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Pressure leaching characteristics of a magnetically enhanced concentrate with specific refrence to the precious metal components

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APPENDIX C

Mass Balance Data

Tertiary Leach No. 1

Tertiary leach feed mass : 240.26
Volume of 50 g/l H_2SO_4 : 1200
Fractions used : 1, 5, 9, 13 and 3

Leach Conditions :
Pressure with O_2 10 Bar
RPM with baffle insert 400
Temperature 150 ℃
Solid : Liquid 5
Acid Concentration 50 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ir mg	Ru mg	Cu g	Ni g	Fe mg	Co mg	S g
Head	6400.526	8517.217	639.092	2152.730	336.364	3543.835	78.493	26.244	3101.757	365.195	71.037
1 Hour Leach Solid	92.324	269.004	18.548	62.884	4.698	103.182	1264.110	198.569	24.778	3.236	809.796
1 Hour Total Liquor Content	0.023	0.023	0.012	0.077	0.023	0.240	1258.225	614.660	64.588	7.919	1562.000
2 Hour Leach Solid	151.469	362.987	26.065	88.660	7.148	145.948	417.707	53.564	24.803	0.835	314.601
2 Hour Total Liquor Content	0.020	0.020	0.010	0.606	0.044	2.226	3064.470	1033.166	101.326	13.672	2838.930
3 Hour Leach Solid	138.663	328.863	25.163	69.913	6.288	122.988	0.000	0.000	0.000	0.000	0.000
3 Hour Total Liquor Content	0.036	10.648	0.016	14.482	0.413	15.963	3613.560	1083.088	114.828	14.429	3129.520
4 Hour Leach Solid	428.741	853.592	65.288	163.351	19.141	333.300	244.633	141.544	66.948	2.054	235.630
4 Hour Leach Liquor	0.110	32.666	0.110	24.543	1.109	24.552	8641.600	2600.400	271.480	35.438	8012.400
Final Leach Solid	5473.986	6332.197	470.282	1177.873	265.843	2505.283	3401.782	2578.968	1292.735	35.398	2261.834
Final Leach Liquor	0.489	23.323	0.489	426.190	8.094	164.787	59647.050	18103.300	2236.520	252.195	53977.550

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
In 1 Hour	0.00	0.00	0.00	0.00	0.01	0.01	1.60	2.34	2.08	2.17	2.20
In 2 Hours	0.00	0.00	0.00	0.03	0.01	0.06	3.97	3.97	3.29	3.78	4.04
In 3 Hours	0.00	0.14	0.00	0.72	0.13	0.48	4.70	4.17	3.76	4.00	4.48
In 4 Hours	0.00	0.43	0.02	1.27	0.35	0.77	11.25	10.00	8.89	9.81	11.46
In Final	0.01	0.35	0.10	24.11	2.71	5.81	77.90	70.03	74.92	70.24	77.47

Cumulative Deportment	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
After 0 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.59
After 1 Hour	0.00	0.00	0.00	0.00	0.01	0.01	1.60	2.34	2.08	2.17	2.20
After 2 Hours	0.00	0.00	0.00	0.03	0.02	0.07	5.60	6.33	5.39	5.97	6.27
After 3 Hours	0.00	0.14	0.01	0.76	0.15	0.56	10.33	10.51	9.20	9.97	10.77
After 4 Hours	0.00	0.57	0.03	2.06	0.50	1.36	21.58	20.51	18.09	19.79	22.23
Final	0.01	0.99	0.13	26.35	3.24	7.32	99.55	90.66	93.42	90.14	99.77

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
ALR Starting feed	2.664	3.545	0.266	0.896	0.14	1.475	32.67	10.923	1.291	0.152	21.409
Final leach material	15.155	17.531	1.302	3.261	0.736	6.936	9.418	7.14	3.579	0.098	6.262

Tertiary Leach No. 2

Tertiary leach feed mass : 100.70
Volume of 60 g/l H_2SO_4 : 1200.00 plus 50 g/l after 5.5 hours
Fractions used : 13-2 and 13-12

