

APPENDIX C

MATERIALS HANDLING FLOWCHARTS AND CALCULATIONS

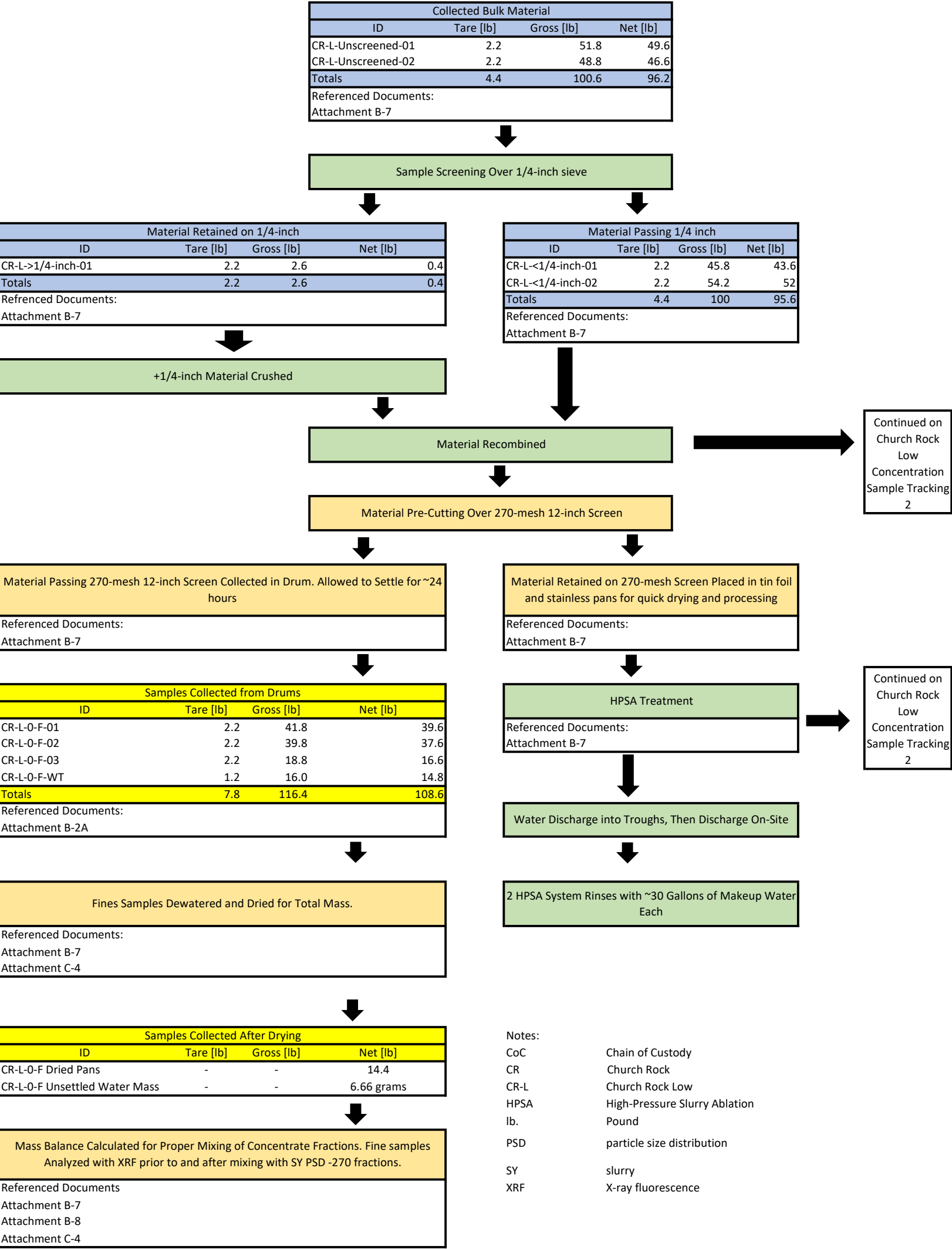
The following project files are available by request from the USEPA TOCOR and include backup calculations used in the development of tables and figures in this report.

1. Recon Samples Table.xlsx
2. RAES T033 Bulk Feed XRF Analyzer.xlsx
3. CR Fractionation XRF Analyzer.xlsx
4. CTS Fractionation XRF Analyzer.xlsx
5. QV Fractionation XRF Analyzer.xlsx
6. Treatability Study XRF Analyzer Summary.xlsx
7. CR Mass Balance.xlsx
8. QV Mass Balance.xlsx
9. Pace Sample Compositing Ra 226.xlsx
10. CR Water Results Summary.xlsx
11. CTS Water Results Summary.xlsx
12. QV Water Results Summary.xlsx
13. CR SPLP Summary.xlsx
14. CTS SPLP Summary.xlsx
15. QV SPLP Summary.xlsx
16. CR Fractionation Summary.xlsx
17. CTS Fractionation Summary.xlsx
18. QV Fractionation Summary.xlsx
19. Water and SPLP Comparison.xlsx
20. Disa PSD QAQC.xlsx
21. Process Water QAQC.xlsx
22. RAES T033 Sample Weight Tracking.xlsx

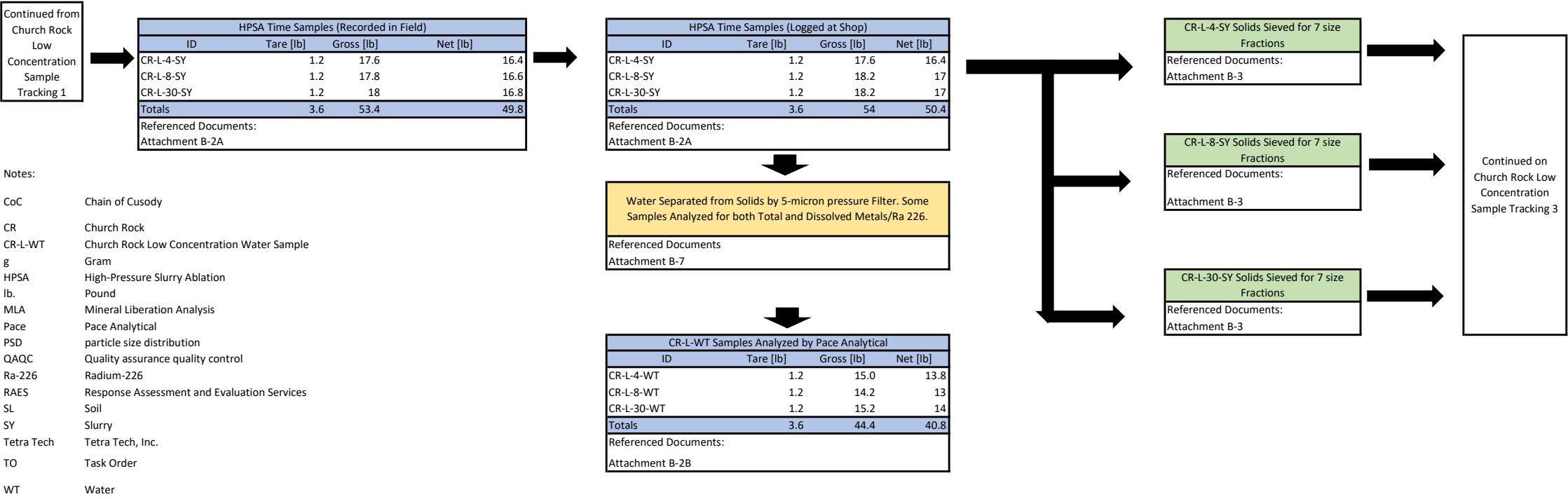
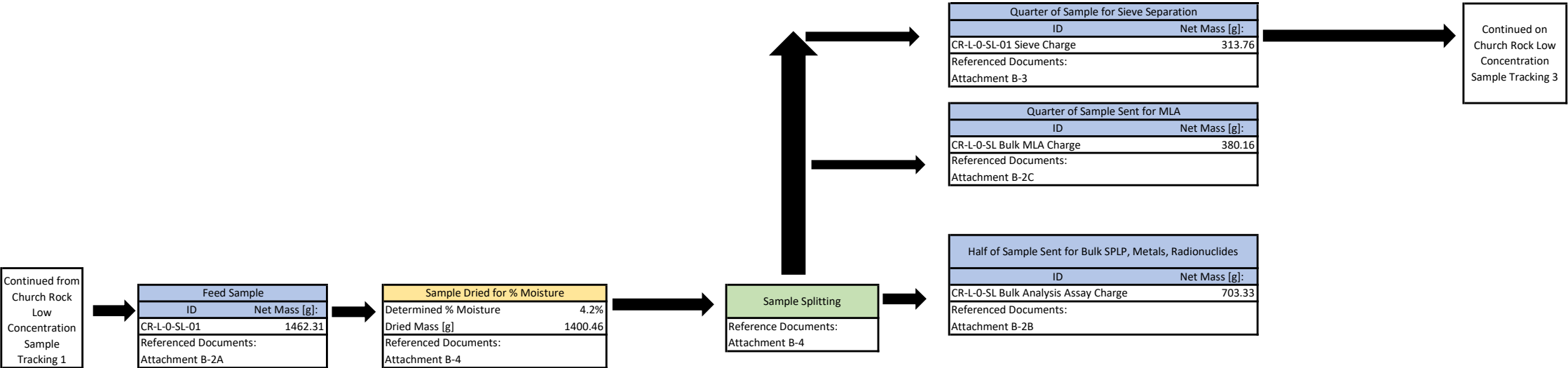
APPENDIX C-1
OLD CHURCH ROCK MINE SAMPLE TRACKING SHEETS

Church Rock Low Concentration Sample Tracking

1



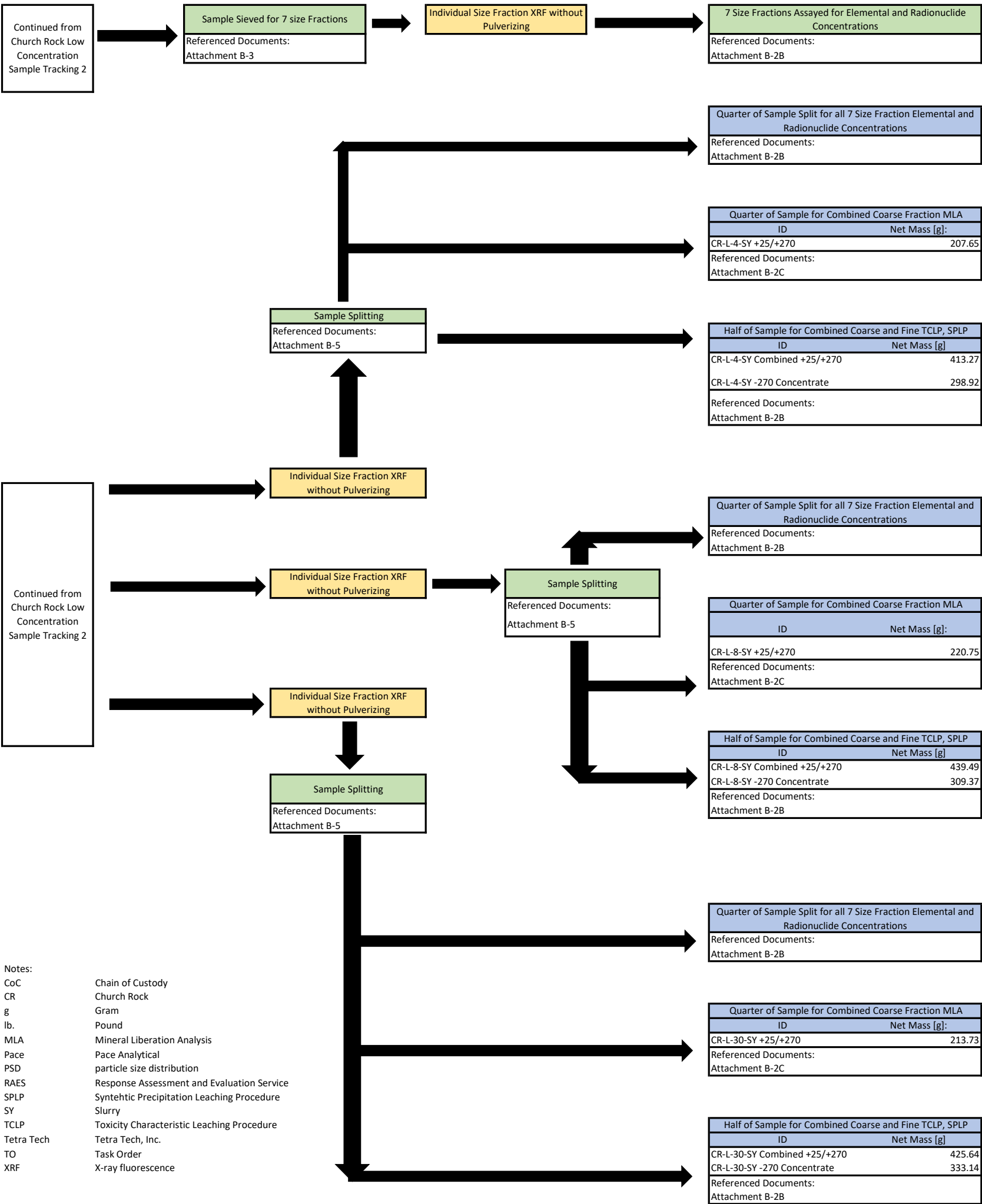
Church Rock Low Concentration Sample Tracking
2



- Notes:
- CoC Chain of Custody
- CR Church Rock
- CR-L-WT Church Rock Low Concentration Water Sample
- g Gram
- HPSA High-Pressure Slurry Ablation
- lb. Pound
- MLA Mineral Liberation Analysis
- Pace Pace Analytical
- PSD particle size distribution
- QAQC Quality assurance quality control
- Ra-226 Radium-226
- RAES Response Assessment and Evaluation Services
- SL Soil
- SY Slurry
- Tetra Tech Tetra Tech, Inc.
- TO Task Order
- WT Water

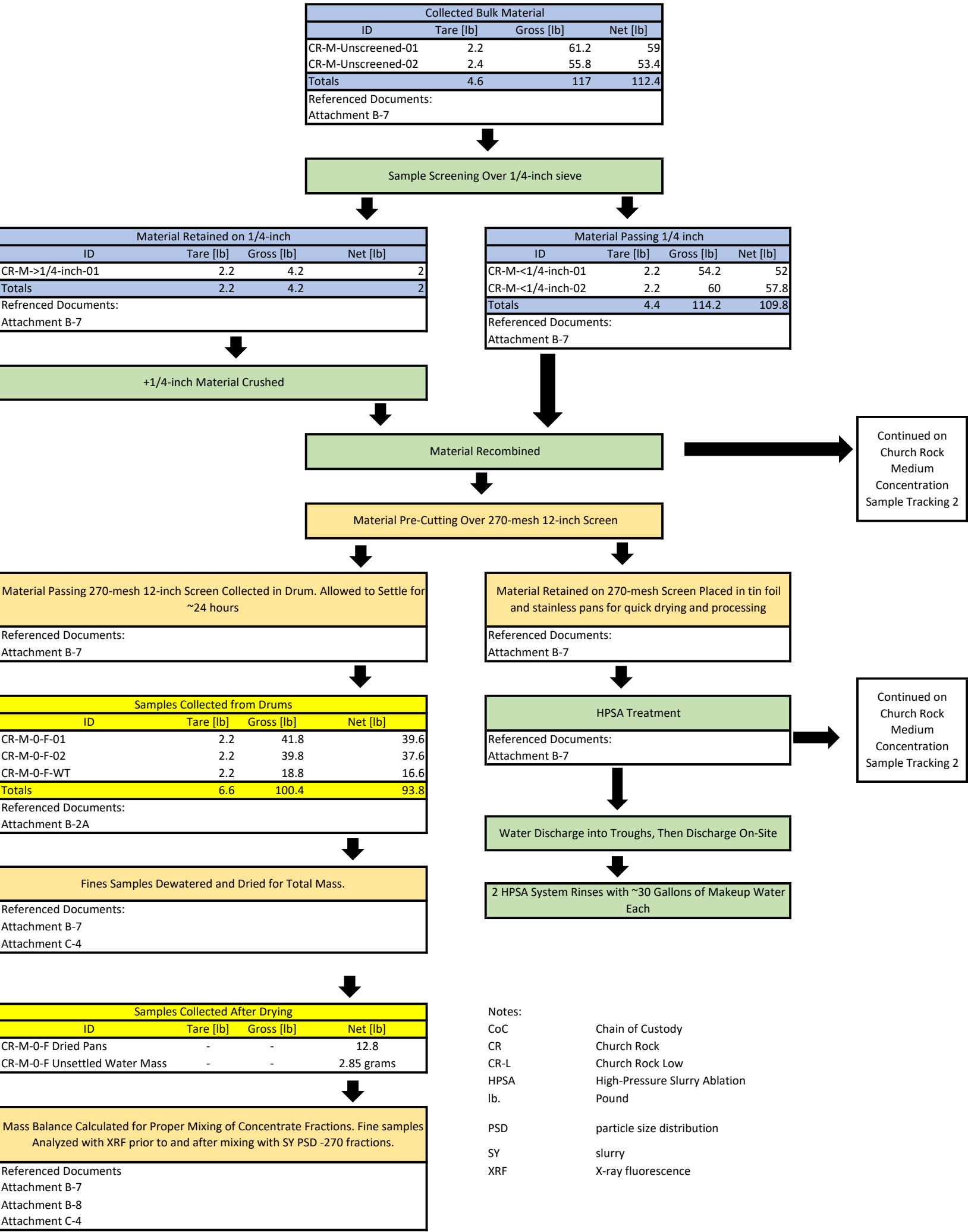
Church Rock Low Concentration Sample Tracking

