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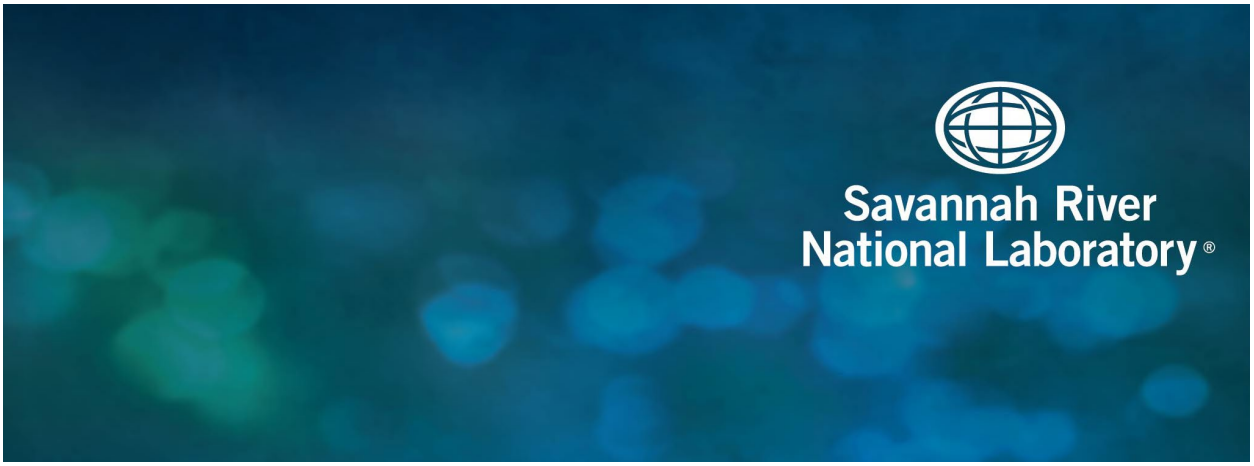

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Characterization of the Sulfur-Saturated Melt Versions of the LAW ALG Glasses

M. C. Hsieh

February 2022

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EXECUTIVE SUMMARY

This report provides the results from the chemical analyses of a series of sulfur-saturated melt version of the Low Activity Waste Algorithm study glasses, a series of simulated nuclear waste glasses designed and fabricated at Pacific Northwest National Laboratory. These data will be used in the development, validation, and implementation of enhanced property/composition models for waste glass vitrification at Hanford.

Chemical analyses were performed on a representative sample of each of the sulfur-saturated melt versions of the glasses to allow for comparisons with targeted compositions, as well as the measured compositions of the quenched glasses. The relative differences between the targeted and measured concentrations of B_2O_3, Na_2O, P_2O_5, and SO_3 for several of the glasses and F^-, K_2O, and ZrO_2 in three individual glasses were greater than ±10%.

The wash solutions contained mainly sodium, sulfur, and sulfate.

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LIST OF ABBREVIATIONS

BDL	below detection limit
DOE	Department of Energy
hp std	High Purity Standards ICP multi-element custom solution SM-744-063
IC	ion chromatography
ICP-OES	inductively coupled plasma – optical emission spectroscopy
ID	identifier
KH	potassium hydroxide fusion
LAW	low-activity waste
LM	lithium metaborate fusion
LRM	low-activity test reference material
ORP	Office of River Protection
PF	sodium peroxide fusion
PNNL	Pacific Northwest National Laboratory
Q	quenched
seq	sequence
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
SSM	sulfur-saturated melt
std	High Purity Standards ICP multi-element custom solution SM-744-013
TTQAP	Task Technical and Quality Assurance Plan
wt.%	weight percent
WTP	Hanford Waste Treatment and Immobilization Plant

1.0 Introduction

The U.S. Department of Energy (DOE) is responsible for 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 Office of River Protection (ORP) has requested that the Savannah River National Laboratory (SRNL) contribute in areas of recognized capabilities and expertise for glass waste form development to support successful startup of the WTP.

Successful efforts have allowed for demonstration of greatly enhanced treatment efficiencies of those projected from the minimum requirements set forth in the WTP Contract[a]. Additional flexibility and expansion of the qualified glass forming region are the current focus.[1] SRNL support of this work is defined in the Task Technical and Quality Assurance Plan (TTQAP).[2]

This report provides results from the chemical analyses of the sulfur-saturated melt (SSM) versions of the Low Activity Waste Algorithm (LAW ALG) study glasses, a series of simulated nuclear waste glasses designed and fabricated at Pacific Northwest National Laboratory (PNNL). The glasses were selected as part of a broader study of the influence of glass composition on chemical durability, sulfur retention, and other properties.[3] The resulting data will be used in the development, validation, and implementation of enhanced property/composition models for nuclear waste glasses.[1]

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 (SRS) Manual E7, Procedure 2.60.[4] SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011.[5] Laboratory data for this study were recorded in the SRNL Electronic Laboratory Notebook system, experiment L6390-00441-03. The glasses provided by PNNL were designed and fabricated following a Task Plan.[1]

2.2 Glasses Selected for Study

The baseline (quenched) glass compositions in this study were designed and fabricated by PNNL. Characterization of the baseline glasses were reported earlier.[6] Samples of each of the SSM versions of the study glasses, along with samples of the wash solutions resulting from the preparation of each of the SSM glasses, were received at SRNL for chemical composition analysis. PNNL identifiers (IDs) for the glass samples and associated SRNL sample identifiers are listed in Table 2-1. The identifiers for the wash solutions are likewise listed in Table 2-2.

[a] Contract DE-AC27-01RV14136, as amended, U.S. Department of Energy, Richland, WA (2000).

Table 2-1. Identifiers for the LAW ALG SSM Study Glasses

PNNL Glass ID	Lab ID
LAWALG-01-SSM-S	S-13348
LAWALG-02-SSM-S	S-13349
LAWALG-03-SSM-S	S-13350
LAWALG-04-SSM-S	S-13351
LAWALG-05-1-SSM-S	S-13352
LAWALG-06-SSM-S	S-13353
LAWALG-07-SSM-S	S-13354
LAWALG-08-SSM-1-S	S-13355
LAWALG-09-SSM-S	S-13356
LAWALG-10-SSM-S	S-13357
LAWALG-11-SSM-S	S-13358
LAWALG-12-SSM-S	S-13359
LAWALG-13-SSM-S	S-13360
LAWALG-14-SSM-S	S-13361
LAWALG-15-SSM-S	S-13362
LAWALG-16-SSM-S	S-13363
LAWALG-17-SSM-S	S-13364

Table 2-2. Identifiers for the LAW ALG SSM Wash Solutions

PNNL Wash Solution ID	Lab ID
LAWALG-01-SSM-W	S-13366
LAWALG-02-SSM-W	S-13367
LAWALG-03-SSM-W	S-13368
LAWALG-04-SSM-W	S-13369
LAWALG-05-1-SSM-W	S-13370
LAWALG-06-SSM-W	S-13371
LAWALG-07-SSM-W	S-13372
LAWALG-08-SSM-1-W	S-13373
LAWALG-09-SSM-W	S-13374
LAWALG-10-SSM-W	S-13375
LAWALG-11-SSM-W	S-13376
LAWALG-12-SSM-W	S-13377
LAWALG-13-SSM-W	S-13378
LAWALG-14-SSM-W	S-13379
LAWALG-15-SSM-W	S-13380
LAWALG-16-SSM-W	S-13381
LAWALG-17-SSM-W	S-13382
LAWALG-SSM-W	S-13383

2.3 Glass Composition Analysis

Chemical analyses were performed under the auspices of an analytical plan[7] 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 were used for preparing each of the glass samples, in duplicate, for analysis (potassium hydroxide fusion (KH), lithium metaborate fusion (LM), and sodium peroxide fusion (PF)).[8-10] Note that for some analytes, the analytical plan specified more than one preparation method for analysis. The results were reviewed and, in general, the method that provided better recovery of the analyte was selected for reporting.

Each of the duplicate samples was analyzed twice for each element of interest by inductively coupled plasma – optical emission spectroscopy (ICP-OES)[11] or ion chromatography (IC),[12] for a total of four measurements per element per glass. Glass standards were also intermittently measured to assess the performance of the ICP-OES and IC instruments over the course of these analyses. Specifically, several samples of the low-activity test reference material (LRM) were included as part of the analytical plans. The LRM composition reported as the "Consensus Average" is used as the reference composition of this glass.[13] The preparation and measurement methods used for each of the reported glass components are listed in Table 2-3.

Table 2-3. Preparation and Measurement Methods Used in Reporting the Analyte Concentrations of the Study Glasses

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

2.4 Wash Solution Analysis

Chemical analyses were performed under the auspices of an analytical plan[7] on a representative sample of each of the wash solutions resulting from the preparation of the SSM versions of the glasses, as listed in Table 2-2. The samples were diluted at SRNL based on the expected concentrations of the species in solution in preparation for the analysis.

Each of the samples was analyzed in triplicate for each element of interest by ICP-OES[11] and IC[12]. Solution standards and blanks were also intermittently measured to assess the performance of the ICP-OES 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 2-4.

Table 2-4. Measurement Methods Used in Reporting the Analyte Concentrations of the Wash Solutions

Analyte	Measurement Method
Al	ICP-OES
B	ICP-OES
Ca	ICP-OES
Cl^-	IC
Cr	ICP-OES
F^-	IC
Fe	ICP-OES
K	ICP-OES
Li	ICP-OES
Mg	ICP-OES
Na	ICP-OES
P	ICP-OES
PO_4^{3-}	IC
S	ICP-OES
SO_4^{2-}	IC
Si	ICP-OES
Sn	ICP-OES
Ti	ICP-OES
V	ICP-OES
Zn	ICP-OES
Zr	ICP-OES

3.0 Results and Discussion

JMP® Version 16.0.0 (SAS Institute, Inc.)[14] was used to support these analyses

3.1 Review and Evaluation of the SSM Glass Composition Measurements

Table A-1, Table A-2, and Table A-3 in Appendix A provide the elemental concentration measurements in weight percent (wt.%) from glasses prepared using KH, LM, and PF methods, respectively. Elemental measurements for samples of the LRM glass are also included in these tables of Appendix A.

3.1.1 Treatment of Detection Limits

The elemental concentrations in Table A-1, Table A-2, and Table A-3 in Appendix A were converted to oxide concentrations by multiplying the values of each element by the gravimetric factor for the corresponding oxide. A concentration measurement that was reported to be below the detection limit was set to the detection limit for the purposes of data review and calculating a sum of oxides for each glass. Concentration measurements that were below the detection limit (BDL) are denoted with a less than symbol (<).

3.1.2 Composition Measurements by Glass Identifier

Exhibit A-1 in Appendix A provides plots of the oxide concentration measurements by the PNNL Glass ID (including the LRM glasses) 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 duplicates of each preparation method and 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 preparations and duplicate measurements. A review of the plots presented in these exhibits reveals

the repeatability of the four individual values for each oxide for each glass. There were no indications of errors in preparation or measurement that had to be addressed in treatment of the data.

3.1.3 Results for the LRM Standard Glass

Exhibit A-2 in Appendix A provides a comparison of the LRM results to their acceptability limits utilized by SRNL.[11] 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 each element of interest. The results show that all measurements of the LRM elements of interest were within the acceptability limits during the execution of these analyses.

3.1.4 Measured versus Target Compositions

All measurements for each oxide for each glass (Table A-1, Table A-2, and Table A-3 in Appendix A) were used in calculating oxide values, which were then averaged to determine a representative chemical composition for each glass. A sum of oxides was also computed for each glass based upon the averaged oxide values. Exhibit A-3 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.

Exhibit A-4 in Appendix A provides a summary of the average compositions, targeted compositions and some associated differences and relative differences. The measured sums of oxides for all glasses fall within the interval of 95.4 wt.% to 103 wt. %, indicating acceptable recovery of the glass components.[15] Entries in Table A-4 show the relative differences between the measured and targeted values for the analytes with measured and targeted values above 1 wt.%. The relative differences were shaded if they are 10% or more and are summarized below.

- B_2O_3 relative differences were 10% or greater for LAWALG-05-1-SSM-S, LAWALG-06-SSM-S, LAWALG-09-SSM-S, LAWALG-10-SSM-S, LAWALG-11-SSM-S, LAWALG-12-SSM-S, LAWALG-13-SSM-S, and LAWALG-14-SSM-S.
- The F^- relative difference was greater than 10% for LAWALG-12-SSM-S.
- The K_2O relative difference was greater than 10% for LAWALG-11-SSM-S.
- Na_2O relative differences were 10% or greater for LAWALG-05-1-SSM-S, LAWALG-08-SSM-1-S, and LAWALG-13-SSM-S.
- The P_2O_5 relative difference was greater than 10% for LAWALG-03-SSM-S, LAWALG-07-SSM-S, LAWALG-09-SSM-S, and LAWALG-12-SSM-S.
- The ZrO_2 relative difference was 10% for LAWALG-09-SSM-S.
- As expected, the measured SO_3 concentrations in the glasses were higher than targeted due to the use of the sulfur saturation method in fabricating these glasses.

3.2 Comparison of Measured Compositions of Baseline and SSM Glasses

Exhibit A-4 in Appendix A provides a comparison of the measured oxide concentrations among the baseline (quenched) and SSM versions of the study glasses. A review of Table A-4 led to the following observation:

- The measured SO_3 concentrations were higher for SSM versions of the study glasses, as expected, due to the use of the sulfur saturation method in fabricating these glasses.

The discussion of the analyses of the wash solutions, provided in Section 3.3, may provide further insight into the measured compositions of the SSM glasses.

3.3 Review and Evaluation of the 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-OES. 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 included in these tables of Appendix B.

3.3.1 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. These values were set to the detection limit for the purposes of data review and of calculating an average composition for each wash solution.

3.3.2 Composition Measurements by Wash Solution Identifier

Exhibit B-1 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 review the values for each individual solution as a function of the triplicate measurements. A review of the plots presented in these exhibits reveals the repeatability of the three individual values for each analyte for each solution. 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.

3.3.3 Results for the Standard Solutions

Table B-3 in Appendix B provides comparisons of the standard solution results to their reference values. The results in this table indicate no issues with the performance of the analyses.

3.3.4 Measured Compositions of the Wash Solutions

From the discussion of Section 3.3.2, all the measurements for each analyte for each wash solution (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 the review of Table B-4:

- The wash solutions contained mainly Na (<1.00-1120 mg/L), S (<1.00-614 mg/L), and SO_4^{2-} (20.1-1870 mg/L), which could be attributed to the excess sodium sulfate added as part of the SSM preparation process.
- The measured concentrations of B, Ca, Cr, K, Li, P, Si, V, and PO_4^{3-} in the wash solutions were generally below 100 mg/L.
- The measured concentrations of Al, Cl^-, F^-, Fe, Mg, Sn, Ti, Zn and Zr in the wash solutions were near or below the detection limits.

4.0 Summary

Chemical analyses were performed on a series of SSM versions of simulated nuclear waste glasses and resulting wash solutions with ICP-OES and IC. The glasses were designed and fabricated by PNNL as part of a broader study of the influence of glass composition on chemical durability, sulfur retention, and other properties.

The relative differences between the targeted and measured concentrations of B_2O_3, Na_2O, P_2O_5, and SO_3 for several of the glasses and F^-, K_2O, and ZrO_2 in three individual glasses were greater than ±10%. As expected, the measured concentrations of SO_3 in most of the glasses were higher than targeted due to the use of the sulfur saturation method in fabricating these glasses.

The wash solutions contained mainly sodium, sulfur, and sulfate.

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Appendix A. Tables and Exhibits Supporting the LAW ALG Glass Composition Measurements

Table A-1. KH Measurements (wt.%) of the SSM Study Glasses

PNNL ID	Block	Sub – Block	Seq	Lab ID	Cl^-	F^-
LRM	1	1	1	LRMKH111	<0.0250	0.864
LAWALG-07-SSM-S	1	1	2	S-13354KH21	<0.0250	0.204
LAWALG-16-SSM-S	1	1	3	S-13363KH21	0.0374	0.0555
LAWALG-08-SSM-1-S	1	1	4	S-13355KH21	<0.0250	0.0347
LAWALG-15-SSM-S	1	1	5	S-13362KH21	0.0437	0.0457
LAWALG-04-SSM-S	1	1	6	S-13351KH21	0.0502	0.0285
LAWALG-17-SSM-S	1	1	7	S-13364KH11	0.168	0.226
LAWALG-04-SSM-S	1	1	8	S-13351KH11	0.0499	0.0280
LAWALG-08-SSM-1-S	1	1	9	S-13355KH11	<0.0250	0.0354
LAWALG-03-SSM-S	1	1	10	S-13350KH11	0.0441	0.241
LRM	1	1	11	LRMKH112	<0.0250	0.864
LAWALG-01-SSM-S	1	1	12	S-13348KH11	0.0341	0.307
LAWALG-03-SSM-S	1	1	13	S-13350KH21	0.0369	0.240
LAWALG-16-SSM-S	1	1	14	S-13363KH11	0.0386	0.0544
LAWALG-02-SSM-S	1	1	15	S-13349KH11	0.0434	0.0653
LAWALG-01-SSM-S	1	1	16	S-13348KH21	0.0297	0.307
LAWALG-02-SSM-S	1	1	17	S-13349KH21	0.0454	0.0661
LAWALG-15-SSM-S	1	1	18	S-13362KH11	0.0418	0.0460
LAWALG-07-SSM-S	1	1	19	S-13354KH11	<0.0250	0.205
LAWALG-17-SSM-S	1	1	20	S-13364KH21	0.162	0.226
LRM	1	1	21	LRMKH113	<0.0250	0.861
LRM	1	2	1	LRMKH121	<0.0250	0.874
LAWALG-16-SSM-S	1	2	2	S-13363KH22	0.0359	0.0554
LAWALG-15-SSM-S	1	2	3	S-13362KH22	0.0422	0.0463
LAWALG-01-SSM-S	1	2	4	S-13348KH12	0.0345	0.309
LAWALG-17-SSM-S	1	2	5	S-13364KH22	0.163	0.228
LAWALG-02-SSM-S	1	2	6	S-13349KH22	0.0454	0.0666
LAWALG-16-SSM-S	1	2	7	S-13363KH12	0.0385	0.0547
LAWALG-07-SSM-S	1	2	8	S-13354KH22	<0.0250	0.207
LAWALG-08-SSM-1-S	1	2	9	S-13355KH12	<0.0250	0.0353
LAWALG-07-SSM-S	1	2	10	S-13354KH12	<0.0250	0.208
LRM	1	2	11	LRMKH122	<0.0250	0.870
LAWALG-17-SSM-S	1	2	12	S-13364KH12	0.168	0.229
LAWALG-04-SSM-S	1	2	13	S-13351KH22	0.0488	0.0279
LAWALG-08-SSM-1-S	1	2	14	S-13355KH22	<0.0250	0.0350
LAWALG-04-SSM-S	1	2	15	S-13351KH12	0.0488	0.0279
LAWALG-15-SSM-S	1	2	16	S-13362KH12	0.0412	0.0462
LAWALG-03-SSM-S	1	2	17	S-13350KH22	0.0357	0.242
LAWALG-02-SSM-S	1	2	18	S-13349KH12	0.0435	0.0661
LAWALG-03-SSM-S	1	2	19	S-13350KH12	0.0441	0.243
LAWALG-01-SSM-S	1	2	20	S-13348KH22	0.0303	0.310
LRM	1	2	21	LRMKH123	<0.0250	0.867
LRM	2	1	1	LRMKH211	<0.0250	0.864
LAWALG-05-1-SSM-S	2	1	2	S-13352KH21	0.0283	0.317
LAWALG-12-SSM-S	2	1	3	S-13359KH11	0.0266	0.709
LAWALG-SSM-S	2	1	4	S-13365KH11	<0.0250	0.853
LAWALG-11-SSM-S	2	1	5	S-13358KH11	0.0264	0.0778

Table A-1. KH Measurements (wt.%) of the SSM Study Glasses (continued)

PNNL ID	Block	Sub – Block	Seq	Lab ID	Cl^-	F^-
LAWALG-09-SSM-S	2	1	6	S-13356KH11	0.0300	0.274
LAWALG-SSM-S	2	1	7	S-13365KH21	<0.0250	0.861
LAWALG-13-SSM-S	2	1	8	S-13360KH11	0.0280	0.187
LAWALG-10-SSM-S	2	1	9	S-13357KH11	0.0284	0.0518
LAWALG-06-SSM-S	2	1	10	S-13353KH11	<0.0250	0.0493
LRM	2	1	11	LRMKH212	<0.0250	0.861
LAWALG-09-SSM-S	2	1	12	S-13356KH21	0.0261	0.276
LAWALG-14-SSM-S	2	1	13	S-13361KH11	0.0424	0.103
LAWALG-05-1-SSM-S	2	1	14	S-13352KH11	0.0272	0.322
LAWALG-11-SSM-S	2	1	15	S-13358KH21	<0.0250	0.0784
LAWALG-06-SSM-S	2	1	16	S-13353KH21	<0.0250	0.0493
LAWALG-14-SSM-S	2	1	17	S-13361KH21	0.0424	0.102
LAWALG-12-SSM-S	2	1	18	S-13359KH21	<0.0250	0.684
LAWALG-13-SSM-S	2	1	19	S-13360KH21	0.0283	0.192
LAWALG-10-SSM-S	2	1	20	S-13357KH21	0.0276	0.0521
LRM	2	1	21	LRMKH213	<0.0250	0.863
LRM	2	2	1	LRMKH221	<0.0250	0.871
LAWALG-SSM-S	2	2	2	S-13365KH12	<0.0250	0.859
LAWALG-12-SSM-S	2	2	3	S-13359KH12	0.0261	0.714
LAWALG-10-SSM-S	2	2	4	S-13357KH12	0.0283	0.0524
LAWALG-09-SSM-S	2	2	5	S-13356KH22	0.0259	0.278
LAWALG-06-SSM-S	2	2	6	S-13353KH22	<0.0250	0.0496
LAWALG-11-SSM-S	2	2	7	S-13358KH22	<0.0250	0.0791
LAWALG-14-SSM-S	2	2	8	S-13361KH22	0.0430	0.103
LAWALG-13-SSM-S	2	2	9	S-13360KH22	0.0284	0.193
LAWALG-12-SSM-S	2	2	10	S-13359KH22	<0.0250	0.688
LRM	2	2	11	LRMKH222	<0.0250	0.867
LAWALG-11-SSM-S	2	2	12	S-13358KH12	0.0262	0.0785
LAWALG-05-1-SSM-S	2	2	13	S-13352KH22	0.0278	0.320
LAWALG-06-SSM-S	2	2	14	S-13353KH12	<0.0250	0.0501
LAWALG-10-SSM-S	2	2	15	S-13357KH22	0.0281	0.0527
LAWALG-SSM-S	2	2	16	S-13365KH22	<0.0250	0.867
LAWALG-14-SSM-S	2	2	17	S-13361KH12	0.0422	0.104
LAWALG-09-SSM-S	2	2	18	S-13356KH12	0.0304	0.278
LAWALG-13-SSM-S	2	2	19	S-13360KH12	0.0277	0.189
LAWALG-05-1-SSM-S	2	2	20	S-13352KH12	0.0274	0.325
LRM	2	2	21	LRMKH223	<0.0250	0.869

Table A-2. LM Measurements (wt.%) of the SSM Study Glasses

PNNL ID	Block	Sub – Block	Seq	Lab ID	Al	Ca	Cr	Fe	K	Mg	Na	S	Sn	Ti	V	Zn
LRM	1	1	1	LRMLM111	5.30	0.356	0.129	0.932	1.21	0.0627	15.2	0.0739	<0.100	0.0612	<0.100	<0.100
LAWALG-07-SSM-S	1	1	2	S-13354LM21	3.01	5.53	0.0299	0.0647	<0.100	0.0787	16.5	0.626	3.42	<0.0500	0.496	<0.100
LAWALG-16-SSM-S	1	1	3	S-13363LM21	4.55	5.32	0.262	0.0813	<0.100	0.0759	16.8	0.468	3.39	0.0811	<0.100	<0.100
LAWALG-08-SSM-1-S	1	1	4	S-13355LM21	1.84	8.19	<0.0250	0.0954	<0.100	0.116	9.15	0.776	<0.100	<0.0500	2.22	<0.100
LAWALG-15-SSM-S	1	1	5	S-13362LM21	4.77	5.42	0.0261	0.0963	<0.100	0.0774	16.9	0.488	3.42	0.108	<0.100	<0.100
LAWALG-04-SSM-S	1	1	6	S-13351LM21	4.58	5.33	<0.0250	0.0906	0.233	0.0743	17.3	0.527	3.43	0.201	<0.100	<0.100
LAWALG-17-SSM-S	1	1	7	S-13364LM11	4.86	5.50	0.0386	0.103	0.318	0.0779	16.9	0.435	3.51	0.106	<0.100	<0.100
LAWALG-04-SSM-S	1	1	8	S-13351LM11	4.52	5.34	<0.0250	0.0689	0.225	0.0745	17.3	0.512	3.41	0.0562	<0.100	<0.100
LAWALG-08-SSM-1-S	1	1	9	S-13355LM11	1.86	8.19	0.0286	0.0967	<0.100	0.117	9.26	0.789	<0.100	0.0511	2.23	<0.100
LAWALG-03-SSM-S	1	1	10	S-13350LM11	2.95	5.82	0.0460	0.0769	<0.100	0.0829	16.3	0.627	3.39	0.0611	1.27	<0.100
LRM	1	1	11	LRMLM112	5.43	0.368	0.130	0.940	1.14	0.0636	15.8	0.0799	<0.100	0.0627	<0.100	<0.100
LAWALG-01-SSM-S	1	1	12	S-13348LM11	1.81	8.01	0.0466	0.0785	0.143	0.117	11.8	1.22	<0.100	<0.0500	2.21	<0.100
LAWALG-03-SSM-S	1	1	13	S-13350LM21	2.89	5.86	0.0443	0.0769	<0.100	0.0838	16.2	0.646	3.63	0.0616	1.31	<0.100
LAWALG-16-SSM-S	1	1	14	S-13363LM11	4.59	5.33	0.267	0.0836	<0.100	0.0774	17.1	0.468	3.63	0.0838	<0.100	<0.100
LAWALG-02-SSM-S	1	1	15	S-13349LM11	2.89	6.58	0.0323	0.0879	<0.100	0.0963	14.7	0.843	<0.100	0.0691	2.23	<0.100
LAWALG-01-SSM-S	1	1	16	S-13348LM21	1.85	8.06	0.0474	0.0784	0.142	0.116	11.8	1.28	<0.100	<0.0500	2.23	<0.100
LAWALG-02-SSM-S	1	1	17	S-13349LM21	2.86	6.70	0.0312	0.0888	<0.100	0.0970	14.7	0.841	<0.100	0.0695	2.26	<0.100
LAWALG-15-SSM-S	1	1	18	S-13362LM11	4.74	5.44	0.0283	0.0985	0.101	0.0788	17.4	0.504	3.71	0.112	<0.100	<0.100
LAWALG-07-SSM-S	1	1	19	S-13354LM11	3.09	5.67	0.0327	0.0689	<0.100	0.0806	17.3	0.643	3.73	0.0509	0.510	<0.100
LAWALG-17-SSM-S	1	1	20	S-13364LM21	4.90	5.54	0.0409	0.100	0.350	0.0786	17.0	0.447	3.77	0.110	<0.100	<0.100
LRM	1	1	21	LRMLM113	5.35	0.361	0.133	0.944	1.21	0.064	15.6	0.0849	<0.100	0.0630	<0.100	<0.100
LRM	1	2	1	LRMLM121	5.34	0.356	0.125	0.951	1.18	0.0648	15.2	0.0803	<0.100	0.0601	<0.100	<0.100
LAWALG-16-SSM-S	1	2	2	S-13363LM22	4.54	5.28	0.256	0.0826	<0.100	0.0777	16.9	0.493	3.34	0.0793	<0.100	<0.100
LAWALG-15-SSM-S	1	2	3	S-13362LM22	4.66	5.33	<0.0250	0.0978	<0.100	0.0792	16.7	0.516	3.39	0.105	<0.100	<0.100
LAWALG-01-SSM-S	1	2	4	S-13348LM12	1.82	8.00	0.0449	0.0802	0.142	0.119	11.6	1.18	<0.100	<0.0500	2.15	<0.100
LAWALG-17-SSM-S	1	2	5	S-13364LM22	4.77	5.47	0.037	0.0992	0.333	0.0790	16.6	0.451	3.48	0.102	<0.100	<0.100
LAWALG-02-SSM-S	1	2	6	S-13349LM22	2.88	6.68	0.0272	0.0900	<0.100	0.0984	14.6	0.862	<0.100	0.0667	2.20	<0.100
LAWALG-16-SSM-S	1	2	7	S-13363LM12	4.66	5.42	0.260	0.0833	<0.100	0.0784	17.1	0.487	3.39	0.0798	<0.100	<0.100
LAWALG-07-SSM-S	1	2	8	S-13354LM22	3.11	5.68	0.028	0.0660	<0.100	0.0815	17.1	0.648	3.43	<0.0500	0.503	<0.100
LAWALG-08-SSM-1-S	1	2	9	S-13355LM12	1.85	8.17	<0.0250	0.0977	<0.100	0.120	9.28	0.829	<0.100	<0.0500	2.22	<0.100
LAWALG-07-SSM-S	1	2	10	S-13354LM12	3.07	5.61	0.0284	0.0681	<0.100	0.0808	16.6	0.664	3.45	<0.0500	0.498	<0.100
LRM	1	2	11	LRMLM122	5.41	0.367	0.123	0.929	1.16	0.0635	15.4	0.087	<0.100	0.0580	<0.100	<0.100
LAWALG-17-SSM-S	1	2	12	S-13364LM12	4.81	5.50	0.0348	0.104	0.321	0.0790	16.9	0.451	3.49	0.102	<0.100	<0.100
LAWALG-04-SSM-S	1	2	13	S-13351LM22	4.57	5.32	<0.0250	0.0905	0.236	0.0753	17.2	0.530	3.40	0.193	<0.100	<0.100
LAWALG-08-SSM-1-S	1	2	14	S-13355LM22	1.83	8.07	<0.0250	0.0950	<0.100	0.117	9.21	0.804	<0.100	<0.0500	2.19	<0.100
LAWALG-04-SSM-S	1	2	15	S-13351LM12	4.53	5.29	<0.0250	0.0682	0.220	0.0749	17.2	0.541	3.39	0.0530	<0.100	<0.100
LAWALG-15-SSM-S	1	2	16	S-13362LM12	4.81	5.48	<0.0250	0.0970	<0.100	0.0783	17.1	0.514	3.46	0.102	<0.100	<0.100
LAWALG-03-SSM-S	1	2	17	S-13350LM22	3.00	5.90	0.0414	0.0757	<0.100	0.0839	16.6	0.641	3.45	0.0574	1.29	<0.100
LAWALG-02-SSM-S	1	2	18	S-13349LM12	3.00	6.82	0.0265	0.0867	<0.100	0.0969	14.8	0.847	<0.100	0.0647	2.23	<0.100
LAWALG-03-SSM-S	1	2	19	S-13350LM12	3.03	5.88	0.0395	0.0757	<0.100	0.0835	16.5	0.649	3.40	0.0573	1.29	<0.100
LAWALG-01-SSM-S	1	2	20	S-13348LM22	1.90	8.29	0.0437	0.0776	0.135	0.117	11.9	1.23	<0.100	<0.0500	2.20	<0.100
LRM	1	2	21	LRMLM123	5.43	0.363	0.121	0.929	1.18	0.0635	15.8	0.0793	<0.100	0.0580	<0.100	<0.100
LRM	2	1	1	LRMLM211	5.18	0.345	0.129	0.961	1.24	0.0657	15.1	0.0930	<0.100	0.0608	<0.100	<0.100
LAWALG-05-1-SSM-S	2	1	2	S-13352LM21	1.74	7.91	0.0269	0.0841	0.103	0.120	8.56	0.821	<0.100	<0.0500	2.14	<0.100
LAWALG-12-SSM-S	2	1	3	S-13359LM11	1.78	7.26	0.0313	0.0816	<0.100	0.108	13.3	1.12	<0.100	<0.0500	2.12	<0.100
LAWALG-SSM-S	2	1	4	S-13365LM11	4.99	0.347	0.126	0.941	1.09	0.0646	14.8	0.0888	<0.100	0.0597	<0.100	<0.100
LAWALG-11-SSM-S	2	1	5	S-13358LM11	4.51	5.10	<0.0250	0.0921	1.77	0.0775	16.0	0.406	3.38	0.0985	<0.100	3.03

Table A-2. LM Measurements (wt.%) of the SSM Study Glasses (continued)

PNNL ID	Block	Sub – Block	Seq	Lab ID	Al	Ca	Cr	Fe	K	Mg	Na	S	Sn	Ti	V	Zn
LAWALG-09-SSM-S	2	1	6	S-13356LM11	4.68	5.56	0.108	0.103	0.125	0.0838	16.5	0.512	3.38	0.0879	<0.100	<0.100
LAWALG-SSM-S	2	1	7	S-13365LM21	5.13	0.358	0.130	0.960	1.18	0.0662	15.0	0.0853	<0.100	0.0609	<0.100	<0.100
LAWALG-13-SSM-S	2	1	8	S-13360LM11	1.81	8.16	<0.0250	0.0777	<0.100	0.120	11.3	1.14	<0.100	<0.0500	2.19	<0.100
LAWALG-10-SSM-S	2	1	9	S-13357LM11	4.54	5.33	0.0716	0.0804	<0.100	0.0787	17.0	0.534	3.34	0.0767	<0.100	<0.100
LAWALG-06-SSM-S	2	1	10	S-13353LM11	3.34	6.23	0.0287	0.0900	<0.100	0.0933	15.7	0.785	1.10	0.0729	2.19	<0.100
LRM	2	1	11	LRMLM212	5.27	0.354	0.127	0.959	1.19	0.0659	15.5	0.0884	<0.100	0.0617	<0.100	<0.100
LAWALG-09-SSM-S	2	1	12	S-13356LM21	4.60	5.54	0.105	0.102	0.126	0.0827	16.1	0.510	3.33	0.0866	<0.100	<0.100
LAWALG-14-SSM-S	2	1	13	S-13361LM11	1.79	7.80	0.0261	0.0871	<0.100	0.120	11.7	1.14	<0.100	<0.0500	2.16	<0.100
LAWALG-05-1-SSM-S	2	1	14	S-13352LM11	1.76	8.05	0.0397	0.0834	<0.100	0.120	8.58	0.833	<0.100	<0.0500	2.16	<0.100
LAWALG-11-SSM-S	2	1	15	S-13358LM21	4.51	5.21	<0.0250	0.0930	1.75	0.0786	16.1	0.410	3.45	0.0985	<0.100	3.09
LAWALG-06-SSM-S	2	1	16	S-13353LM21	3.24	6.08	0.0288	0.0884	<0.100	0.0928	15.4	0.783	1.10	0.0719	2.14	<0.100
LAWALG-14-SSM-S	2	1	17	S-13361LM21	1.83	7.88	0.0251	0.0876	<0.100	0.118	11.9	1.11	<0.100	<0.0500	2.18	<0.100
LAWALG-12-SSM-S	2	1	18	S-13359LM21	1.80	7.31	0.0304	0.0799	<0.100	0.108	13.3	1.15	<0.100	<0.0500	2.14	<0.100
LAWALG-13-SSM-S	2	1	19	S-13360LM21	1.79	8.07	<0.0250	0.0772	<0.100	0.120	11.1	1.22	<0.100	<0.0500	2.18	<0.100
LAWALG-10-SSM-S	2	1	20	S-13357LM21	4.52	5.31	0.0781	0.0810	<0.100	0.0792	17.0	0.544	3.39	0.0777	<0.100	<0.100
LRM	2	1	21	LRMLM213	5.20	0.354	0.129	0.965	1.26	0.0664	15.2	0.0902	<0.100	0.0622	<0.100	<0.100
LRM	2	2	1	LRMLM221	5.26	0.367	0.126	0.933	1.17	0.0634	15.4	0.0804	<0.100	0.0588	<0.100	<0.100
LAWALG-SSM-S	2	2	2	S-13365LM12	5.20	0.352	0.125	0.928	1.19	0.0631	15.2	0.0819	<0.100	0.0585	<0.100	<0.100
LAWALG-12-SSM-S	2	2	3	S-13359LM12	1.84	7.61	0.0315	0.0811	<0.100	0.107	13.7	1.05	<0.100	<0.0500	2.18	<0.100
LAWALG-10-SSM-S	2	2	4	S-13357LM12	4.56	5.44	0.0737	0.0802	<0.100	0.0779	17.5	0.515	3.37	0.0766	<0.100	<0.100
LAWALG-09-SSM-S	2	2	5	S-13356LM22	4.76	5.76	0.109	0.102	0.115	0.0821	16.8	0.513	3.32	0.0878	<0.100	<0.100
LAWALG-06-SSM-S	2	2	6	S-13353LM22	3.31	6.37	0.0300	0.0891	<0.100	0.0927	15.7	0.781	1.11	0.0737	2.20	<0.100
LAWALG-11-SSM-S	2	2	7	S-13358LM22	4.75	5.54	<0.0250	0.0943	1.90	0.0787	16.6	0.406	3.47	0.102	<0.100	3.19
LAWALG-14-SSM-S	2	2	8	S-13361LM22	1.89	8.43	0.0280	0.0885	<0.100	0.118	12.4	1.05	<0.100	<0.0500	2.26	<0.100
LAWALG-13-SSM-S	2	2	9	S-13360LM22	1.88	8.56	<0.0250	0.0779	<0.100	0.119	11.8	1.13	<0.100	<0.0500	2.26	<0.100
LAWALG-12-SSM-S	2	2	10	S-13359LM22	1.91	7.77	0.0321	0.0808	<0.100	0.108	14.1	1.17	<0.100	<0.0500	2.21	<0.100
LRM	2	2	11	LRMLM222	5.40	0.364	0.129	0.955	1.19	0.0647	15.8	0.0828	<0.100	0.0614	<0.100	<0.100
LAWALG-11-SSM-S	2	2	12	S-13358LM12	4.75	5.53	<0.0250	0.0941	1.90	0.0777	16.7	0.414	3.47	0.102	<0.100	3.18
LAWALG-05-1-SSM-S	2	2	13	S-13352LM22	1.77	8.17	0.0272	0.0861	0.102	0.121	8.55	0.836	<0.100	<0.0500	2.17	<0.100
LAWALG-06-SSM-S	2	2	14	S-13353LM12	3.28	6.31	0.0309	0.0907	<0.100	0.0932	15.9	0.789	1.08	0.0752	2.17	<0.100
LAWALG-10-SSM-S	2	2	15	S-13357LM22	4.55	5.48	0.0750	0.0811	<0.100	0.0783	17.4	0.534	3.36	0.0787	<0.100	<0.100
LAWALG-SSM-S	2	2	16	S-13365LM22	5.15	0.364	0.130	0.961	1.16	0.0651	15.2	0.0867	<0.100	0.0614	<0.100	<0.100
LAWALG-14-SSM-S	2	2	17	S-13361LM12	1.79	8.08	0.0260	0.0871	<0.100	0.118	11.9	1.04	<0.100	<0.0500	2.18	<0.100
LAWALG-09-SSM-S	2	2	18	S-13356LM12	4.73	5.81	0.108	0.102	0.124	0.0823	16.7	0.499	3.39	0.0879	<0.100	<0.100
LAWALG-13-SSM-S	2	2	19	S-13360LM12	1.82	8.31	<0.0250	0.0788	<0.100	0.120	11.4	1.18	<0.100	<0.0500	2.21	<0.100
LAWALG-05-1-SSM-S	2	2	20	S-13352LM12	1.80	8.38	0.0424	0.0855	0.101	0.121	8.83	0.849	<0.100	<0.0500	2.21	<0.100
LRM	2	2	21	LRMLM223	5.23	0.363	0.130	0.971	1.20	0.0657	15.4	0.0795	<0.100	0.0626	<0.100	<0.100

Table A-3. PF Measurements (wt.%) of the SSM Study Glasses

PNNL ID	Block	Sub – Block	Seq	Lab ID	B	Li	P	Si	Zr
LRM	1	1	1	LRMPF111	2.35	<0.100	0.233	25.1	0.721
LAWALG-07-SSM-S	1	1	2	S-13354PF21	2.43	<0.100	0.702	18.8	4.35
LAWALG-16-SSM-S	1	1	3	S-13363PF21	2.67	<0.100	0.249	20.3	4.62
LAWALG-08-SSM-1-S	1	1	4	S-13355PF21	4.15	0.788	<0.100	23.8	1.55
LAWALG-15-SSM-S	1	1	5	S-13362PF21	2.83	<0.100	0.166	20.3	4.77
LAWALG-04-SSM-S	1	1	6	S-13351PF21	2.90	<0.100	<0.100	21.0	5.28
LAWALG-17-SSM-S	1	1	7	S-13364PF11	2.60	<0.100	<0.100	19.2	5.00
LAWALG-04-SSM-S	1	1	8	S-13351PF11	2.85	<0.100	<0.100	20.4	5.19
LAWALG-08-SSM-1-S	1	1	9	S-13355PF11	4.57	0.858	<0.100	25.9	1.70
LAWALG-03-SSM-S	1	1	10	S-13350PF11	2.24	<0.100	1.32	19.8	5.25
LRM	1	1	11	LRMPF112	2.30	<0.100	0.232	25.1	0.747
LAWALG-01-SSM-S	1	1	12	S-13348PF11	2.69	1.31	0.280	24.1	1.62
LAWALG-03-SSM-S	1	1	13	S-13350PF21	2.19	<0.100	1.31	19.4	5.19
LAWALG-16-SSM-S	1	1	14	S-13363PF11	2.70	<0.100	0.263	20.6	4.73
LAWALG-02-SSM-S	1	1	15	S-13349PF11	4.23	<0.100	0.161	21.5	3.15
LAWALG-01-SSM-S	1	1	16	S-13348PF21	2.67	1.34	0.265	24.0	1.64
LAWALG-02-SSM-S	1	1	17	S-13349PF21	3.83	<0.100	0.152	20.0	2.93
LAWALG-15-SSM-S	1	1	18	S-13362PF11	2.54	<0.100	0.131	18.7	4.39
LAWALG-07-SSM-S	1	1	19	S-13354PF11	2.54	<0.100	0.739	20.1	4.68
LAWALG-17-SSM-S	1	1	20	S-13364PF21	2.56	<0.100	0.107	19.3	5.06
LRM	1	1	21	LRMPF113	2.18	<0.100	0.203	24.0	0.728
LRM	1	2	1	LRMPF121	2.32	<0.100	0.184	25.2	0.701
LAWALG-16-SSM-S	1	2	2	S-13363PF22	2.41	<0.100	0.204	18.6	4.11
LAWALG-15-SSM-S	1	2	3	S-13362PF22	2.54	<0.100	<0.100	18.3	4.19
LAWALG-01-SSM-S	1	2	4	S-13348PF12	2.35	0.968	0.200	21.0	1.37
LAWALG-17-SSM-S	1	2	5	S-13364PF22	2.42	<0.100	<0.100	18.2	4.65
LAWALG-02-SSM-S	1	2	6	S-13349PF22	3.56	<0.100	<0.100	18.7	2.66
LAWALG-16-SSM-S	1	2	7	S-13363PF12	2.34	<0.100	0.185	18.4	4.06
LAWALG-07-SSM-S	1	2	8	S-13354PF22	2.29	<0.100	0.633	18.4	4.12
LAWALG-08-SSM-1-S	1	2	9	S-13355PF12	3.61	0.572	<0.100	21.2	1.32
LAWALG-07-SSM-S	1	2	10	S-13354PF12	2.33	<0.100	0.623	18.6	4.18
LRM	1	2	11	LRMPF122	2.28	<0.100	0.163	25.0	0.719
LAWALG-17-SSM-S	1	2	12	S-13364PF12	2.36	<0.100	<0.100	18.0	4.54
LAWALG-04-SSM-S	1	2	13	S-13351PF22	2.44	<0.100	<0.100	18.2	4.45
LAWALG-08-SSM-1-S	1	2	14	S-13355PF22	3.77	0.620	<0.100	22.1	1.38
LAWALG-04-SSM-S	1	2	15	S-13351PF12	2.51	<0.100	<0.100	18.5	4.56
LAWALG-15-SSM-S	1	2	16	S-13362PF12	2.45	<0.100	<0.100	18.1	4.11
LAWALG-03-SSM-S	1	2	17	S-13350PF22	1.90	<0.100	1.10	17.3	4.42
LAWALG-02-SSM-S	1	2	18	S-13349PF12	3.66	<0.100	0.104	19.2	2.70
LAWALG-03-SSM-S	1	2	19	S-13350PF12	2.01	<0.100	1.17	18.3	4.67
LAWALG-01-SSM-S	1	2	20	S-13348PF22	2.37	1.09	0.208	21.6	1.41
LRM	1	2	21	LRMPF123	2.27	<0.100	0.190	25.1	0.724
LRM	2	1	1	LRMPF211	2.28	<0.100	0.205	25.1	0.709
LAWALG-05-1-SSM-S	2	1	2	S-13352PF21	3.73	0.731	0.109	22.1	1.40
LAWALG-12-SSM-S	2	1	3	S-13359PF11	3.46	<0.100	0.831	19.1	1.40
LAWALG-SSM-S	2	1	4	S-13365PF11	2.16	<0.100	0.199	24.4	0.693
LAWALG-11-SSM-S	2	1	5	S-13358PF11	1.61	<0.100	<0.100	16.5	4.62