Leach Conditions :
Pressure with O_2 10 Bar
RPM with baffle insert 400
Temperature 150 ℃
Solid : Liquid 12
Acid Concentration 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ir mg	Ru mg	Cu g	Ni g	Fe mg	Co mg	S g
Head	6444.800	4712.760	364.534	1188.260	1772.320	305.121	37.662	14.501	1943.510	181.260	18.630
0.5 Hour Total Liquor Content	0.000	0.011	0.000	0.005	0.116	0.002	0.089	0.033	0.000	0.000	0.222
1 Hour Total Liquor Content	0.000	0.005	0.000	0.005	0.014	0.002	0.093	0.029	0.000	0.209	0.107
2 Hour Total Liquor Content	0.000	0.005	0.000	0.004	0.013	0.002	0.101	0.030	0.000	0.246	0.082
3 Hour Leach Liquor	0.000	0.006	0.000	0.002	0.007	0.000	0.029	0.008	0.000	0.000	0.018
4 Hour Leach Liquor	0.001	0.019	0.000	0.007	0.013	0.000	0.057	0.018	0.000	0.000	0.032
4.5 Hour Leach Liquor	0.001	0.025	0.000	0.013	0.039	0.001	0.357	0.107	12.776	1.264	0.197
5 Hour Leach Liquor	0.000	0.005	0.000	0.011	0.045	0.002	0.428	0.121	14.408	1.516	0.205
5.5 Hour Leach Solid	416.380	439.300	31.782	103.522	151.654	16.770	0.863	0.356	0.045	0.005	0.653
5.5 Hour Leach Liquor	0.000	0.006	0.000	0.141	1.414	0.061	19.629	5.554	668.057	74.999	9.314
6 Hour Leach Liquor	0.000	0.005	0.000	0.007	0.055	0.002	0.014	0.002	0.000	0.000	0.207
7 Hour Leach Liquor	0.000	0.011	0.000	0.008	0.020	0.001	0.007	0.001	0.000	0.000	0.044
8 Hour Leach Liquor	0.002	0.079	0.000	0.040	0.144	0.008	0.092	0.026	0.000	0.000	0.237
9 Hour Leach Liquor	0.009	0.816	0.000	3.360	3.900	0.091	0.236	0.077	0.000	0.000	0.413
9.5 Hour Leach Liquor	0.007	7.562	0.000	3.477	3.819	0.084	0.129	0.044	0.000	0.000	0.213
9.75 Hour Leach Liquor	0.009	9.775	0.000	5.675	6.100	0.133	0.195	0.067	0.000	0.000	0.320
10 Hour Leach Liquor	0.009	12.000	0.000	6.125	6.475	0.144	0.192	0.066	0.000	0.000	0.311
Final Leach Solid	5171.400	2738.700	200.430	460.530	823.140	198.900	0.636	1.458	426.870	15.300	0.474
Final Leach Liquor	0.278	7.470	0.000	248.250	277.500	6.518	7.922	2.315	833.574	0.000	12.952

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.01	0.00	0.24	0.23	0.00	0.00	1.19
In 1 Hour	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.20	0.00	0.12	0.58
In 2 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.21	0.00	0.14	0.44
In 3 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.05	0.00	0.00	0.10
In 4 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.00	0.00	0.17
In 4.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.74	0.66	0.70	1.06
In 5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.83	0.74	0.84	1.10
In 5.5 Hour	0.00	0.00	0.00	0.01	0.08	0.02	52.12	38.30	34.37	41.38	50.00
In 6 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	1.11
In 7 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.24
In 8 Hours	0.00	0.00	0.00	0.00	0.01	0.00	0.24	0.18	0.00	0.00	1.27
In 9 Hours	0.00	0.02	0.00	0.28	0.22	0.03	0.63	0.53	0.00	0.00	2.22
In 9.5 Hours	0.00	0.16	0.00	0.29	0.22	0.03	0.34	0.30	0.00	0.00	1.14
In 9.75 Hours	0.00	0.21	0.00	0.48	0.34	0.04	0.52	0.46	0.00	0.00	1.72
In 10 Hours	0.00	0.25	0.00	0.52	0.37	0.05	0.51	0.46	0.00	0.00	1.67
In Final	0.00	0.16	0.00	20.89	15.66	2.14	21.03	15.97	42.89	0.00	69.52