3

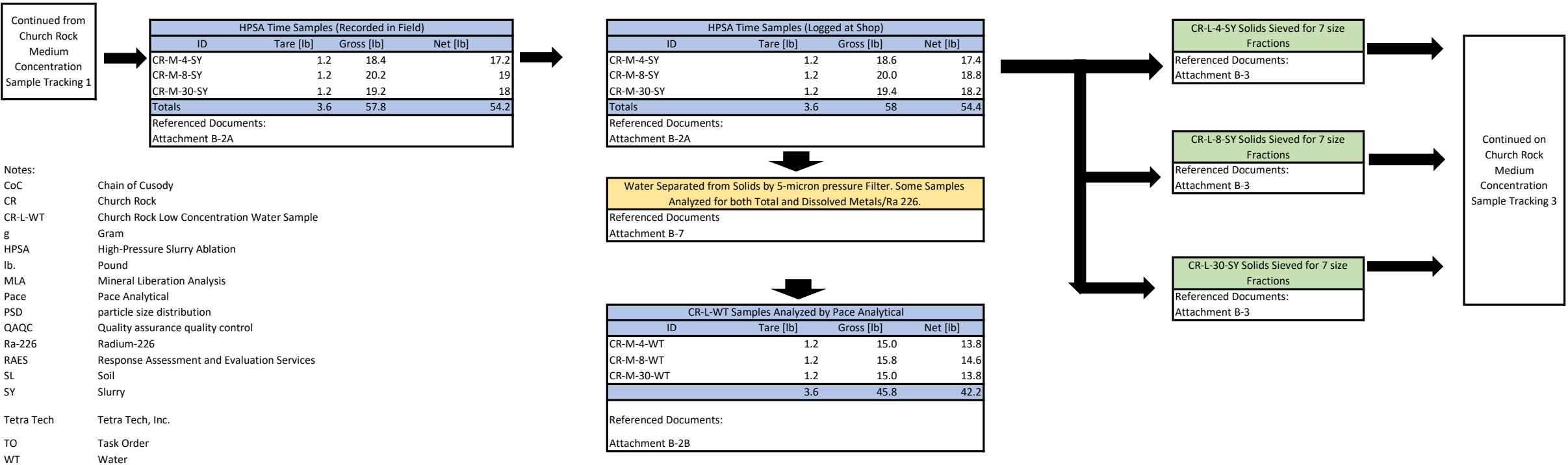
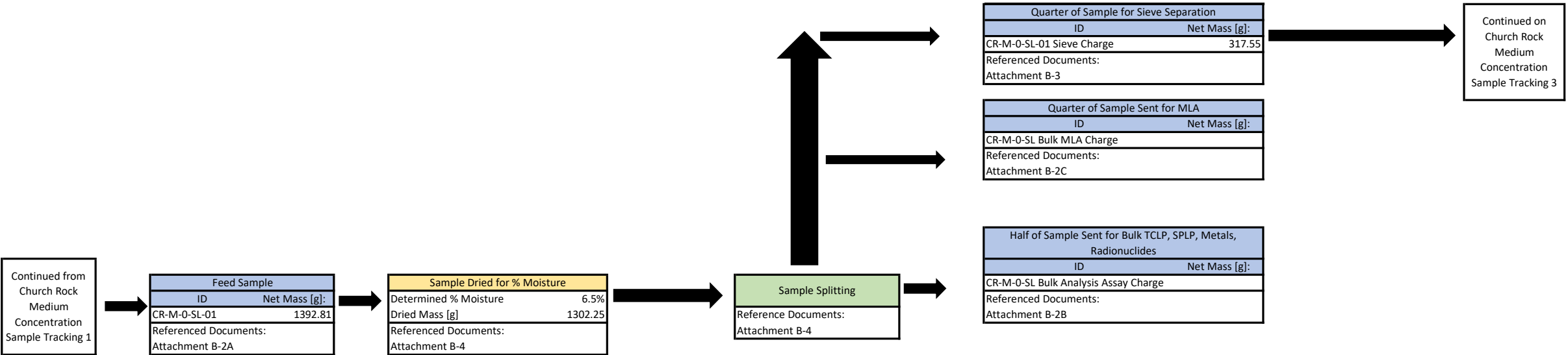


Church Rock Medium Concentration Sample Tracking

1



Church Rock Medium Concentration Sample Tracking
2



Notes:

CoC Chain of Custody

CR Church Rock

CR-L-WT Church Rock Low Concentration Water Sample

g Gram

HPSA High-Pressure Slurry Ablation

lb. Pound

MLA Mineral Liberation Analysis

Pace Pace Analytical

PSD particle size distribution

QAQC Quality assurance quality control

Ra-226 Radium-226

RAES Response Assessment and Evaluation Services

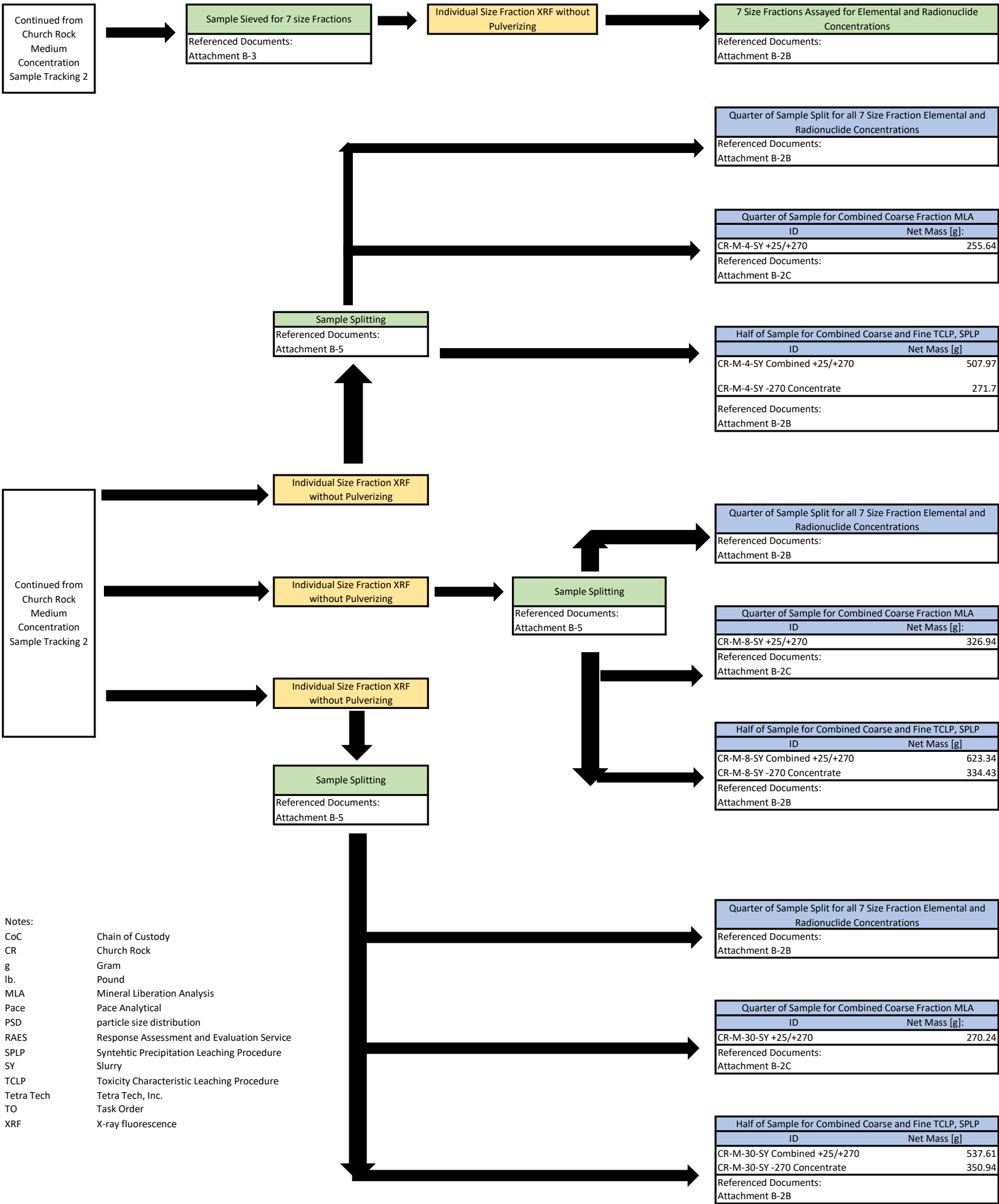
SL Soil

SY Slurry

Tetra Tech Tetra Tech, Inc.

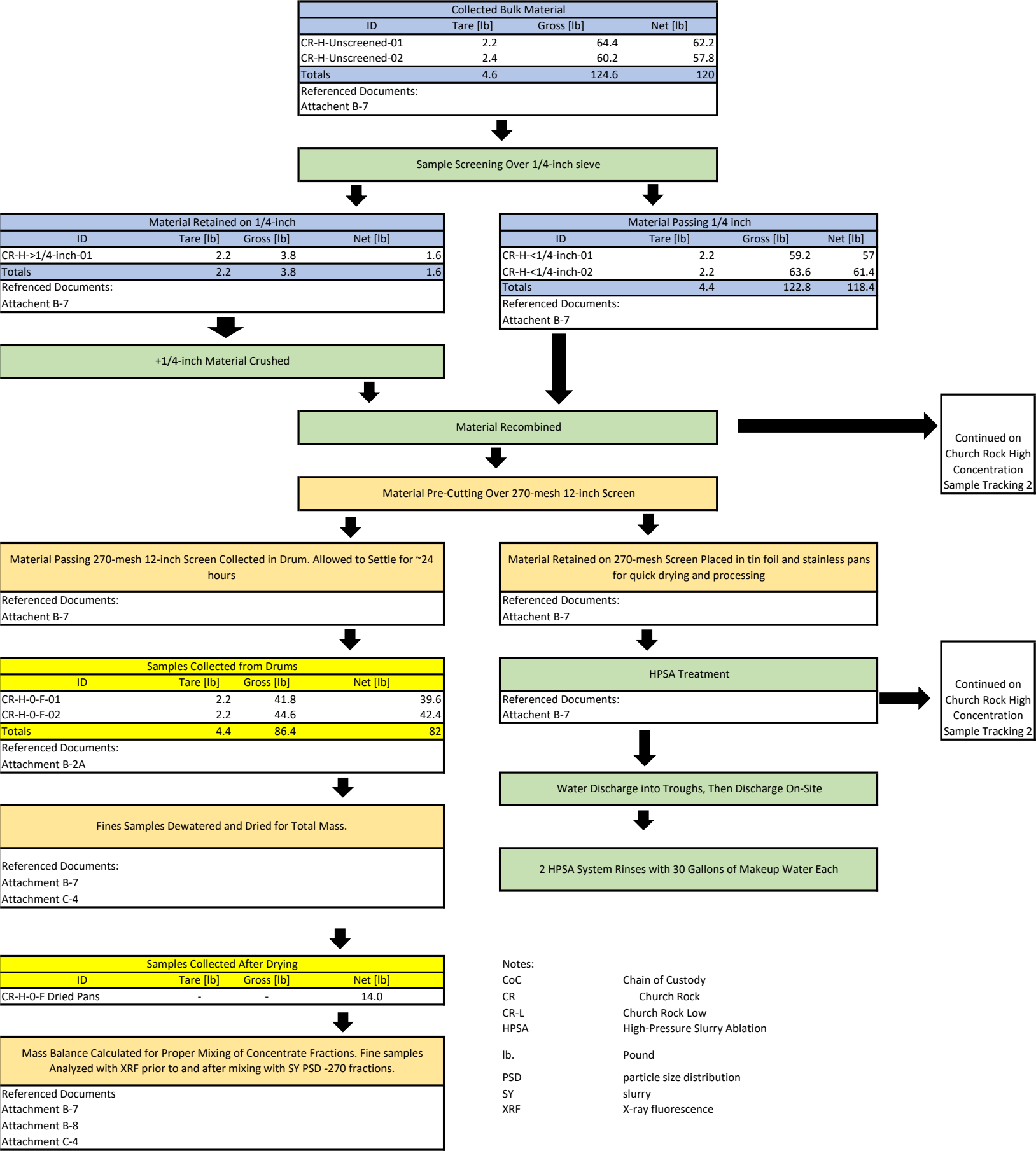
TO Task Order

WT Water

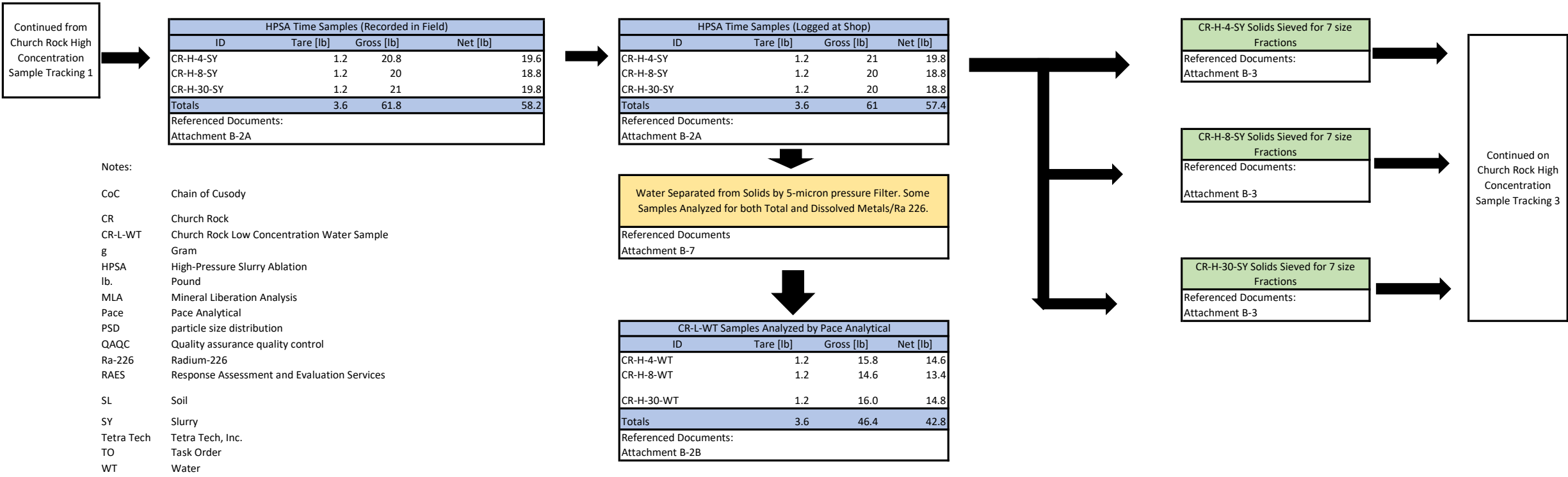
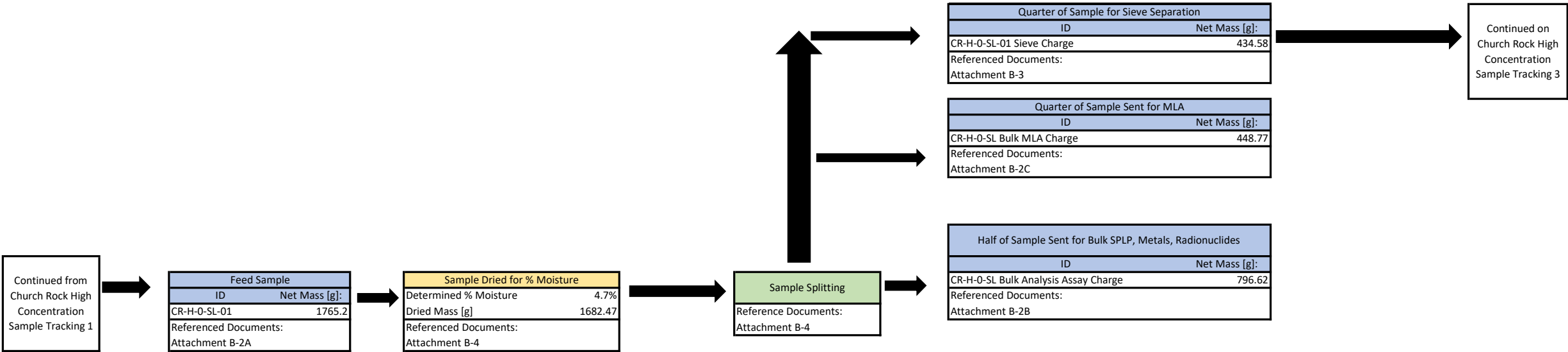