Table A-3. PF Measurements (wt.%) of the SSM Study Glasses (continued)

PNNL ID	Block	Sub – Block	Seq	Lab ID	B	Li	P	Si	Zr
LAWALG-09-SSM-S	2	1	6	S-13356PF11	2.34	<0.100	1.14	16.4	4.40
LAWALG-SSM-S	2	1	7	S-13365PF21	2.20	<0.100	0.213	24.9	0.734
LAWALG-13-SSM-S	2	1	8	S-13360PF11	3.72	0.515	0.357	20.3	1.40
LAWALG-10-SSM-S	2	1	9	S-13357PF11	2.34	<0.100	0.115	17.9	4.12
LAWALG-06-SSM-S	2	1	10	S-13353PF11	3.01	<0.100	<0.100	17.8	4.03
LRM	2	1	11	LRMPF212	2.22	<0.100	0.183	24.8	0.738
LAWALG-09-SSM-S	2	1	12	S-13356PF21	2.24	<0.100	1.22	16.0	4.44
LAWALG-14-SSM-S	2	1	13	S-13361PF11	3.68	0.358	<0.100	20.2	1.40
LAWALG-05-1-SSM-S	2	1	14	S-13352PF11	3.61	0.728	0.108	21.6	1.38
LAWALG-11-SSM-S	2	1	15	S-13358PF21	1.57	<0.100	<0.100	16.5	4.62
LAWALG-06-SSM-S	2	1	16	S-13353PF21	2.99	<0.100	<0.100	17.8	4.03
LAWALG-14-SSM-S	2	1	17	S-13361PF21	3.68	0.368	<0.100	20.3	1.42
LAWALG-12-SSM-S	2	1	18	S-13359PF21	3.36	<0.100	0.802	18.9	1.39
LAWALG-13-SSM-S	2	1	19	S-13360PF21	3.57	0.495	0.336	19.7	1.36
LAWALG-10-SSM-S	2	1	20	S-13357PF21	2.29	<0.100	0.106	17.8	4.06
LRM	2	1	21	LRMPF213	2.14	<0.100	0.198	24.2	0.718
LRM	2	2	1	LRMPF221	2.33	<0.100	0.179	24.9	0.691
LAWALG-SSM-S	2	2	2	S-13365PF12	2.30	<0.100	0.200	24.8	0.695
LAWALG-12-SSM-S	2	2	3	S-13359PF12	3.69	<0.100	0.849	19.6	1.42
LAWALG-10-SSM-S	2	2	4	S-13357PF12	2.45	<0.100	0.115	17.7	4.03
LAWALG-09-SSM-S	2	2	5	S-13356PF22	2.42	<0.100	1.26	16.4	4.53
LAWALG-06-SSM-S	2	2	6	S-13353PF22	3.12	<0.100	<0.100	18.0	4.02
LAWALG-11-SSM-S	2	2	7	S-13358PF22	1.70	<0.100	<0.100	16.5	4.56
LAWALG-14-SSM-S	2	2	8	S-13361PF22	3.90	0.386	<0.100	20.8	1.44
LAWALG-13-SSM-S	2	2	9	S-13360PF22	3.83	0.519	0.341	20.2	1.38
LAWALG-12-SSM-S	2	2	10	S-13359PF22	3.65	<0.100	0.879	19.6	1.44
LRM	2	2	11	LRMPF222	2.28	<0.100	0.189	24.6	0.696
LAWALG-11-SSM-S	2	2	12	S-13358PF12	1.63	<0.100	<0.100	16.1	4.39
LAWALG-05-1-SSM-S	2	2	13	S-13352PF22	3.67	0.717	<0.100	21.5	1.35
LAWALG-06-SSM-S	2	2	14	S-13353PF12	3.01	<0.100	<0.100	17.2	3.82
LAWALG-10-SSM-S	2	2	15	S-13357PF22	2.39	<0.100	0.111	17.5	3.98
LAWALG-SSM-S	2	2	16	S-13365PF22	2.21	<0.100	0.187	24.0	0.701
LAWALG-14-SSM-S	2	2	17	S-13361PF12	3.56	0.326	<0.100	19.1	1.28
LAWALG-09-SSM-S	2	2	18	S-13356PF12	2.23	<0.100	1.04	15.3	3.87
LAWALG-13-SSM-S	2	2	19	S-13360PF12	3.64	0.475	0.331	19.3	1.32
LAWALG-05-1-SSM-S	2	2	20	S-13352PF12	3.76	0.736	<0.100	21.5	1.36
LRM	2	2	21	LRMPF223	2.32	<0.100	0.178	24.7	0.704

Table A-4. Comparison of Measured and Target Compositions

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LRM	Al_2O_3	10.0	9.51	0.536	6%
LRM	B_2O_3	7.32	7.85	-0.533	-7%
LRM	CaO	0.503	0.540	-0.037	
LRM	Cl^-	<0.025	0		
LRM	Cr_2O_3	0.186	0.190	-0.004	
LRM	F^-	0.866	0.860	0.006	
LRM	Fe_2O_3	1.35	1.38	-0.026	-2%
LRM	K_2O	1.44	1.48	-0.042	-3%
LRM	Li_2O	<0.215	0.110	0.105	
LRM	MgO	0.107	0.100	0.007	
LRM	Na_2O	20.8	20.0	0.797	4%
LRM	P_2O_5	0.446	0.540	-0.094	
LRM	SiO_2	53.1	54.2	-1.110	-2%
LRM	SnO_2	<0.127	0		
LRM	SO_3	0.208	0.300	-0.092	
LRM	TiO_2	0.102	0.100	0.002	
LRM	V_2O_5	<0.179	0		
LRM	ZnO	<0.124	0		
LRM	ZrO_2	0.968	0.930	0.038	
LRM	**Sum of Oxides**	**98.1**	**98.1**	**0.010**	**0%**
LAWALG-01-SSM-S	Al_2O_3	3.49	3.57	-0.081	-2%
LAWALG-01-SSM-S	B_2O_3	8.11	8.51	-0.399	-5%
LAWALG-01-SSM-S	CaO	11.3	12.3	-0.944	-8%
LAWALG-01-SSM-S	Cl^-	0.0322	0.0680	-0.036	
LAWALG-01-SSM-S	Cr_2O_3	0.0667	0.0830	-0.016	
LAWALG-01-SSM-S	F^-	0.308	0.583	-0.275	
LAWALG-01-SSM-S	Fe_2O_3	0.112	0.120	-0.008	
LAWALG-01-SSM-S	K_2O	0.169	0.236	-0.067	
LAWALG-01-SSM-S	Li_2O	2.53	2.74	-0.207	-8%
LAWALG-01-SSM-S	MgO	0.194	0.180	0.014	
LAWALG-01-SSM-S	Na_2O	15.9	14.9	0.970	7%
LAWALG-01-SSM-S	P_2O_5	0.546	0.555	-0.009	
LAWALG-01-SSM-S	SiO_2	48.5	48.3	0.183	0%
LAWALG-01-SSM-S	SnO_2	<0.127	0		
LAWALG-01-SSM-S	SO_3	3.06	1.71	1.360	80%
LAWALG-01-SSM-S	TiO_2	<0.0834	0.0690	0.014	
LAWALG-01-SSM-S	V_2O_5	3.92	4.05	-0.124	-3%
LAWALG-01-SSM-S	ZnO	<0.124	0		
LAWALG-01-SSM-S	ZrO_2	2.04	2.03	0.015	1%
LAWALG-01-SSM-S	**Sum of Oxides**	**101**	**100**	**0.642**	**1%**
LAWALG-02-SSM-S	Al_2O_3	5.49	5.41	0.089	2%
LAWALG-02-SSM-S	B_2O_3	12.3	13.0	-0.706	-5%
LAWALG-02-SSM-S	CaO	9.37	9.75	-0.383	-4%
LAWALG-02-SSM-S	Cl^-	0.0444	0.119	-0.075	
LAWALG-02-SSM-S	Cr_2O_3	0.0428	0.0550	-0.012	
LAWALG-02-SSM-S	F^-	0.0660	0.115	-0.049	

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-02-SSM-S	Fe_2O_3	0.126	0.133	-0.007	
LAWALG-02-SSM-S	K_2O	<0.120	0.128	-0.008	
LAWALG-02-SSM-S	Li_2O	<0.215	0		
LAWALG-02-SSM-S	MgO	0.161	0.145	0.016	
LAWALG-02-SSM-S	Na_2O	19.8	19.6	0.215	1%
LAWALG-02-SSM-S	P_2O_5	<0.296	0.308	-0.012	
LAWALG-02-SSM-S	SiO_2	42.5	41.7	0.756	2%
LAWALG-02-SSM-S	SnO_2	<0.127	0		
LAWALG-02-SSM-S	SO_3	2.12	1.56	0.562	36%
LAWALG-02-SSM-S	TiO_2	0.113	0.128	-0.015	
LAWALG-02-SSM-S	V_2O_5	3.98	4.05	-0.066	-2%
LAWALG-02-SSM-S	ZnO	<0.124	0		
LAWALG-02-SSM-S	ZrO_2	3.86	3.78	0.080	2%
LAWALG-02-SSM-S	**Sum of Oxides**	**101**	**100**	**0.852**	**1%**
LAWALG-03-SSM-S	Al_2O_3	5.61	5.47	0.138	3%
LAWALG-03-SSM-S	B_2O_3	6.71	6.97	-0.255	-4%
LAWALG-03-SSM-S	CaO	8.21	8.32	-0.117	-1%
LAWALG-03-SSM-S	Cl^-	0.0402	0.0930	-0.053	
LAWALG-03-SSM-S	Cr_2O_3	0.0626	0.0820	-0.019	
LAWALG-03-SSM-S	F^-	0.242	0.382	-0.141	
LAWALG-03-SSM-S	Fe_2O_3	0.109	0.118	-0.009	
LAWALG-03-SSM-S	K_2O	<0.120	0.0980	0.023	
LAWALG-03-SSM-S	Li_2O	<0.215	0		
LAWALG-03-SSM-S	MgO	0.139	0.124	0.015	
LAWALG-03-SSM-S	Na_2O	22.1	22.3	-0.214	-1%
LAWALG-03-SSM-S	P_2O_5	2.81	3.12	-0.310	-10%
LAWALG-03-SSM-S	SiO_2	40.0	38.3	1.660	4%
LAWALG-03-SSM-S	SnO_2	4.40	4.37	0.030	1%
LAWALG-03-SSM-S	SO_3	1.60	1.20	0.405	34%
LAWALG-03-SSM-S	TiO_2	0.0990	0.116	-0.017	
LAWALG-03-SSM-S	V_2O_5	2.30	2.47	-0.170	-7%
LAWALG-03-SSM-S	ZnO	<0.124	0		
LAWALG-03-SSM-S	ZrO_2	6.60	6.39	0.209	3%
LAWALG-03-SSM-S	**Sum of Oxides**	**101**	**100**	**1.510**	**2%**
LAWALG-04-SSM-S	Al_2O_3	8.60	8.64	-0.045	-1%
LAWALG-04-SSM-S	B_2O_3	8.61	8.76	-0.144	-2%
LAWALG-04-SSM-S	CaO	7.44	7.67	-0.222	-3%
LAWALG-04-SSM-S	Cl^-	0.0494	0.191	-0.142	
LAWALG-04-SSM-S	Cr_2O_3	<0.0365	0.0260	0.011	
LAWALG-04-SSM-S	F^-	0.0281	0.0360	-0.008	
LAWALG-04-SSM-S	Fe_2O_3	0.114	0.103	0.011	
LAWALG-04-SSM-S	K_2O	0.275	0.375	-0.100	
LAWALG-04-SSM-S	Li_2O	<0.215	0		
LAWALG-04-SSM-S	MgO	0.124	0.114	0.010	
LAWALG-04-SSM-S	Na_2O	23.3	23.4	-0.169	-1%
LAWALG-04-SSM-S	P_2O_5	<0.229	0.0800	0.149	
LAWALG-04-SSM-S	SiO_2	41.8	39.7	2.090	5%

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-04-SSM-S	SnO_2	4.33	4.38	-0.051	-1%
LAWALG-04-SSM-S	SO_3	1.32	0.126	1.190	945%
LAWALG-04-SSM-S	TiO_2	0.210	0.0970	0.113	
LAWALG-04-SSM-S	V_2O_5	<0.179	0		
LAWALG-04-SSM-S	ZnO	<0.124	0		
LAWALG-04-SSM-S	ZrO_2	6.58	6.30	0.280	4%
LAWALG-04-SSM-S	**Sum of Oxides**	**103**	**100**	**3.490**	**3%**
LAWALG-05-1-SSM-S	Al_2O_3	3.34	3.56	-0.220	-6%
LAWALG-05-1-SSM-S	B_2O_3	11.9	13.6	-1.730	-13%
LAWALG-05-1-SSM-S	CaO	11.4	12.3	-0.950	-8%
LAWALG-05-1-SSM-S	Cl^-	0.0277	0.109	-0.081	
LAWALG-05-1-SSM-S	Cr_2O_3	0.0498	0.0480	0.002	
LAWALG-05-1-SSM-S	F^-	0.321	0.751	-0.430	
LAWALG-05-1-SSM-S	Fe_2O_3	0.121	0.127	-0.006	
LAWALG-05-1-SSM-S	K_2O	<0.122	0.150	-0.028	
LAWALG-05-1-SSM-S	Li_2O	1.57	1.68	-0.108	-6%
LAWALG-05-1-SSM-S	MgO	0.200	0.181	0.019	
LAWALG-05-1-SSM-S	Na_2O	11.6	9.07	2.560	28%
LAWALG-05-1-SSM-S	P_2O_5	<0.239	0.258	-0.019	
LAWALG-05-1-SSM-S	SiO_2	46.4	50.3	-3.920	-8%
LAWALG-05-1-SSM-S	SnO_2	<0.127	0		
LAWALG-05-1-SSM-S	SO_3	2.08	1.67	0.416	25%
LAWALG-05-1-SSM-S	TiO_2	<0.0834	0.0830	0.000	
LAWALG-05-1-SSM-S	V_2O_5	3.87	4.05	-0.180	-4%
LAWALG-05-1-SSM-S	ZnO	<0.124	0		
LAWALG-05-1-SSM-S	ZrO_2	1.85	2.02	-0.165	-8%
LAWALG-05-1-SSM-S	**Sum of Oxides**	**95.4**	**100**	**-4.590**	**-5%**
LAWALG-06-SSM-S	Al_2O_3	6.22	6.27	-0.045	-1%
LAWALG-06-SSM-S	B_2O_3	9.76	11.1	-1.330	-12%
LAWALG-06-SSM-S	CaO	8.74	8.99	-0.251	-3%
LAWALG-06-SSM-S	Cl^-	<0.025	0.181	-0.156	
LAWALG-06-SSM-S	Cr_2O_3	0.0433	0.0680	-0.025	
LAWALG-06-SSM-S	F^-	0.0496	0.0880	-0.038	
LAWALG-06-SSM-S	Fe_2O_3	0.128	0.133	-0.005	
LAWALG-06-SSM-S	K_2O	<0.120	0.148	-0.028	
LAWALG-06-SSM-S	Li_2O	<0.215	0		
LAWALG-06-SSM-S	MgO	0.154	0.134	0.020	
LAWALG-06-SSM-S	Na_2O	21.1	21.0	0.123	1%
LAWALG-06-SSM-S	P_2O_5	<0.229	0.224	0.005	
LAWALG-06-SSM-S	SiO_2	37.9	39.0	-1.170	-3%
LAWALG-06-SSM-S	SnO_2	1.39	1.40	-0.003	0%
LAWALG-06-SSM-S	SO_3	1.96	1.42	0.539	38%
LAWALG-06-SSM-S	TiO_2	0.122	0.136	-0.014	
LAWALG-06-SSM-S	V_2O_5	3.88	4.04	-0.158	-4%
LAWALG-06-SSM-S	ZnO	<0.124	0		
LAWALG-06-SSM-S	ZrO_2	5.37	5.63	-0.261	-5%
LAWALG-06-SSM-S	**Sum of Oxides**	**97.5**	**100**	**-2.450**	**-2%**

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-07-SSM-S	Al_2O_3	5.80	5.75	0.051	1%
LAWALG-07-SSM-S	B_2O_3	7.72	8.31	-0.594	-7%
LAWALG-07-SSM-S	CaO	7.87	8.02	-0.156	-2%
LAWALG-07-SSM-S	Cl^-	<0.0250	0.0550	-0.030	
LAWALG-07-SSM-S	Cr_2O_3	0.0435	0.0630	-0.020	
LAWALG-07-SSM-S	F^-	0.206	0.346	-0.140	
LAWALG-07-SSM-S	Fe_2O_3	0.0957	0.103	-0.007	
LAWALG-07-SSM-S	K_2O	<0.120	0.0960	0.025	
LAWALG-07-SSM-S	Li_2O	<0.215	0		
LAWALG-07-SSM-S	MgO	0.133	0.119	0.014	
LAWALG-07-SSM-S	Na_2O	22.7	22.9	-0.113	0%
LAWALG-07-SSM-S	P_2O_5	1.54	1.74	-0.194	-11%
LAWALG-07-SSM-S	SiO_2	40.6	40.1	0.496	1%
LAWALG-07-SSM-S	SnO_2	4.45	4.37	0.082	2%
LAWALG-07-SSM-S	SO_3	1.61	1.15	0.457	40%
LAWALG-07-SSM-S	TiO_2	<0.0838	0.0910	-0.007	
LAWALG-07-SSM-S	V_2O_5	0.896	0.971	-0.075	
LAWALG-07-SSM-S	ZnO	<0.124	0		
LAWALG-07-SSM-S	ZrO_2	5.85	5.83	0.019	0%
LAWALG-07-SSM-S	**Sum of Oxides**	**100**	**100**	**0.147**	**0%**
LAWALG-08-SSM-1-S	Al_2O_3	3.49	3.57	-0.088	-2%
LAWALG-08-SSM-1-S	B_2O_3	13.0	13.7	-0.717	-5%
LAWALG-08-SSM-1-S	CaO	11.4	12.4	-0.953	-8%
LAWALG-08-SSM-1-S	Cl^-	<0.0250	0.0760	-0.051	
LAWALG-08-SSM-1-S	Cr_2O_3	<0.0379	0.0250	0.013	
LAWALG-08-SSM-1-S	F^-	0.0351	0.0960	-0.061	
LAWALG-08-SSM-1-S	Fe_2O_3	0.138	0.132	0.006	
LAWALG-08-SSM-1-S	K_2O	<0.120	0.0880	0.033	
LAWALG-08-SSM-1-S	Li_2O	1.53	1.67	-0.144	-9%
LAWALG-08-SSM-1-S	MgO	0.195	0.182	0.013	
LAWALG-08-SSM-1-S	Na_2O	12.4	9.91	2.530	26%
LAWALG-08-SSM-1-S	P_2O_5	<0.229	0.160	0.069	
LAWALG-08-SSM-1-S	SiO_2	49.7	50.2	-0.411	-1%
LAWALG-08-SSM-1-S	SnO_2	<0.127	0		
LAWALG-08-SSM-1-S	SO_3	2.00	1.70	0.294	17%
LAWALG-08-SSM-1-S	TiO_2	<0.0839	0.0920	-0.008	
LAWALG-08-SSM-1-S	V_2O_5	3.95	4.07	-0.118	-3%
LAWALG-08-SSM-1-S	ZnO	<0.124	0		
LAWALG-08-SSM-1-S	ZrO_2	2.01	2.02	-0.010	0%
LAWALG-08-SSM-1-S	**Sum of Oxides**	**101**	**100**	**0.649**	**1%**
LAWALG-09-SSM-S	Al_2O_3	8.87	8.99	-0.122	-1%
LAWALG-09-SSM-S	B_2O_3	7.43	8.50	-1.070	-13%
LAWALG-09-SSM-S	CaO	7.93	8.06	-0.128	-2%
LAWALG-09-SSM-S	Cl^-	0.0281	0.0860	-0.058	
LAWALG-09-SSM-S	Cr_2O_3	0.157	0.197	-0.040	
LAWALG-09-SSM-S	F^-	0.277	0.407	-0.130	
LAWALG-09-SSM-S	Fe_2O_3	0.146	0.139	0.007	

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-09-SSM-S	K_2O	0.148	0.217	-0.069	
LAWALG-09-SSM-S	Li_2O	<0.215	0		
LAWALG-09-SSM-S	MgO	0.137	0.121	0.016	
LAWALG-09-SSM-S	Na_2O	22.3	22.8	-0.497	-2%
LAWALG-09-SSM-S	P_2O_5	2.67	3.53	-0.860	-24%
LAWALG-09-SSM-S	SiO_2	34.3	35.6	-1.270	-4%
LAWALG-09-SSM-S	SnO_2	4.26	4.37	-0.114	-3%
LAWALG-09-SSM-S	SO_3	1.27	0.345	0.925	268%
LAWALG-09-SSM-S	TiO_2	0.146	0.163	-0.017	
LAWALG-09-SSM-S	V_2O_5	<0.179	0		
LAWALG-09-SSM-S	ZnO	<0.124	0		
LAWALG-09-SSM-S	ZrO_2	5.82	6.53	-0.707	-11%
LAWALG-09-SSM-S	**Sum of Oxides**	**96.4**	**100**	**-3.630**	**-4%**
LAWALG-10-SSM-S	Al_2O_3	8.58	8.78	-0.197	-2%
LAWALG-10-SSM-S	B_2O_3	7.62	8.72	-1.100	-13%
LAWALG-10-SSM-S	CaO	7.54	7.71	-0.168	-2%
LAWALG-10-SSM-S	Cl^-	0.0281	0.0780	-0.050	
LAWALG-10-SSM-S	Cr_2O_3	0.109	0.169	-0.060	
LAWALG-10-SSM-S	F^-	0.0523	0.0680	-0.016	
LAWALG-10-SSM-S	Fe_2O_3	0.115	0.125	-0.010	
LAWALG-10-SSM-S	K_2O	<0.120	0.0720	0.049	
LAWALG-10-SSM-S	Li_2O	<0.215	0		
LAWALG-10-SSM-S	MgO	0.130	0.116	0.014	
LAWALG-10-SSM-S	Na_2O	23.2	23.5	-0.260	-1%
LAWALG-10-SSM-S	P_2O_5	0.256	0.314	-0.058	
LAWALG-10-SSM-S	SiO_2	37.9	39.8	-1.840	-5%
LAWALG-10-SSM-S	SnO_2	4.27	4.38	-0.109	-2%
LAWALG-10-SSM-S	SO_3	1.33	0.192	1.140	592%
LAWALG-10-SSM-S	TiO_2	0.129	0.141	-0.012	
LAWALG-10-SSM-S	V_2O_5	<0.179	0		
LAWALG-10-SSM-S	ZnO	<0.124	0		
LAWALG-10-SSM-S	ZrO_2	5.47	5.88	-0.411	-7%
LAWALG-10-SSM-S	**Sum of Oxides**	**97.4**	**100**	**-2.580**	**-3%**
LAWALG-11-SSM-S	Al_2O_3	8.75	8.69	0.061	1%
LAWALG-11-SSM-S	B_2O_3	5.24	6.16	-0.923	-15%
LAWALG-11-SSM-S	CaO	7.48	7.44	0.038	1%
LAWALG-11-SSM-S	Cl^-	<0.0257	0.273	-0.247	
LAWALG-11-SSM-S	Cr_2O_3	<0.0365	0.0450	-0.008	
LAWALG-11-SSM-S	F^-	0.0785	0.106	-0.028	
LAWALG-11-SSM-S	Fe_2O_3	0.133	0.143	-0.010	
LAWALG-11-SSM-S	K_2O	2.20	3.16	-0.952	-30%
LAWALG-11-SSM-S	Li_2O	<0.215	0		
LAWALG-11-SSM-S	MgO	0.130	0.113	0.017	
LAWALG-11-SSM-S	Na_2O	22.0	22.0	0.003	0%
LAWALG-11-SSM-S	P_2O_5	<0.229	0.130	0.099	
LAWALG-11-SSM-S	SiO_2	35.1	36.2	-1.090	-3%
LAWALG-11-SSM-S	SnO_2	4.37	4.38	-0.007	0%

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-11-SSM-S	SO_3	1.02	0.572	0.449	79%
LAWALG-11-SSM-S	TiO_2	0.167	0.180	-0.013	
LAWALG-11-SSM-S	V_2O_5	<0.179	0		
LAWALG-11-SSM-S	ZnO	3.89	3.84	0.044	1%
LAWALG-11-SSM-S	ZrO_2	6.14	6.55	-0.405	-6%
LAWALG-11-SSM-S	**Sum of Oxides**	**97.4**	**100**	**-2.580**	**-3%**
LAWALG-12-SSM-S	Al_2O_3	3.46	3.56	-0.098	-3%
LAWALG-12-SSM-S	B_2O_3	11.4	12.9	-1.520	-12%
LAWALG-12-SSM-S	CaO	10.5	11.0	-0.547	-5%
LAWALG-12-SSM-S	Cl^-	<0.0257	0.0600	-0.034	
LAWALG-12-SSM-S	Cr_2O_3	0.0458	0.0520	-0.006	
LAWALG-12-SSM-S	F^-	0.699	1.36	-0.663	-49%
LAWALG-12-SSM-S	Fe_2O_3	0.116	0.116	0.000	
LAWALG-12-SSM-S	K_2O	<0.120	0.0810	0.040	
LAWALG-12-SSM-S	Li_2O	<0.215	0		
LAWALG-12-SSM-S	MgO	0.179	0.162	0.017	
LAWALG-12-SSM-S	Na_2O	18.3	17.2	1.100	6%
LAWALG-12-SSM-S	P_2O_5	1.93	2.17	-0.247	-11%
LAWALG-12-SSM-S	SiO_2	41.3	43.5	-2.190	-5%
LAWALG-12-SSM-S	SnO_2	<0.127	0		
LAWALG-12-SSM-S	SO_3	2.80	1.63	1.170	72%
LAWALG-12-SSM-S	TiO_2	<0.0834	0.0780	0.005	
LAWALG-12-SSM-S	V_2O_5	3.86	4.03	-0.172	-4%
LAWALG-12-SSM-S	ZnO	<0.124	0		
LAWALG-12-SSM-S	ZrO_2	1.91	2.02	-0.116	-6%
LAWALG-12-SSM-S	**Sum of Oxides**	**97.2**	**100**	**-2.790**	**-3%**
LAWALG-13-SSM-S	Al_2O_3	3.45	3.58	-0.134	-4%
LAWALG-13-SSM-S	B_2O_3	11.9	13.6	-1.730	-13%
LAWALG-13-SSM-S	CaO	11.6	12.3	-0.743	-6%
LAWALG-13-SSM-S	Cl^-	0.0281	0.0790	-0.051	
LAWALG-13-SSM-S	Cr_2O_3	<0.0365	0.0350	0.002	
LAWALG-13-SSM-S	F^-	0.190	0.404	-0.214	
LAWALG-13-SSM-S	Fe_2O_3	0.111	0.116	-0.005	
LAWALG-13-SSM-S	K_2O	<0.120	0.0730	0.048	
LAWALG-13-SSM-S	Li_2O	1.08	1.14	-0.060	-5%
LAWALG-13-SSM-S	MgO	0.199	0.180	0.019	
LAWALG-13-SSM-S	Na_2O	15.4	13.5	1.890	14%
LAWALG-13-SSM-S	P_2O_5	0.782	0.925	-0.143	
LAWALG-13-SSM-S	SiO_2	42.5	46.2	-3.670	-8%
LAWALG-13-SSM-S	SnO_2	<0.127	0		
LAWALG-13-SSM-S	SO_3	2.92	1.72	1.200	70%
LAWALG-13-SSM-S	TiO_2	<0.0834	0.0610	0.022	
LAWALG-13-SSM-S	V_2O_5	3.95	4.05	-0.108	-3%
LAWALG-13-SSM-S	ZnO	<0.124	0		
LAWALG-13-SSM-S	ZrO_2	1.84	2.02	-0.180	-9%
LAWALG-13-SSM-S	**Sum of Oxides**	**96.4**	**100**	**-3.610**	**-4%**

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-14-SSM-S	Al_2O_3	3.45	3.57	-0.124	-3%
LAWALG-14-SSM-S	B_2O_3	11.9	13.6	-1.700	-12%
LAWALG-14-SSM-S	CaO	11.3	12.2	-0.893	-7%
LAWALG-14-SSM-S	Cl^-	0.0425	0.120	-0.078	
LAWALG-14-SSM-S	Cr_2O_3	0.0384	0.0470	-0.009	
LAWALG-14-SSM-S	F^-	0.103	0.211	-0.108	
LAWALG-14-SSM-S	Fe_2O_3	0.125	0.128	-0.003	
LAWALG-14-SSM-S	K_2O	<0.120	0.112	0.008	
LAWALG-14-SSM-S	Li_2O	0.774	0.815	-0.041	
LAWALG-14-SSM-S	MgO	0.197	0.179	0.018	
LAWALG-14-SSM-S	Na_2O	16.1	15.2	0.940	6%
LAWALG-14-SSM-S	P_2O_5	<0.229	0.162	0.067	
LAWALG-14-SSM-S	SiO_2	43.0	45.8	-2.790	-6%
LAWALG-14-SSM-S	SnO_2	<0.127	0		
LAWALG-14-SSM-S	SO_3	2.71	1.70	1.010	59%
LAWALG-14-SSM-S	TiO_2	<0.0834	0.0870	-0.004	
LAWALG-14-SSM-S	V_2O_5	3.92	4.06	-0.139	-3%
LAWALG-14-SSM-S	ZnO	<0.124	0		
LAWALG-14-SSM-S	ZrO_2	1.87	2.02	-0.152	-8%
LAWALG-14-SSM-S	**Sum of Oxides**	**96.2**	**100**	**-3.740**	**-4%**
LAWALG-15-SSM-S	Al_2O_3	8.97	8.86	0.111	1%
LAWALG-15-SSM-S	B_2O_3	8.34	8.77	-0.426	-5%
LAWALG-15-SSM-S	CaO	7.58	7.71	-0.134	-2%
LAWALG-15-SSM-S	Cl^-	0.0422	0.145	-0.103	
LAWALG-15-SSM-S	Cr_2O_3	<0.0381	0.0580	-0.020	
LAWALG-15-SSM-S	F^-	0.0461	0.0500	-0.004	
LAWALG-15-SSM-S	Fe_2O_3	0.139	0.153	-0.014	
LAWALG-15-SSM-S	K_2O	<0.121	0.167	-0.046	
LAWALG-15-SSM-S	Li_2O	<0.215	0		
LAWALG-15-SSM-S	MgO	0.130	0.118	0.012	
LAWALG-15-SSM-S	Na_2O	22.9	23.4	-0.425	-2%
LAWALG-15-SSM-S	P_2O_5	<0.285	0.316	-0.031	
LAWALG-15-SSM-S	SiO_2	40.3	38.9	1.380	4%
LAWALG-15-SSM-S	SnO_2	4.44	4.38	0.055	1%
LAWALG-15-SSM-S	SO_3	1.26	0.991	0.271	27%
LAWALG-15-SSM-S	TiO_2	0.178	0.196	-0.018	
LAWALG-15-SSM-S	V_2O_5	<0.179	0		
LAWALG-15-SSM-S	ZnO	<0.124	0		
LAWALG-15-SSM-S	ZrO_2	5.90	5.76	0.137	2%
LAWALG-15-SSM-S	**Sum of Oxides**	**101**	**100**	**1.270**	**1%**
LAWALG-16-SSM-S	Al_2O_3	8.66	8.81	-0.143	-2%
LAWALG-16-SSM-S	B_2O_3	8.15	8.32	-0.175	-2%
LAWALG-16-SSM-S	CaO	7.47	7.73	-0.263	-3%
LAWALG-16-SSM-S	Cl^-	0.0376	0.113	-0.075	
LAWALG-16-SSM-S	Cr_2O_3	0.382	0.607	-0.225	
LAWALG-16-SSM-S	F^-	0.0550	0.0710	-0.016	
LAWALG-16-SSM-S	Fe_2O_3	0.118	0.128	-0.010	

Table A-4. Comparison of Measured and Target Compositions (continued)

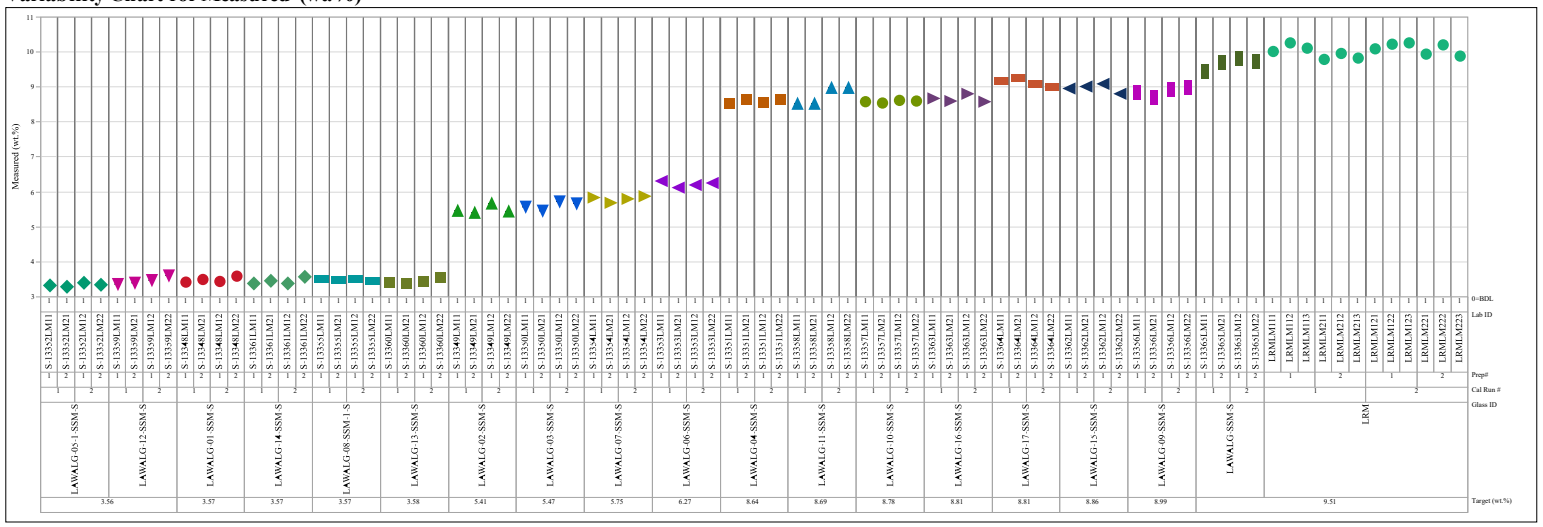
PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-16-SSM-S	K_2O	<0.120	0.0770	0.044	
LAWALG-16-SSM-S	Li_2O	<0.215	0		
LAWALG-16-SSM-S	MgO	0.128	0.117	0.011	
LAWALG-16-SSM-S	Na_2O	22.9	23.4	-0.550	-2%
LAWALG-16-SSM-S	P_2O_5	0.516	0.541	-0.025	
LAWALG-16-SSM-S	SiO_2	41.7	39.7	1.980	5%
LAWALG-16-SSM-S	SnO_2	4.36	4.38	-0.017	0%
LAWALG-16-SSM-S	SO_3	1.20	0.163	1.030	634%
LAWALG-16-SSM-S	TiO_2	0.135	0.146	-0.011	
LAWALG-16-SSM-S	V_2O_5	<0.179	0		
LAWALG-16-SSM-S	ZnO	<0.124	0		
LAWALG-16-SSM-S	ZrO_2	5.92	5.67	0.246	4%
LAWALG-16-SSM-S	**Sum of Oxides**	**102**	**100**	**2.320**	**2%**
LAWALG-17-SSM-S	Al_2O_3	9.14	8.81	0.324	4%
LAWALG-17-SSM-S	B_2O_3	8.00	8.33	-0.325	-4%
LAWALG-17-SSM-S	CaO	7.70	7.68	0.023	0%
LAWALG-17-SSM-S	Cl^-	0.165	0.797	-0.632	
LAWALG-17-SSM-S	Cr_2O_3	0.0553	0.0880	-0.033	
LAWALG-17-SSM-S	F^-	0.227	0.320	-0.093	
LAWALG-17-SSM-S	Fe_2O_3	0.145	0.150	-0.005	
LAWALG-17-SSM-S	K_2O	0.398	0.585	-0.187	
LAWALG-17-SSM-S	Li_2O	<0.215	0		
LAWALG-17-SSM-S	MgO	0.130	0.117	0.013	
LAWALG-17-SSM-S	Na_2O	22.7	23.1	-0.348	-2%
LAWALG-17-SSM-S	P_2O_5	<0.233	0.159	0.074	
LAWALG-17-SSM-S	SiO_2	40.0	38.3	1.660	4%
LAWALG-17-SSM-S	SnO_2	4.52	4.36	0.162	4%
LAWALG-17-SSM-S	SO_3	1.11	0.772	0.342	44%
LAWALG-17-SSM-S	TiO_2	0.175	0.189	-0.014	
LAWALG-17-SSM-S	V_2O_5	<0.179	0		
LAWALG-17-SSM-S	ZnO	<0.124	0		
LAWALG-17-SSM-S	ZrO_2	6.50	6.28	0.218	3%
LAWALG-17-SSM-S	**Sum of Oxides**	**102**	**100**	**1.700**	**2%**
LAWALG-SSM-S	Al_2O_3	9.67	9.51	0.160	2%
LAWALG-SSM-S	B_2O_3	7.14	7.85	-0.710	-9%
LAWALG-SSM-S	CaO	0.497	0.54	-0.043	
LAWALG-SSM-S	Cl^-	<0.0250	0		
LAWALG-SSM-S	Cr_2O_3	0.187	0.190	-0.003	
LAWALG-SSM-S	F^-	0.860	0.860	0.000	
LAWALG-SSM-S	Fe_2O_3	1.35	1.38	-0.025	-2%
LAWALG-SSM-S	K_2O	1.39	1.48	-0.089	-6%
LAWALG-SSM-S	Li_2O	<0.215	0.110	0.105	
LAWALG-SSM-S	MgO	0.107	0.100	0.007	
LAWALG-SSM-S	Na_2O	20.3	20.0	0.257	1%
LAWALG-SSM-S	P_2O_5	0.458	0.540	-0.082	
LAWALG-SSM-S	SiO_2	52.5	54.2	-1.730	-3%
LAWALG-SSM-S	SnO_2	<0.127	0		

Table A-4. Comparison of Measured and Target Compositions (continued)

PNNL ID	Oxide	Mean Measurement (wt.%)	Target (wt.%)	Difference of Measured versus Target	% Difference Measured versus Target
LAWALG-SSM-S	SO_3	0.214	0.300	-0.086	
LAWALG-SSM-S	TiO_2	0.100	0.100	0.000	
LAWALG-SSM-S	V_2O_5	<0.179	0		
LAWALG-SSM-S	ZnO	<0.124	0		
LAWALG-SSM-S	ZrO_2	0.953	0.930	0.023	
LAWALG-SSM-S	**Sum of Oxides**	**96.4**	**98.1**	**-1.760**	**-2%**

Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations

Oxide=Al_2O_3 (wt%)
Variability Chart for Measured (wt.%)



Oxide=B_2O_3 (wt%)
Variability Chart for Measured (wt.%)

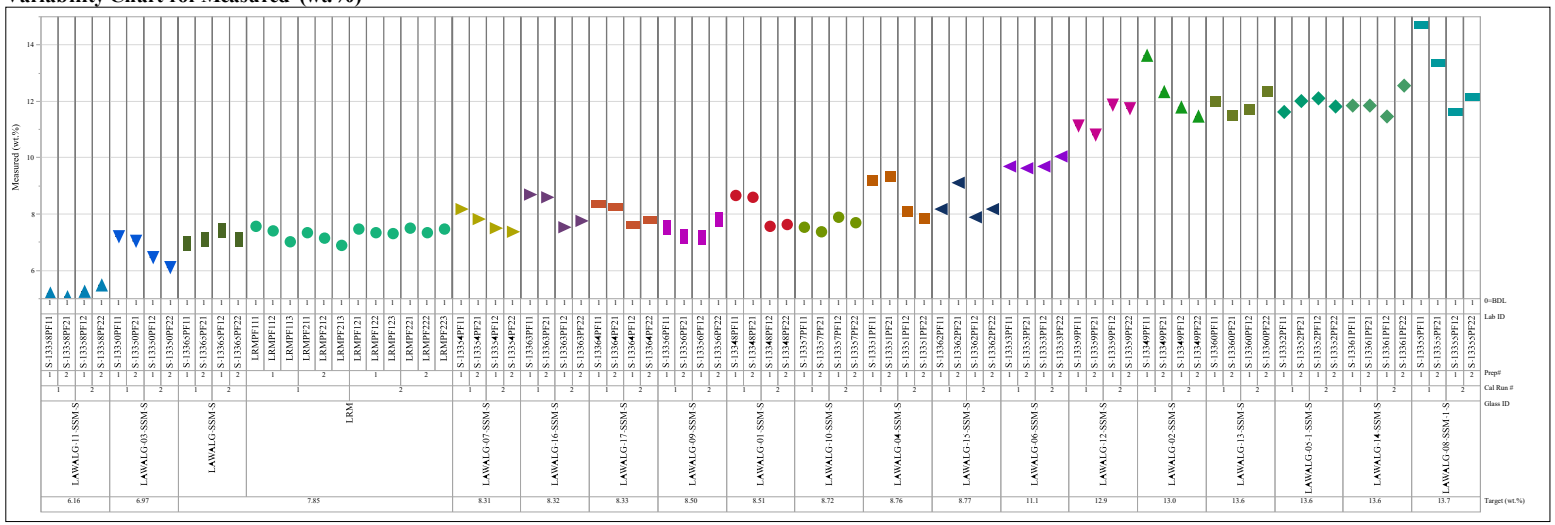
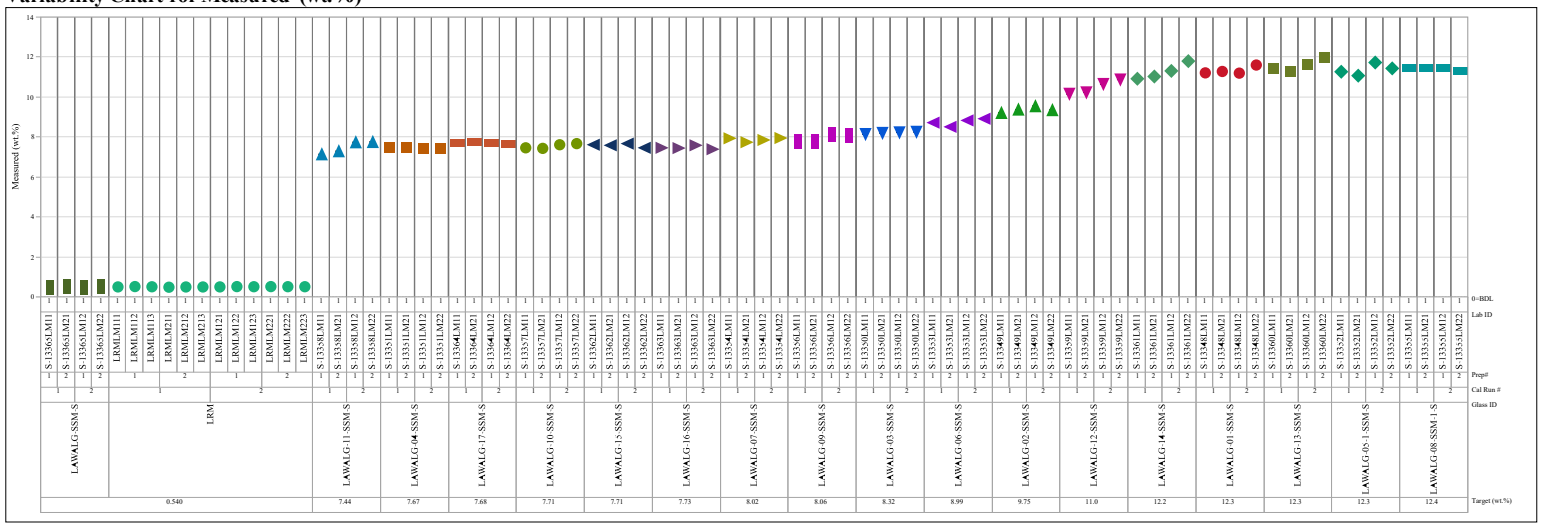