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO_4^{2-} %
ALR Starting feed	6.400	4.680	0.362	1.180	1.760	0.303	37.400	14.400	1.930	0.180	18.500	1.860
Final leach material	33.800	17.900	1.310	3.010	5.380	1.300	4.160	9.530	2.790	0.100	3.100	1.060

Tertiary Leach No. 3

Tertiary leach feed mass : 100.02
Volume of 60 g/l H_2SO_4 : 1200
Fractions used : 13-6 and 13-13

Leach Conditions :
Pressure with O_2 : 10 Bar
RPM with baffle insert : 400
Solid : Liqid ratio : 12
Acid Concentration : 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ru mg	Ir mg	Cu g	Ni g	Fe g	Co mg	S g
Head	9051.810	5551.110	430.086	1360.272	2010.402	380.076	29.406	16.403	1.960	200.040	20.704
0.5 Hour Leach Liquor	0.001	0.030	0.000	0.053	0.761	0.014	0.288	61.866	0.000	0.168	691.243
1 Hour Leach Liquor	0.001	0.022	0.000	0.019	0.116	0.006	0.208	67.887	0.000	0.453	286.444
2 Hour Leach Liquor	0.000	0.019	0.000	0.007	0.035	0.003	0.129	38.397	0.000	0.358	114.291
3 Hour Leach Liquor	0.000	0.013	0.000	0.010	0.044	0.004	0.298	80.629	11.489	0.996	218.799
3.5 Hour Leach Liquor	0.000	0.014	0.000	0.008	0.031	0.003	0.277	77.208	10.814	0.942	201.834
Final Leach Solid	9649.600	4570.240	367.040	1124.800	1704.960	408.480	12.550	8.525	1.421	112.480	11.070
Final Leach Liquor	0.000	0.000	0.000	0.057	1.127	0.181	16.865	4.570	0.635	59.354	11.828

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ru %	Ir %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.04	0.00	0.98	0.38	0.00	0.08	3.34
In 1 Hour	0.00	0.00	0.00	0.00	0.01	0.00	0.71	0.41	0.00	0.23	1.38
In 2 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.23	0.00	0.18	0.55
In 3 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.49	0.59	0.50	1.06
In 3.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.47	0.55	0.47	0.97
In Final	0.00	0.00	0.00	0.00	0.06	0.05	57.35	27.86	32.40	29.67	57.13

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO42- %
ALR Starting feed	9.050	5.550	0.430	1.360	2.010	0.380	29.400	16.400	1.960	0.200	20.700	2.750
Final leach material	16.300	7.720	0.620	1.900	2.880	0.690	21.200	14.400	2.400	0.190	18.700	

Tertiary Leach No. 4

Tertiary leach feed mass : 100.41
Volume of 60 g/l H2SO4 : 1200
Fractions used : 13-3 and 13-11

