


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Cl (mg/L)
Variability Chart for Measurement (mg/L)

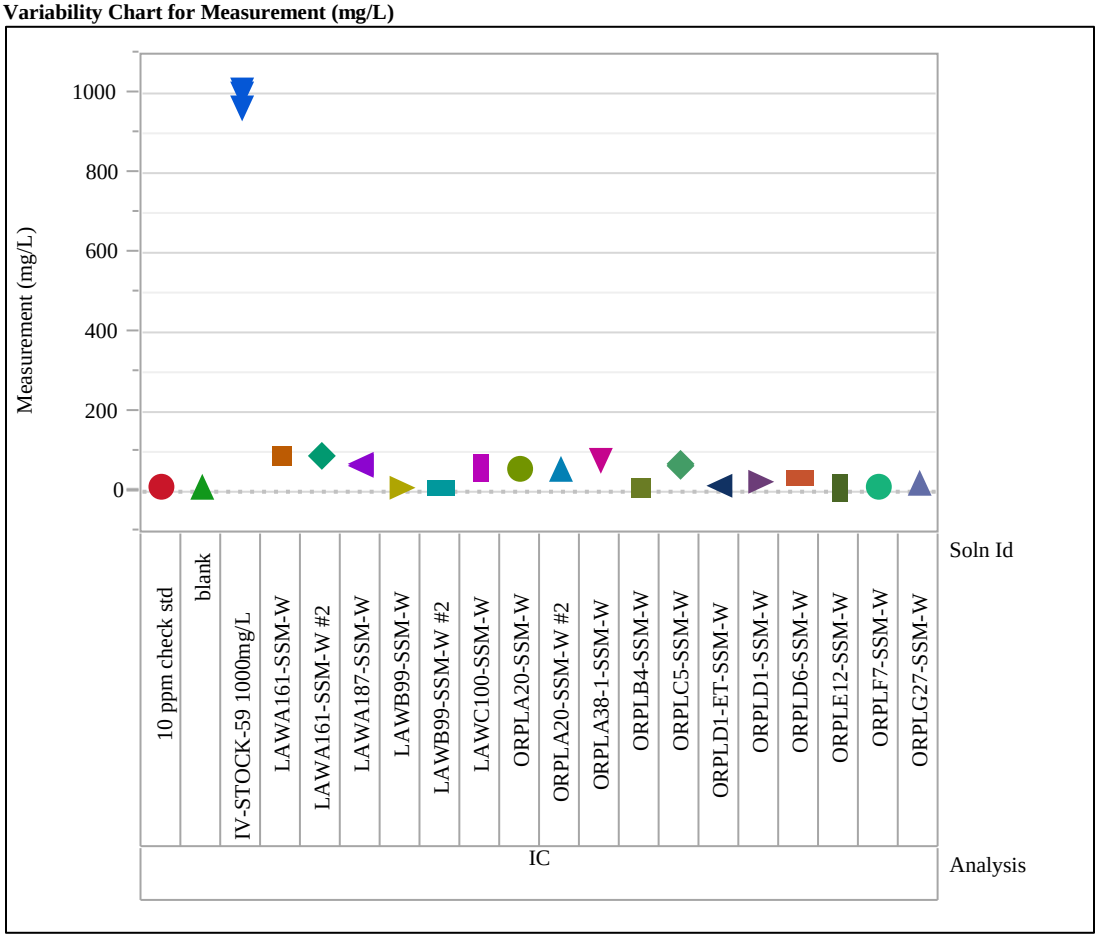


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Cr (mg/L)
Variability Chart for Measurement (mg/L)

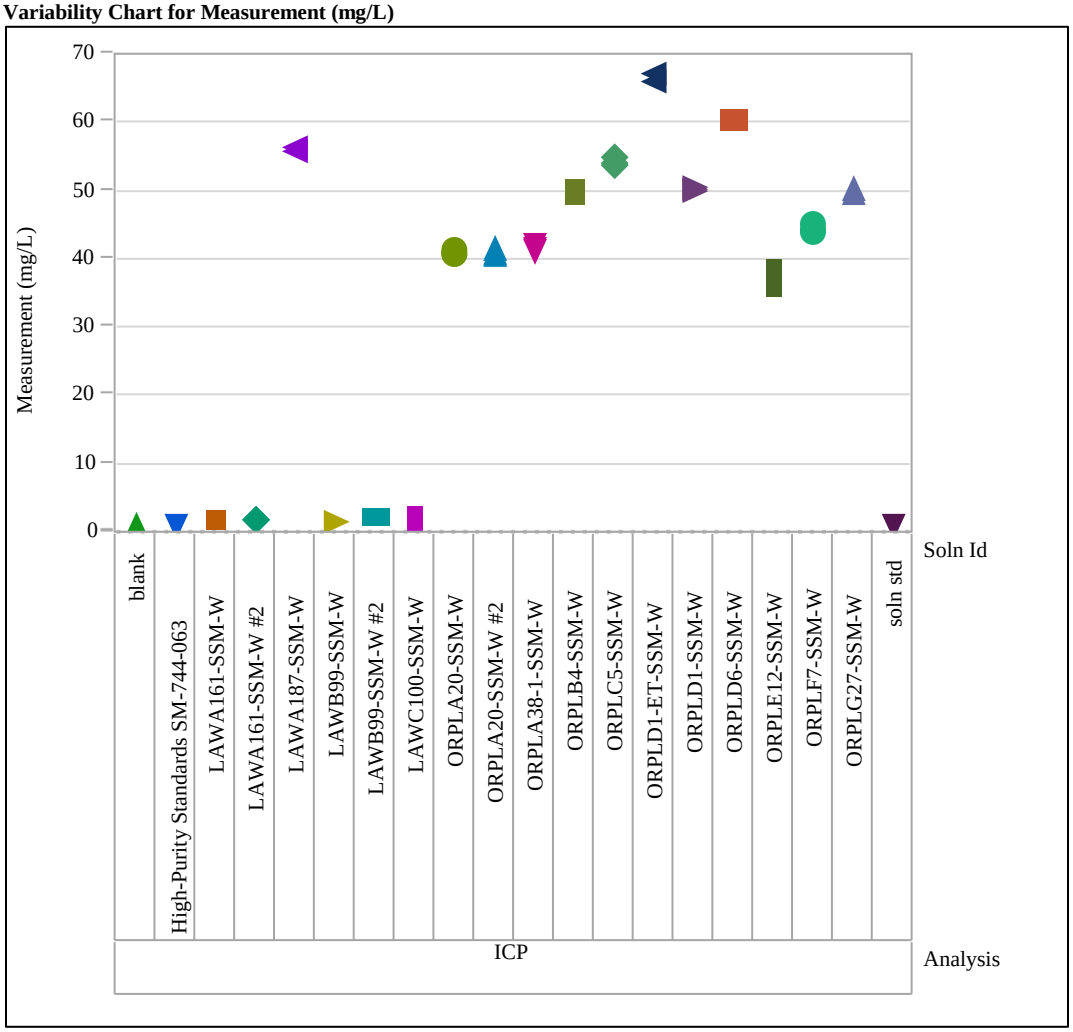


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=F (mg/L)
Variability Chart for Measurement (mg/L)