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=CaO (wt%)
Variability Chart for Measured (wt.%)



Oxide=Cl^- (wt%)
Variability Chart for Measured (wt.%)

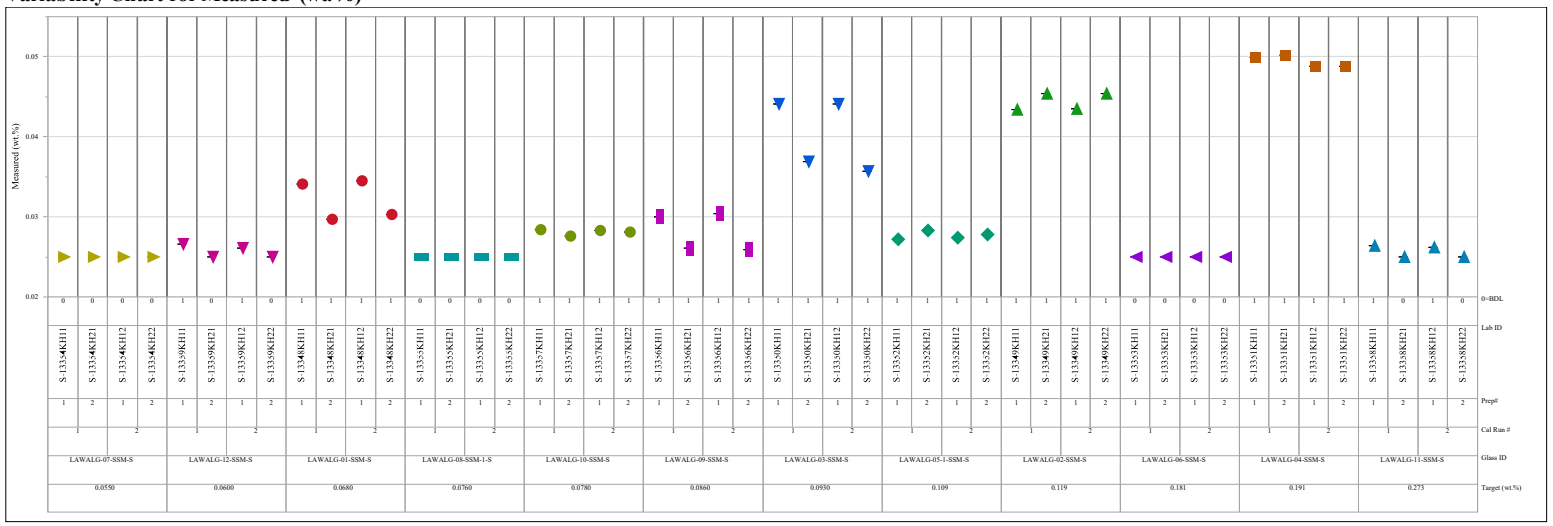
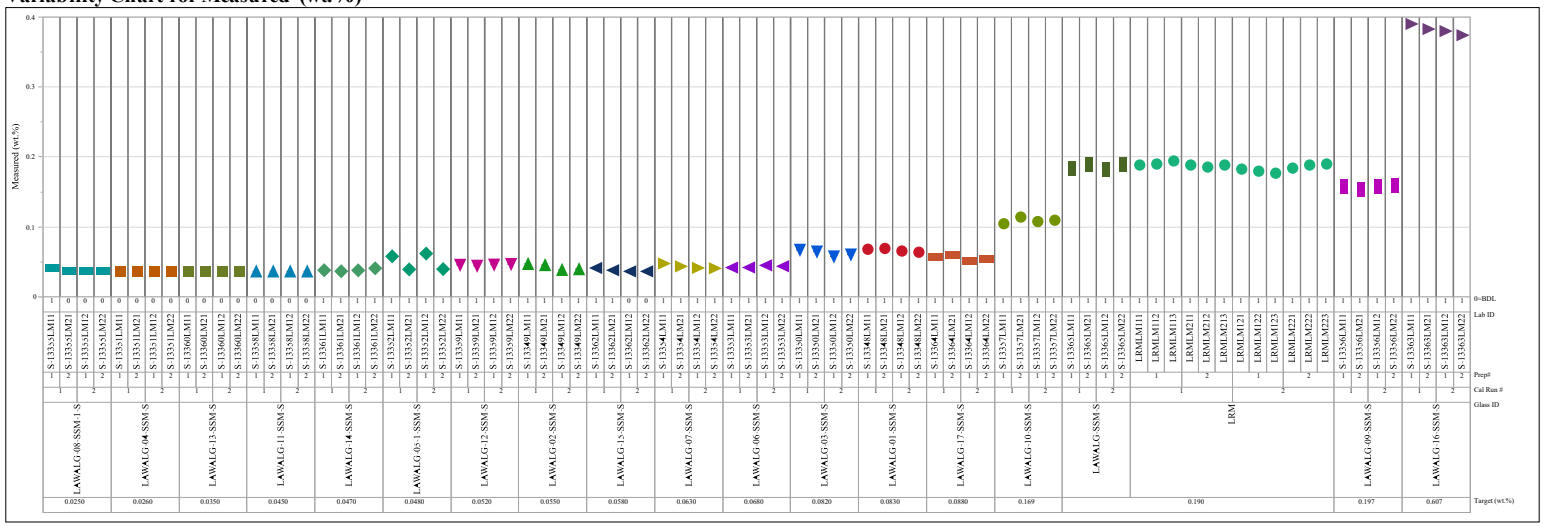


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=Cr_2O_3 (wt%)
Variability Chart for Measured (wt.%)



Oxide=F^- (wt%)
Variability Chart for Measured (wt.%)

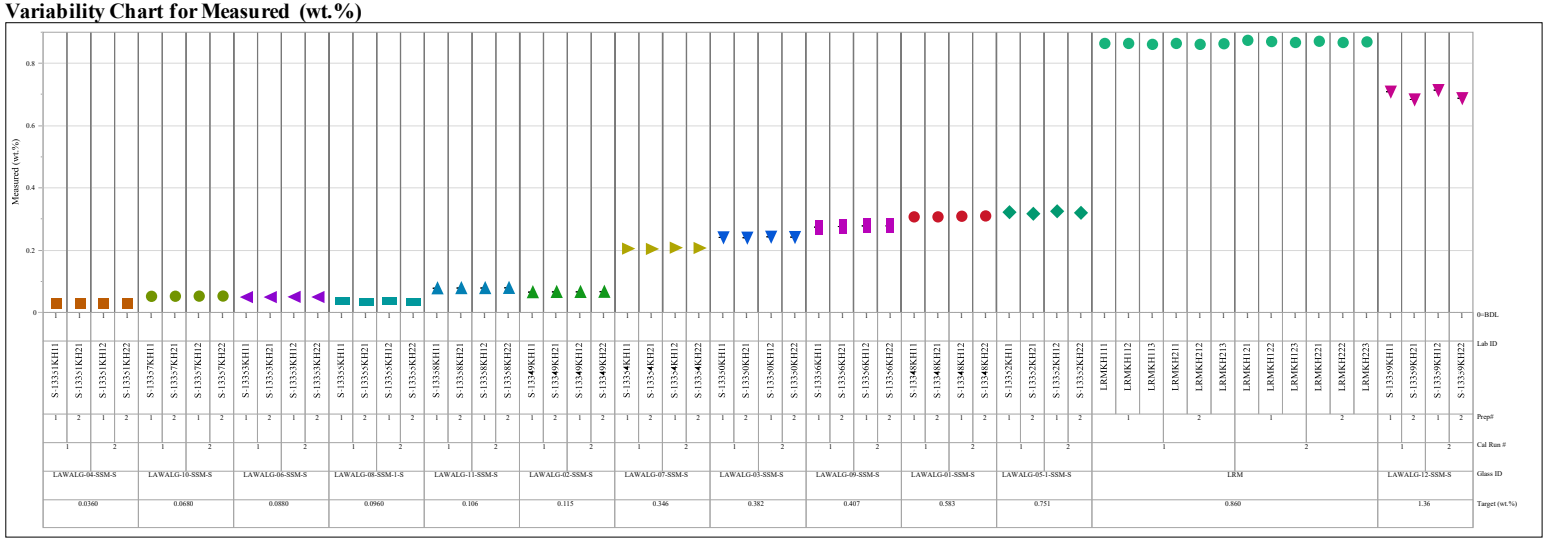
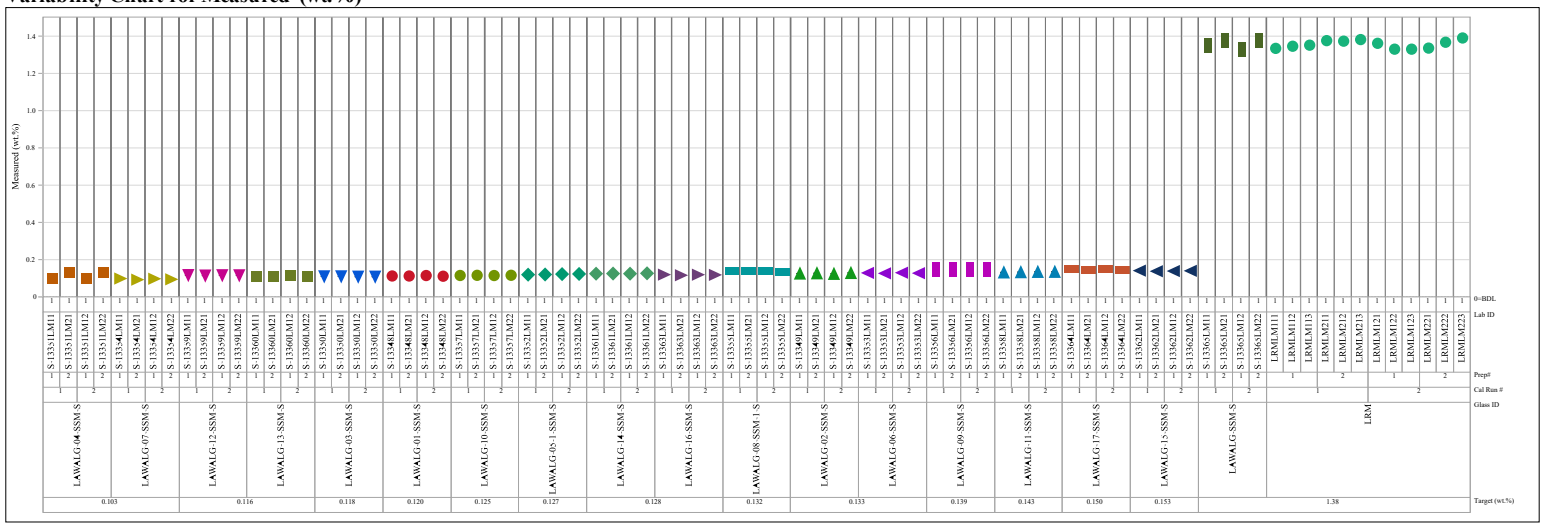


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=Fe_2O_3 (wt%)
Variability Chart for Measured (wt.%)



Oxide=K_2O (wt%)
Variability Chart for Measured (wt.%)

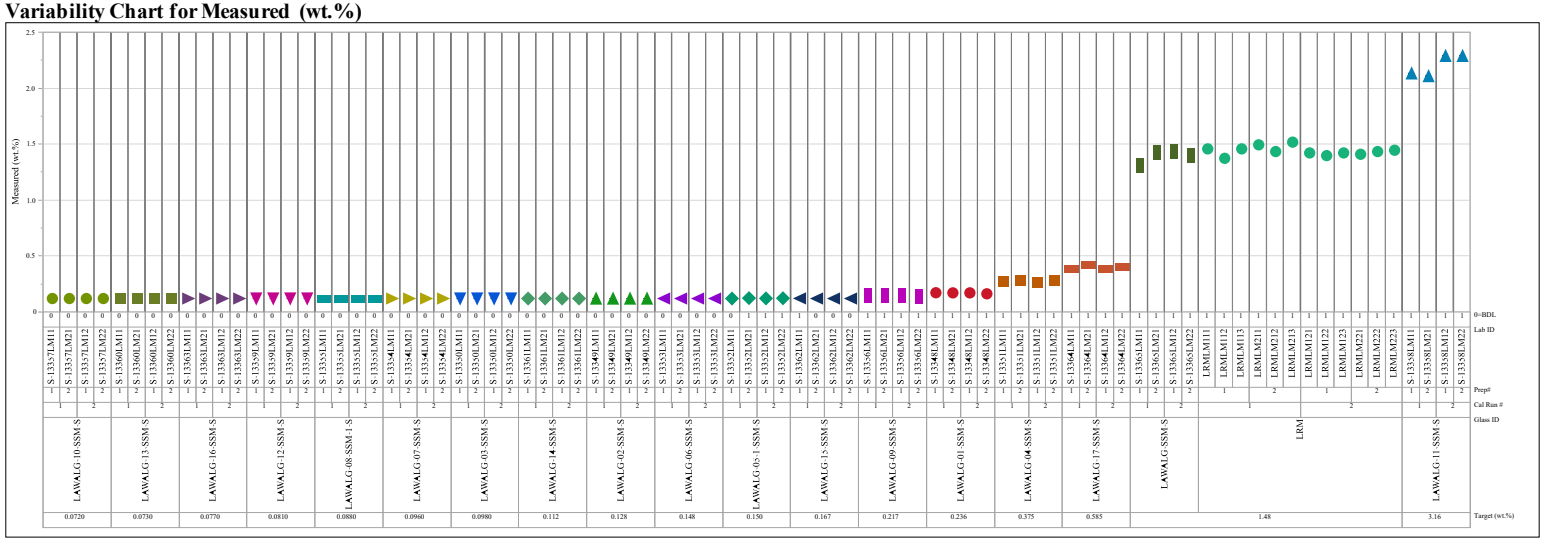
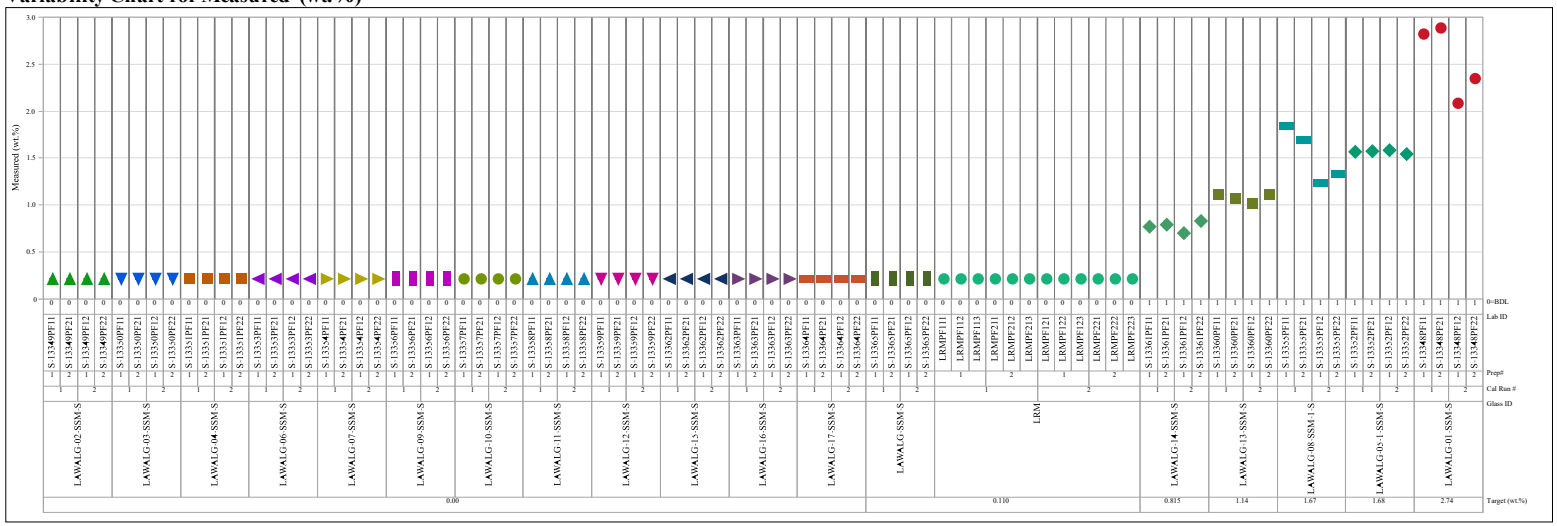


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=Li_2O (wt%)
Variability Chart for Measured (wt.%)



Oxide=MgO (wt%)
Variability Chart for Measured (wt.%)

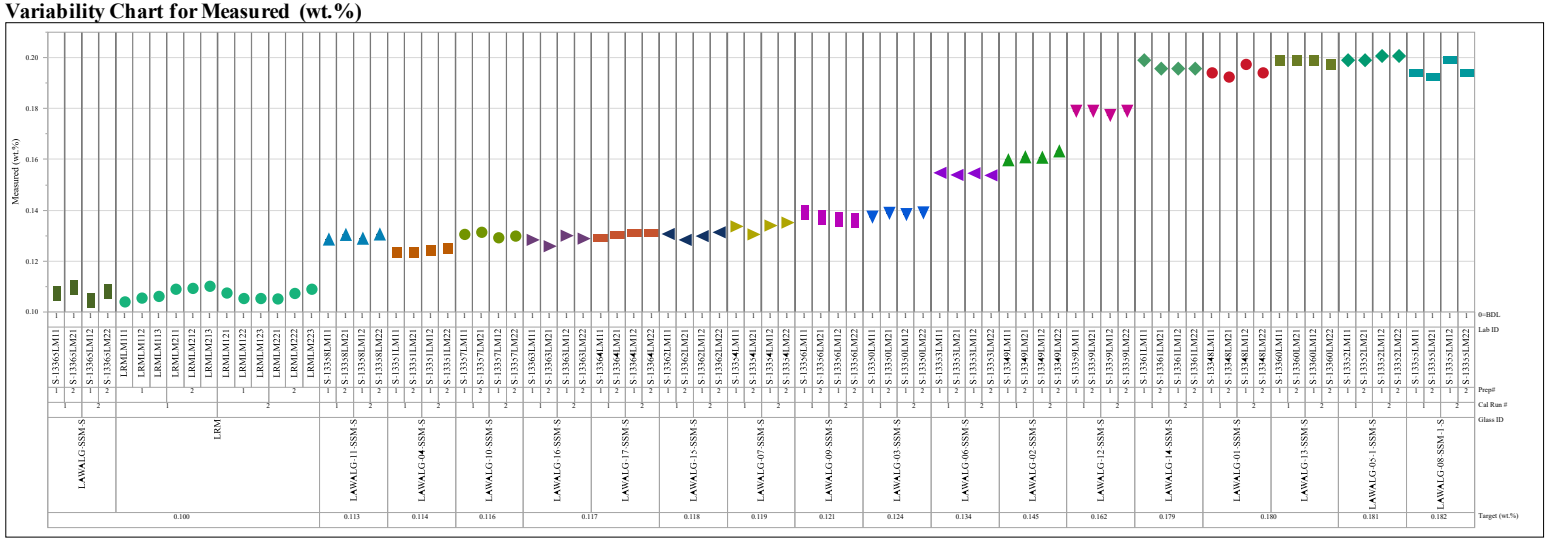
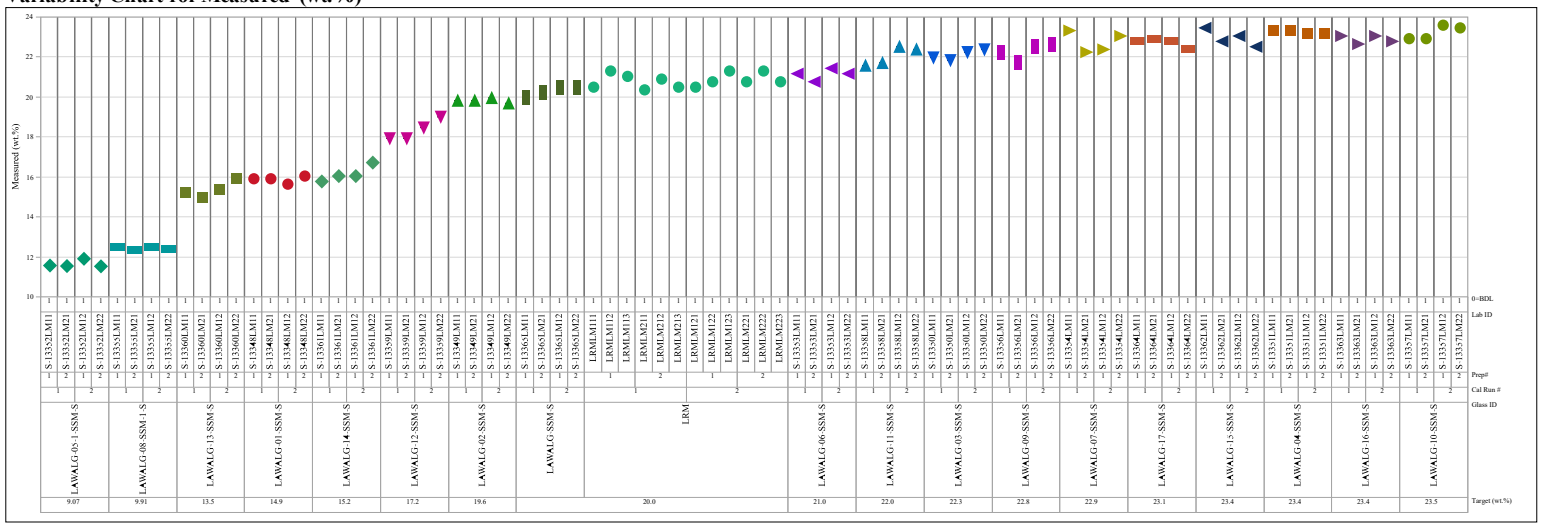


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=Na_2O (wt%)
Variability Chart for Measured (wt.%)



Oxide=P_2O_5 (wt%)
Variability Chart for Measured (wt.%)

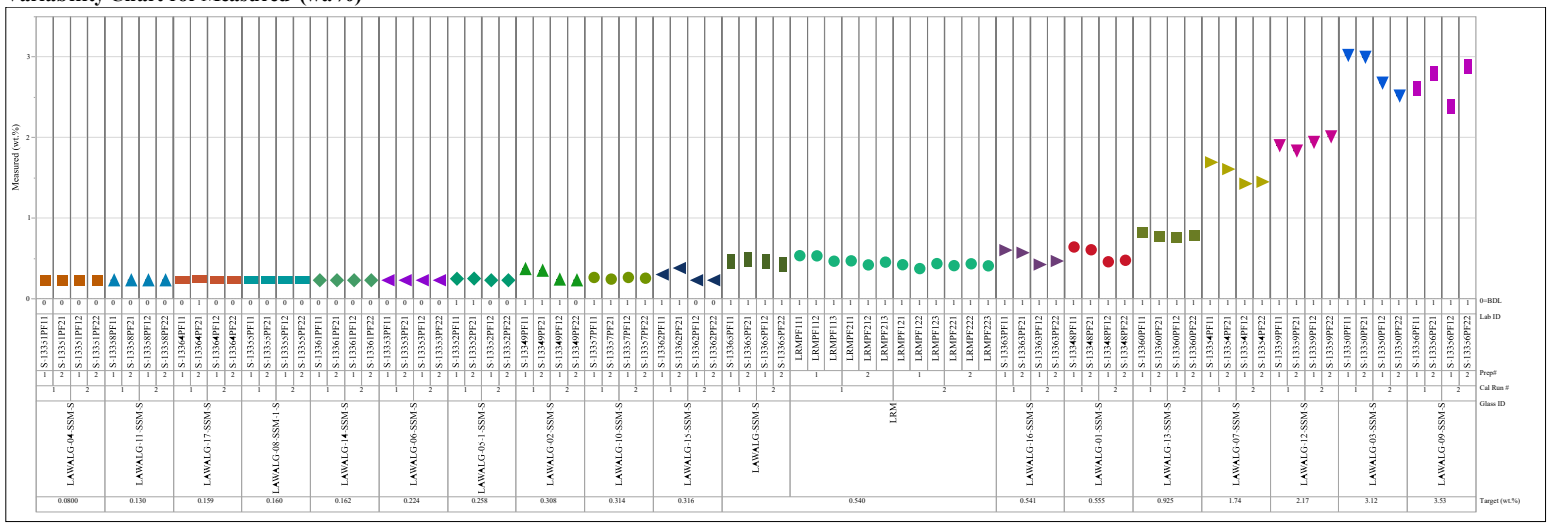
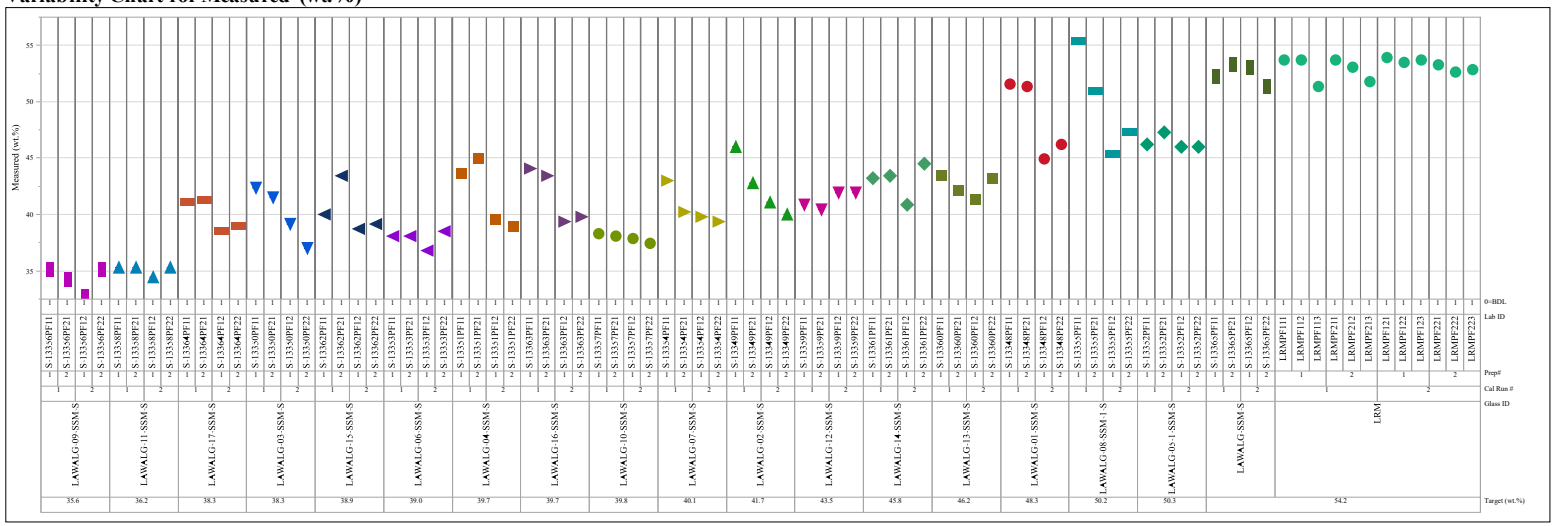


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=SiO_2 (wt%)
Variability Chart for Measured (wt.%)



Oxide=SnO_2 (wt%)
Variability Chart for Measured (wt.%)

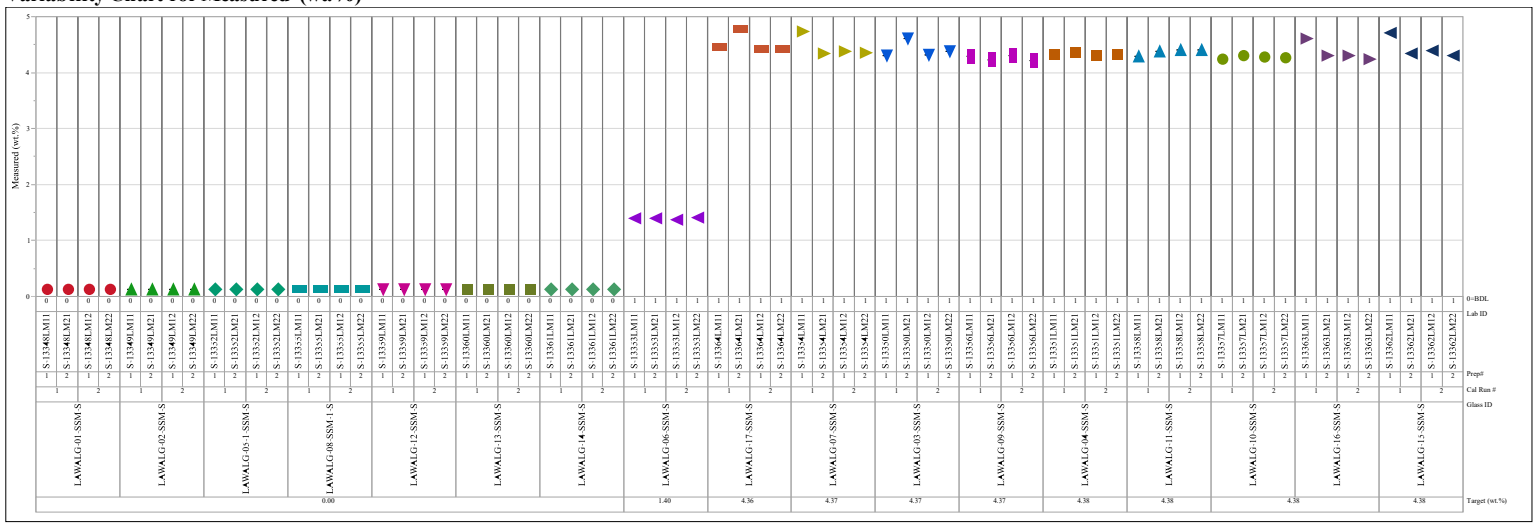
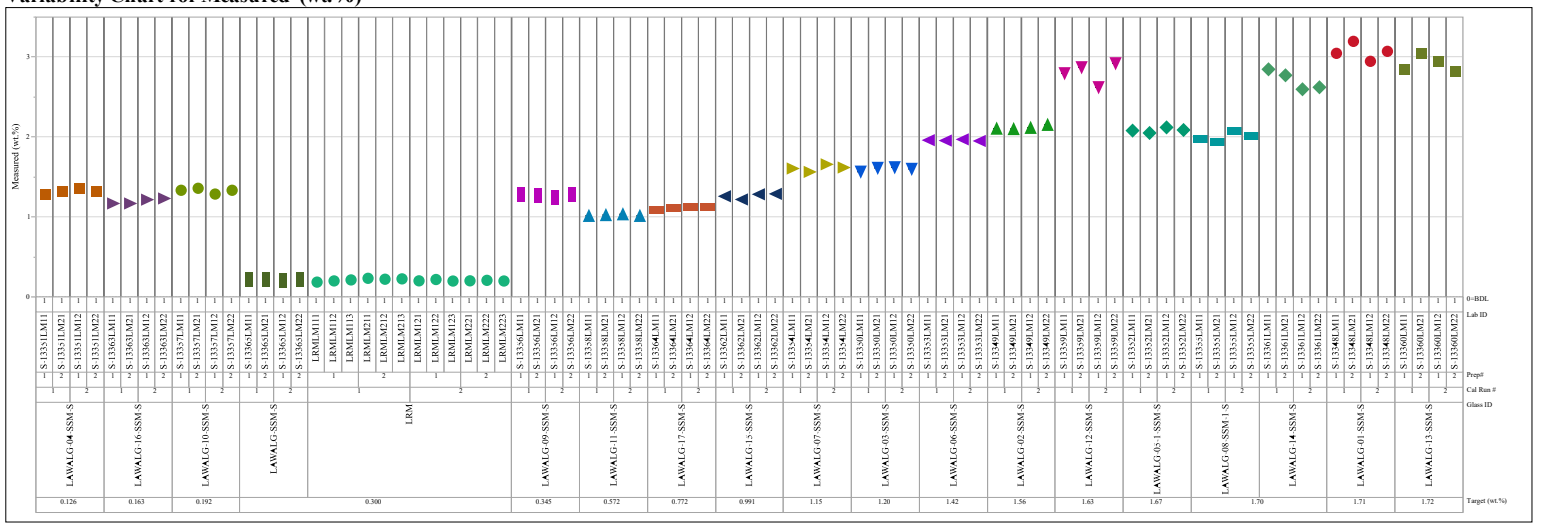


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=SO_3 (wt%)
Variability Chart for Measured (wt.%)



Oxide=TiO_2 (wt%)
Variability Chart for Measured (wt.%)

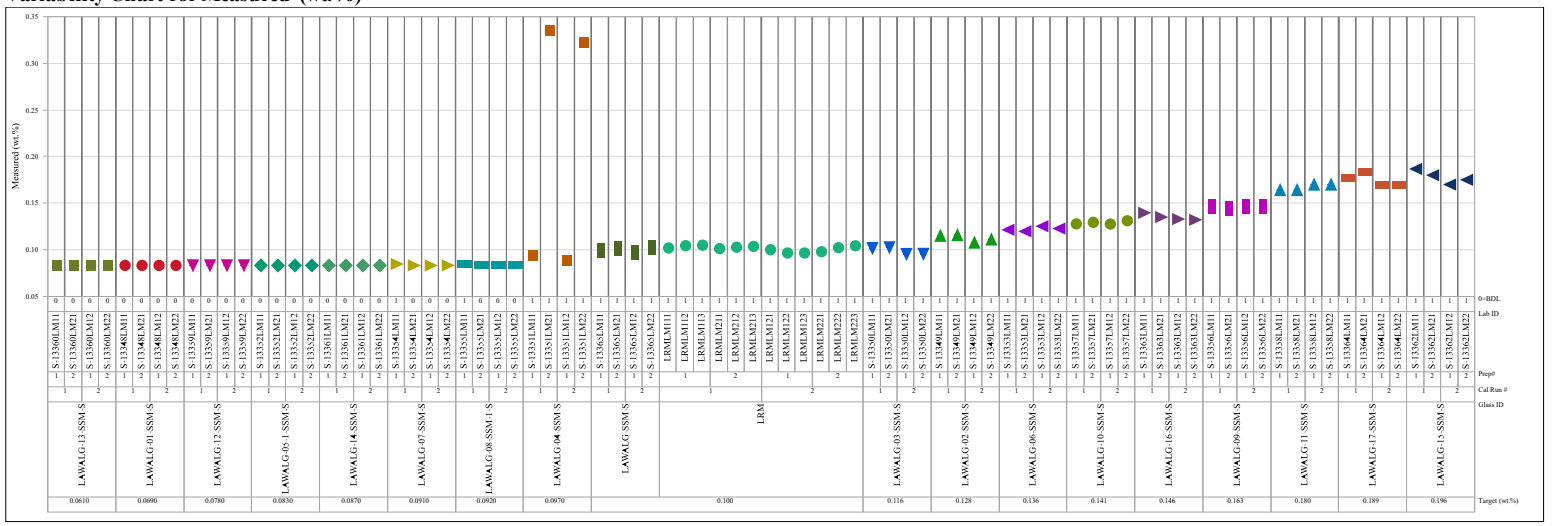
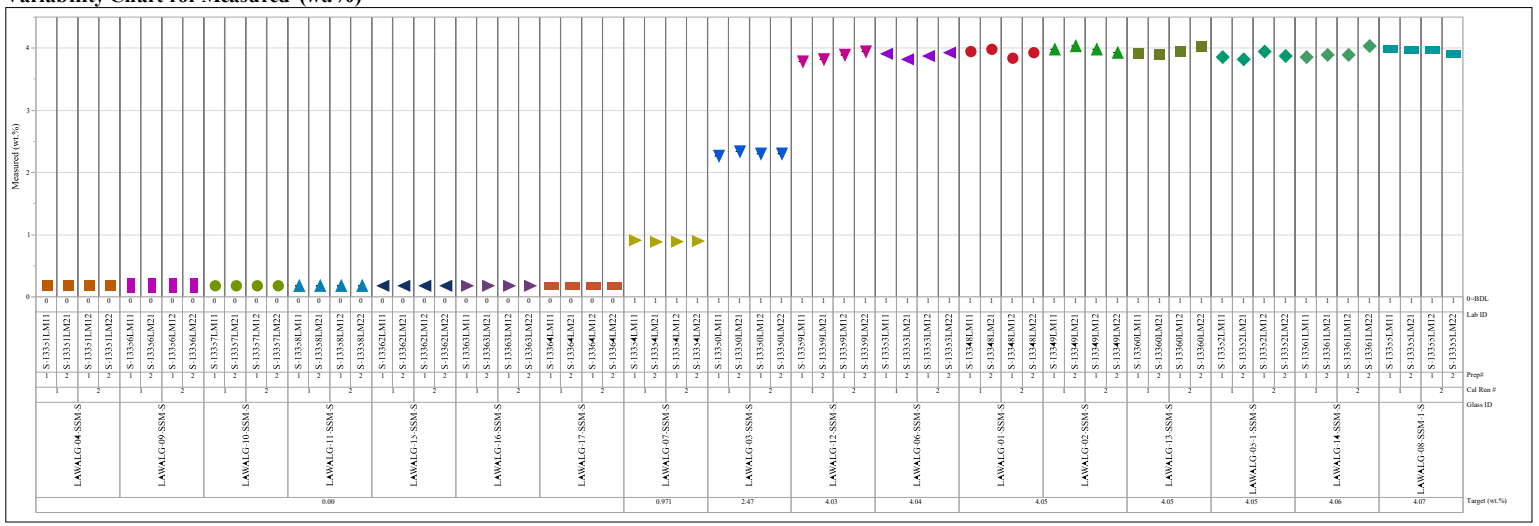


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=V_2O_5 (wt%)
Variability Chart for Measured (wt.%)



Oxide=ZnO (wt%)
Variability Chart for Measured (wt.%)

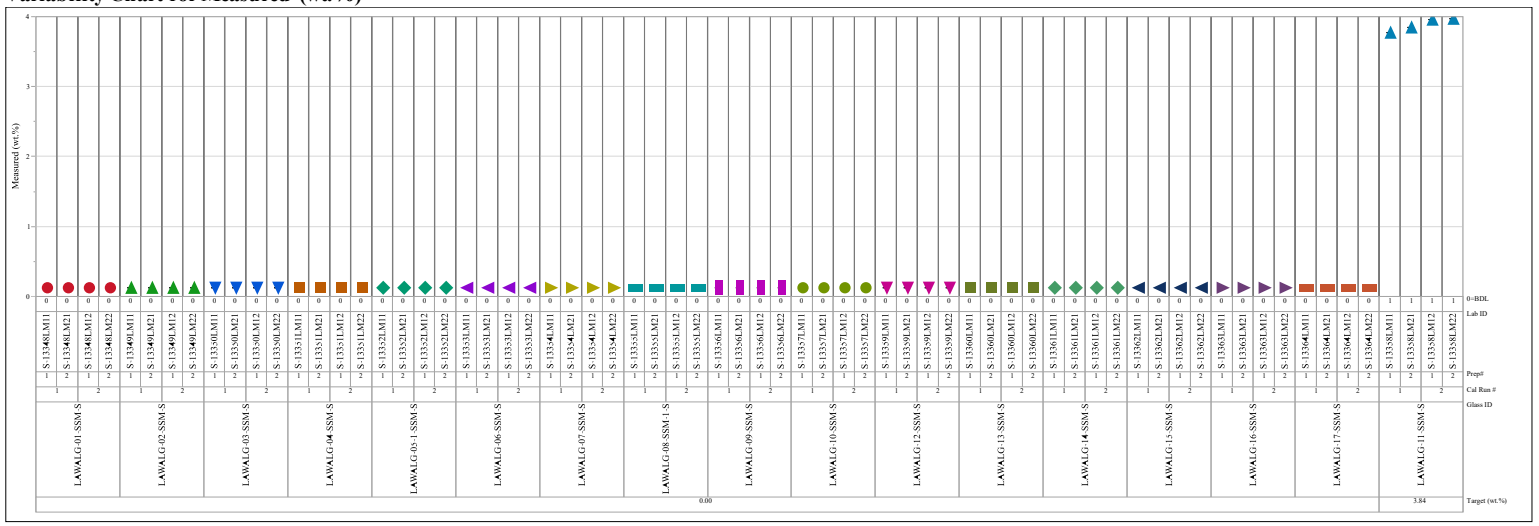


Exhibit A-1. Plots of Oxide Measurements by Glass Identifier by Target Concentrations (continued)

Oxide=ZrO_2 (wt%)
Variability Chart for Measured (wt.%)

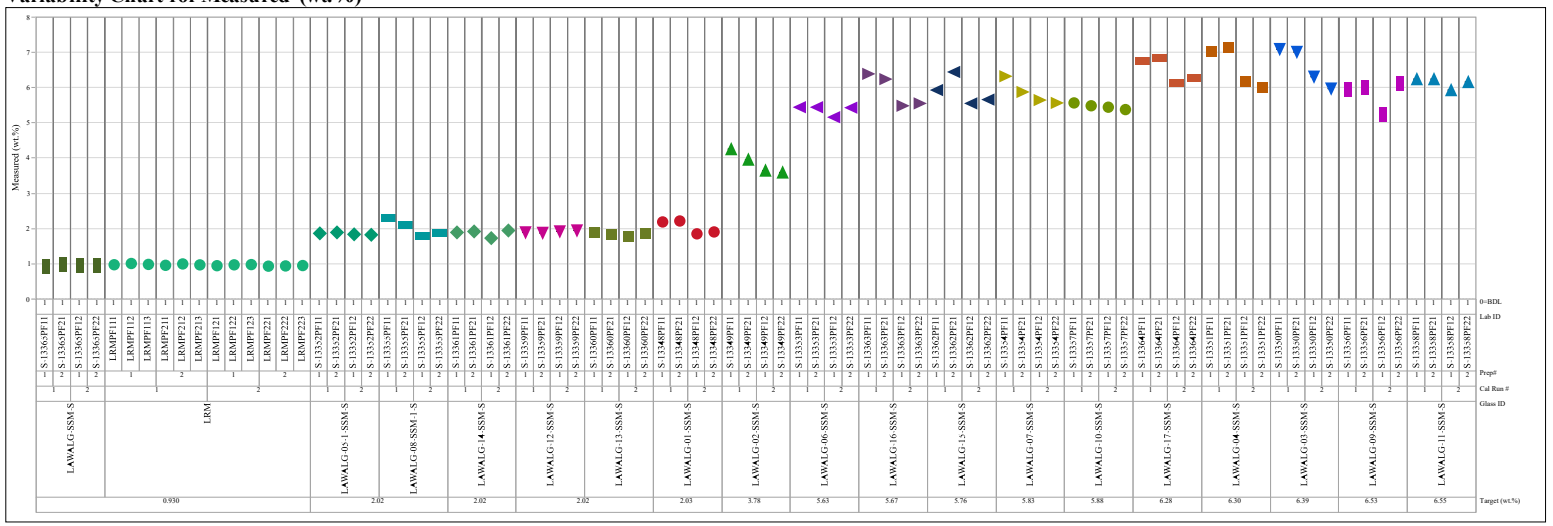
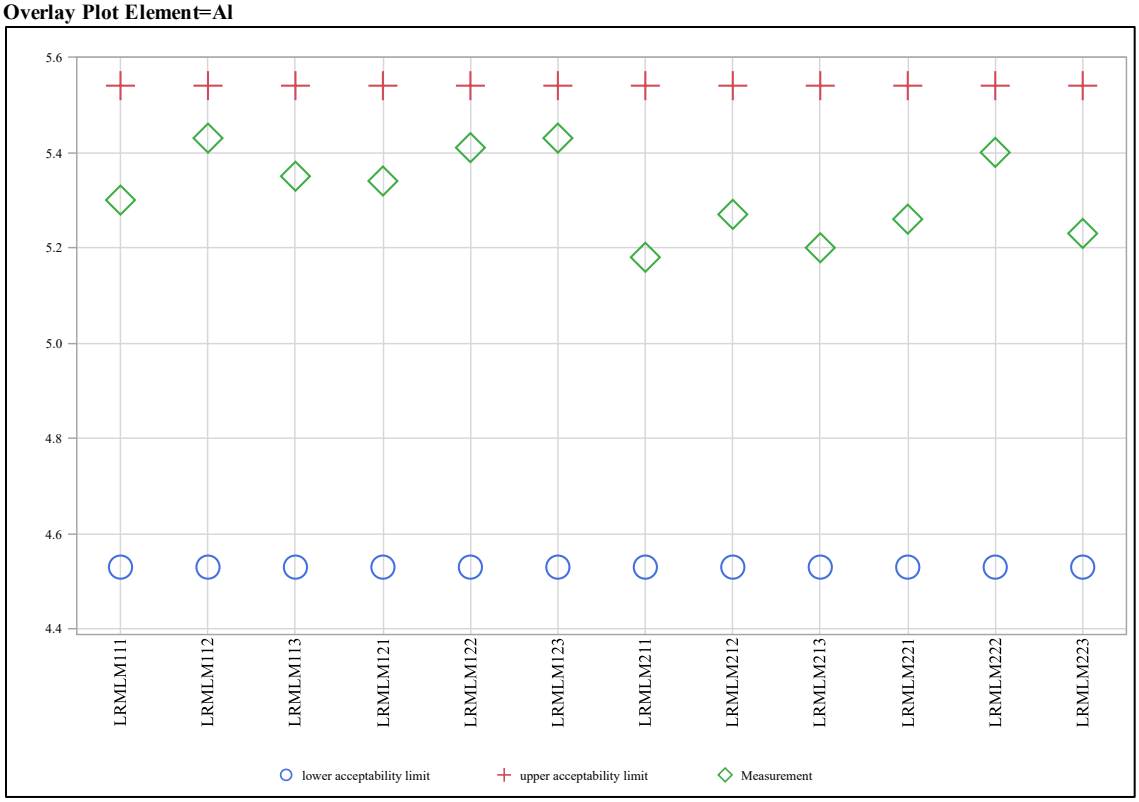