Leach Conditions :
Pressure with O2 : 10 Bar
RPM with baffle insert : 400
Solid : Liqid ratio : 12
Acid Concentration : 80 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ru mg	Ir mg	Cu g	Ni g	Fe g	Co mg	S g
Head	7791.816	5130.951	391.599	1235.043	1968.036	328.341	37.353	14.258	1.526	160.656	18.375
0.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	0.283	0.062	0.000	0.000	0.963
1 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.091	0.000	0.312	0.130	0.024	1.140	0.623
2 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.036	0.000	0.227	0.077	0.018	0.000	0.317
3 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.108	0.000	0.363	0.104	0.028	1.236	0.368
4 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.175	0.000	0.541	0.145	0.038	0.000	0.414
5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.186	0.000	0.764	0.209	0.054	0.000	0.474
5.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.283	0.000	0.642	0.203	0.047	2.608	0.385
6 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.227	0.000	0.610	0.186	0.047	2.503	0.345
6.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.212	0.000	0.620	0.178	0.048	0.000	0.332
6.75 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.600	0.000	0.873	0.246	0.068	3.750	0.473
7 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.539	0.000	1.080	0.310	0.089	4.534	0.553
7.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	7.363	0.000	17.477	5.067	1.512	0.000	9.048
8 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	0.204	0.075	0.006	0.915	0.472
8.5 Hour Leach Liquor	0.000	0.000	0.000	0.640	1.685	0.000	0.261	0.099	0.000	0.000	0.573
9 Hour Leach Liquor	0.000	11.369	0.000	2.386	5.072	0.000	0.345	0.131	0.000	0.000	0.732
9.25 Hour Leach Liquor	0.000	6.160	0.000	2.983	4.219	0.000	0.200	0.075	0.000	0.000	0.413
10 Hour Leach Liquor	0.000	7.170	0.000	8.811	0.000	0.000	0.266	0.103	0.000	0.000	0.554
10.25 Hour Leach Liquor	0.000	0.000	0.000	261.494	118.018	0.000	8.103	2.979	0.000	0.000	15.912
Final Leach Solid	6249.600	3180.600	238.080	448.260	1086.240	241.800	0.768	1.447	0.463	15.810	0.445
Final Leach Liquor	0.000	0.000	0.000	263.774	118.018	0.000	8.409	3.023	0.000	0.000	16.081

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ru %	Ir %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.43	0.00	0.00	5.24
In 1 Hour	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.91	1.58	0.71	3.39
In 2 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.54	1.15	0.00	1.72
In 3 Hours	0.00	0.00	0.00	0.00	0.01	0.00	0.97	0.73	1.81	0.77	2.00
4 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.01	0.00	1.45	1.02	2.49	0.00	2.25
5 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.01	0.00	2.05	1.46	3.52	0.00	2.58
5.5 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.01	0.00	1.72	1.42	3.07	1.62	2.09
6 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.01	0.00	1.63	1.30	3.06	1.56	1.88
6.5 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.01	0.00	1.66	1.25	3.13	0.00	1.81
6.75 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.03	0.00	2.34	1.73	4.48	2.33	2.57
7 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.03	0.00	2.89	2.18	5.80	2.82	3.01
7.5 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.37	0.00	46.79	35.54	99.07	0.00	49.24
8 Hour Leach Liquor	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.52	0.40	0.57	2.57
8.5 Hour Leach Liquor	0.00	0.00	0.00	0.05	0.09	0.00	0.70	0.69	0.00	0.00	3.12
9 Hour Leach Liquor	0.00	0.22	0.00	0.19	0.26	0.00	0.92	0.92	0.00	0.00	3.99
9.25 Hour Leach Liquor	0.00	0.12	0.00	0.24	0.21	0.00	0.53	0.53	0.00	0.00	2.25
10 Hour Leach Liquor	0.00	0.14	0.00	0.71	0.00	0.00	0.71	0.73	0.00	0.00	3.01
In Final	0.00	0.00	0.00	21.36	6.00	0.00	22.51	21.20	0.00	0.00	87.52

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO_4^{2-} %
ALR Starting feed	7.760	5.110	0.390	1.230	1.960	0.327	37.200	14.200	1.520	0.160	18.300	1.320
Final leach material	33.600	17.100	1.280	2.410	5.840	1.300	4.130	7.780	2.490	0.085	2.390	1.270

Tertiary Leach No. 5

Tertiary leach feed mass : 100.67
Volume of 60 g/l H2SO4 : 1200
Fractions used : 13-8 and 13-16