Church Rock High Concentration Sample Tracking

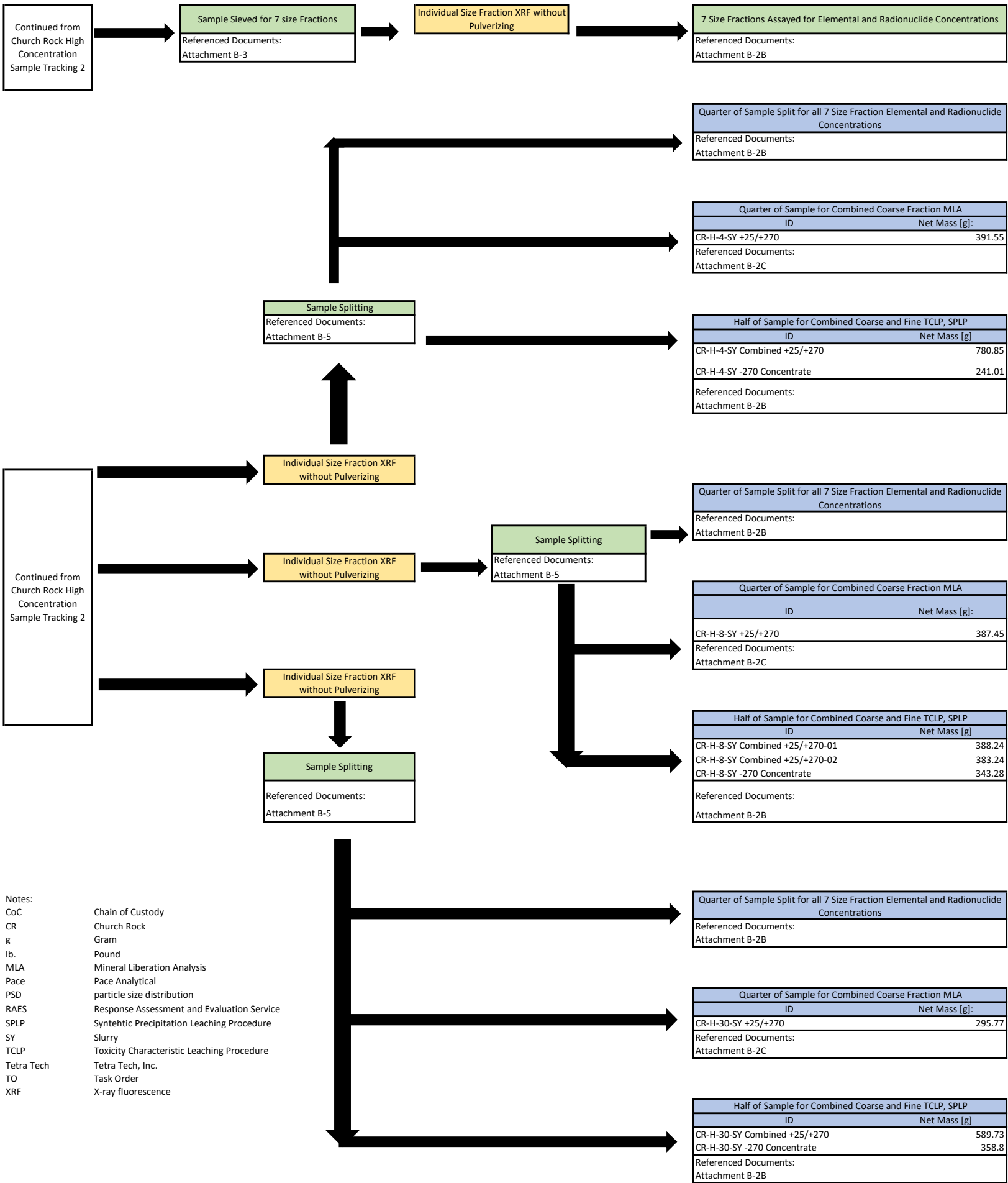
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Church Rock High Concentration Sample Tracking
2



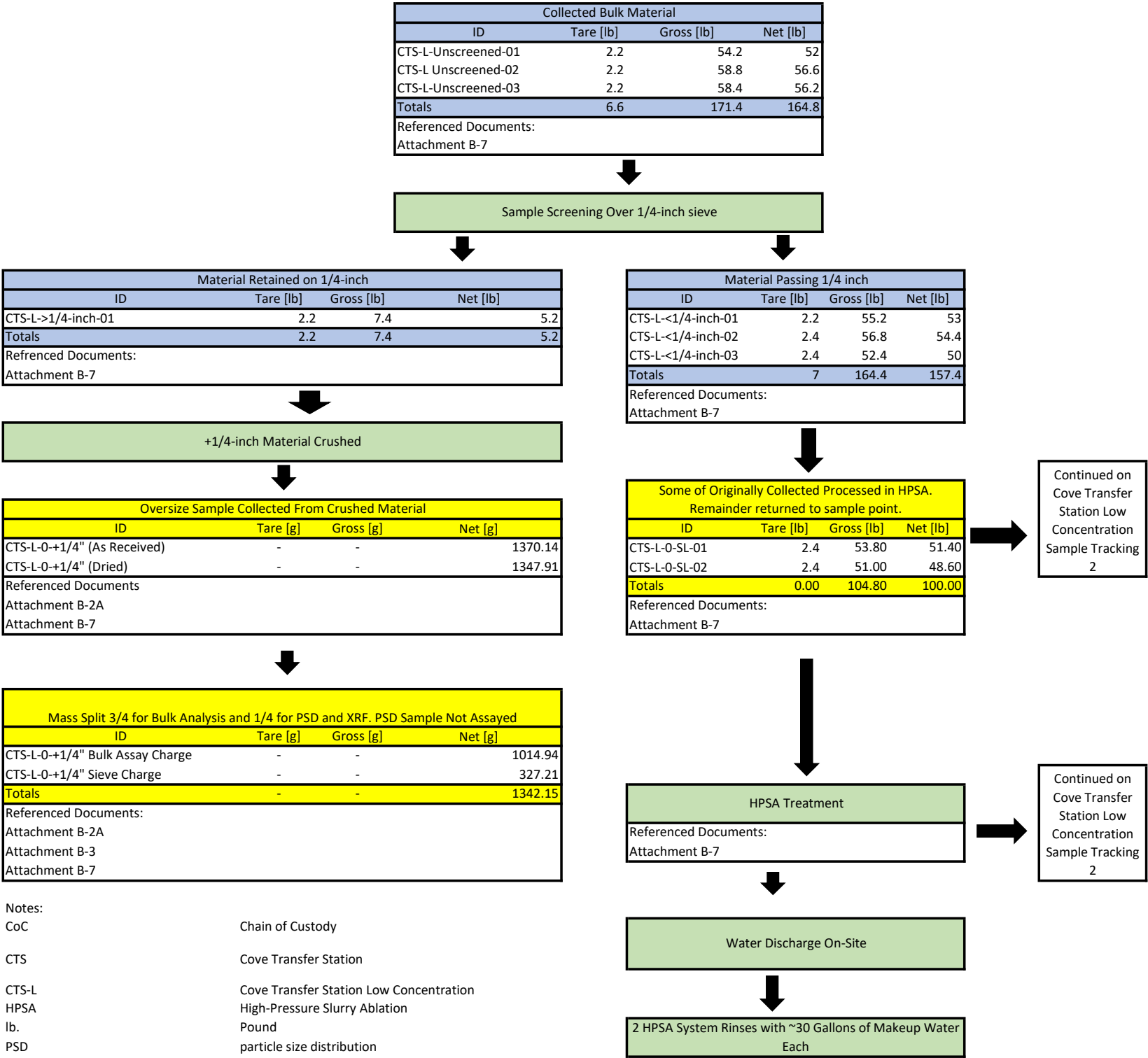
- Notes:
- CoC Chain of Custody
 - CR Church Rock
 - CR-L-WT Church Rock Low Concentration Water Sample
 - g Gram
 - HPSA High-Pressure Slurry Ablation
 - lb. Pound
 - MLA Mineral Liberation Analysis
 - Pace Pace Analytical
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 - TO Task Order
 - WT Water



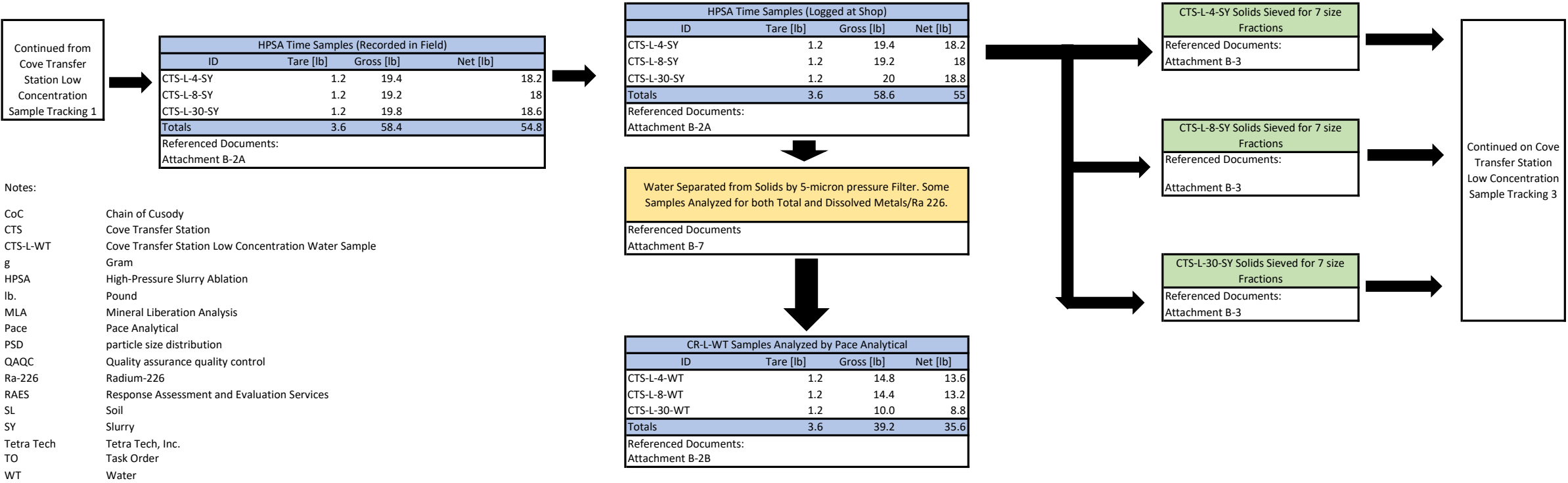
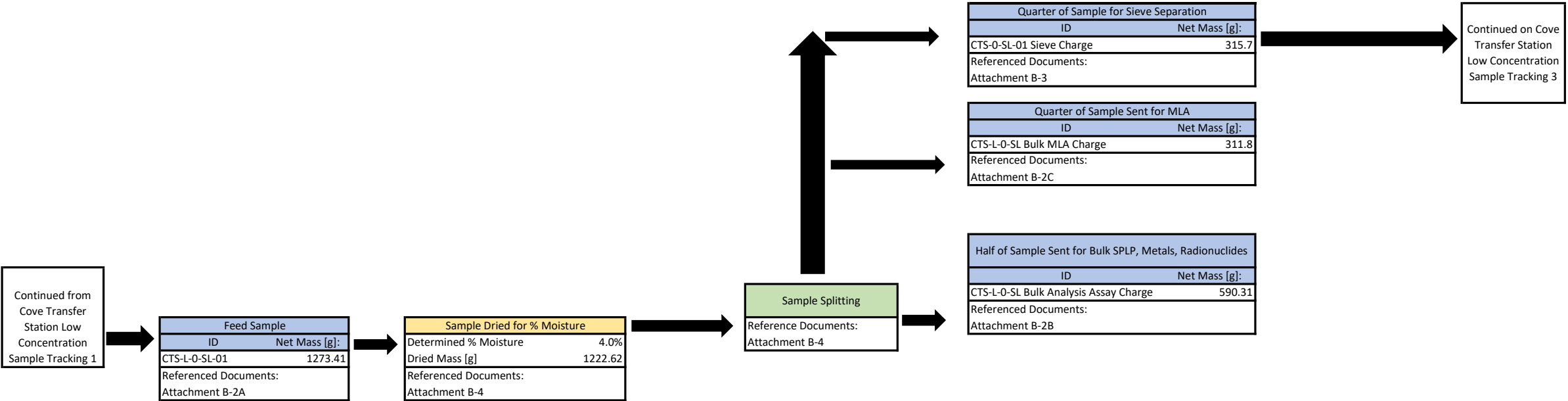
APPENDIX C-2
COVE TRANSFER STATION 2 SAMPLE TRACKING SHEETS

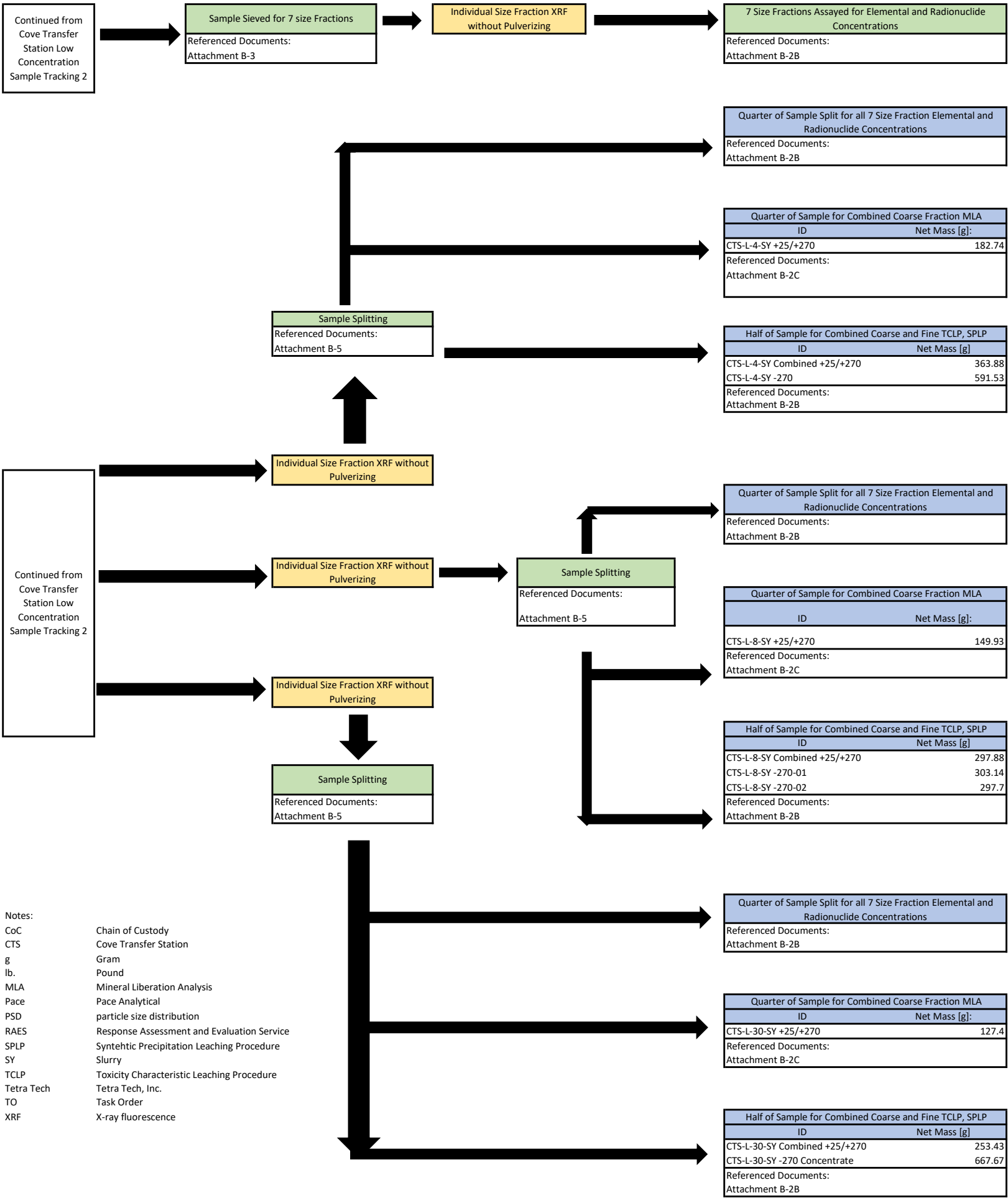
Cove Transfer Station Low Concentration Sample Tracking