Exhibit A-2. Acceptability Evaluation for Measurements of the LRM Glass

Overlay Plot Element=Al



Overlay Plot Element=B

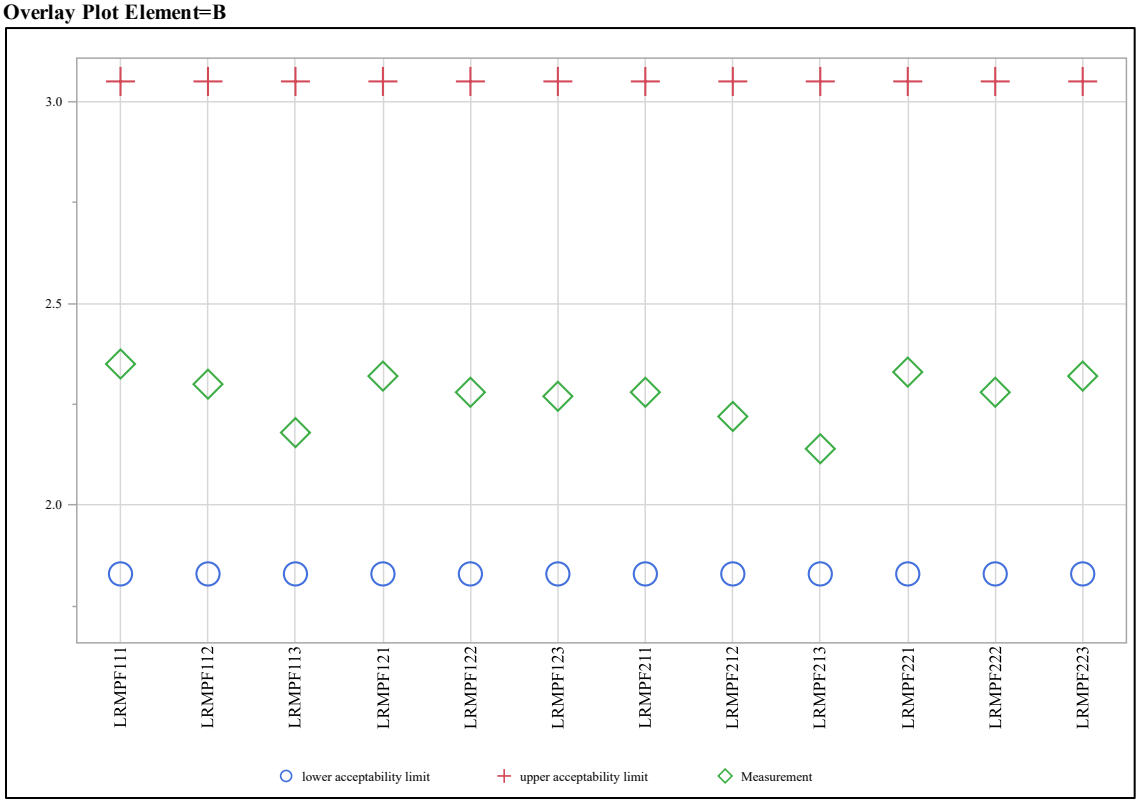
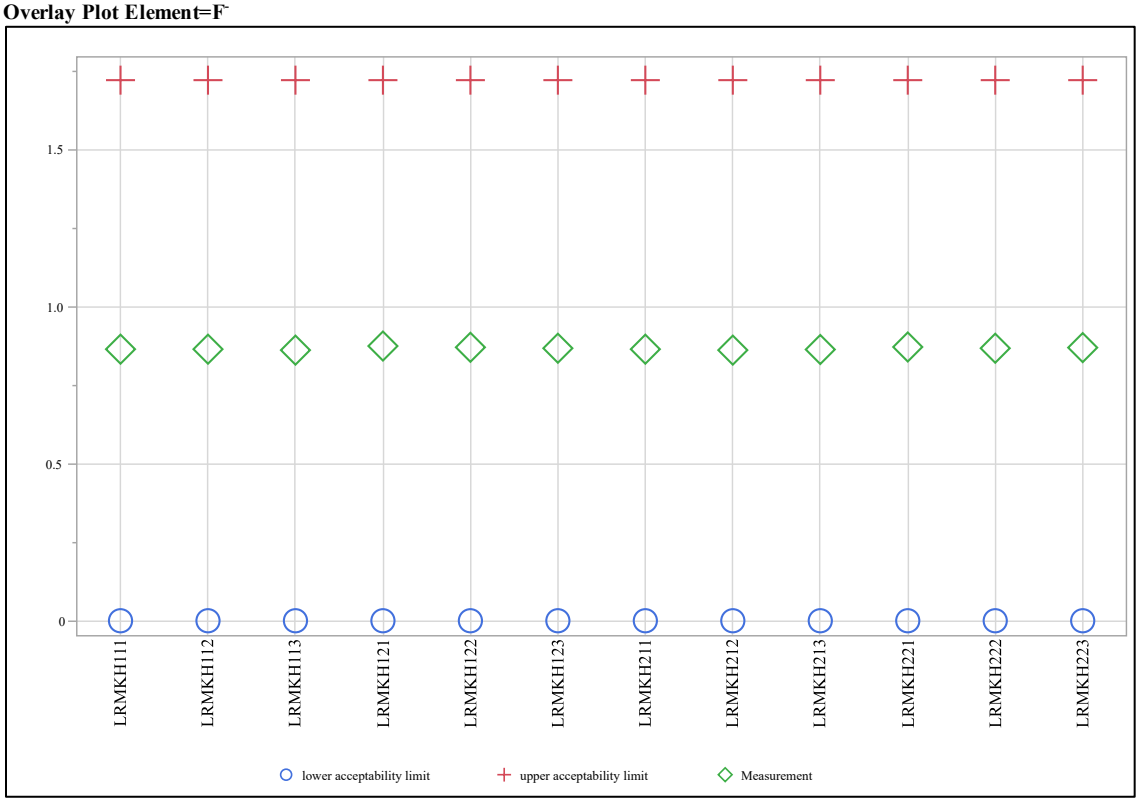


Exhibit A-2. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=F⁻



Overlay Plot Element=Fe

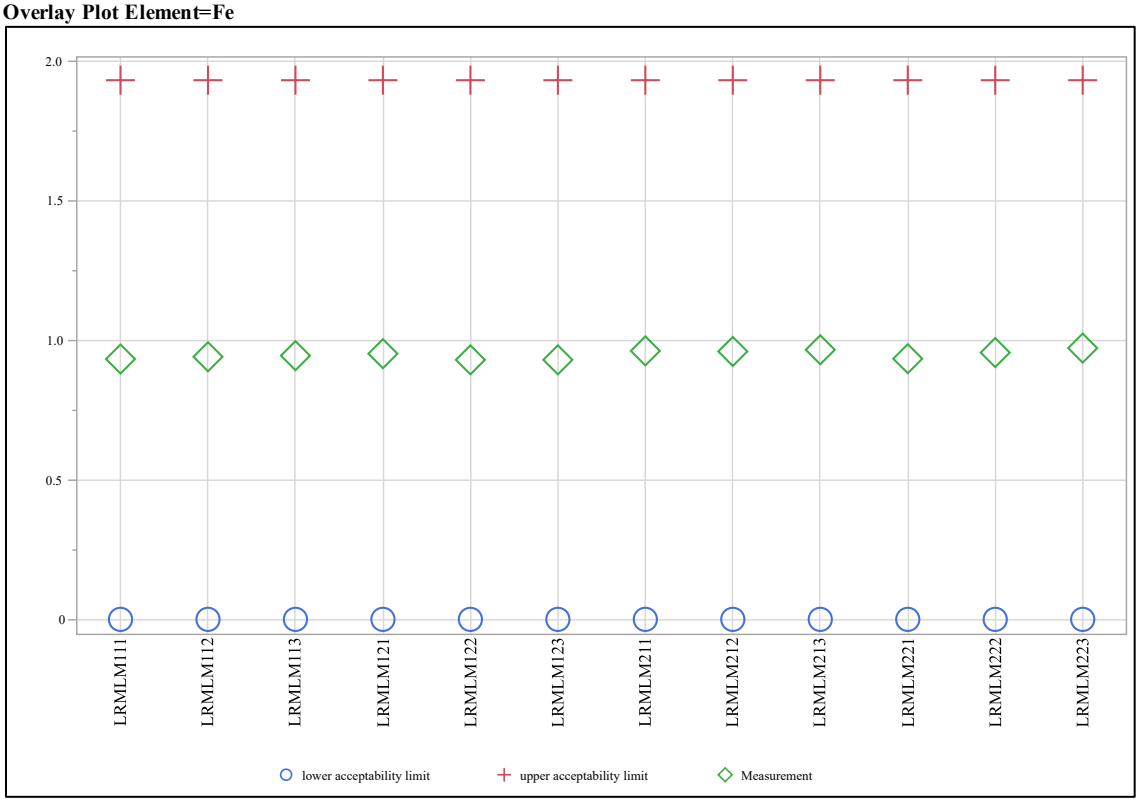
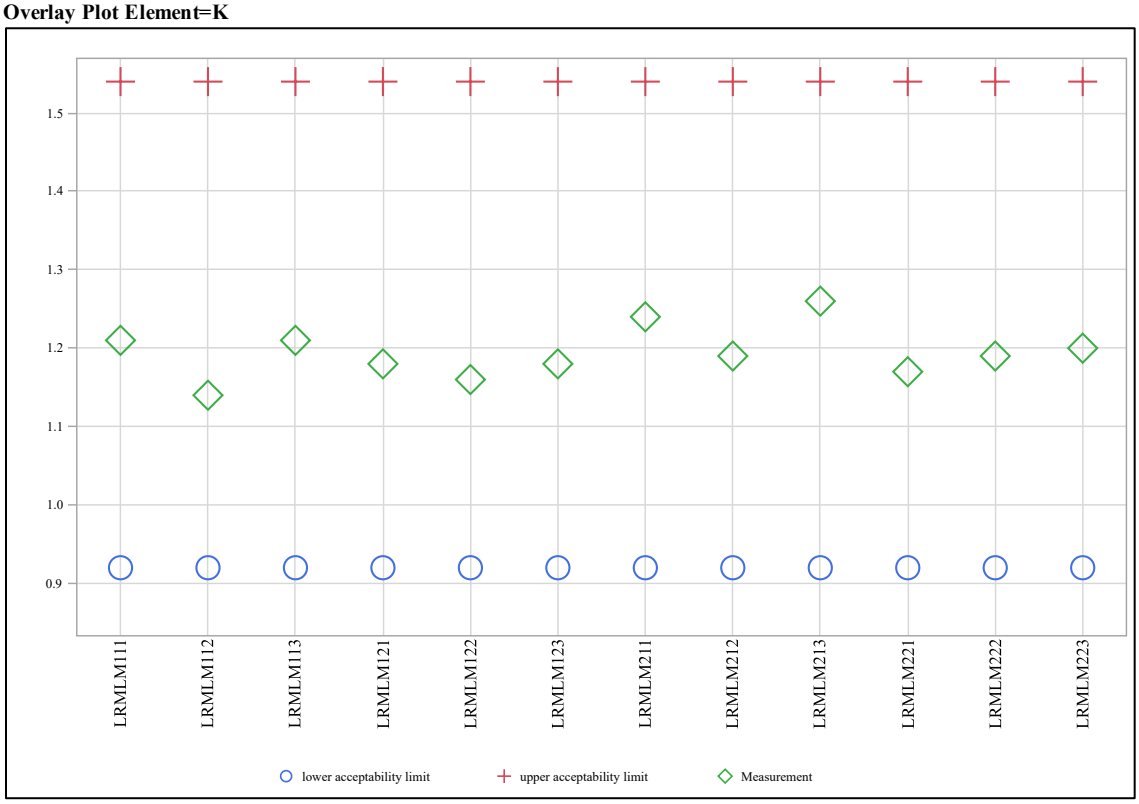


Exhibit A-2. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=K



Overlay Plot Element=Na

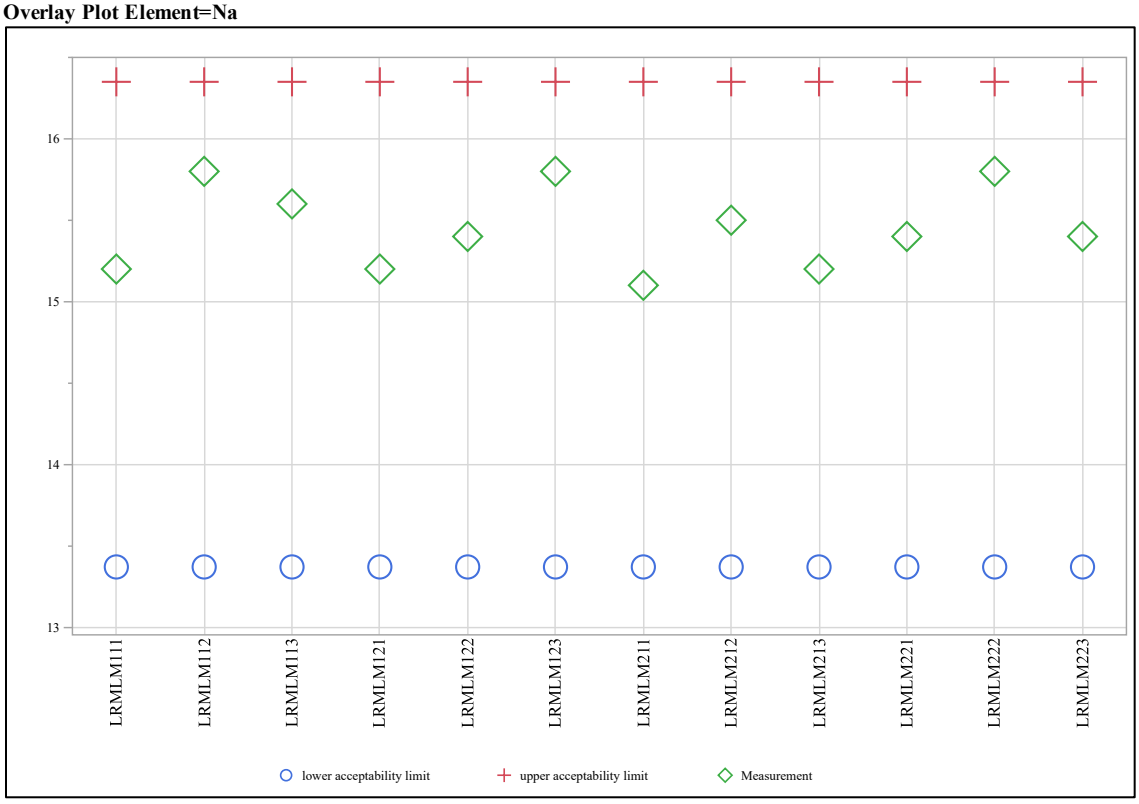
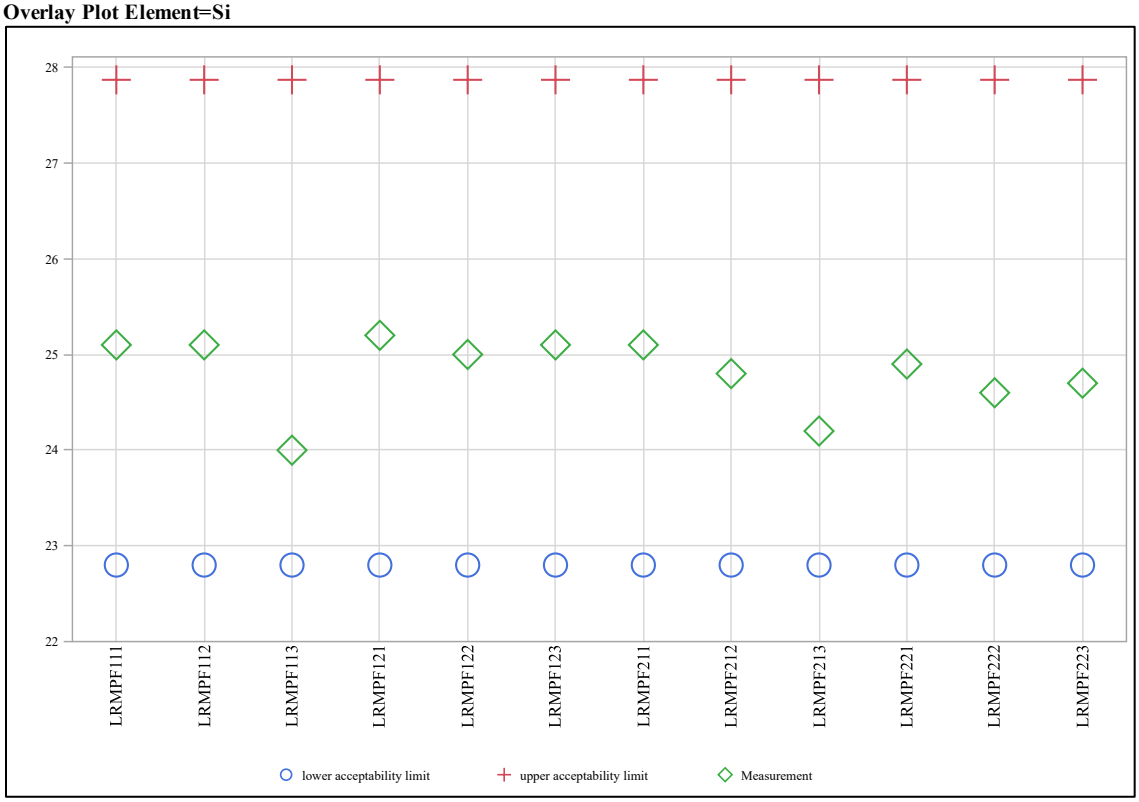


Exhibit A-2. Acceptability Evaluation for Measurements of the LRM Glass (continued)

Overlay Plot Element=Si



Overlay Plot Element=Zr

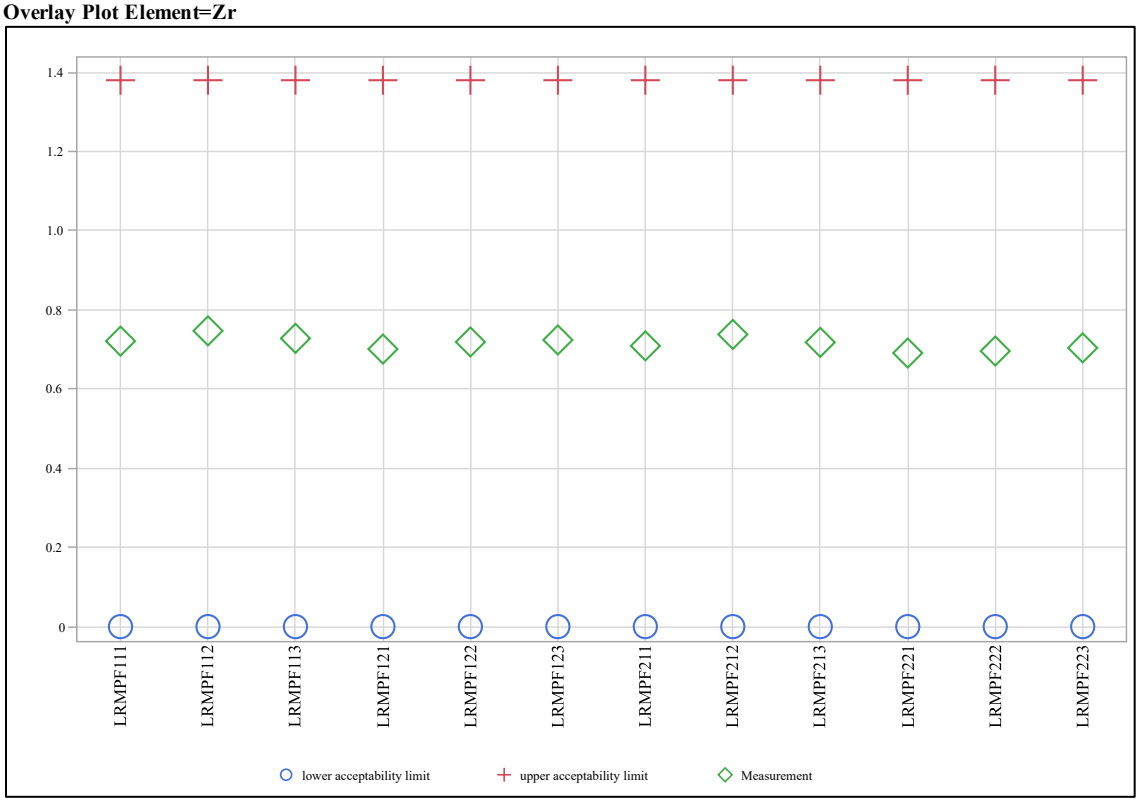
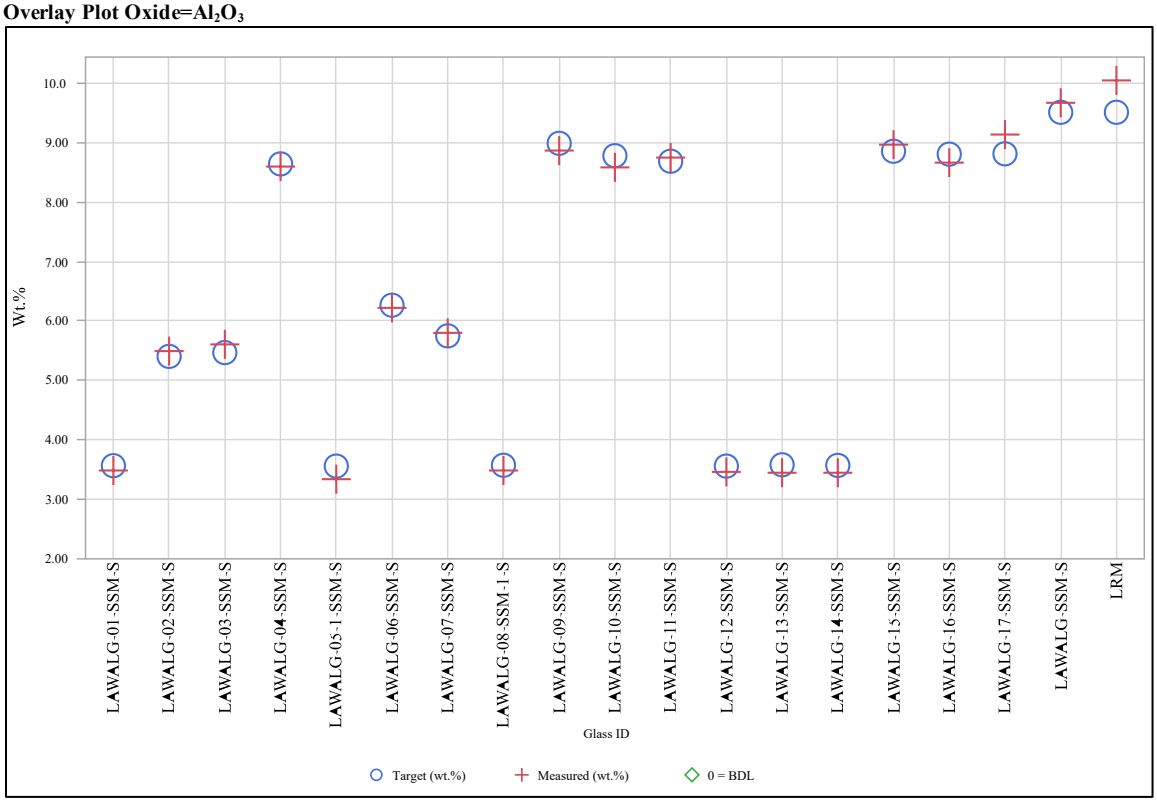


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide

Overlay Plot Oxide=Al_2O_3



Overlay Plot Oxide=B_2O_3

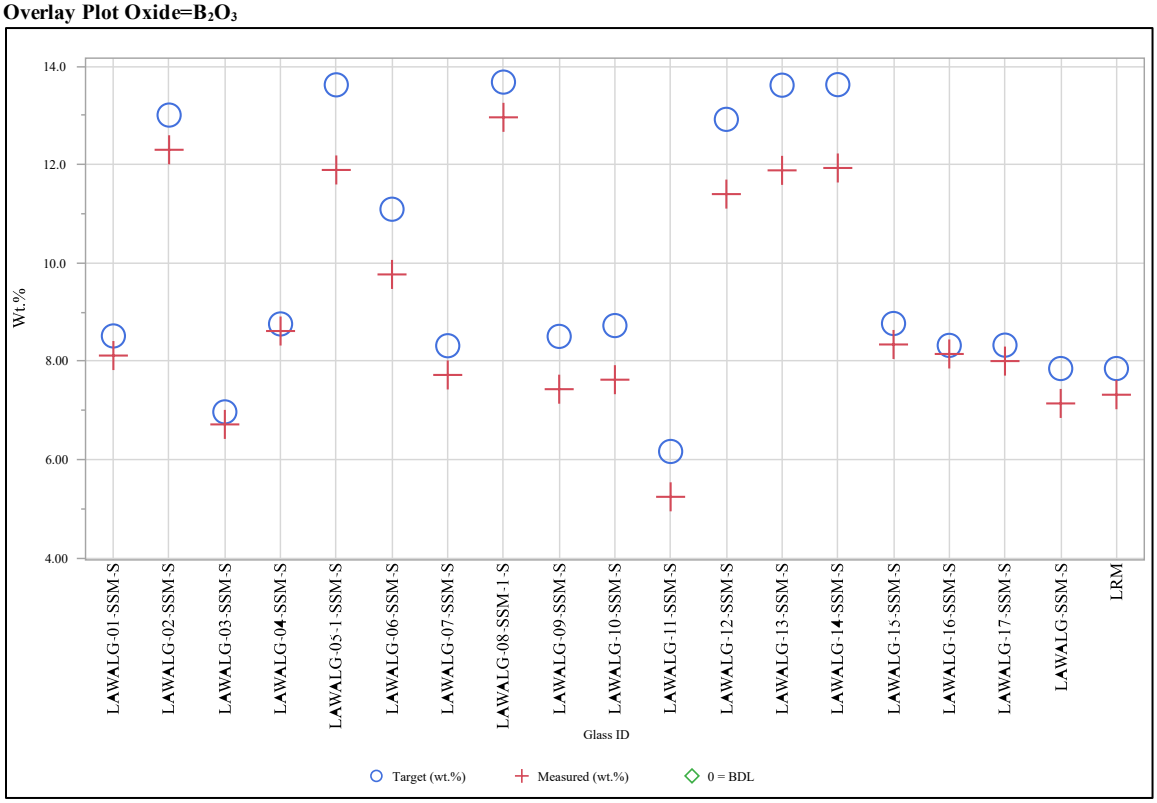
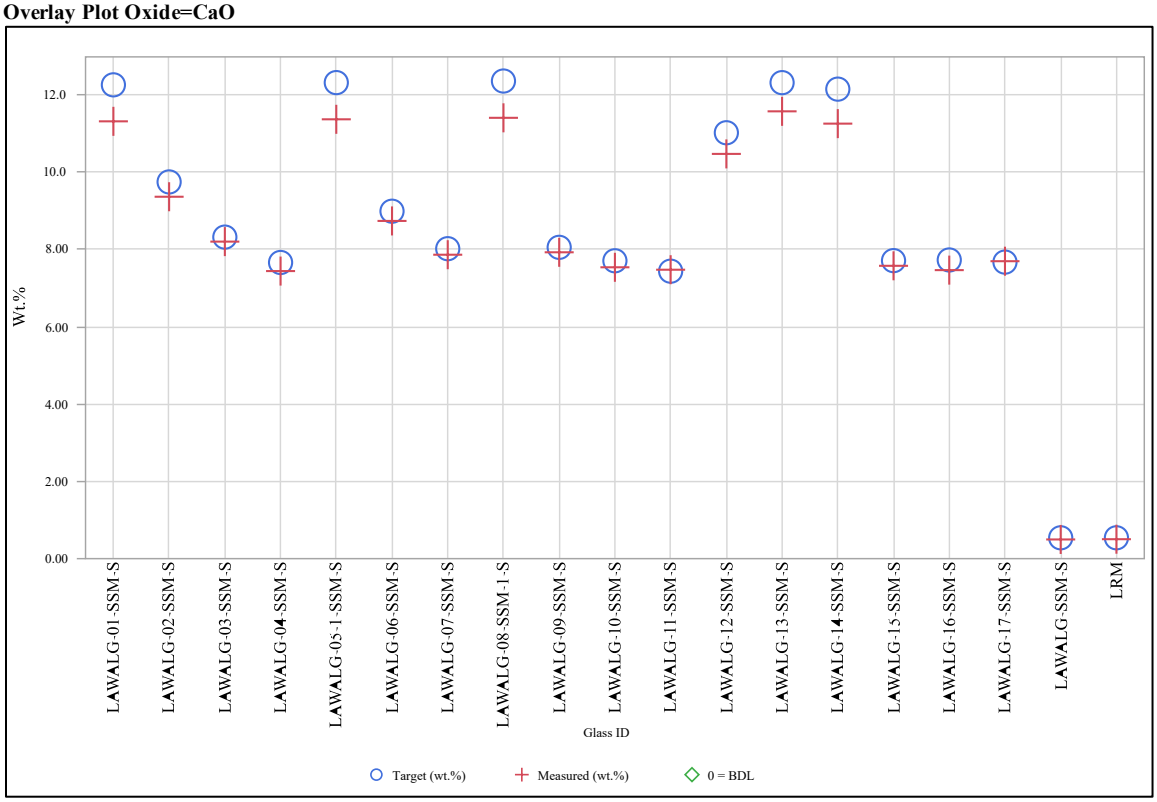


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=CaO



Overlay Plot Oxide=Cl^-

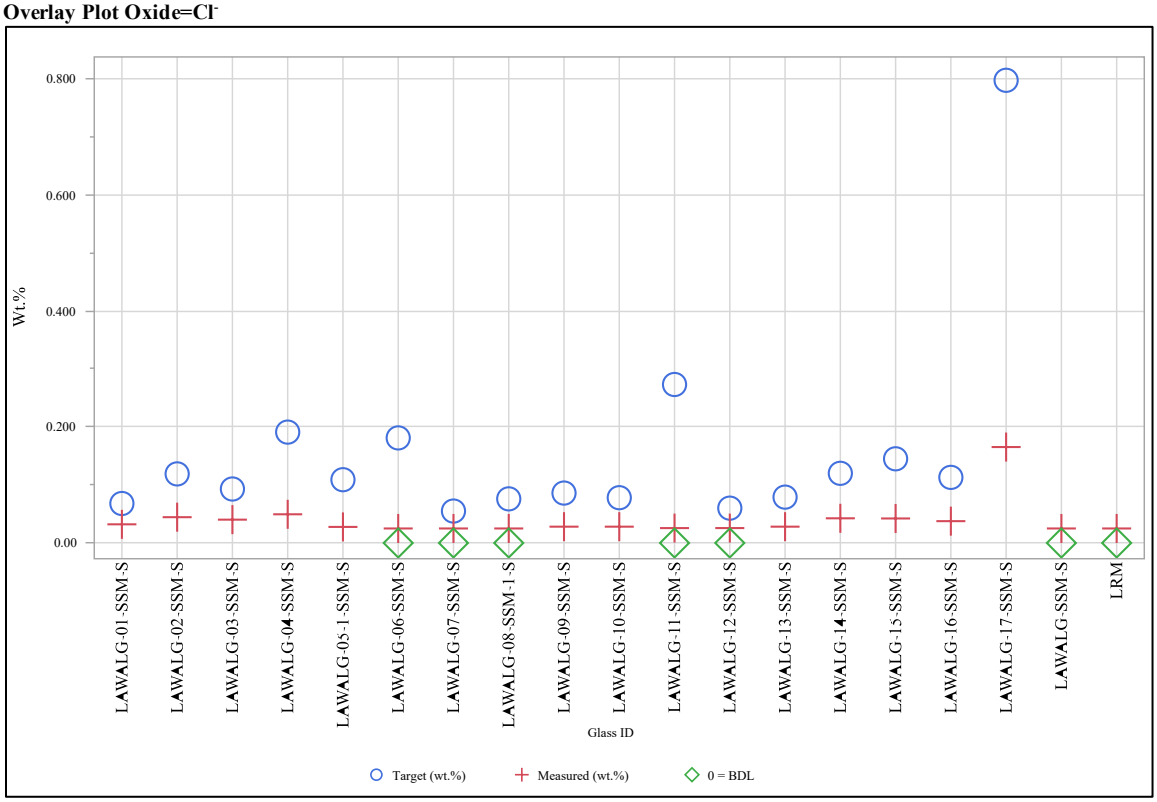
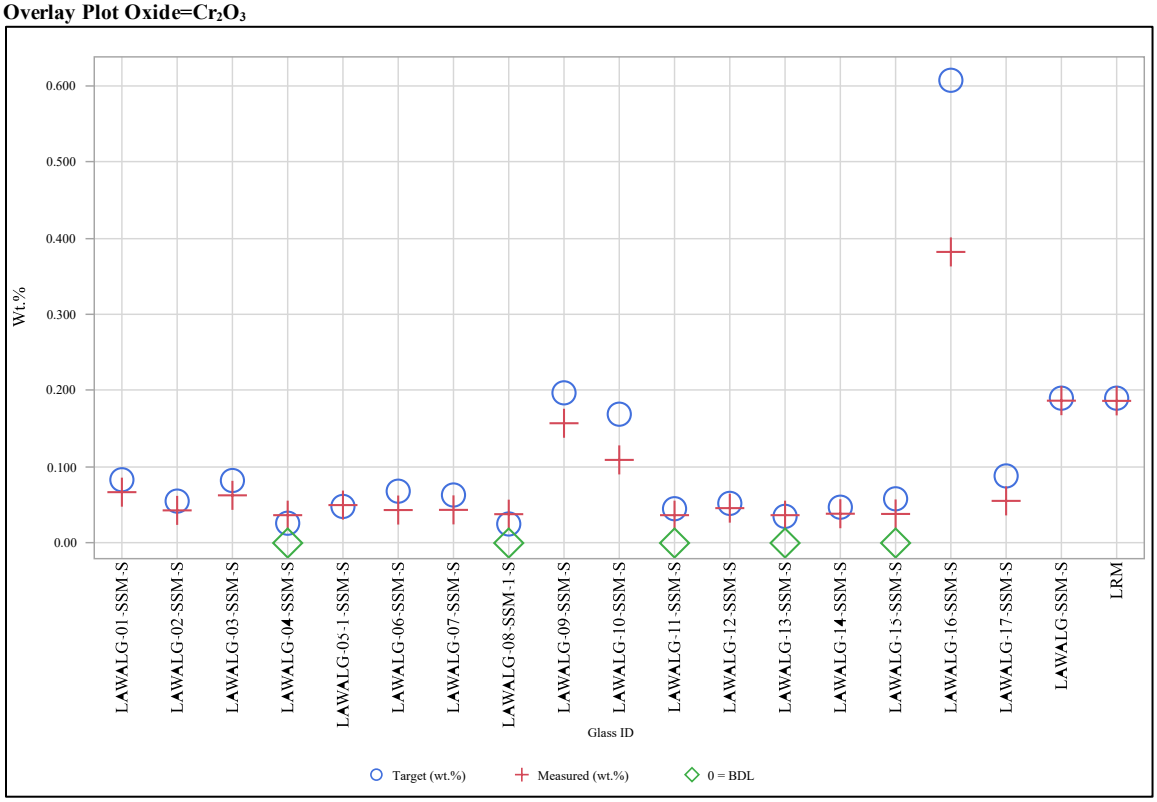


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=Cr_2O_3



Overlay Plot Oxide=F^-

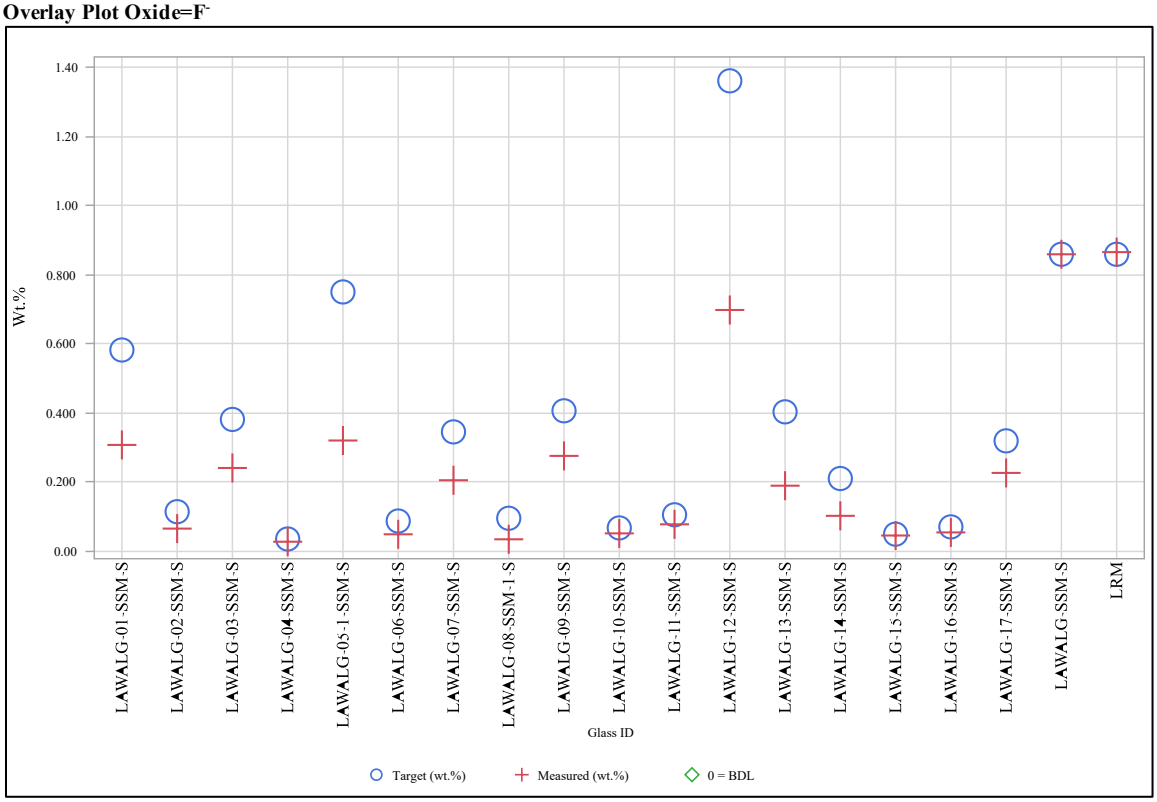
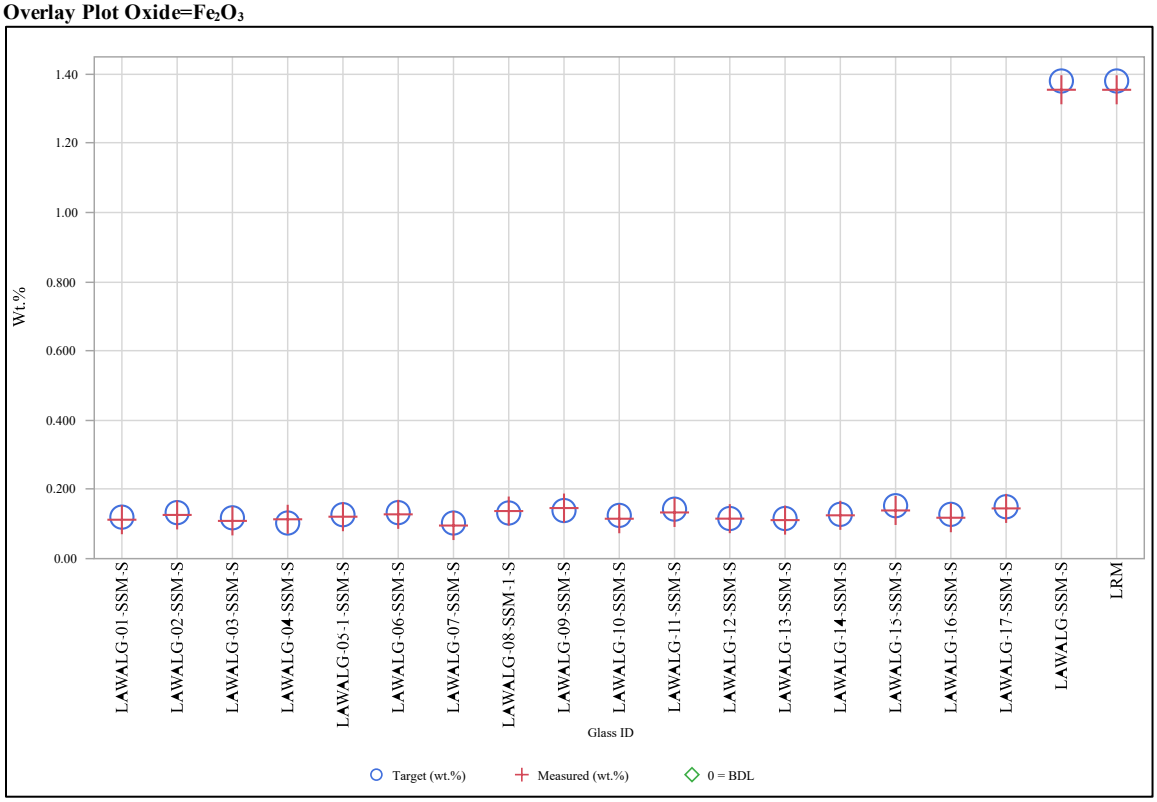