Leach Conditions :
Pressure with O2 : 10 Bar
RPM with baffle insert : 400
Solid : Liqid ratio : 12
Acid Concentration : 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ru mg	Ir mg	Cu g	Ni g	Fe g	Co mg	S g
Head	7751.590	4691.222	352.345	1147.638	1741.591	342.278	37.349	14.094	1.842	171.139	18.825
0.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	261.349	47.987	3.283	0.000	512.420
1.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.226	0.000	260.673	122.251	18.468	0.987	628.492
2.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.111	0.000	331.780	145.035	21.278	1.318	469.861
3.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.123	0.000	486.486	206.656	29.389	1.977	558.465
4 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.096	0.000	453.796	171.701	25.298	1.720	437.138
5 Hour Leach Liquor	0.000	0.000	0.000	0.000	1.007	0.000	5564.260	1766.162	256.425	19.358	3970.138
5.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	203.460	64.706	0.000	0.659	529.298
Final Leach Solid	2027.970	514.485	43.956	135.864	225.774	89.910	2.438	1.499	0.296	19.980	1.598
Final Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	9.031	2.515	0.060	29.732	23.937

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ru %	Ir %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.34	0.18	0.00	2.72
In 1.5 Hour	0.00	0.00	0.00	0.00	0.01	0.00	0.70	0.87	1.00	0.58	3.34
In 2.5 Hours	0.00	0.00	0.00	0.00	0.01	0.00	0.89	1.03	1.16	0.77	2.50
In 3.5 Hours	0.00	0.00	0.00	0.00	0.01	0.00	1.30	1.47	1.60	1.16	2.97
4 Hours	0.00	0.00	0.00	0.00	0.01	0.00	1.22	1.22	1.37	1.01	2.32
5 Hours	0.00	0.00	0.00	0.00	0.06	0.00	14.90	12.53	13.92	11.31	21.09
5.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.46	0.00	0.39	2.81
In Final	0.00	0.00	0.00	0.00	0.00	0.00	24.18	17.84	3.25	17.37	127.15

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO_4^{2-} %
ALR Starting feed	7.700	4.660	0.350	1.140	1.730	0.340	37.100	14.000	1.830	0.170	18.700	1.320
Final leach material	20.300	5.150	0.440	1.360	2.260	0.900	24.400	15.000	2.960	0.200	16.000	2.460

Tertiary Leach No. 6

Tertiary leach feed mass : 100.28
Volume of 60 g/l H_2SO_4 : 1200.00 plus 50 g/l after 5.5 hours
Fractions used : 5-13 and 5-5