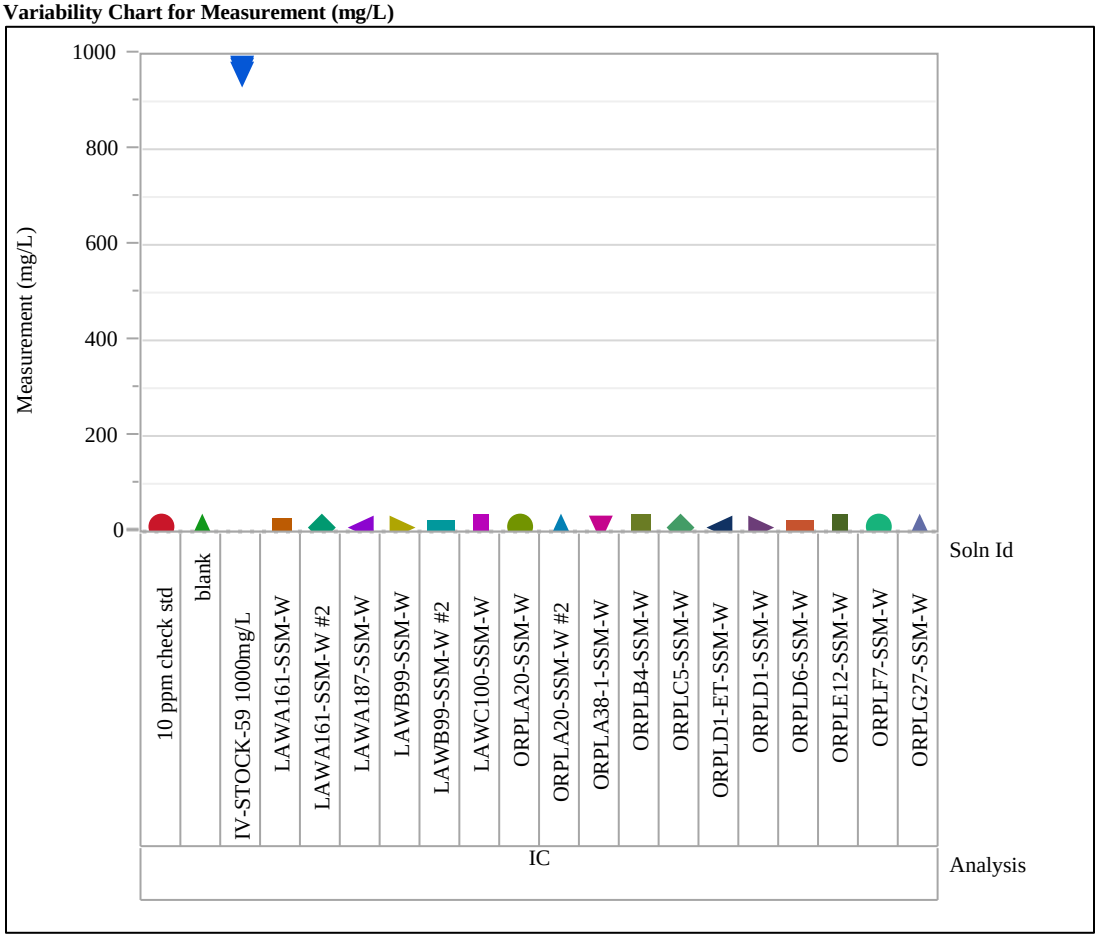


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Fe (mg/L)
Variability Chart for Measurement (mg/L)

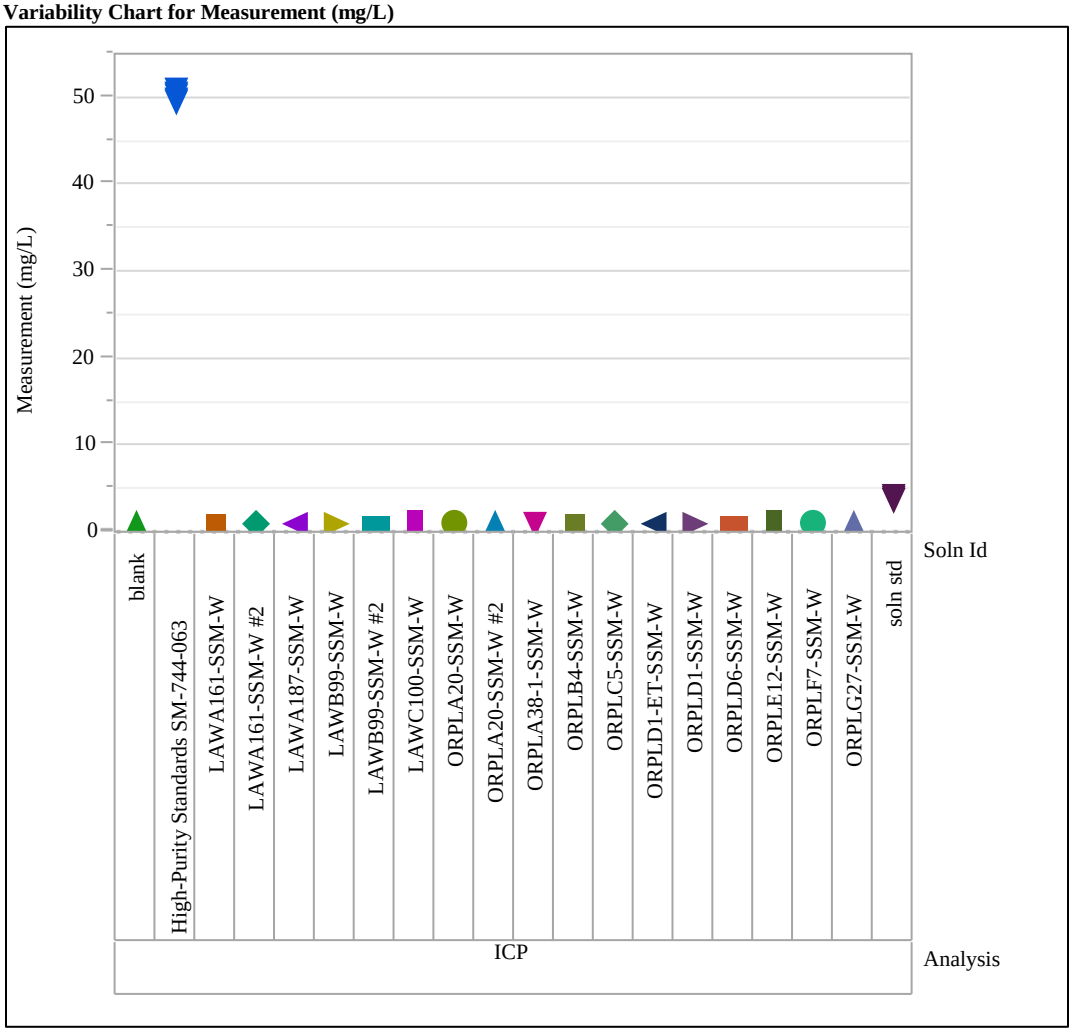


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=K (mg/L)
Variability Chart for Measurement (mg/L)

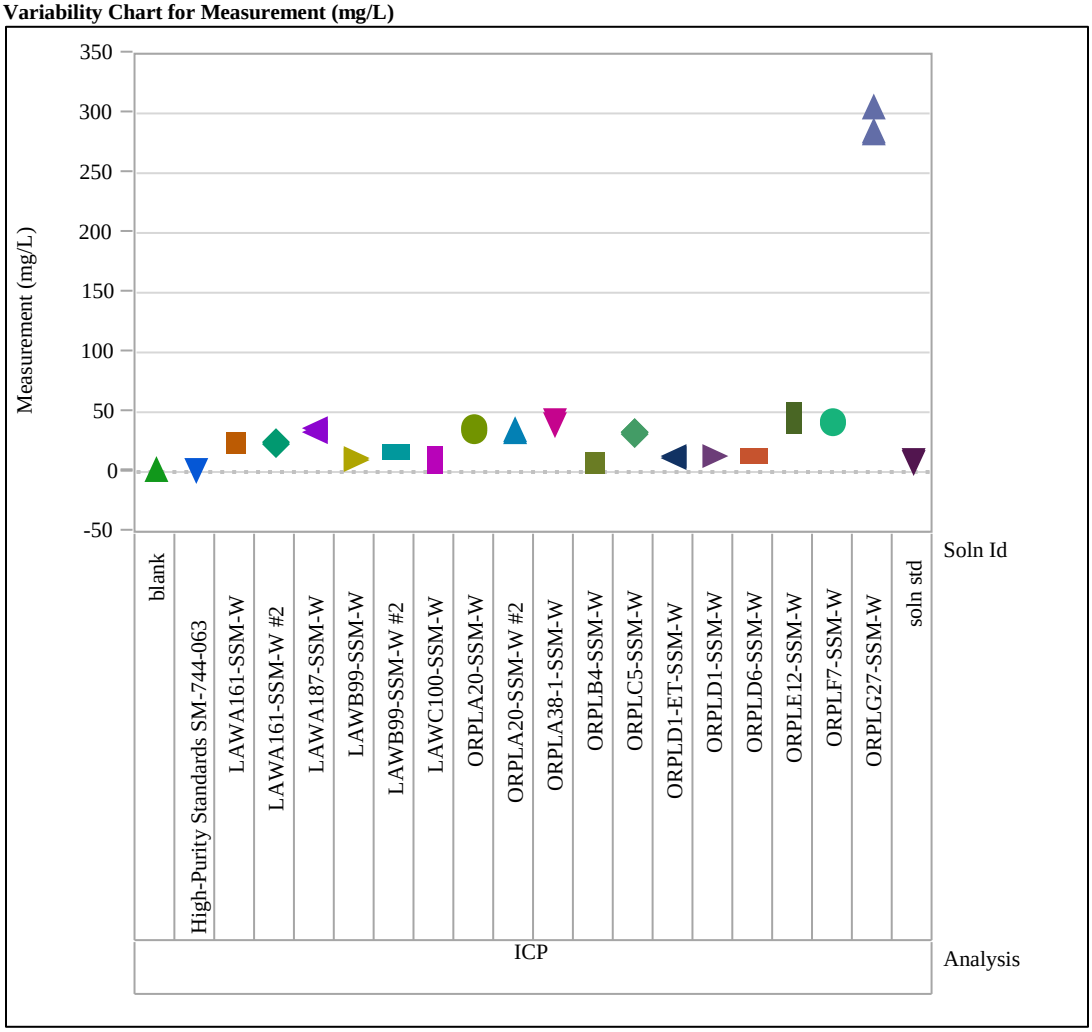


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Li (mg/L)
Variability Chart for Measurement (mg/L)