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=Fe_2O_3



Overlay Plot Oxide=K_2O

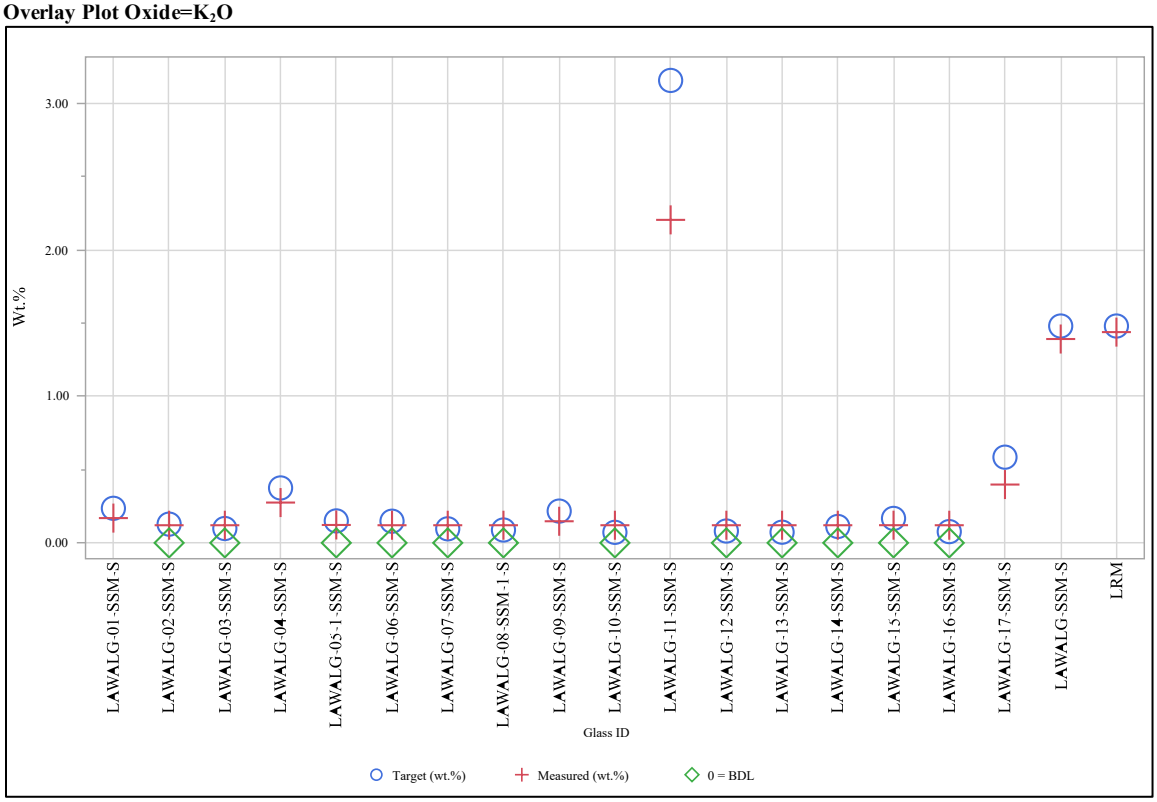
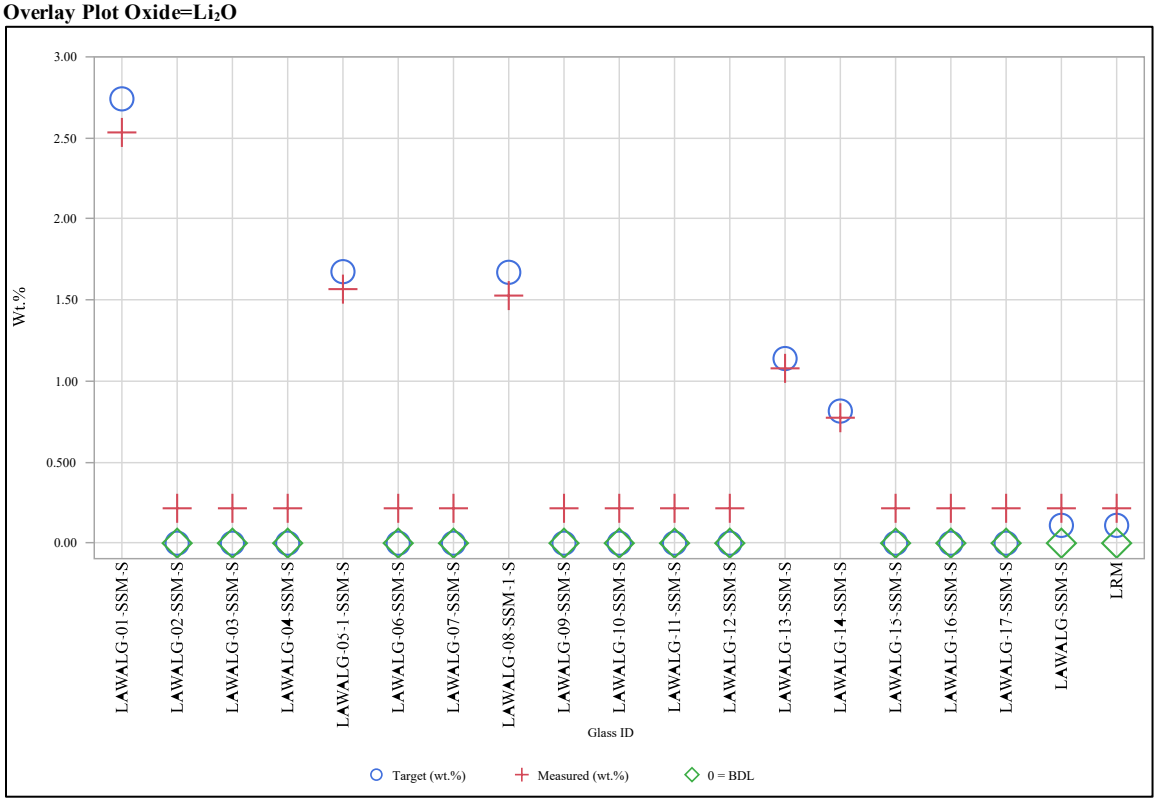


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=Li_2O



Overlay Plot Oxide=MgO

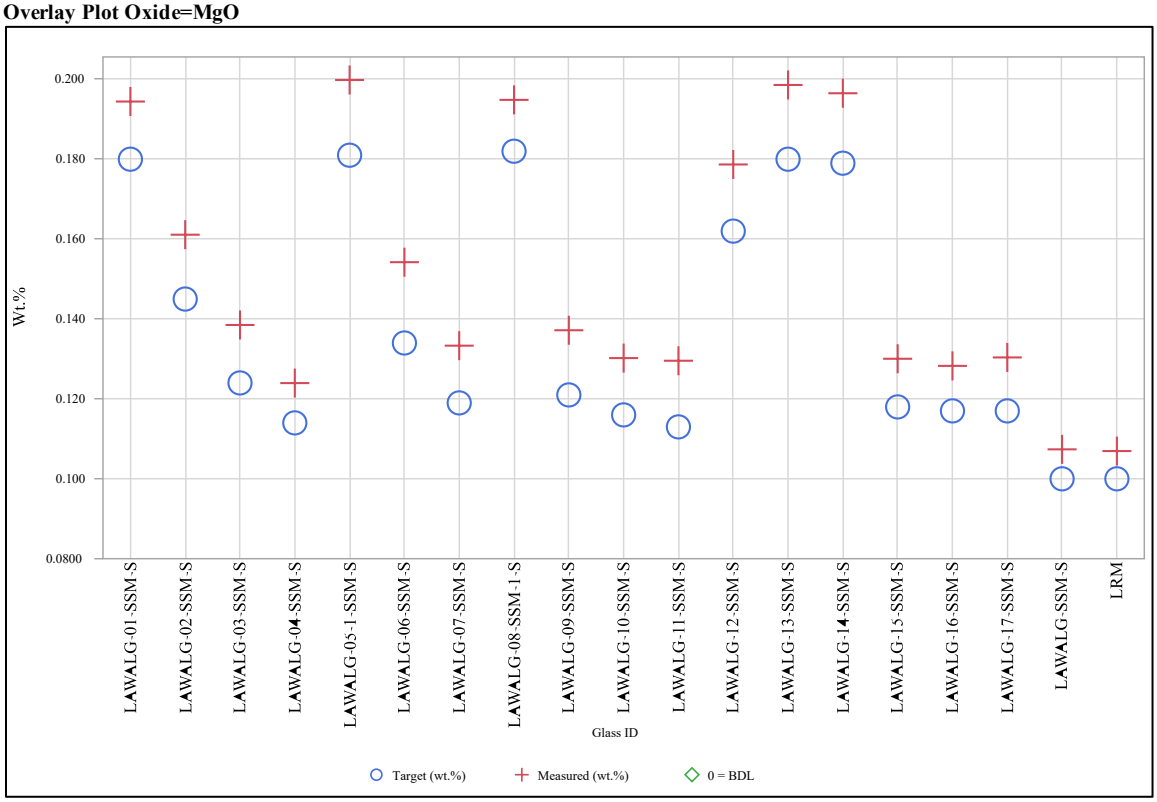
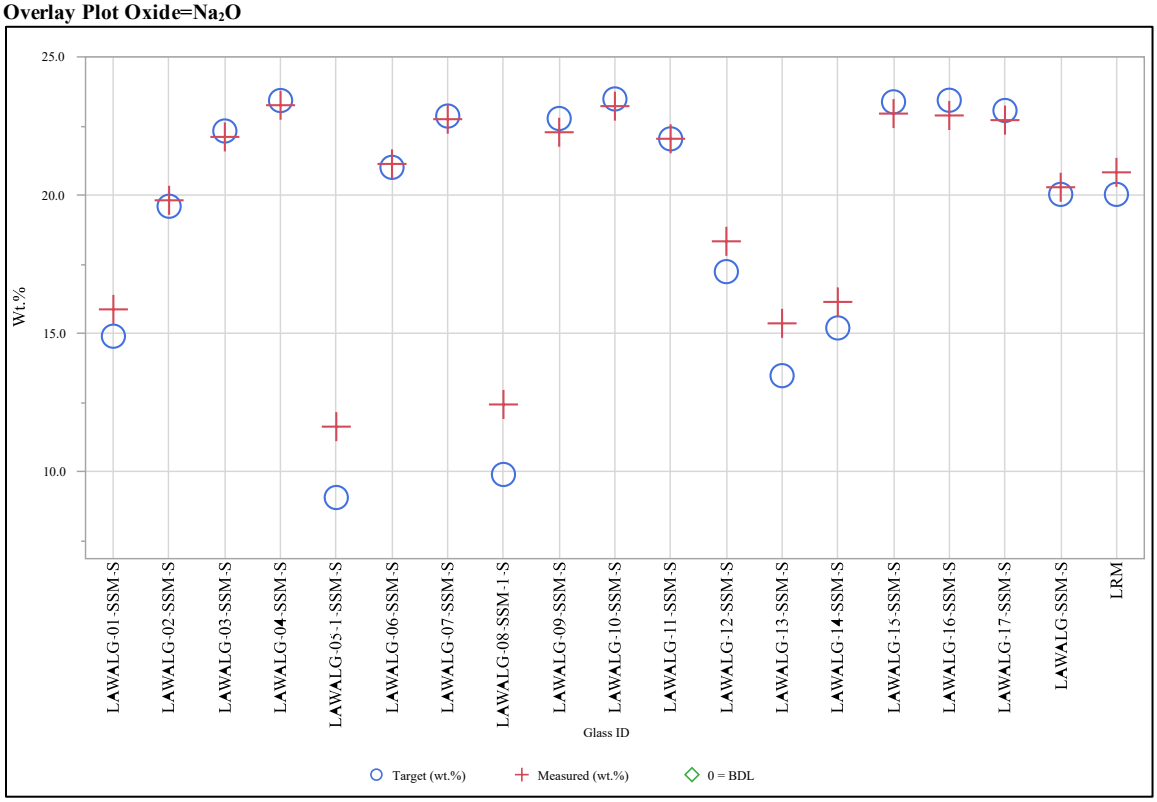


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=Na_2O



Overlay Plot Oxide=P_2O_5

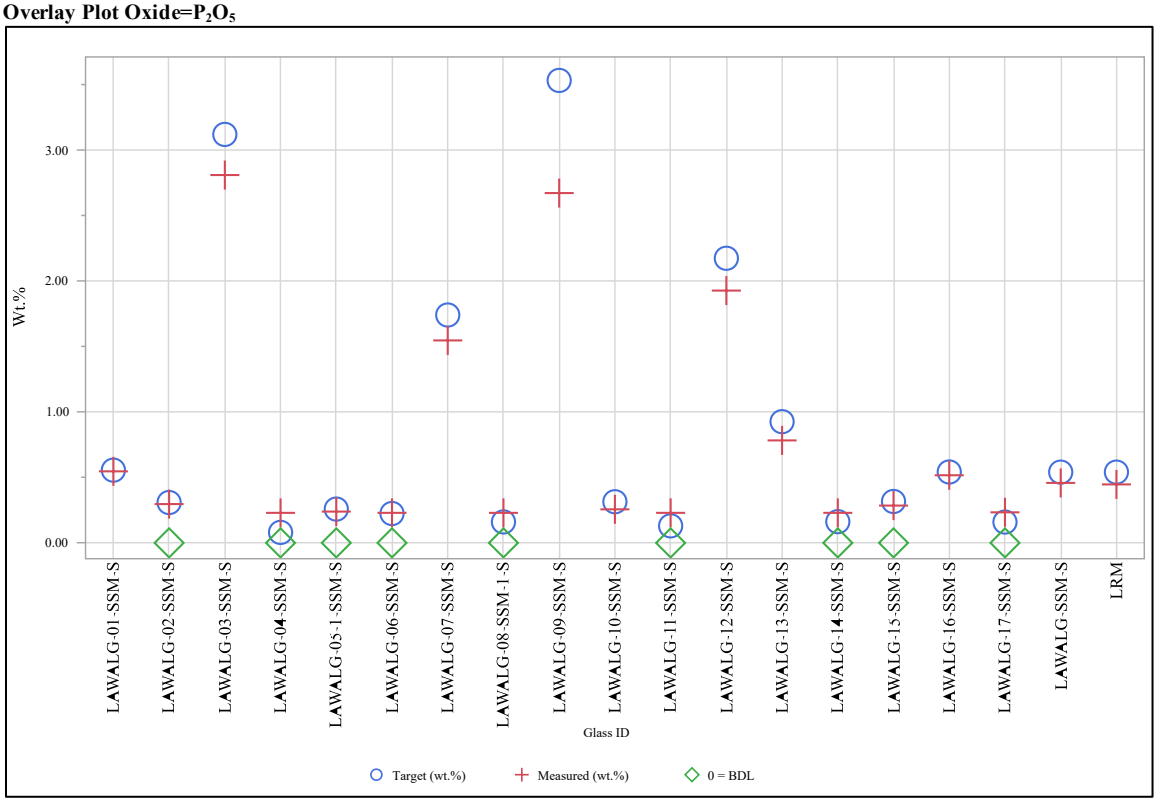
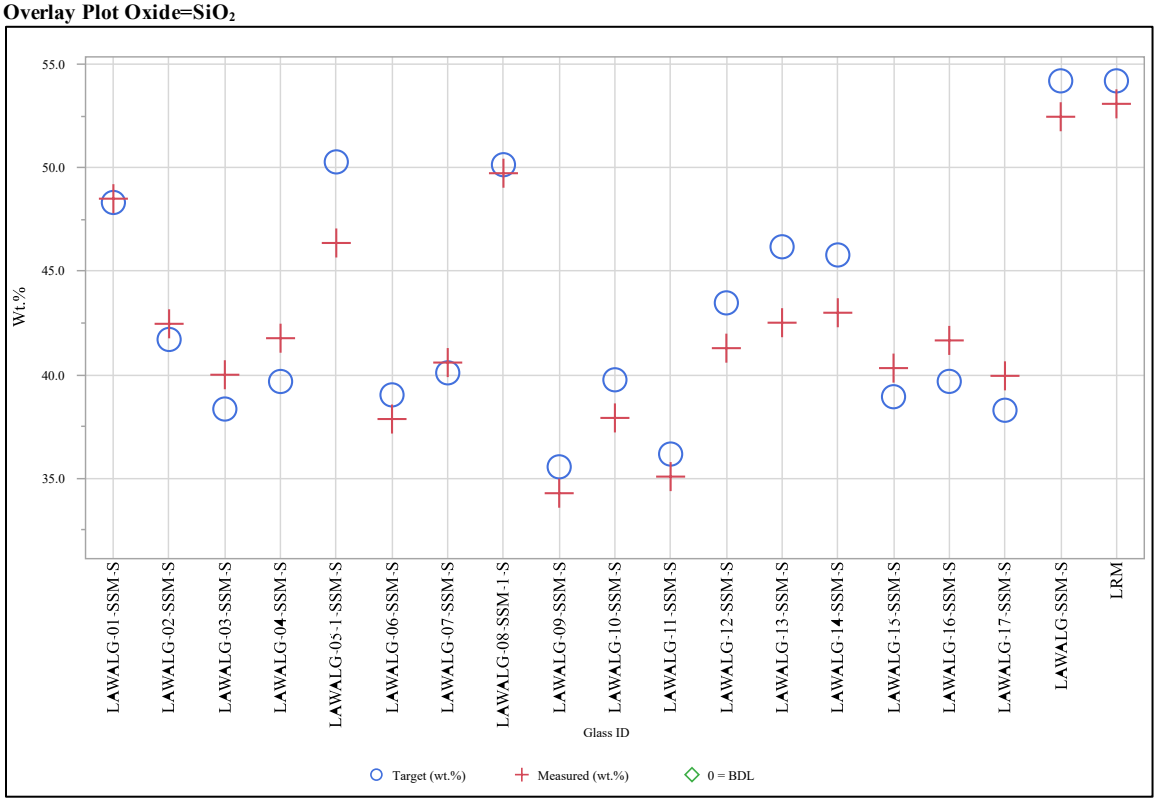


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=SiO_2



Overlay Plot Oxide=SnO_2

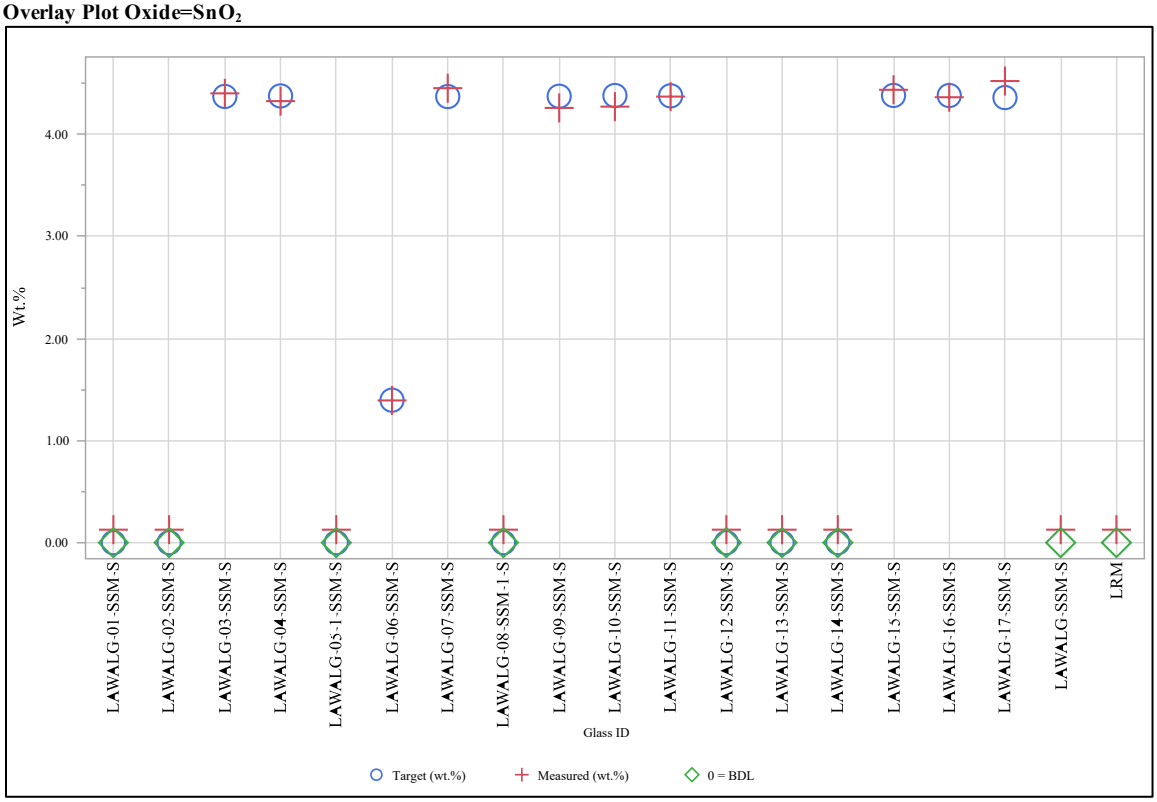
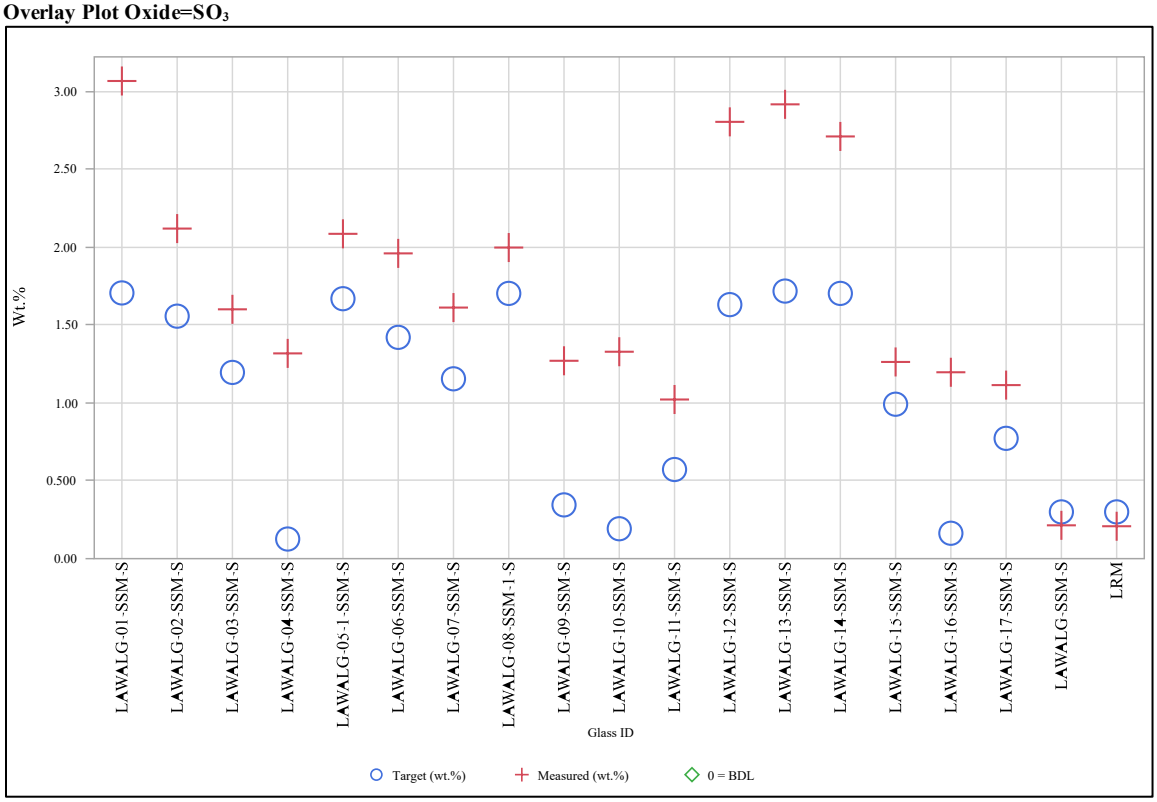


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=SO_3



Overlay Plot Oxide=TiO_2

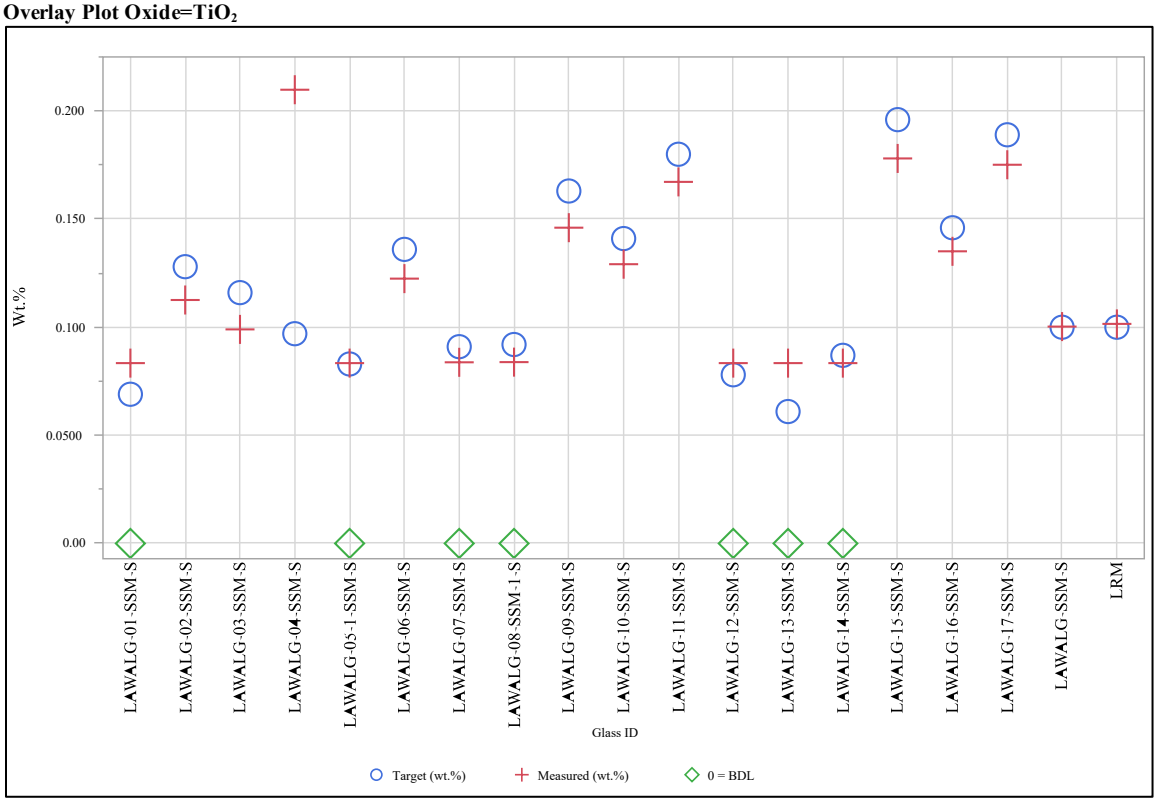
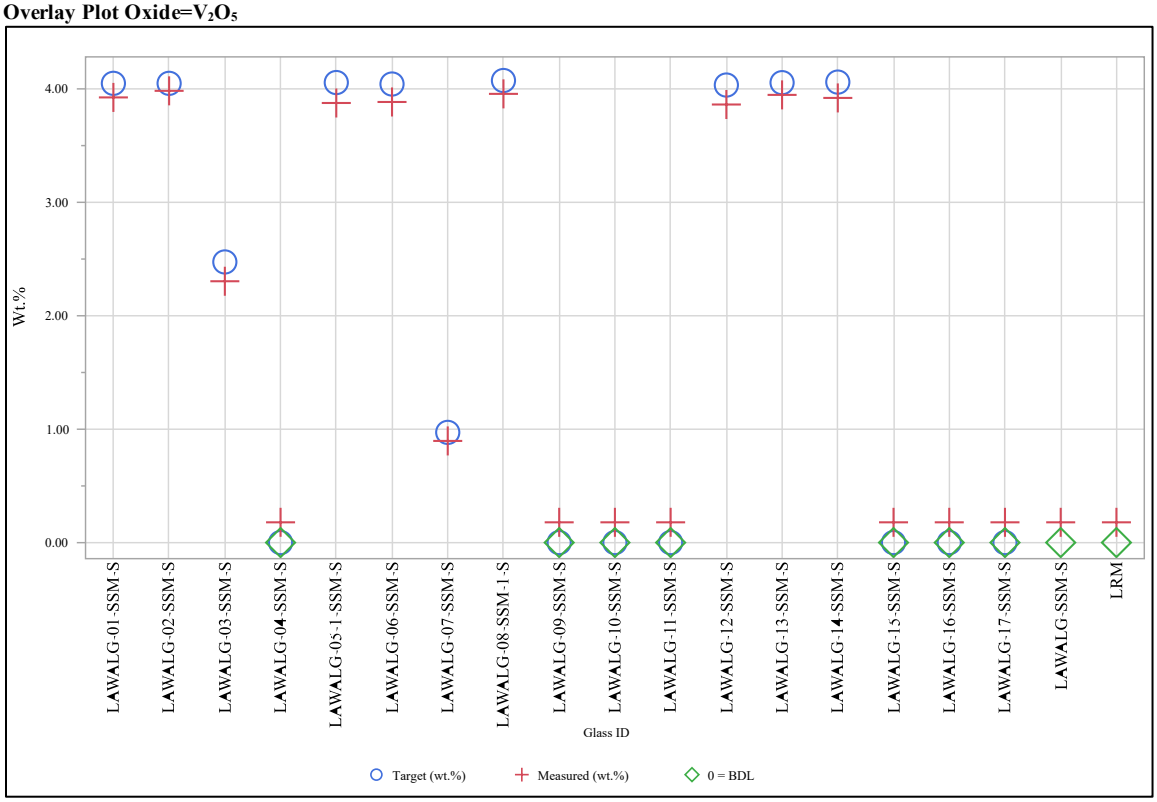


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=V_2O_5



Overlay Plot Oxide=ZnO

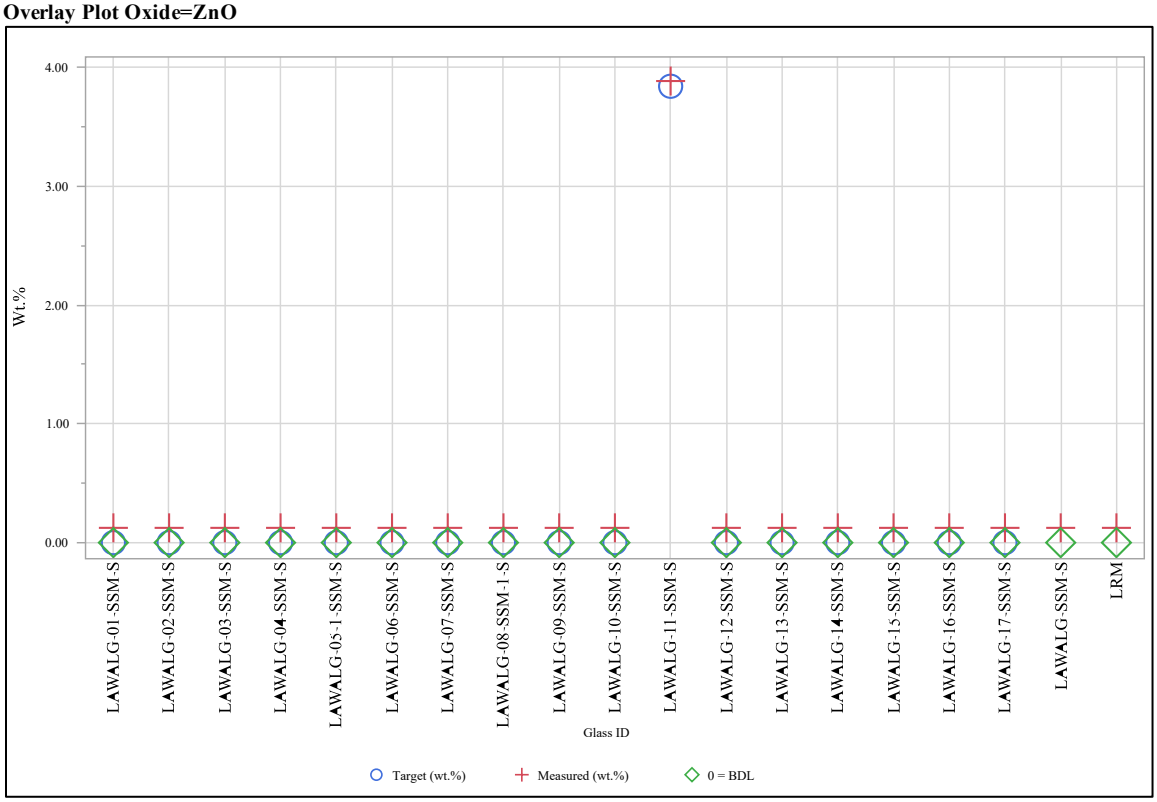
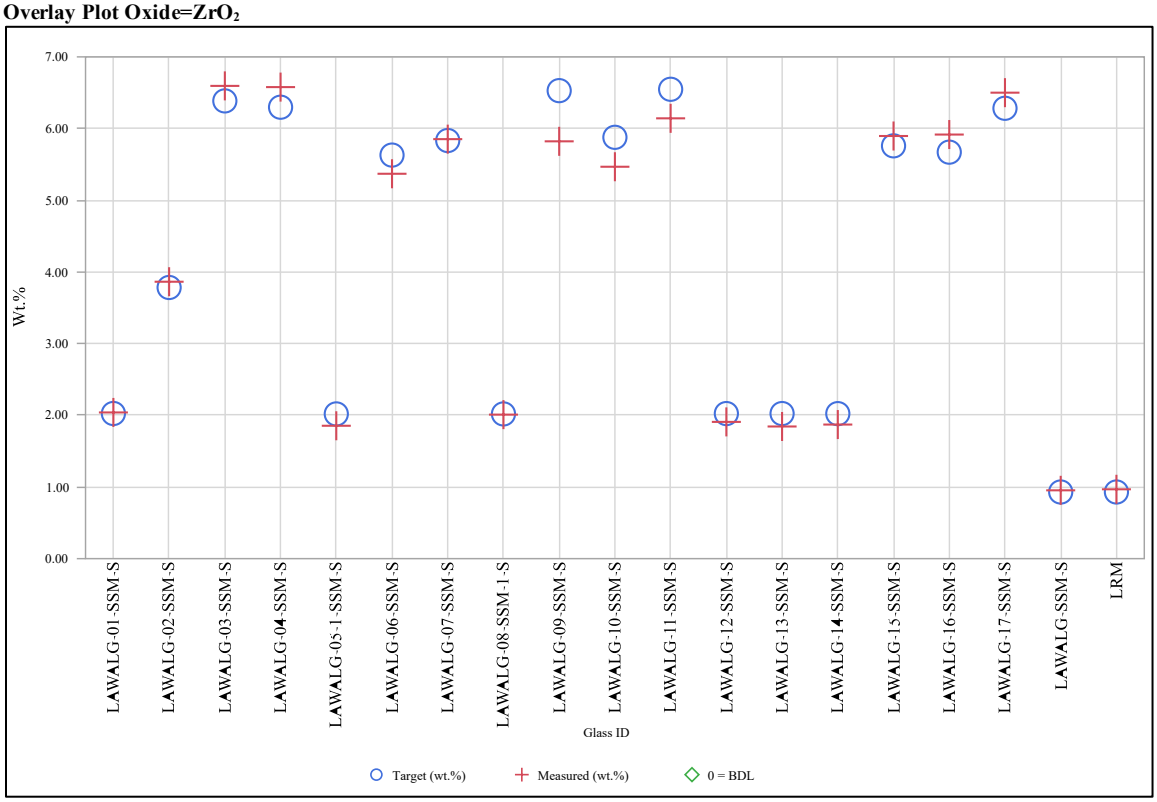


Exhibit A-3. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Oxide=ZrO_2



Overlay Plot Oxide=Sum of Oxides

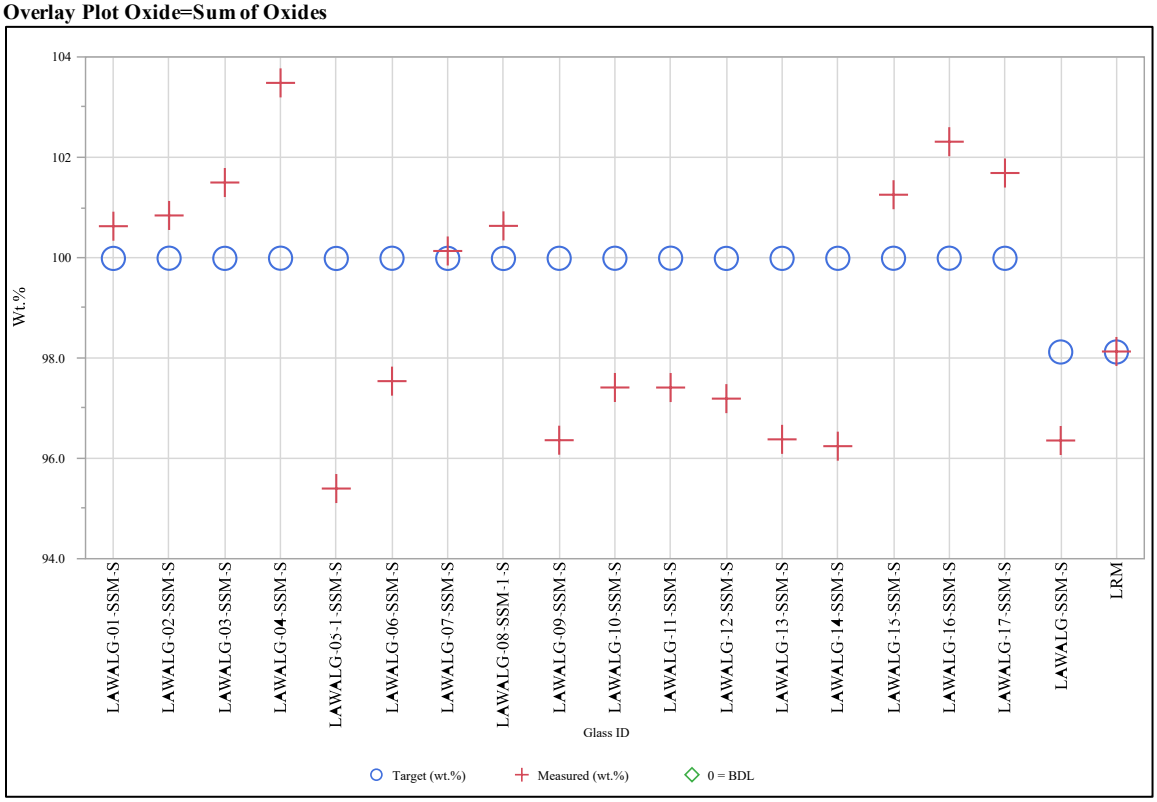
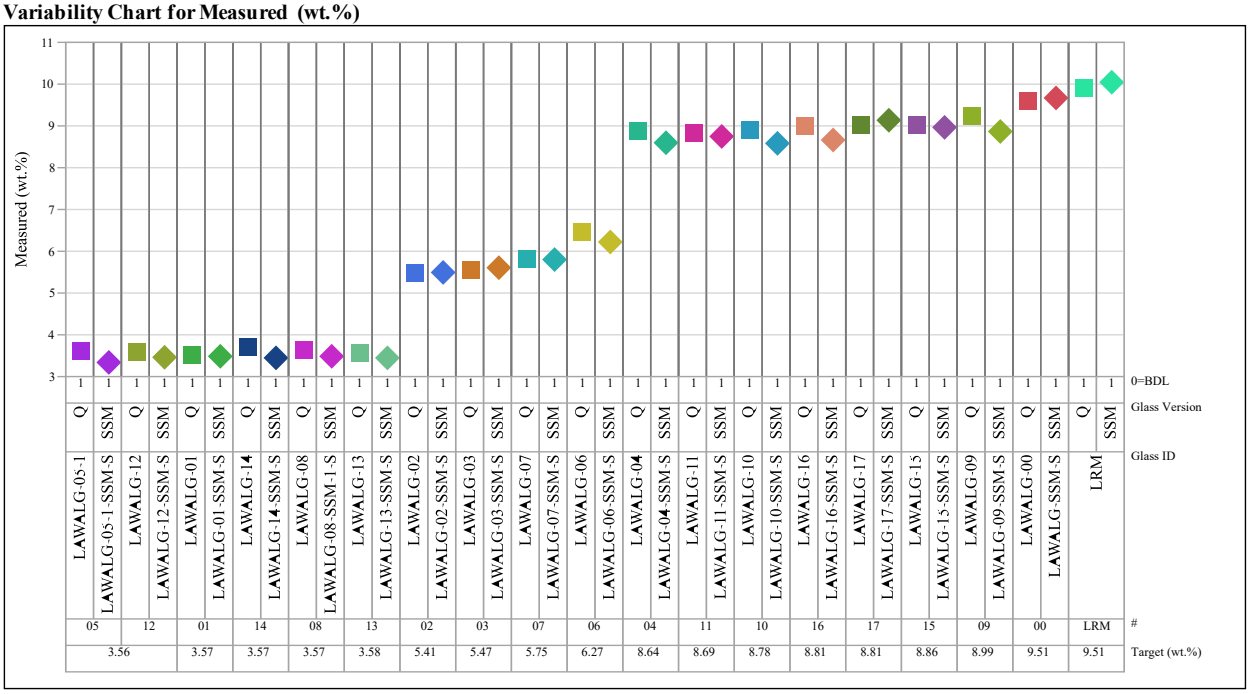


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses

Oxide=Al_2O_3
Variability Chart for Measured (wt.%)



Oxide=B_2O_3
Variability Chart for Measured (wt.%)

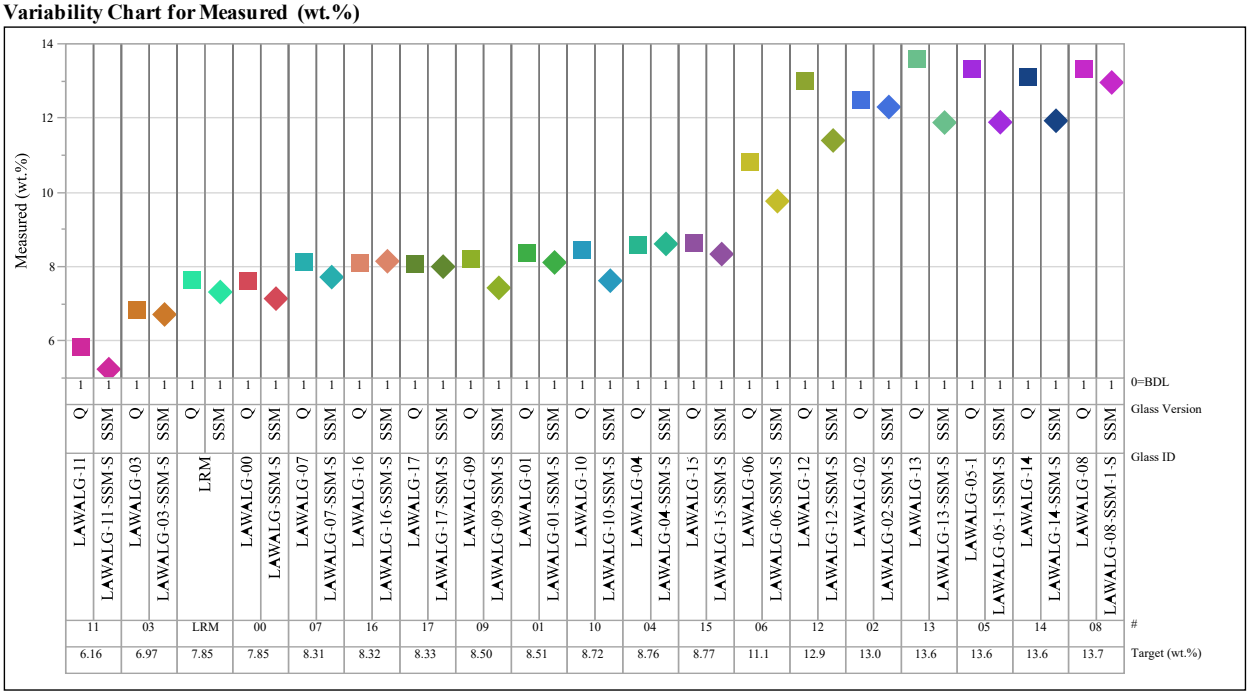
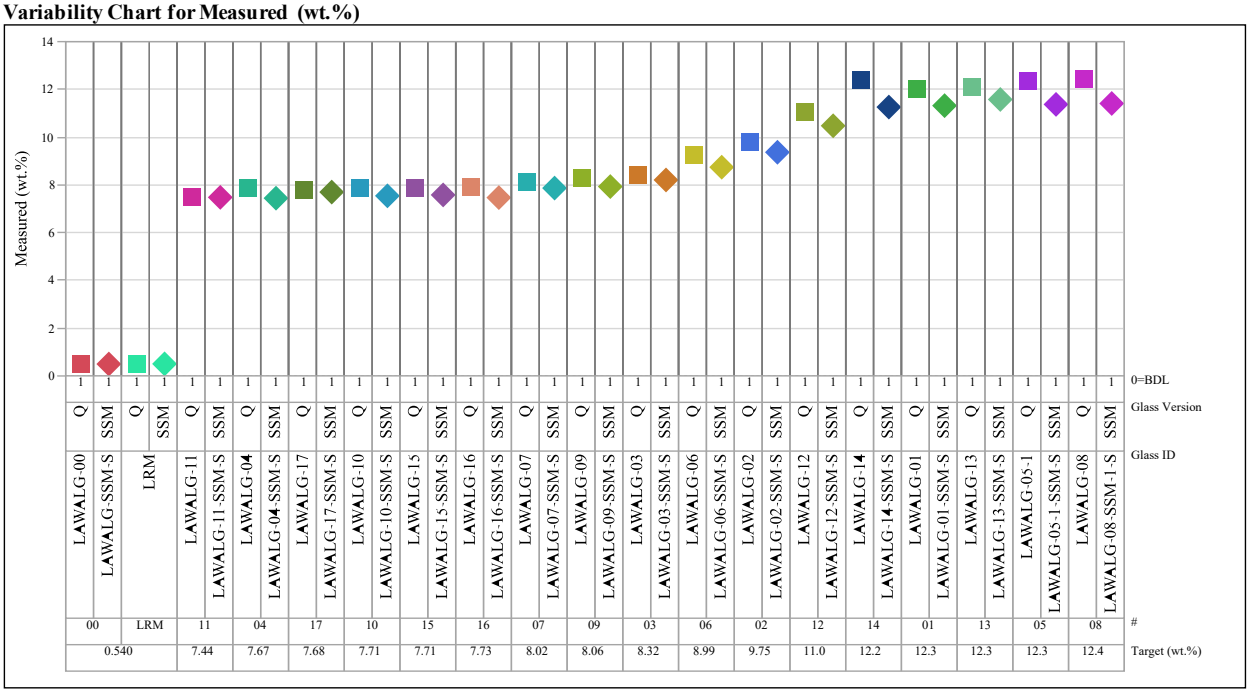