Leach Conditions :
Pressure with O_2 10 Bar
RPM with baffle insert 400
Temperature 150 ℃
Solid : Liquid 12
Acid Concentration 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ir mg	Ru mg	Cu g	Ni g	Fe mg	Co mg	S g
Head	7721.560	4673.048	350.980	1143.192	1734.844	340.952	37.204	14.039	1835.124	170.476	18.752
0.5 Hour Leach Liquor	0.001	0.051	0.002	0.055	0.666	0.004	0.108	0.027	0.000	0.000	0.475
1 Hour Leach Liquor	0.001	0.031	0.004	0.011	0.434	0.006	0.292	0.237	0.000	0.000	1.661
2 Hour Leach Liquor	0.000	0.018	0.001	0.005	0.042	0.001	0.181	0.084	0.000	0.000	0.314
3 Hour Leach Liquor	0.000	0.013	0.001	0.004	0.023	0.001	0.177	0.069	0.000	0.000	0.234
4 Hour Leach Liquor	0.001	0.030	0.001	0.006	0.029	0.001	0.343	0.119	0.000	0.000	0.371
5 Hour Leach Liquor	0.001	0.037	0.001	0.010	0.044	0.002	0.427	0.138	0.000	0.000	0.389
5.5 Hour Leach Liquor	0.001	0.030	0.001	0.008	0.037	0.001	0.377	0.124	0.000	0.000	0.341
5.6 Hour Leach Solid	0.001	0.033	0.001	0.009	0.045	0.002	0.534	0.172	0.000	0.000	0.459
5.7 Hour Leach Liquor	0.001	0.041	0.001	0.008	0.042	0.001	0.506	0.163	0.000	0.000	0.439
7 Hour Leach Liquor	0.001	0.055	0.001	0.011	0.043	0.001	0.486	0.159	0.000	0.000	0.399
8 Hour Leach Liquor	0.003	0.006	0.017	0.045	0.469	0.012	6.667	2.134	0.000	0.000	5.216
9 Hour Leach Liquor	0.000	0.017	0.002	0.006	0.054	0.001	0.922	0.288	0.000	0.000	1.066
10 Hour Leach Liquor	0.000	0.024	0.002	0.010	0.037	0.002	0.812	0.256	0.000	0.000	0.943
10.5 Hour Leach Liquor	0.001	0.077	0.002	0.021	0.082	0.003	0.815	0.255	0.000	0.000	0.945
10.6 Hour Leach Liquor	0.001	0.040	0.002	0.009	0.054	0.002	0.811	0.254	0.000	0.000	0.926
11 Hour Leach Liquor	0.001	0.046	0.001	0.016	0.099	0.003	0.772	0.238	0.000	0.000	0.865
11.75 Hour Leach Liquor	0.000	0.015	0.001	0.028	0.160	0.004	0.788	0.241	0.000	0.000	0.864
11.78 Hour Leach Liquor	0.001	0.063	0.001	0.038	0.155	0.004	0.729	0.222	0.000	0.000	0.799
12 Hour Leach Liquor	0.001	0.052	0.001	0.029	0.153	0.004	0.760	0.231	0.000	0.000	0.831
13 Hour Leach Liquor	0.002	0.215	0.001	0.325	0.406	0.020	0.762	0.251	0.000	0.000	0.774
13.5 Hour Leach Liquor	0.004	0.382	0.001	0.910	1.115	0.038	0.751	0.235	0.000	0.000	0.797
13.75 Hour Leach Liquor	0.013	1.018	0.002	3.427	3.864	0.115	1.357	0.421	0.000	0.000	1.437
14 Hour Leach Liquor	0.013	1.533	0.001	2.425	2.550	0.071	0.723	0.225	0.000	0.000	0.756
14.1 Hour Leach Liquor	0.019	2.802	0.002	3.240	3.300	0.090	0.856	0.266	0.000	0.000	0.891
14.2 Hour Leach Liquor	0.012	3.724	0.001	3.444	3.472	0.094	0.817	0.254	0.000	0.000	0.863
14.4 Hour Leach Liquor	0.059	10.578	0.002	5.699	5.535	0.149	1.197	0.372	0.000	0.000	1.253
Final Leach Solid	5770.660	2315.280	213.988	475.334	869.984	271.870	1.894	1.722	538.478	21.048	0.933
Final Leach Liquor	0.210	200.000	0.050	223.000	214.000	6.410	33.770	10.320	0.000	0.000	36.752

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.04	0.00	0.29	0.19	0.00	0.00	2.53
In 1 Hour	0.00	0.00	0.00	0.00	0.02	0.00	0.78	1.69	0.00	0.00	8.86
In 2 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.60	0.00	0.00	1.68
In 3 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.49	0.00	0.00	1.25
In 4 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.85	0.00	0.00	1.98
In 5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.98	0.00	0.00	2.07
In 5.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.88	0.00	0.00	1.82
In 5.6 Hour	0.00	0.00	0.00	0.00	0.00	0.00	1.43	1.23	0.00	0.00	2.45
In 5.7 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.36	1.16	0.00	0.00	2.34
In 7 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.31	1.13	0.00	0.00	2.13
In 8 Hours	0.00	0.00	0.00	0.00	0.03	0.00	17.92	15.20	0.00	0.00	27.82
In 9 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.48	2.05	0.00	0.00	5.69
In 10 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.18	1.83	0.00	0.00	5.03
In 10.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.19	1.82	0.00	0.00	5.04
In 10.6 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.18	1.81	0.00	0.00	4.94
In 11 Hours	0.00	0.00	0.00	0.00	0.01	0.00	2.07	1.70	0.00	0.00	4.61
In 11.75 Hours	0.00	0.00	0.00	0.00	0.01	0.00	2.12	1.72	0.00	0.00	4.61
In 11.78 Hours	0.00	0.00	0.00	0.00	0.01	0.00	1.96	1.58	0.00	0.00	4.26
In 12 Hours	0.00	0.00	0.00	0.00	0.01	0.00	2.04	1.65	0.00	0.00	4.43
In 13 Hours	0.00	0.00	0.00	0.03	0.02	0.01	2.05	1.79	0.00	0.00	4.13
In 13.5 Hours	0.00	0.01	0.00	0.08	0.06	0.01	2.02	1.67	0.00	0.00	4.25
In 13.75 Hours	0.00	0.02	0.00	0.30	0.22	0.03	3.65	3.00	0.00	0.00	7.66
In 14 Hours	0.00	0.03	0.00	0.21	0.15	0.02	1.94	1.60	0.00	0.00	4.03
In 14.1 Hours	0.00	0.06	0.00	0.28	0.19	0.03	2.30	1.90	0.00	0.00	4.75
In 14.2 Hours	0.00	0.08	0.00	0.30	0.20	0.03	2.20	1.81	0.00	0.00	4.60
In 14.4 Hours	0.00	0.23	0.00	0.50	0.32	0.04	3.22	2.65	0.00	0.00	6.68
In Final	0.00	4.28	0.01	19.51	12.34	1.88	90.77	73.51	0.00	0.00	195.98