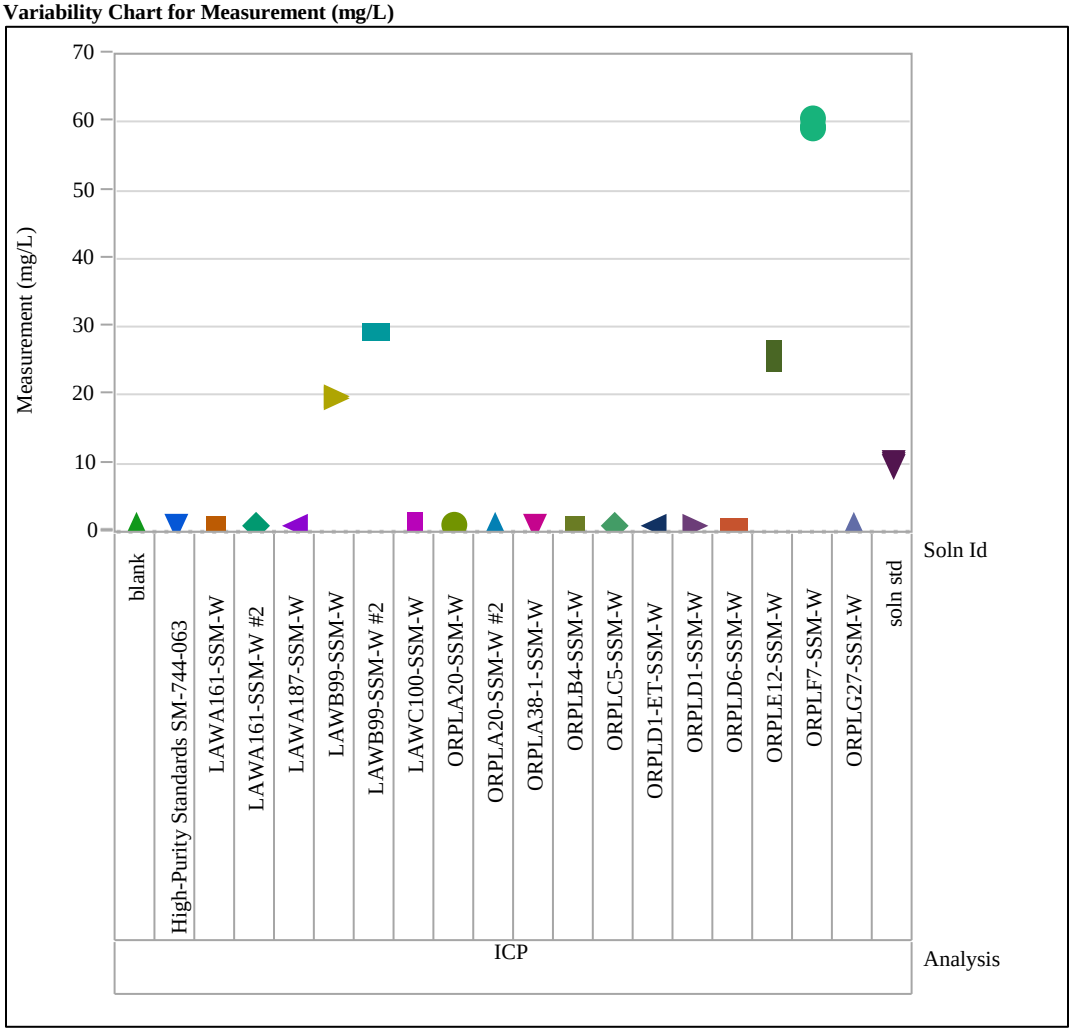


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Mg (mg/L)
Variability Chart for Measurement (mg/L)

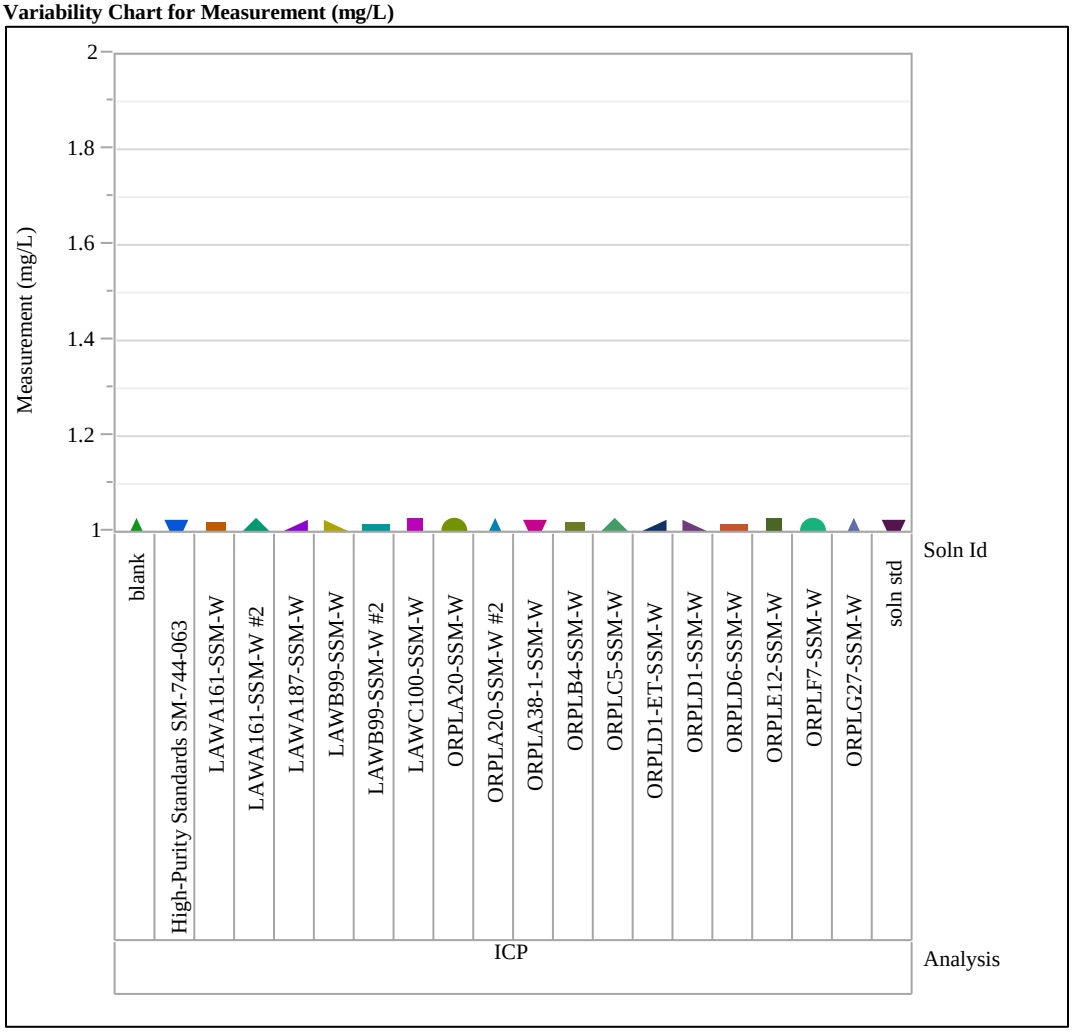


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Mn (mg/L)
Variability Chart for Measurement (mg/L)