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=CaO
Variability Chart for Measured (wt.%)



Oxide=Cl^-
Variability Chart for Measured (wt.%)

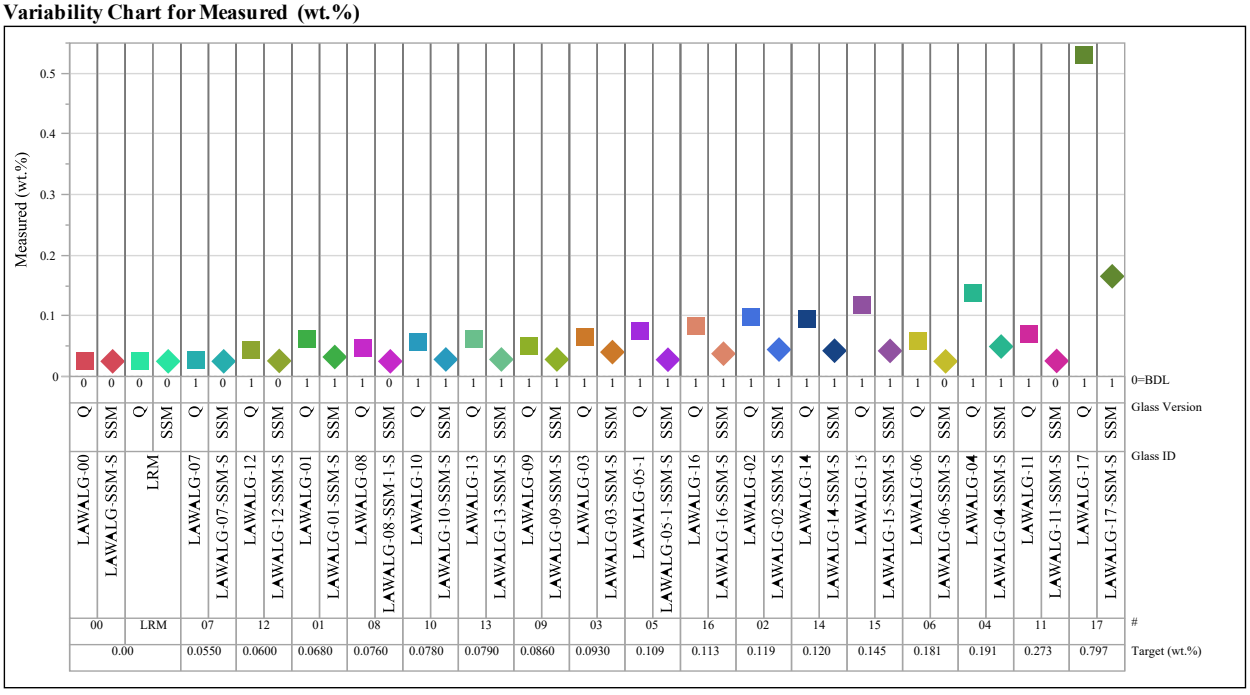
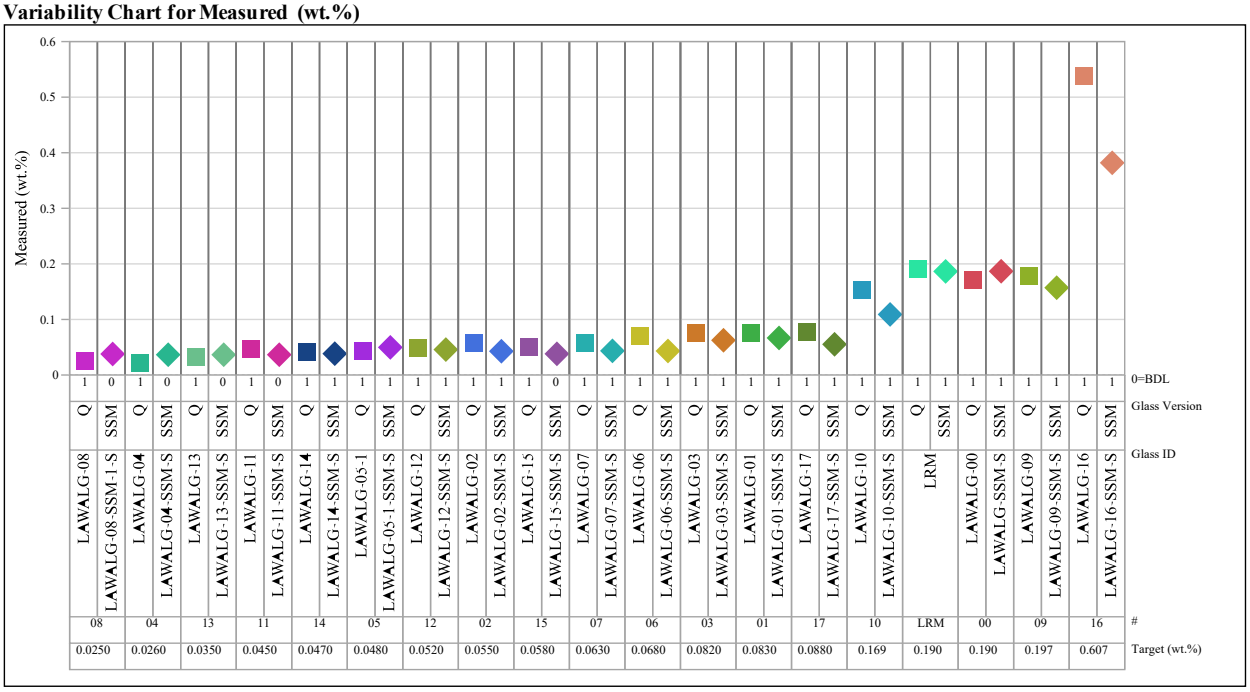


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=Cr_2O_3
Variability Chart for Measured (wt.%)



Oxide=F^-
Variability Chart for Measured (wt.%)

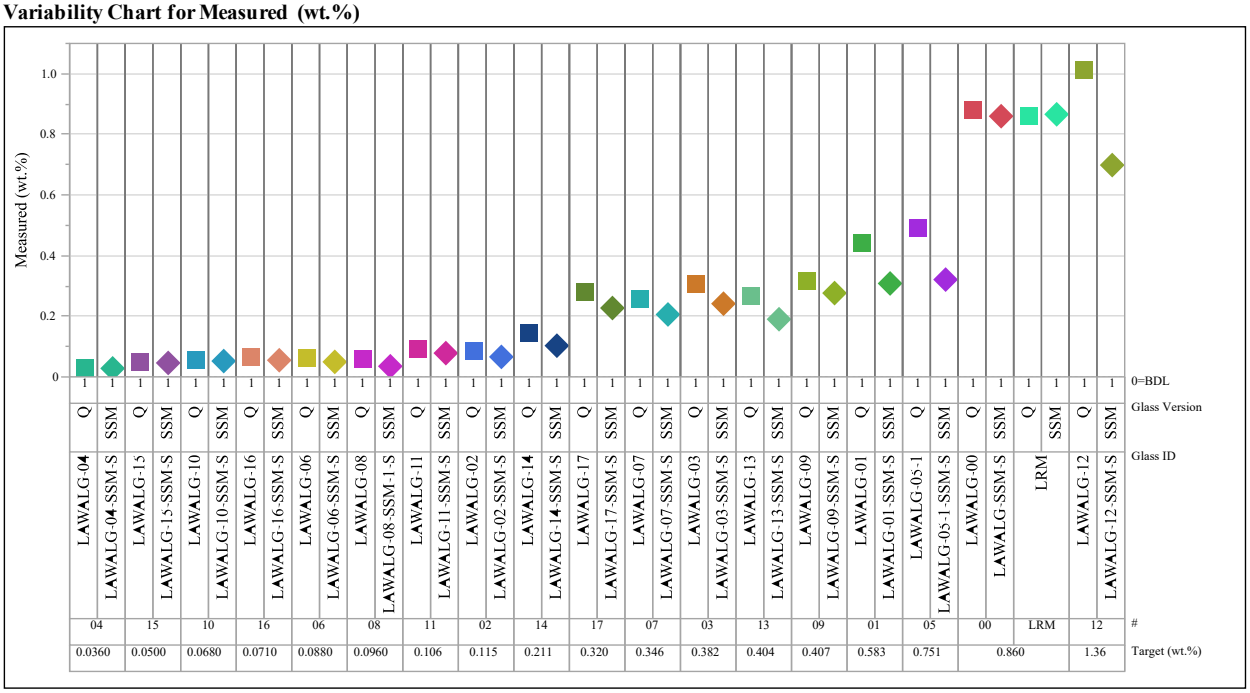
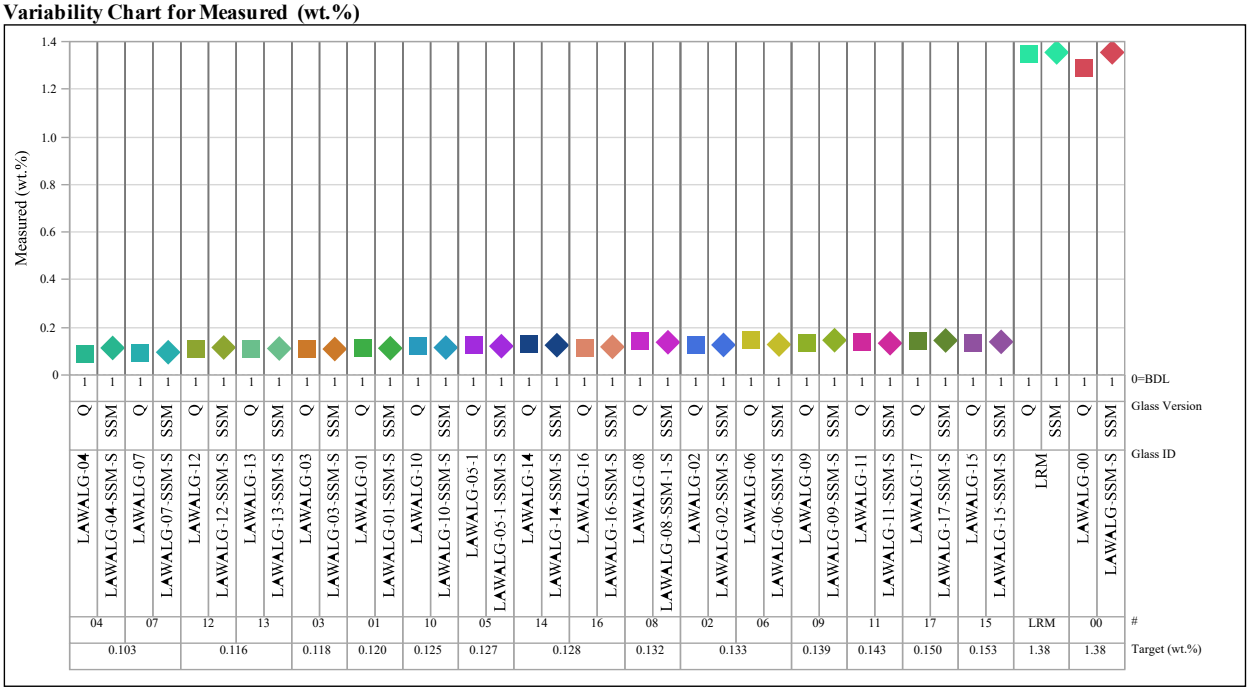


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=Fe_2O_3
Variability Chart for Measured (wt.%)



Oxide=K_2O
Variability Chart for Measured (wt.%)

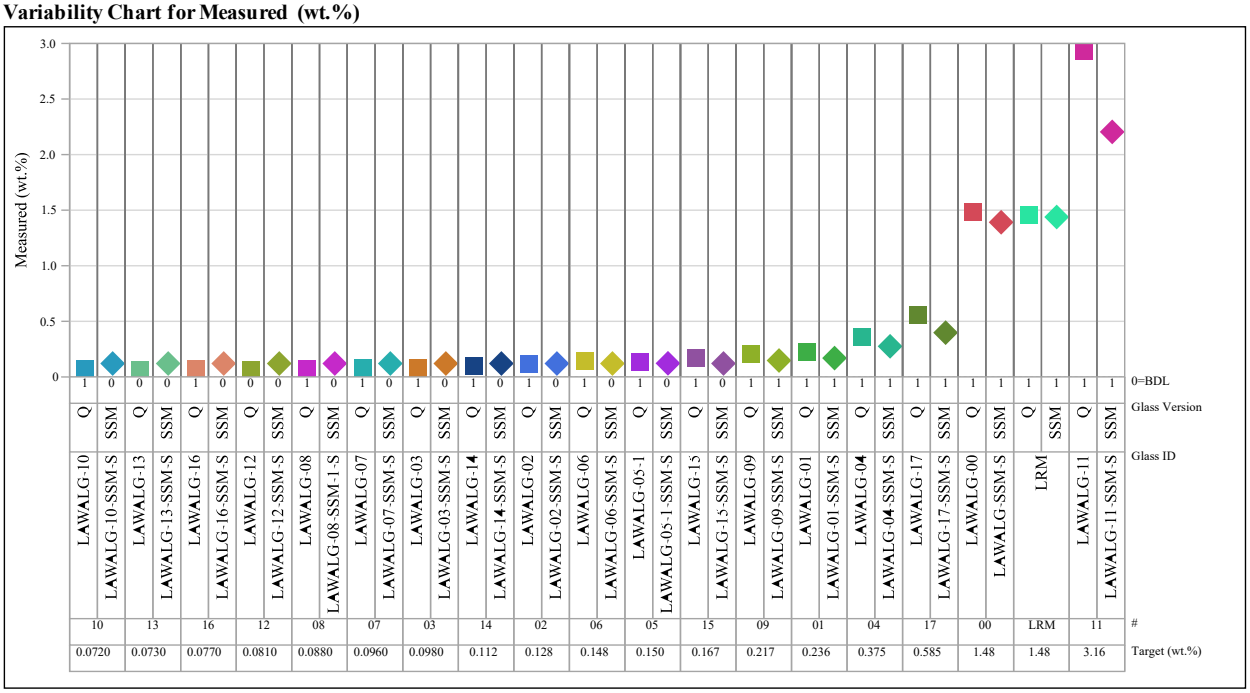
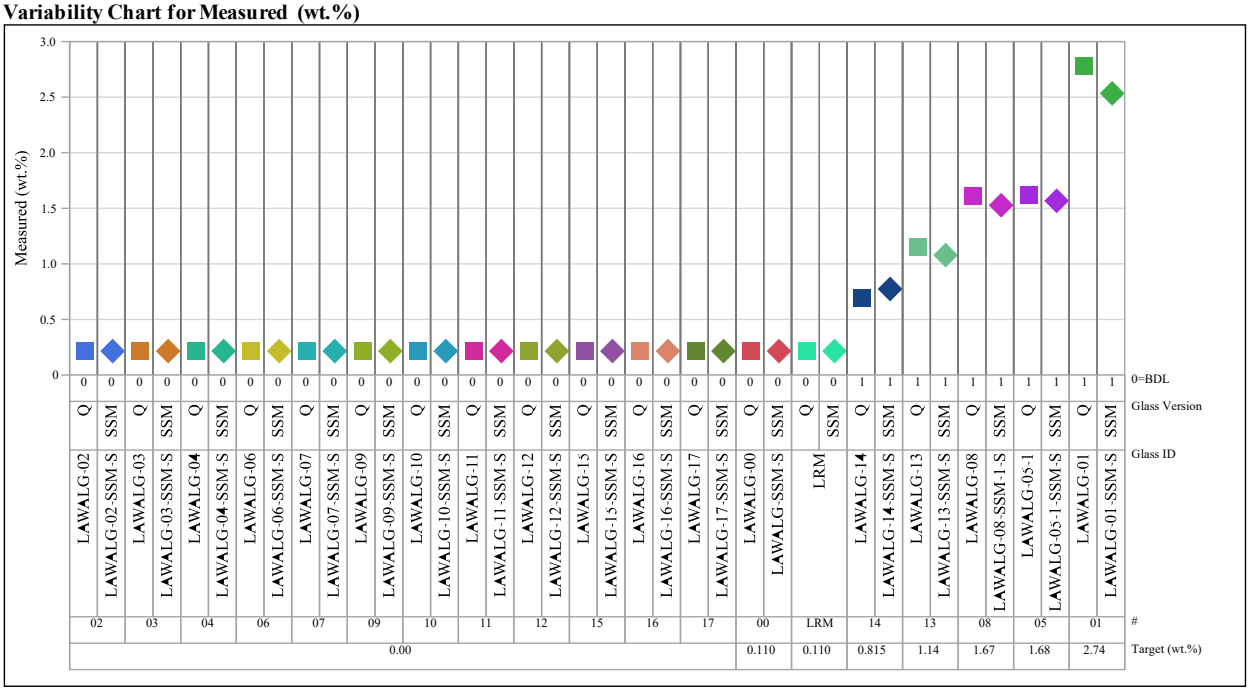


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=Li_2O
Variability Chart for Measured (wt.%)



Oxide=MgO
Variability Chart for Measured (wt.%)

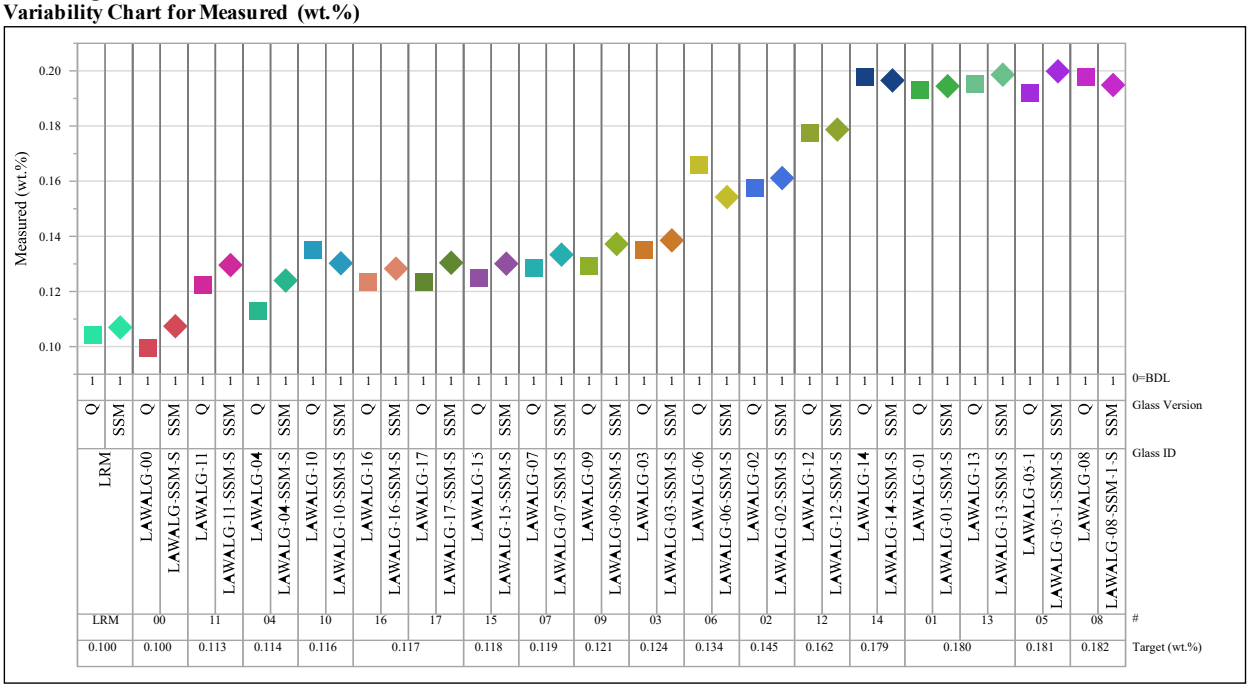
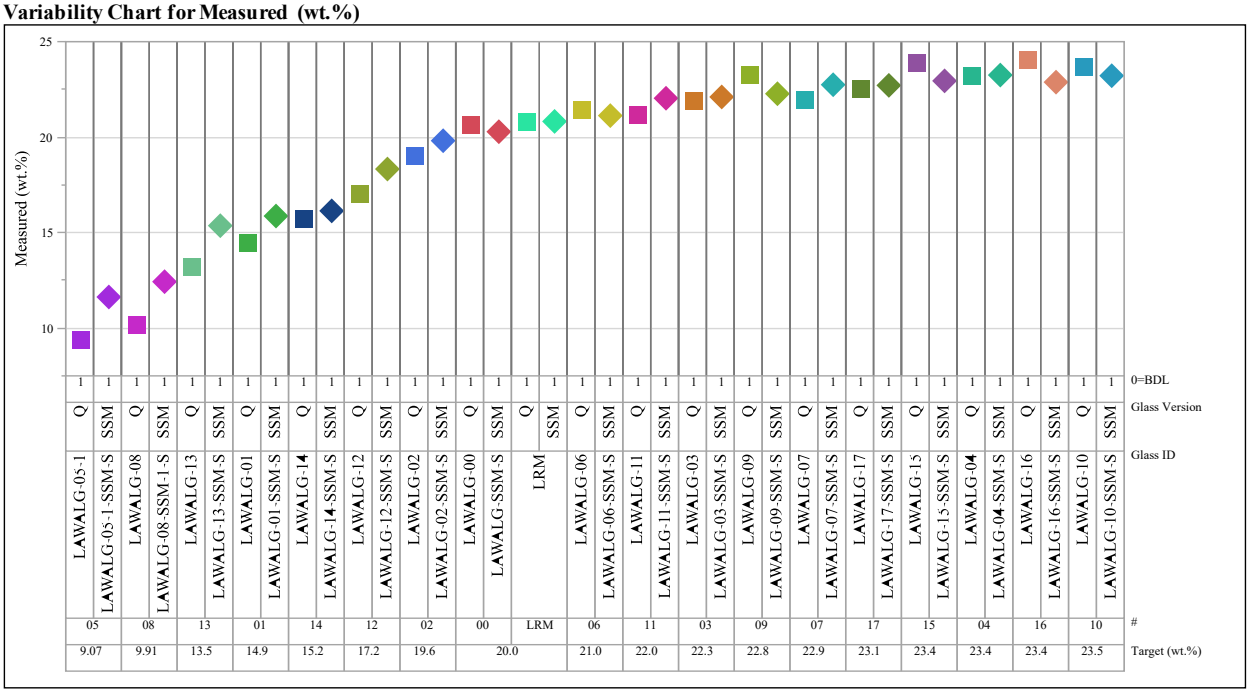


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=Na_2O
Variability Chart for Measured (wt.%)



Oxide=P_2O_5
Variability Chart for Measured (wt.%)

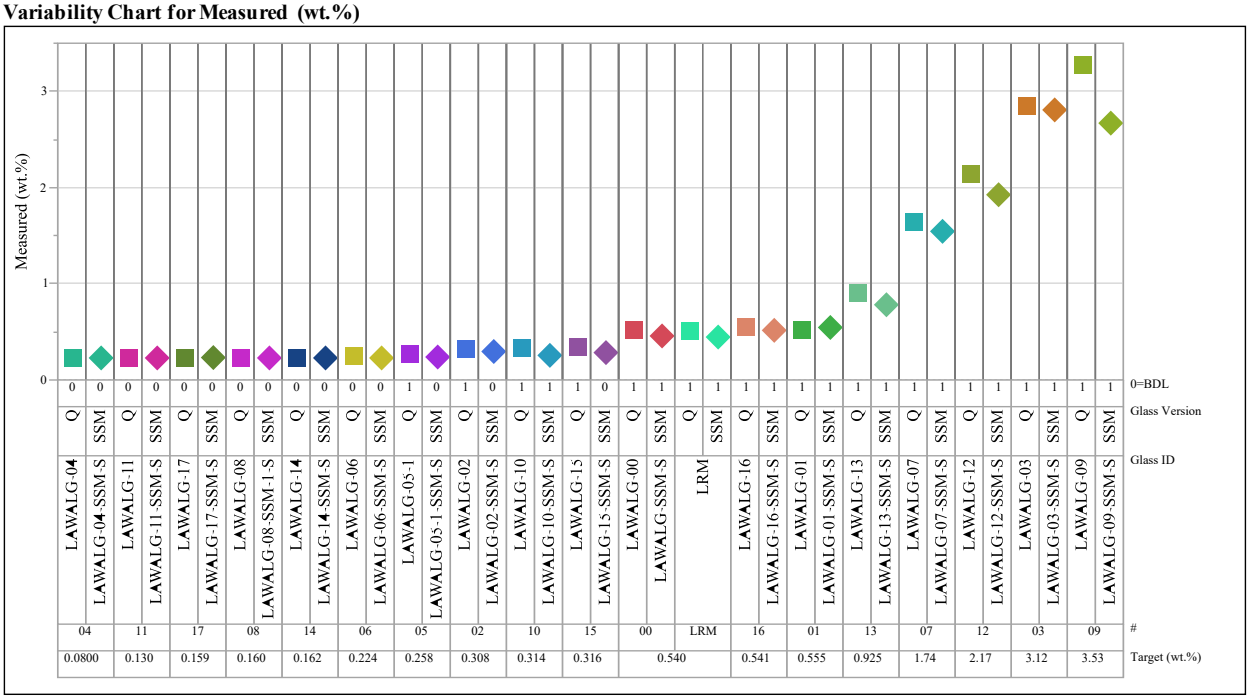
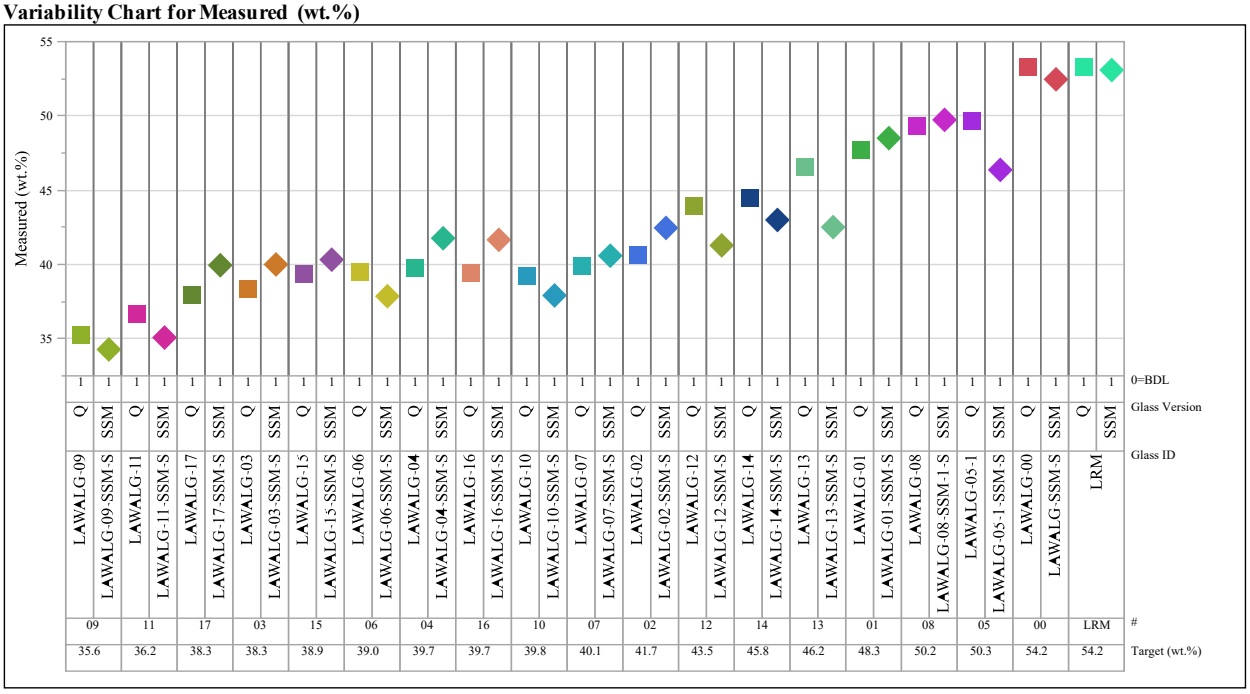


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=SiO_2
Variability Chart for Measured (wt.%)



Oxide=SnO_2
Variability Chart for Measured (wt.%)

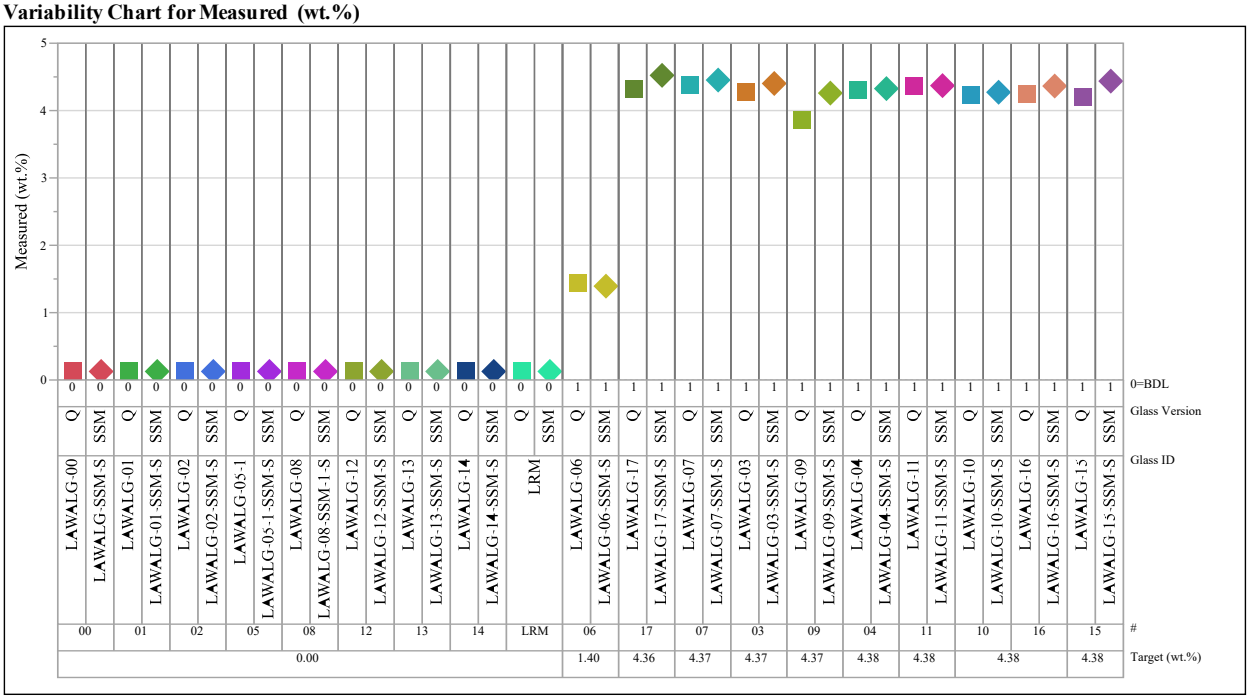
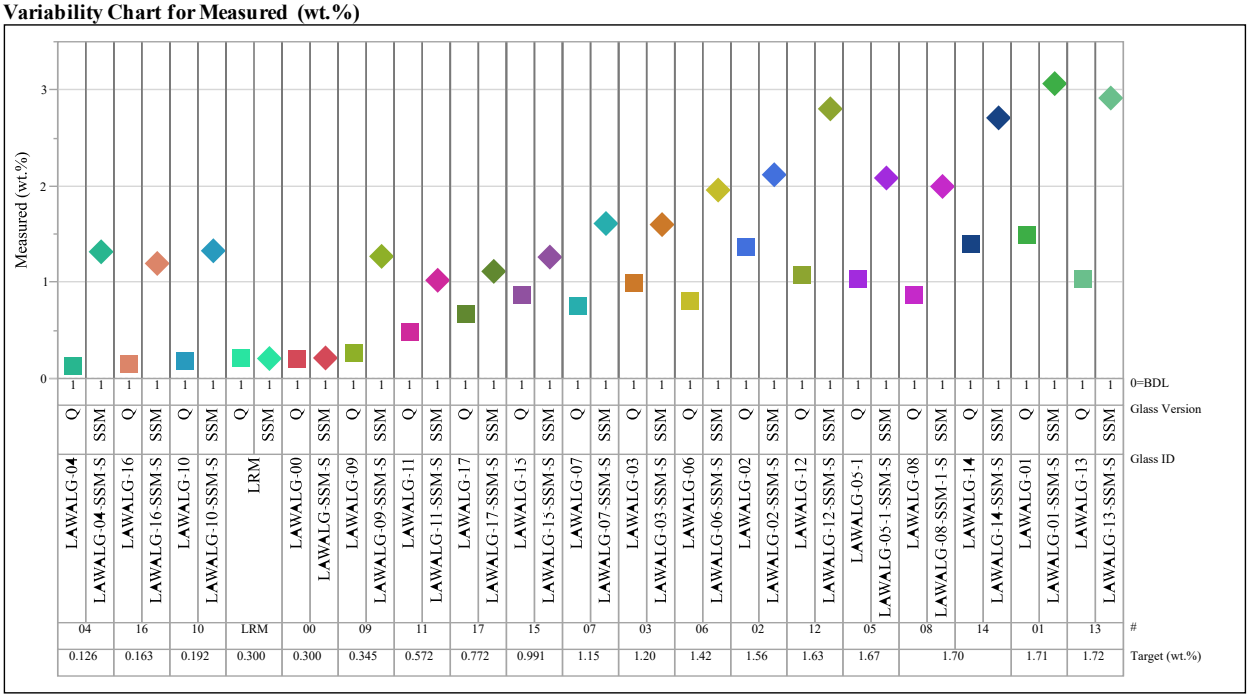


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=SO_3
Variability Chart for Measured (wt.%)



Oxide=TiO_2
Variability Chart for Measured (wt.%)

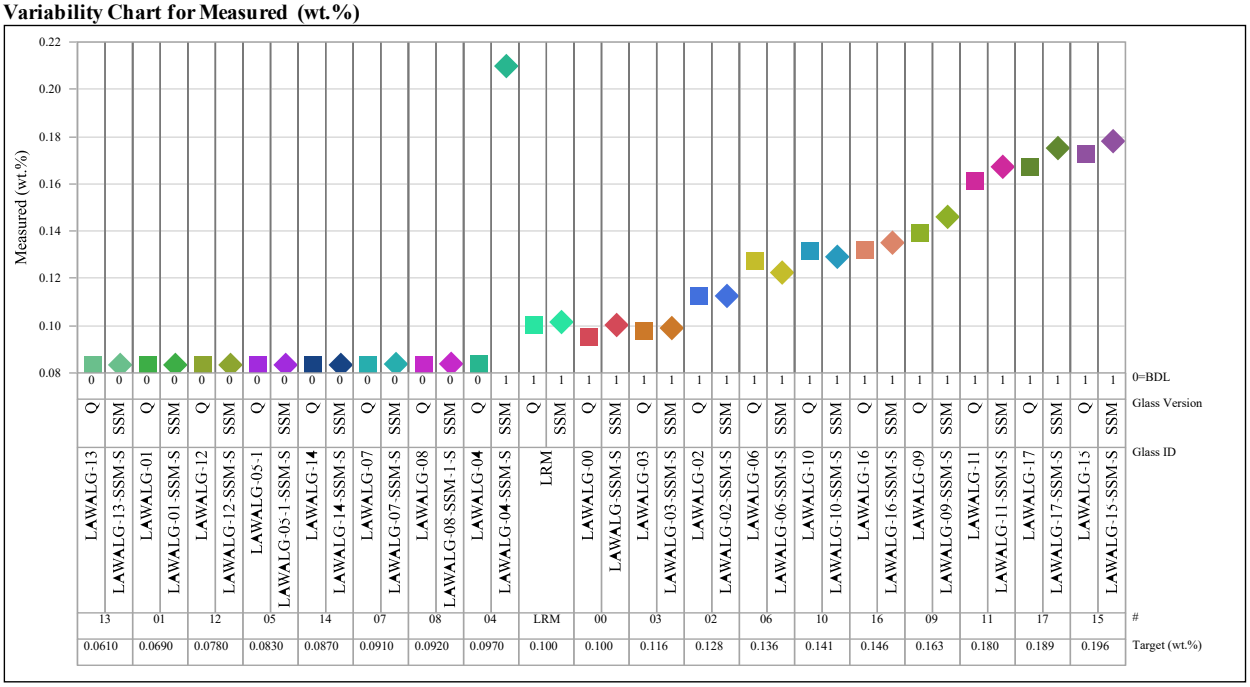
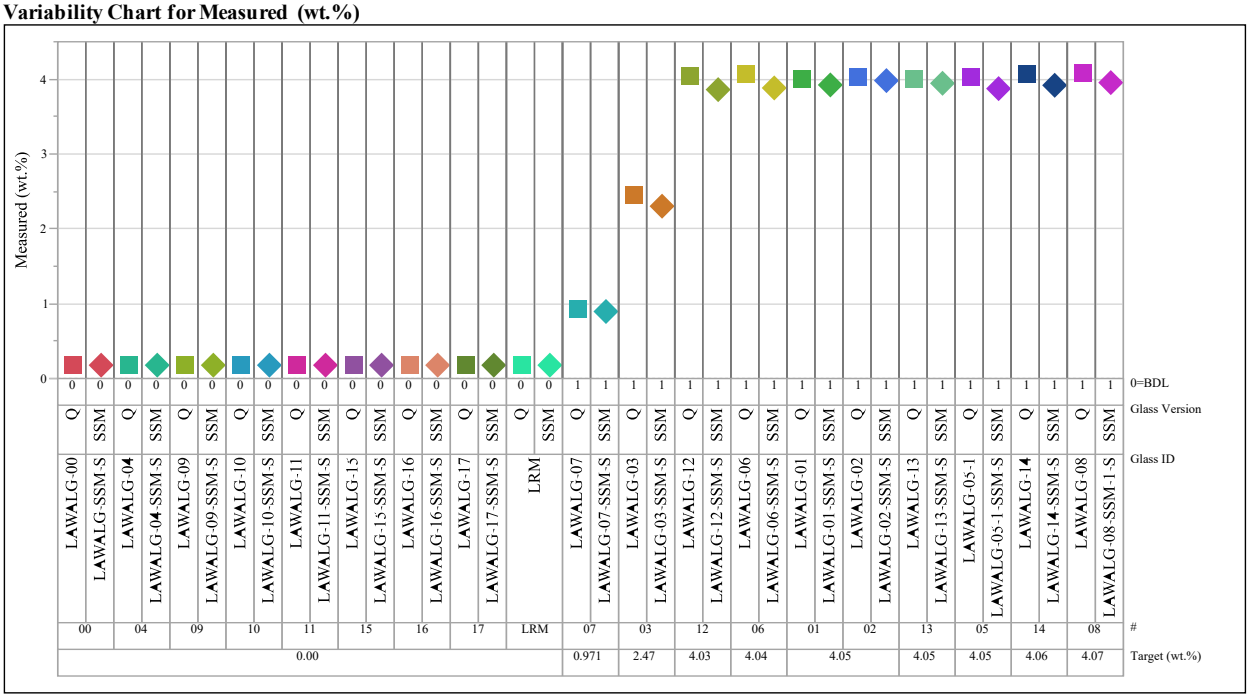


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=V_2O_5
Variability Chart for Measured (wt.%)



Oxide=ZnO
Variability Chart for Measured (wt.%)