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO_4^{2-} %
ALR Starting feed	7.700	4.660	0.350	1.140	1.730	0.340	37.100	14.000	1.830	0.170	18.700	2.580
Final leach material	32.900	13.200	1.220	2.710	4.960	1.550	10.800	9.820	3.070	0.120	5.320	1.140

Tertiary Leach No. 7

Tertiary leach feed mass : 100.24
Volume of 60 g/l H_2SO_4 : 1200
Fractions used : 5-9 and 5-16

Leach Conditions :
Pressure with O_2 : 10 Bar
RPM with baffle insert : 400
Solid : Liqid ratio : 12
Acid Concentration : 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ru mg	Ir mg	Cu g	Ni g	Fe g	Co mg	S g
Head	6726.104	5102.216	363.871	1062.544	1824.368	298.715	37.089	13.933	1.634	160.384	18.745
0.5 Hour Leach Liquor	0.001	0.014	0.001	0.163	0.469	0.005	0.079	12.105	0.000	0.000	267.337
1 Hour Leach Liquor	0.003	0.003	0.003	0.032	0.700	0.007	0.421	88.594	0.000	0.000	1204.540
2 Hour Leach Liquor	0.003	0.003	0.003	0.003	0.060	0.003	0.624	276.262	0.000	0.000	1231.039
3 Hour Leach Liquor	0.005	0.005	0.005	0.005	0.050	0.005	1.071	597.586	0.000	0.000	1952.370
3.5 Hour Leach Liquor	0.002	0.002	0.002	0.008	0.059	0.002	0.757	303.414	0.000	0.000	913.450
Final Leach Solid	5206.380	3881.950	293.658	854.029	1438.605	230.634	9.408	4.494	0.731	50.237	7.581
Final Leach Liquor	0.032	0.032	0.032	0.282	2.624	0.035	15.307	4.274	0.000	0.000	10.898

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ru %	Ir %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.02	0.03	0.00	0.21	0.09	0.00	0.00	1.43
In 1 Hour	0.00	0.00	0.00	0.00	0.04	0.00	1.14	0.64	0.00	0.00	6.43
In 2 Hours	0.00	0.00	0.00	0.00	0.00	0.00	1.68	1.98	0.00	0.00	6.57
In 3 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.89	4.29	0.00	0.00	10.42
In 3.5 Hours	0.00	0.00	0.00	0.00	0.00	0.00	2.04	2.18	0.00	0.00	4.87
In Final	0.00	0.00	0.01	0.03	0.14	0.01	41.27	30.67	0.00	0.00	58.14

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO42- %
ALR Starting feed	6.710	5.090	0.363	1.060	1.820	0.298	37.000	13.900	1.630	0.160	18.700	1.590
Final leach material	11.400	8.500	0.643	1.870	3.150	0.505	20.600	9.840	1.600	0.110	16.600	4.250