1



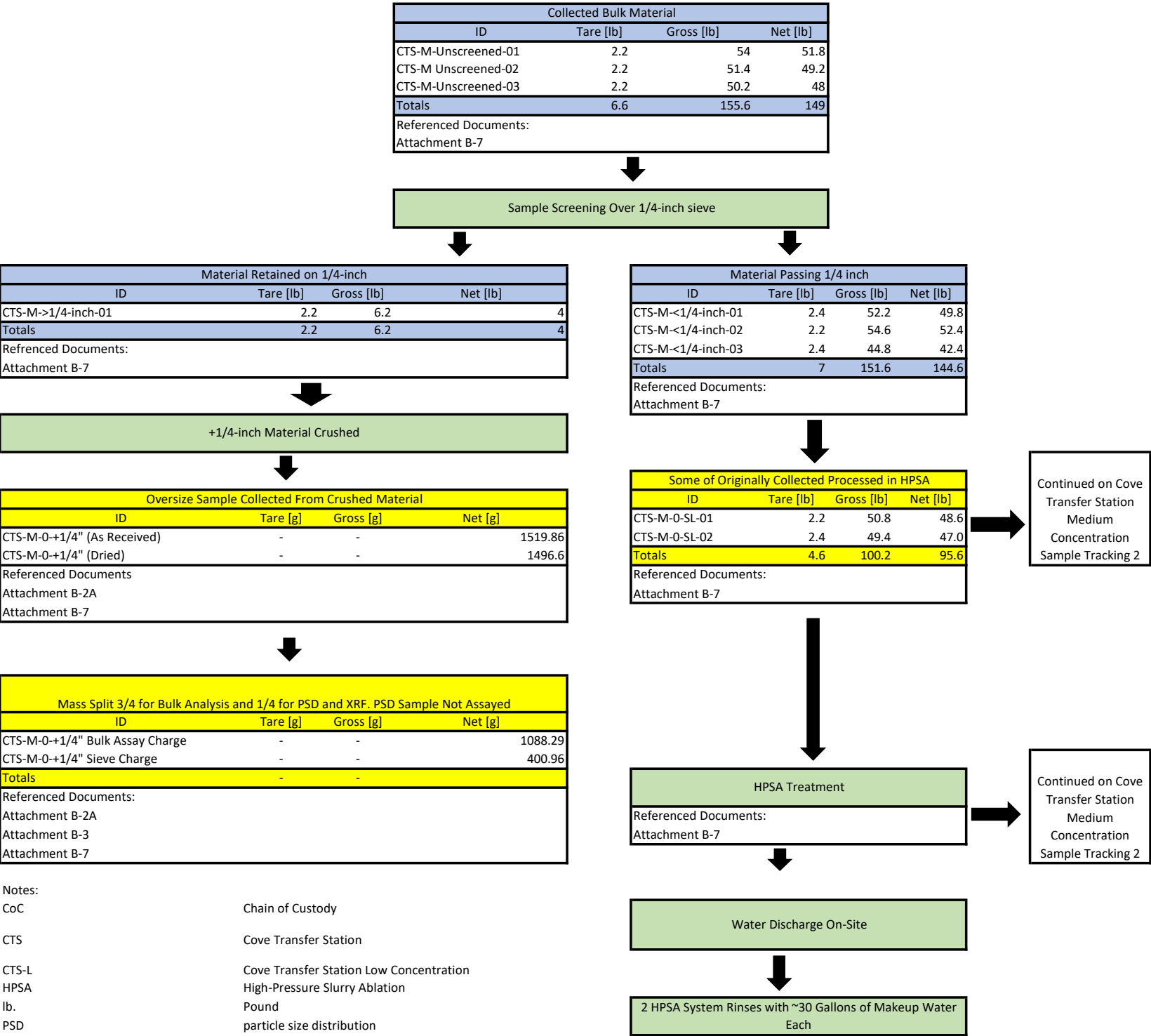
Cove Transfer Station Low Concentration Sample Tracking
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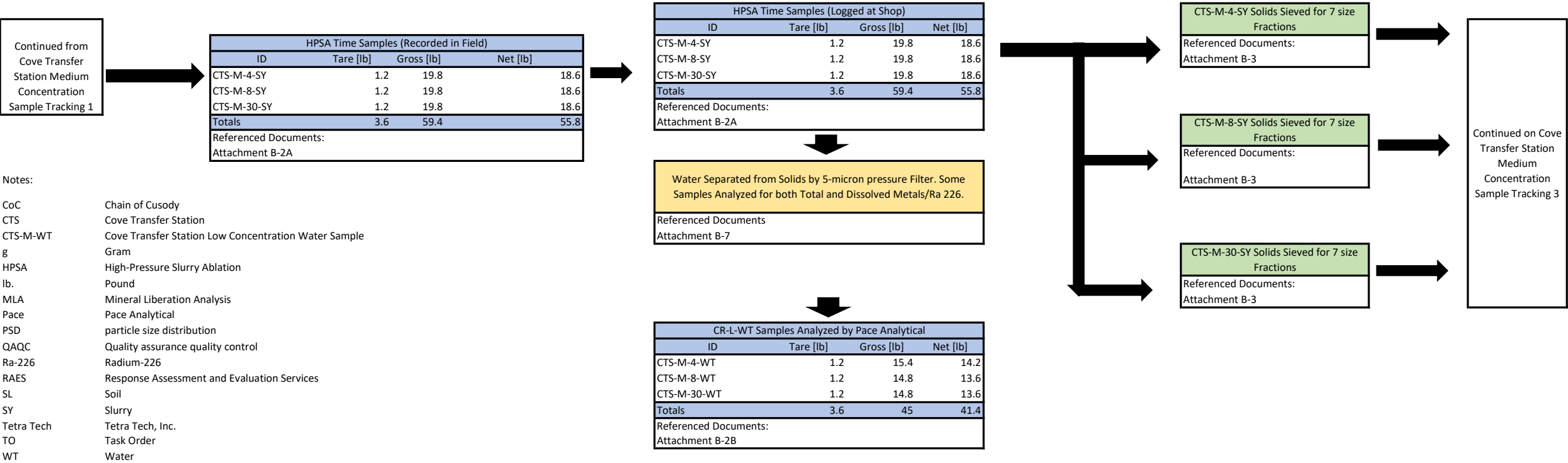
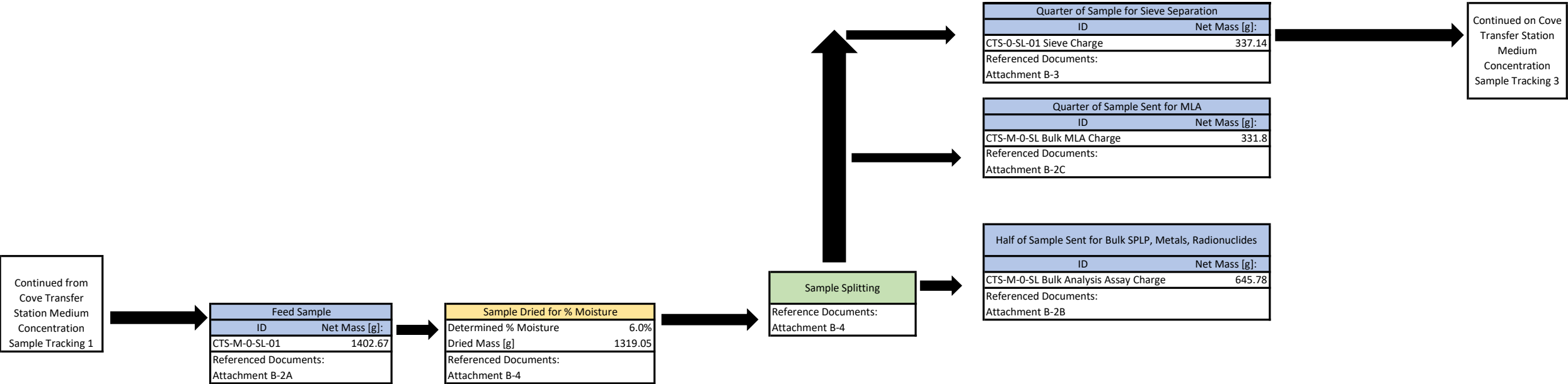


Cove Transfer Station Medium Concentration Sample Tracking

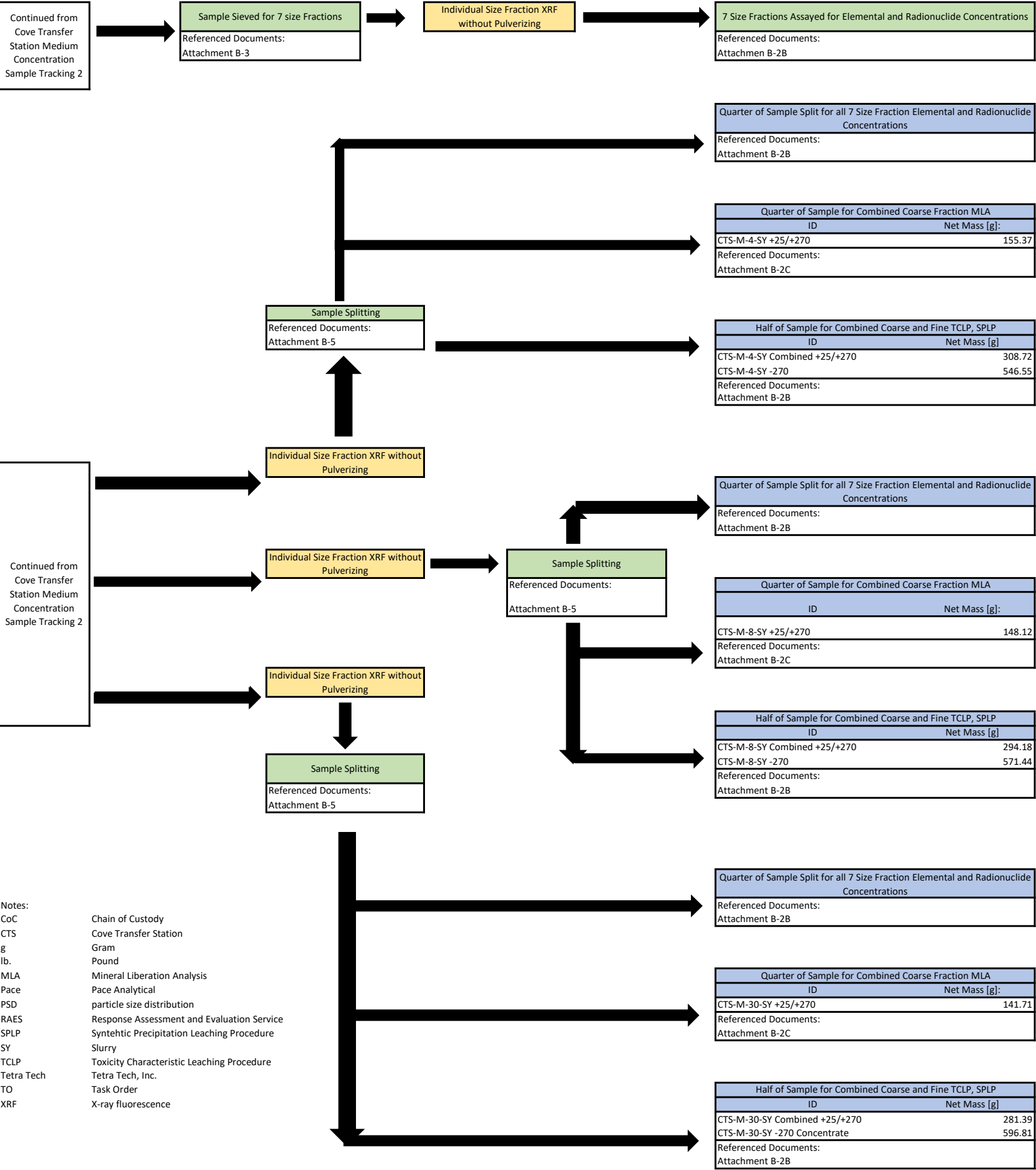
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Cove Transfer Station Medium Concentration Sample Tracking
2

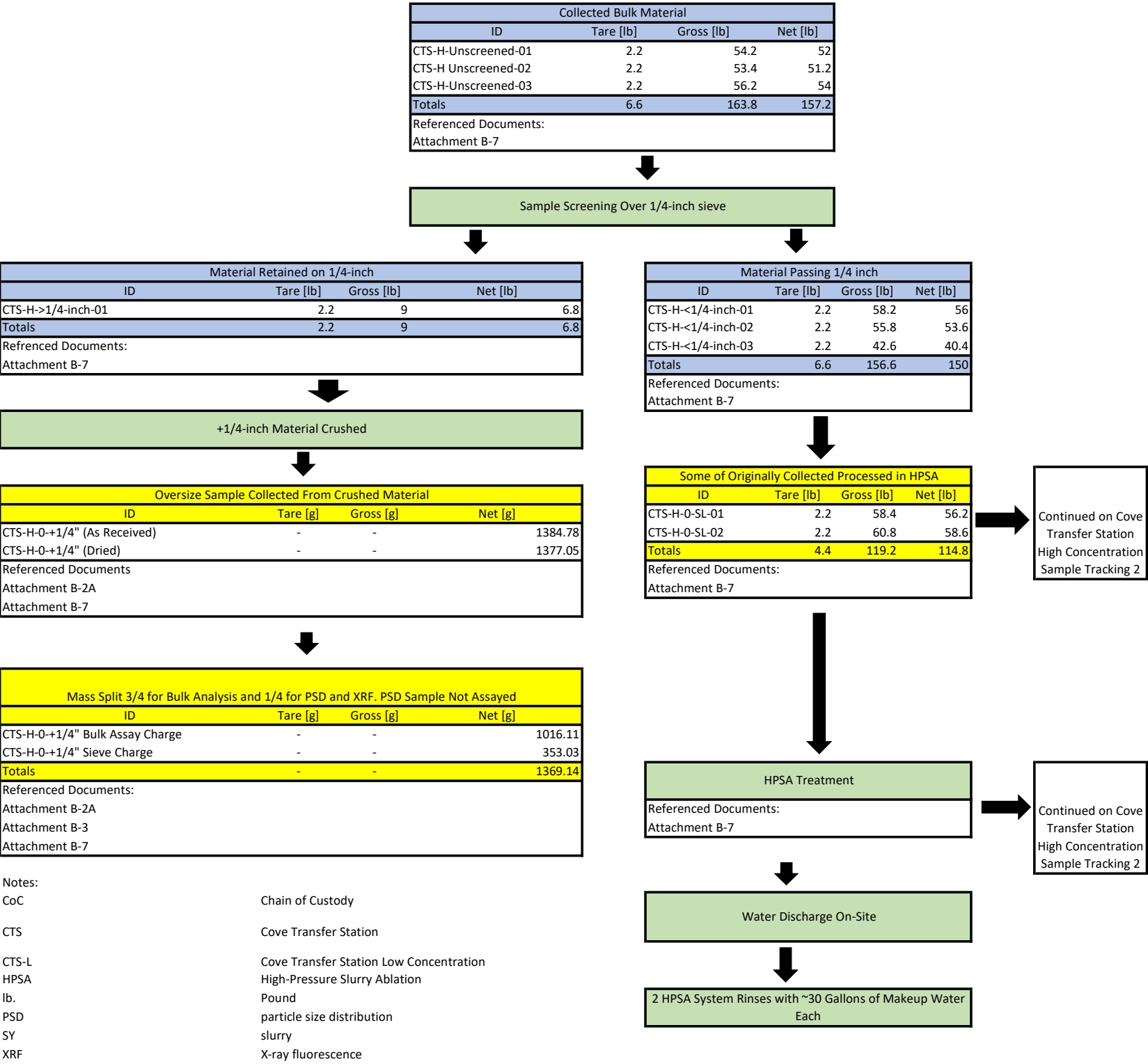


- Notes:
- CoC Chain of Custody
 - CTS Cove Transfer Station
 - CTS-M-WT Cove Transfer Station Low Concentration Water Sample
 - g Gram
 - HPSA High-Pressure Slurry Ablation
 - lb. Pound
 - MLA Mineral Liberation Analysis
 - Pace Pace Analytical
 - PSD particle size distribution
 - QAQC Quality assurance quality control
 - Ra-226 Radium-226
 - RAES Response Assessment and Evaluation Services
 - SL Soil
 - SY Slurry
 - Tetra Tech Tetra Tech, Inc.
 - TO Task Order
 - WT Water