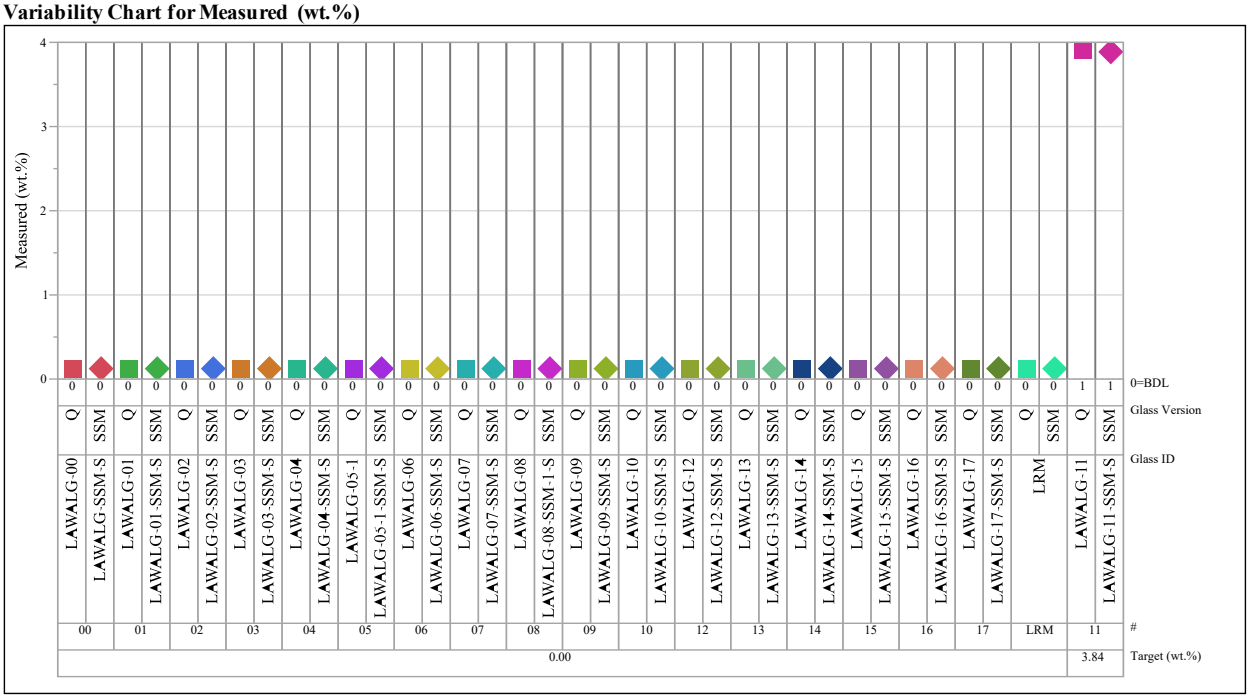
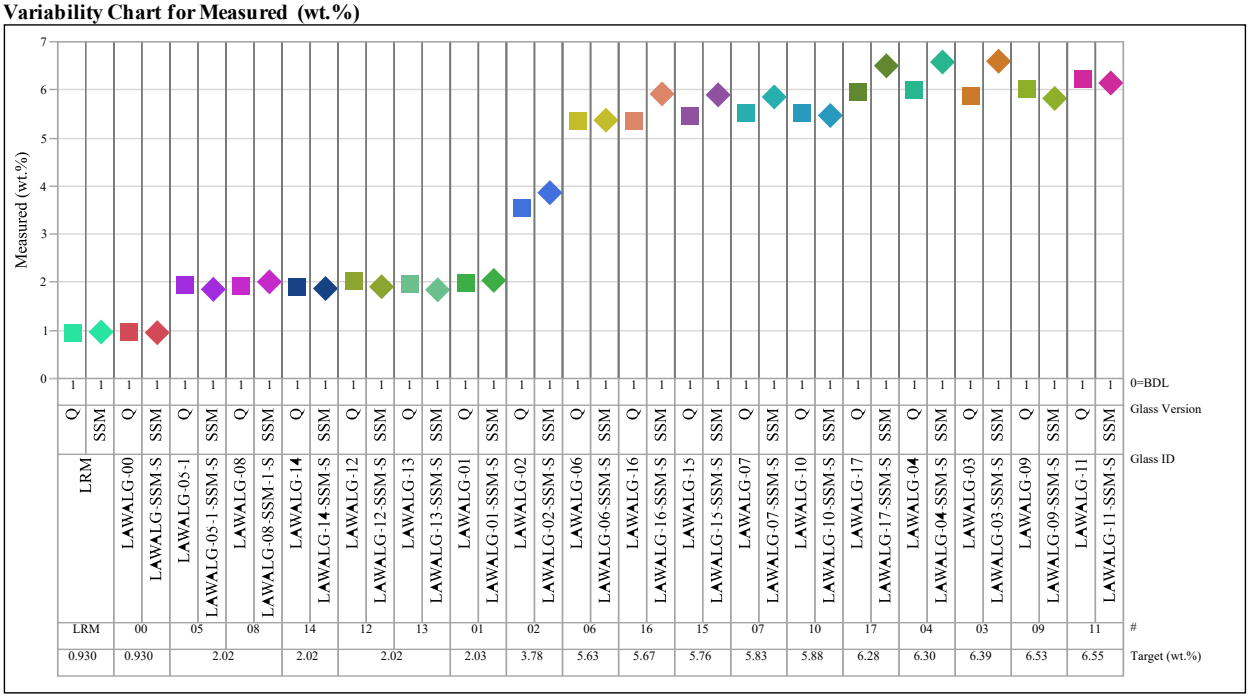
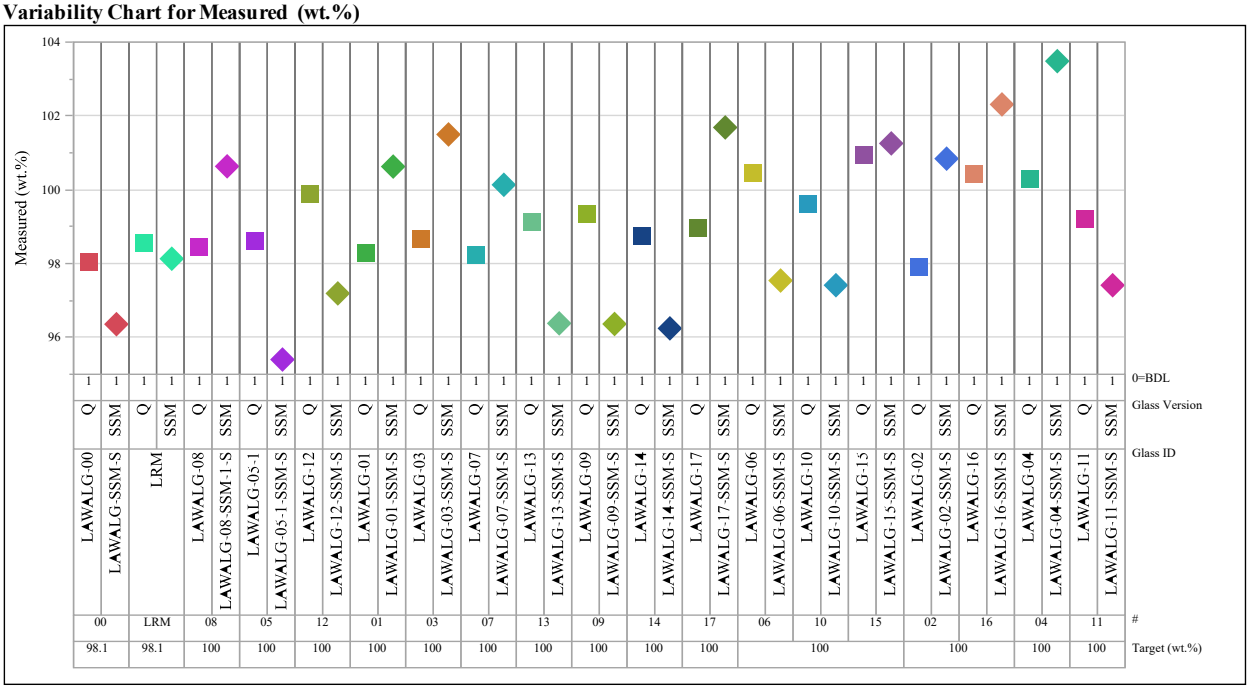


Exhibit A-4. Comparisons of the Measured Compositions of the Quenched and SSM Versions of the Study Glasses (continued)

Oxide=ZrO_2
Variability Chart for Measured (wt.%)



Oxide=Sum of Oxides
Variability Chart for Measured (wt.%)



Appendix B. Tables and Exhibits Supporting the LAW ALG Wash Solution Composition Measurements

Table B-1. Measurements (mg/L) of the SSM Wash Solutions Measured by ICP-OES

PNNL ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	P	S	Si	Sn	Ti	V	Zn	Zr
soln std	1	1	soln std-11	3.83	18.4	<1.00	<1.00	4.07	9.57	9.83	<1.00	82.1	<1.00	<1.00	47.3	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-05-1-SSM-W	1	2	S-13370-1	<1.00	16.9	23.3	<1.00	<1.00	2.89	4.11	<1.00	46.2	<1.00	5.06	43.0	<1.00	<1.00	10.5	<1.00	<1.00
LAWALG-15-SSM-W	1	3	S-13380-1	<1.00	20.7	8.14	5.20	<1.00	13.2	<1.00	<1.00	1010	3.68	604	5.06	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-11-SSM-W	1	4	S-13376-1	<1.00	13.0	3.13	7.56	<1.00	71.9	<1.00	<1.00	850	3.52	573	3.72	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-09-SSM-W	1	5	S-13374-1	<1.00	19.6	1.23	17.5	<1.00	4.20	<1.00	<1.00	962	53.0	489	8.75	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-13-SSM-W	1	6	S-13378-1	<1.00	11.7	32.1	<1.00	<1.00	3.49	4.81	<1.00	323	<1.00	207	20.1	<1.00	<1.00	11.6	<1.00	<1.00
hpstd	1	7	hpstd-11	49.5	<1.00	<1.00	<1.00	51.3	<1.00	<1.00	<1.00	154	<1.00	9.87	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-07-SSM-W	1	8	S-13372-1	<1.00	18.1	2.08	5.01	<1.00	1.67	<1.00	<1.00	941	23.4	518	14.4	<1.00	<1.00	11.6	<1.00	<1.00
LAWALG-06-SSM-W	1	9	S-13371-1	<1.00	19.9	18.6	4.70	<1.00	1.96	<1.00	<1.00	758	1.57	428	15.4	<1.00	<1.00	35.9	<1.00	<1.00
ICP Blank	1	10	ICP BLANK 1-1	<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	<1.00	<1.00
LAWALG-04-SSM-W	1	11	S-13369-1	<1.00	15.1	5.93	2.38	<1.00	6.06	<1.00	<1.00	768	1.73	447	5.95	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-17-SSM-W	1	12	S-13382-1	<1.00	18.4	5.90	7.87	<1.00	3.70	<1.00	<1.00	997	5.56	573	5.39	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-16-SSM-W	1	13	S-13381-1	<1.00	15.9	<1.00	50.4	<1.00	<1.00	<1.00	<1.00	829	<1.00	442	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
soln std	1	14	soln std-12	3.89	18.1	<1.00	<1.00	4.01	9.66	9.76	<1.00	83.5	<1.00	<1.00	47.0	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-02-SSM-W	1	15	S-13367-1	<1.00	26.3	31.2	1.87	<1.00	1.64	<1.00	<1.00	784	<1.00	449	28.2	<1.00	<1.00	29.5	<1.00	<1.00
ICP Blank	1	16	ICP BLANK 1-2	<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	<1.00	<1.00
LAWALG-SSM-W	1	17	S-13383-1	<1.00	<1.00	3.77	<1.00	<1.00	1.50	<1.00	<1.00	658	7.55	429	7.77	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-01-SSM-W	1	18	S-13366-1	<1.00	16.3	33.9	1.86	<1.00	16.2	21.7	<1.00	578	<1.00	358	49.9	<1.00	<1.00	23.8	<1.00	<1.00
LAWALG-12-SSM-W	1	19	S-13377-1	<1.00	34.9	22.4	<1.00	<1.00	<1.00	<1.00	<1.00	573	<1.00	280	56.4	<1.00	<1.00	33.1	<1.00	<1.00
hpstd	1	20	hpstd-12	49.7	<1.00	<1.00	<1.00	50.4	<1.00	<1.00	<1.00	157	<1.00	9.96	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-14-SSM-W	1	21	S-13379-1	<1.00	20.0	58.4	<1.00	<1.00	5.70	6.74	<1.00	653	<1.00	423	32.9	<1.00	<1.00	19.1	<1.00	<1.00
ICP Blank	1	22	ICP BLANK 1-3	<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	<1.00	<1.00
LAWALG-08-SSM-1-W	1	23	S-13373-1	<1.00	9.20	13.6	<1.00	<1.00	1.90	2.70	<1.00	34.3	<1.00	5.06	24.5	<1.00	<1.00	6.32	<1.00	<1.00
LAWALG-10-SSM-W	1	24	S-13375-1	<1.00	14.8	4.29	11.8	<1.00	1.15	<1.00	<1.00	766	4.57	431	6.67	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-03-SSM-W	1	25	S-13368-1	<1.00	20.2	1.73	5.27	<1.00	1.83	<1.00	<1.00	1140	44.7	573	21.3	<1.00	<1.00	49.6	<1.00	<1.00
soln std	1	26	soln std-13	3.88	18.6	<1.00	<1.00	4.14	9.65	9.81	<1.00	84.1	<1.00	<1.00	47.2	<1.00	<1.00	<1.00	<1.00	<1.00
soln std	2	1	soln std-21	3.90	19.9	<1.00	<1.00	4.19	9.66	9.66	<1.00	82.0	<1.00	<1.00	48.2	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-16-SSM-W	2	2	S-13381-2	<1.00	17.2	<1.00	50.7	<1.00	<1.00	<1.00	<1.00	806	<1.00	449	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
ICP Blank	2	3	ICP BLANK 2-1	<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	<1.00	<1.00
LAWALG-03-SSM-W	2	4	S-13368-2	<1.00	20.7	1.64	5.21	<1.00	1.78	<1.00	<1.00	1100	44.7	584	21.2	<1.00	<1.00	49.6	<1.00	<1.00
LAWALG-SSM-W	2	5	S-13383-2	<1.00	<1.00	3.83	<1.00	<1.00	1.39	<1.00	<1.00	630	7.71	438	8.04	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-09-SSM-W	2	6	S-13374-2	<1.00	20.2	1.25	17.2	<1.00	4.06	<1.00	<1.00	942	53.1	495	8.89	<1.00	<1.00	<1.00	<1.00	<1.00
hpstd	2	7	hpstd-21	49.4	<1.00	<1.00	<1.00	51.6	<1.00	<1.00	<1.00	148	<1.00	10.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-04-SSM-W	2	8	S-13369-2	<1.00	16.5	6.10	2.43	<1.00	6.09	<1.00	<1.00	753	1.63	461	6.10	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-11-SSM-W	2	9	S-13376-2	<1.00	13.2	3.12	7.35	<1.00	71.1	<1.00	<1.00	834	3.38	594	3.82	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-10-SSM-W	2	10	S-13375-2	<1.00	15.5	4.31	11.3	<1.00	1.03	<1.00	<1.00	741	4.57	446	6.91	<1.00	<1.00	<1.00	<1.00	<1.00
ICP Blank	2	11	ICP Blank 2-2	<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	<1.00	<1.00
LAWALG-02-SSM-W	2	12	S-13367-2	<1.00	26.4	31.5	1.84	<1.00	1.62	<1.00	<1.00	748	<1.00	454	28.9	<1.00	<1.00	29.6	<1.00	<1.00
LAWALG-12-SSM-W	2	13	S-13377-2	<1.00	34.8	22.3	<1.00	<1.00	<1.00	<1.00	<1.00	553	<1.00	289	57.2	<1.00	<1.00	33.1	<1.00	<1.00
soln std	2	14	soln std-22	3.92	19.0	<1.00	<1.00	4.09	9.64	9.60	<1.00	80.5	<1.00	<1.00	48.3	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-06-SSM-W	2	15	S-13371-2	<1.00	19.7	18.0	4.47	<1.00	1.71	<1.00	<1.00	754	1.50	445	15.3	<1.00	<1.00	35.1	<1.00	<1.00
LAWALG-08-SSM-1-W	2	16	S-13373-2	<1.00	10.3	13.6	<1.00	<1.00	1.88	2.62	<1.00	33.8	<1.00	5.01	24.8	<1.00	<1.00	6.29	<1.00	<1.00
LAWALG-15-SSM-W	2	17	S-13380-2	<1.00	19.4	8.13	4.72	<1.00	12.9	<1.00	<1.00	991	3.48	626	5.07	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-07-SSM-W	2	18	S-13372-2	<1.00	17.3	2.05	4.68	<1.00	1.50	<1.00	<1.00	929	23.5	533	14.6	<1.00	<1.00	11.6	<1.00	<1.00
LAWALG-14-SSM-W	2	19	S-13379-2	<1.00	19.5	58.3	<1.00	<1.00	5.86	6.68	<1.00	616	<1.00	419	33.4	<1.00	<1.00	19.1	<1.00	<1.00
hpstd	2	20	hpstd-22	49.6	<1.00	<1.00	<1.00	51.0	<1.00	<1.00	<1.00	149	<1.00	10.1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-17-SSM-W	2	21	S-13382-2	<1.00	19.3	5.89	7.80	<1.00	3.67	<1.00	<1.00	966	5.52	591	5.61	<1.00	<1.00	<1.00	<1.00	<1.00
ICP Blank	2	22	ICP BLANK 2-3	<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	<1.00	<1.00

Table B-1. Measurements (mg/L) of the SSM Wash Solutions Measured by ICP-OES (continued)

PNNL ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	P	S	Si	Sn	Ti	V	Zn	Zr
LAWALG-05-1-SSM-W	2	23	S-13370-2	<1.00	16.6	22.7	<1.00	<1.00	2.88	3.98	<1.00	45.1	<1.00	4.94	42.8	<1.00	<1.00	10.3	<1.00	<1.00
LAWALG-01-SSM-W	2	24	S-13366-2	<1.00	16.3	33.2	1.77	<1.00	16.1	21.2	<1.00	541	<1.00	363	50.2	<1.00	<1.00	23.5	<1.00	<1.00
LAWALG-13-SSM-W	2	25	S-13378-2	<1.00	12.2	31.4	<1.00	<1.00	3.50	4.66	<1.00	317	<1.00	213	20.2	<1.00	<1.00	11.5	<1.00	<1.00
soln std	2	26	soln std-23	3.83	19.4	<1.00	<1.00	4.11	9.58	9.56	<1.00	80.6	<1.00	<1.00	47.6	<1.00	<1.00	<1.00	<1.00	<1.00
soln std	3	1	soln std-31	3.83	18.4	<1.00	<1.00	4.00	9.57	9.62	<1.00	80.9	<1.00	<1.00	48.3	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-16-SSM-W	3	2	S-13381-3	<1.00	15.6	<1.00	48.1	<1.00	<1.00	<1.00	<1.00	793	<1.00	443	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-03-SSM-W	3	3	S-13368-3	<1.00	20.9	1.55	5.28	<1.00	1.73	<1.00	<1.00	1120	44.5	584	21.3	<1.00	<1.00	49.9	<1.00	<1.00
ICP Blank	3	4	ICP BLANK 3-1	<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	<1.00	<1.00
LAWALG-15-SSM-W	3	5	S-13380-3	<1.00	19.7	7.63	4.86	<1.00	12.0	<1.00	<1.00	993	3.36	613	4.83	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-01-SSM-W	3	6	S-13366-3	<1.00	15.6	34.3	1.73	<1.00	16.3	21.5	<1.00	535	<1.00	346	51.1	<1.00	<1.00	23.9	<1.00	<1.00
hpstd	3	7	hpstd-31	49.1	<1.00	<1.00	<1.00	50.0	<1.00	<1.00	<1.00	148	<1.00	9.78	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-17-SSM-W	3	8	S-13382-3	<1.00	18.3	6.02	7.57	<1.00	3.44	<1.00	<1.00	967	5.49	585	5.83	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-06-SSM-W	3	9	S-13371-3	<1.00	19.4	18.2	4.52	<1.00	1.63	<1.00	<1.00	739	1.38	429	15.4	<1.00	<1.00	35.5	<1.00	<1.00
LAWALG-02-SSM-W	3	10	S-13367-3	<1.00	26.0	32.1	1.77	<1.00	1.50	<1.00	<1.00	751	<1.00	446	29.3	<1.00	<1.00	30.1	<1.00	<1.00
LAWALG-11-SSM-W	3	11	S-13376-3	<1.00	12.4	3.23	7.10	<1.00	71.5	<1.00	<1.00	834	3.34	586	3.87	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-08-SSM-1-W	3	12	S-13373-3	<1.00	9.68	13.5	<1.00	<1.00	1.83	2.62	<1.00	34.4	<1.00	4.78	24.9	<1.00	<1.00	6.31	<1.00	<1.00
LAWALG-SSM-W	3	13	S-13383-3	<1.00	<1.00	3.59	<1.00	<1.00	1.32	<1.00	<1.00	622	7.54	431	8.08	<1.00	<1.00	<1.00	<1.00	<1.00
soln std	3	14	soln std-32	3.89	18.0	<1.00	<1.00	3.98	9.67	9.76	<1.00	80.6	<1.00	<1.00	48.6	<1.00	<1.00	<1.00	<1.00	<1.00
ICP Blank	3	15	ICP BLANK 3-2	<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	<1.00	<1.00
LAWALG-13-SSM-W	3	16	S-13378-3	<1.00	11.9	31.6	<1.00	<1.00	3.37	4.89	<1.00	312	<1.00	211	20.2	<1.00	<1.00	11.5	<1.00	<1.00
LAWALG-05-1-SSM-W	3	17	S-13370-3	<1.00	16.2	23.3	<1.00	<1.00	2.85	4.00	<1.00	45.8	<1.00	4.90	43.7	<1.00	<1.00	10.5	<1.00	<1.00
ICP Blank	3	18	ICP BLANK 3-3	<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	<1.00	<1.00
LAWALG-14-SSM-W	3	19	S-13379-3	<1.00	19.6	59.0	<1.00	<1.00	5.39	6.74	<1.00	623	<1.00	424	33.8	<1.00	<1.00	19.2	<1.00	<1.00
hpstd	3	20	hpstd-32	49.7	<1.00	<1.00	<1.00	51.1	<1.00	<1.00	<1.00	149	<1.00	9.91	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-04-SSM-W	3	21	S-13369-3	<1.00	14.5	5.83	2.18	<1.00	5.84	<1.00	<1.00	735	1.64	450	5.97	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-09-SSM-W	3	22	S-13374-3	<1.00	19.0	1.12	16.8	<1.00	3.89	<1.00	<1.00	927	52.6	491	8.74	<1.00	<1.00	<1.00	<1.00	<1.00
LAWALG-07-SSM-W	3	23	S-13372-3	<1.00	17.0	1.78	4.65	<1.00	1.43	<1.00	<1.00	920	22.3	514	13.9	<1.00	<1.00	11.0	<1.00	<1.00
LAWALG-12-SSM-W	3	24	S-13377-3	<1.00	35.8	22.3	<1.00	<1.00	<1.00	<1.00	<1.00	559	<1.00	288	58.1	<1.00	<1.00	33.3	<1.00	<1.00
LAWALG-10-SSM-W	3	25	S-13375-3	<1.00	15.6	4.40	11.8	<1.00	<1.00	<1.00	<1.00	743	4.76	430	6.88	<1.00	<1.00	<1.00	<1.00	<1.00
soln std	3	26	soln std-33	3.89	18.7	<1.00	<1.00	4.08	9.60	9.70	<1.00	79.8	<1.00	<1.00	48.3	<1.00	<1.00	<1.00	<1.00	<1.00

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

PNNL ID	Block	Seq.	Lab ID	Cl^-	F^-	PO_4^{3-}	SO_4^{2-}
5 ppm check	1	1	5 ppm check	5.34	5.35	5.12	5.48
LAWALG-07-SSM-W	1	2	S-13372-1	<5.00	7.67	52.1	1600
LAWALG-11-SSM-W	1	3	S-13376-1	<5.00	<5.00	<10.0	1770
LAWALG-14-SSM-W	1	4	S-13379	<5.00	<5.00	<10.0	1300
IC Blank	1	5	IC BLANK 1-1	<5.00	<5.00	<10.0	<10.0
LAWALG-13-SSM-W	1	6	S-13378-1	<5.00	<5.00	<10.0	667
LAWALG-04-SSM-W	1	7	S-13369-1	<5.00	<5.00	<10.0	1390
LAWALG-09-SSM-W	1	8	S-13374-1	<5.00	11.9	133	1520
LAWALG-03-SSM-W	1	9	S-13368-1	<5.00	10.5	109	1760
LAWALG-10-SSM-W	1	10	S-13375-1	<5.00	<5.00	10.4	1330
LAWALG-15-SSM-W	1	11	S--13380-1	6.69	<5.00	12.4	1850
LAWALG-02-SSM-W	1	12	S-13367-1	<5.00	<5.00	<10.0	1410
LAWALG-SSM-W	1	13	S-13383-1	<5.00	<5.00	<10.0	1380
IC Blank	1	14	IC BLANK 1-2	<5.00	<5.00	<10.0	<10.0
LAWALG-05-1-SSM-W	1	15	S-13370-1	<5.00	<5.00	<10.0	27.8
LAWALG-17-SSM-W	1	16	S-13382-1	41.9	11.5	<10.0	1780
LAWALG-01-SSM-W	1	17	S-13366-1	<5.00	8.59	<10.0	1140
IC Blank	1	18	IC BLANK 1-3	<5.00	<5.00	<10.0	<10.0
LAWALG-06-SSM-W	1	19	S-13371-1	<5.00	<5.00	<10.0	1340
LAWALG-08-SSM-1-W	1	20	S-13373-1	<5.00	<5.00	<10.0	19.2
LAWALG-12-SSM-W	1	21	S-13377-1	<5.00	12.5	<10.0	902
LAWALG-16-SSM-W	1	22	S-13381-1	5.80	<5.00	17.1	1370
5 ppm check	1	23	5 ppm check	5.32	5.33	5.06	5.48
5 ppm check	2	1	5 ppm check	5.26	5.29	5.05	5.46
LAWALG-15-SSM-W	2	2	S-13380-2	6.88	<5.00	13.4	1870
IC Blank	2	3	IC BLANK 2-1	<5.00	<5.00	<10.0	<10.0
LAWALG-17-SSM-W	2	4	S-13382-2	41.8	11.5	<10.0	1780
LAWALG-01-SSM-W	2	5	S-13366-2	<5.00	8.63	<10.0	1140
LAWALG-05-1-SSM-W	2	6	S-13370-2	<5.00	<5.00	<10.0	16.6
LAWALG-11-SSM-W	2	7	S-13376-2	<5.00	<5.00	<10.0	1810
LAWALG-SSM-W	2	8	S-13383-2	<5.00	<5.00	<10.0	1350
LAWALG-06-SSM-W	2	9	S-13371-2	<5.00	<5.00	<10.0	1350
LAWALG-14-SSM-W	2	10	S-13379-2	<5.00	<5.00	<10.0	1320
IC Blank	2	11	IC BLANK 2-2	<5.00	<5.00	<10.0	<10.0
LAWALG-03-SSM-W	2	12	S-13368-2	<5.00	10.8	110	1800
LAWALG-08-SSM-1-W	2	13	S-13373-2	<5.00	<5.00	<10.0	17.3
LAWALG-12-SSM-W	2	14	S-13377-2	<5.00	12.8	<10.0	911
LAWALG-13-SSM-W	2	15	S-13378-2	<5.00	<5.00	<10.0	678
LAWALG-09-SSM-W	2	16	S-13374-2	<5.00	12.2	135	1530
LAWALG-04-SSM-W	2	17	S-13369-2	<5.00	<5.00	<10.0	1420
LAWALG-16-SSM-W	2	18	S-13381-2	5.77	<5.00	17.6	1390
LAWALG-10-SSM-W	2	19	S-13375-2	<5.00	<5.00	<10.0	1380
LAWALG-02-SSM-W	2	20	S-13367-2	<5.00	<5.00	<10.0	1410
LAWALG-07-SSM-W	2	21	S-13372-2	<5.00	8.82	55.9	1680
IC Blank	2	22	IC BLANK 2-3	<5.00	<5.00	<10.0	<10.0
5 ppm check	2	23	5 ppm check	5.14	5.24	5.06	5.48
5 ppm check	3	1	5 ppm check	5.09	5.16	4.82	5.40
LAWALG-15-SSM-W	3	2	S-13380-3	6.91	<5.00	13.3	1890

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

PNNL ID	Block	Seq.	Lab ID	Cl^-	F^-	PO_4^{3-}	SO_4^{2-}
LAWALG-05-1-SSM-W	3	3	S-13370-3	<5.00	<5.00	<10.0	15.8
LAWALG-SSM-W	3	4	S-13383-3	<5.00	<5.00	<10.0	1390
LAWALG-13-SSM-W	3	5	S-13378-3	<5.00	<5.00	<10.0	680
LAWALG-17-SSM-W	3	6	S-13382-3	42.4	11.7	<10.0	1800
IC Blank	3	7	IC BLANK 3-1	<5.00	<5.00	<10.0	<10.0
LAWALG-12-SSM-W	3	8	S-13377-3	<5.00	12.8	<10.0	916
LAWALG-04-SSM-W	3	9	S-13369-3	<5.00	<5.00	<10.0	1430
LAWALG-07-SSM-W	3	10	S-13372-3	<5.00	7.91	53.0	1630
IC Blank	3	11	IC BLANK 3-2	<5.00	<5.00	<10.0	<10.0
LAWALG-02-SSM-W	3	12	S-13367-3	<5.00	<5.00	<10.0	1420
LAWALG-09-SSM-W	3	13	S-13374-3	<5.00	12.2	136	1550
LAWALG-03-SSM-W	3	14	S-13368-3	<5.00	11.0	112	1820
LAWALG-16-SSM-W	3	15	S-13381-3	5.83	<5.00	17.7	1400
LAWALG-10-SSM-W	3	16	S-13375-3	<5.00	<5.00	10.7	1370
LAWALG-01-SSM-W	3	17	S-13366-3	<5.00	8.81	<10.0	1160
LAWALG-14-SSM-W	3	18	S-13379-3	<5.00	<5.00	<10.0	1340
IC Blank	3	19	IC BLANK 3-3	<5.00	<5.00	<10.0	<10.0
LAWALG-08-SSM-1-W	3	20	S-13373-3	<5.00	<5.00	<10.0	33.5
LAWALG-06-SSM-W	3	21	S-13371-3	<5.00	<5.00	<10.0	1360
LAWALG-11-SSM-W	3	22	S-13376-3	5.01	<5.00	<10.0	1820
5 ppm check	3	23	5 ppm check	5.03	5.15	4.80	5.33

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

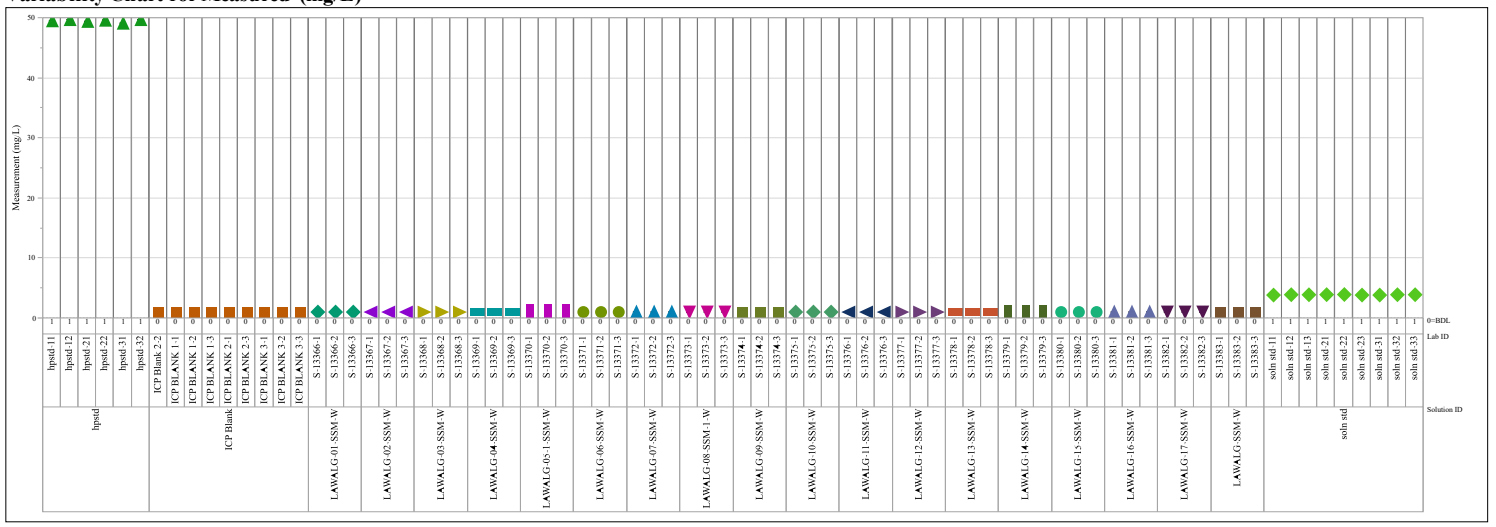
Solution ID	Instrument	Analyte	Reference Value (mg/L)	Mean Measurement (mg/L)
5 ppm check	IC	Cl^-	5	5.20
5 ppm check	IC	F^-	5	5.25
5 ppm check	IC	PO_4^{3-}	5	4.99
5 ppm check	IC	SO_4^{2-}	5	5.44
hp std	ICP-OES	Al	50	49.5
hp std	ICP-OES	B	0	<1.00
hp std	ICP-OES	Ca	0	<1.00
hp std	ICP-OES	Cr	0	<1.00
hp std	ICP-OES	Fe	50	50.9
hp std	ICP-OES	K	0	<1.00
hp std	ICP-OES	Li	0	<1.00
hp std	ICP-OES	Mg	0	<1.00
hp std	ICP-OES	Na	150	151
hp std	ICP-OES	P	0	<1.00
hp std	ICP-OES	S	10	9.94
hp std	ICP-OES	Si	0	<1.00
hp std	ICP-OES	Sn	0	<1.00
hp std	ICP-OES	Ti	0	<1.00
hp std	ICP-OES	V	0	<1.00
hp std	ICP-OES	Zn	0	<1.00
hp std	ICP-OES	Zr	0	<1.00
std	ICP-OES	Al	4	3.87
std	ICP-OES	B	20	18.7
std	ICP-OES	Ca	0	<1.00
std	ICP-OES	Cr	0	<1.00
std	ICP-OES	Fe	4	4.07
std	ICP-OES	K	10	9.62
std	ICP-OES	Li	10	9.70
std	ICP-OES	Mg	0	<1.00
std	ICP-OES	Na	81	81.6
std	ICP-OES	P	0	<1.00
std	ICP-OES	S	0	<1.00
std	ICP-OES	Si	50	47.9
std	ICP-OES	Sn	0	<1.00
std	ICP-OES	Ti	0	<1.00
std	ICP-OES	V	0	<1.00
std	ICP-OES	Zn	0	<1.00
std	ICP-OES	Zr	0	<1.00

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

		IC				ICP-OES																
Lab ID	PNNL ID	Cl^-	F^-	PO_4^{3-}	SO_4^{2-}	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	P	S	Si	Sn	Ti	V	Zn	Zr
S-13366	LAWALG-01-SSM-W	<5.00	8.68	<10.0	1150	<1.00	16.1	33.8	1.79	<1.00	16.2	21.5	<1.00	151	<1.00	9.94	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
S-13367	LAWALG-02-SSM-W	<5.00	<5.00	<10.0	1410	<1.00	26.2	31.6	1.83	<1.00	1.59	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
S-13368	LAWALG-03-SSM-W	<5.00	10.8	110	1790	<1.00	20.6	1.64	5.25	<1.00	1.78	<1.00	<1.00	551	<1.00	356	50.4	<1.00	<1.00	23.7	<1.00	<1.00
S-13369	LAWALG-04-SSM-W	<5.00	<5.00	<10.0	1410	<1.00	15.4	5.95	2.33	<1.00	6.00	<1.00	<1.00	761	<1.00	450	28.8	<1.00	<1.00	29.7	<1.00	<1.00
S-13370	LAWALG-05-1-SSM-W	<5.00	<5.00	<10.0	20.1	<1.00	16.6	23.1	<1.00	<1.00	2.87	4.03	<1.00	1120	44.6	580	21.3	<1.00	<1.00	49.7	<1.00	<1.00
S-13371	LAWALG-06-SSM-W	<5.00	<5.00	<10.0	1350	<1.00	19.7	18.3	4.56	<1.00	1.77	<1.00	<1.00	752	1.67	453	6.01	<1.00	<1.00	<1.00	<1.00	<1.00
S-13372	LAWALG-07-SSM-W	<5.00	8.13	53.7	1640	<1.00	17.5	1.97	4.78	<1.00	1.53	<1.00	<1.00	45.7	<1.00	4.97	43.2	<1.00	<1.00	10.4	<1.00	<1.00
S-13373	LAWALG-08-SSM-1-W	<5.00	<5.00	<10.0	23.3	<1.00	9.73	13.6	<1.00	<1.00	1.87	2.65	<1.00	750	1.48	434	15.4	<1.00	<1.00	35.5	<1.00	<1.00
S-13374	LAWALG-09-SSM-W	<5.00	12.1	135	1530	<1.00	19.6	1.20	17.2	<1.00	4.05	<1.00	<1.00	930	23.1	522	14.3	<1.00	<1.00	11.4	<1.00	<1.00
S-13375	LAWALG-10-SSM-W	<5.00	<5.00	<10.4	1360	<1.00	15.3	4.33	11.6	<1.00	<1.06	<1.00	<1.00	34.2	<1.00	4.95	24.7	<1.00	<1.00	6.31	<1.00	<1.00
S-13376	LAWALG-11-SSM-W	<5.00	<5.00	<10.0	1800	<1.00	12.9	3.16	7.34	<1.00	71.5	<1.00	<1.00	944	52.9	492	8.79	<1.00	<1.00	<1.00	<1.00	<1.00
S-13377	LAWALG-12-SSM-W	<5.00	12.7	<10.0	910	<1.00	35.2	22.3	<1.00	<1.00	<1.00	<1.00	<1.00	750	4.63	436	6.82	<1.00	<1.00	<1.00	<1.00	<1.00
S-13378	LAWALG-13-SSM-W	<5.00	<5.00	<10.0	675	<1.00	11.9	31.7	<1.00	<1.00	3.45	4.79	<1.00	839	3.41	584	3.80	<1.00	<1.00	<1.00	<1.00	<1.00
S-13379	LAWALG-14-SSM-W	<5.00	<5.00	<10.0	1320	<1.00	19.7	58.6	<1.00	<1.00	5.65	6.72	<1.00	562	<1.00	286	57.2	<1.00	<1.00	33.2	<1.00	<1.00
S-13380	LAWALG-15-SSM-W	6.83	<5.00	13.0	1870	<1.00	19.9	7.97	4.93	<1.00	12.7	<1.00	<1.00	317	<1.00	210	20.2	<1.00	<1.00	11.5	<1.00	<1.00
S-13381	LAWALG-16-SSM-W	5.80	<5.00	17.5	1390	<1.00	16.2	<1.00	49.7	<1.00	<1.00	<1.00	<1.00	631	<1.00	422	33.4	<1.00	<1.00	19.1	<1.00	<1.00
S-13382	LAWALG-17-SSM-W	42.0	11.6	<10.0	1790	<1.00	18.7	5.94	7.75	<1.00	3.60	<1.00	<1.00	998	3.51	614	4.99	<1.00	<1.00	<1.00	<1.00	<1.00
S-13383	LAWALG-SSM-W	<5.00	<5.00	<10.0	1370	<1.00	<1.00	3.73	<1.00	<1.00	1.40	<1.00	<1.00	809	<1.00	445	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte

Analyte=Al, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=B, Analysis=ICP
Variability Chart for Measured (mg/L)

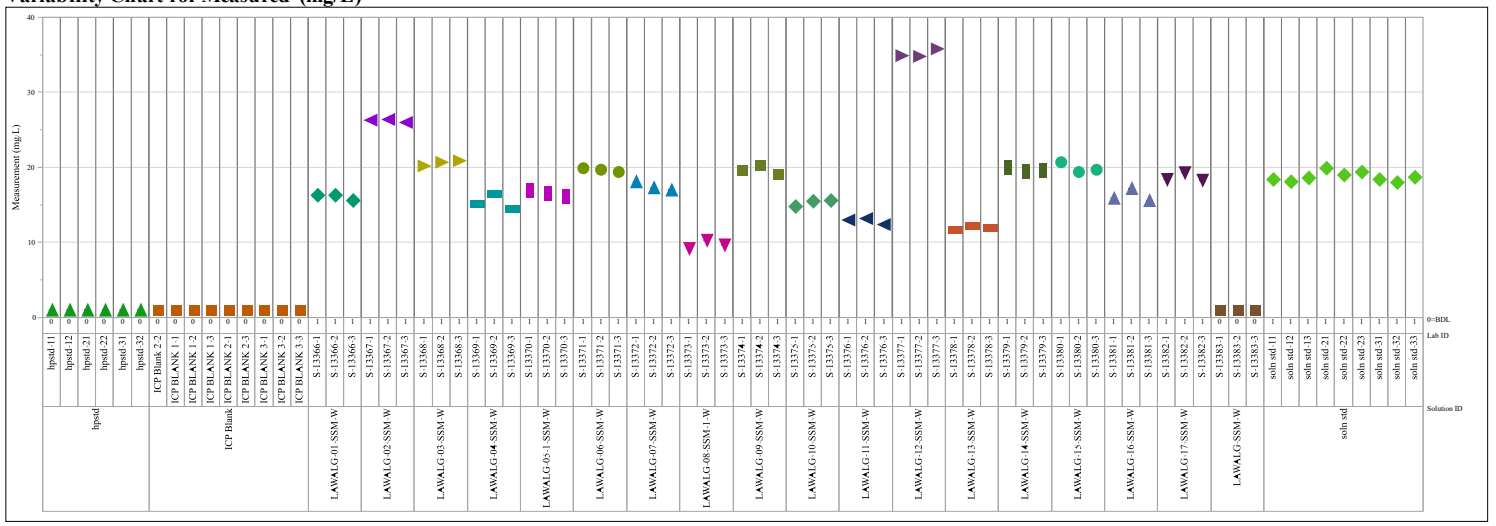
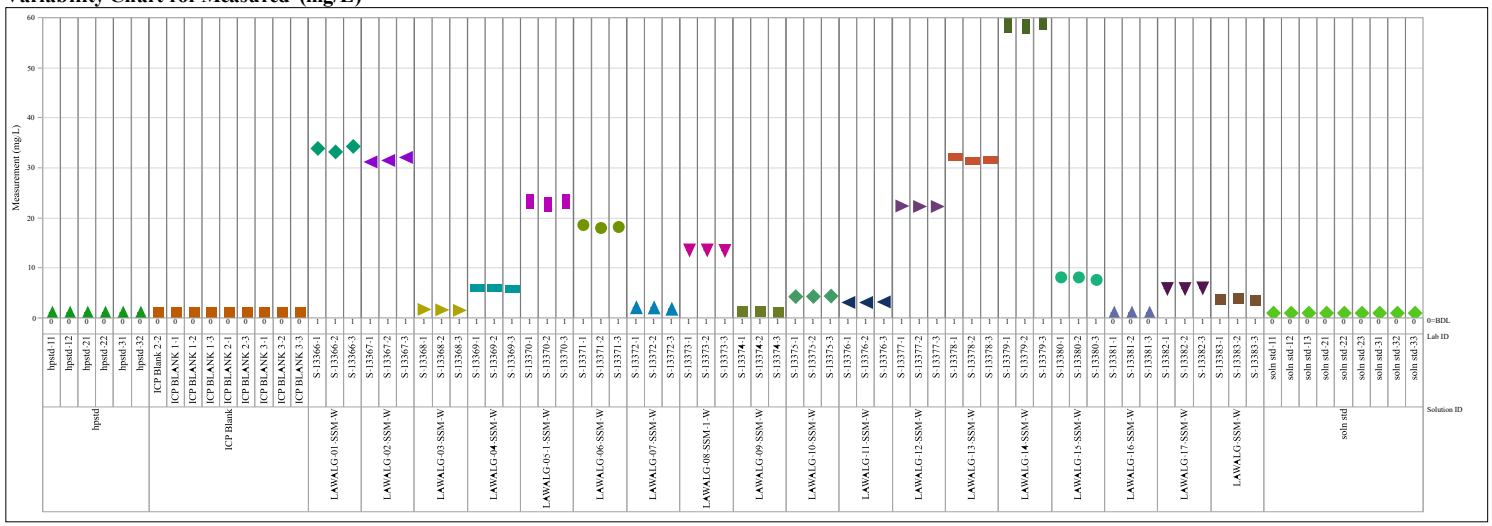


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Ca, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=Cl^-, Analysis=IC
Variability Chart for Measured (mg/L)

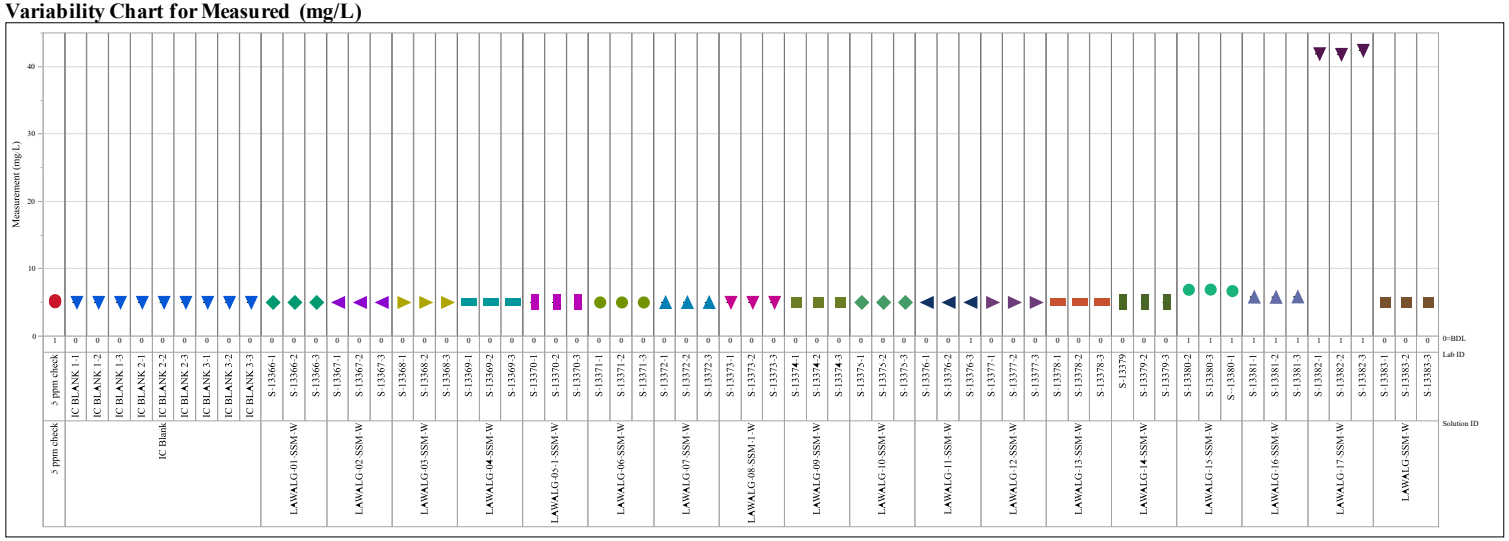
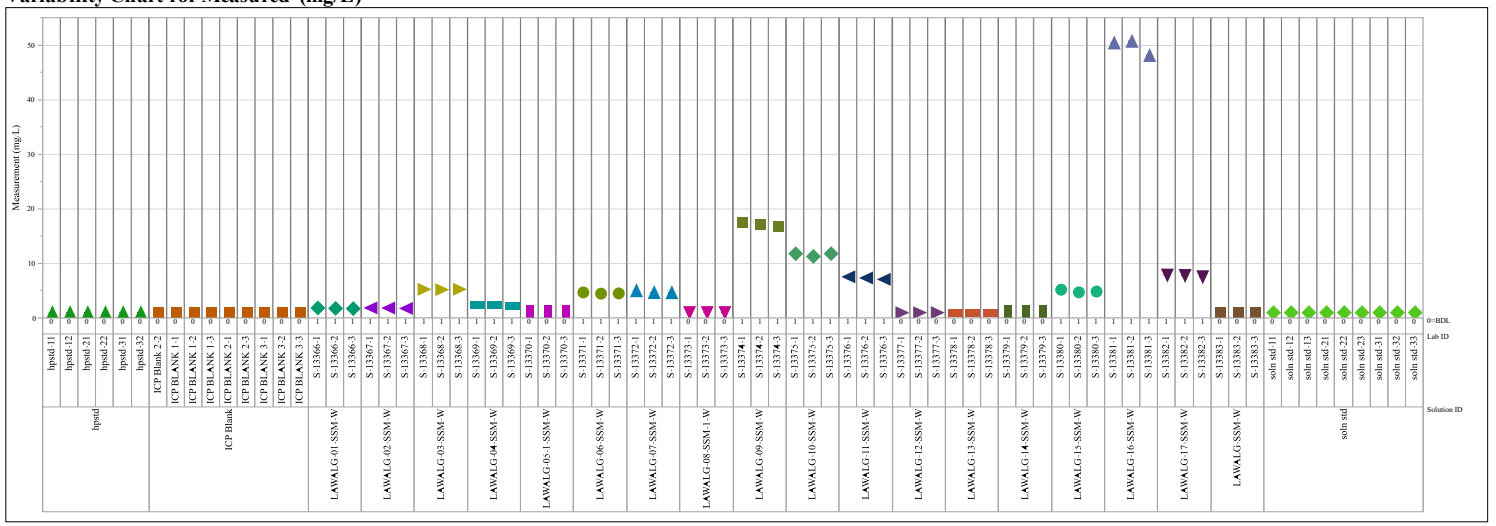