Tertiary Leach No. 10

Tertiary leach feed mass : 90.11
Volume of 60 g/l H2SO4 : 1500.00
Fractions used : 5-3 and 5-12

Leach Conditions :
Pressure with O2 10 Bar
RPM with baffle insert 400
Temperature 150 ℃
Solid : Liquid 17
Acid Concentration 60 g/l

Mass Balance Details

	Pt mg	Pd mg	Au mg	Rh mg	Ir mg	Ru mg	Cu g	Ni g	Fe mg	Co mg	S g
Head	6399.000	4302.000	324.900	1080.000	1674.000	302.400	33.291	12.546	1800.000	162.000	16.803
0.5 Hour Leach Liquor	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.031	0.000	0.000	0.397
1.5 Hour Leach Liquor	0.005	0.005	0.005	0.005	0.228	0.005	0.207	0.086	0.000	0.000	0.827
7 Hour Leach Liquor	0.005	0.005	0.005	0.007	0.137	0.008	0.685	0.209	0.000	0.000	0.866
9 Hour Leach Liquor	0.005	0.005	0.005	0.141	0.681	0.042	0.975	0.302	0.000	0.000	0.822
9.5 Hour Leach Liquor	0.007	0.007	0.007	0.054	0.921	0.133	1.645	0.488	0.000	0.000	1.440
10.5 Hour Leach Liquor	0.066	0.066	0.066	1.089	9.788	1.287	15.035	4.420	0.000	0.000	12.634
11.5 Hour Leach Liquor	0.005	0.005	0.005	0.041	0.440	0.039	1.617	0.457	0.000	0.000	2.054
13.5 Hour Leach Liquor	0.006	0.006	0.006	0.106	0.803	0.049	1.823	0.508	0.000	0.000	2.284
16 Hour Leach Liquor	0.009	37.485	0.009	8.755	12.580	0.534	2.718	0.772	0.000	0.000	3.335
Final Leach Solid	5.223	2.347	0.197	0.325	0.804	0.208	0.444	1.245	0.450	0.017	0.158
Final Leach Liquor	0.121	280.203	0.121	379.669	266.860	11.960	40.494	11.782	0.000	0.000	51.002

Deportment to Leach Liquor

Sequential Deportment	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %
In 0.5 Hour	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.25	0.00	0.00	2.36
In 1.5 Hour	0.00	0.00	0.00	0.00	0.01	0.00	0.62	0.69	0.00	0.00	4.92
In 7 Hours	0.00	0.00	0.00	0.00	0.01	0.00	2.06	1.67	0.00	0.00	5.16
In 9 Hours	0.00	0.00	0.00	0.01	0.04	0.01	2.93	2.41	0.00	0.00	4.89
In 9.5 Hours	0.00	0.00	0.00	0.01	0.06	0.04	4.94	3.89	0.00	0.00	8.57
In 10.5 Hours	0.00	0.00	0.02	0.10	0.58	0.43	45.16	35.23	0.00	0.00	75.19
In 11.5 Hours	0.00	0.00	0.00	0.00	0.03	0.01	4.86	3.64	0.00	0.00	12.23
In 13.5 Hour	0.00	0.00	0.00	0.01	0.05	0.02	5.48	4.05	0.00	0.00	13.60
In 16 Hours	0.00	0.87	0.00	0.81	0.75	0.18	8.16	6.16	0.00	0.00	19.85
In Final	0.00	6.51	0.04	35.15	15.94	3.96	121.64	93.91	0.00	0.00	303.53

Materials	Pt %	Pd %	Au %	Rh %	Ir %	Ru %	Cu %	Ni %	Fe %	Co %	S %	SO_4^{2-} %
ALR Starting feed	7.110	4.780	0.361	1.200	1.860	0.336	36.990	13.940	2.000	0.180	18.670	1.080
Final leach material	37.600	16.900	1.420	2.340	5.790	1.500	3.200	8.960	3.240	0.120	1.140	0.790