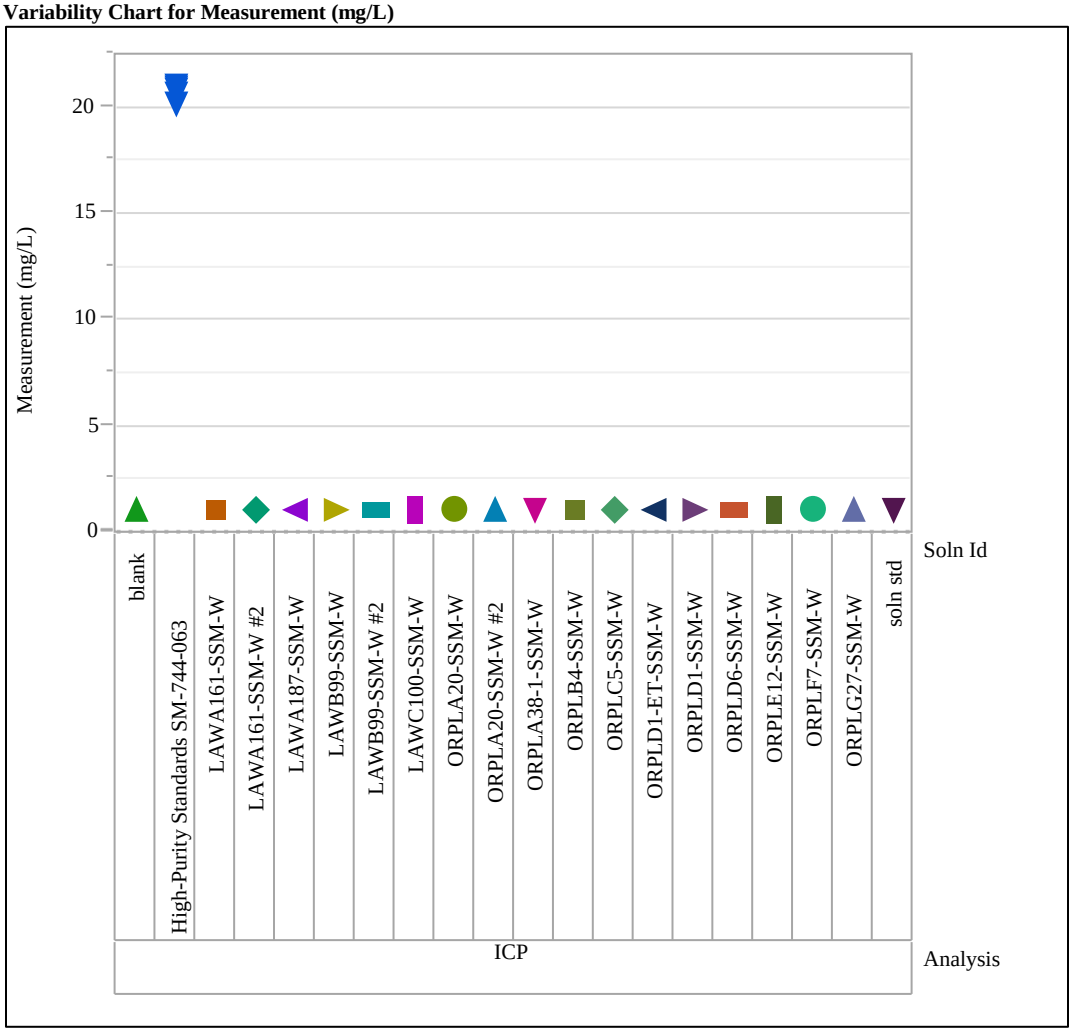


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Na (mg/L)
Variability Chart for Measurement (mg/L)

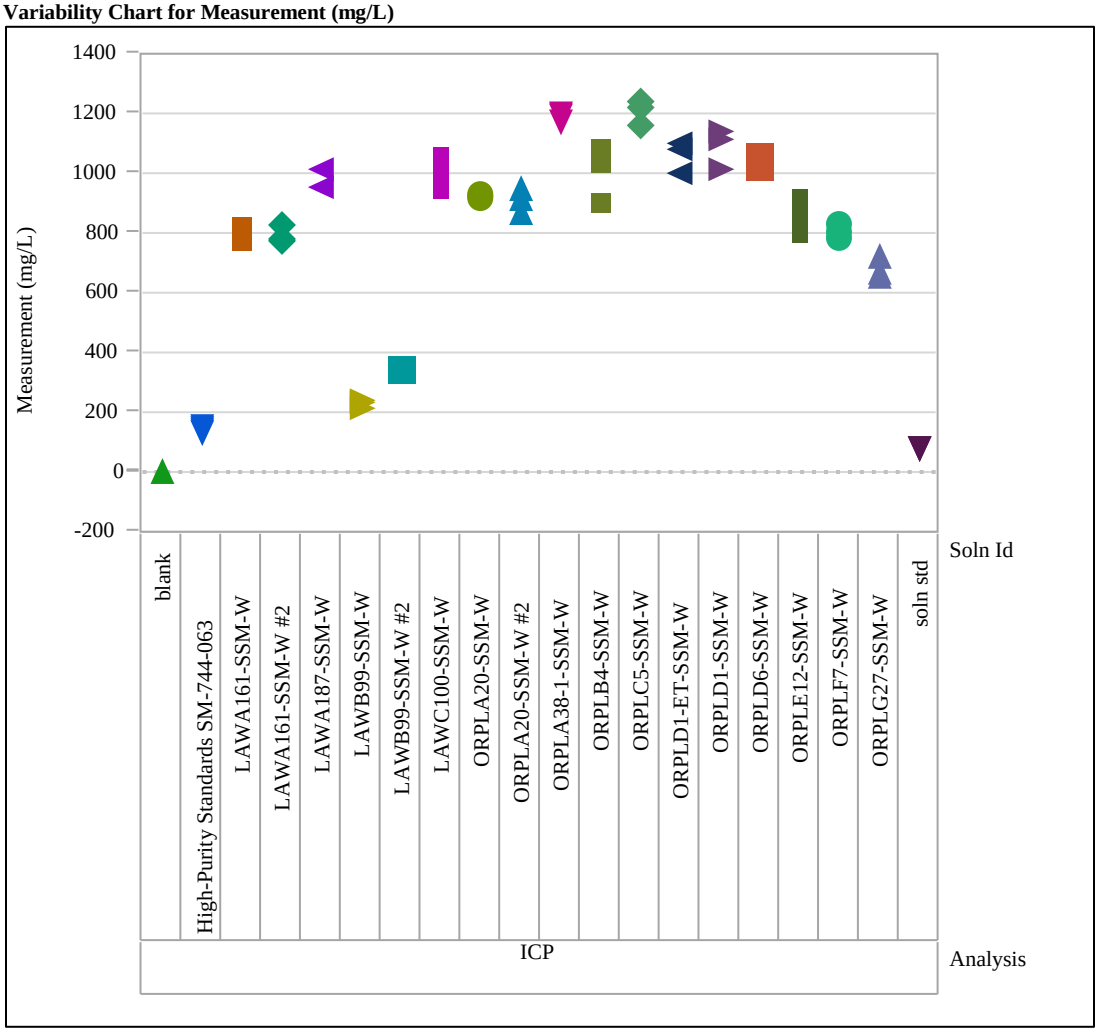


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Ni (mg/L)
Variability Chart for Measurement (mg/L)

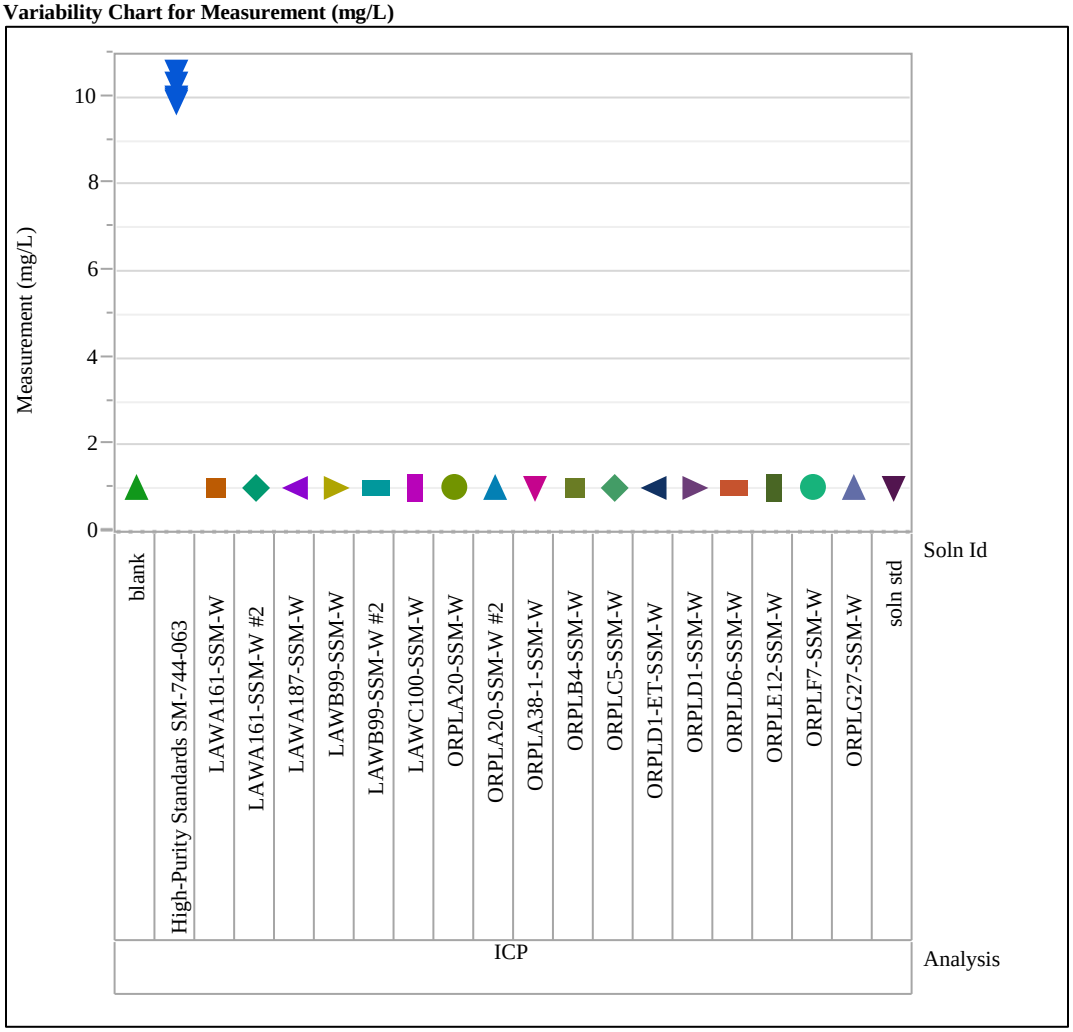


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=P (mg/L)
Variability Chart for Measurement (mg/L)