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Cr, Analysis=ICP
Variability Chart for Measured (mg/L)



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

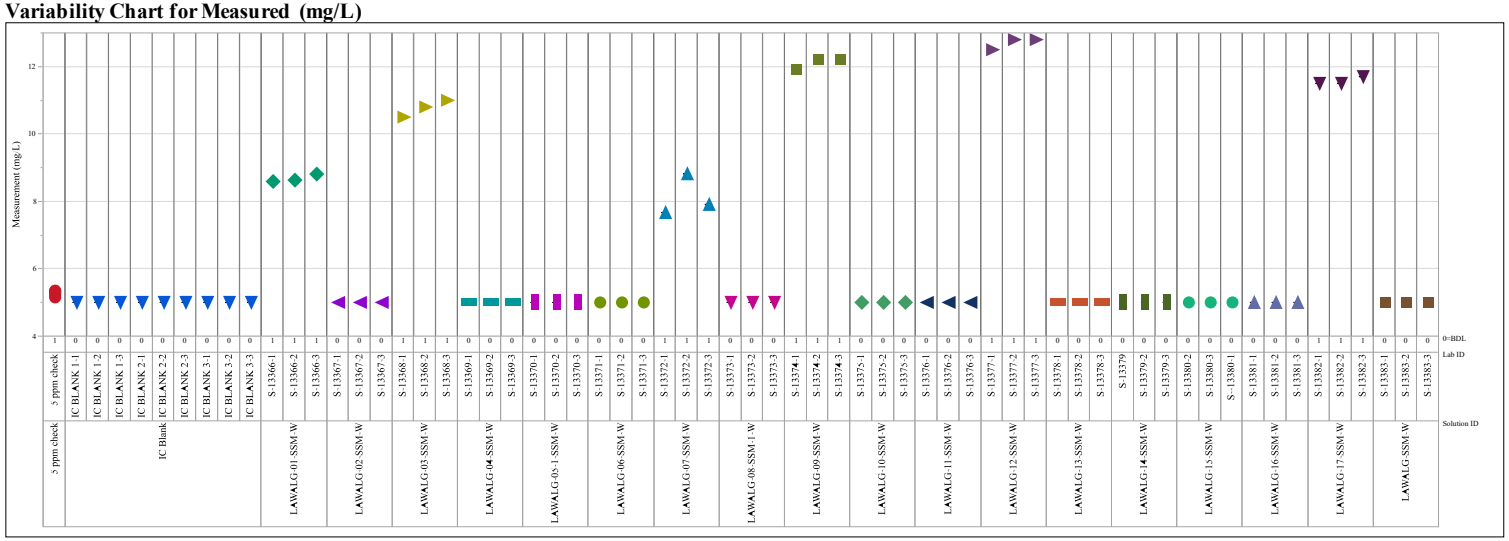
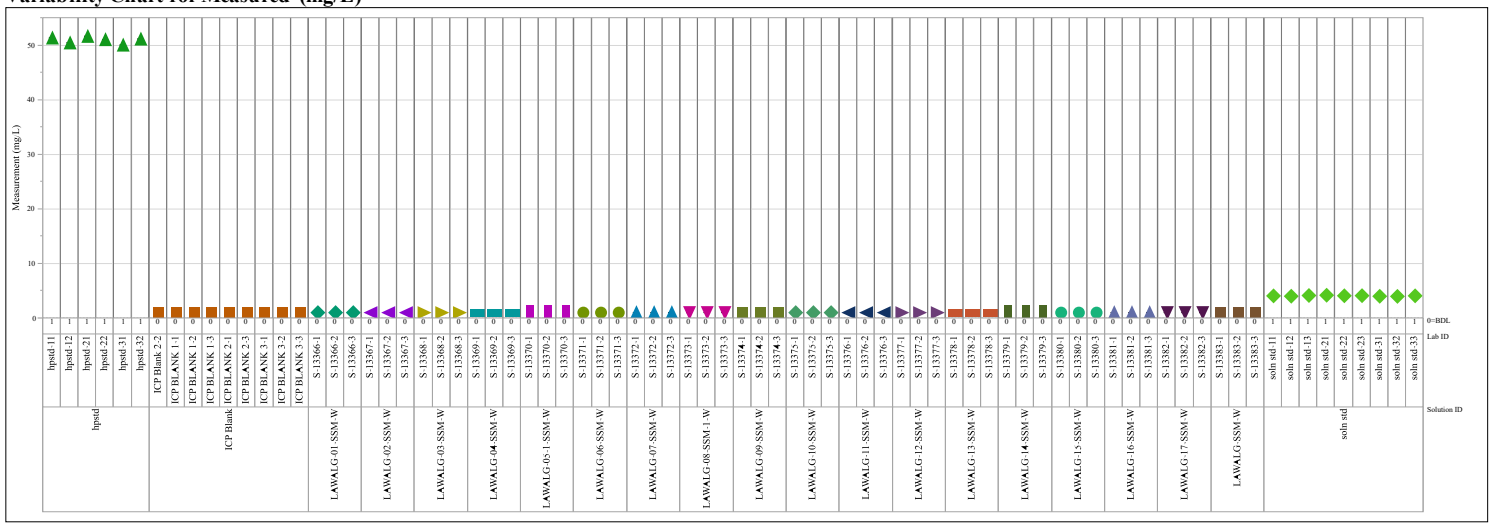


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Fe, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=K, Analysis=ICP
Variability Chart for Measured (mg/L)

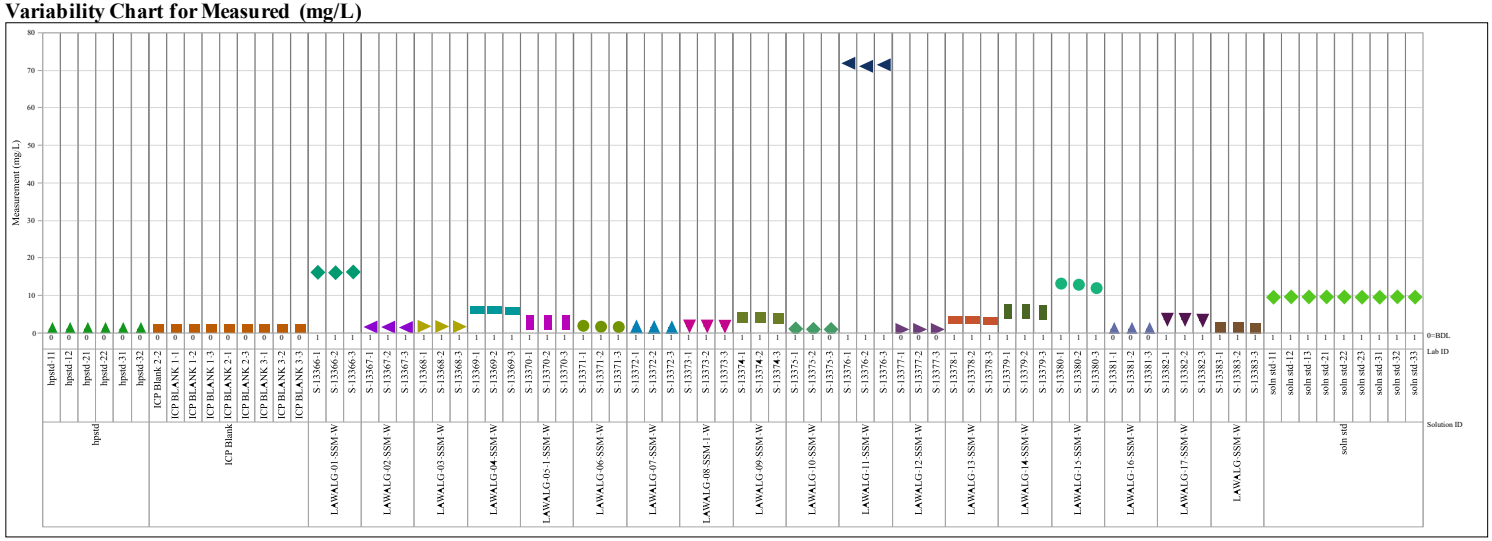
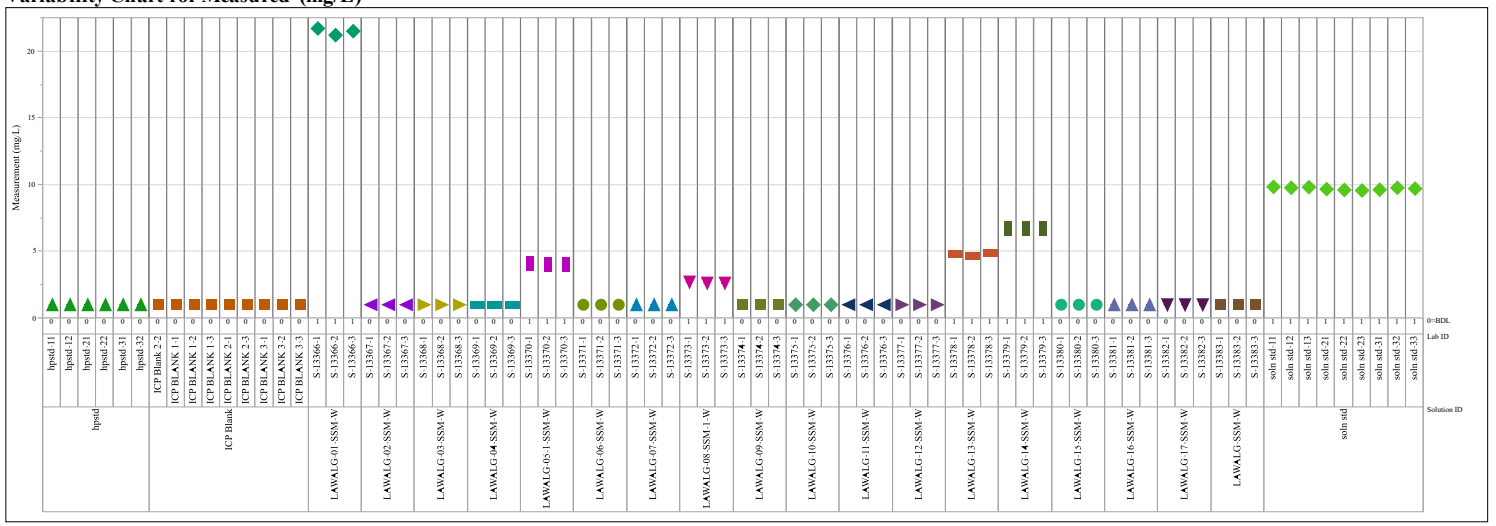


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Li, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=Mg, Analysis=ICP
Variability Chart for Measured (mg/L)

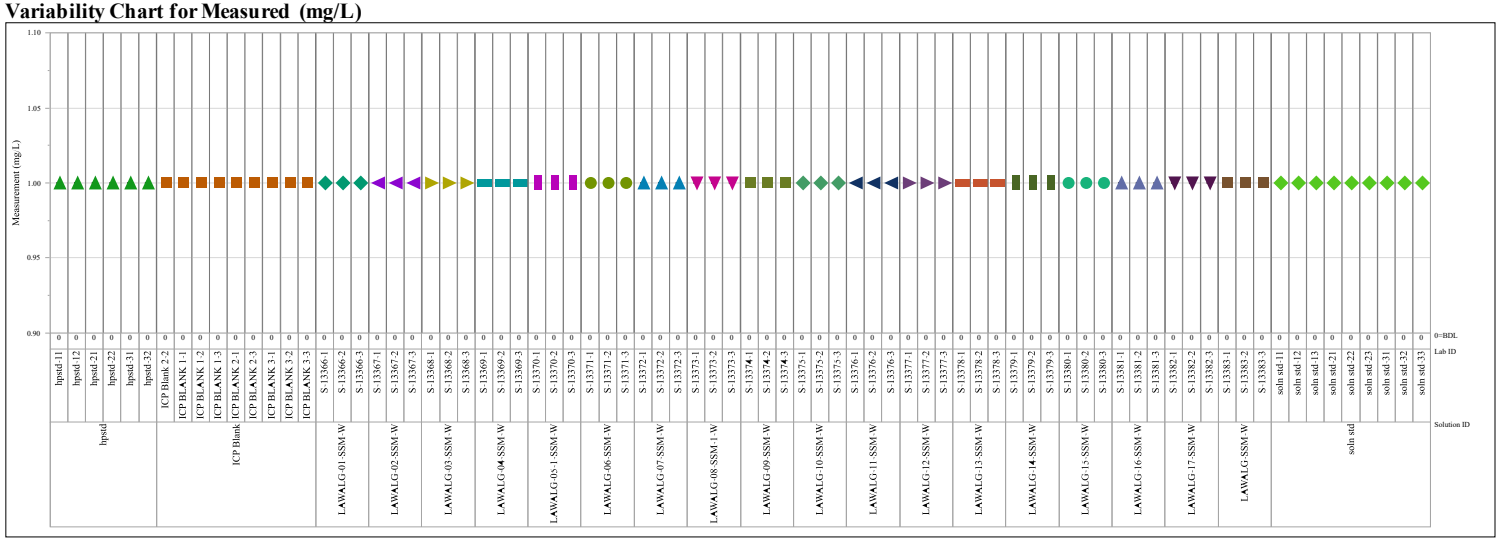
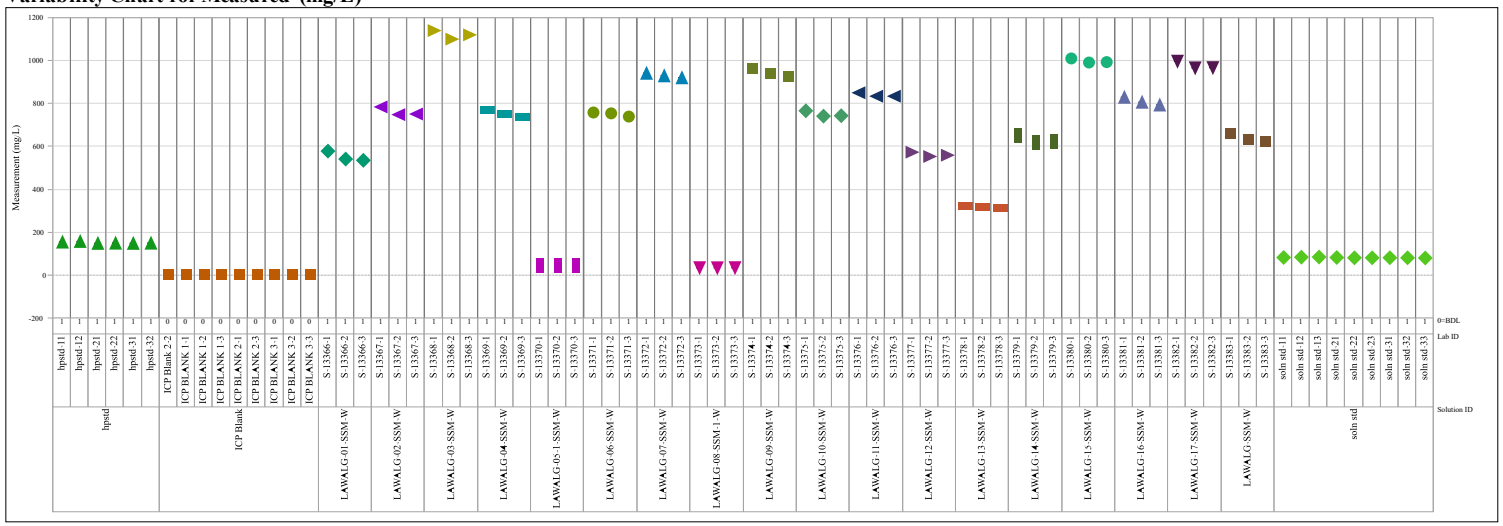


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Na, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=P, Analysis=ICP
Variability Chart for Measured (mg/L)

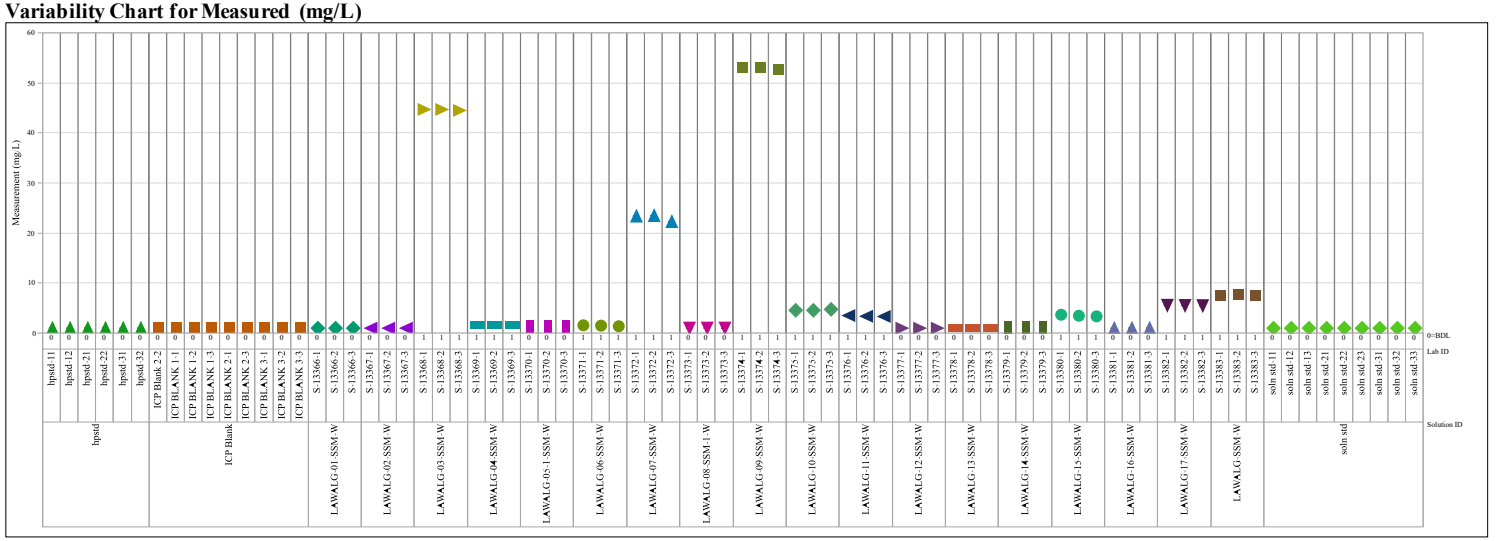
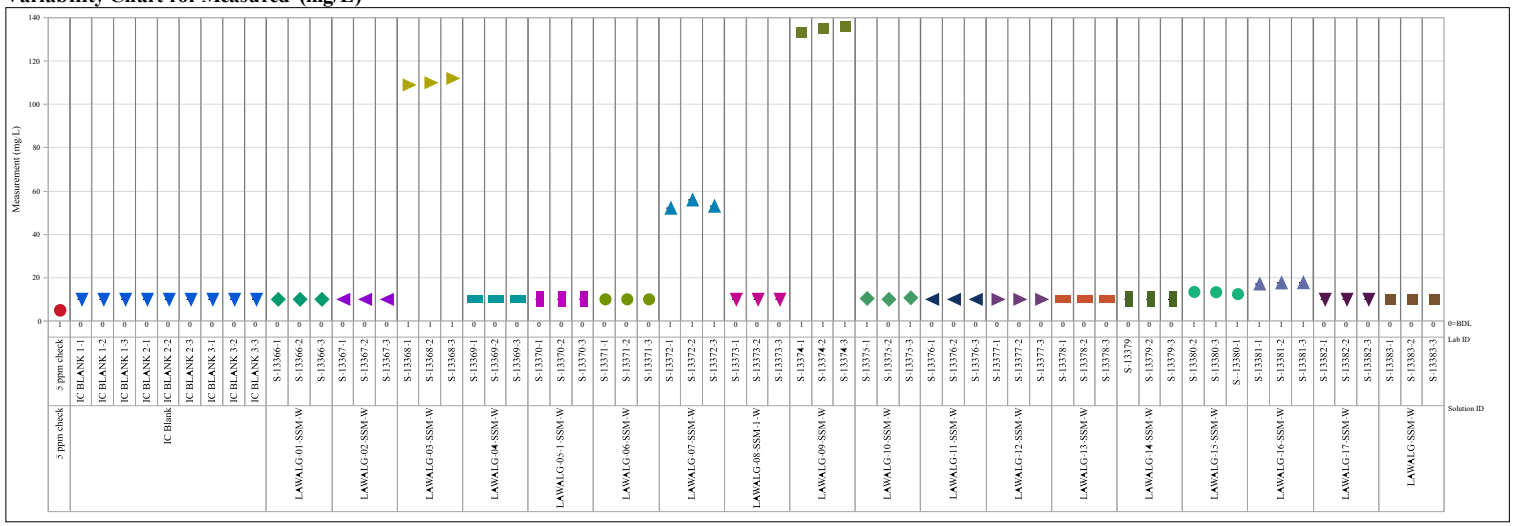


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=PO_4, Analysis=IC
Variability Chart for Measured (mg/L)



Analyte=S, Analysis=ICP
Variability Chart for Measured (mg/L)

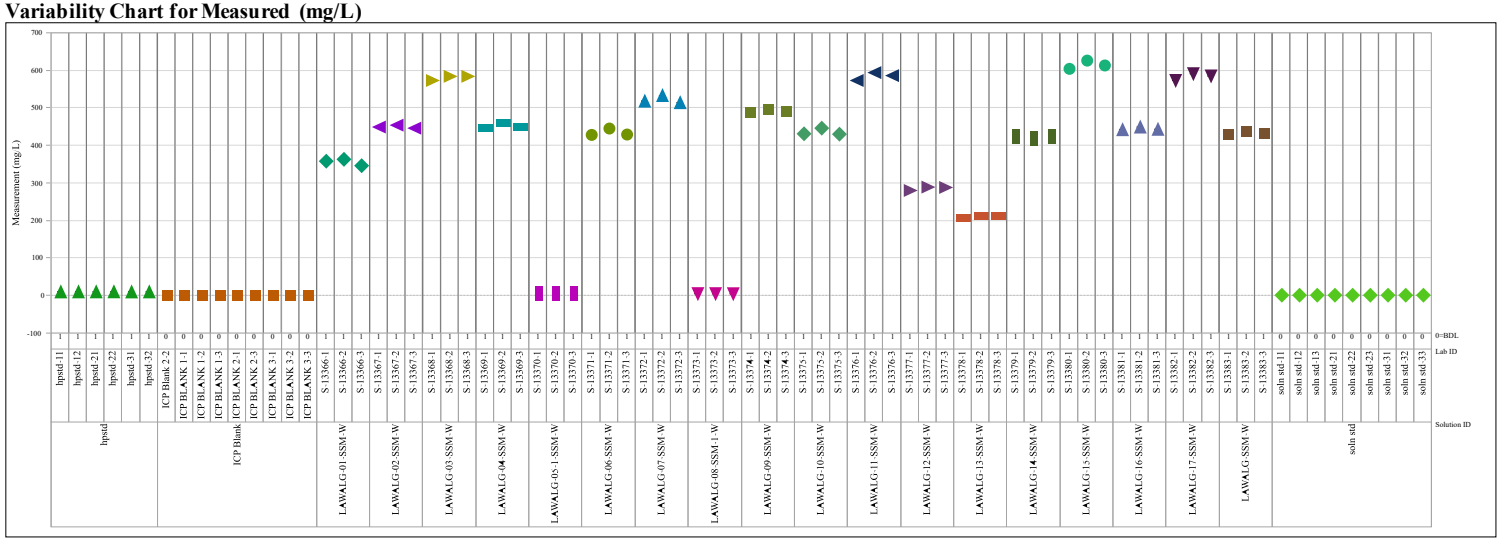
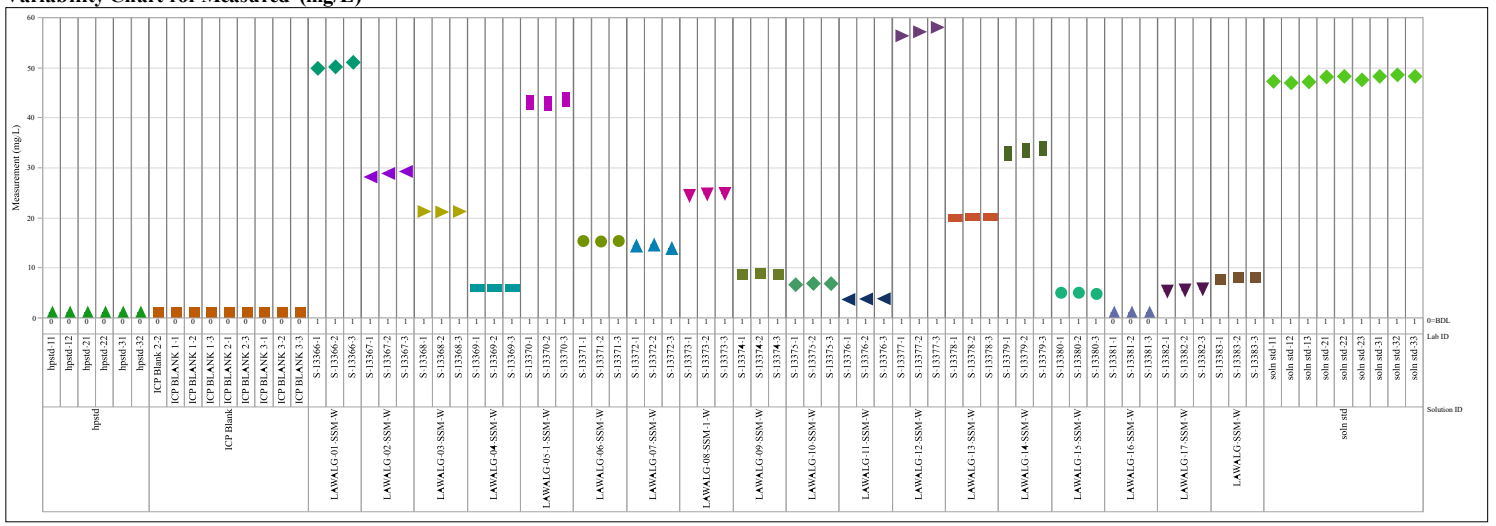


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Si, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=Sn, Analysis=ICP
Variability Chart for Measured (mg/L)

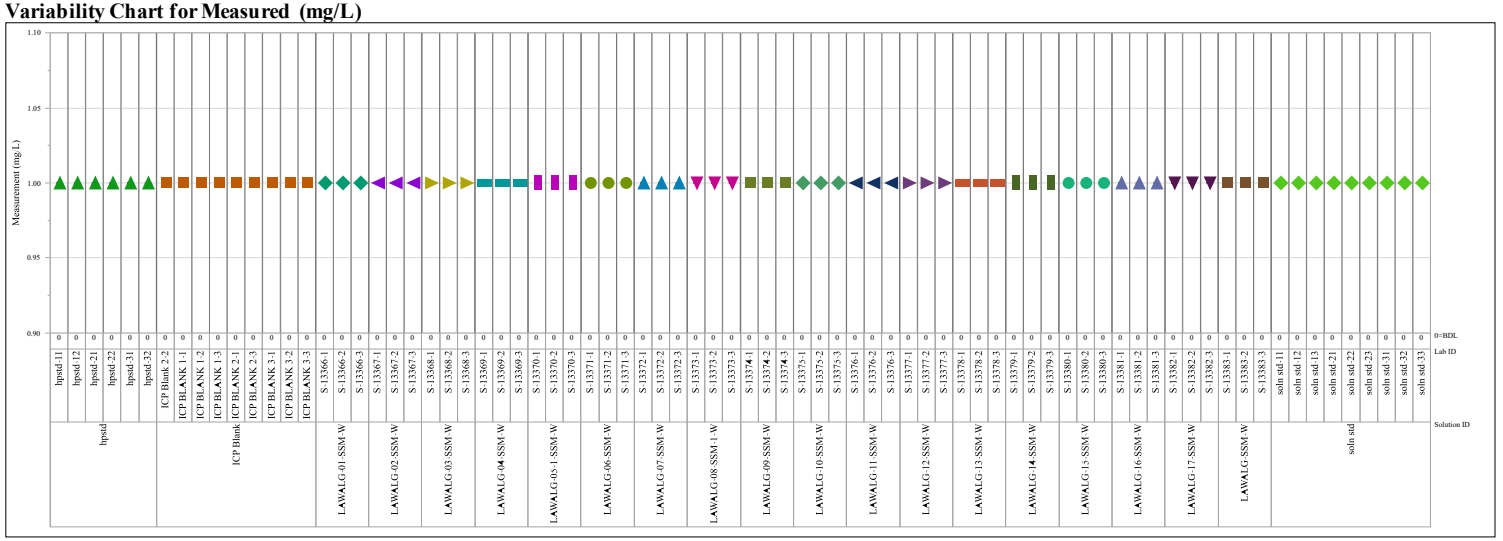
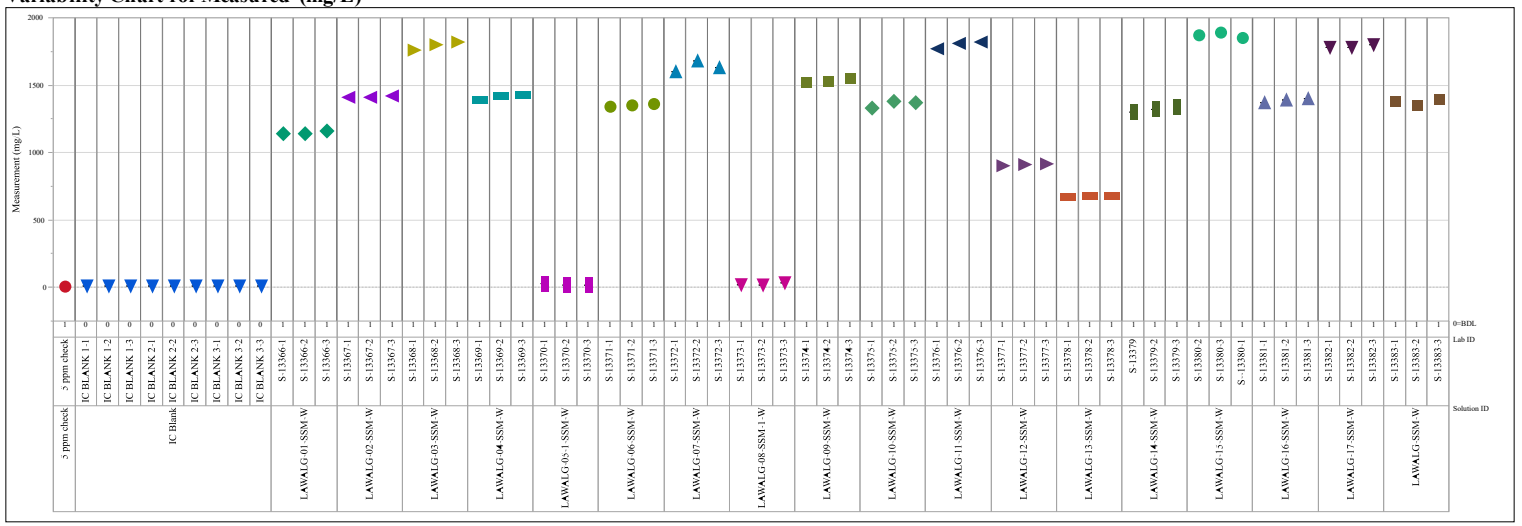


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=SO_4, Analysis=IC
Variability Chart for Measured (mg/L)



Analyte=Ti, Analysis=ICP
Variability Chart for Measured (mg/L)

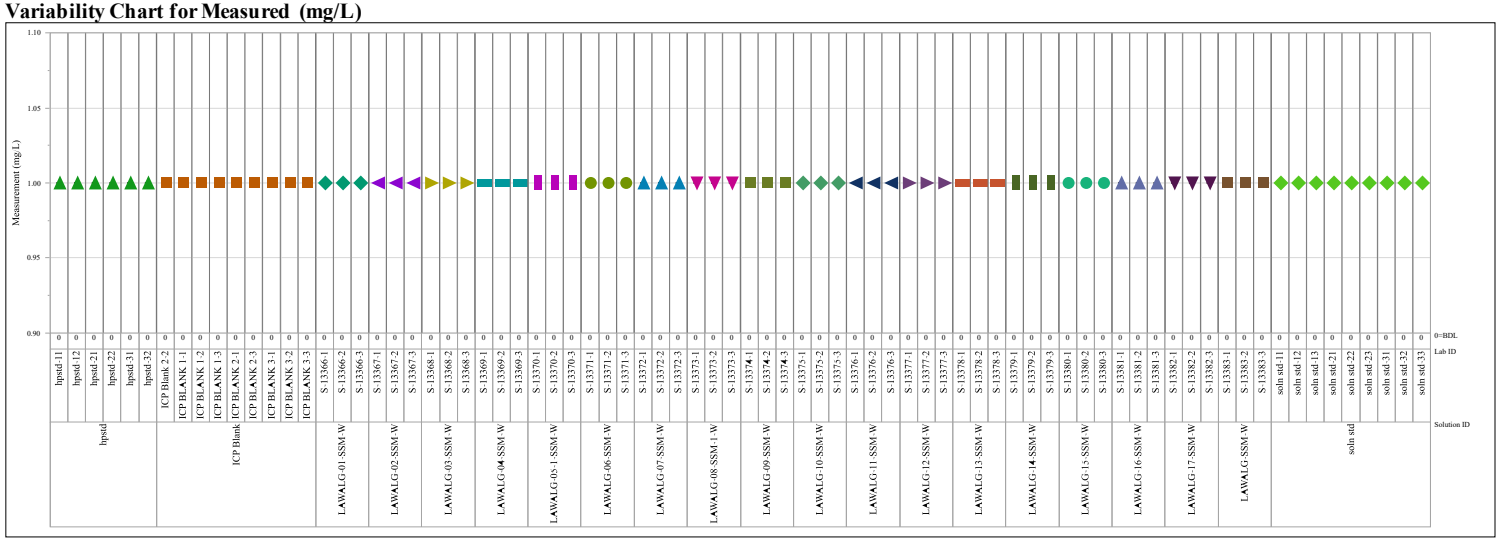
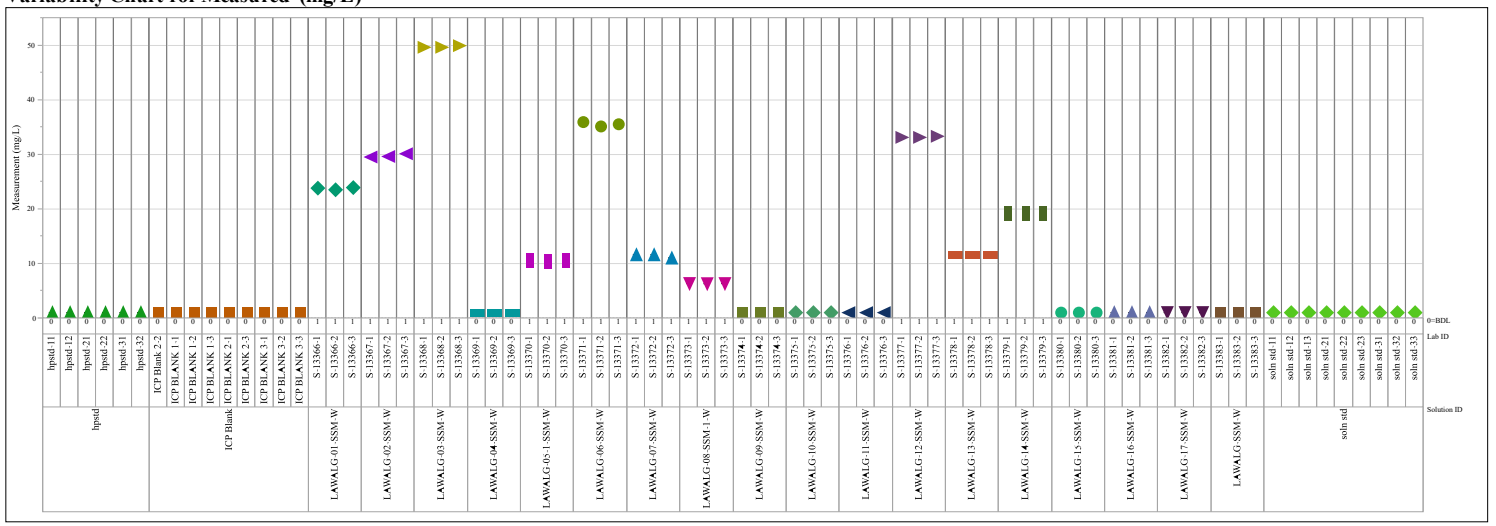


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=V, Analysis=ICP
Variability Chart for Measured (mg/L)



Analyte=Zn, Analysis=ICP
Variability Chart for Measured (mg/L)

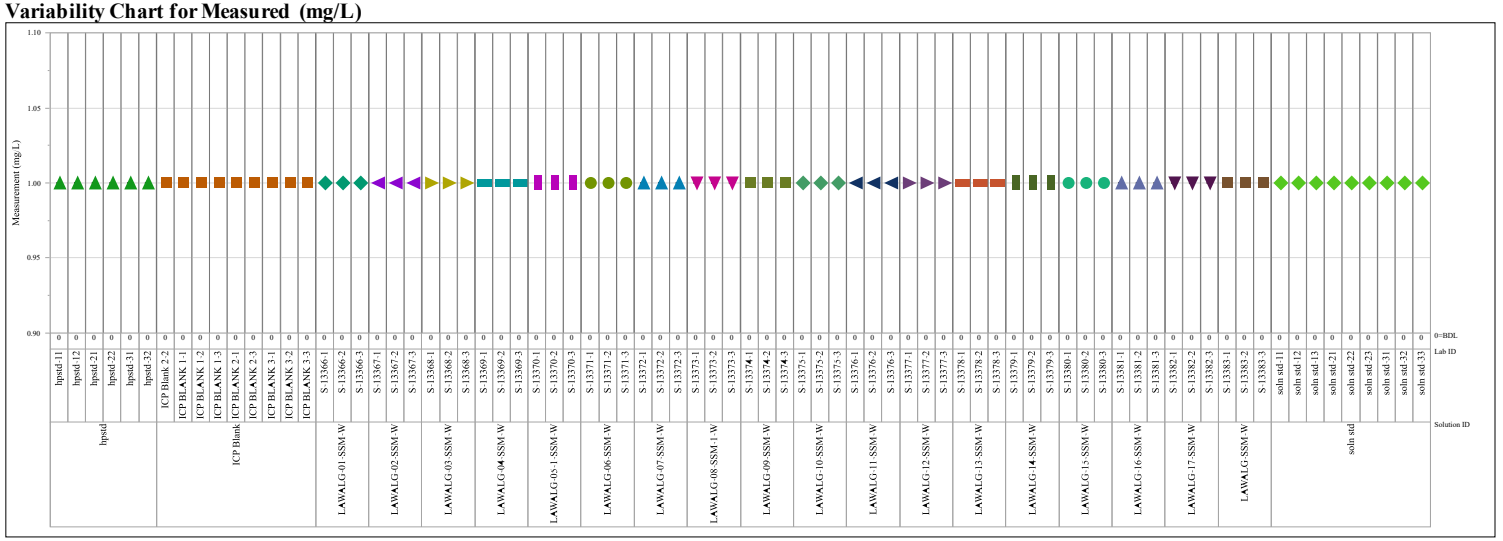
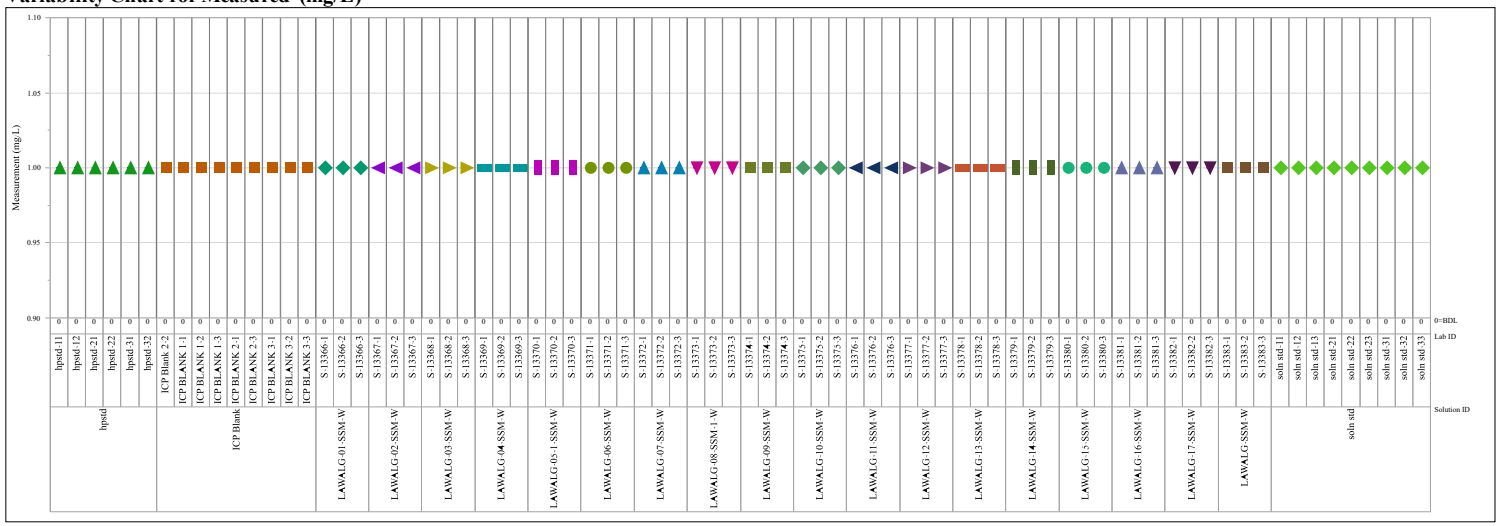


Exhibit B-1. Measurements of SSM Wash Solutions by Solution ID by Analyte (continued)

Analyte=Zr, Analysis=ICP
Variability Chart for Measured (mg/L)



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