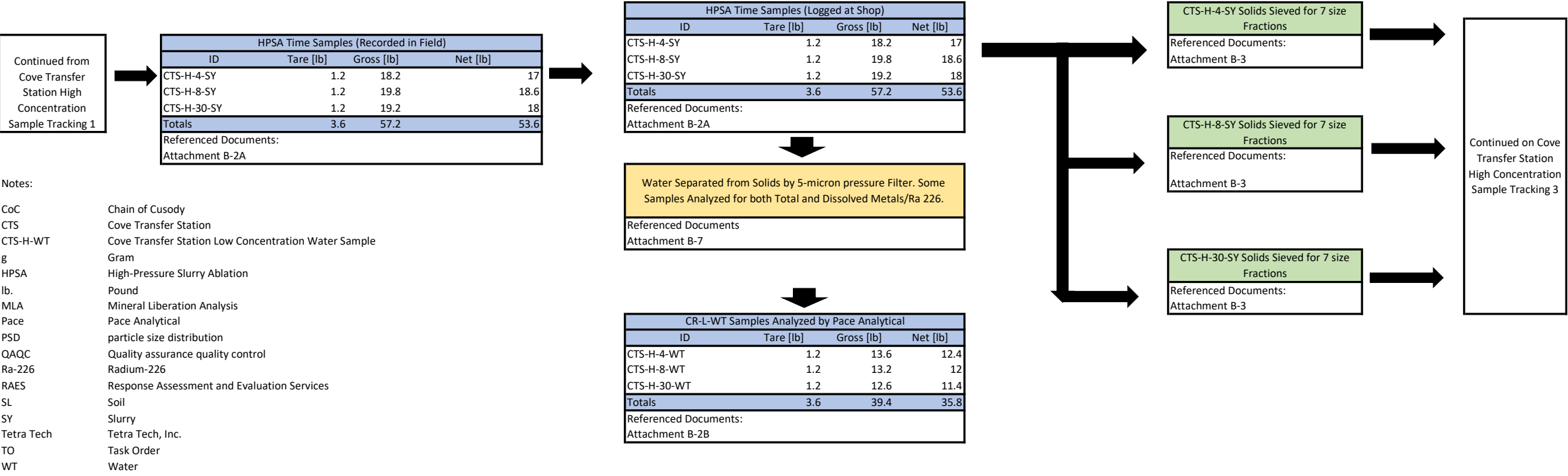
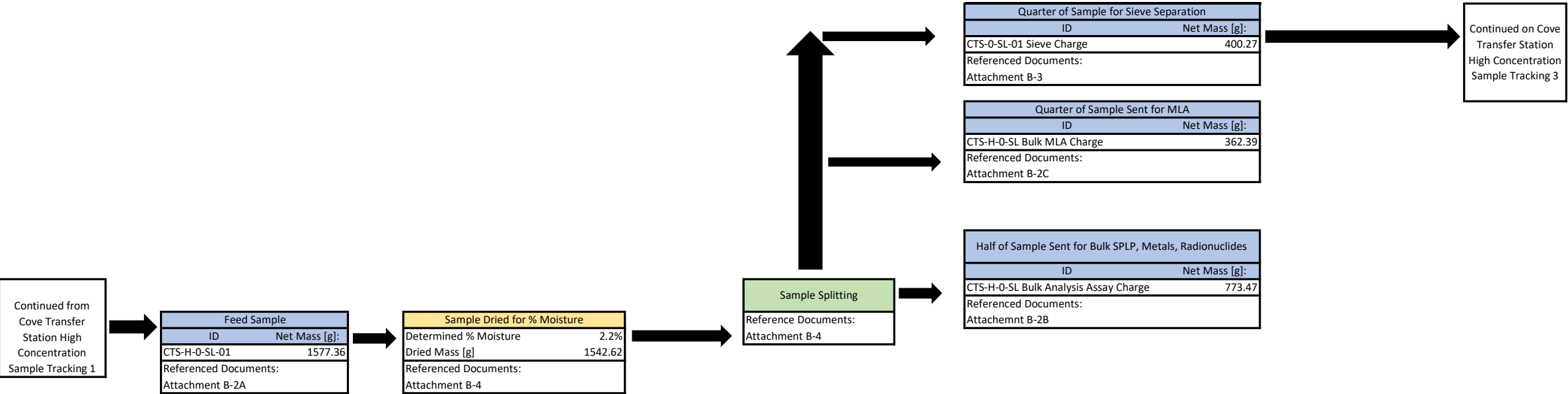


Cove Transfer Station High Concentration Sample Tracking

1



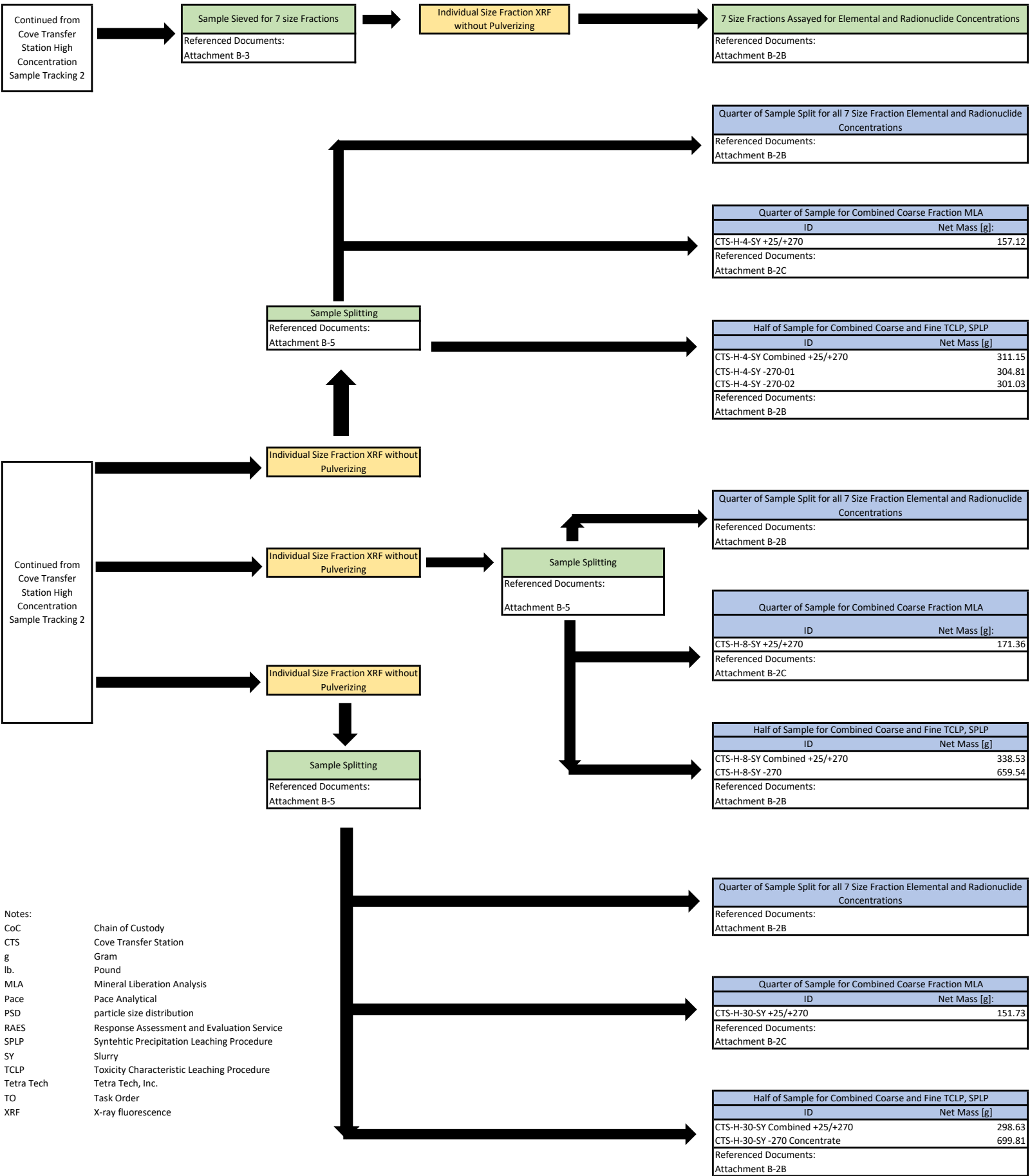
Cove Transfer Station High Concentration Sample Tracking
2



Notes:

CoC Chain of Custody
CTS Cove Transfer Station
CTS-H-WT Cove Transfer Station Low Concentration Water Sample
g Gram
HPSA High-Pressure Slurry Ablation
lb. Pound
MLA Mineral Liberation Analysis
Pace Pace Analytical
PSD particle size distribution
QAQC Quality assurance quality control
Ra-226 Radium-226
RAES Response Assessment and Evaluation Services
SL Soil
SY Slurry
Tetra Tech Tetra Tech, Inc.
TO Task Order
WT Water

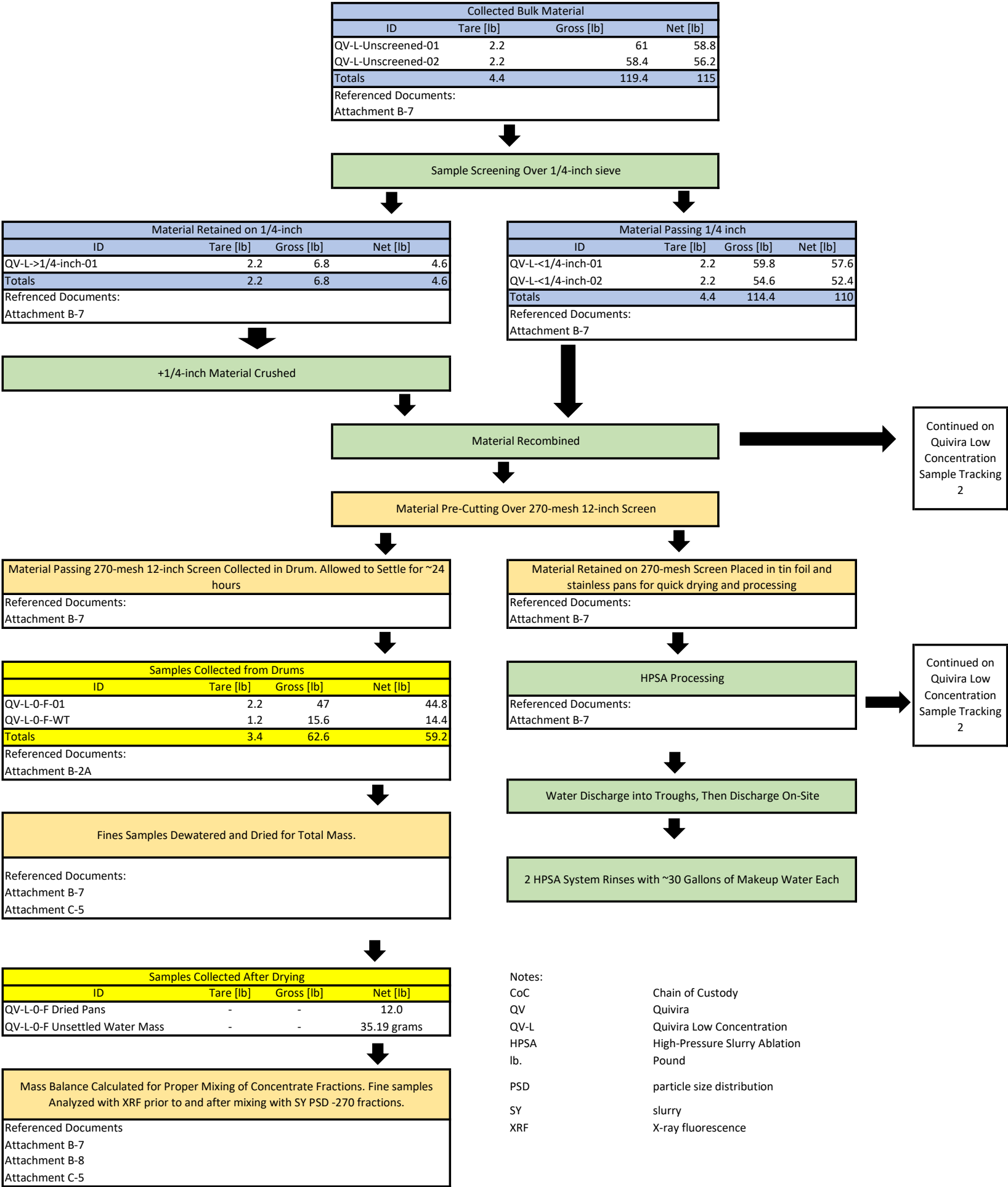
Cove Transfer Station High Concentration Sample Tracking
3



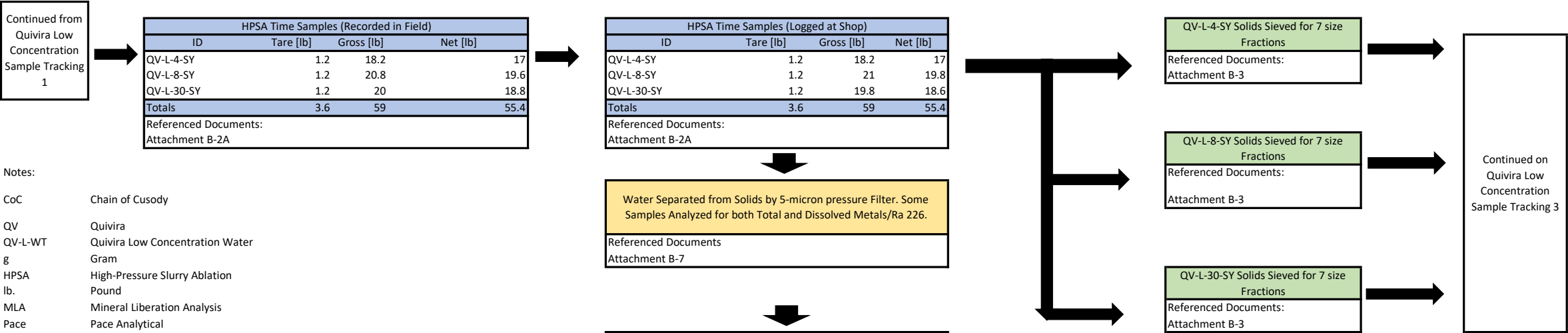
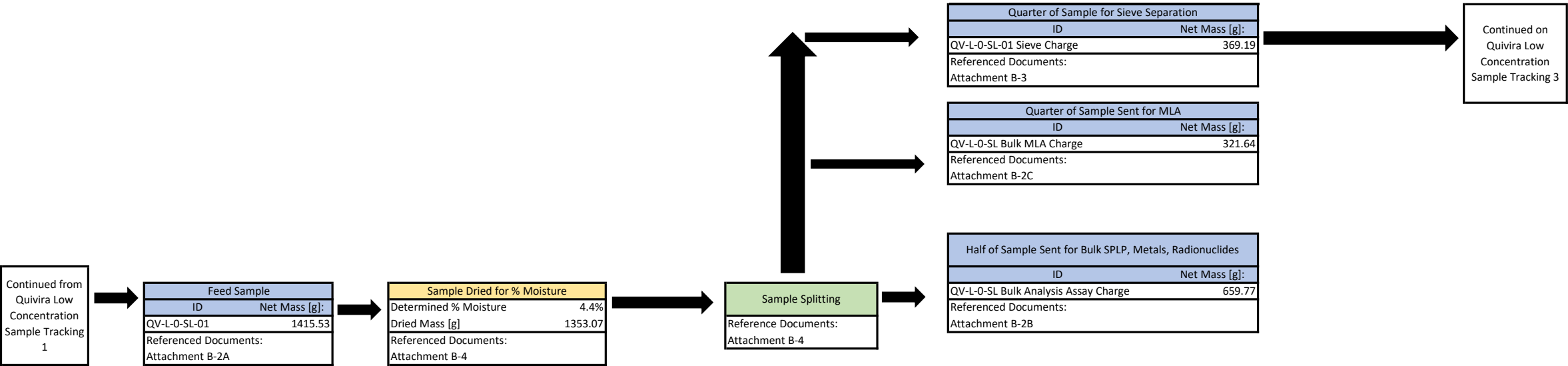
APPENDIX C-3
QUIVIRA CHURCH ROCK 1 MINE SAMPLE TRACKING SHEETS