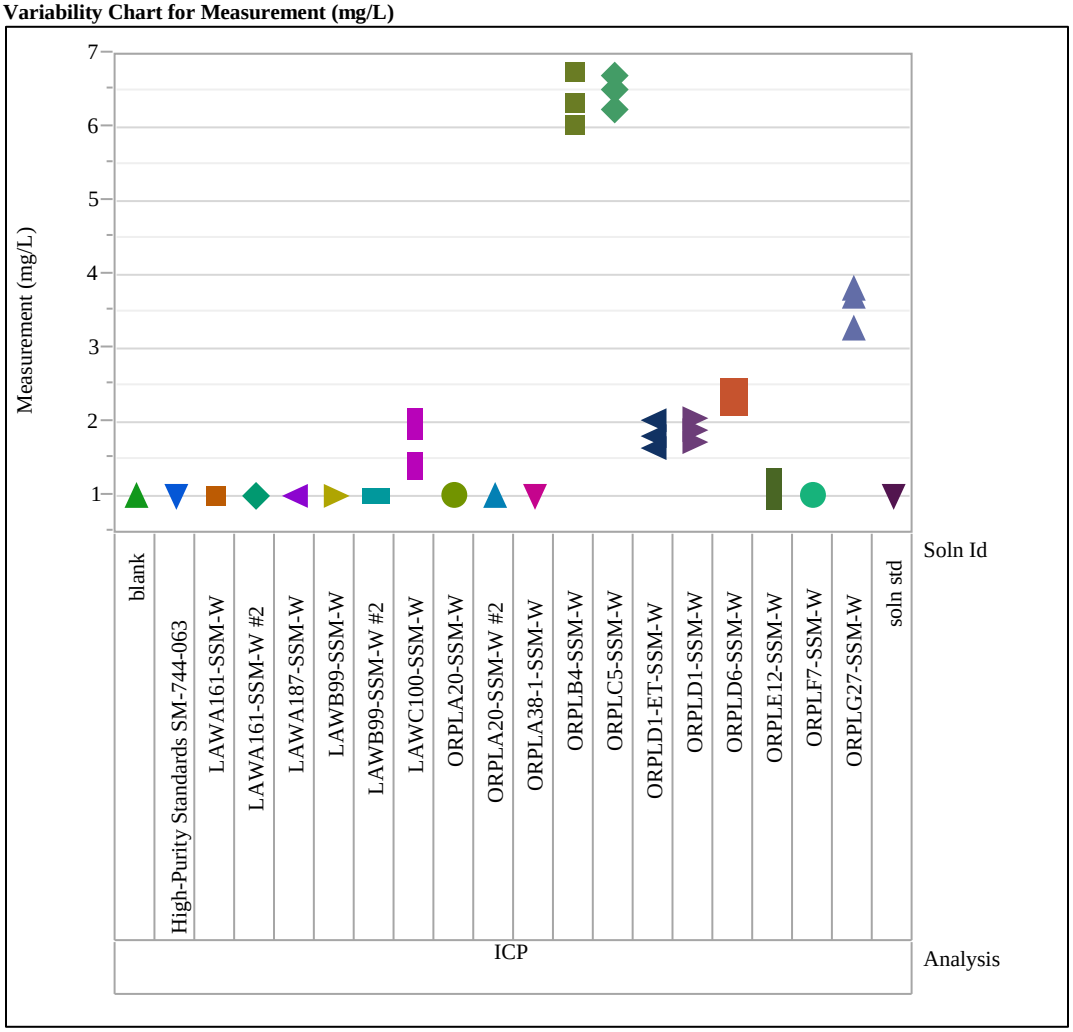


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Pb (mg/L)
Variability Chart for Measurement (mg/L)

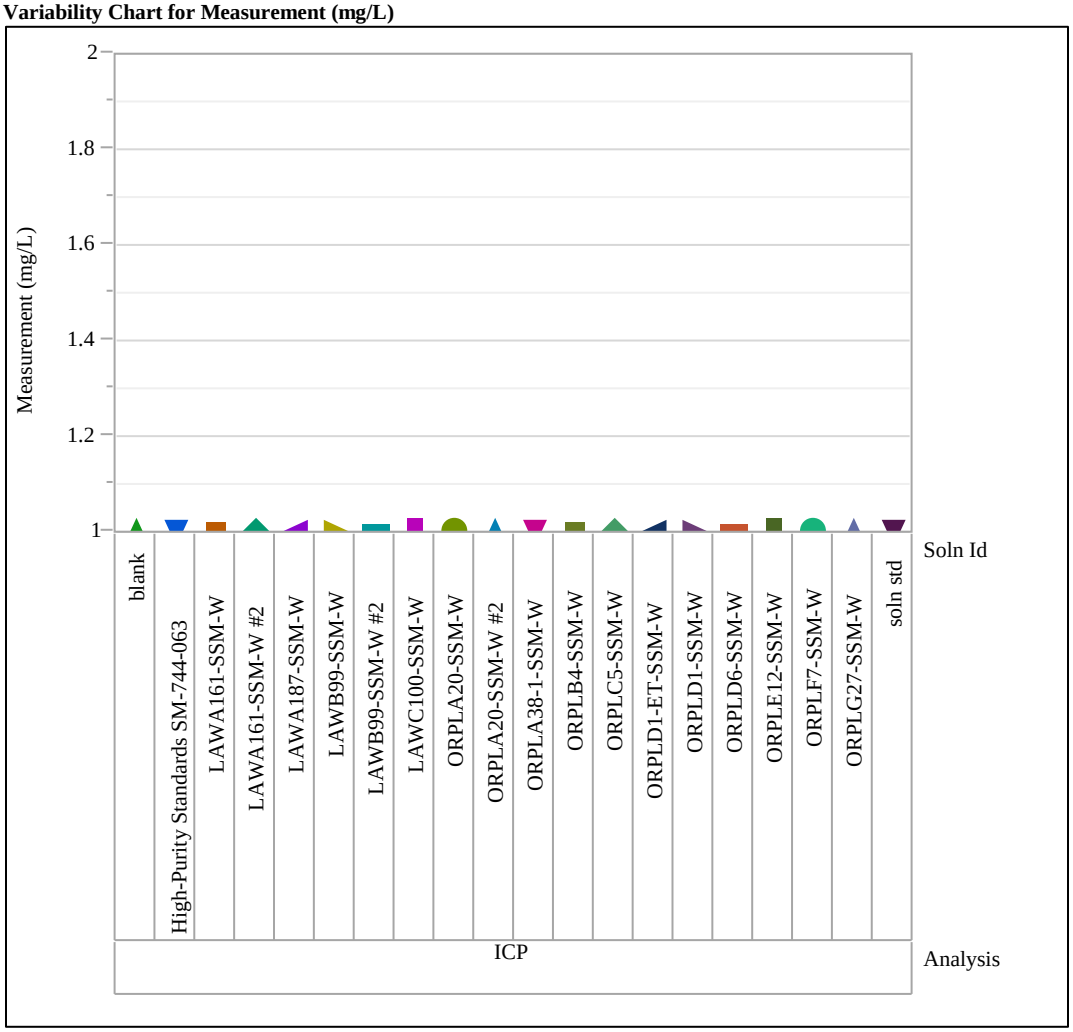


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=PO4 (mg/L)
Variability Chart for Measurement (mg/L)