Quivira Low Concentration Sample Tracking

1

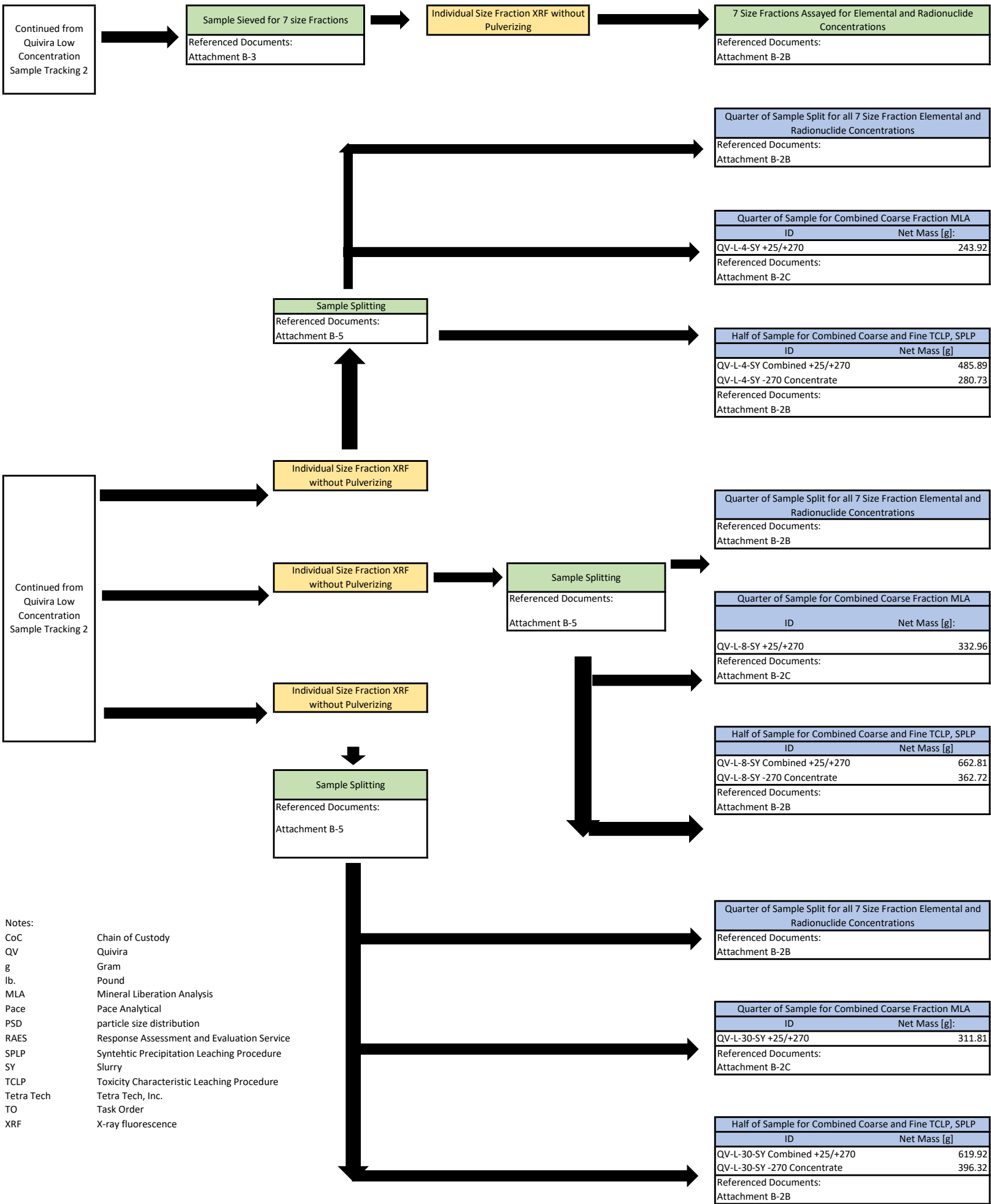


Quivira Low Concentration Sample Tracking
2



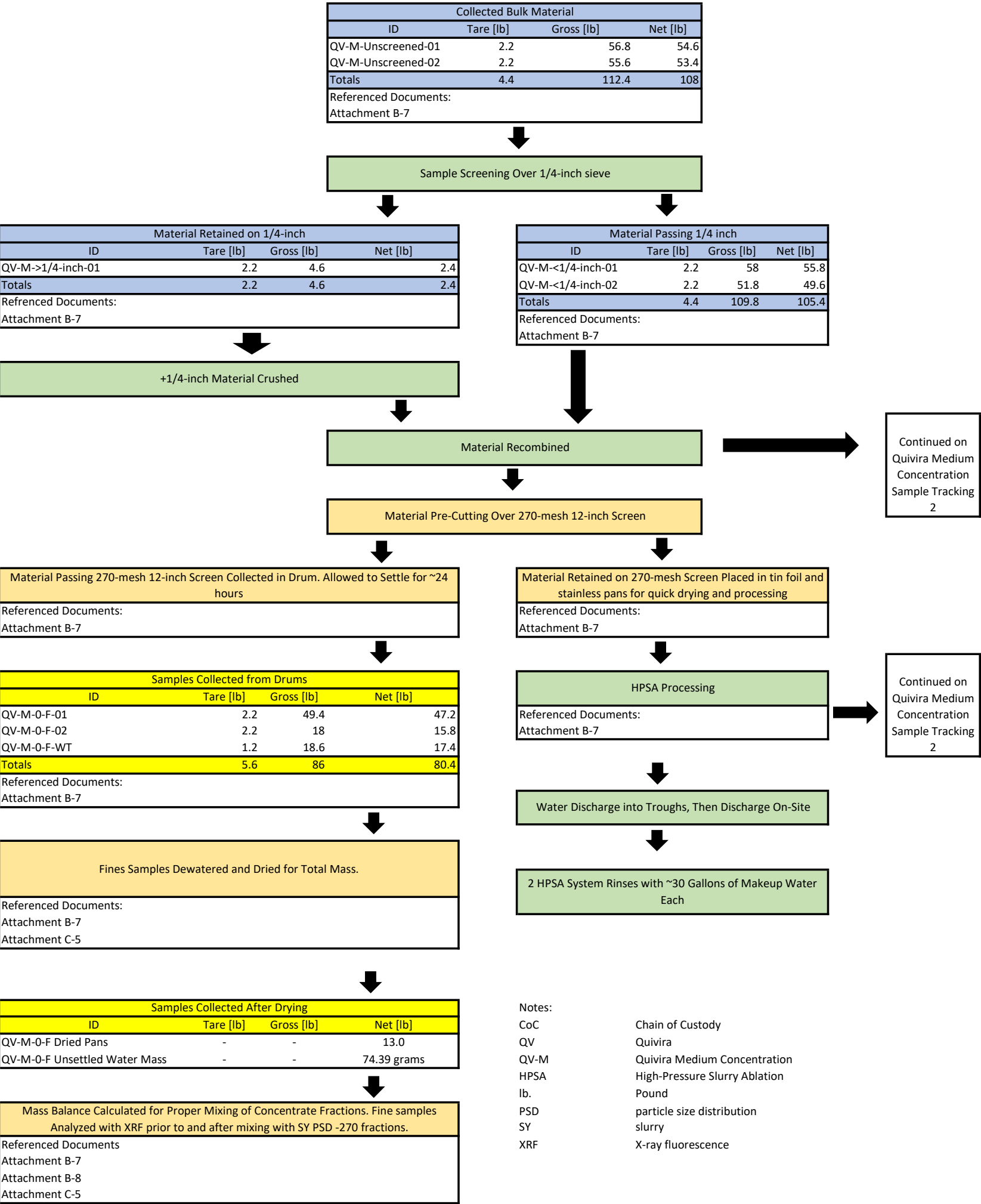
- Notes:
- CoC Chain of Custody
- QV Quivira
- QV-L-WT Quivira Low Concentration Water
- g Gram
- HPSA High-Pressure Slurry Ablation
- lb. Pound
- MLA Mineral Liberation Analysis
- Pace Pace Analytical
- PSD particle size distribution
- QAQC Quality assurance quality control
- Ra-226 Radium-226
- RAES Response Assessment and Evaluation Services
- SL Soil
- SY Slurry
- Tetra Tech Tetra Tech, Inc.
- TO Task Order
- WT Water

QV-L-WT Samples Analyzed by Pace Analytical			
ID	Tare [lb]	Gross [lb]	Net [lb]
QV-L-4-WT	1.2	14.8	13.6
QV-L-8-WT	1.2	16.4	15.2
QV-L-30-WT	1.2	15.8	14.6
Totals	3.6	47	43.4
Referenced Documents: Attachment B-2B			

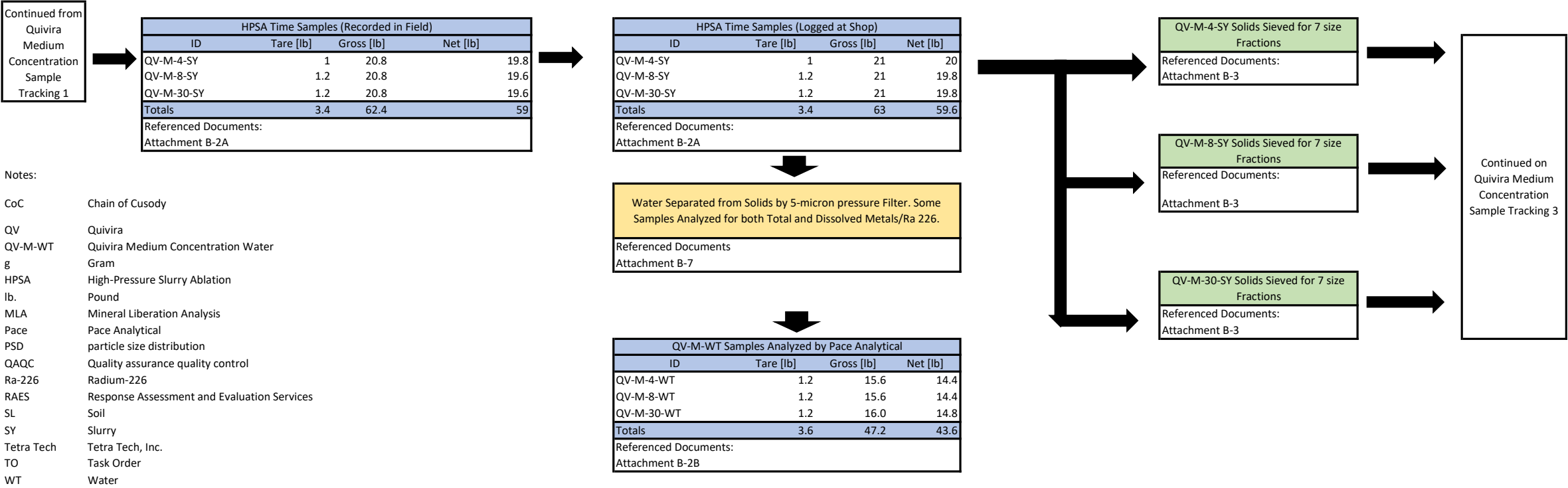
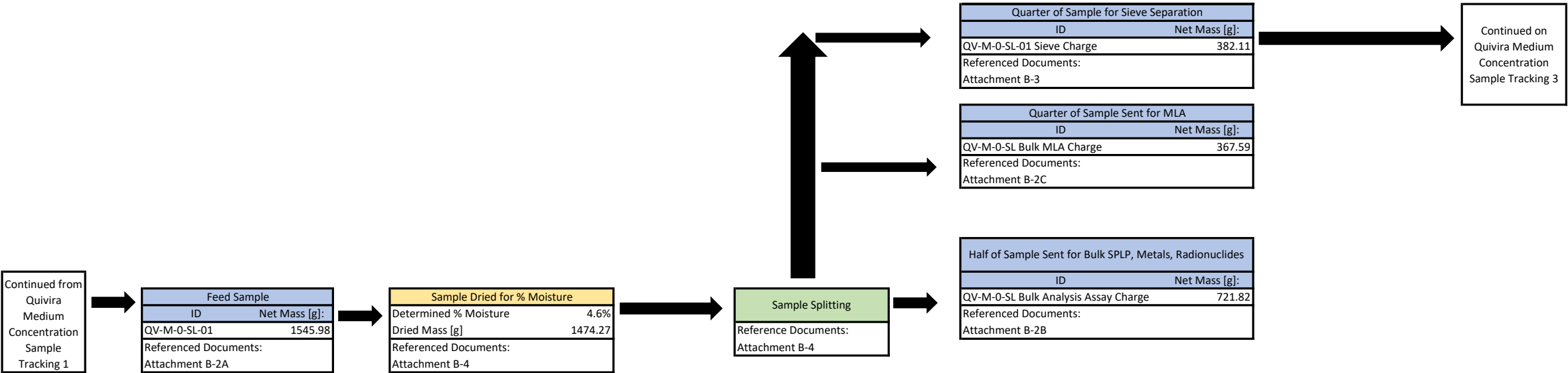


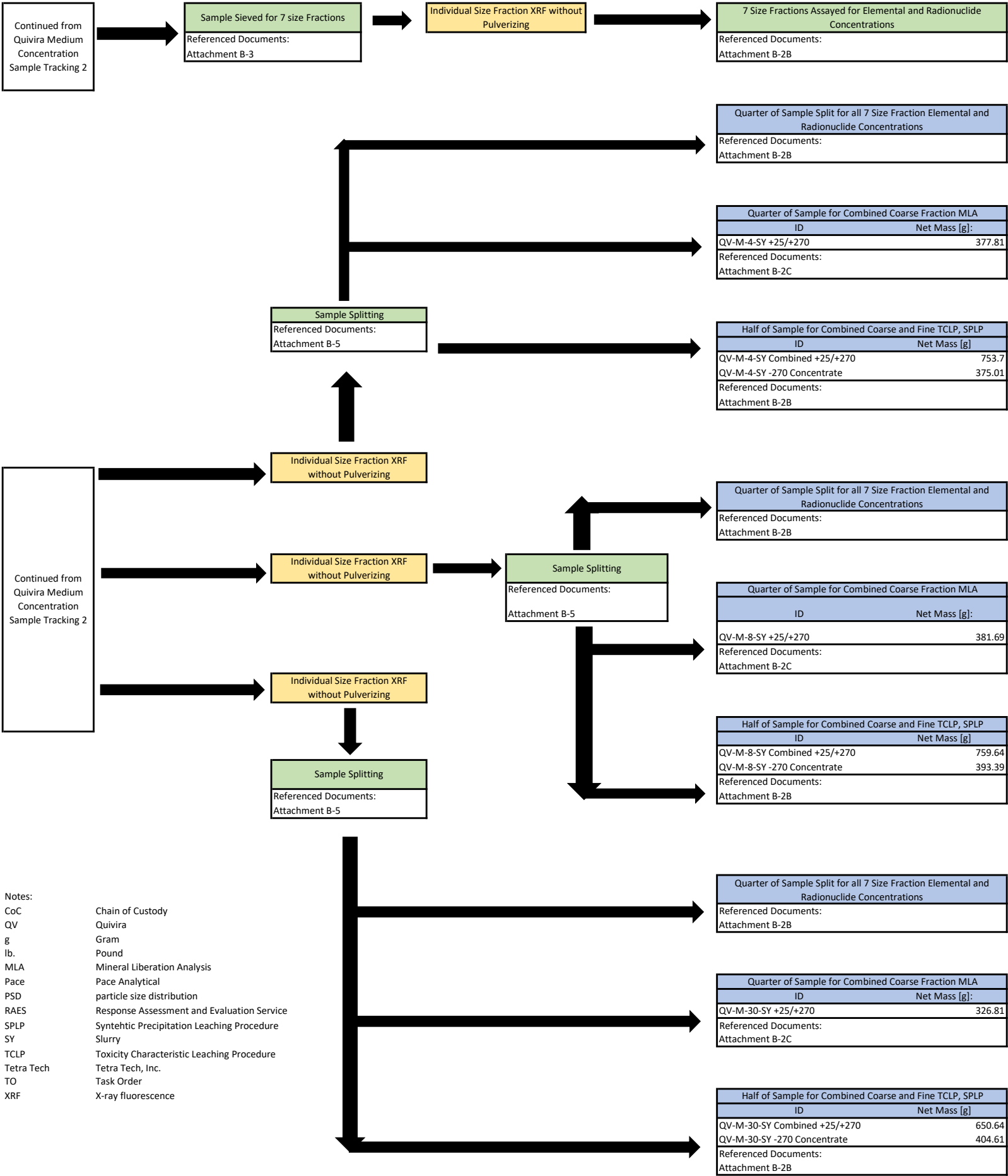
Quivira Medium Concentration Sample Tracking