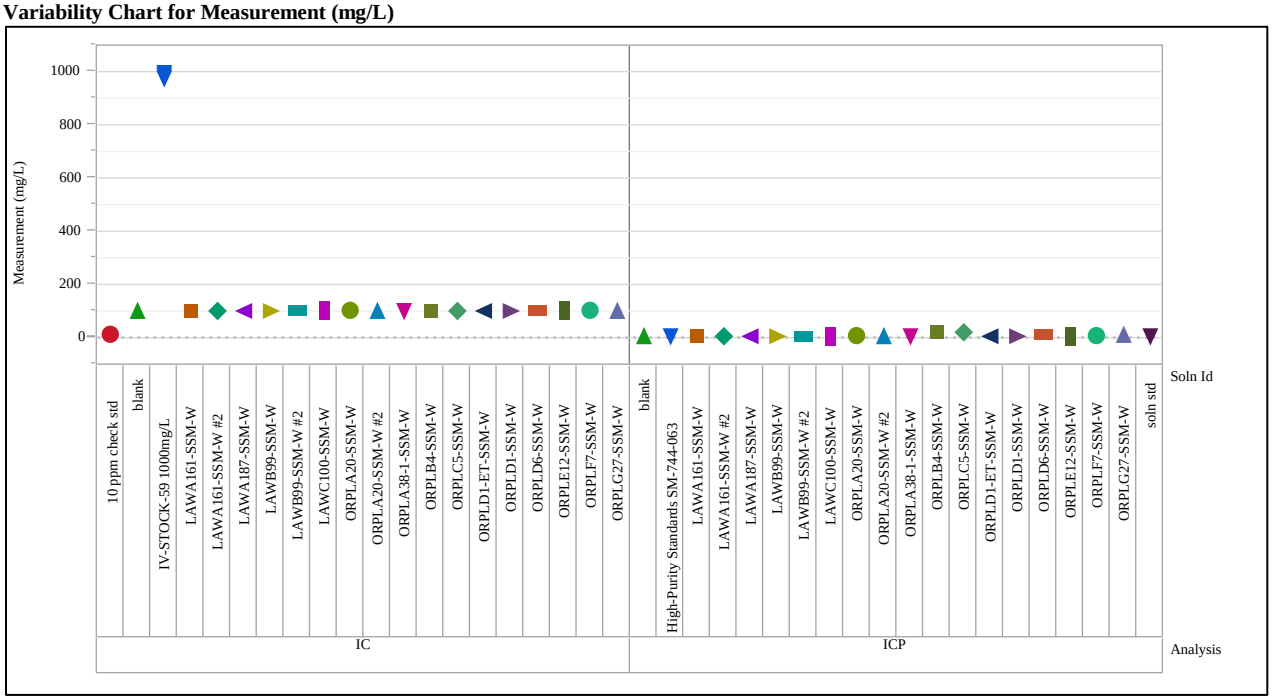


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

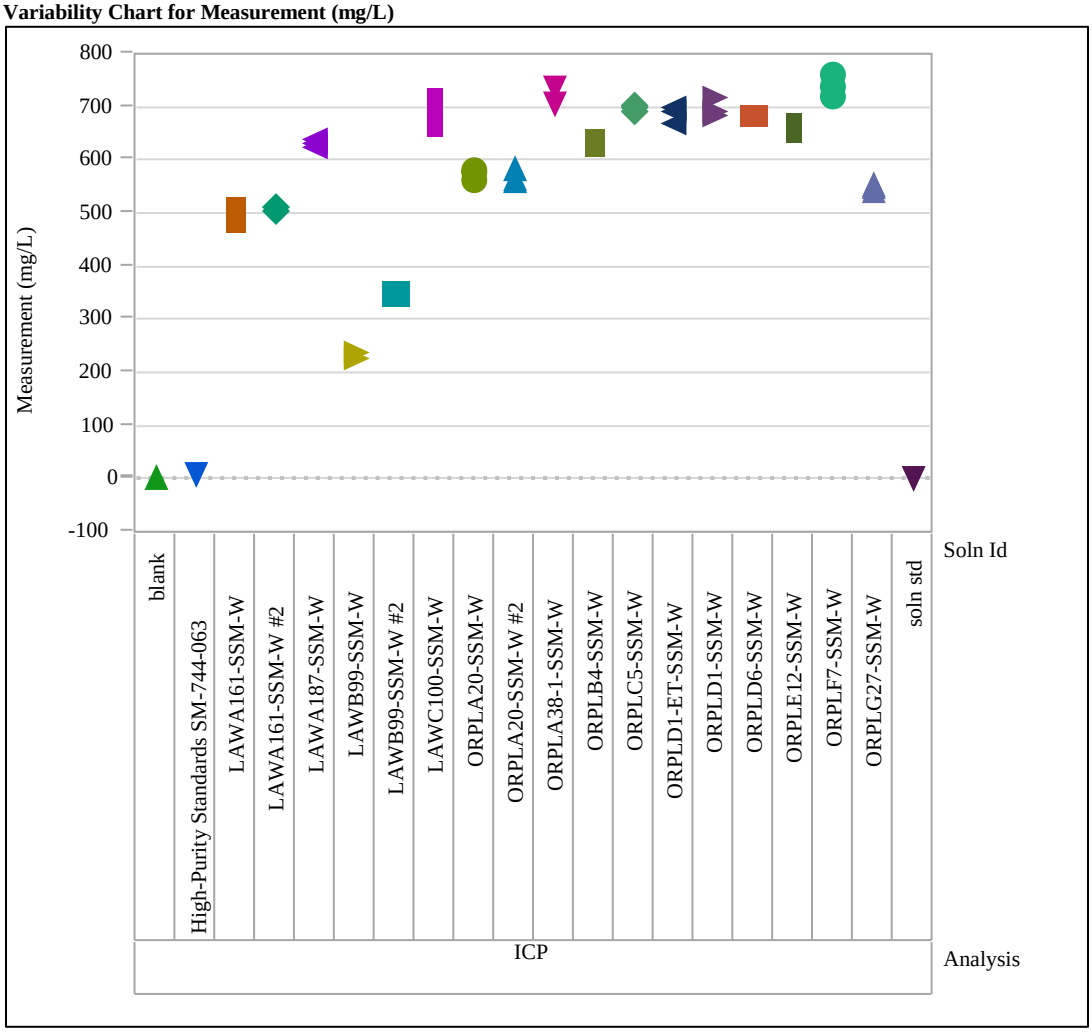


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Si (mg/L)
Variability Chart for Measurement (mg/L)

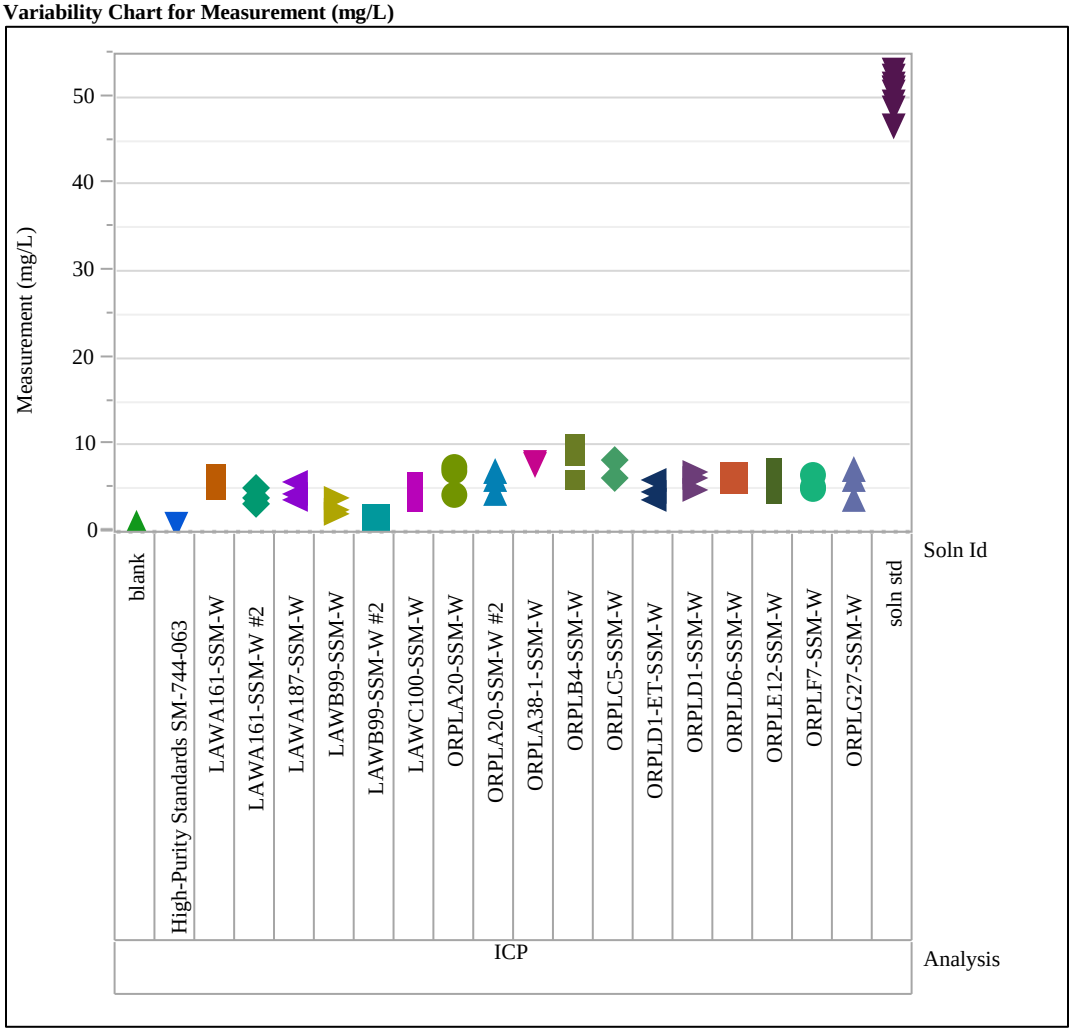


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Sn (mg/L)
Variability Chart for Measurement (mg/L)