1



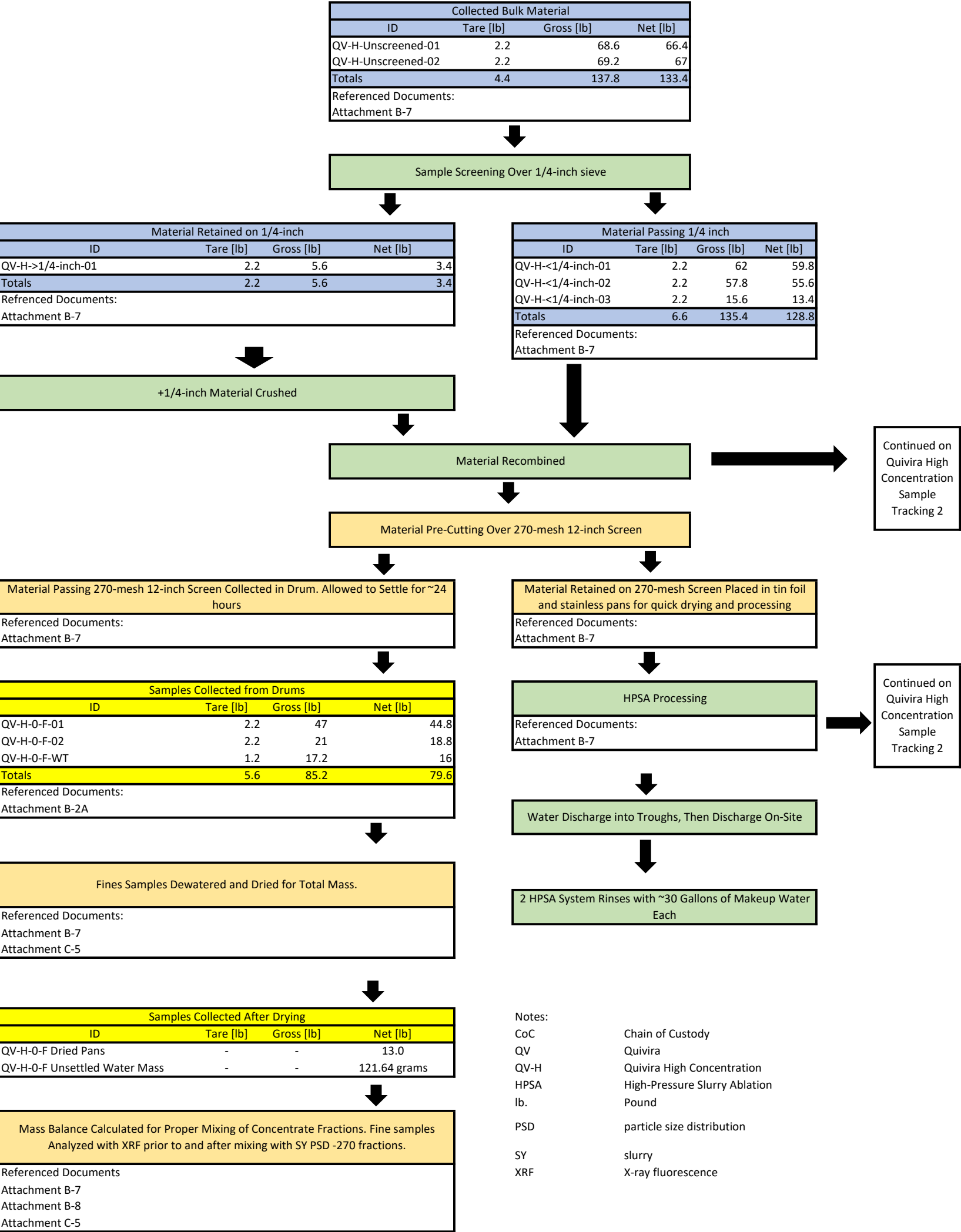
Quivira Medium Concentration Sample Tracking
2

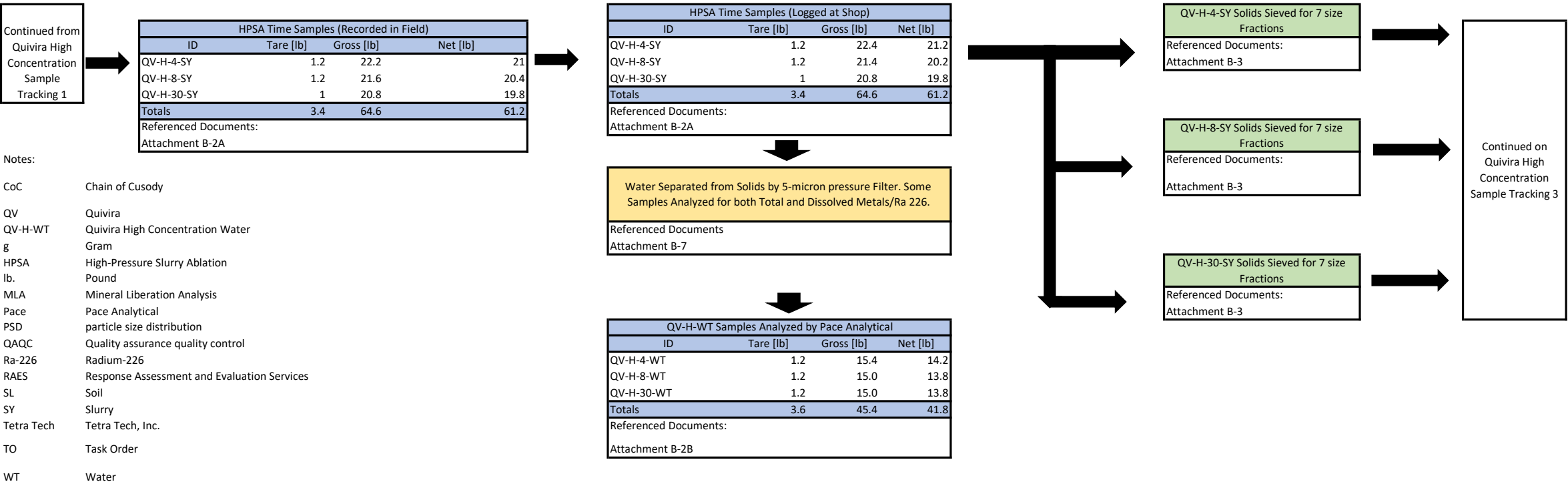
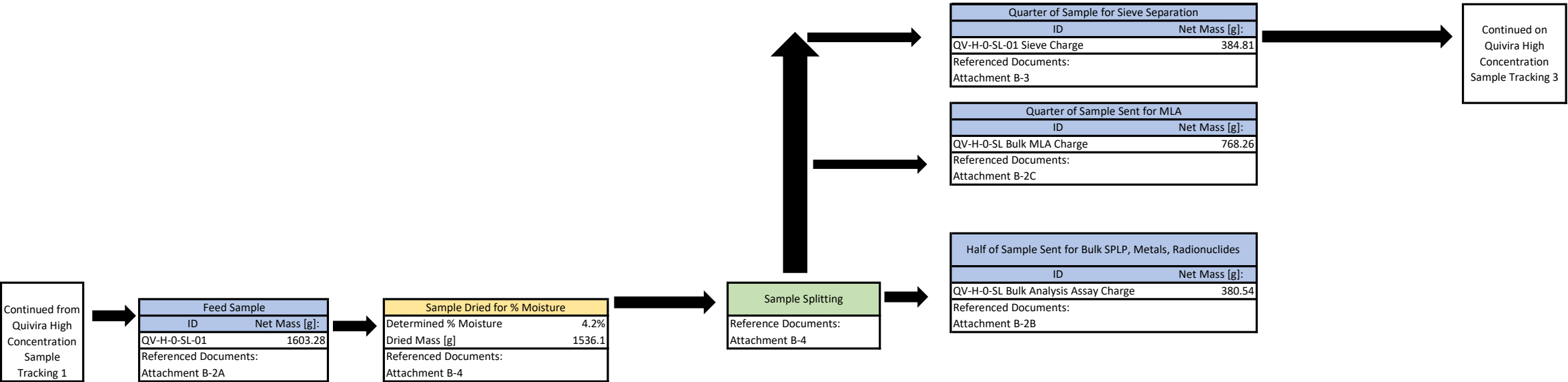




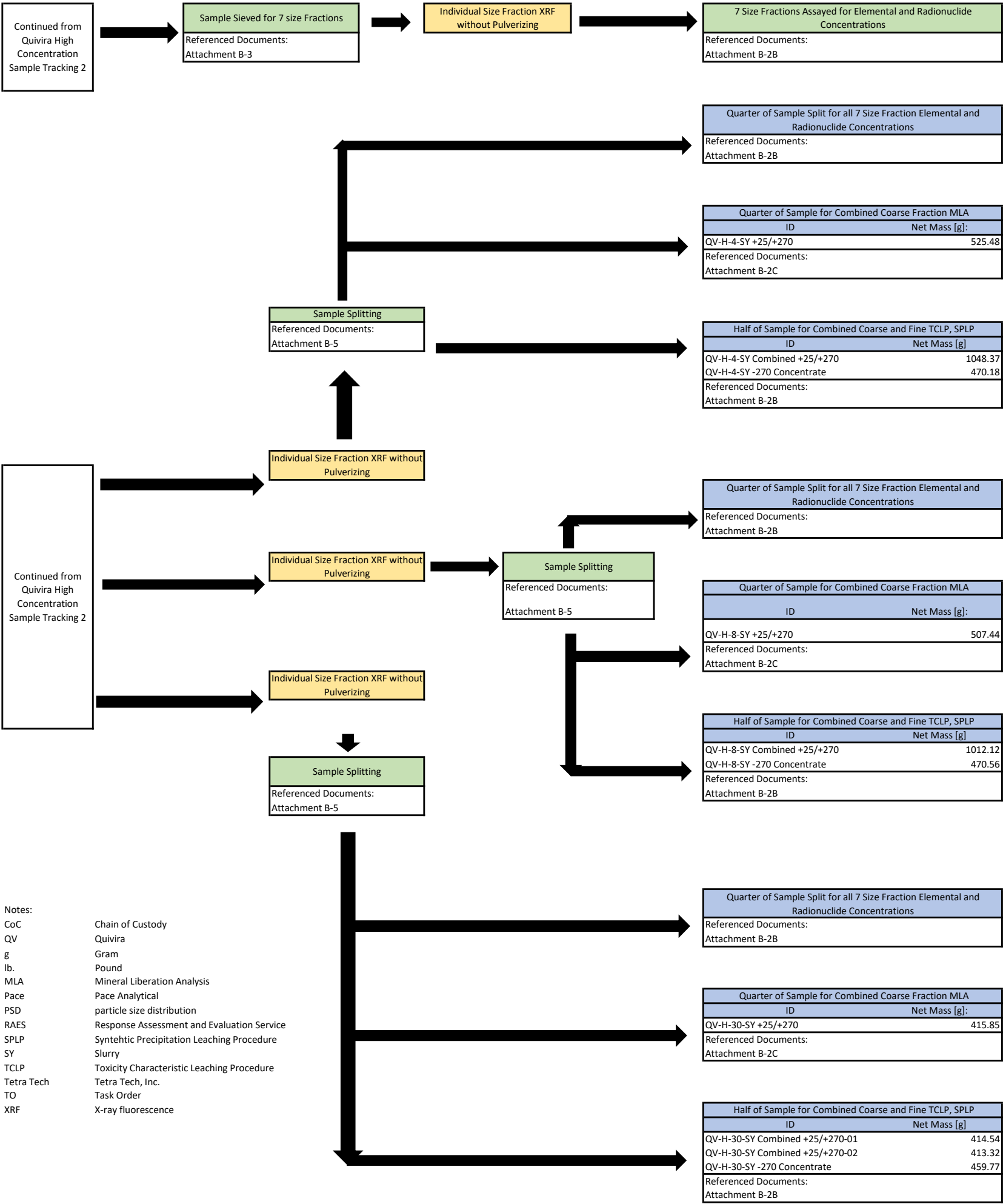
Quivira High Sample Concentration Tracking

1





- Notes:
- CoC Chain of Custody
 - QV Quivira
 - QV-H-WT Quivira High Concentration Water
 - g Gram
 - HPSA High-Pressure Slurry Ablation
 - lb. Pound
 - MLA Mineral Liberation Analysis
 - Pace Pace Analytical
 - PSD particle size distribution
 - QAQC Quality assurance quality control
 - Ra-226 Radium-226
 - RAES Response Assessment and Evaluation Services
 - SL Soil
 - SY Slurry
 - Tetra Tech Tetra Tech, Inc.
 - TO Task Order
 - WT Water



APPENDIX C-4
OLD CHURCH ROCK MINE MASS BALANCE SHEETS

Church Rock Low Concentration Mass Balance

1

Original Mass Collected			
Bucket	Tare [lb]	Gross [lb]	Net [lb]
CR-L-Unscreened-01	2.2	51.8	49.6
CR-L-Unscreened-02	2.2	48.8	46.6
Totals	4.4	100.6	96.2



Material Screening over 1/4 inch

1/4" Screened Material				
Bucket	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
CR-L-0-SL +1/4 inch-01	2.2	2.6	0.4	0.4%
CR-L-0-SL -1/4 inch-01	2.2	45.8	43.6	99.6%
CR-L-0-SL -1/4 inch-02	2.2	54.2	52	
	6.6	102.6	96	



Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1462.31
Estimated Remaining Mass 8/26 [lb]	92.78



Moisture Content as Determined as Disa Lab

% Moisture	4.23%
Estimated True Dry Mass [lb]	88.9



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on Church Rock Low Concentration Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
CR-L-0-F-01	2.8	3	0.2
CR-L-0-F-02	2.8	8.2	5.4
CR-L-0-F-03	2.8	9.4	6.6
CR-L-0-F-04	2.8	5	2.2
			14.4

Unsettled Water Collection	
Depth Drum Total [in]	34
Volume Drum Total [gal]	55
Full Volume Used	
Collected Unsettled Water Bucket Net Mass [lb]	14.8
Collected Unsettled Water Volume [gal]	1.77
Sampled as % of Total	3.2%
Net Mass Unsettled Water Sample [g]	6.66
Approximate Unsettled Mass [lb]	0.46

Notes:

Refer to sample nomenclature in Section 4.1

lb pound
g gram

Church Rock Low Concentration Mass Balance
2

Continued from
Church Rock Low
Concentration Mass
Balance 2



Coarse Material Processed 8/28/2022



Samples Collected and Wet Sieved at Disa HQ

Dry Calculated Mass [lb]	74.0
Still Wet Mass Not Recorded	
Processed Mass % of Total	83.3%
Fines Mass % of Total	16.7%

Sample ID	Field CoC 8/25/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
CR-L-4-SY	1.2	17.6	16.4	1.2	17.6	16.4	941.91	2.08	12.7%
CR-L-8-SY	1.2	17.8	16.6	1.2	18.2	17	994.84	2.19	12.9%
CR-L-30-SY	1.2	18	16.8	1.2	18.2	17	991.67	2.19	12.9%

Notes:
Refer to sample nomenclature in Section 4.1
CoC chain of custody
g gram
lb pound
mg/kg milligrams per kilogram
U Uranium

Mass Balance and Combination Goals							
Sample ID	RO-TAP Mass (-270-mesh) [g]	Mass % of RO-TAP Sample	Mass % TTL by Mass Balance	Proposed Mass Added of CR-L-O-F [g]	RO-TAP -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
CR-L-4-SY	111.20	11.8%	9.83%	189.09	168	192	183
CR-L-8-SY	112.07	11.3%	9.38%	199.72	111	192	163
CR-L-30-SY	137.04	13.8%	11.51%	199.08	93	192	152

Sample Mass Check				
Sample ID	Total RO-TAP Mass [g]	Total RO-TAP Mass Including Combined CR-L-O-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
CR-L-4-SY	941.91	1131.00	26.55%	26.55%
CR-L-8-SY	994.84	1194.56	26.10%	26.10%
CR-L-30-SY	991.67	1190.75	28.23%	28.23%

Church Rock Medium Concentration Mass Balance

1

Unscreened Mass			
Bucket	Tare [lb]	Gross [lb]	Net [lb]
CR-M-0-SL Unscreened-01	2.2	61.2	59
CR-M-0-SL Unscreened-02	2.4	55.8	53.4
Totals	4.6	117	112.4



Material Screening over 1/4 inch

Post-Screening				
Bucket	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
CR-M-0-SL +1/4 inch-01	2.2	4.2	2	1.8%
CR-M-0-SL -1/4 inch-01	2.2	54.2	52	98.2%
CR-M-0-SL -1/4 inch-02	2.2	60	57.8	
Totals	6.6	118.4	111.8	



Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1392.81
Estimated Remaining Mass [lb]	108.7



Moisture Content as Determined as Disa Lab

% Moisture	6.50%
Estimated True Dry Mass [lb]	101.7



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on Church Rock Medium Concentration Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
CR-M-0-F-01	2.8	10.6	7.8
CR-M-0-F-02	2.8	4	1.2
CR-M-0-F-03	3	6.8	3.8
			12.8

Unsettled Water Collection	
Depth Drum Total [in]	34
Volume Drum Total [gal]	55
Total Drum Volume Used	
Collected Unsettled Water Bucket Net Mass [lb]	15.8
Collected Unsettled Water Volume [gal]	1.89
Sampled as % of Total	3.4%
Net Mass Unsettled Water Sample [g]	2.85
Approximate Unsettled Mass [lb]	0.18

Notes:

Refer to sample nomenclature in Section 4.1

lb pound
g gram

Church Rock Medium Concentration Mass Balance

2

Continued from Church
Rock Medium
Concentration Mass
Balance 2



Coarse Material Processed 8/28/2022



Samples Collected and RO-TAPped at Disa HQ

Dry Calculated Mass [lb]		88.7	
Still Wet Mass Recorded in Field			
ID	Tare [lb]	Gross [lb]	Net [lb]
Bucket 1	-	-	53.2
Bucket 2	-	-	52
		Total	105.2
		% Moisture	15.7%

Only net mass recorded

Processed Mass % of Total	87.2%
Fines Mass % of Total	12.8%

Notes:

Refer to sample nomenclature in Section 4.1

CoC	chain of custody
g	gram
lb	pound
mg/kg	milligrams per kilogram
U	Uranium

Sample ID	Field CoC 8/28/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
CR-M-4-SY	1.2	18.4	17.2	1.2	18.6	17.4	1130.23	2.5	14.3%
CR-M-8-SY	1.2	20.2	19.0	1.2	20.0	18.8	1408.47	3.1	16.5%
CR-M-30-SY	1.2	19.2	18.0	1.2	19.4	18.2	1251.94	2.8	15.2%

Mass Balance and Combination Goals							
Sample ID	RO-TAP Mass (-270-mesh) [g]	Mass % of RO-TAP Sample	Mass % TTL by Mass Balance	Proposed Mass Added of CR-M-O-F [g]	RO-TAP -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
CR-M-4-SY	109.17	9.7%	8.4%	165.47	735	1326	1091
CR-M-8-SY	131.25	9.3%	8.1%	206.20	671	1326	1071
CR-M-30-SY	171.24	13.7%	11.9%	183.29	391	1326	874

Sample Mass Check				
Sample ID	Total RO-TAP Mass [g]	Total RO-TAP Mass Including Combined CR-M-O-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
CR-M-4-SY	1130.23	1295.70	21.20%	21.20%
CR-M-8-SY	1408.47	1614.67	20.90%	20.90%
CR-M-30-SY	1251.94	1435.23	24.70%	24.70%

Church Rock High Concentration Mass Balance

1

Unscreened Mass			
Bucket	Tare [lb]	Gross [lb]	Net [lb]
CR-H-0-SL Unscreened-01	2.2	64.4	62.2
CR-H-0-SL Unscreened-02	2.4	60.2	57.8
Totals	4.6	124.6	120



Material Screening over 1/4 inch

Post-Screening				
Bucket	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
CR-H-0-SL +1/4 inch-01	2.2	3.8	1.6	1.3%
CR-H-0-SL -1/4 inch-01	2.2	59.2	57	98.7%
CR-H-0-SL -1/4 inch-02	2.2	63.6	61.4	
Totals	6.6	126.6	120	



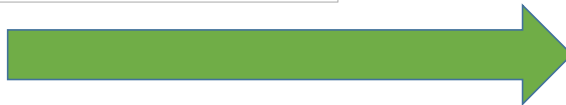
Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1765.20
Estimated Remaining Mass [lb]	116.1



Moisture Content as Determined as Disa Lab

% Moisture	4.69%
Estimated True Dry Mass [g]	110.7



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on Church Rock High Concentration Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

Notes:

Refer to sample nomenclature in Section 4.1

lb pound
g gram

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
CR-H-0-F-01	2.8	3.8	1.0
CR-H-0-F-02	2.8	7.2	4.4
CR-H-0-F-03	2.8	11.4	8.6
			14.0
All Water Settled			

Church Rock High Concentration Mass Balance
2

Continued from Church
Rock High
Concentration Mass
Balance 2

Coarse Material Processed 8/28/2022

Samples Collected and RO-TAPPED at Disa HQ

Dry Calculated Mass [lb]	96.7		
Still Wet Mass Recorded in Field			
ID	Tare [lb]	Gross [lb]	Net [lb]
Bucket 1	2.2	65.6	63.4
Bucket 2	2.2	58.2	56
		Total	119.4
		% Moisture	19.0%

Processed Mass % of Total	87.3%
Fines Mass % of Total	12.7%

Notes:
Refer to sample nomenclature in Section 4.1
CoC chain of custody
g gram

lb pound
mg/kg milligrams per kilogram
U Uranium

Sample ID	Field CoC 8/28/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
CR-H-4-SY	1.2	20.8	19.6	1.2	21.0	19.8	1663.96	3.67	18.5%
CR-H-8-SY	1.2	20.0	18.8	1.2	20.0	18.8	1655.26	3.65	19.4%
CR-H-30-SY	1.2	21.0	19.8	1.2	20.0	18.8	1350.28	2.98	15.8%

Mass Balance and Combination Goals							
Sample ID	RO-TAP Mass (-270-mesh) [g]	Mass % of RO-TAP Sample	Mass % TTL by Mass Balance	Proposed Mass Added of CR-H-0-F [g]	RO-TAP -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
CR-H-4-SY	97.92	5.9%	5.1%	240.99	2745	5414	4643
CR-H-8-SY	105.42	6.4%	5.6%	239.73	2683	5414	4580
CR-H-30-SY	167.47	12.4%	10.8%	195.56	1509	5414	3613

Sample Mass Check				
Sample ID	Total RO-TAP Mass [g]	Total RO-TAP Mass Including Combined CR-H-0-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
CR-H-4-SY	1663.96	1904.95	17.79%	17.79%
CR-H-8-SY	1655.26	1894.99	18.21%	18.21%
CR-H-30-SY	1350.28	1545.84	23.48%	23.48%

APPENDIX C-5
QUIVIRA CHURCH ROCK 1 MINE MASS BALANCE SHEETS

Quivira Low Sample Concentration Mass Balance
1

Original Mass Collected			
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]
QV-L-0-SL-01 Unscreened	2.2	61	58.8
QV-L-0-SL-02 Unscreened	2.2	58.4	56.2
Totals	4.4	119.4	115

8/25/2022



Material Screening over 1/4 inch

1/4" Screened Material				
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
QV-L-0-SL +1/4-inch-01	2.2	6.8	4.6	4.0%
QV-L-0-SL -1/4-inch-01	2.2	59.8	57.6	96.0%
QV-L-0-SL -1/4-inch-02	2.2	54.6	52.4	
Totals	6.6	121.2	114.6	

8/26/2022



Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1415.53
Estimated Remaining Mass 8/26 [lb]	111.48

CoC 8/26 recorded as 1414.34 g in field. Verified as 1415.53 in Lab

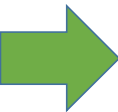


Moisture Content as Determined as Disa Lab

% Moisture	4.41%
Estimated True Dry Mass [lb]	106.56



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on
Quivira Low
Concentration
Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

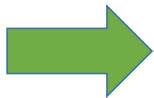
Notes:
Refer to sample nomenclature in Section 4.1
lb pound
g gram

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
QV-L-0-F-01	2.8	3.0	0.2
QV-L-0-F-02	2.8	8.0	5.2
QV-L-0-F-03	2.8	5.8	3.0
QV-L-0-F-04	2.8	6.4	3.6
			12.0

Unsettled Water Collection	
Depth Drum Total [in]	34
Volume Drum Total [gal]	55
Depth to Top of Water [in]	5.25
Volume Unsettled Water [gal]	46.5
Collected Unsettled Water Bucket Net Mass [lb]	14.4
Collected Unsettled Water Volume [gal]	1.73
Sampled as % of Total	3.7%
Net Mass Unsettled Water Sample [g]	35.19
Approximate Unsettled Mass [lb]	2.1

Quivira Low Sample Concentration Mass Balance
2

Continued from
Quivira Low
Concentration
Mass Balance 2



Coarse Material Processed 8/28/2022



Samples Collected and Wet Sieved at Disa Lab

Dry Calculated Mass [lb]		92.47	
Still Wet Mass Recorded in Field 8/28			
ID	Tare [lb]	Gross [lb]	Net [lb]
Bucket 1	2.2	46	43.8
Bucket 2	2.2	64	61.8
		Total	105.6
		% Moisture	12.4%

Processed Mass % of Total	86.8%
Fines Mass % of Total	13.2%

Notes:
Refer to sample nomenclature in Section 4.1

CoC chain of custody

g gram

lb pound

mg/kg milligrams per kilogram

U Uranium

Sample ID	Field CoC 8/28/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
QV-L-4-SY	1.2	18.2	17.0	1.2	18.2	17.0	1092.75	2.409	14.2%
QV-L-8-SY	1.2	20.8	19.6	1.2	21.0	19.8	1428.03	3.148	15.9%
QV-L-30-SY	1.2	20.0	18.8	1.2	19.8	18.6	1473.62	3.249	17.5%

Mass Balance and Combination Goals							
Sample ID	Sieved Mass (-270-mesh) [g]	Mass % of Sieved Sample	Mass % TTL by Mass Balance	Proposed Mass Added of QV-L-0-F [g]	Sieved -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
QV-L-4-SY	117.17	11%	9.3%	166.52	154	313	247
QV-L-8-SY	141.64	10%	8.3%	224.56	145	313	248
QV-L-30-SY	181.25	13%	11.0%	217.61	106	313	219

Sample Mass Check				
Sample ID	Total Sieved Mass [g]	Total Sieved Mass Including Combined QV-L-0-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
QV-L-4-SY	1092.75	1259.27	22.53%	22.53%
QV-L-8-SY	1473.62	1698.18	21.56%	21.56%
QV-L-30-SY	1428.03	1645.64	24.24%	24.24%

Quivira Medium Sample Concentration Mass Balance

1

Original Mass Collected			
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]
QV-M-0-SL-01			
Unscreened	2.2	56.8	54.6
QV-M-0-SL-02			
Unscreened	2.2	55.6	53.4
Totals	4.4	112.4	108

Originally collected as QV-H, Relabel due to concentration 8/25-8/27



Material Screening over 1/4 inch

1/4" Screened Material				
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
QV-M-0-SL +1/4-inch-01	2.2	4.6	2.4	2.2%
QV-M-0-SL -1/4-inch-01	2.2	58	55.8	97.8%
QV-M-0-SL -1/4-inch-01	2.2	51.8	49.6	
Totals	6.6	114.4	107.8	

8/26/2022



Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1545.98
Estimated Remaining Mass 8/26 [lb]	104.39

CoC 8/27 recorded as 1545.11 g in field. Verified as 1545.98 g in Lab



Moisture Content as Determined as Disa Lab

% Moisture	4.64%
Estimated True Dry Mass [lb]	99.55



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on Quivira Medium Concentration Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
QV-M-0-F-01	3.0	4.0	1.0
QV-M-0-F-02	2.8	8.0	5.2
QV-M-0-F-03	3.0	9.8	6.8
			13.0
Unsettled Water Collection			
Depth Drum Total [in]	34.0		
Volume Drum Total [gal]	55.0		
Depth to Top of Water [in]	7.0		
Volume Unsettled Water [gal]	43.7		
Collected Unsettled Water Bucket Net Mass [lb]	17.4		
Collected Unsettled Water Volume [gal]	2.1		
Sampled as % of Total	4.8%		
Net Mass Unsettled Water Sample [g]	74.39		
Approximate Unsettled Mass [lb]	3.4		

Notes:

Refer to sample nomenclature in Section 4.1

lb pound
g gram

Quivira Medium Sample Concentration Mass Balance
2

Continued from
Quivira Medium
Concentration
Mass Balance 2



Coarse Material Processed 8/28/2022



Samples Collected and Wet Sieved at Disa Lab

Dry Calculated Mass [lb]		83.11	
Still Wet Mass Recorded in Field 8/28			
ID	Tare [lb]	Gross [lb]	Net [lb]
Bucket 1	2.2	63.8	61.6
Bucket 2	2.2	35.8	33.6
		Total	95.2
		% Moisture	12.7%

Processed Mass % of Total	83.5%
Fines Mass % of Total	16.5%

Notes:

Refer to sample nomenclature in Section 4.1

CoC chain of custody

g gram

lb pound

mg/kg milligrams per kilogram

U Uranium

Sample ID	Field CoC 8/28/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
QV-M-4-SY	1.0	20.8	19.8	1.2	21.0	19.8	1577.35	3.477	17.6%
QV-M-8-SY	1.2	20.8	19.6	1.2	21.0	19.8	1605.29	3.539	17.9%
QV-M-30-SY	1.2	20.8	19.6	1.2	21	19.8	1430.72	3.154	15.9%

Mass Balance and Combination Goals							
Sample ID	Sieved Mass (-270-mesh) [g]	Mass % of Sieved Sample	Mass % TTL by Mass Balance	Proposed Mass Added of QV-M-0-F [g]	Sieved -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
QV-M-4-SY	66.40	4%	3.5%	311.91	330	994	877
QV-M-8-SY	78.60	5%	4.1%	317.44	337	994	864
QV-M-30-SY	124.50	9%	7.3%	282.92	248	994	766

Sample Mass Check				
Sample ID	Total Sieved Mass [g]	Total Sieved Mass Including Combined QV-M-0-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
QV-M-4-SY	1577.35	1889.26	20.02%	20.02%
QV-M-8-SY	1605.29	1922.73	20.60%	20.60%
QV-M-30-SY	1430.72	1713.64	23.78%	23.78%

1

Original Mass Collected			
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]
QV-H-0-SL-01			
Unscreened	2.2	68.6	66.4
QV-H-0-SL-02			
Unscreened	2.2	69.2	67
Totals	4.4	137.8	133.4



Material Screening over 1/4 inch

1/4" Screened Material				
Bulk Sample ID	Tare [lb]	Gross [lb]	Net [lb]	Percent of Total
QV-H-0-SL +1/4-inch-01	2.2	5.6	3.4	2.6%
QV-H-0-SL -1/4-inch-01	2.2	62.0	59.8	97.4%
QV-H-0-SL -1/4-inch-02	2.2	57.8	55.6	
QV-H-0-SL -1/4-inch-03	2.2	15.6	13.4	
Totals	8.8	141	132.2	

8/26/2022



Mixing and Subsampling

Subsample Taken	
Net Mass [g]	1603.28
Estimated Remaining Mass 8/26 [lb]	128.67

CoC 8/27 recorded as 1602.93 g in field. Verified as 1603.28 g in Lab



Moisture Content as Determined as Disa Lab

% Moisture	4.19%
Estimated True Dry Mass [lb]	123.3



Material Pre-Cutting over 270-mesh screen at site 8/27/2022



Continued on
Quivira High
Concentration
Mass Balance 2



-270 Feed Fines Brought Back to Shop and Dried

Notes:

Refer to sample nomenclature in Section 4.1

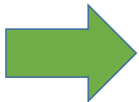
lb pound

g gram

Dried Pan ID	Tare Mass [lb]	Gross Mass [lb]	Net Mass [lb]
QV-H-O-F-01	2.8	11.2	8.4
QV-H-O-F-02	2.8	4.4	1.6
QV-H-O-F-03	2.8	5.8	3
			13
Unsettled Water Collection			
Depth Drum Total [in]	34		
Volume Drum Total [gal]	55		
Depth to Top of Water [in]	9		
Volume Unsettled Water [gal]	40.4		
Collected Unsettled Water Bucket Net Mass [lb]	16		
Collected Unsettled Water Volume [gal]	1.92		
Sampled as % of Total	4.7%		
Net Mass Unsettled Water Sample [g]	121.64		
Approximate Suspended Mass [lb]	5.66		

Quivira High Sample Concentration Mass Balance
2

Continued from
Quivira High
Concentration
Mass Balance 2



Coarse Material Processed 8/28/2022



Samples Collected and Wet Sieved at Disa Lab

Dry Calculated Mass [lb]		104.6	
Still Wet Mass Recorded in Field 8/28			
ID	Tare [lb]	Gross [lb]	Net [lb]
Bucket 1	2.2	65.6	63.4
Bucket 2	2.2	58.2	56
		Total	119.4
		% Moisture	12.4%

Processed Mass % of Total	84.9%
Fines Mass % of Total	15.1%

Notes:

Refer to sample nomenclature in Section 4.1

CoC chain of custody

g gram

lb pound

mg/kg milligrams per kilogram

U Uranium

Sample ID	Field CoC 8/28/22			Shop Receipt CoC 9/2/22 (True Value)			Solids Dry Mass [g]	Solids Dry Mass [lb]	Solids % by Mass
	Tare [lb]	Gross [lb]	Net [lb]	Tare [lb]	Gross [lb]	Net [lb]			
QV-H-4-SY	1.2	22.2	21.0	1.2	22.4	21.2	2185.54	4.818	22.7%
QV-H-8-SY	1.2	21.6	20.4	1.2	21.4	20.2	2125.8	4.687	23.2%
QV-H-30-SY	1.0	20.8	19.8	1.0	20.8	19.8	1808.39	3.987	20.1%

Mass Balance and Combination Goals							
Sample ID	Sieved Mass (-270-mesh) [g]	Mass % of Sieved Sample	Mass % TTL by Mass Balance	Proposed Mass Added of QV-H-0-F [g]	Sieved -270 XRF U mg/kg	Fines XRF U mg/kg	Proposed Combined Concentrate U mg/kg
QV-H-4-SY	84.22	4%	3.27%	389.75	658	1510	1359
QV-H-8-SY	96.03	5%	3.83%	379.09	545	1510	1315
QV-H-30-SY	144.96	8%	6.80%	322.49	340	1510	1147

Sample Mass Check				
Sample ID	Total Sieved Mass [g]	Total Sieved Mass Including Combined QV-H-0-F [g]	Concentrate Mass % of Total (Mass Calculated)	Concentrate Mass % of Total (Balance sum of Percents in this Sheet)
QV-H-4-SY	2185.54	2575.29	18.40%	18.40%
QV-H-8-SY	2125.80	2504.89	18.97%	18.97%
QV-H-30-SY	1808.39	2130.88	21.94%	21.94%