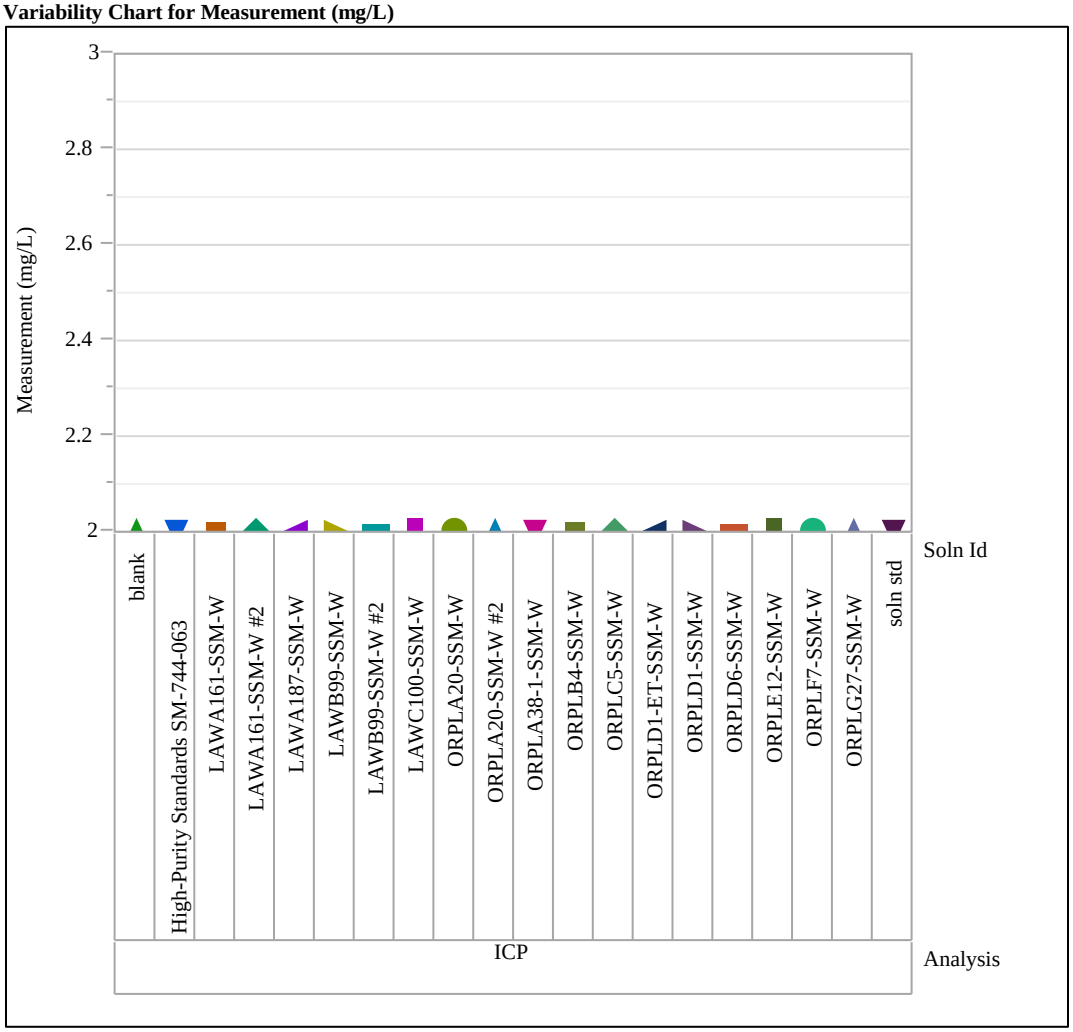


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=SO4 (mg/L)
Variability Chart for Measurement (mg/L)

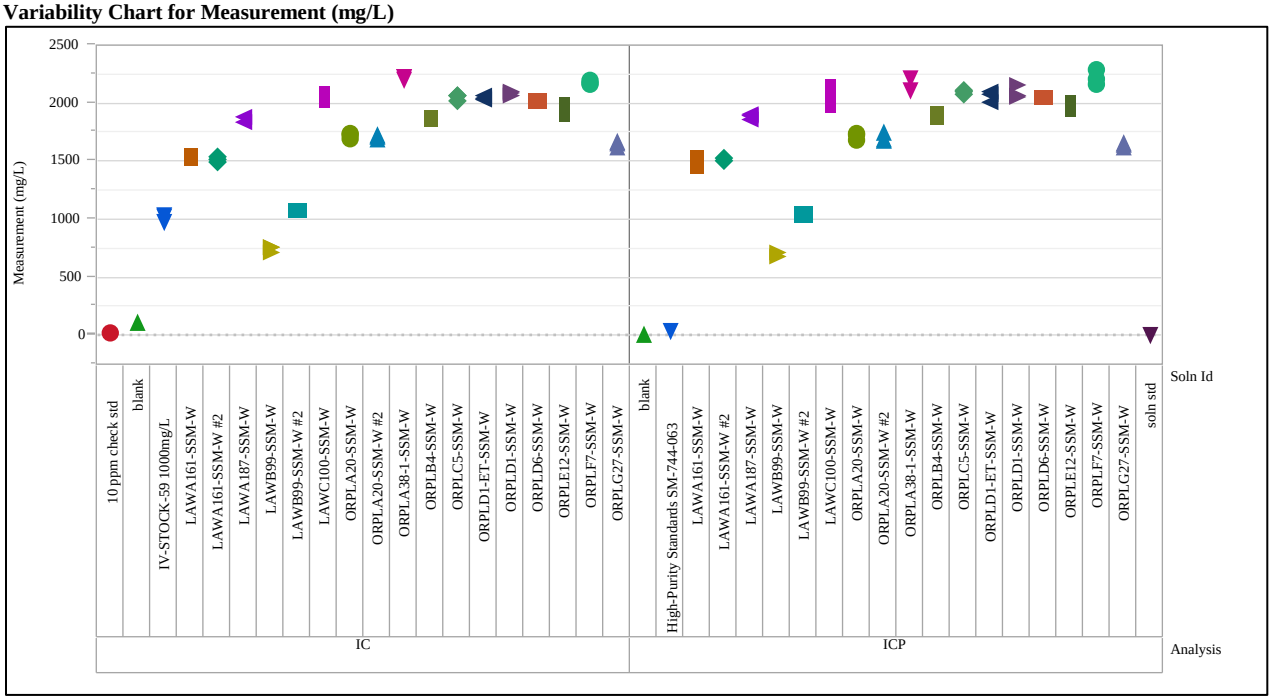


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=V (mg/L)
Variability Chart for Measurement (mg/L)

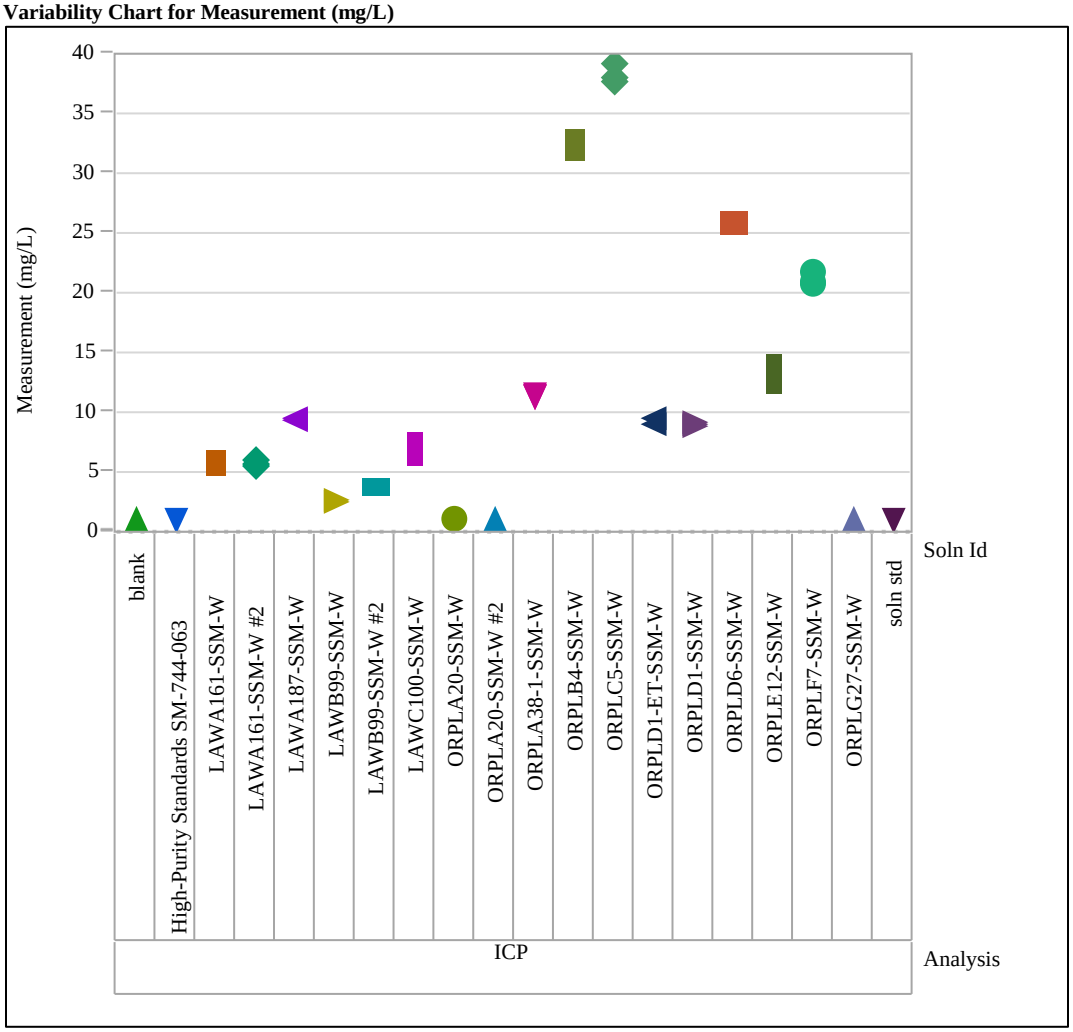


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Zn (mg/L)
Variability Chart for Measurement (mg/L)

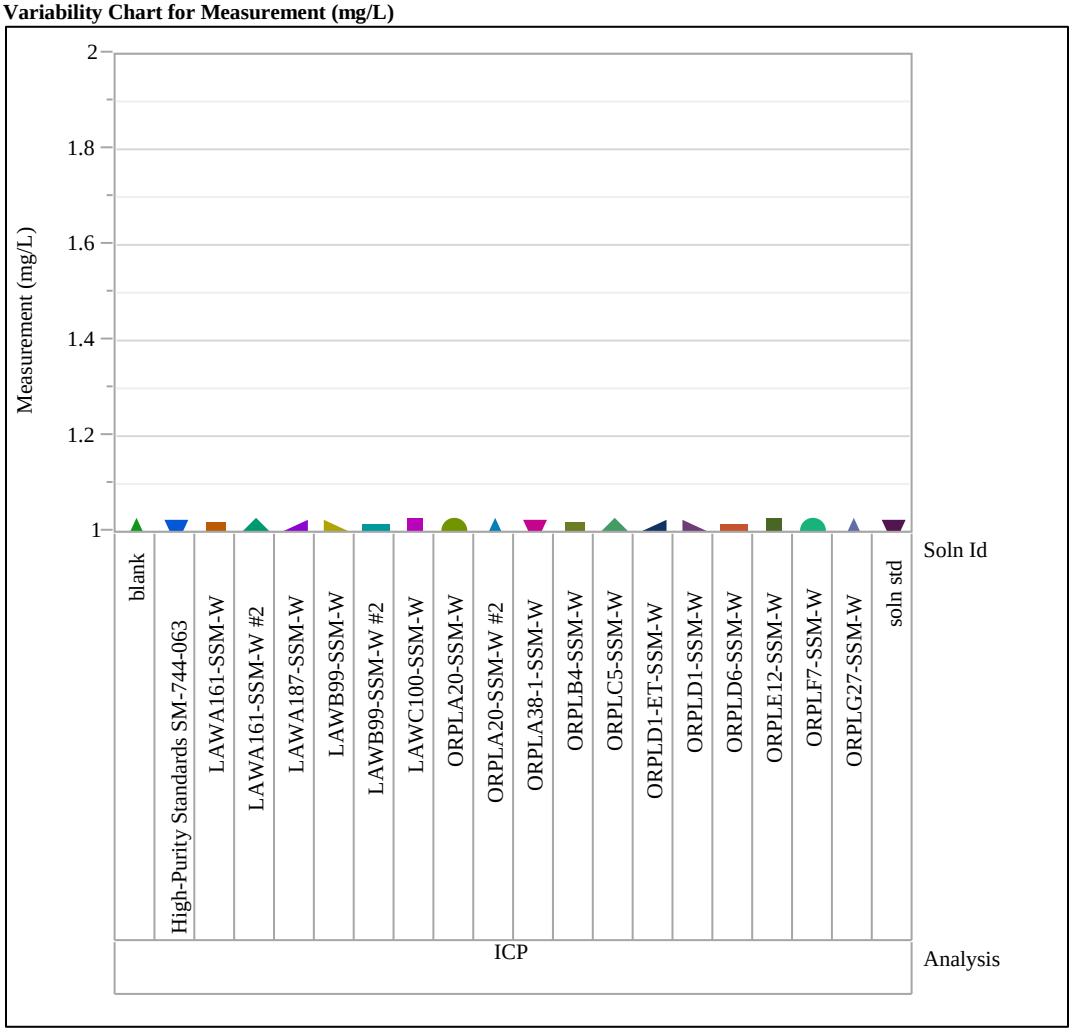
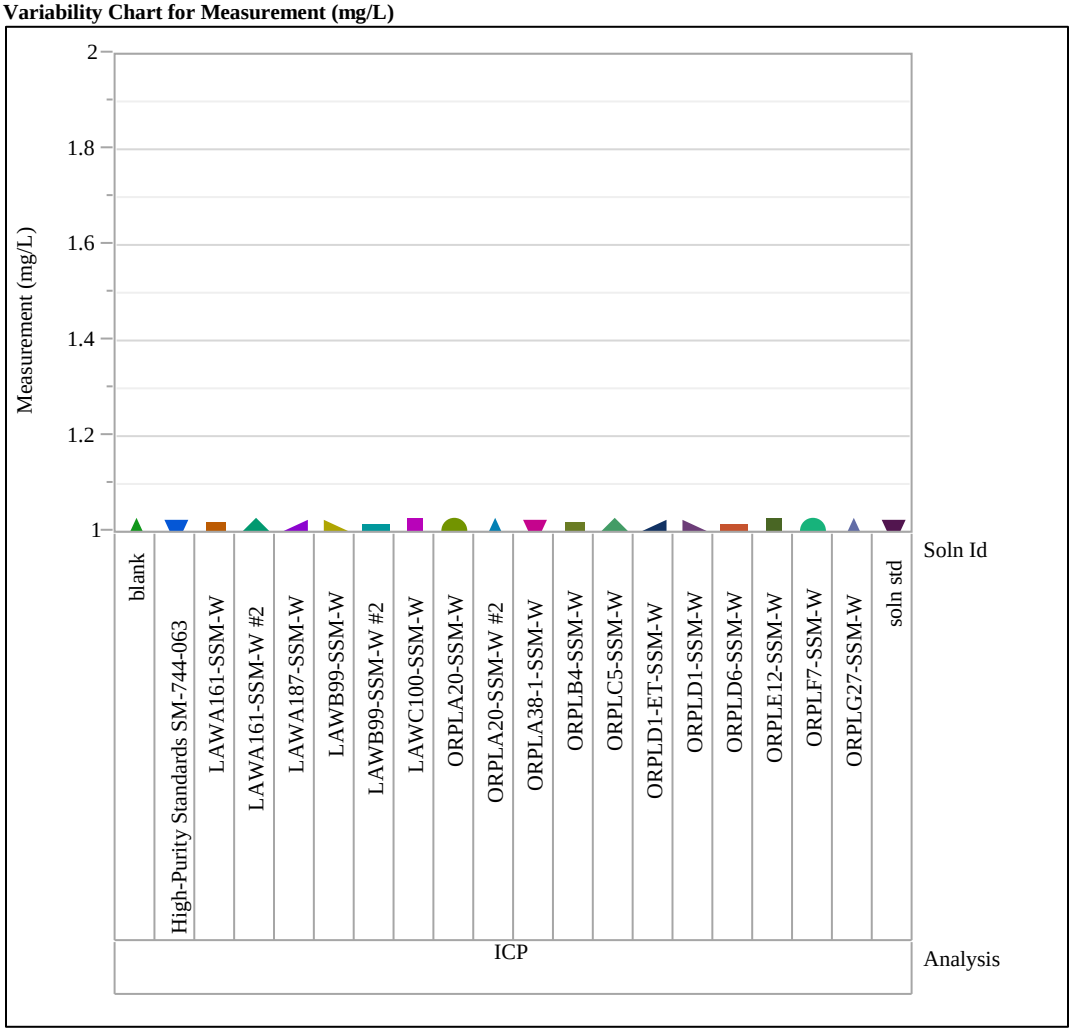


Exhibit B-2. Analysis of Wash Solutions by Solution Identifier (continued)

Analyte=Zr (mg/L)
Variability Chart for Measurement (mg/L)



Distribution:

J. W. Amoroso, 999-W
T. B. Brown, 773-A
M. E. Caldwell, 999-W
A. D. Cozzi, 999-W
C. L. Crawford, 773-42A
D. E. Dooley, 773-A
W. C. Eaton, PNNL
T. B. Edwards, 999-W
A. P. Fellinger, 773-42A
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K. M. Fox, 999-W
C. C. Herman, 773-A
A. M. Howe, 999-W
C. M. Jantzen, 773-A
T. Jin, PNNL
F. C. Johnson, 999-W
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D. J. McCabe, 773-42A
D. L. McClane, 999-W
G. A. Morgan, 999-W
F. M. Pennebaker, 773-42A
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W. G. Ramsey, 999-W
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R. L. Russell, PNNL
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G. N. Smoland, 999-1W
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B. J. Wiedenman, 773-42A
W. R. Wilmarth, 773-A
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